Review for last Week (Nov. 6-Dec. 1)

- Virtual instruments (VIs) have three main parts: the front panel, the block diagram, and the icon/connector
- The front panel is the interface of a LabVIEW program and the block diagram is the executable code
- Menu options allow you to access different features in LabVIEW
- Floating Palettes
  - Tools Palette
  - Controls Palette (only when Panel Window is active)
  - Functions Palette (only when Diagram Window is active)

  Right mouse click on Windows to get Controls and Functions
- There are help utilities including the Context Help Window and Contents and Index…
- Hands-on examples: 1.C to F conversion; 2. Creating a VI to generate, display and analyze a signal
- Homework: F to C conversion VI

This Week (Dec 2-8)---Lesson 2
Sub VI, Reading and Saving a signal

You Will Learn:

A. How to Create sub VIs

B. How to save a signal

C. How to read a file

We would emphasize what we learnt also last week:

- An Express VI (only in LabVIEW Express 8.2) is a component of the block diagram that you can configure to perform common measurement tasks. It is first-level shortcut in Controls and Functions pallets with white&blue background
- All LabVIEW objects have shortcut menus (Right mouse click)
- You place controls (inputs) and indicators (outputs) in the panel window
- Control terminals have thicker borders than indicator terminals
- Wiring is the mechanism to control dataflow and produce LabVIEW programs
- Broken Run arrow = nonexecutable VI
- Various debugging tools and options available such as execution highlighting

A. Creating a SubVI

You Will Learn:

