Data Acquisition with the eLockIn in LabView

General ways to get connected to the eLockIn

The measurement data of the eLockIn can be acquired and settings of the eLockIn can be performed by LabView in three different ways:
A) with the commands of the lockin.dll, which is provided by Anfatec together with the instrument
B) through a TCP-IP connection
C) through a VISA connection

Anfatec provides the following programs to realize these ways:

For the way (A):

- eLockin.dll provides the interface function
- eLockin.vi main program, which starts the comminication
  - and uses the Get_eLockin.vi and the Ref_eLockin.vi
- Get_eLockin.vi data interface, which takes the data from the eLockIn
- Ref_eLockin.vi settings of the reference output

These three files are provided in two different versions in the directories “Sync” and “TimeConst”. One for the Sync-Filter ON and one for the useage of time constants (Butterworth filter).

- TestAuxOut.vi example for the AuxOut usage

For the way (B):

- tcpip.vi reads the lia.dat via a TCP-IP connection
- Keycontrol.vi demonstrates the key code use at the example of time constant
- Autophase.vi demonstrates the key code use for adjusting the phase offset
- tcpip_settings.vi reads the lockin.ini via a TCP-IP connection

For the way (C):

- VISA.vi reads the lia.dat via a VISA connection

An additional example shows how the results can be shown as graphic:

- Diagram.vi shows the data as diagram.

(A) data acquisition via lockin.dll

Exported function of the eLockin.dll

The functions exported by the dll are described in the following table.

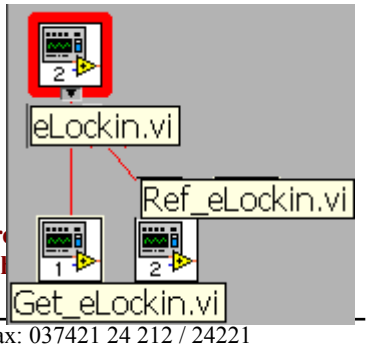
Name	***Input***	***Output***	***Description***
_Init	IP-address type: pChar	No Return value.	Initializes the eLockIn by calling the current IP address.
_GetLockInData	Channel [1 to 4]	Value [real number]	Returns the measured *Value* of the *Channel* as real number.

	type: Integer	type: double	***
_SetLockInInpRange	Range type: double	No Return value.	Switches the input range between low noise (1), normal (10) and high dynamic reserve (100) (see table 2 page 33).
_SetLockInCouple	Couple type: double	No Return value.	Switches the input coupling between dc (0) and ac (1).
_SetLockInFilterTime	Time constant type: double	No Return value.	Switches the time constant of the filter. The values are coded as in table 3 on page 33[A]
_SetLockInSyncFilter (Vers. 1.0.0.2 or later)	Number of cycles: double	No Return value.	Switches the number of cycles for the sync filter. Values from 0 (Off) to 255[A]
_SetLockInFilterSlope	Filter Slope type: double	No Return value.	Switches the rol-off of the filter. The values are coded as in table 4 on page 33.
_SetLockInUac	Uac type: double	No Return value.	Sets the amplitude of the reference output to a values given as double.
_SetLockInFreq	Frequency type: double	No Return value.	Sets the frequency of the reference output to a values given as double.
_SetLockInPhase	Phase type: double	No Return value.	Sets the phase offset of the internal oscillator with repect to the analyzed signal. The values are given as double.
_SetLockInHarm	Harmonic type: double	No Return value.	Sets the harmonic at which the signal is analyzed. The values are given as double.
_SetLockInAuxOut	Channel: [4 to 7] Data: type: double	No Return value	Sets the auxiliary output channels 5 to 8. Channel = 4 equals „DA5“ at the backpanel of the eLockIn.

*** In order to obtain values from channel 2 to 4, one has to call channel 1 first, because the channels 2 to 4 are not taken directly from the eLockIn via TCP/IP. When calling „__GetLockInData“ for channel 1, the data of the other three channels simulatneously are transferred and stored locally in the memory. A subsequent call of „__GetLockInData“ for the channels 2 to 4 takes the values from the memory, only.

eLockin.vi hierarchie

The main program eLockin.vi contains a sequency in three steps and calls two sub-VI's: Ref_eLockin.vi and Get_eLockin.vi.



