

LabView Tutorial

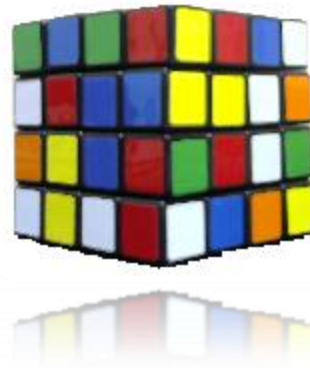


Image Acquisition Using IMAQdx (examples using a webcam)

Graham Gibson
Graham.Gibson@glasgow.ac.uk

Measurement & Automation Explorer (MAX)

Camera needs to work in MAX before it can work in LabView

National Instruments Measurement & Automation Explorer

Measurement & Automation Explorer (MAX) provides access to your National Instruments products.

What do you want to do?

- Manage my devices and interfaces
- Manage my installed National Instruments software
- Manage my virtual channels and create from my devices

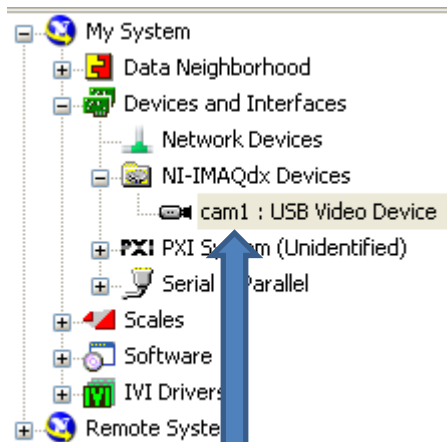
Expand “Devices and Interfaces”
Check that “NI-IMAQdx” appears
(may take a few seconds to refresh)
Expand “NI-IMAQdx”
Check that camera is listed

appears only if you have
the **Help** menu. If you need
know more about your device, visit the National Instruments [Technical Support Web site](#).

For more information about this version of MAX, visit ni.com/info and enter the following Info Codes

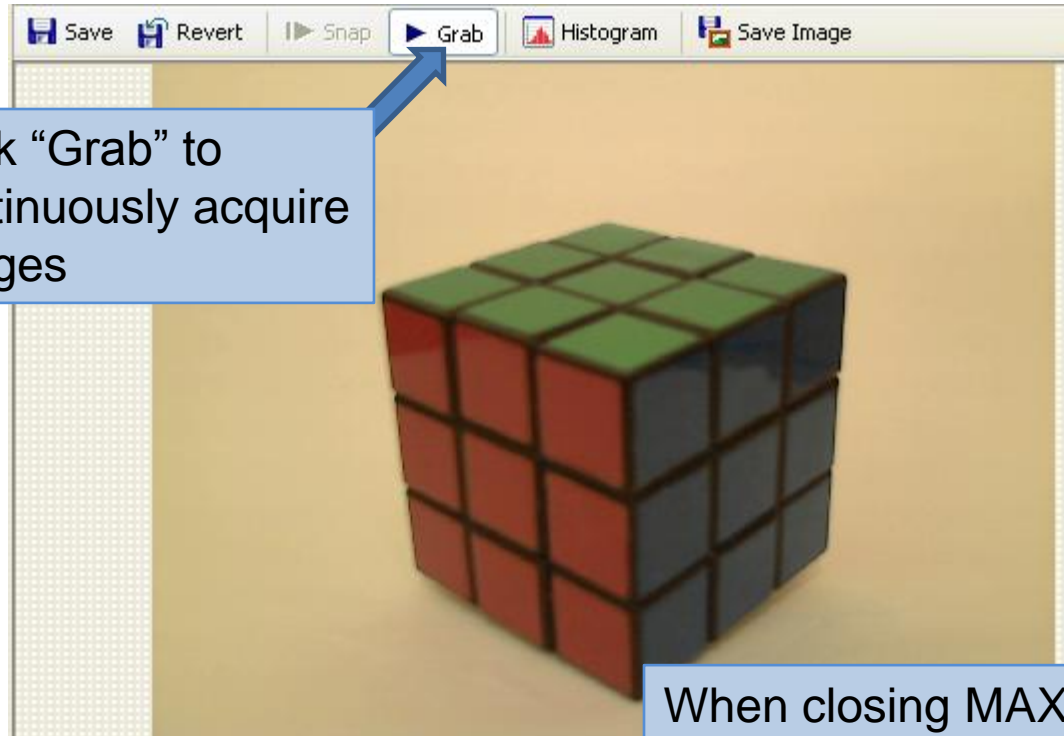
- [MAXFixList](#)—Improvements and bug fixes
- [MAX47KnownIssues](#)—Known issues