A. What a SubVI is

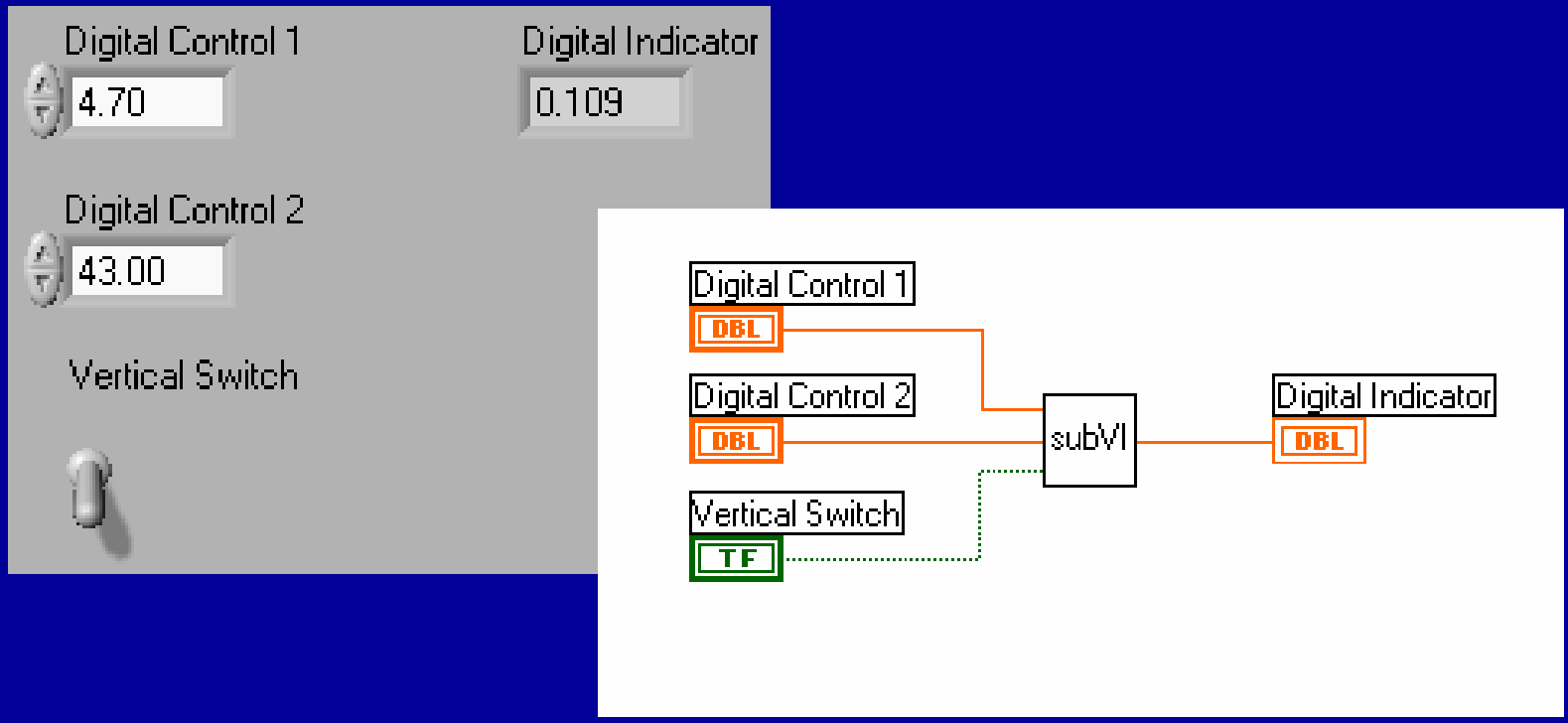
B. How to create the icon and connector

C. How to use a VI as a subVI

D. How to use the *Create SubVI* menu option

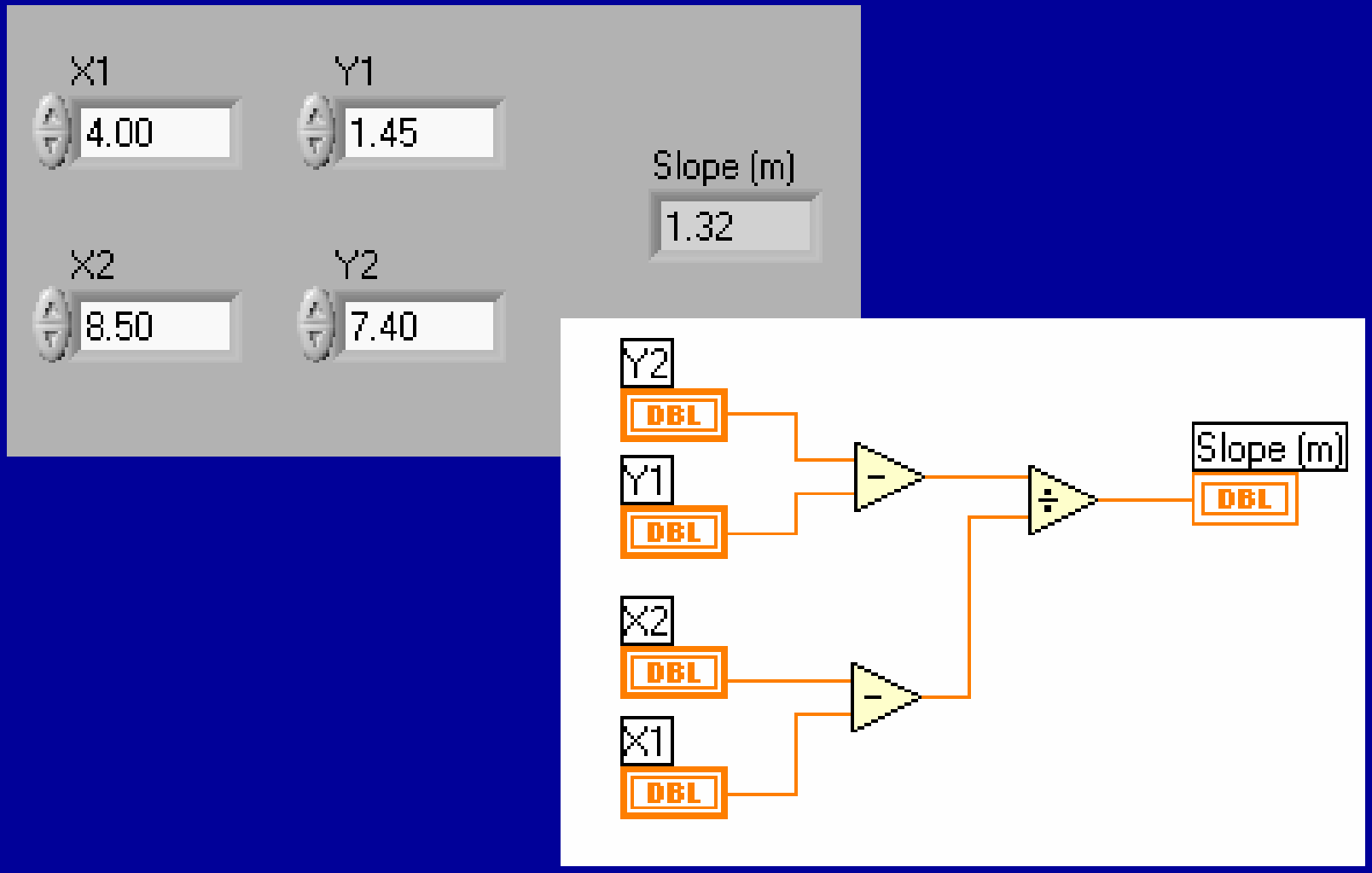
SubVIs

- A VI called from the block diagram of another VI is called a subVI. A subVI corresponds to a subroutine in text-based programming languages.
- Means of using a VI in the block diagram of a higher-level VI
- Requires icon and connector



