FW102C
Motorized Filter Wheel

Software Manual

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Filter Wheel Software

Thorlabs Filter Wheel®
User Manual
Version 3.2.0 Edition

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FW102C Software

Chapter 1 Installation Guide

1.1 Installing On Windows

1.1.1 Prerequisites

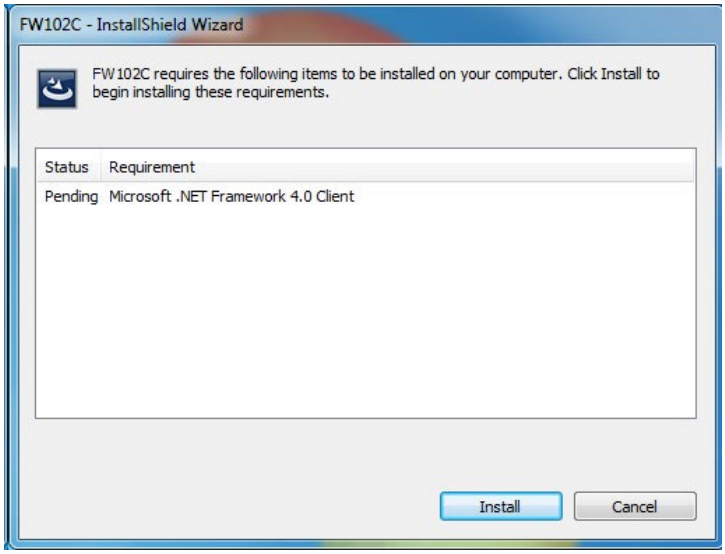
Currently, Thorlabs Software runs on the following host operating systems only:

Windows XP, all service packs (32-bit)
Windows 7 (32-bit and 64-bit)

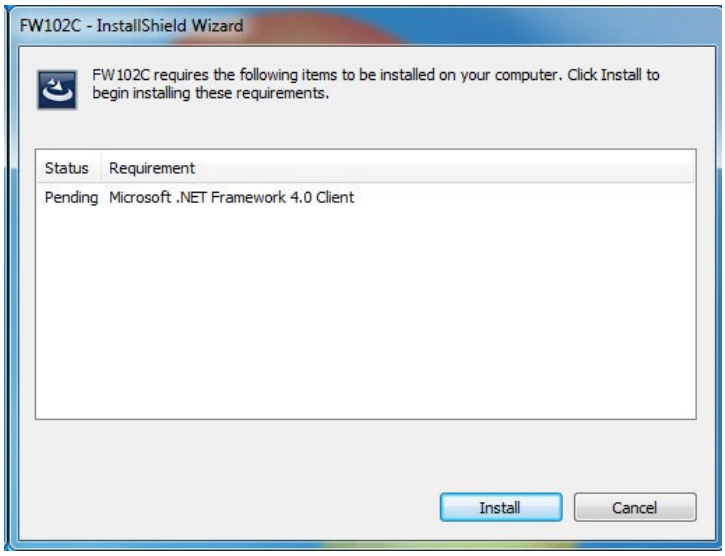
.NET Framework 4.0 Client Profile is required. The LabVIEW 2011 Run-Time Engine (Standard) (32-bit) must be installed on any Windows system where the software will be used.

1.1.2 Performing the Installation

Run setup.exe, the FW102C installation wizard will prompt you to install Microsoft .NET Framework 4.0 Client if it is not already installed on the system, click **Install**. If it has been installed, installation of FW102C will begin.



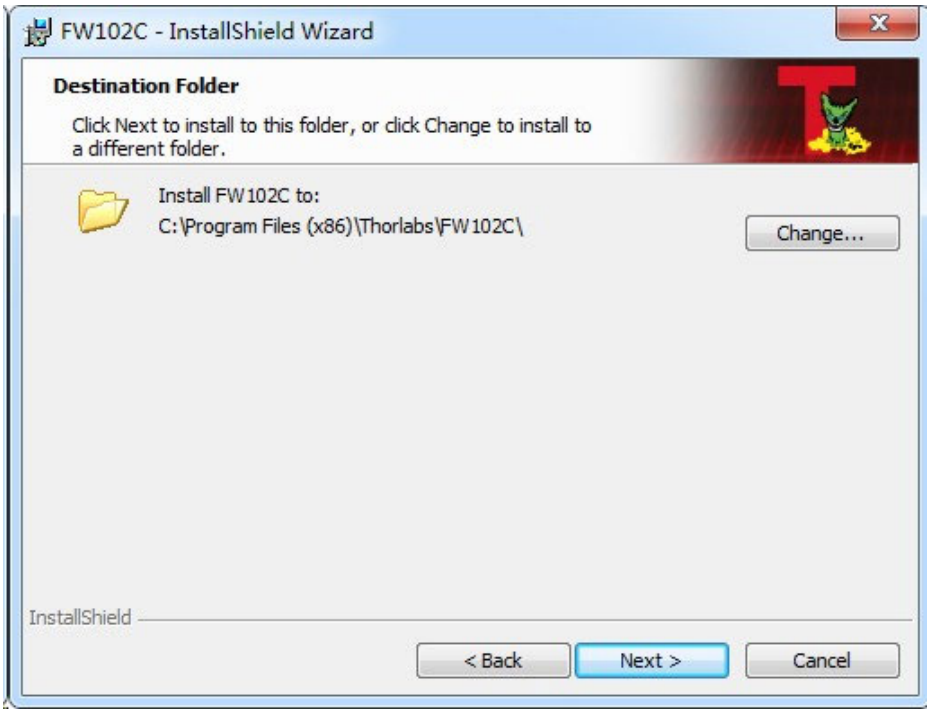
The installation wizard will download and install Microsoft .NET Framework 4.0 Client automatically.



After the installation of Microsoft .NET Framework 4.0 Client, you may be required to restart the computer. The installation of the FW102C software will continue after the reboot.

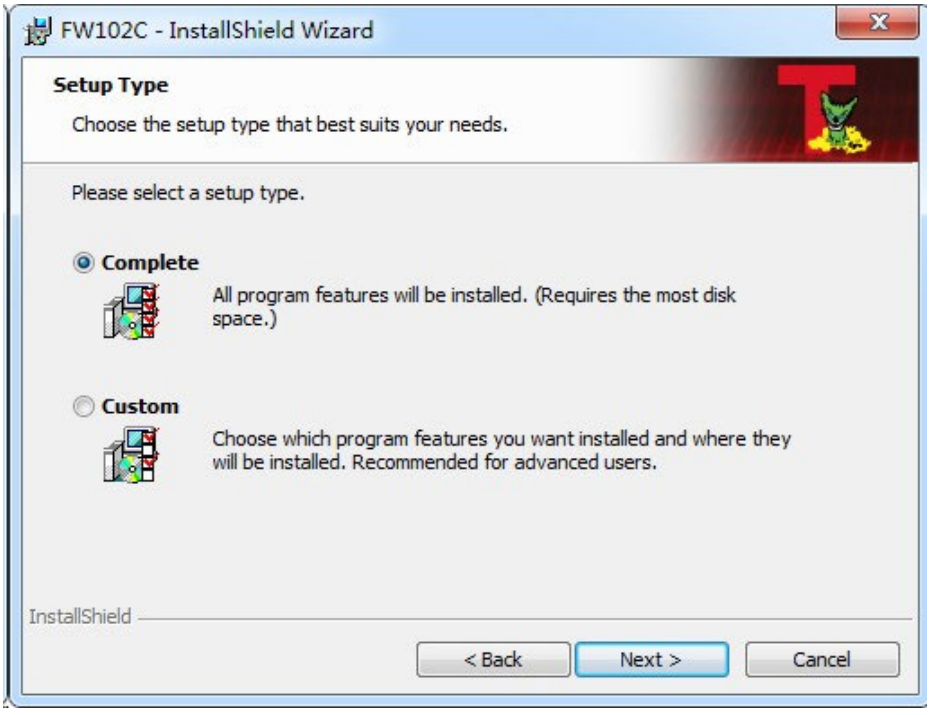
Installation of FW102C, click **Next**.

Click **Next** to install to the default folder, or click **Change** to install to a different folder.

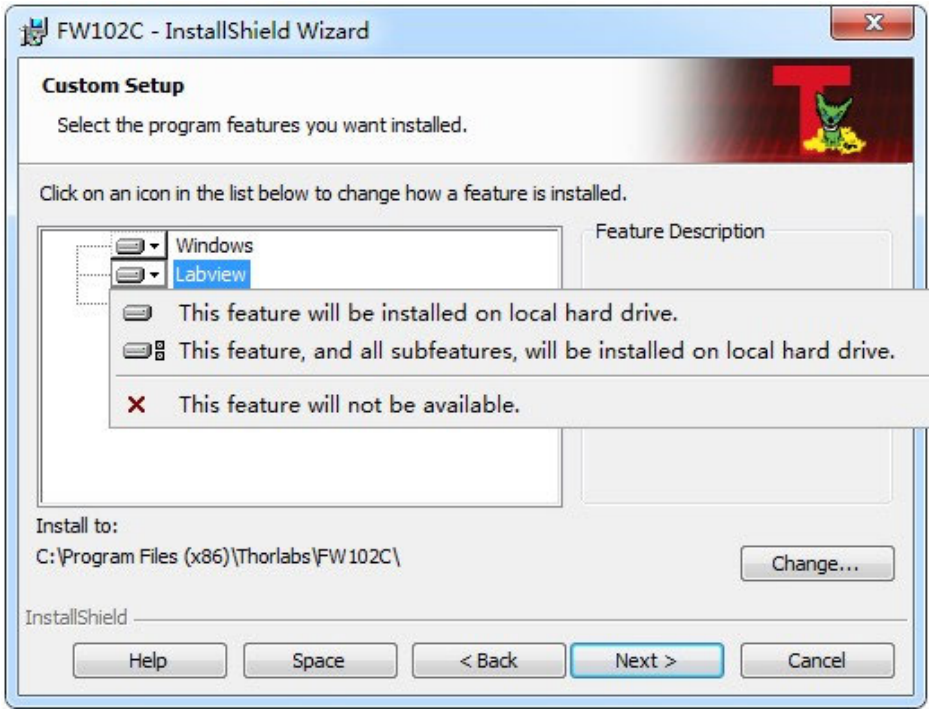


Please choose the setup type that best suits your needs.

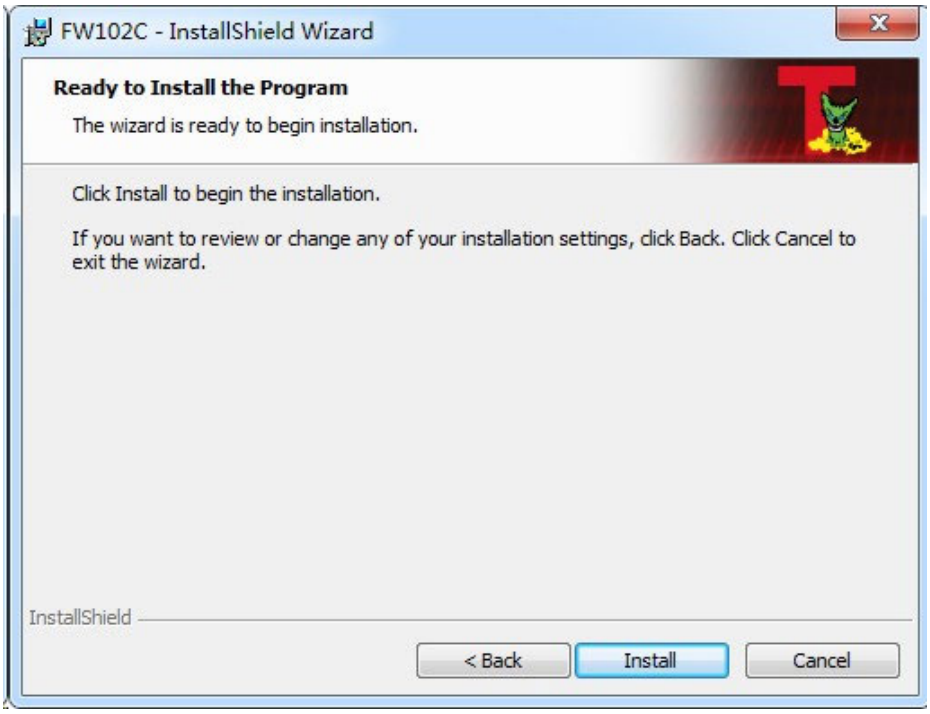
1. Complete – Install all software features.
2. Custom – Choose needed software feature.



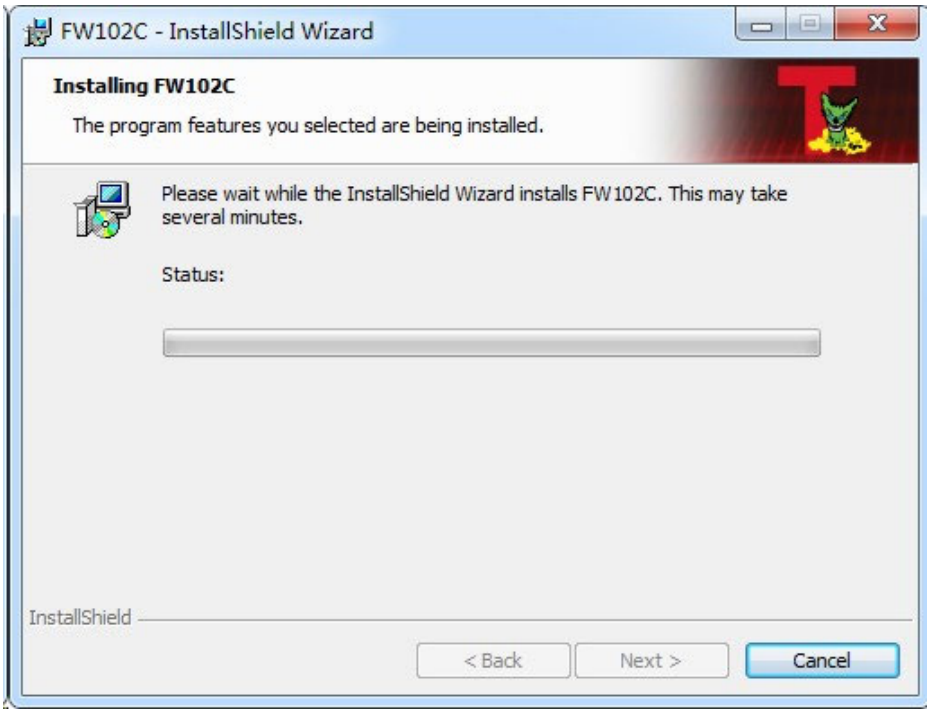
If a feature is not needed, select custom setup and click the icon of feature not needed in the list, then click **This feature will not be available** in context menu. Click **Next**



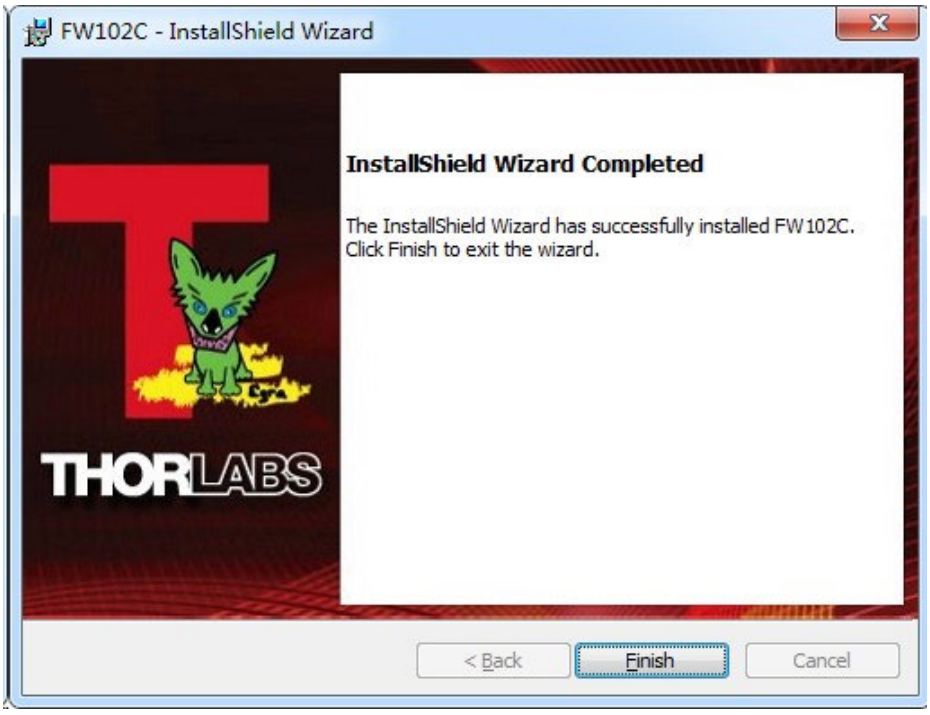
Then the wizard is ready for installation. Click **Install** to begin the installation. If you want to review or change any of your installation settings, click **Back**. Click **Cancel** to exit the wizard.



The installation will start. This may take several minutes. To stop the installation, click the **Cancel** button.



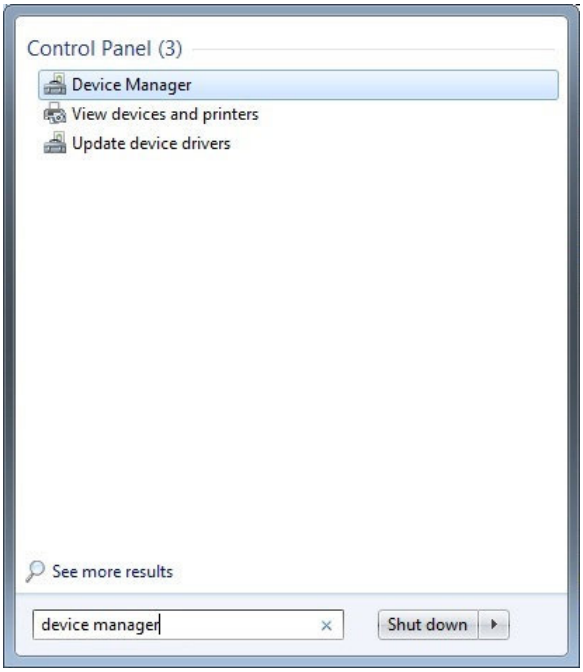
The wizard has successfully installed FW102C. Click **Finish** to exit the wizard.