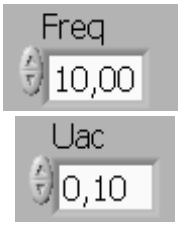
A **Note: The functions “_SetLockInSyncFilter” and “_SetLockInFilterTime” ar thus the one which is used later will be set and overwrite the settings of the ot**

During run, it calls a three-step sequency:

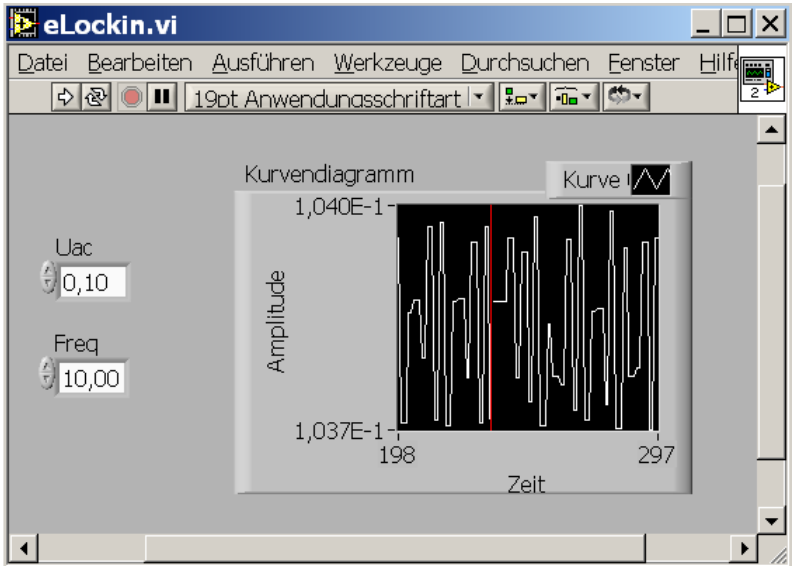
- Step 0: eLockin.vi starts the communication with the lockin. The IP address is a value entry in the diagram used as input for the library function call „__Init“. Then, the system waits for 500 ms to let the eLockIn initialize.
- Step 1: The Sub-VI „Ref_eLockin.vi“ is called to set reference voltage and reference frequency. The other two functions of this Sub-VI, phase and harmonic, are not used here.
- Step 2: A curve diagram is drawn with 100 values, which are taken from hte Sub-VI „Get_eLockin.vi“, which uses the function call of „__GetLockInData2 for the channel number 1. Between the single data, 100 ms delay time is given.

The example does not use all provided DLL-functions, but it shows how to implement them in own applications.

Usage of the LabView control



To start Labview, double-click on the icon or program eLockin.vi.
The main program shows a curve diagram and two input windows for the reference amplitude and reference frequency:



The entered values are overtaken, when the start knob  is applied. The same knob starts the acquisition of data in the curve diagram for one time cycle.

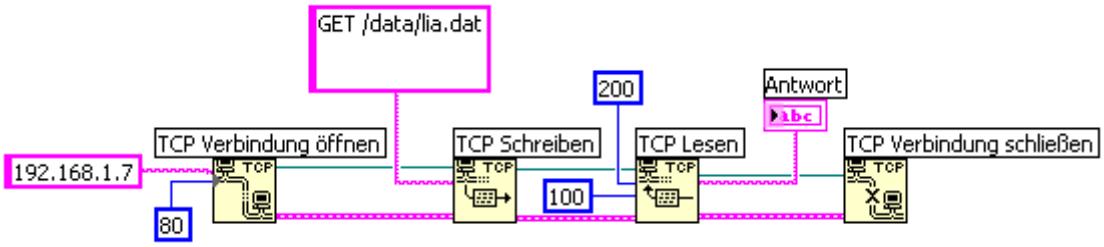
TestAuxOut.vi

This is an additional example program, which shows how to use the function „_SetLockInAuxOut“. The number taken as „Channel“ are counted from zero, while the labeling at the backside of the instrument count the AuxOut-Pins from One. Therefore, the 5th output named „DA5“ in the software is addressed from Channel = 4.
Remark: In order to check your settings, use [LockIn/Display/..] to set one out of the four lockin displays to the addressed channel (e.g. „DA5“).

(B) TCP-IP interface

tcpip.vi

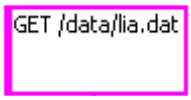
The LabView-file “tcpip.vi”
- opens the network connection to the eLockIn,
- reads the data from the file “/data/lia.dat”,
- writes the answer into a string called “Antwort” and
- closes the network connection again:



The LabView functions for the TCPIP connection are found in the section communication: 

and there in the sub-menu TCP:  .

192.168.1.7 is the IP address of the eLockIn.



After the call “GET /data/lia.dat”, LabView requires two times a “CR” symbol.