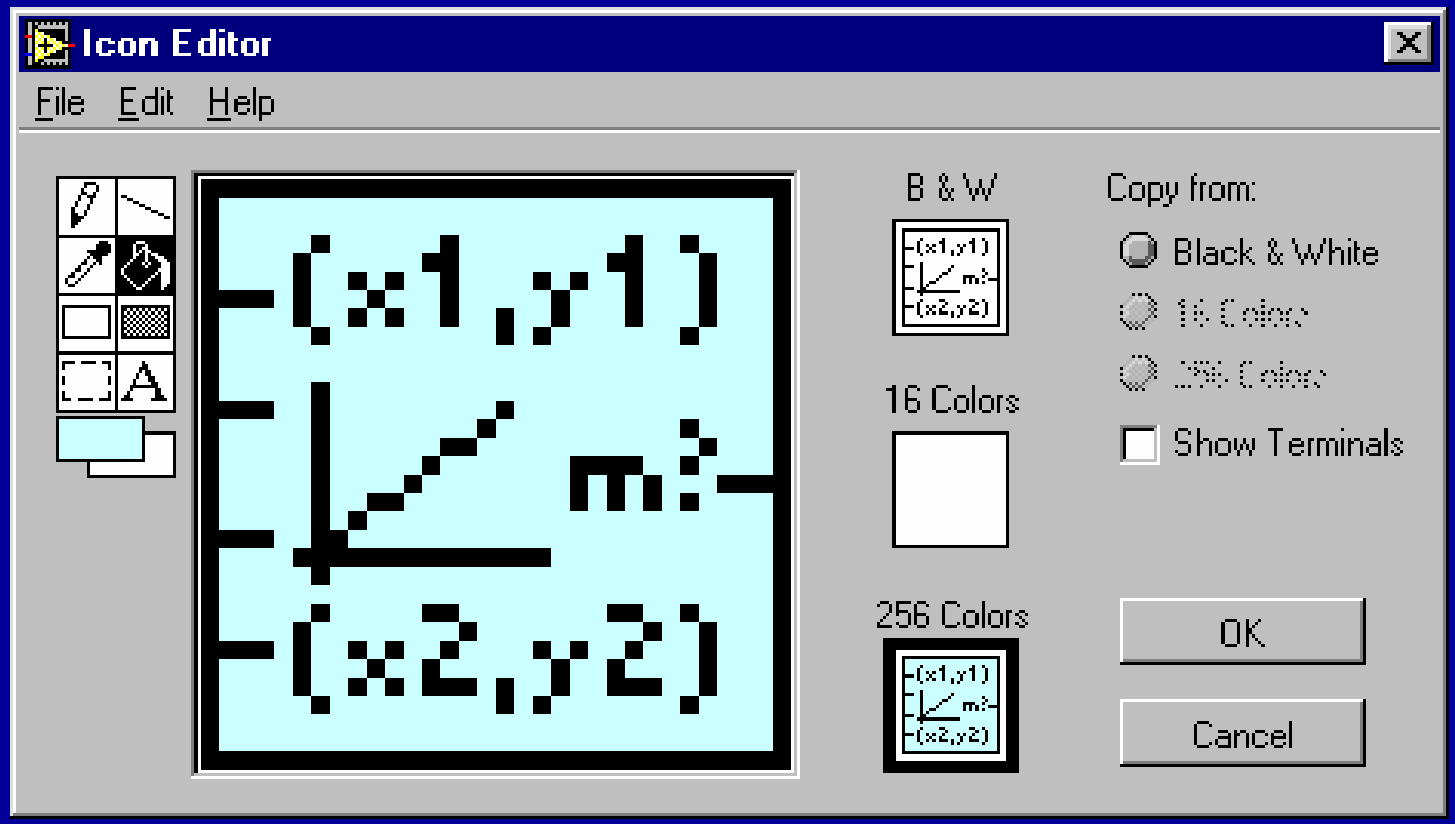
SubVI Example – Calculating Slope

Let's create the following Slope.vi



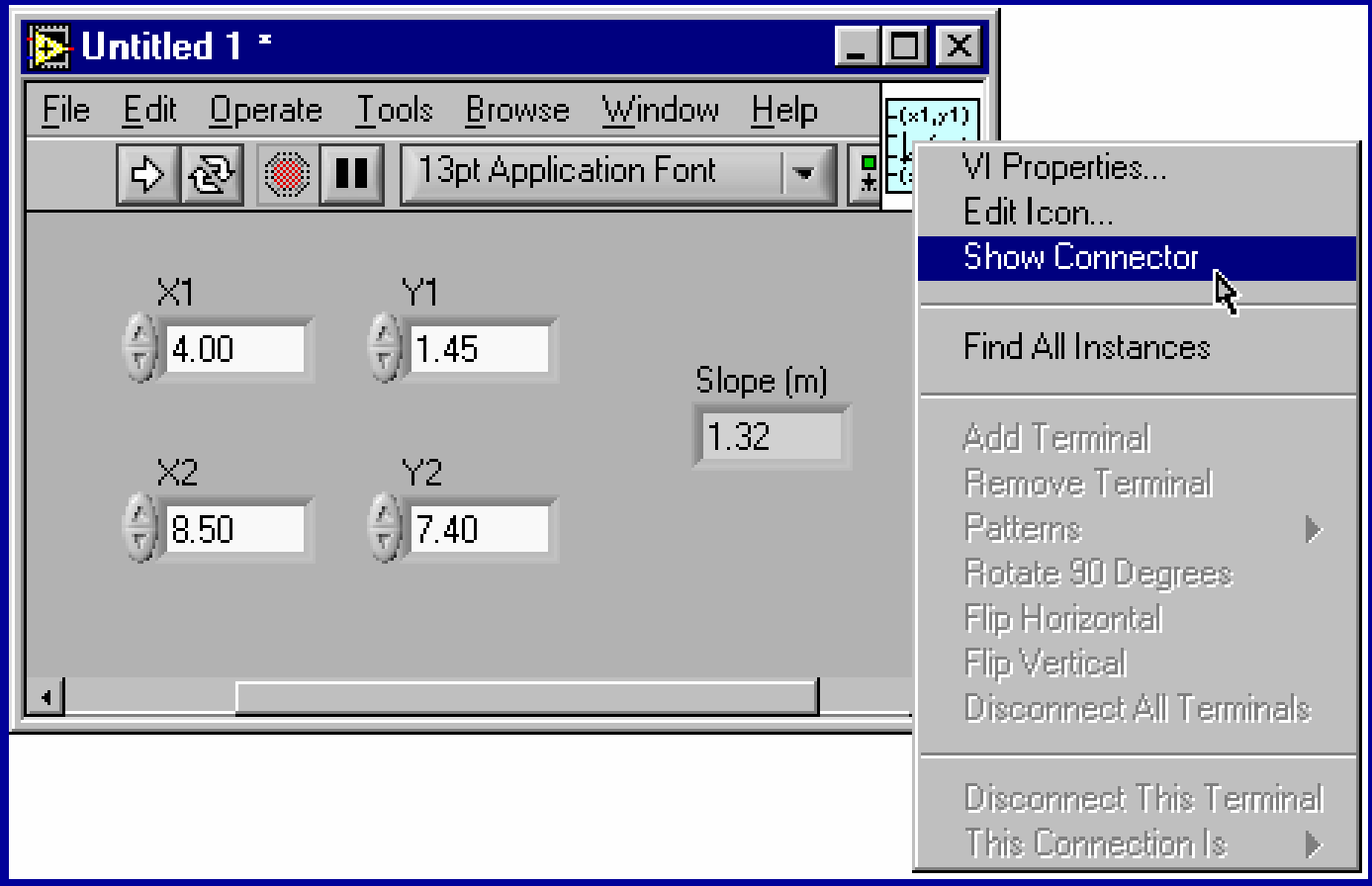
Creating the Icon

- Right-click in the icon pane (Panel or Diagram)
- Always create a black and white icon

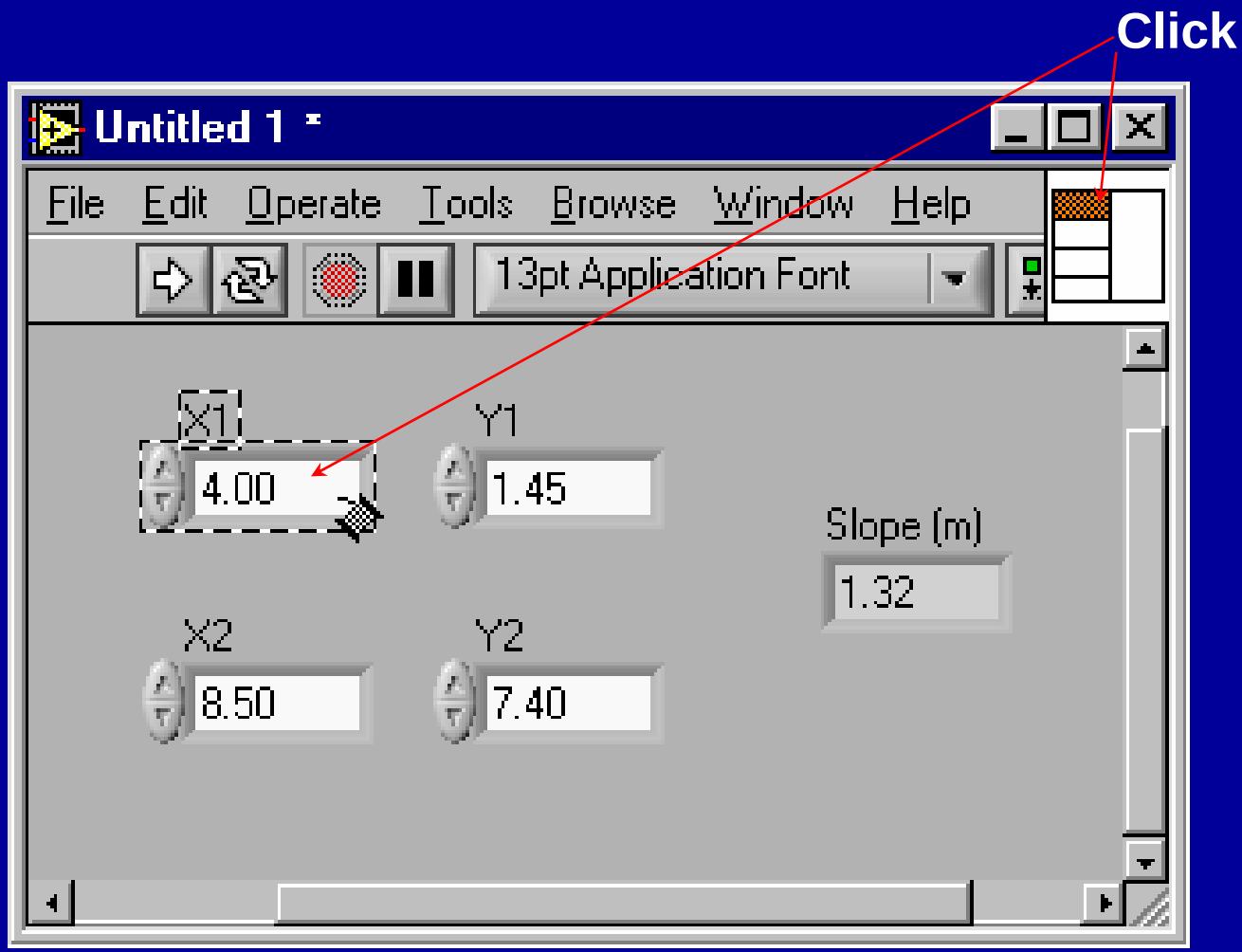


Creating the Connector

Right-click in the icon pane (Panel only)