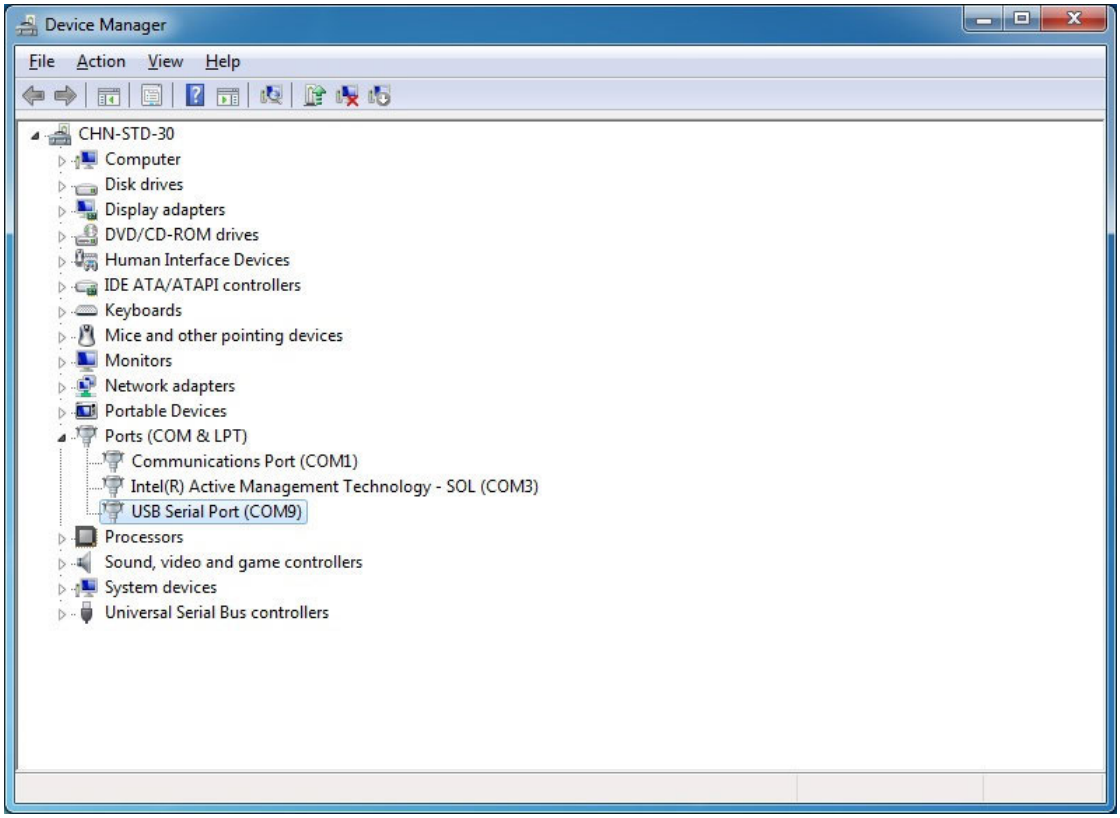
1.2 Before Running Software

Completed the installation, you can find the Thorlabs device listed in your device manager by following the steps below:

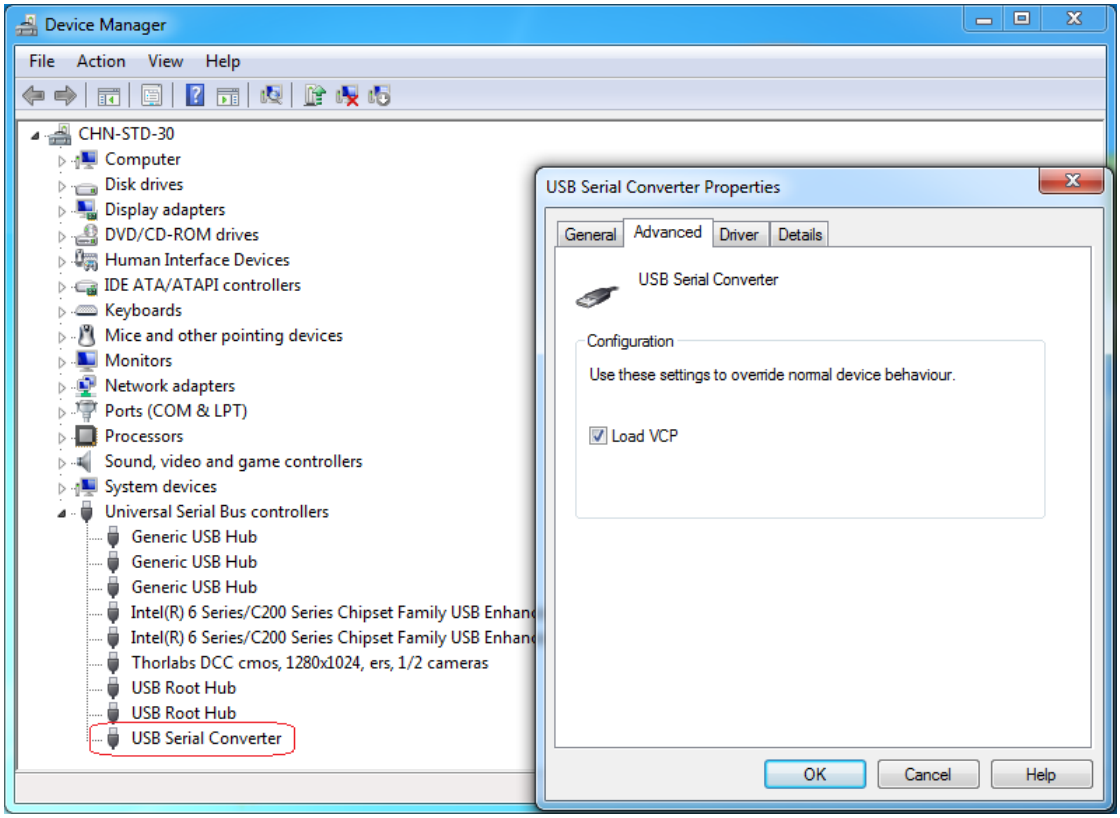
1. Click on the **Start Menu**.
2. Type **device manager** in search box and press enter. Select **Device Manager** from the results list. Below is an example of what you should see:



3. Find the serial port connected to the device, for example USB Serial Port (COM9).



If the serial port is not in the list of **Ports (COM & LPT)**, please check if **Load VCP** has been selected in the properties dialog of **USB Serial Converter**. If not, please click it and reconnect your device. Then the serial port should show up.

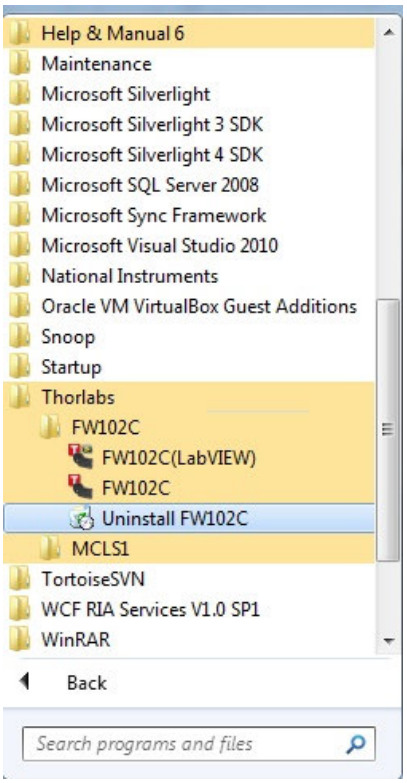


The FW102C software is now ready to use.
Running Your Software (Windows)
Running Your Software (LabVIEW)

1.3 Uninstalling Software

To uninstall the software, click **Start** then:

All Programs > Thorlabs > FW102C > Uninstall FW102C



Chapter 2 Running Your Software (Windows)

2.1 Quick Start

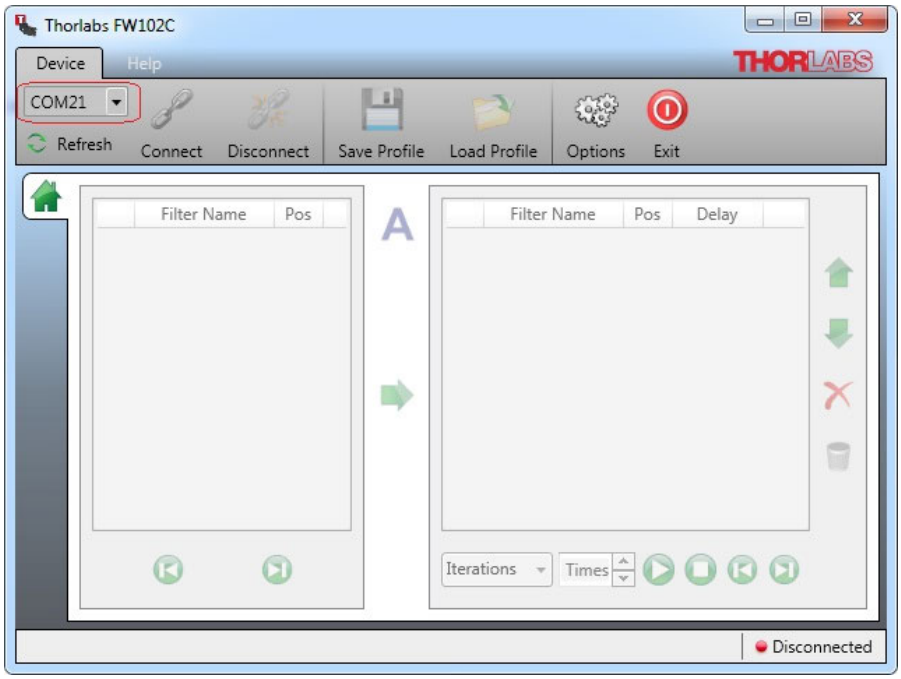
To use **Quick Start**, double click the FW102C desktop shortcut or select it from the **Start Menu** by going to:

All Programs > Thorlabs > FW102C > FW102C.

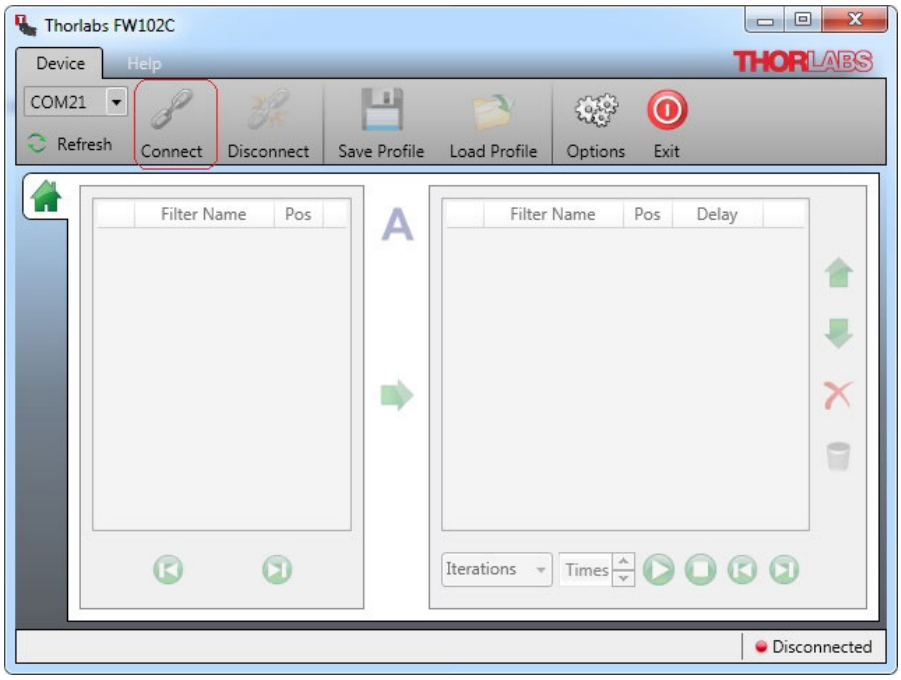
2.2 Connect Device

To connect your FW102C device, please follow the steps below:

1. Select FW102C from the Start Menu.
2. After the software loads, you will see the screen below. Select the com port your FW102C is connected to by choosing it from the **Com Port** drop down box. To determine which com port your device is connected to, see the section on how to find FW102C com port.



3. To connect, click the **Connect** button next to the drop down box.

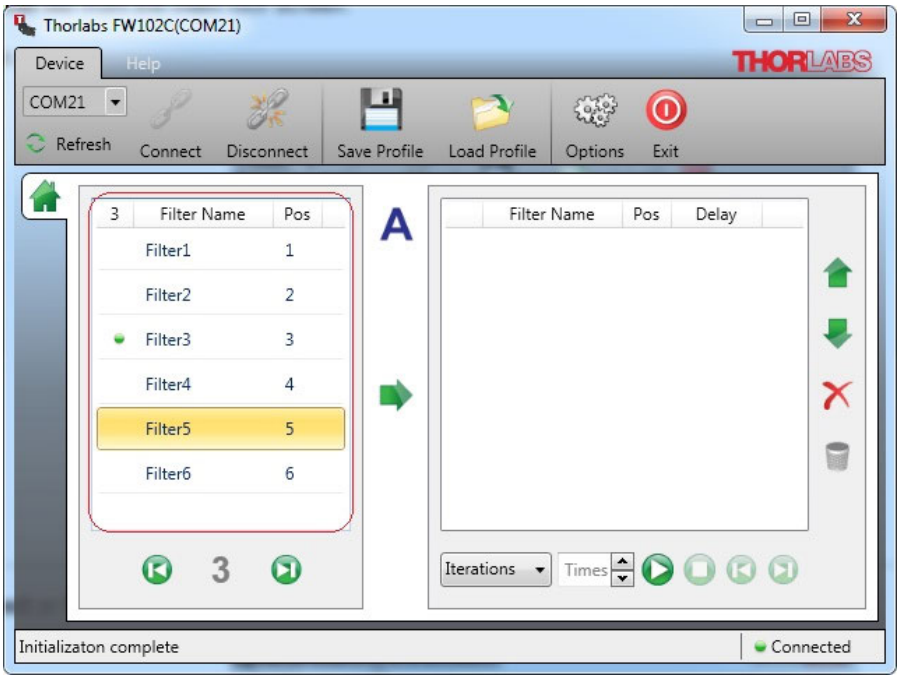


2.3 Front Panel

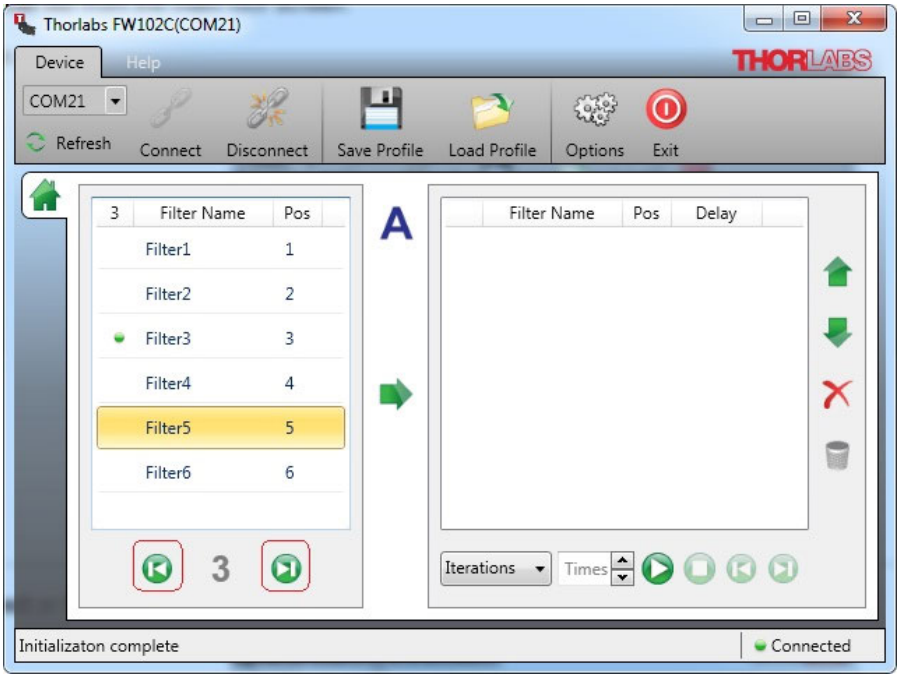
2.3.1 Set Filter Position

Set Filter Position can be accessed on the **Front Panel** tab from the main GUI screen.

1. Double click the filter name to set to this position.



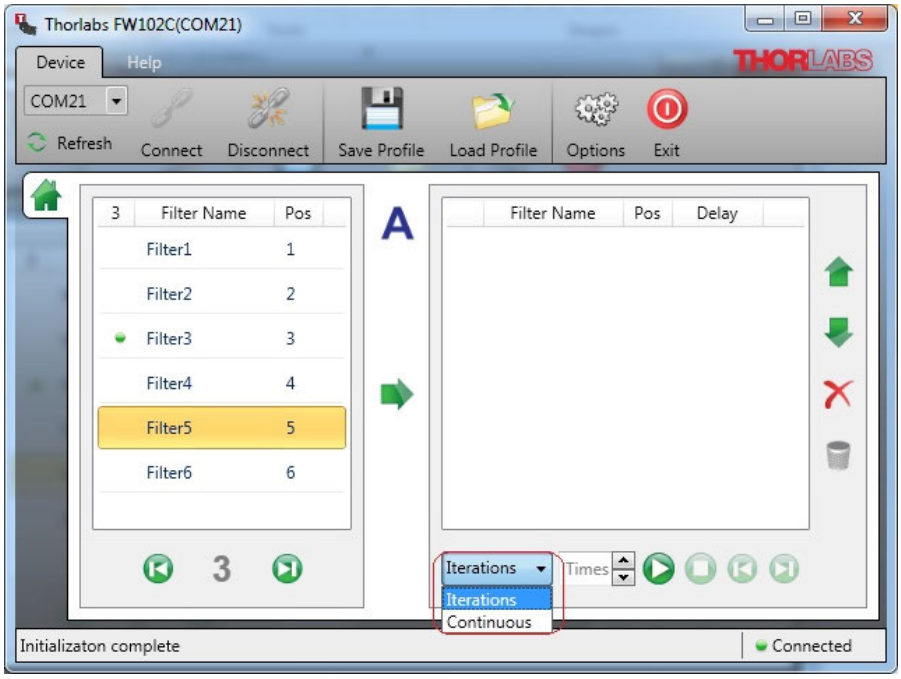
2. To set the next or previous position, click the **Next** or **Previous** button in the bottom of left side (outlined in red in the picture below).



