

# PHY 406 - Microprocessor Interfacing Techniques

## LabVIEW Tutorial - Part IV

### Data Representations and Help

#### Data Representations

You should have on your diagram three colours of wire and three data types

- ▶ Orange/Brown - with DBL boxes
- ▶ Blue - with I32 boxes
- ▶ Dotted Green - with TF boxes

LabVIEW supports a large number of data types and their conversion. The major types of numeric variable are:

| Abbreviation | Type                    | Storage Length (Bytes) | Minimum Value | Maximum Value |
|--------------|-------------------------|------------------------|---------------|---------------|
| EXT          | Extended Precision Real |                        |               |               |
| DBL          | Double Precision Real   | 8                      |               |               |
| SGL          | Single Precision Real   | 4                      |               |               |
| I32          | Long Integer            | 4                      |               |               |
| I16          | Word Integer            | 2                      | -32766        | 32767         |
| I8           | Byte Integer            | 1                      | -126          | 127           |
| U32          | Unsigned Long Integer   | 4                      | 0             |               |
| U16          | Unsigned Word Integer   | 2                      | 0             | 65535         |
| U8           | Unsigned Byte Integer   | 1                      | 0             | 255           |

Since similar arithmetic operations can be performed on each of these types, the arithmetic functions, the controls and the indicators must be able to cope with these. To achieve this, three different techniques are used: changing type, implicit type conversion and explicit type conversion.

To see an example of the first and the second, use the pop-up on the input control to the multiplier in your example to change the representation. Notice that the wires are orange/brown for float and blue for integer/unsigned. Notice also that if the input types to the multiplier are not

the same type, then a black spot on the input indicates and implicit type conversion - the types of the inputs are changed to compatible types.

To see an example of explicit conversion, let's change the type of the output to a Word Integer. Remove the wires from the output of the multiplier to the chart and indicator by selecting them with the select tool and **delete**. Use **Ctrl-B** to clean up the broken wires. Now select **functions>>numeric>>conversion>>To Word Integer** and place the converter opposite the output of the multiplier. Complete the wiring from multiplier to input of covnerter and then to the chart and the indicator. The chart automatically changes to an I16 when you connect to it, the indicator stays at DBL and acquires a conversion dot to indicate the conversion. You can change the type of the indicator by using the pop-up and the **representation** item to change to an I16 in which case the conversion dot disappears and the type is consistent throughout.

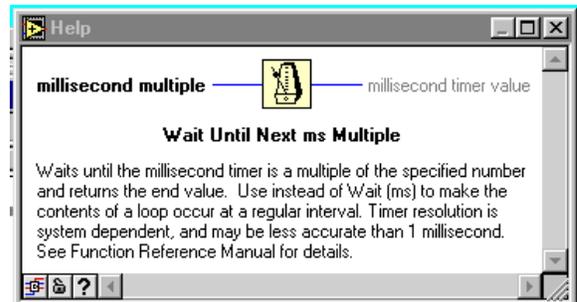
There are many times in LabVIEW programming where you will have to be aware of the data type and ensure that the type conversions are being handled correctly.

### Help - I Need Somebody!

There are two forms of help in LabView - LabVIEW's help to you, the designer, and your help to the user.

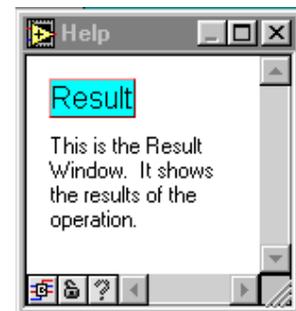
LabVIEW will help you in many ways. There is a built-in Help system (under **Help>>Online Reference**) which will give extensive information about LabVIEW,

There is also a more specific help system which can tell you about individual items. This help system is available under **Help>>Show Help**. To use it, activate the option by selecting it and then put the select tool on any item. For a system item you get a little summary of the item, for example the one for the millisecond timer looks like this:



If this help system is activated, then you will get help on any item that your tool is on. This can be useful, but frankly I find it annoying to have on all the time, so I use it sparingly and use the short-cut key **Ctrl-H** to toggle it on and off when I need it.

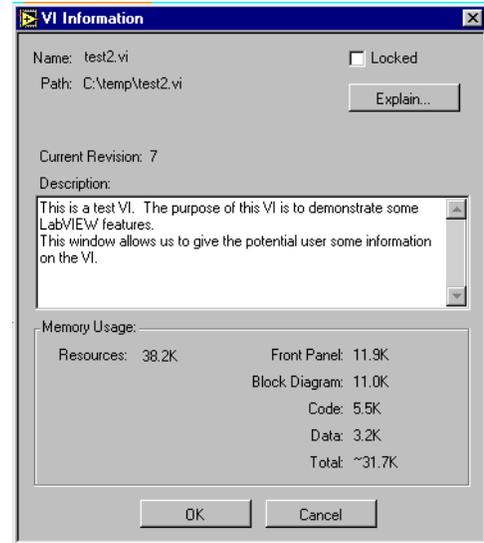
If you place the tool over a control or indicator, you will notice that it comes up with the label of the control and the information "No description available". You can change that by using the pop-up and selecting **Data Operations>>Description**. This will give you a simple window into which you can type some useful description of the item. The when you (or someone else) asks for help on that item, the description appears. Here's a simple message that I put in for the "Result" thermometer:



These facilities are extremely useful.

Documentation is the curse and salvation of many systems and a little bit of time spent in documenting things at an early stage (like before making the VI!) Will save an enormous amount of time later. Remember that the person you may be writing the help file for is a grumpy version of yourself, five years older, and working your second double shift in a row!

Finally there is a space for an overall description of the VI. This is found under **Windows>>Show VI Info**. In this area you can write an overall description of the VI and its functionality. Again this is useful as “unlosable” documentation for the VI.



### Summary

- ▶ Data can be of several types - LabVIEW will convert between them but you might need to intervene from time to time
- ▶ Help can be easily written for any control and for the overall VI - do it!

### Exercise

Create a blank “while loop” with an indicator for the iteration count. Time the loop with a watch and find out the limiting rate for a blank loop. Using the timer, as above, but by varying the interval, find out the fastest timed loop iteration rate which actually executes at the right rate.