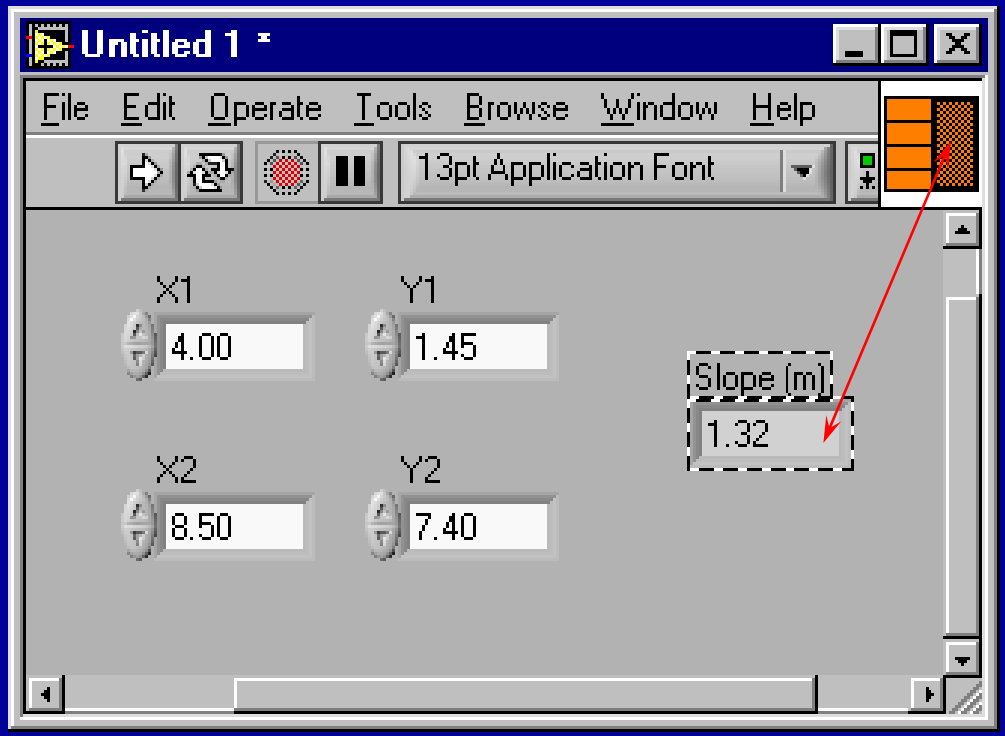


Creating the Connector - cont.



The Connector Pane

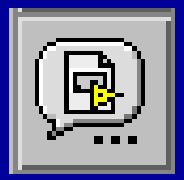
- The terminal colors match the data types to which they are connected
- Click on the terminal to see its associated front panel object

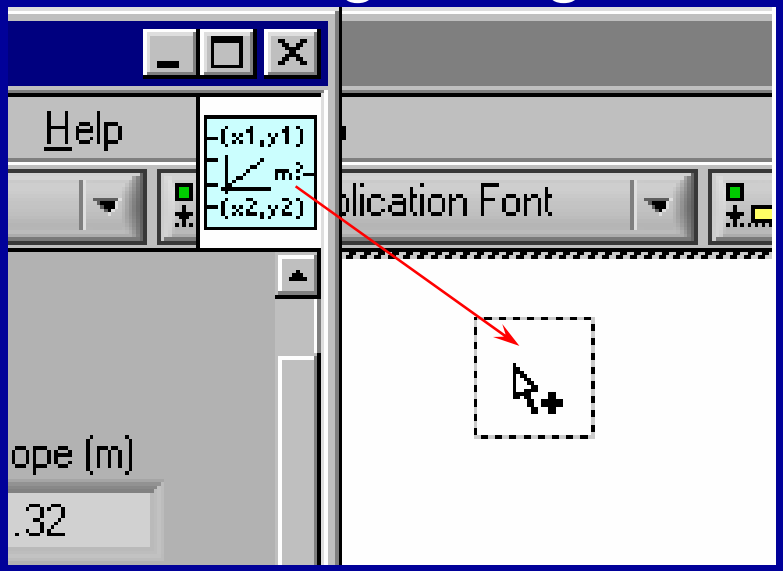


Using the VI as a SubVI

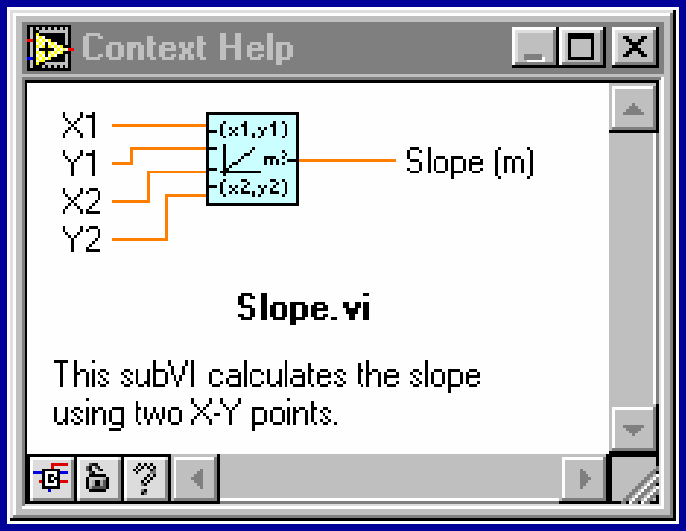
- Changes made to subVI saved in memory until saved to disk
- Calling subVIs
  - Functions»Select a VI…

