EFW Filter Wheel Software Manual
. Linux & OSX Platform

Revision 1.0

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Instruction

There are several ways to control our filter wheel through software on OSX/Linux.
You don't need to install driver for EFW filter wheel.

INDI:
INDI is a protocol designed to support control, automation, data acquisition, and exchange among hardware devices and software frontends. It is a particular implementation of the INDI protocol for POSIX operating systems. Currently, Linux, BSD, and OSX are supported. Currently, INDI Library supports a growing number of telescopes, CCD, focusers, filter wheels and video capture devices.
Lots of software support INDI driver: http://www.indilib.org/about/clients.html

INDIGO:
INDIGO is a proof-of-concept of next generation fork of INDI protocol based on layered architecture and software bus. It maintains full backward compatibility with INDI while adds some extensions which offer better performance and USB hot-pug. Currently, Linux, MacOSX and BSD are supported.While INDIGO is capable of using the old INDI drivers, to unveil it true potential native drivers should be used.   The driver library is growing fast and it supports a number of telescopes, CCD cameras, focusers, and filter wheels. INDIGO is available here: http://www.indigo-astronomy.org

SDK:
This is Software Development Kit for developer, user don't need to install it. This is the most flexible way to control our filter wheel.

Plug-in:
Currently we provide plug-in for TheSkyX and Micro-Manager.

1. Install udev rule(Linux)

In this way you can open filter wheel without root permission on Linux, the rule is located at 'SDK directory'/lib
Open a terminal, type:
$ lsusb

  ……

  Bus 002 Device 003: ID 03c3:1f01

  ……

  The vendor ID of our filter wheel is 0x03c3, so the device of bus

  number 002 and device number 003 is EFW filter wheel.

  $ ls -l /dev/bus/usb/002/003 (002 and 003 is bus and device number

  respectively)

  crw-rw-r-- 1 root root 189, 130 2月   9 12:08 /dev/bus/usb/002/003

  before the rule is installed, owner is root, group is root

  install the rule

  $sudo cp efw.rules /lib/udev/rules.d

  Replug filter wheel
$ lsusb

  ……

  Bus 002 Device 004: ID 03c3:1f01

  ……

  $ ls -l /dev/bus/usb/002/004

  crw-rw-rw- 1 root users 189, 131 2月   9 12:10 /dev/bus/usb/002/004

 now the group is users, the rule takes effect, if not, try to install it to

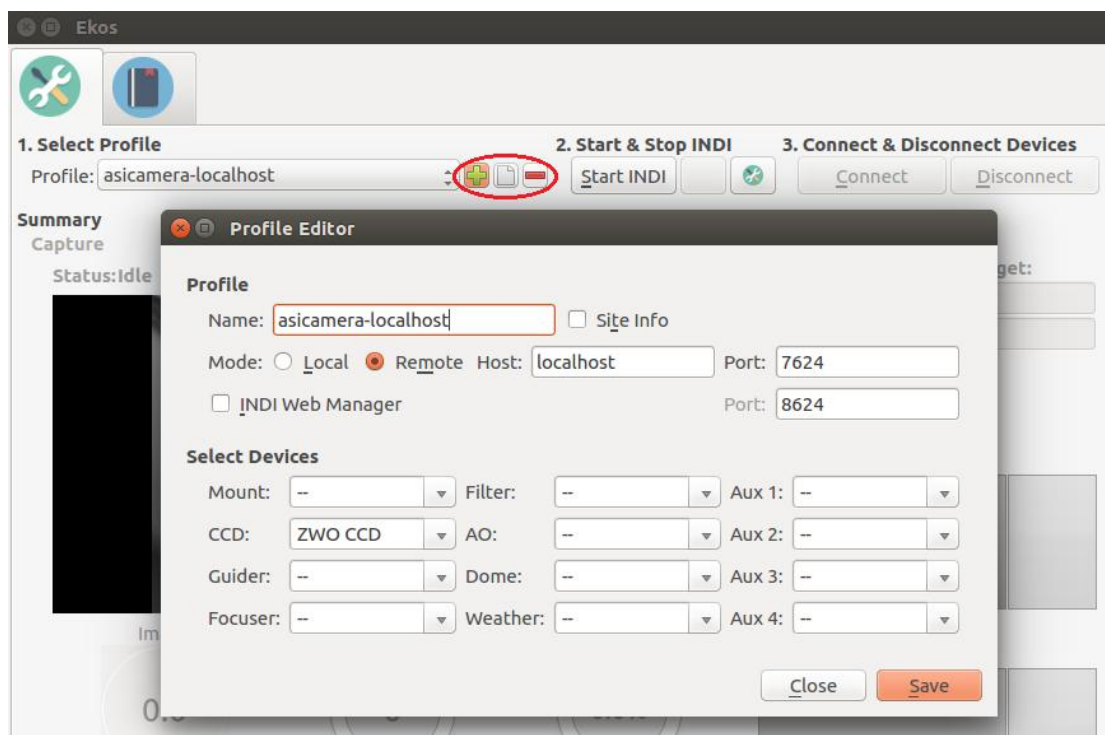/etc/udev/rules.d .