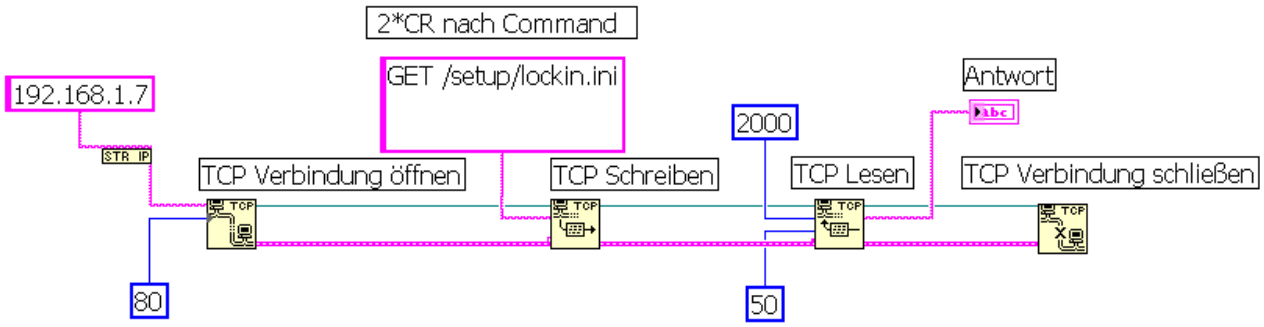
Keycontrol.vi and Autophase.vi

Alternatively, one can call the “/cgi-bin/remote.cgi” program with a similar vi-File. This opens access to all functions that are available for the user from the front panel of the eLockIn.
The key codes are described in the manual in the section
“4.1.3 Remote Control → Sending Key Codes to the eLockIn”.

“Keycontrol.vi” and “Autophase.vi” demonstrate, how to set the time constant to “0.1 ms” and how to adjust the phase offset.

Please note, that one can call several key codes in series within one call of the remote.cgi.
Example: cgi-bin/remote.cgi?**859_1_1_118_9_3_1_118_** sets the display range of display channels 1 and 3 to 10 mV.

Read Settings of the eLockIn with “tcpip_settings.vi”



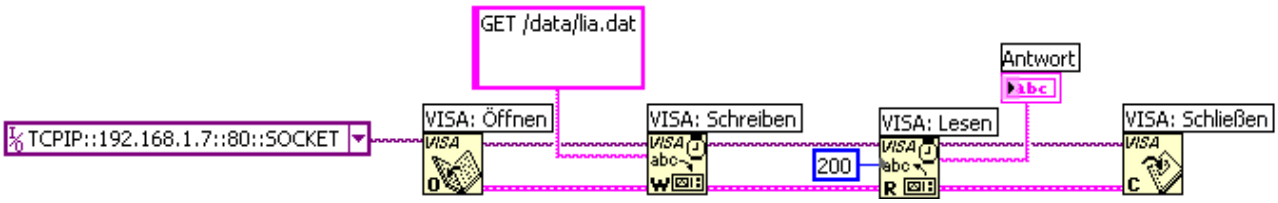
This works like getting the data from lia.dat, with the difference that the file “/setup/lockin.ini” is read.

(C) VISA interface

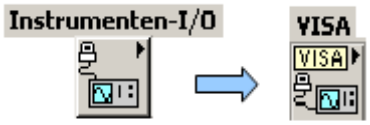
VISA.vi

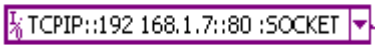
The LabView-file “VISA.vi”

- opens the network connection to the eLockIn,
- reads the data from the file “/data/lia.dat”,
- writes the answer into a string called “Antwort” and
- closes the network connection again:



The LabView functions for the TCPIP connection are found in the section instrument I/O and the sub-menu VISA:





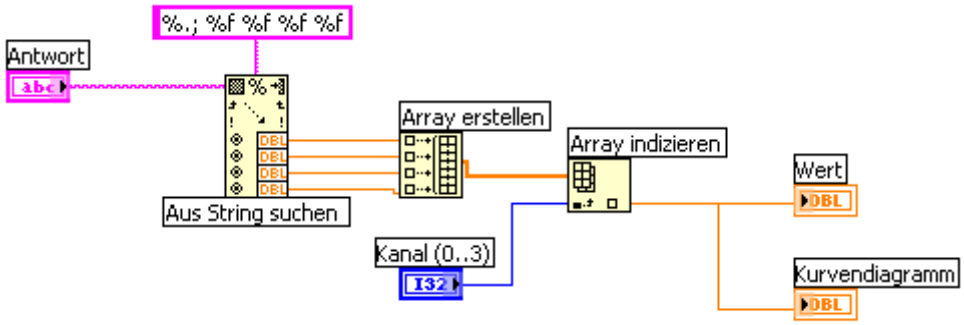
tell VISA to use TCP-IP with this IP address for the eLockIn.

Produce a diagram from the data with “Diagram.vi”

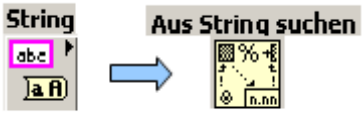
The LabView-file “Diagram.vi”

- takes the answer “Antwort” from the TCP-IP or VISA data acquisition.
- produces a data array

- allows to chose the channel to be displayed (Kanal (0..3))
- shows the value and draws them into a diagram



The LabView functions are found in the sections “String” and “Array” as shown here:



%.; %f %f %f %f devides the string into four parts.