    OR
  - Drag icon onto target diagram

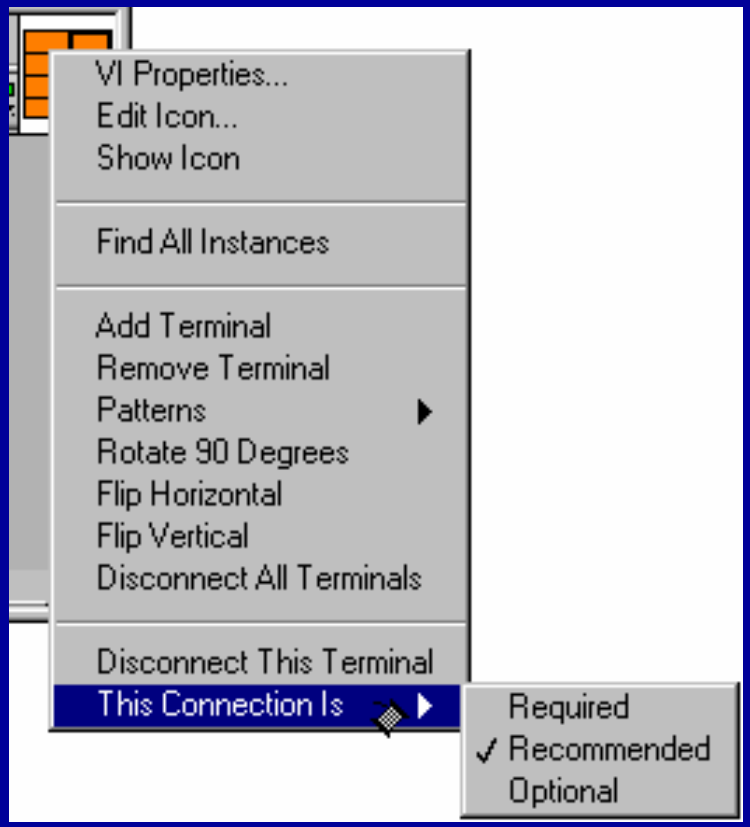




Help and Classifying Terminals



- **Context Help for subVIs**



- **Classify inputs and outputs:**

How displayed in Context Help Window

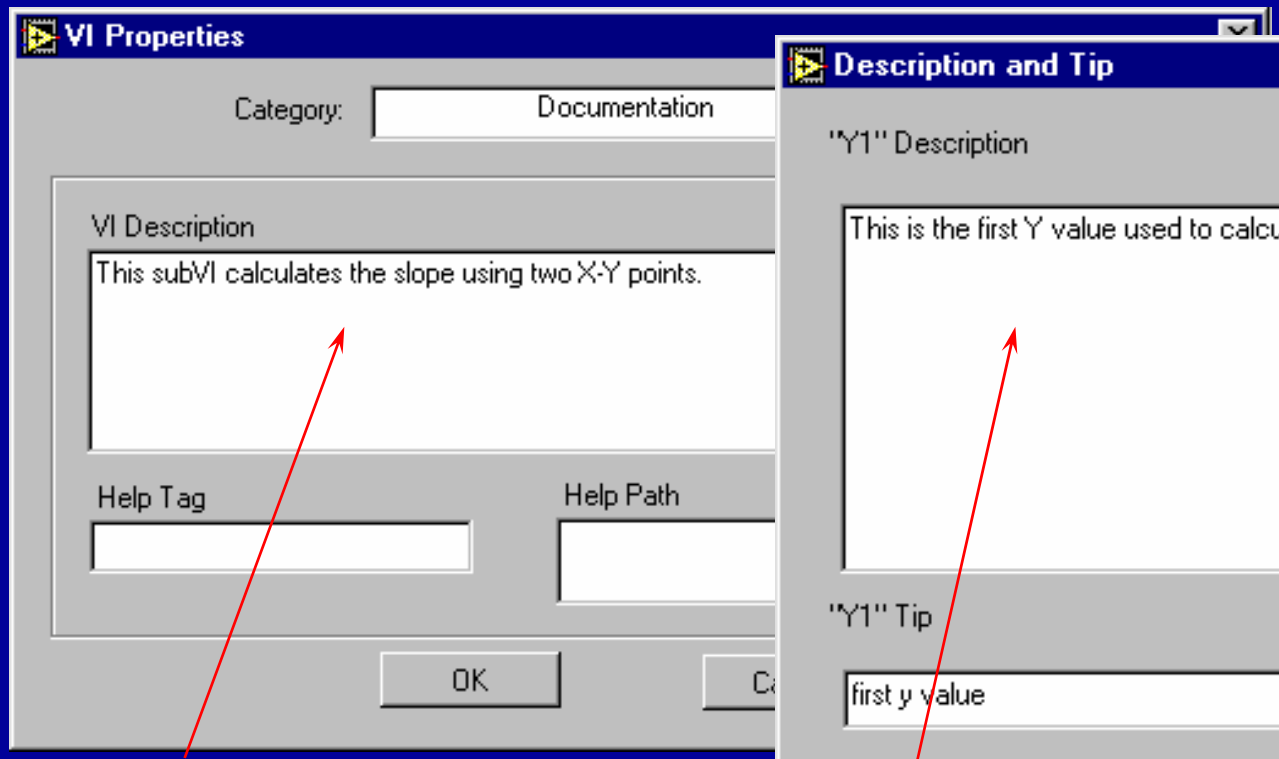
Required - Bold label

Recommended - Normal text

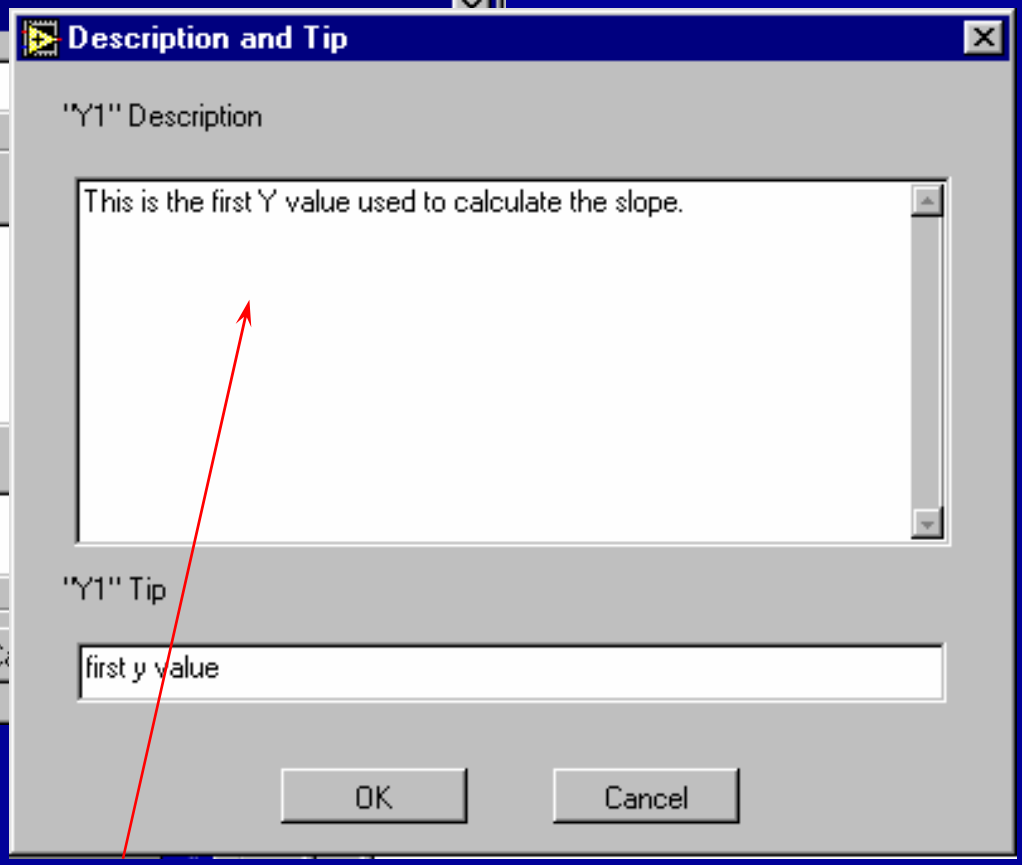
Optional - Visible or wire stubs shown

Documenting the VI

- Document VIs - VI Properties»Documentation
- Document objects - Description and Tip...



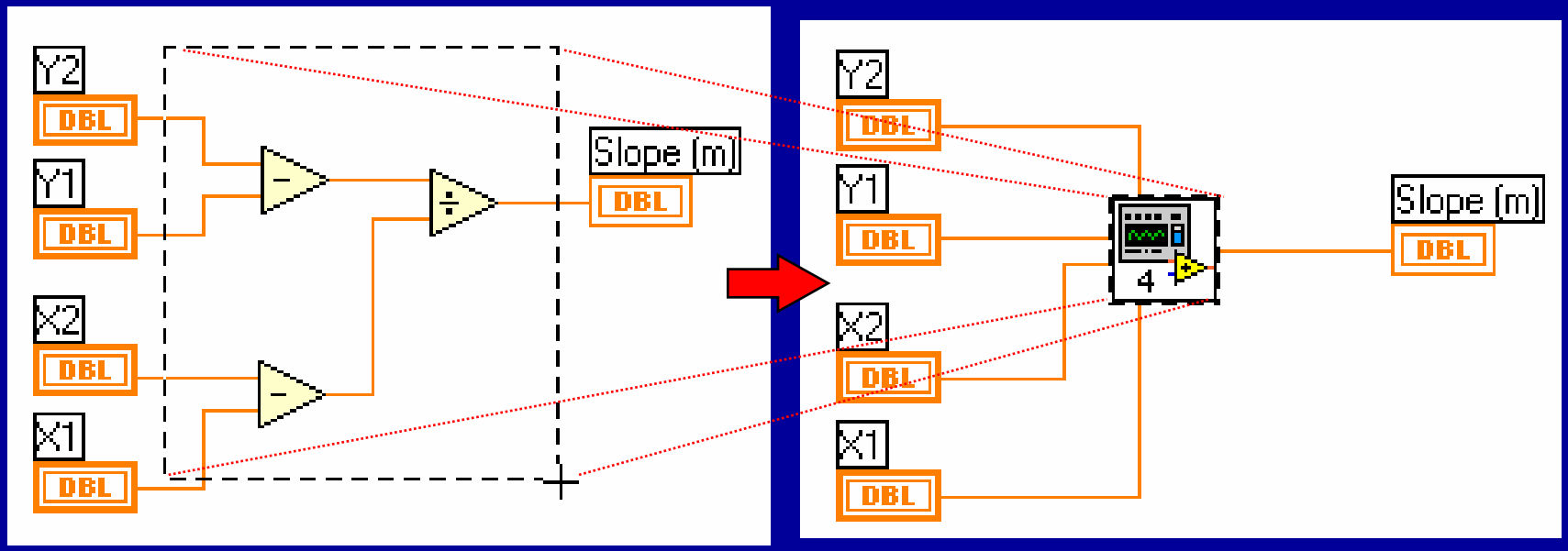
VI Documentation



Description and Tip