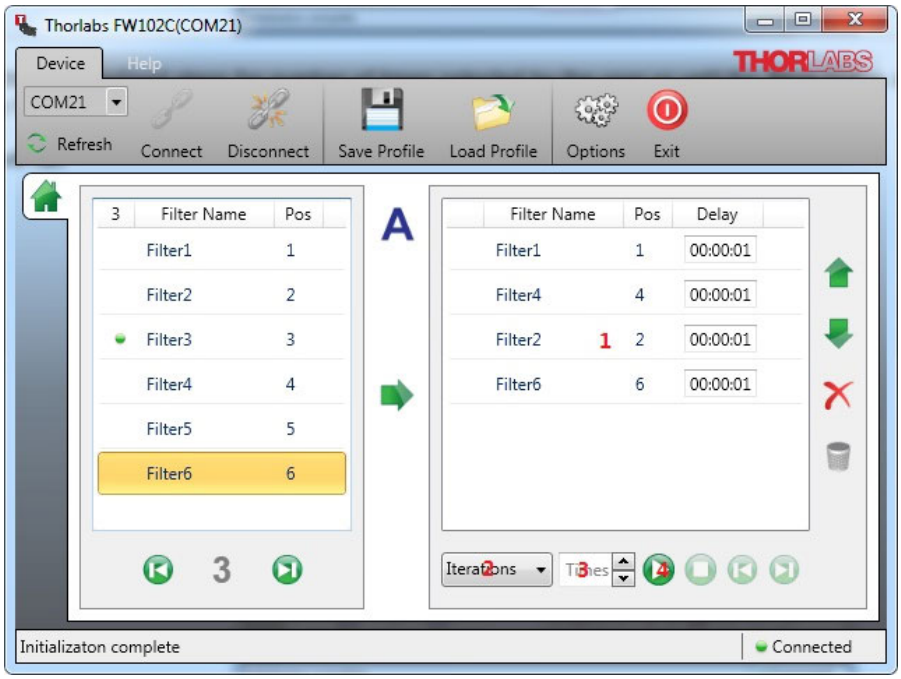
2.3.2 User Defined Sequence

2.3.2.1 Run

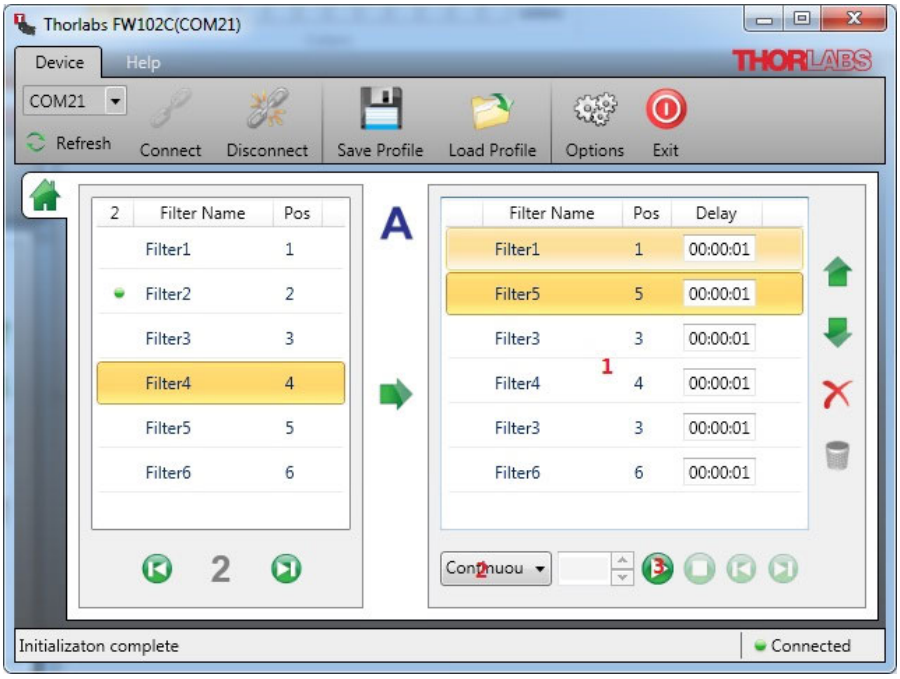
The software allows the user to define their own sequence of filter stops and how long the filter wheel will remain at that location. This program can run for a set iteration or continuously. Each mode is selected from the drop down box on the bottom right of the window.



- **Iteration:** Run filter wheel in accordance with the user defined steps for number of times selected by the user or until the **Stop** button is clicked manually. To setup iteration mode,
  1. Set up the filter location sequence and delay time in the box on the right
  2. Select **Iteration** in the drop down box
  3. Specify the number of times the sequence will run
  4. Click the **Run** button.

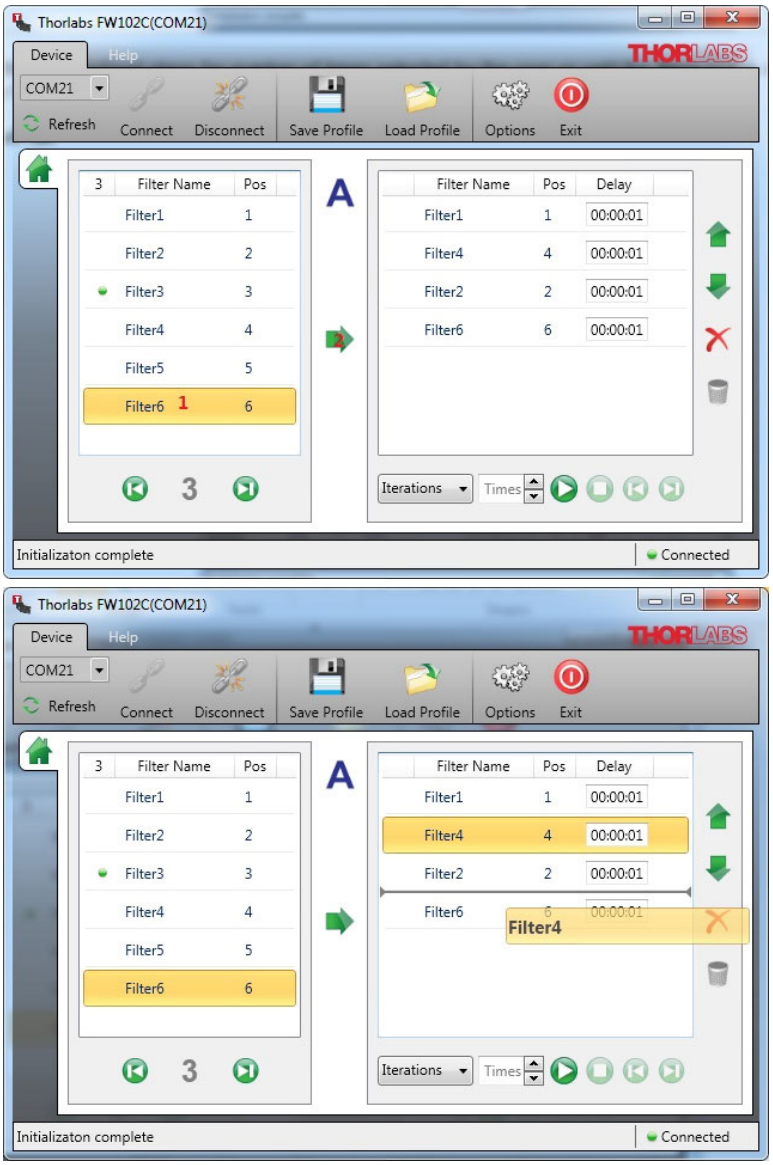


- **Continuous:** Run filter wheel in accordance with defined steps once until click stop.
  1. Set up the filter location sequence and delay time in the box on the right
  2. Select **Continuous** in the combo box
  3. Click the **Run** button.

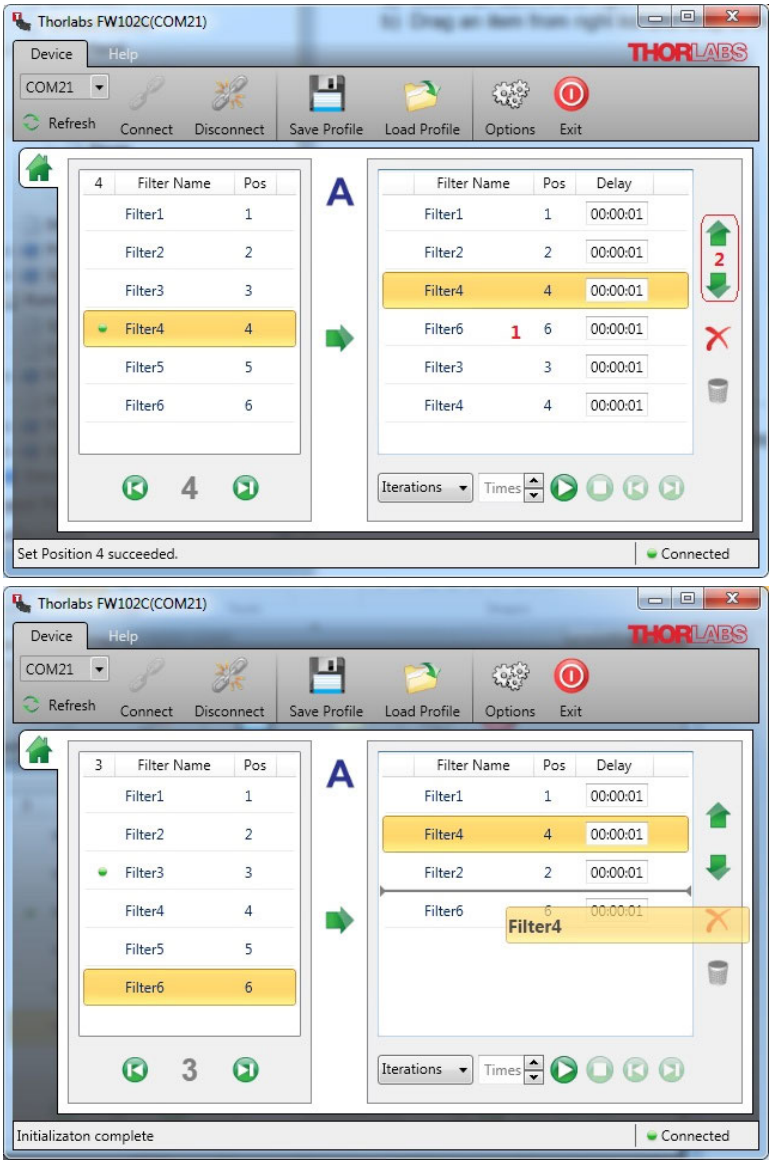


Defining the Step Sequence

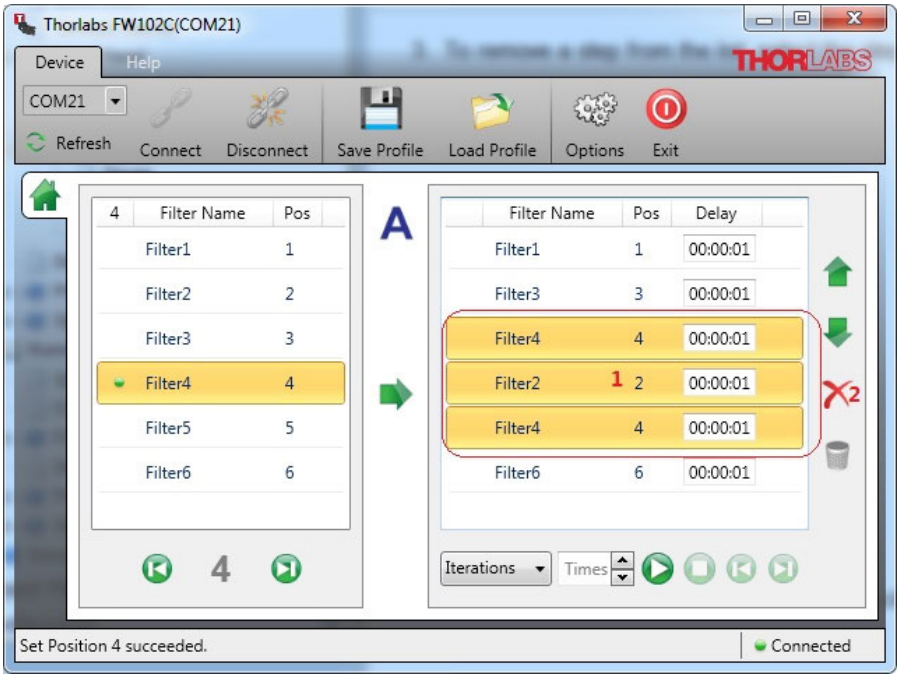
1. To add a step, the user can either drag and drop a filter spot form the left or select an item and hit the right arrow (2).
   a) Select an item form left list, then click the **Right Arrow**. The new step will be added after the last, or
   b) Drag an item from left list and drop it into the right list. The step will be inserted into the list at the highlight bar.



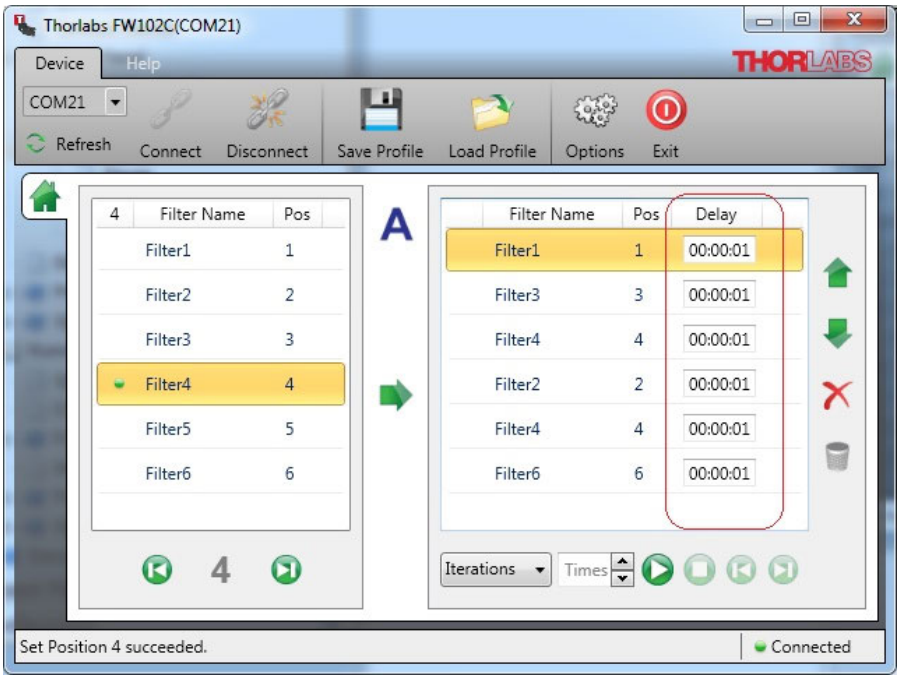
2. The sequence of steps can be reordered. The user has two methods to choose.
   a) Select an item in the right list box then click either the Up or Down arrow to move the step either up or down respectively.
   b) Drag an item from right list and drop to the position you want.



3. To remove a step from the list, select the step or steps in the list and click the **Delete** button (2).

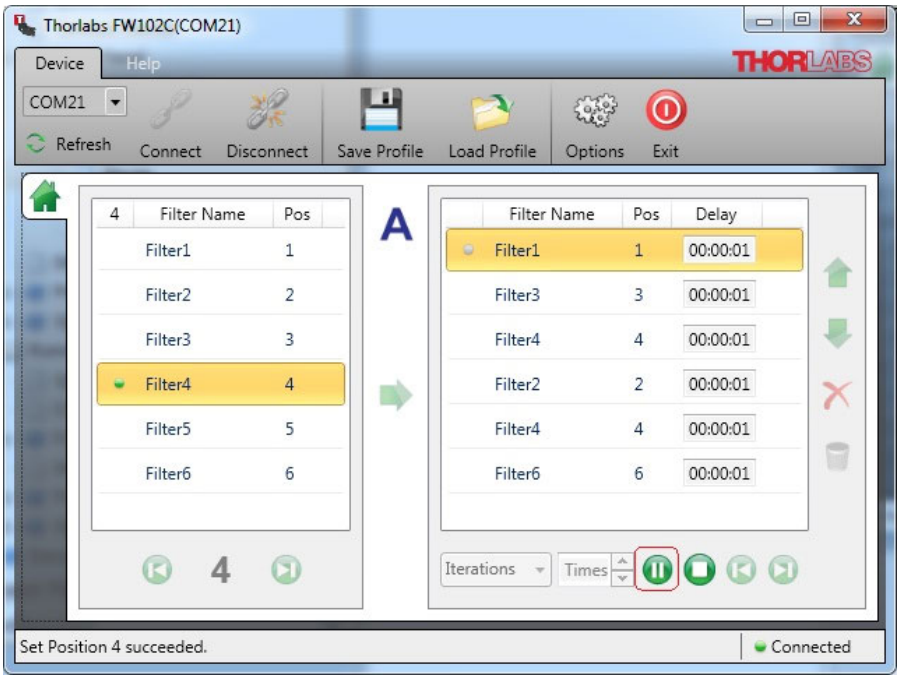


4. Lastly, set the delay time for every step by clicking and editing the text box.



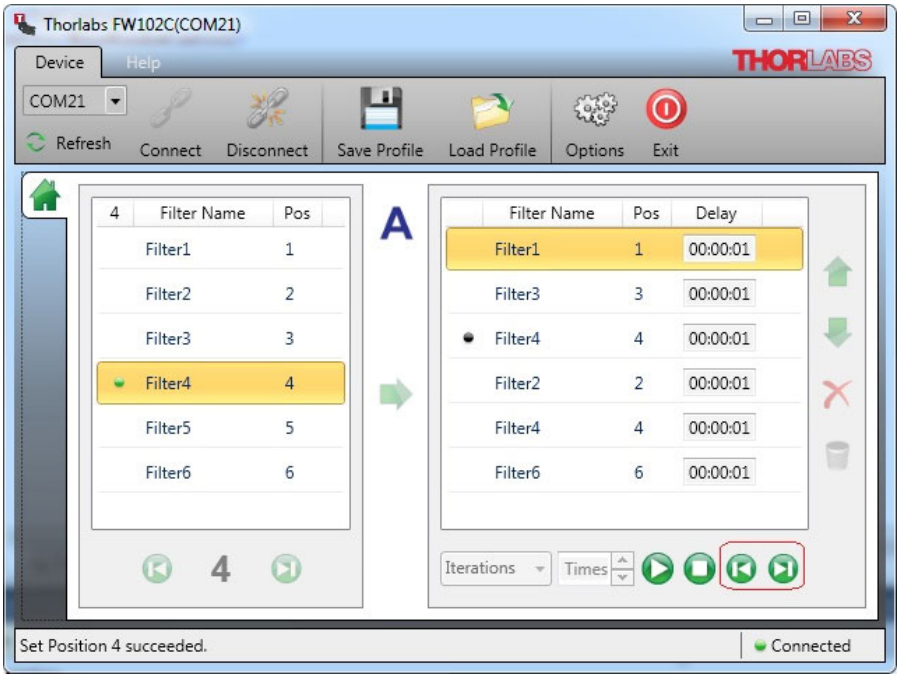
2.3.2.2 Pause

To pause the sequence during *Continuous* play, click the **Pause** button found in the lower right corner of the control window. Click the **Play** button to continue running.