2. Control software

2.1 KStars(Linux /OSX)

Control ASI camera and EFW filter wheel through INDI Driver, here only show the base frame capture function.
Install Kstars and INDI driver as: http://www.indilib.org/download/ubuntu.html
Open Ekos panel from menu->Tools->Ekos
Edit a Profile, select "ZWO CCD" as CCD

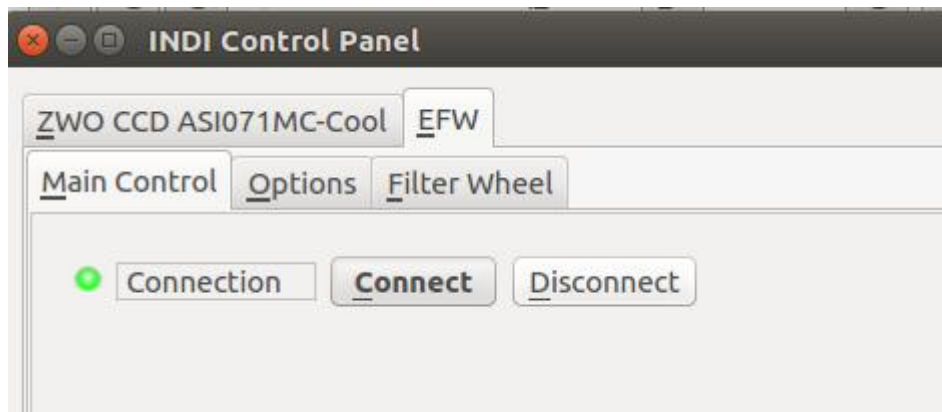Open a terminal and type:

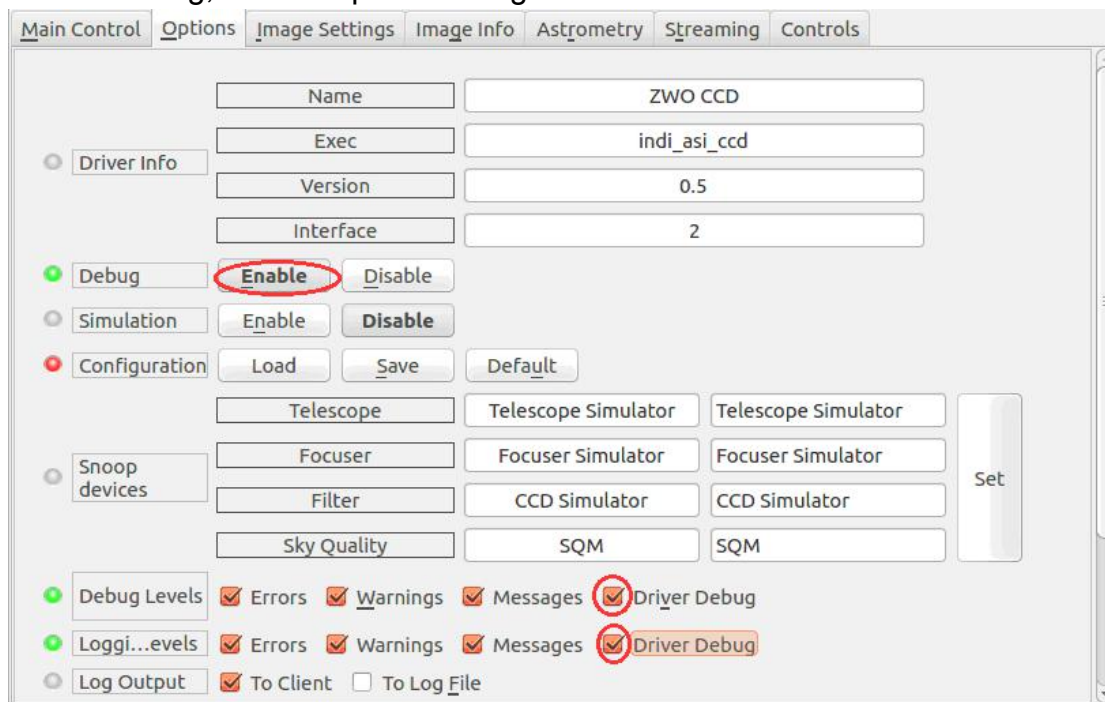*$ indiserver -v indi_asi_wheel indi_asi_ccd*