The Create SubVI Option

- Enclose area to be converted into a subVI
- Select Create SubVI from the Edit Menu



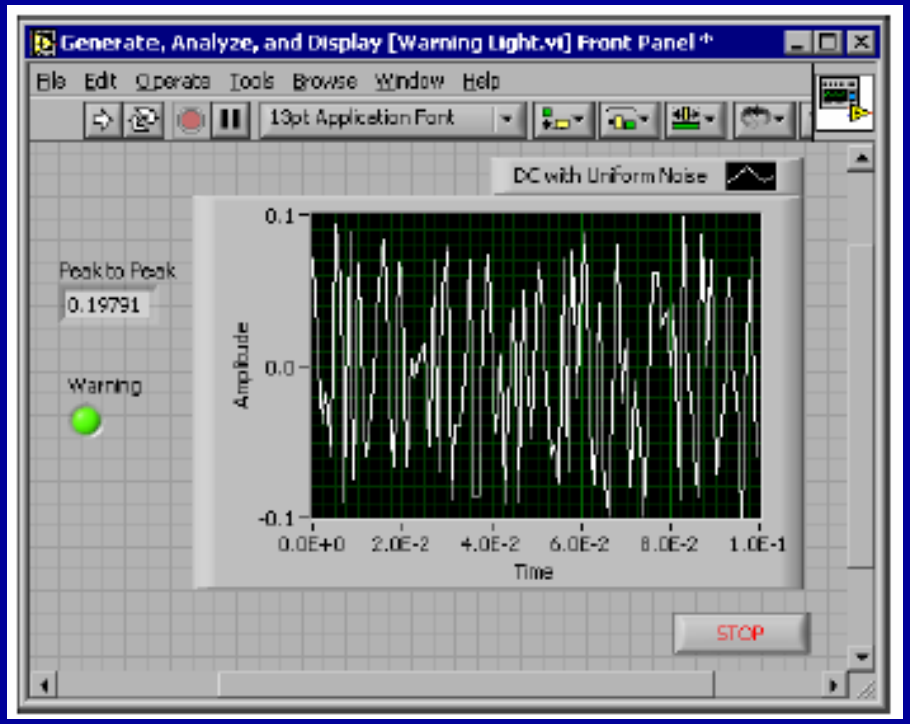
Summary for SubVI

- VIs can be used as subVIs after you make the icon and connector
- Icon created using Icon Editor
- Connector defined by choosing number of terminals
- Load subVIs using the Select a VI... option in the Functions palette or dragging the icon onto a new diagram
- Online help for subVIs using the Show Context Help option
- Descriptions document functionality
- Use Create SubVI feature to easily modularize the block diagram