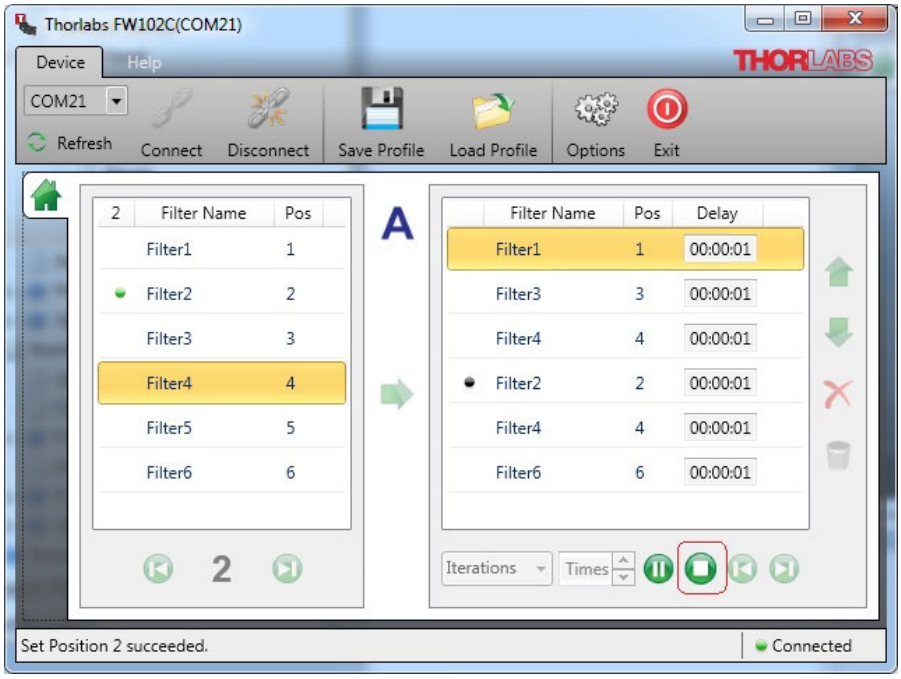
2.3.2.3 Next\Previous step

The user can manually jump the filter to the next or previous step by clicking the **Next** or **Previous** button respectively.



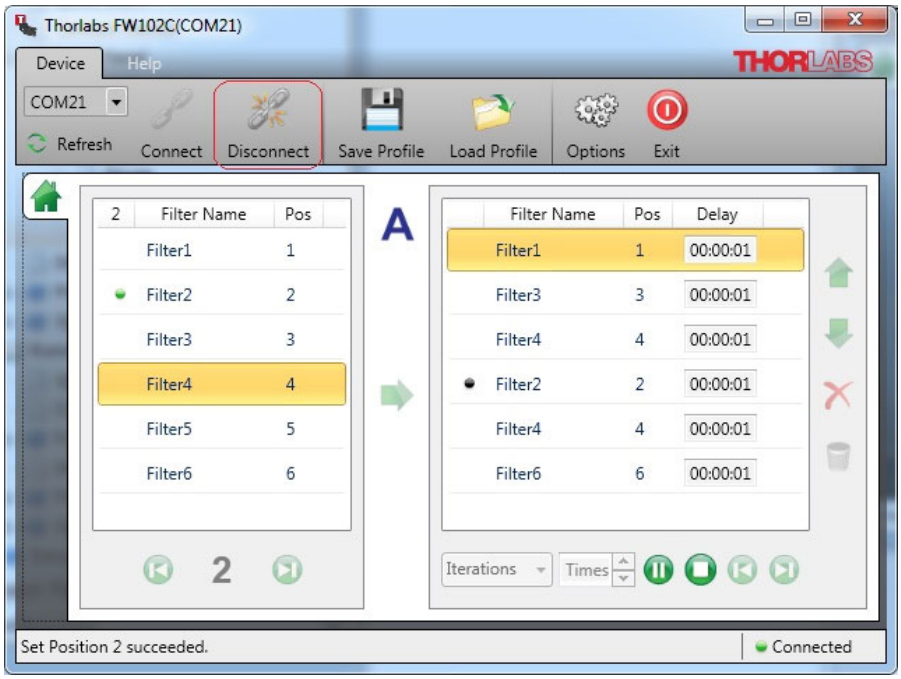
2.3.2.4 Stop

Clicking the **Stop** button will stop the programed sequence.



2.4 Disconnect Device

Pressing the **Disconnect** button at any time will cause the software to disconnect the link to the device



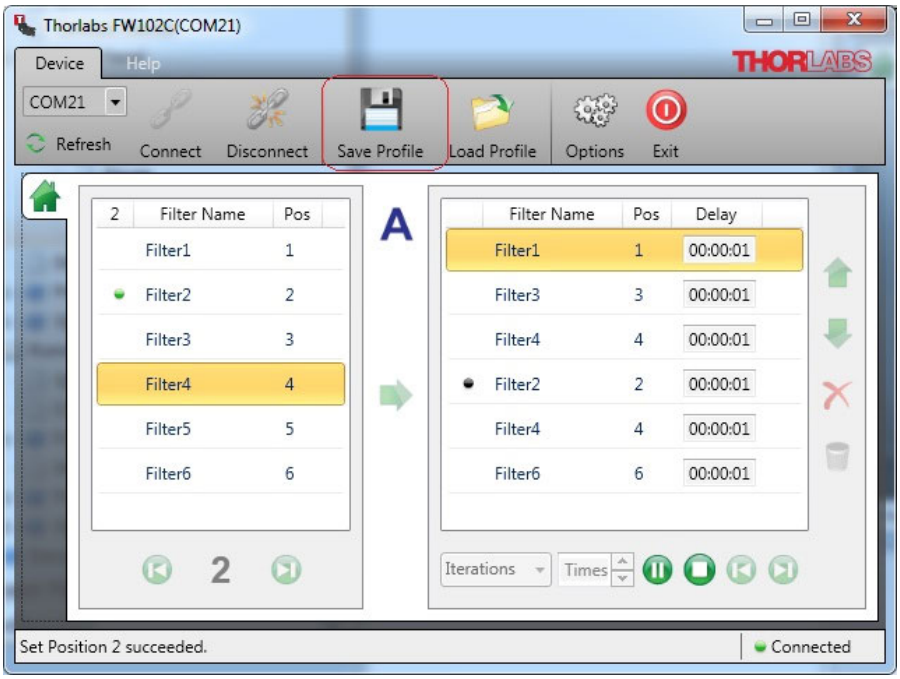
2.5 Profile

The user can save the current status of the connected device to an XML file for future quick set up.

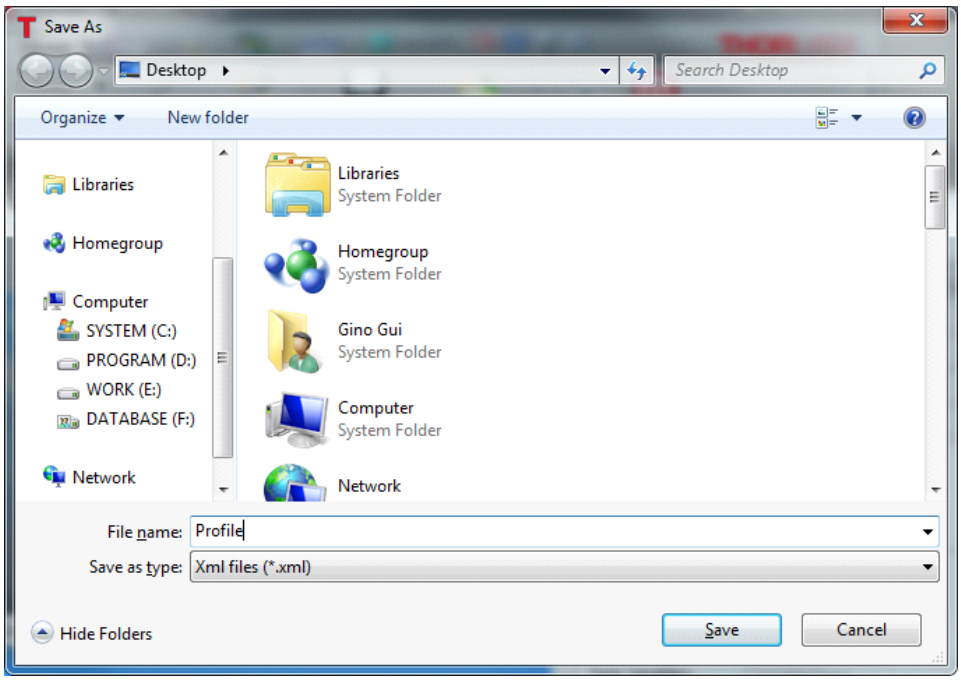
2.5.1 Save Profile

Following the steps below, the user can save the current status of the device to an XML file.

1. Click the **Save Profile** button from the menu bar to save the current settings for the device to an XML file.



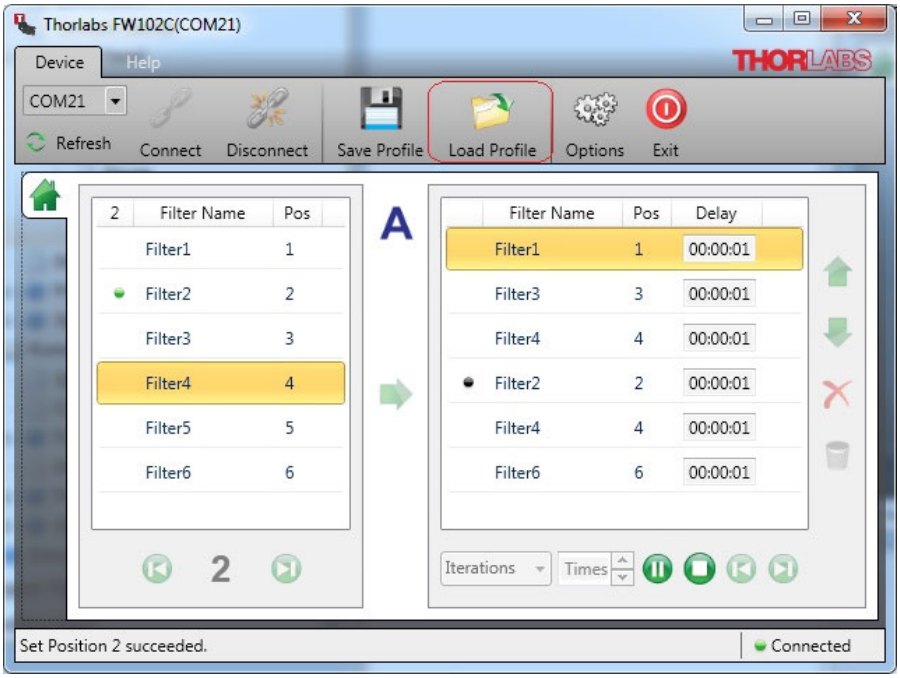
2. Select the desired save location then click OK. The current settings will be saved to a XML file with the specified file name.



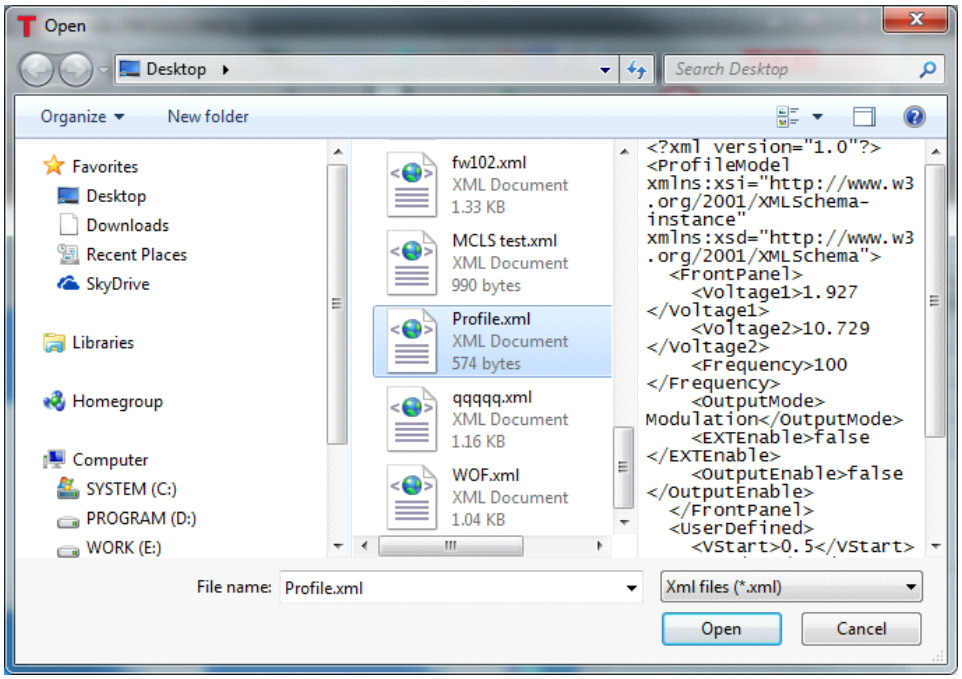
2.5.2 Load Profile

Follow the steps below to load a previously saved XML profile file to set the desired waveform.

1. Click the **Load Profile** button from the menu to load the settings to the device. A standard Windows file dialog box will open.

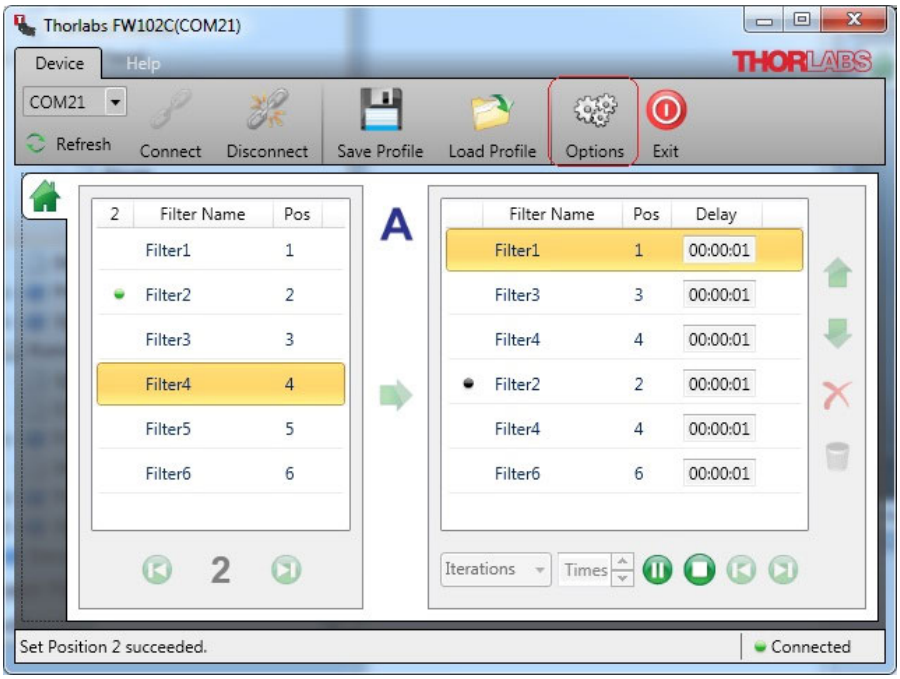


2. Select a profile file to load by clicking on the file name in the dialog box. The settings will be loaded and applied.



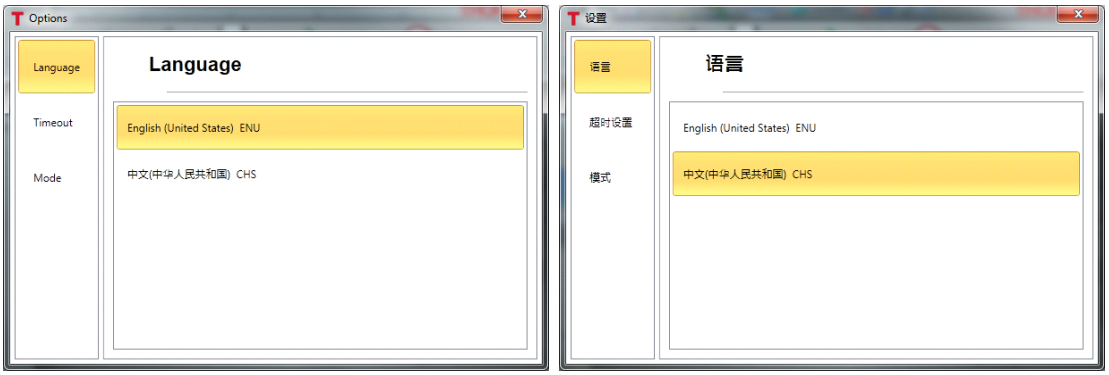
2.6 Options

Software settings that can be changed are outlined below. These settings are shown in the options window after clicking the **Options** button on the menu.



