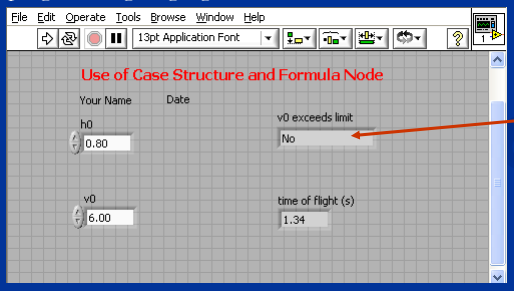
Engin 103
Fall ‘06
Meeting #19: Nov. 2, 2006
Time of flight with LabVIEW: Case Structure

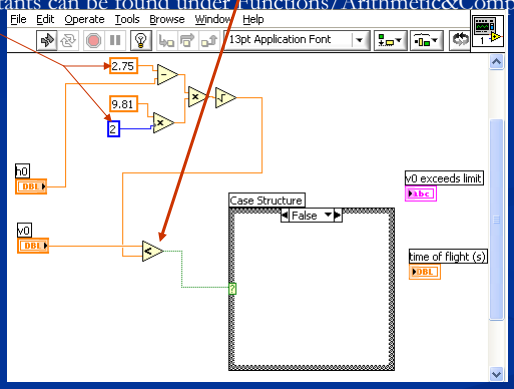
What is a Case Structure?
We use it to perform different actions depending on whether a condition is satisfied or not, similar to an IF/THEN in a conventional programming language.
What is a Formula Node?
We use it to enter a formula as an expression, as in a conventional programming language.



1) In the Front Panel, place Two Numeric Controls for h0 and v0; one String Indicator (Controls/Text Indicators); and one Numeric Indicator for the Time of flight t.

1

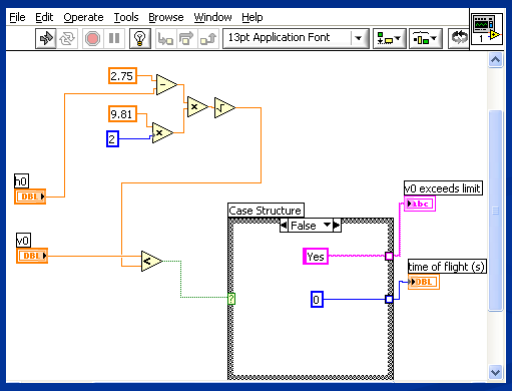
2) In the Block Diagram produce the upper limit for v0 using the given formula (see E-syllabus) in term of h0. Note for the “Less?” operator (Functions/ Arithmetic&Comparison/Express Comparison): it is checking whether the upper terminal is less than the lower terminal, giving a result of true or false.
Numeric constants can be found under Functions/Arithmetic&Comparison/Express Numeric



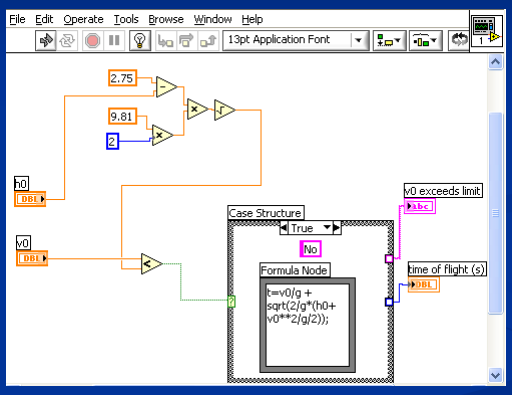
The case structure can be found in Functions/Exec Ctrl/Case Structure or All Functions/Structure. Note it has two windows: False and True. The result of the Less? Operator will dictate which window to use.

2

3) **What is a String Constant?**
Enter a String Constant (All Functions/String) to say Yes in the False window (when v0 Is NOT less than its maximum allowed value, then connect it to the String Indicator ("Vo exceeds limit"). And a Numeric Constant of 0 connected to the time of flight.