Setting the camera exposure



This is the name "cam1" that LabView uses to identify the camera

Click "Grab" to continuously acquire images

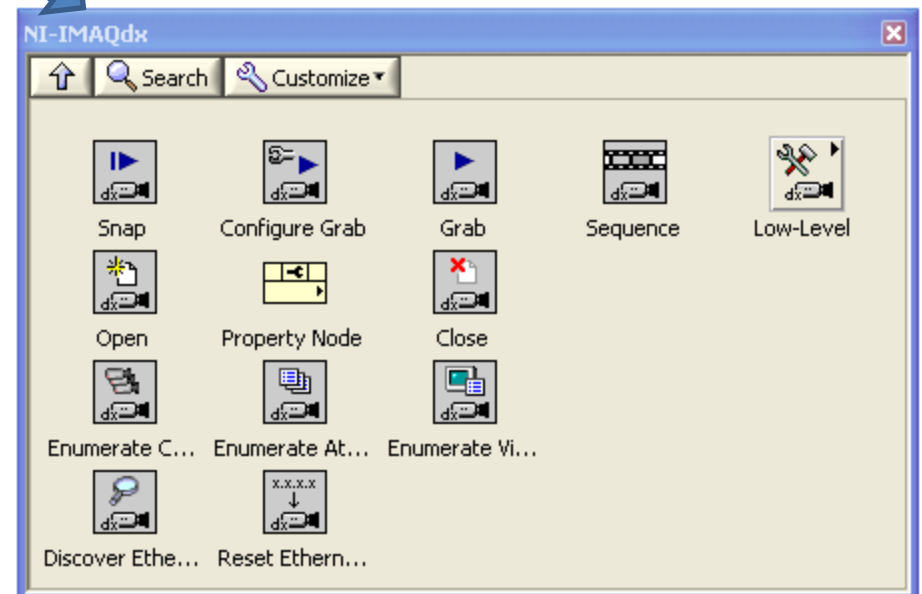
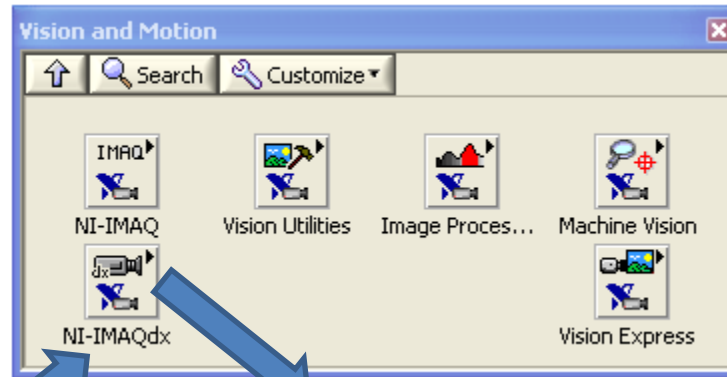
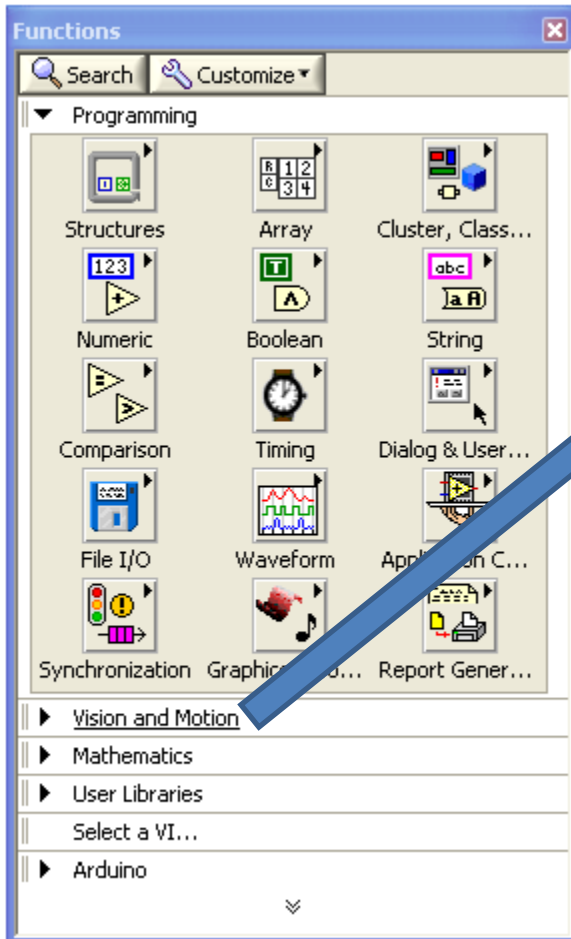