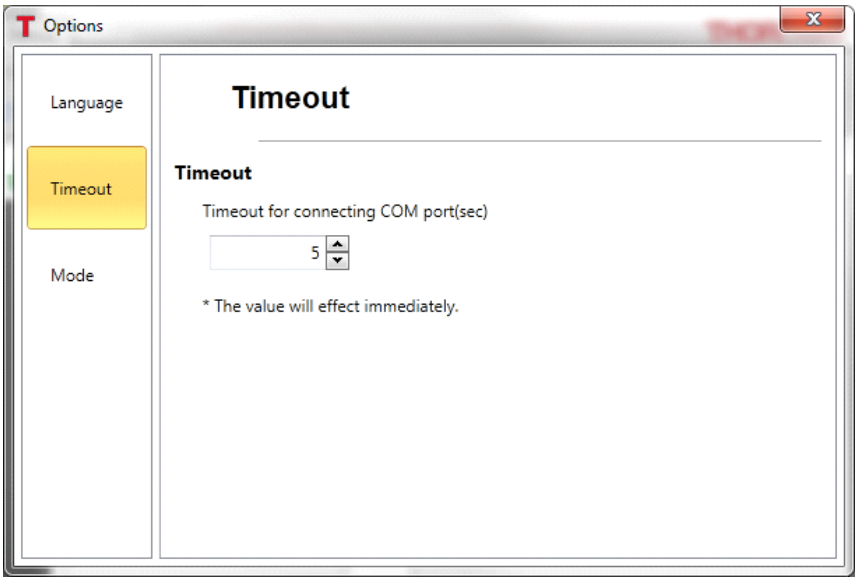
2.6.1 Language

The **Select Language** option located on the left side bar allows you to change the language of your software as shown in the screens below.



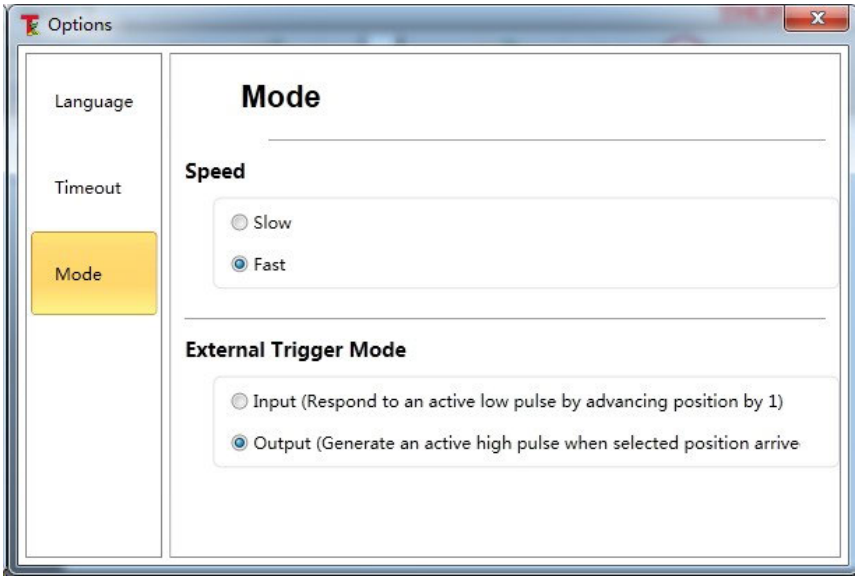
2.6.2 Timeout

Select the **Timeout** tab to set the time out for communicating to the FW102C device. The default value is 5 seconds.



2.6.3 Mode

Select the **Mode** tab to set the mode of the FW102C device. **Speed** mode and **trigger** mode are supported in this tab.



Chapter 3 Running Your Software (LabVIEW)

3.1 Quick Start

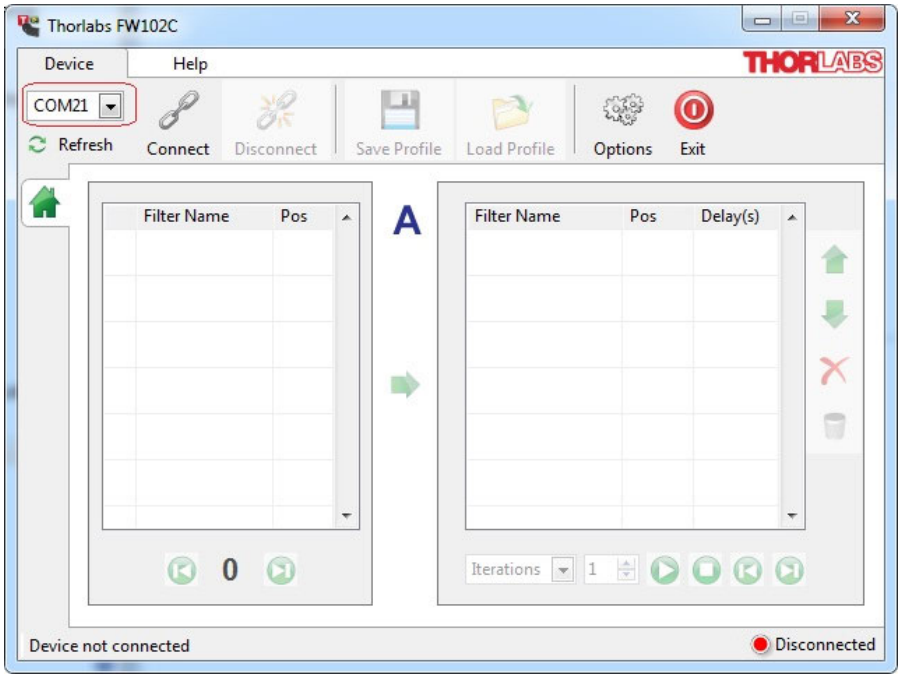
To use **Quick Start**, double click the FW102C desktop shortcut or select it from the **Start Menu** by going to:

All Programs > Thorlabs > FW102C > FW102C-LabVIEW.

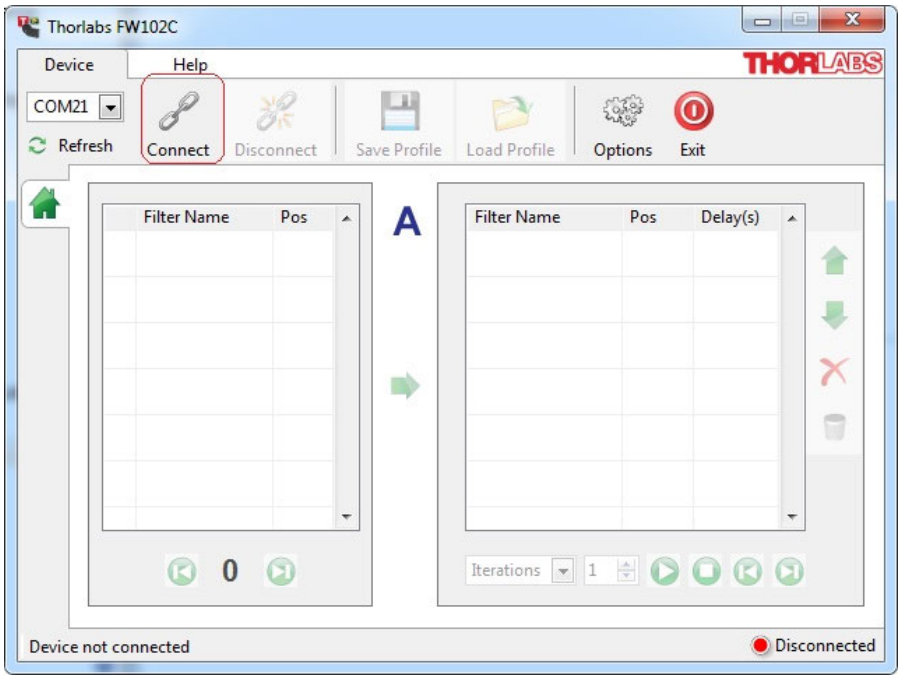
3.2 Connect Device

To connect your FW102C device, please follow the steps below:

1. Select FW102C-LabVIEW from the Start Menu.
2. After the software loads, you will see the screen below. Select the com port your FW102C is connected to by choosing it from the **Com Port** drop down box. To determine which com port your device is connected to, see the section on how to find FW102C com port.



1. To connect, click the **Connect** button next to the drop down box.

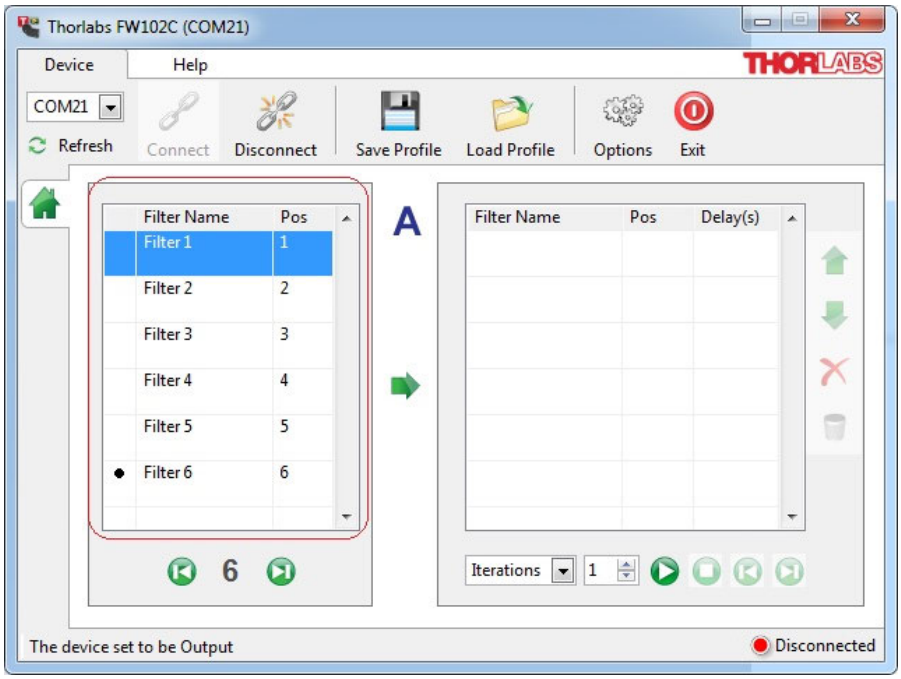


3.3 Front Panel

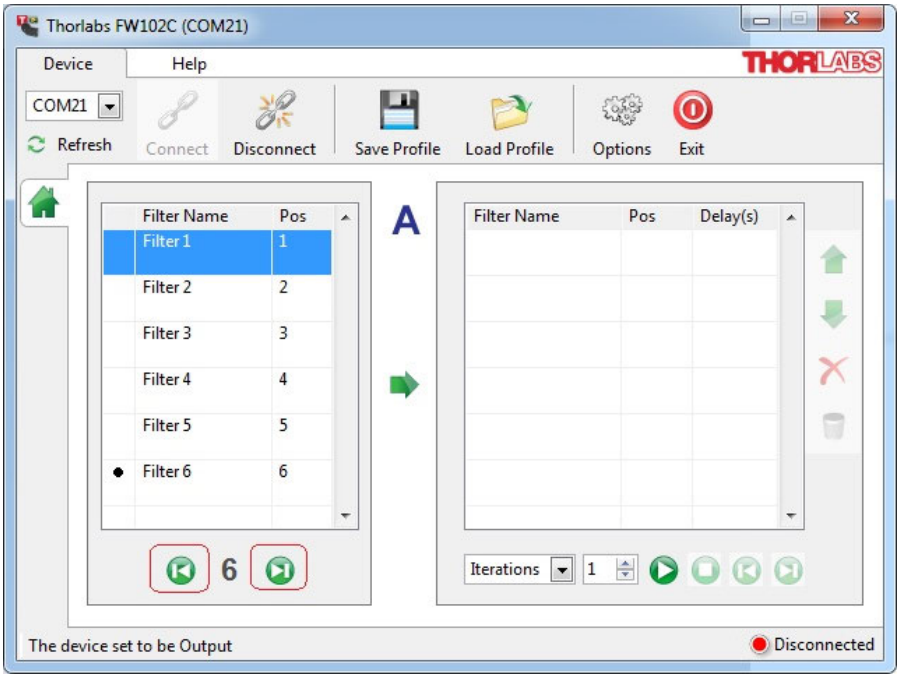
3.3.1 Set Filter Position

Set Filter Position can be accessed on the **Front Panel** tab from the main GUI screen.

1. Double click the filter name to set to this position.



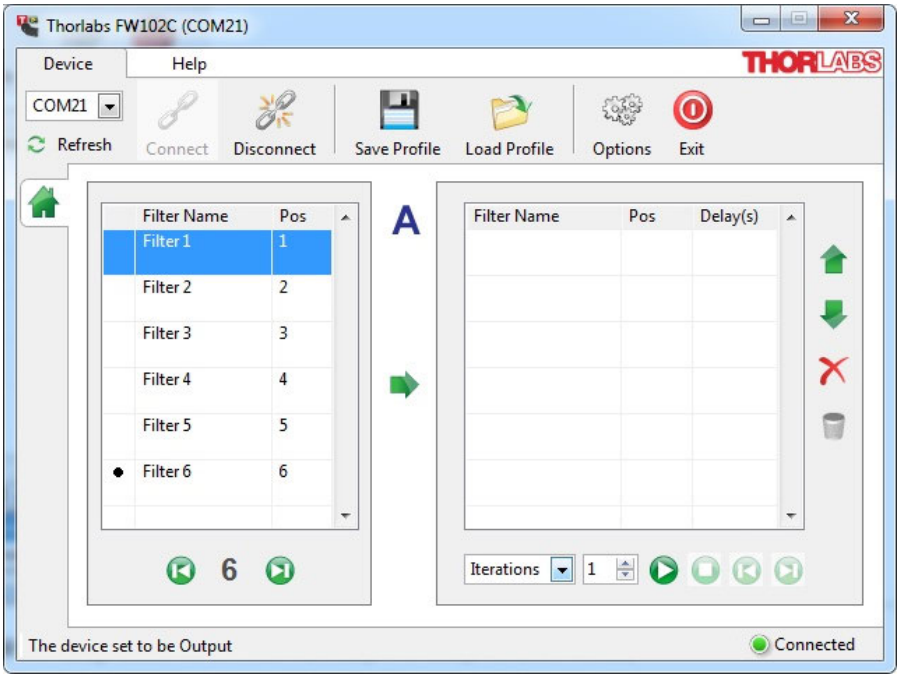
1. To set the next or previous position, click the **Next** or **Previous** button in the bottom of left side (outlined in red in the picture below).



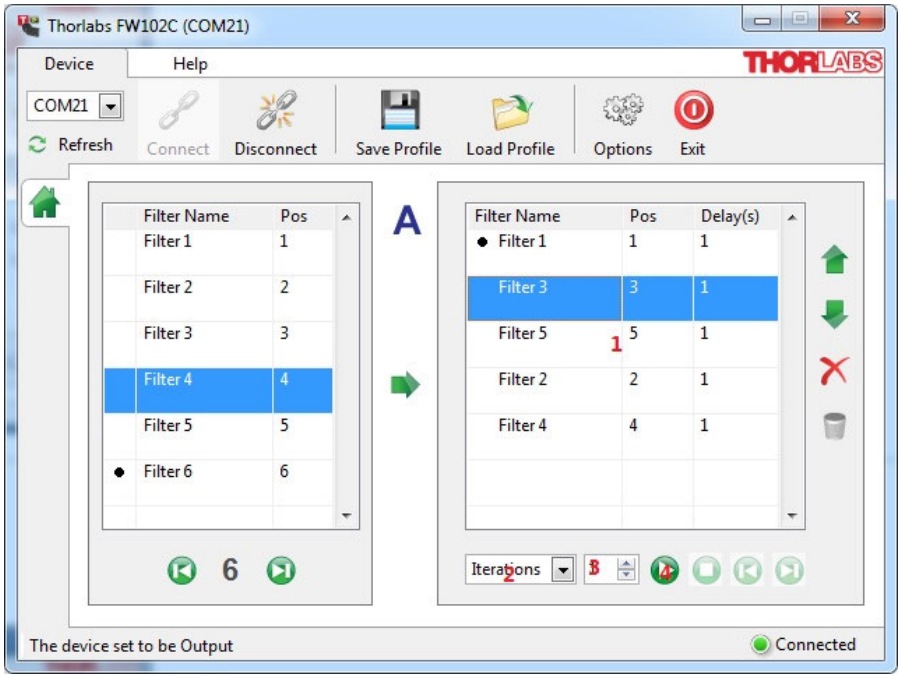
3.3.2 User Defined Sequence

3.3.2.1 Run

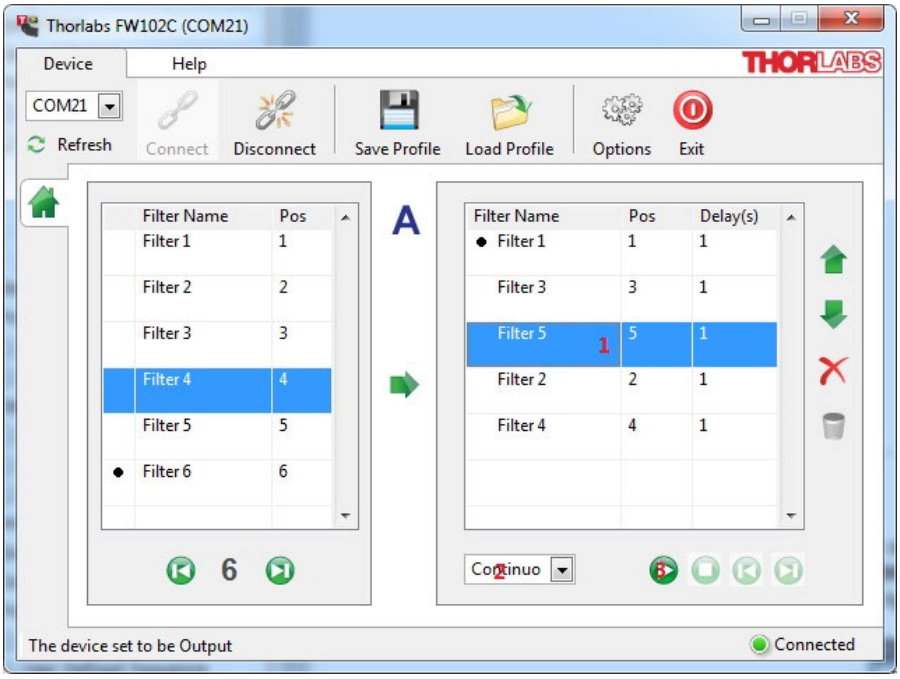
The software allows the user to define their own sequence of filter stops and how long the filter wheel will remain at that location. This program can run for a set iteration or continuously. Each mode is selected from the drop down box on the bottom right of the window.