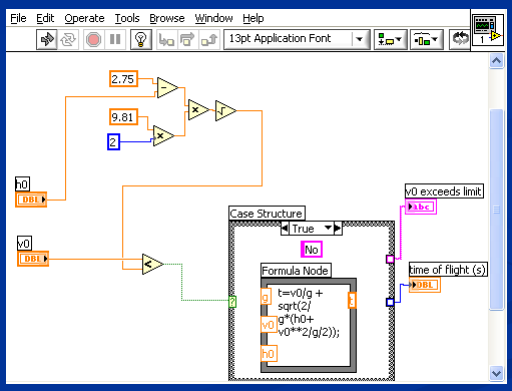


4) Switch to the True window, enter a Formula Node (All Functions/Structures); type in The formula as indicated in equation (2) in the link using "**" for power (not "^" as In Excel). Enter a String Constant for to indicate NO then connect to String Indicator "v0 exceeds limit".



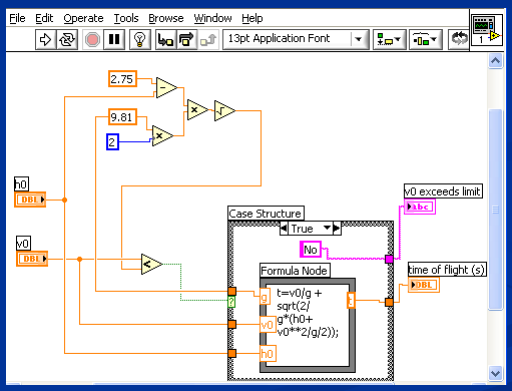
What is the meaning of the blank squares on the right border of the Case Structure?

5) To connect the Formula Node to the rest of the Diagram, right-click on the left border Of the Formula Node, select Add Input, an orange box appears, type in "v0", the same way as you refer to the initial speed in your formula within the Formula Node. Then repeat for "g" and "h0". Also right-click on the right border of the Formula Node, select Add Output, then type "t" in the orange box, remember to use the same variable as You refer to the time of flight in your expression within the Formula Node.

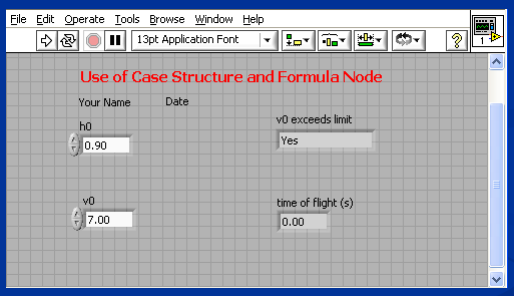


Why does the little square on the right side of the formula node has a thicker border?

6) Wire the "Inputs and Output" variables for the Formula Node as you defined in the Previous step to the corresponding elements in the Diagram as shown below. The "Run" button should become continuous now if you did not get any grammar Error. To check other type of hidden errors (non-grammar errors are not detected by the software) test the VI following step 7).



7) **Why do I need to test the program?**
The testing step is important to detect "hidden" errors or non-grammar errors which Cannot be detected by the software. You should get the same outputs for the inputs Shown below. Also in the link there is a table of different input values for a more Thorough testing. This constitutes CW8 that is due today (note the values you need to Use in the CW and do Operate/Save Current Values as Default before you save.



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Suggested items to write in the Engin 103 logbook:

1) What element in a Case Structure switches the true/false windows? What type of variable does it expect? What happens when the little squares on the right side of the Case Structure are blank or unfilled? What need to be done to fix this error?
What are the color codes for a Boolean or Logical variable, an integer numeric constant, a real (with decimal digits) numeric constant, a string constant? What is the limit for v0, up to 2 digits of precision, if h0=0.9m by playing with the Front Panel of this VI?

2) Explain in your own words another application of the Case Structure that is not for deciding whether a variable is less than certain limit.