Click Start INDI and INDI Control Panel will show, afterwards you can click the right blank button to show the INDI Control Panel.
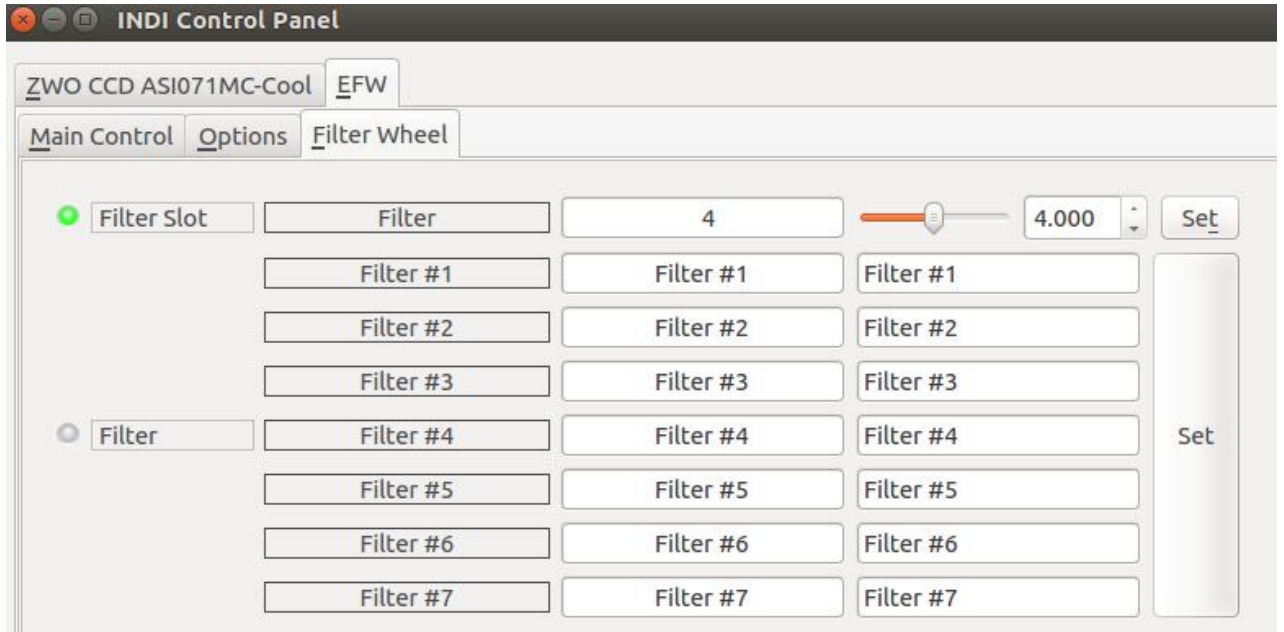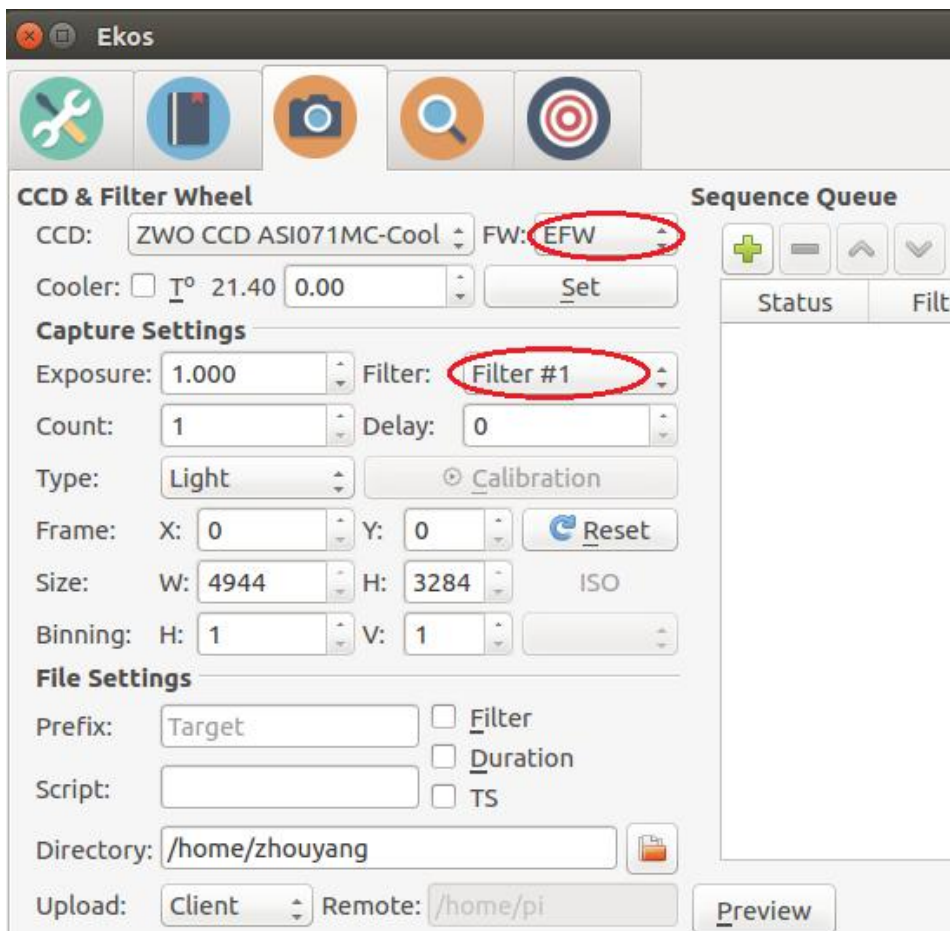
Connect camera and filer wheel