- **Iteration:** Run filter wheel in accordance with the user defined steps for number of times selected by the user or until the **Stop** button is clicked manually. To setup iteration mode,
  1. Set up the filter location sequence and delay time in the box on the right
  2. Select **Iteration** in the drop down box
  3. Specify the number of times the sequence will run
  4. Click the **Run** button.

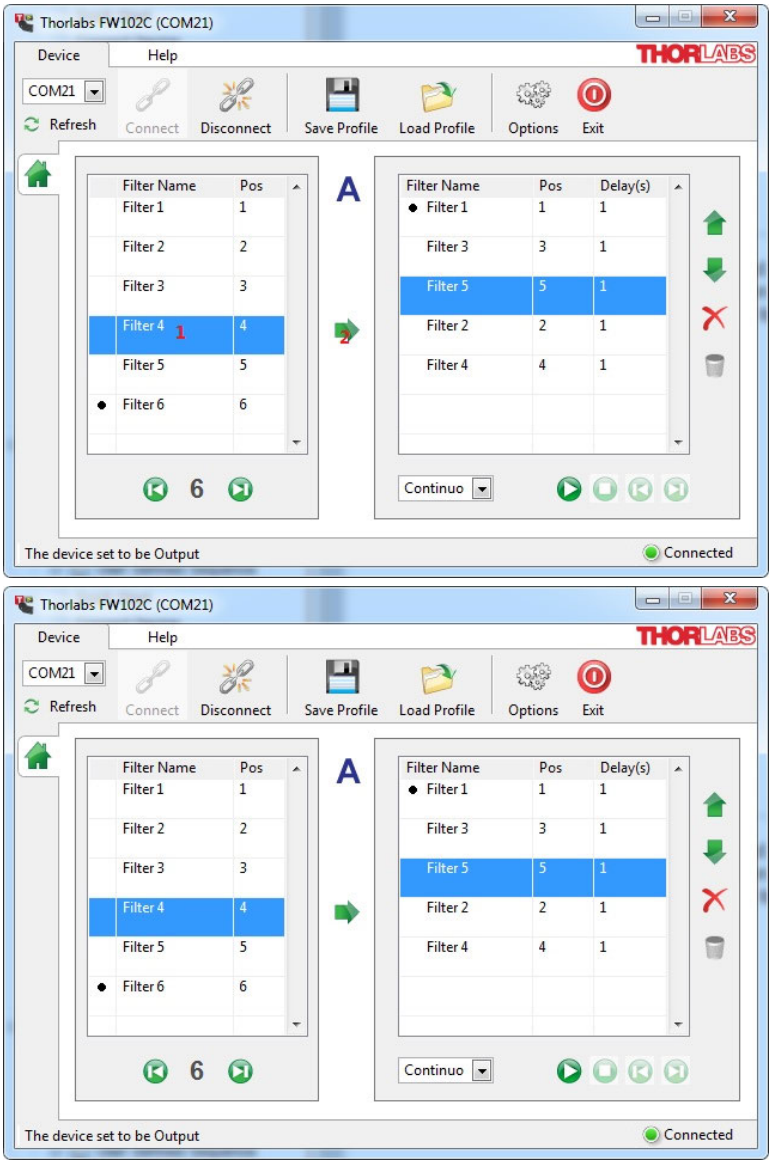


- **Continuous:** Run filter wheel in accordance with defined steps once until click stop.
  1. Set up the filter location sequence and delay time in the box on the right
  2. Select **Continuous** in the combo box
  3. Click the **Run** button.

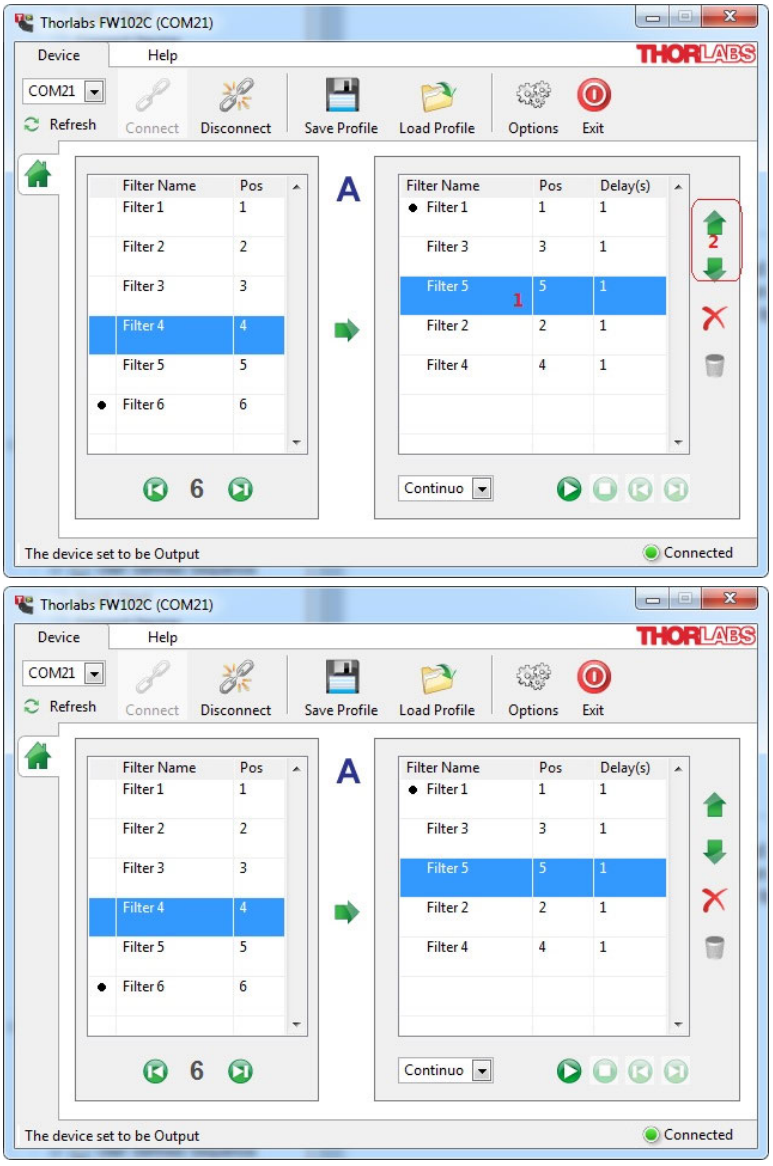


Defining the Step Sequence

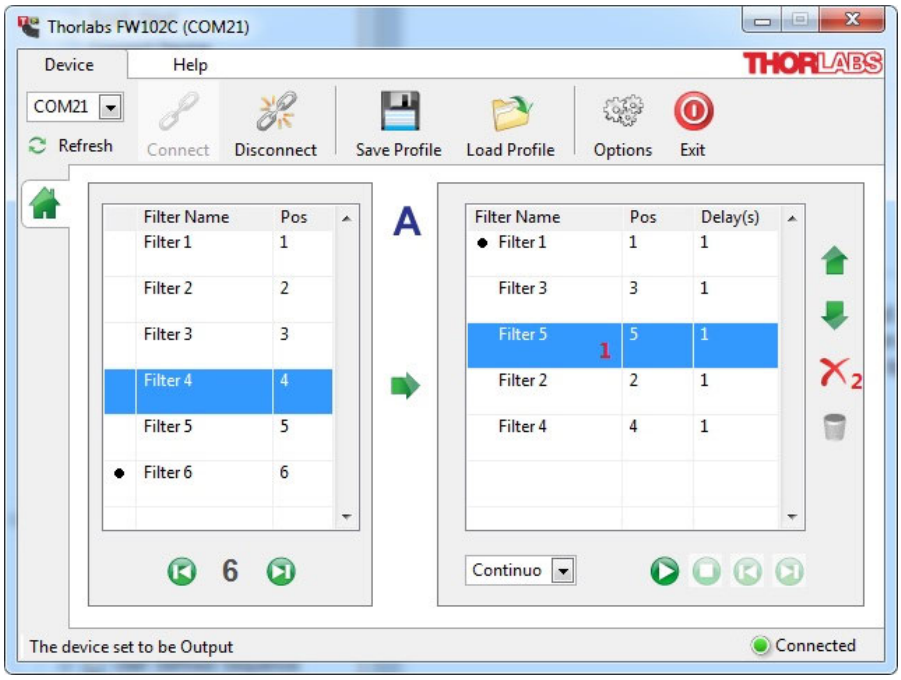
1. To add a step, the user can either drag and drop a filter spot form the left or select an item and hit the right arrow (2).
   a) Select an item form left list, then click the **Right Arrow**. The new step will be added after the last, or
   b) Drag an item from left list and drop it into the right list. The step will be inserted into the list at the highlight bar.



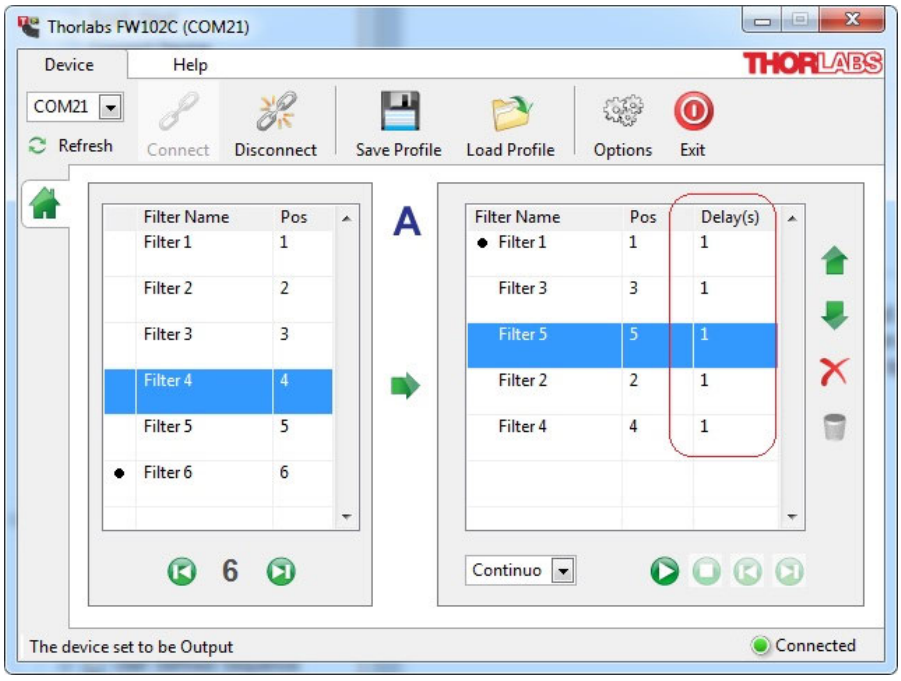
2. The sequence of steps can be reordered. The user has two methods to choose.
   a) Select an item in the right list box then click either the Up or Down arrow to move the step either up or down respectively.
   b) Drag an item from right list and drop to the position you want.



3. To remove a step from the list, select the step or steps in the list and click the **Delete** button (2).

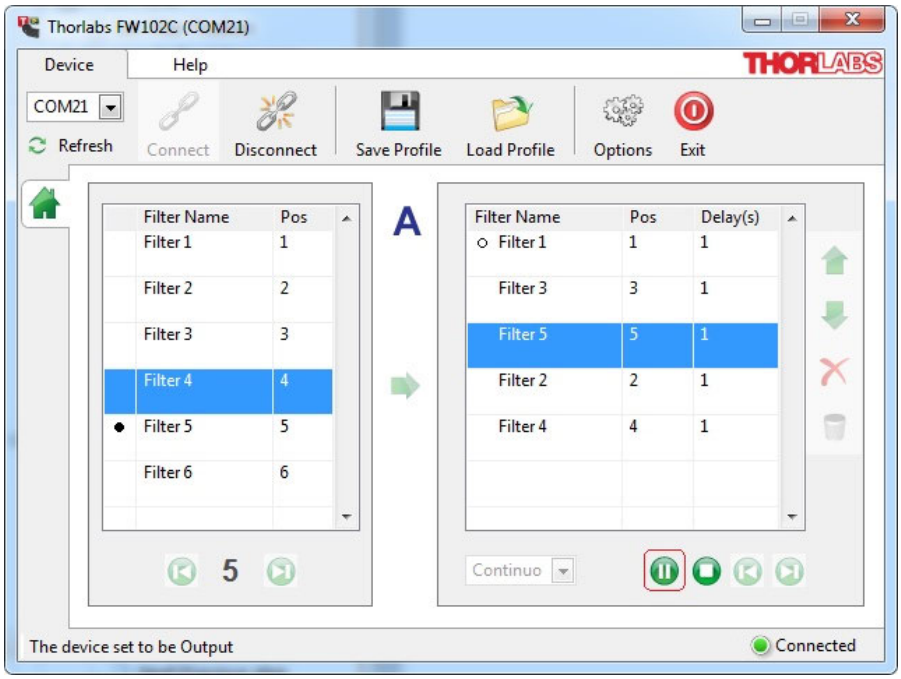


4. Lastly, set the delay time for every step by clicking and editing the text box.



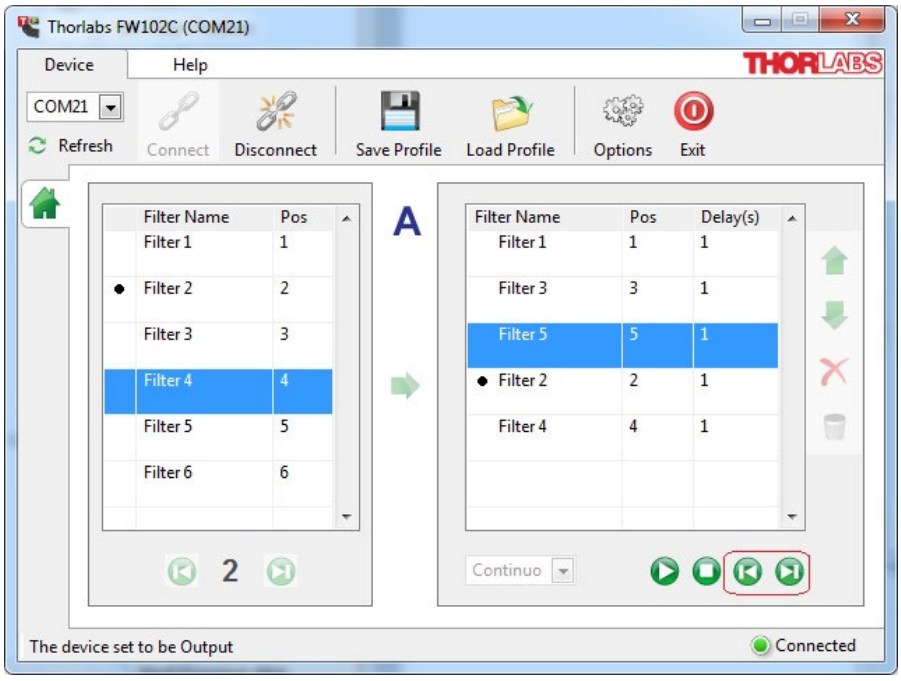
3.3.2.2 Pause

To pause the sequence during *Continuous* play, click the **Pause** button found in the lower right corner of the control window. Click the **Play** button to continue running.



3.3.2.3 Next\Previous step

The user can manually jump the filter to the next or previous step by clicking the **Next** or **Previous** button respectively.

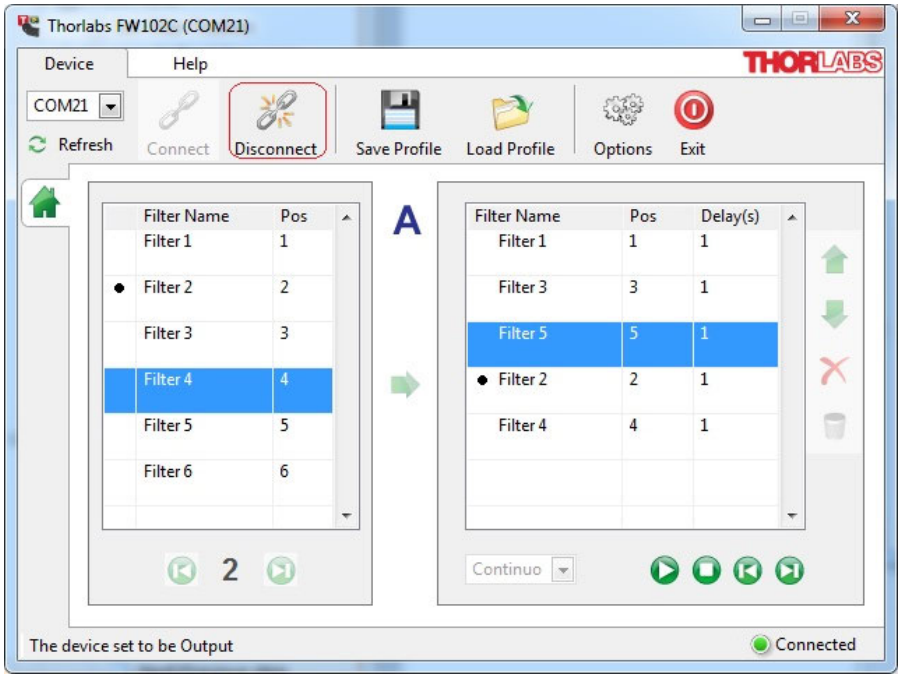


3.3.2.4 Stop

Clicking the **Stop** button will stop the programed sequence.

