Lab 4 FYSS 385

Digital output and construction of a simple data logger.

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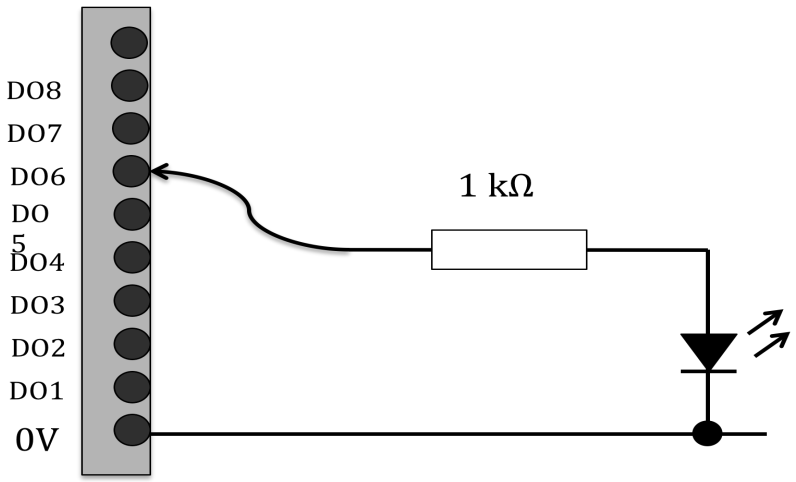
The goal of this lab is to learn how to construct a VI to read and write to the USB-6009 interface using standard DAQmx sub-Vis and how to write .csv format files that can be opened by your favourite spreadsheet program.

1. Hexadecimal is a way of numerically representing binary numbers. The hexadecimal digits run from 0 to 9 then A through F. One hexadecimal digit can re represent 4 bits of data. Two hexadecimal digits such as 7E can then represent a byte of data.

0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

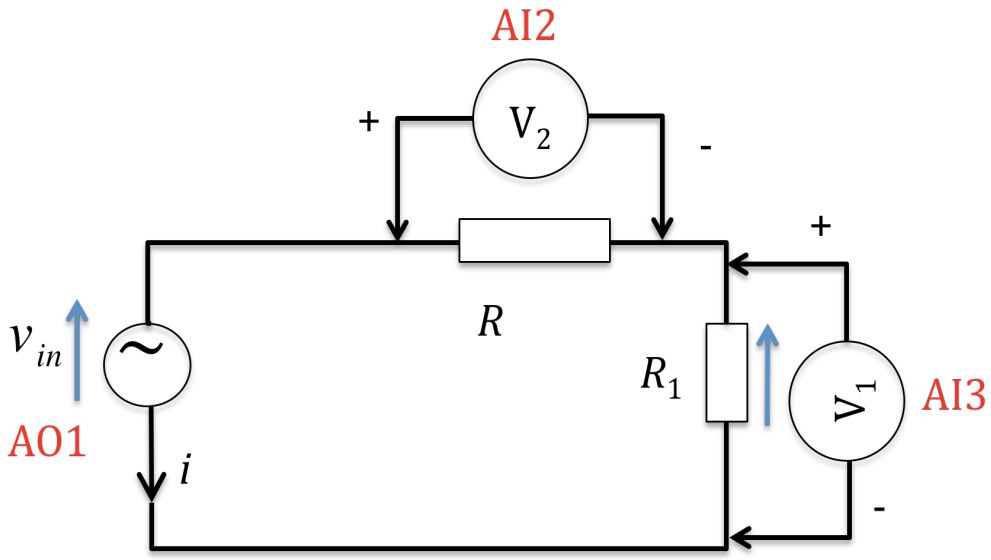
The first task is to construct a sub-VI that writes a single byte of data to port 0 on the USB-6009. This should be called by another VI that reads a hexadecimal number and calls the sub-VI to write it to the interface. The Vis should use the standard error cluster for error handling. Use a LED and a 1 kΩ resistor in series to indicate the logical state of each line on the digital IO port.



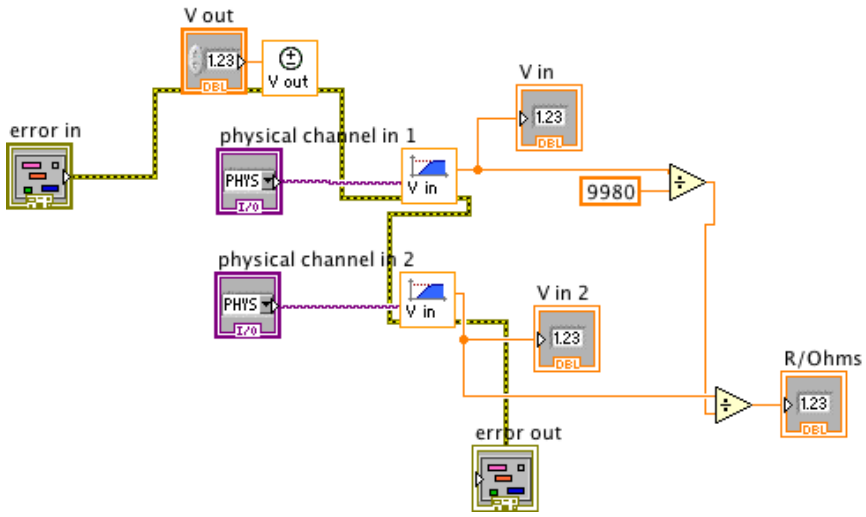
2. Construction of Data Logger

As mentioned in the lectures data loggers are used to record a number of signals at certain specified times. In this case we will use the thermometer and VI constructed in Lab 2 and a photosensor TEPT 4400 (phototransistor) to record e.g. the intensity of the light from the sun. A demonstration will be set up to record the power from a Si solar cell. We this need to record three parameters. time, temperature and voltage. The first row of the data file should contain the time and datestamp and the users name in separate columns.