Enable debug, it can help to find bug

Filter wheel page

Open CCD page, click Preview, filter wheel will rotate to the target position and exposure starts.

You can also use INDIGO driver with ASI Camera and ZWO EFW (Linux and

Mac OSX):

1. To install INDIGO see: http://www.indigo-astronomy.org/?for-users

2. Start the INDIGO server on the computer where the camera / filter wheel is connected

```
$ indigo_server indigo_ccd_asi indigo_wheel_asi
```

This should print some output and report the connected devices like this.

18:01:39.946533 indigo_server: INDIGO server 2.0-29 built on Wed Jan 18 01:19:26 2017

18:01:39.950404 indigo_server: Driver indigo_ccd_asi 2.0.0.1 loaded.

18:01:39.950460 indigo_server: Driver indigo_wheel_asi 2.0.0.2 loaded.

18:01:39.950468 indigo_server: Resource /ctrl (4349, text/html) added

18:01:39.969053 indigo_server: indigo_ccd_asi: 'ZWO ASI071MC-Cool #0' attached.

18:01:39.969706 indigo_server: XML Parser: parser finished

18:01:39.969715 indigo_server: Server home-desktop (7624) attached

18:01:39.969730 indigo_server: Server started on 7624

2. Use your favorite INDI client (Kstars, Astro Telescope, Astro Imager, Astro Guider, etc.) to connect to the INDIGO server. INDIGO shares the same port as INDI - 7624. You can also use a web browser (port 7624) to control the indigo server. See Figure X.

2.2 AstroImager (OSX)

AstroImager is a powerful, but easy to use image capture application for the astrophotography.