3.4 Disconnect Device

Pressing the **Disconnect** button at any time will cause the software to disconnect the link to the device



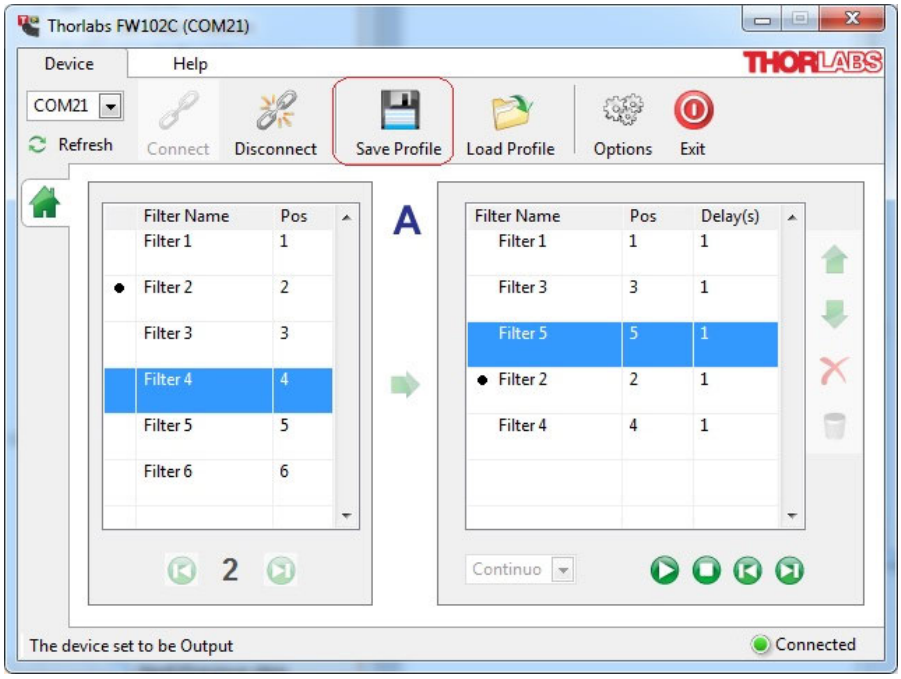
3.5 Profile

The user can save the current status of the connected device to an XML file for future quick set up.

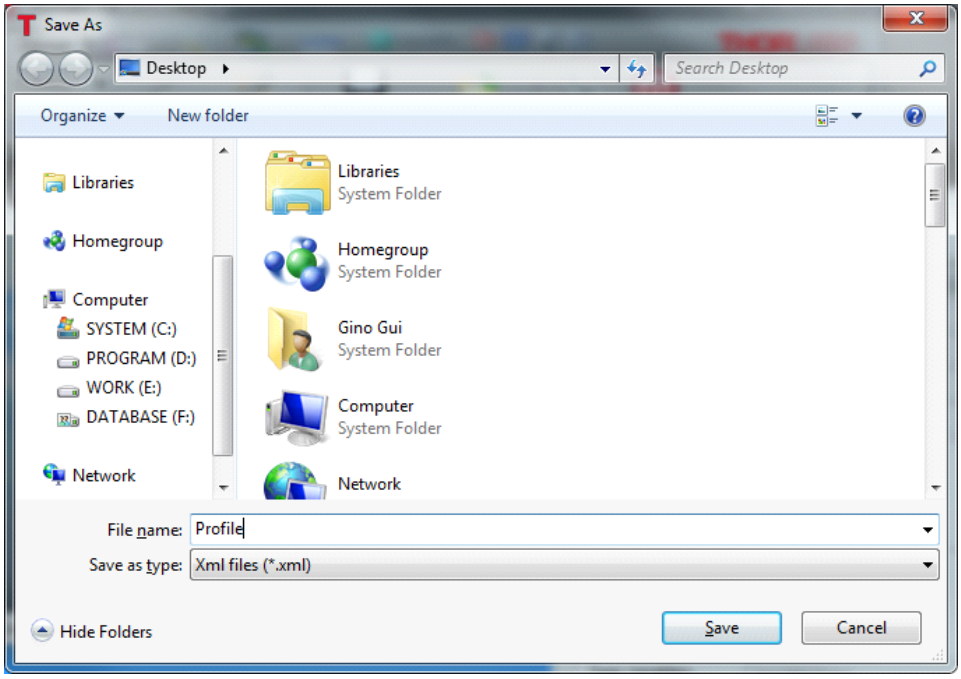
3.5.1 Save Profile

Following the steps below, the user can save the current status of the device to an XML file.

1. Click the **Save Profile** button from the menu bar to save the current settings for the device to an XML file.



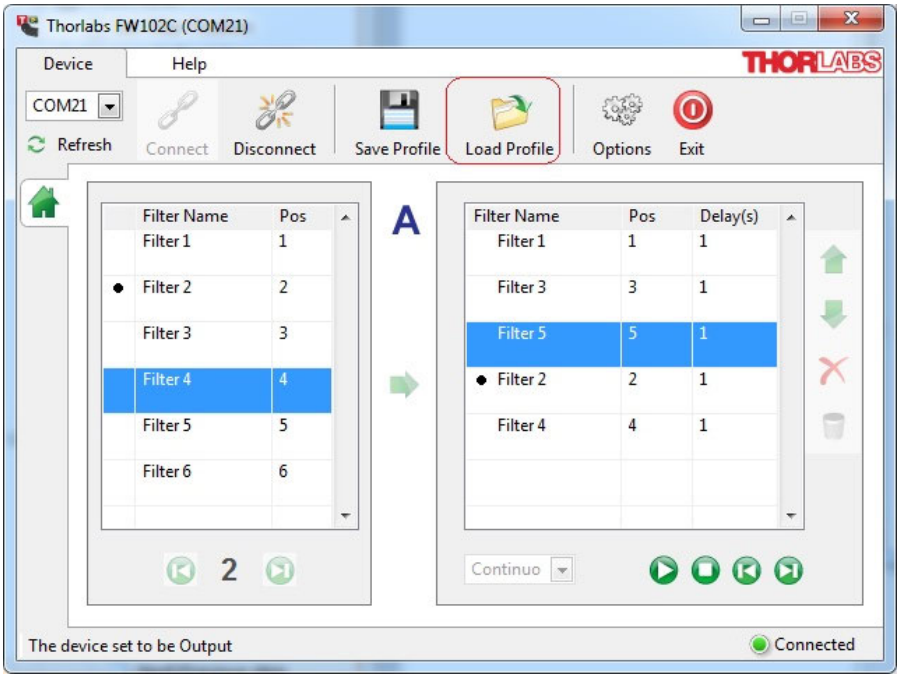
2. Select the desired save location then click OK. The current settings will be saved to a XML file with the specified file name.



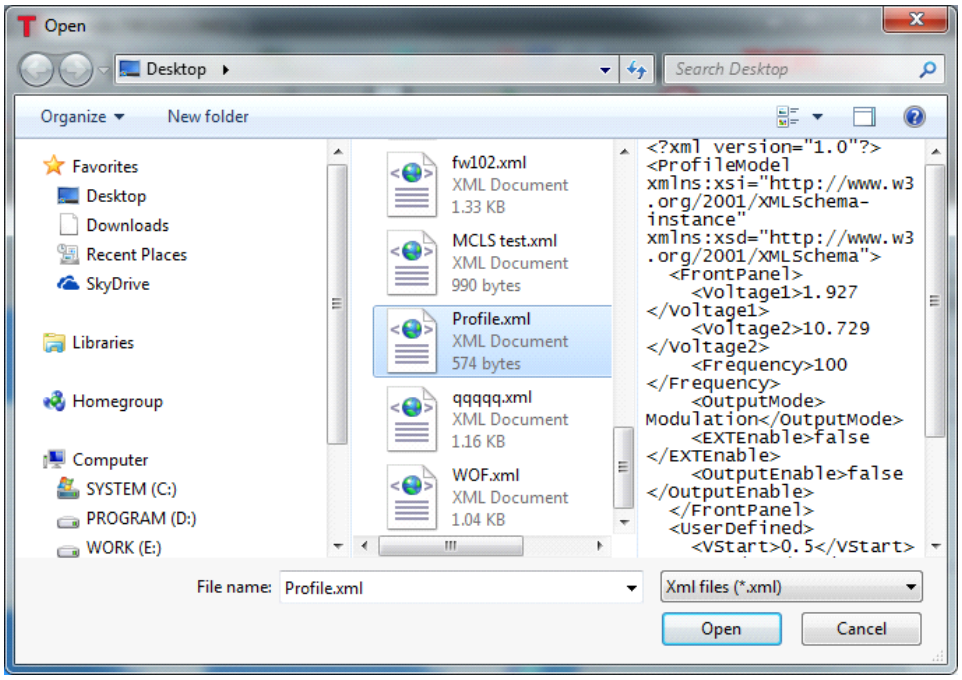
3.5.2 Load Profile

Follow the steps below to load a previously saved XML profile file to set the desired waveform.

1. Click the **Load Profile** button from the menu to load the settings to the device. A standard Windows file dialog box will open.

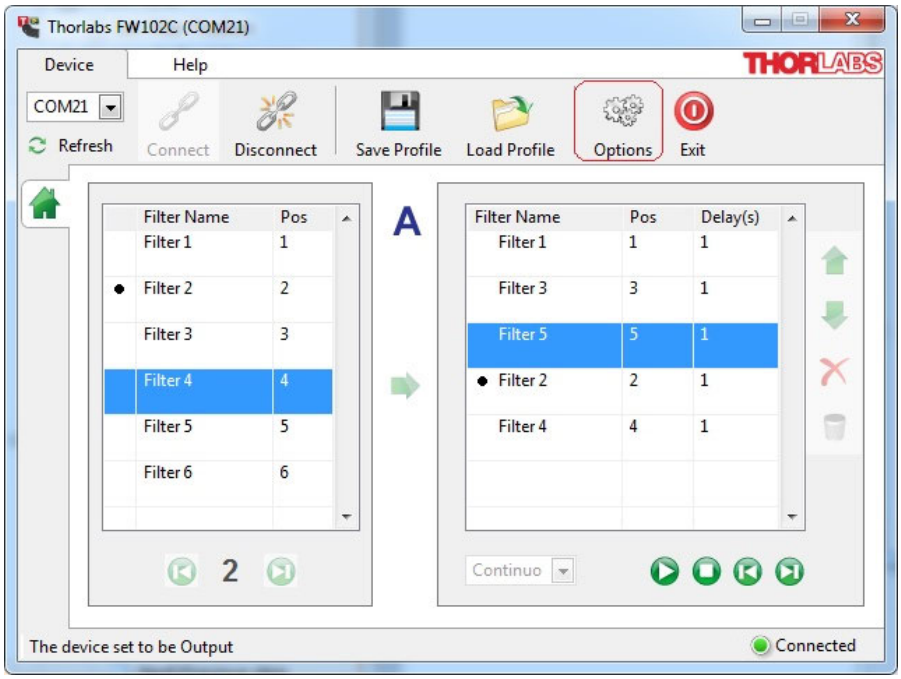


2. Select a profile file to load by clicking on the file name in the dialog box. The settings will be loaded and applied.



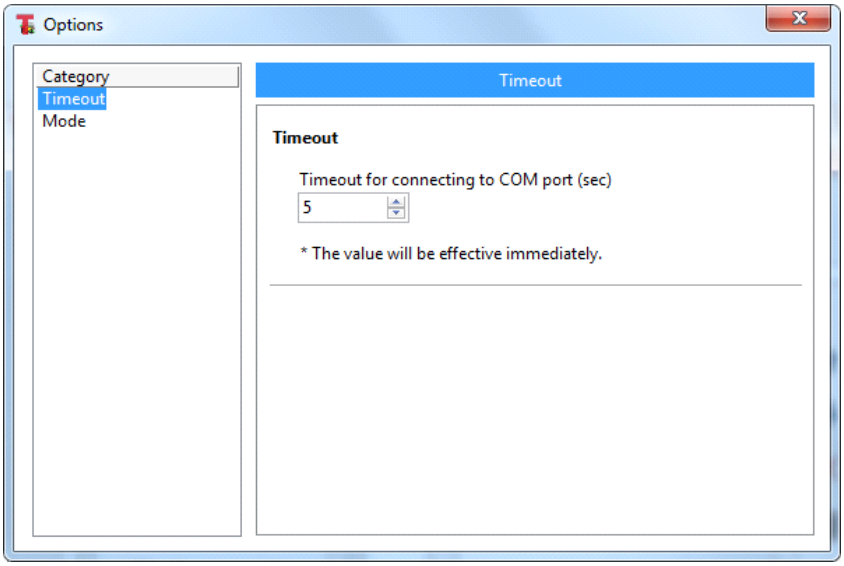
3.6 Options

Software settings that can be changed are outlined below. These settings are shown in the options window after clicking the **Options** button on the menu.



3.6.1 Timeout

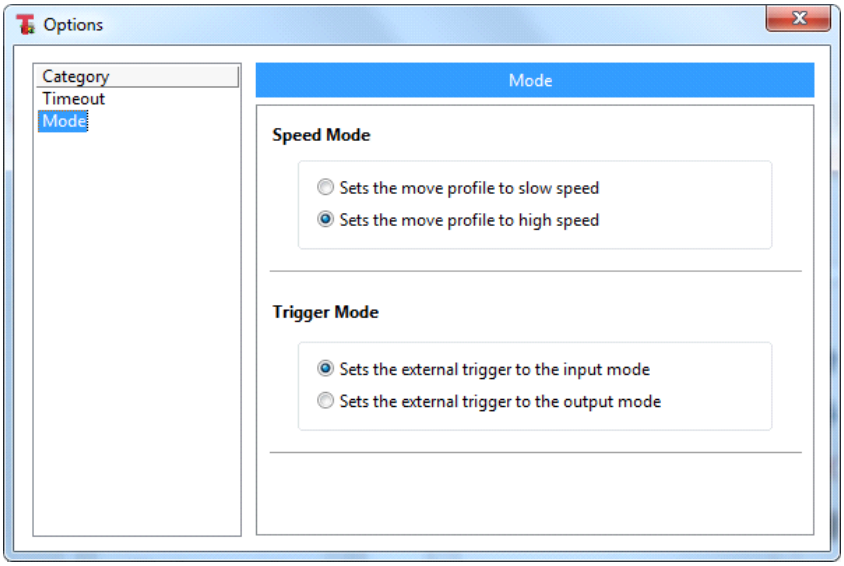
Select the **Timeout** tab to set the time out for communicating to the FW102C device. The default value is 5 seconds.



3.6.2 Mode

Select the **Mode** tab to set the mode of the FW102C device. **Speed** mode and **trigger** mode are supported in this tab

.



Chapter 4 Secondary Development

4.1 Secondary Development (C/C++)

The user can start secondary development with **uart_library.dll** in C/C++ development environment which can be found in the *bin* directory. The corresponding header file is in *msvc* under the **Sample and SDK** directory.

Below is the description of the header file **uart_library.h**:
uart_library.h File Reference
Defines
- #define **UART_LIBRARY_API** extern "C" __declspec(dllimport)

Functions
- **UART_LIBRARY_API** int **fnUART_LIBRARY_open** (int nPort, int nBaud)

Opens the COM port function.
- **UART_LIBRARY_API** void **fnUART_LIBRARY_close** ()

Closes current opened port
- **UART_LIBRARY_API** int **fnUART_LIBRARY_write** (char *b, int size)
- **UART_LIBRARY_API** int **fnUART_LIBRARY_read** (char *b, int limit)
- **UART_LIBRARY_API** int **fnUART_LIBRARY_list** (char *nPort, int var)

Lists all the possible Serial ports on this computer.
- **UART_LIBRARY_API** int **fnUART_LIBRARY_Set** (char *c, int var)
- **UART_LIBRARY_API** int **fnUART_LIBRARY_Get** (char *c, char *d)

Define Documentation
#define UART_LIBRARY_API extern "C" __declspec(dllimport)

Function Documentation

- **UART_LIBRARY_API** void **fnUART_LIBRARY_close** ()

Closes currently opened port

- **UART_LIBRARY_API** int **fnUART_LIBRARY_Get** (char *c, char *d)

set command to device according to protocol in manual and get the return string.
make sure the port was opened successfully before calling this function.
make sure this is the correct device by checking the ID string before call this function.
Parameters:

c	input command string (<255)
d	output string (<255)

Returns:

0: success;
0xEA: CMD_NOT_DEFINED;
0xEB: time out;
0xEC: time out;
0xED: invalid string buffer;

- **UART_LIBRARY_API** int **fnUART_LIBRARY_list** (char *nPort, int var)

List all the possible Serial ports on this computer.
Parameters:

nPort	port list returned string, separated by comma
var	max length value of nPort buffer

Returns:
0: success; 1: failed.

● **UART_LIBRARY_API** int **fnUART_LIBRARY_open** (int nPort, int nBaud)
open the COM port function.
Parameters:

nPort	COM port number to be open, check the correct value through device manager.
nBaud	bit per second of port

Returns:
0: success; 1: failed.

● **UART_LIBRARY_API** int **fnUART_LIBRARY_read** (char *b, int limit)
read string from device through opened serial port.
make sure the port was opened successfully before calling this function.
Parameters:

b	returned string buffer
limit	max length value of b buffer

Returns:
size of actual read data in byte.