-Set up the circuit for the thermometer and use the VI you set-up in Lab. 2.

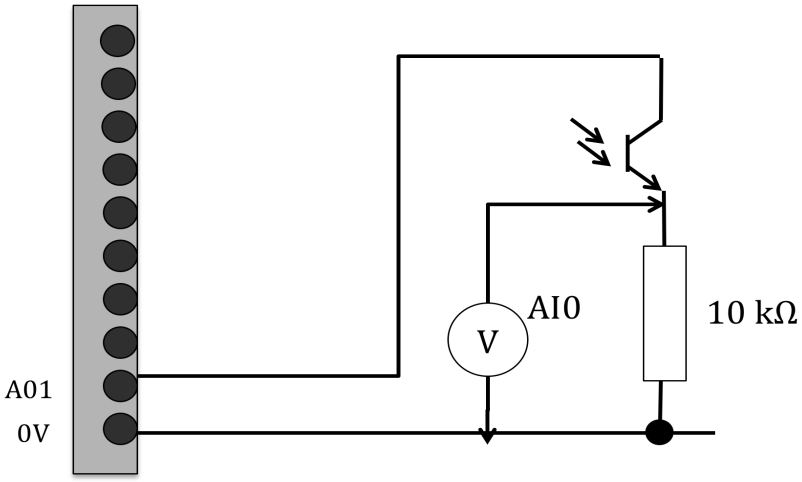


Add extra wiring to your thermistor thermometer VI to report the errors using the LabVIEW standard error cluster as shown below.

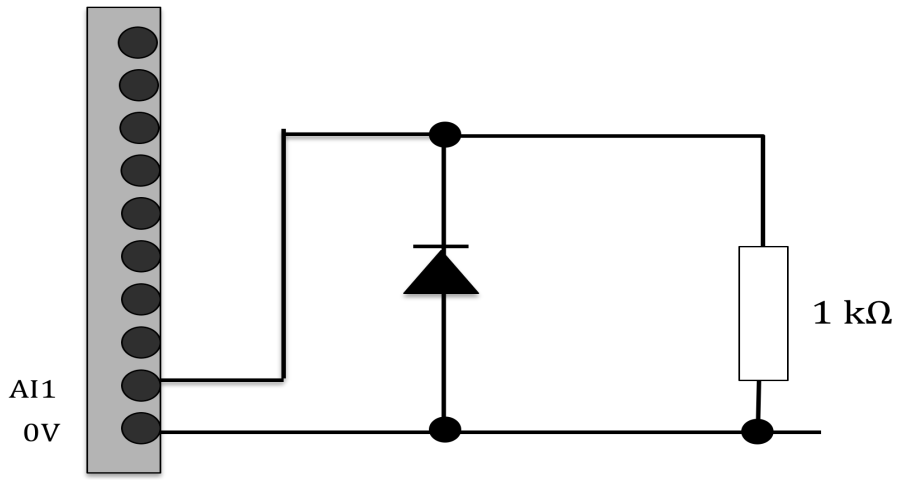


Wire the error control and indicators to the terminal block for the VI.

-Make a VI that measures the phototransitor current which is proportional to the light intensity. The electrical connections are shown below. Note the long wire on the photosensor is the anode. The light intensity VI should be wired to report any errors using the standard LabVIEW error cluster as for the thermistor thermometer above.



-Set up a simple power monitor for the solar cell



Use Ohm's law to calculate the power produced in a VI for the solar cells.

- Assemble the temperture VI, solar cells and light intensity Vis and make a data logger. It may be useful to display current values as indicators on the control pannel. Use the write to spreadsheet VI to write the data to the file, one row per time step.

The data should be in .csv format (comma seperated values) and look like this.

```
2/5/11,5:00:33 PM,Harry
Time/s,Temp/ûC,Light intensity,Cell power
0.000,25.054,0.303,0.085
1.000,25.096,0.288,0.077
2.000,25.075,0.301,0.085
3.000,25.097,0.301,0.077
4.000,25.204,0.290,0.082
5.000,25.204,0.301,0.011
6.000,25.139,0.303,0.006
```

When it is opened in Excel it should look like this.

	A	B	C	D
1	2/5/11	5:00:33 PM		
2	Time/s	Temp/°C	Light intensity	Cell power
3	0	25.054	0.303	0.085
4	1	25.096	0.288	0.077
5	2	25.075	0.301	0.085
6	3	25.097	0.301	0.077
7	4	25.204	0.29	0.082
8	5	25.204	0.301	0.011
9	6	25.139	0.303	0.006
10	7	24.926	0.306	0.077

Note: for some reason Finnish computers may use a semicolon instead of a comma in .csv files.

Reports

These should be brief. Print out the VI's and a sample of the Excel file from 2.