The built-in drivers support ASI USB 3.0 camera, EFW filter wheel, it can be used as a client to any remote or local INDI or INDIGO server with any supported CCD, filter wheel or focuser as well.(http://www.cloudmakers.eu/astroimager/)

In below screen shot I select ASI camera and EFW filter wheel with build-in driver.
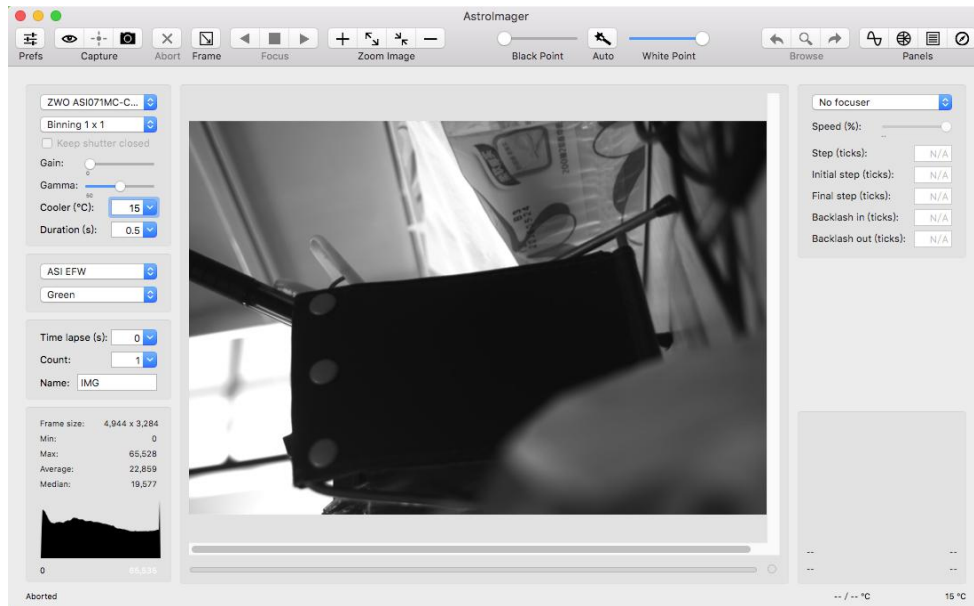
Edit filter wheel name in Preference dialog

2.3 TheSkyX(Linux and OSX)
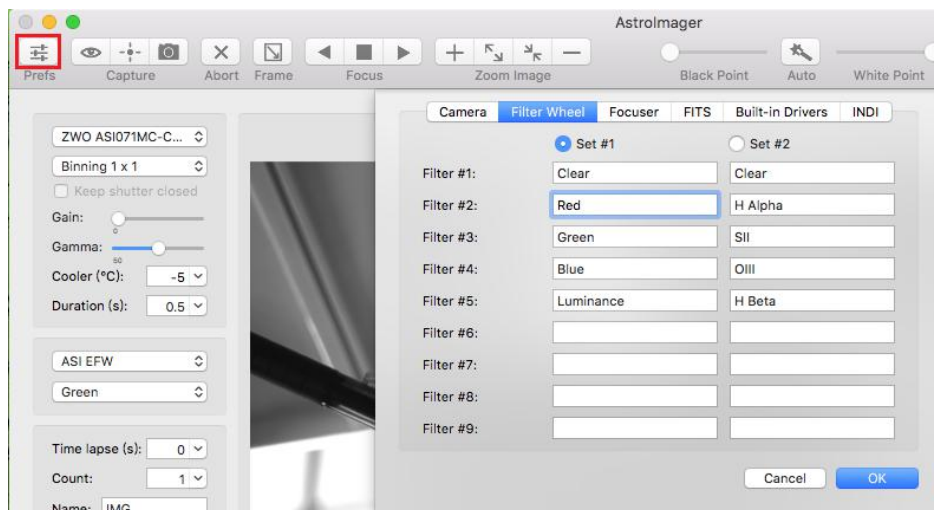
(http://www.bisque.com/sc/pages/TheSkyX-Professional-Edition.aspx)
Install TheSkyX :
TheSkyX Professional Edition for Linux, TheSkyX Professional Edition for Raspberry Pi is released newly.

Install plug-in driver: download TheSkyX_ZWO_EFW.tar.gz from our website and extract, run "install.bin", the plug-in installer suits for Linux and OSX. Using method please refer to manual for Windows.