● **UART_LIBRARY_API** int **fnUART_LIBRARY_Set** (char *c, int var)
set command to device according to protocol in manual.
make sure the port was opened successfully before calling this function.
make sure this is the correct device by checking the ID string before call this function.
Parameters:

c	input command string
var	lenth of input command string (<255)

Returns:

0: success;
0xEA: CMD_NOT_DEFINED;
0xEB: time out;
0xEC: time out;
0xED: invalid string buffer;

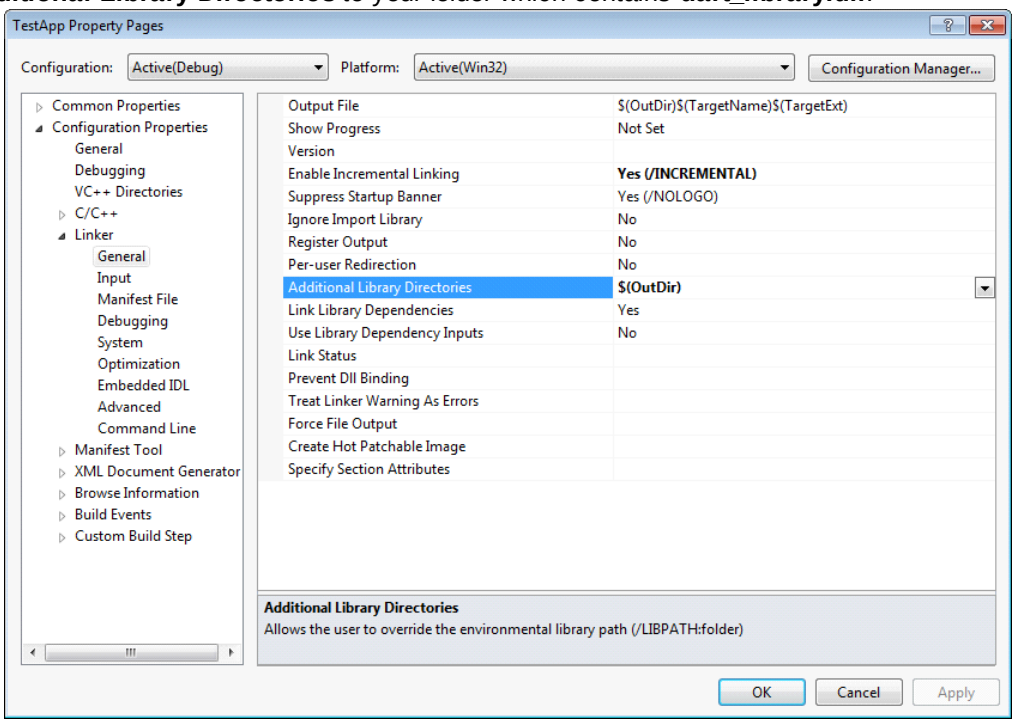
● **UART_LIBRARY_API** int **fnUART_LIBRARY_write** (char *b, int size)
write string to device through opened serial port.
make sure the port was opened successfully before calling this function.
Parameters:

b	input string
size	size of string to be written.

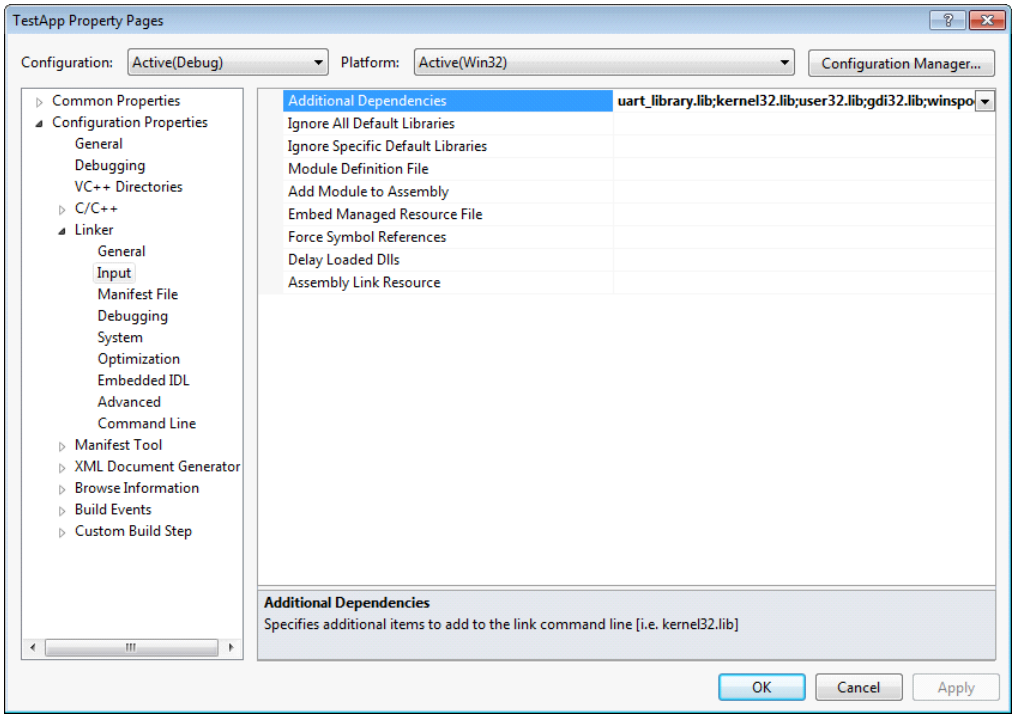
Returns:
0: success; 1: failed.

The following example is a reference for configurations:

1. Set the **Additional Library Directories** to your folder which contains **uart_library.dll**.



2. Add the **uart_library.lib** to **Additional Dependencies** in Input table.



Fw102Test.cpp is an example codes file which you can also find in the sample directory. You can run it for testing and below is the description for it:

Fw102Test.cpp File Reference

#include <stdio.h>
#include <tchar.h>
#include <string.h>
#include <time.h>
#include <assert.h>
#include "uart_library.h"

Functions

- int **fw102_SetPosition** (int n)
- int **_tmain** (int argc, _TCHAR *argv[])

Function Documentation

- **int _tmain (int argc, _TCHAR * argv[])**

  the main function of this test code.

- **int fw102_SetPosition (int n)**

  Move the wheel to a new filter position.

  Parameters:

n	Move the wheel to filter position n

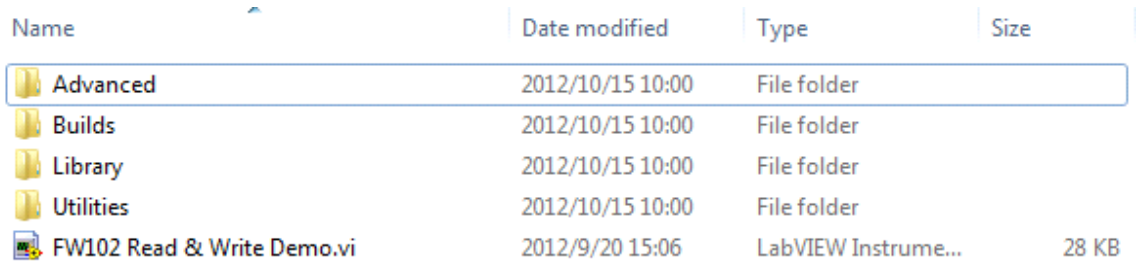
Returns:
0: success;
0xEA: CMD_NOT_DEFINED;
0xEB: time out;
0xEC: time out;
0xED: invalid string buffer;

initialize the FW102C device, the set position to 5.

4.2 Secondary Development (LabVIEW)

The user can start secondary development with LabVIEW 2011 or later. The supported files are in *\LabVIEW* under the **Sample and SDK** directory.

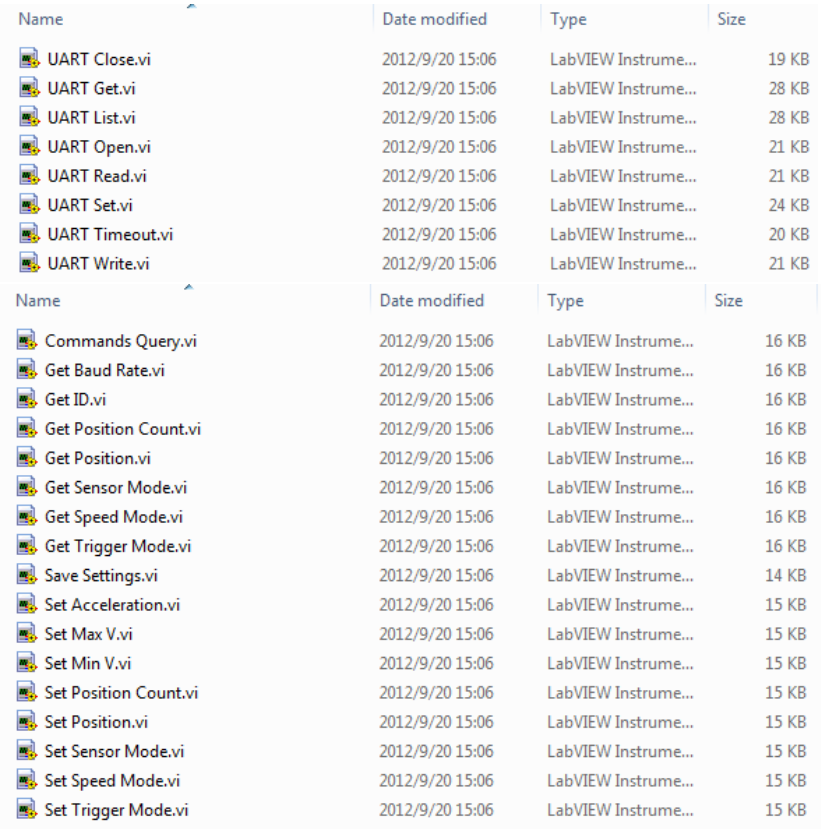
In this folder, you will find sample VIs and three folders named as **Utilities, Advanced,** and **Libraries.**



Name	Date modified	Type	Size
Advanced	2012/10/15 10:00	File folder	
Builds	2012/10/15 10:00	File folder	
Library	2012/10/15 10:00	File folder	
Utilities	2012/10/15 10:00	File folder	
FW102 Read & Write Demo.vi	2012/9/20 15:06	LabVIEW Instrume...	28 KB

You can use these VIs to start your secondary development easily.

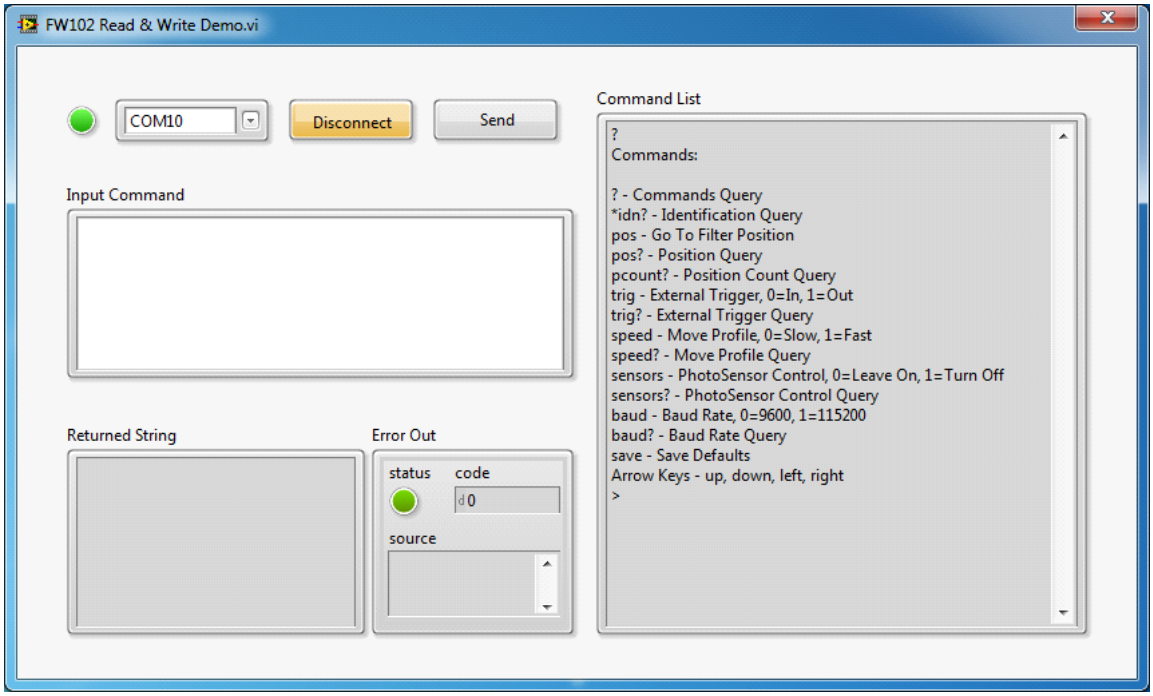
The VIs in the **Utilities** folder can implement all the functions with com port, and the VIs in the **Advanced** folder can implement all the functions with FW102C.

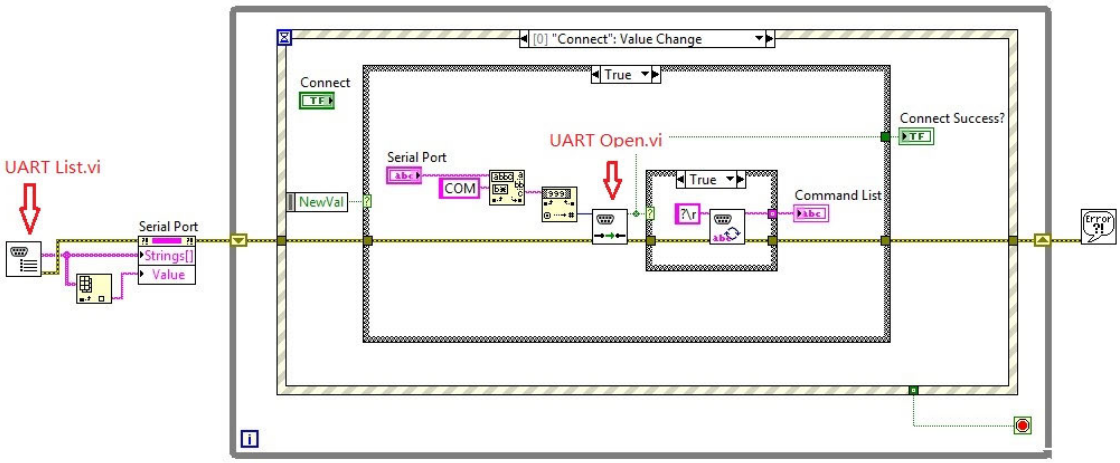


Name	Date modified	Type	Size
UART Close.vi	2012/9/20 15:06	LabVIEW Instrume...	19 KB
UART Get.vi	2012/9/20 15:06	LabVIEW Instrume...	28 KB
UART List.vi	2012/9/20 15:06	LabVIEW Instrume...	28 KB
UART Open.vi	2012/9/20 15:06	LabVIEW Instrume...	21 KB
UART Read.vi	2012/9/20 15:06	LabVIEW Instrume...	21 KB
UART Set.vi	2012/9/20 15:06	LabVIEW Instrume...	24 KB
UART Timeout.vi	2012/9/20 15:06	LabVIEW Instrume...	20 KB
UART Write.vi	2012/9/20 15:06	LabVIEW Instrume...	21 KB

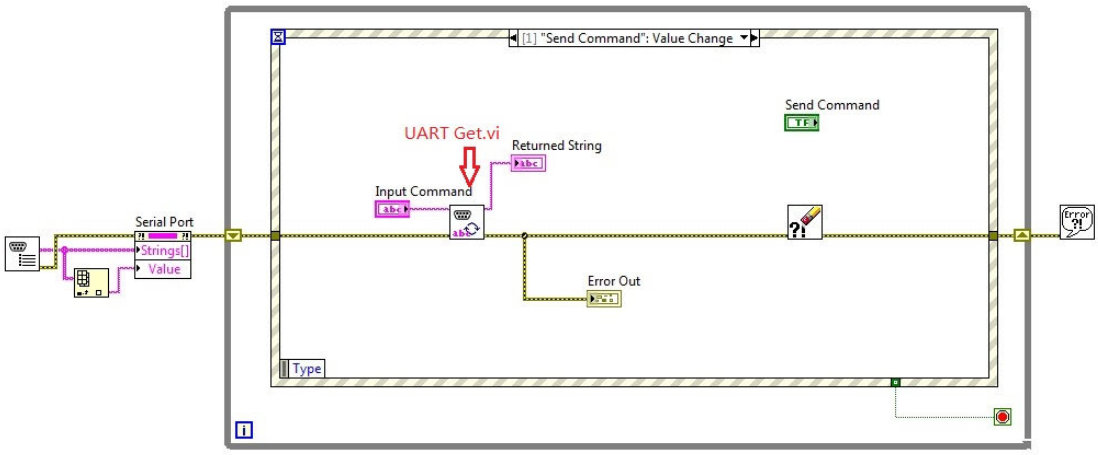
Name	Date modified	Type	Size
Commands Query.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get Baud Rate.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get ID.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get Position Count.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get Position.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get Sensor Mode.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get Speed Mode.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Get Trigger Mode.vi	2012/9/20 15:06	LabVIEW Instrume...	16 KB
Save Settings.vi	2012/9/20 15:06	LabVIEW Instrume...	14 KB
Set Acceleration.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Max V.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Min V.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Position Count.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Position.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Sensor Mode.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Speed Mode.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB
Set Trigger Mode.vi	2012/9/20 15:06	LabVIEW Instrume...	15 KB

The **FW102C Read & Write Demo.vi** is a good sample to help learn how to use the sub VIs in the **Utilities** folder. You will see the front panel and block diagram, shown below, when you open this VI.

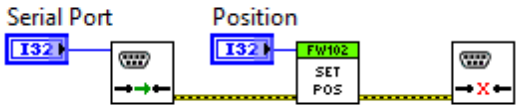




The demo in the diagram below shows how all the com ports in the system are listed first (**UART List.vi**), and then connect (**UART Open.vi**) to the selected com port if user clicks the **Connect** button. If the FW102C device connects successfully, all the commands supported will be shown in the **Command List**. The user can now try sending the command to the FW102C device to test that it is working. The block diagram shows what happens when the **Send** button is clicked.



The input command must follow the format of the FW102C device. The demo software will send the command string user input to FW102C and read the returned string from FW102C (**UART Get.vi**) when the **Send** button is clicked. The user can find all the functional VIs in the folder called **Utilities**. Additionally, the user can use the advanced VIs, found in the **Advanced** folder. Each VI completes one function of the FW102, so it helps the user to develop an application easily and without learning the command formatting. For example, if the user wants to establish a LabVIEW VI to set position of FW102C device, simply follow the diagram shown below.



Follow the step: *Open* > *Set Position* > *Close*. The open and close VIs can be found in the **Utilities** folder and the **Set Position.vi** can be found in the **Advanced** folder. Only use the VIs in the *\Utilities* folder. These VIs call the **uart_library.dll** directly and the input parameters must be integral commands such as:

pos=3\r

The VIs in the *\Advanced* folder execute all the commands of FW102C separately and call the sub VIs in the folder of *\Utilities*. The input parameters of these VIs can be a value such as:

3 (Set Position.vi)

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