B. Saving a signal

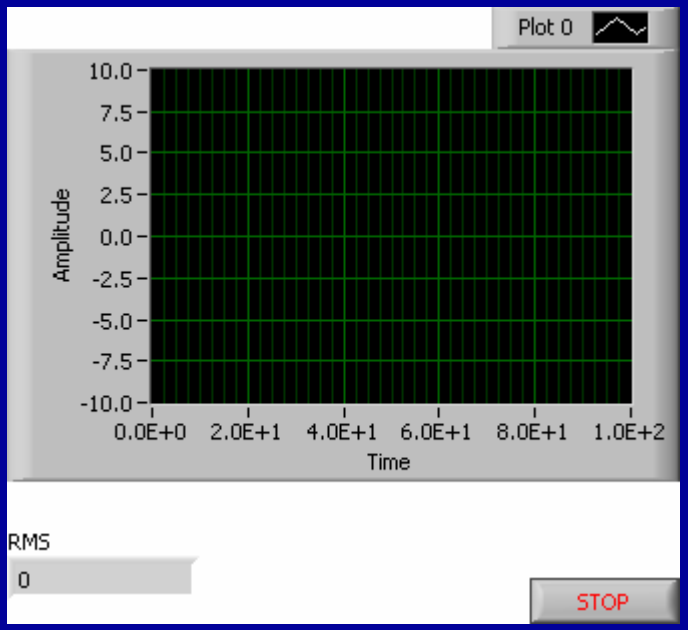
How to use LabVIEW to perform a basic analysis of a signal and how to save the analyzed data to a file.

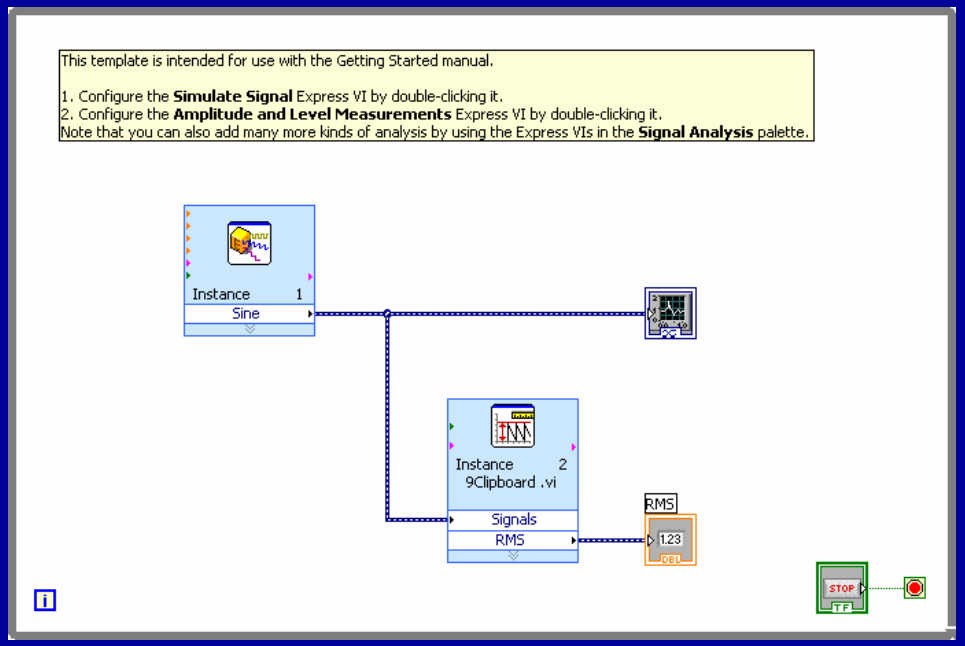
In the following exercises, you will build a VI that generates a signal, extracts the DC value of the signal, indicates if the signal exceeds a certain limit, and records the data. When you complete the exercises, the front panel of the VI will look similar to the front panel



Creating the VI

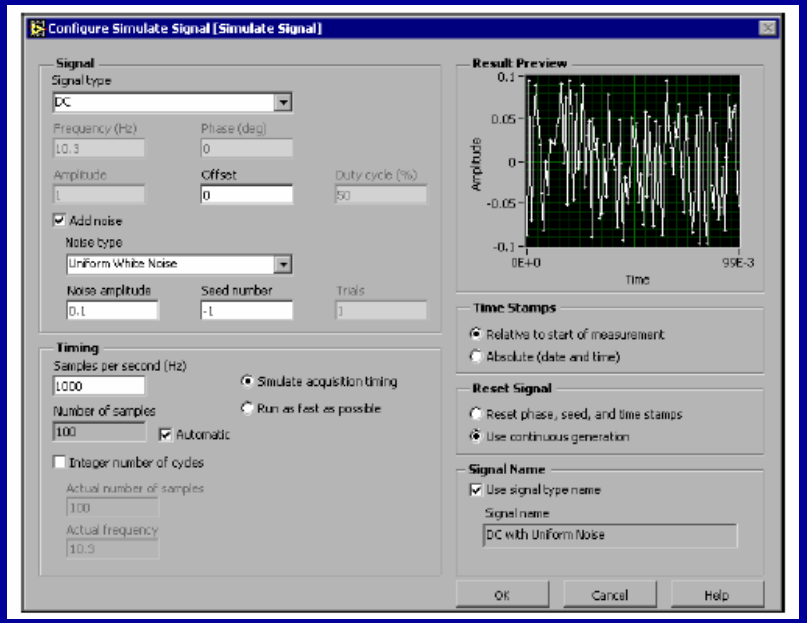
1. In the **LabVIEW** dialog box, click the **New** button to display the **New** dialog box.
2. Select the **VI from Template»Tutorial (Getting Started)»Generate, Analyze, and Display** template in the **Create new** list.
3. Click the **OK** button to open the template. You also can double-click the name of the template VI in the **Create new** list to open the template.
4. Display the block diagram by pressing the <Ctrl-E> keys. And arrange the front panel and the block diagram in parallel.



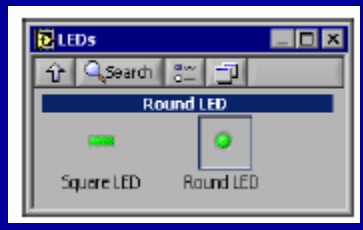


Modifying the VI

1. Right-click the Simulate Signal Express VI and select **Properties** from the shortcut menu to display the **Configure Simulate Signal** dialog box.
2. Select **DC** from the **Signal type** pull-down menu.
3. Place a checkmark in the **Add noise** checkbox to add noise to the signal.
4. Type 0.3 in the **Noise amplitude** text box.
5. Click the **OK** button to save the current configuration and close.
6. Run the VI. The signal appears in the graph and the RMS in the indicator.
7. Click the **STOP** button.
8. Select **File»Save As** and save this VI as Analysis.vi.



Adding a Warning Light and
Select **File»Save As** and save this VI as Warning Light.vi



Setting the Warning Level Limit --On the block diagram, select the Comparison Express VI on the**Arithmetic & Comparison»Express Comparison** palette and place it to the right of the Amplitude and Level Measurements Express VI.

•wiring it to the signal and RMS indicator

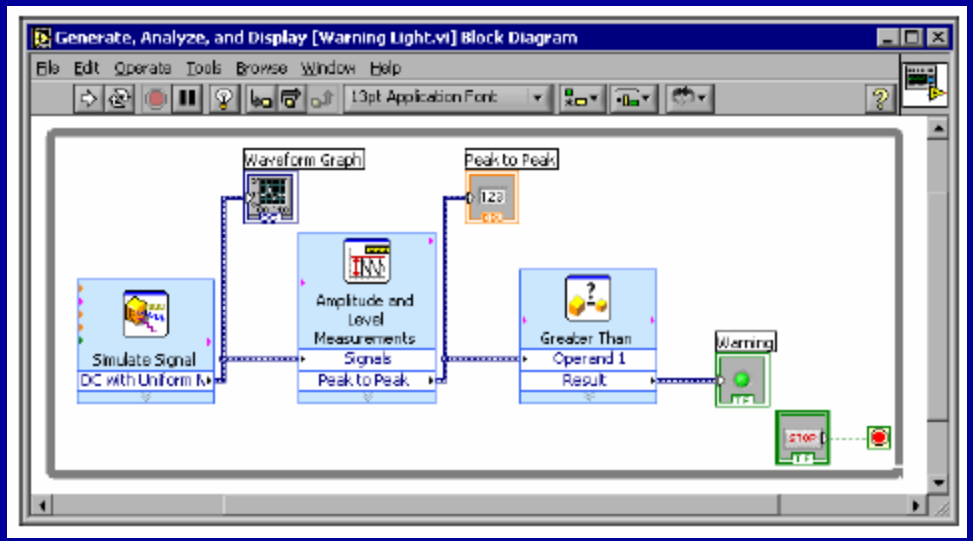
•In the **Configure Comparison** dialog box, select the **> Greater than** option from the **Compare Condition** section.

•In the **Comparison Inputs** section, select **Use constant value** and type 0.18 in the **Constant value** text box.

• Run

• to stop the VI.

• Select **File»Save** to save this VI.

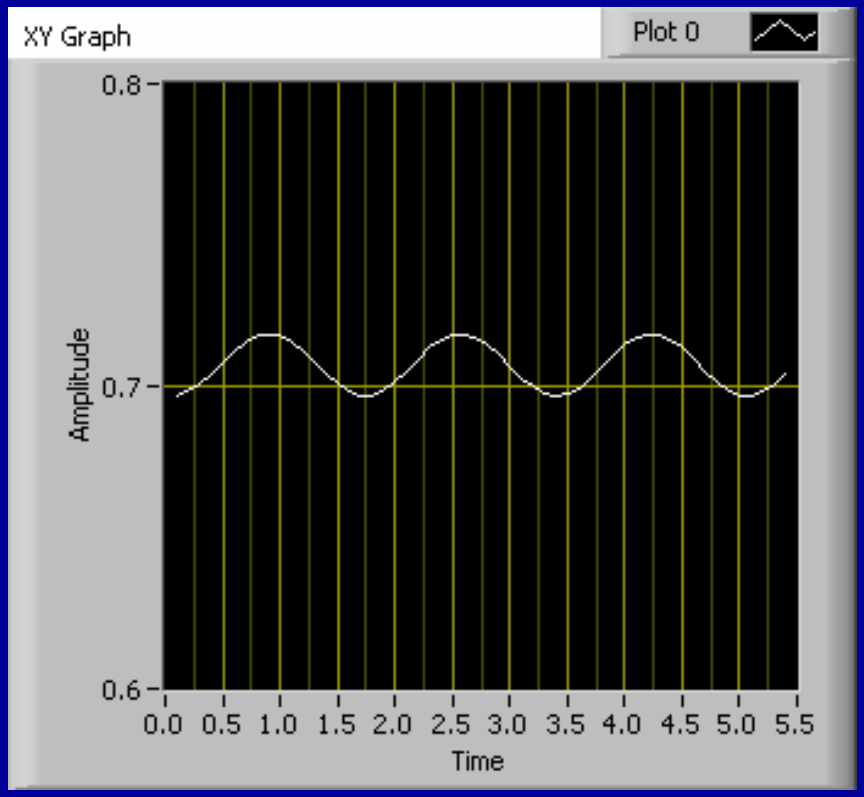


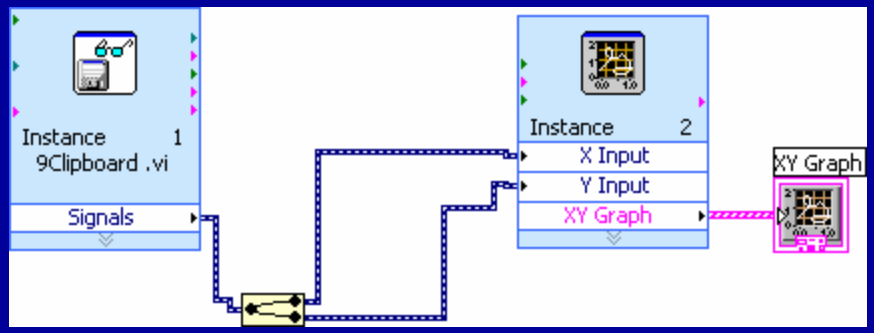
Save Data to a File - cont.

Configuring the VI to Save Data to a File

1. Select the Write LabVIEW Measurement File Express VI on the **Output** palette and place it on the block diagram below and to the right of the Amplitude and Level Measurements Express VI.
2. In the **Configure Write LabVIEW Measurement File** dialog box, select the **Append to file** option in the **If a file already exists** section. By selecting **Append to file**, LabVIEW writes all the data to the test.lvm file (get a path)without erasing the existing data in the file if a file by that name exists already. No headers.
3. Select the **One header only** option in the **Segment Headers** section.
4. Enter the following text in the **File Description** text box: Sample of peak to peak values.
5. Close the **Configure Write LabVIEW Measurement File** dialog box and return to the block diagram.
6. wiring
7. Run
8. open with Microsoft Excel

C. Reading a data file





Summary for Today

- **Sub VIs**
- **VIs can be used as subVIs after you make the icon and connector**
- **Icon created using Icon Editor**
- **Connector defined by choosing number of terminals**
- **Load subVIs using the Select a VI... option in the Functions**
- **palette or dragging the icon onto a new diagram**
- **Online help for subVIs using the Show Context Help option**
- **Descriptions document functionality**
- **Use Create SubVI feature to easily modularize the block diagram**
- **Saving signals to a file**
- **LabVIEW is able to save signals to a file**
- **Reading data files**
- **LabVIEW is able to read data files**

Homework for Today

Make sub VIs for C to F and F to C