When closing MAX agree to save the camera settings

Adjust the exposure & gain

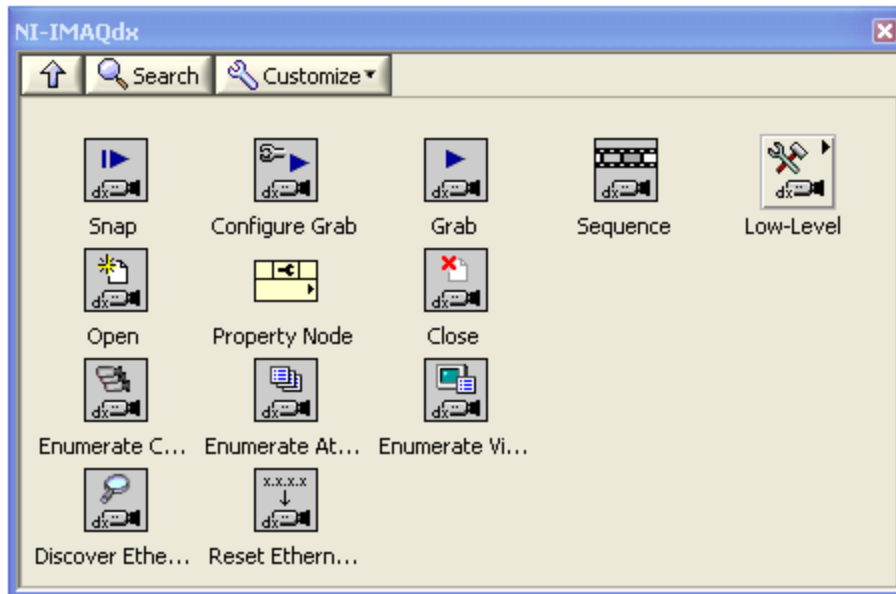
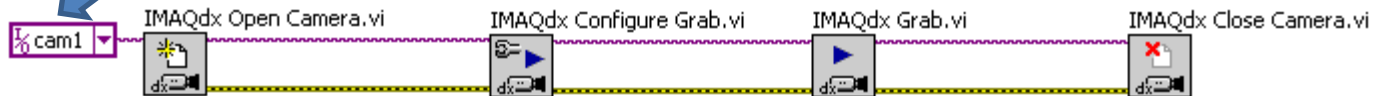
Camera Attributes	
Backlight Compensation	
Brightness	
Contrast	
Exposure	
Mode	Manual
Value	0.125000000
Gain	
Saturation	

Using NI-IMAQdx in LabView



Setting up an image acquisition

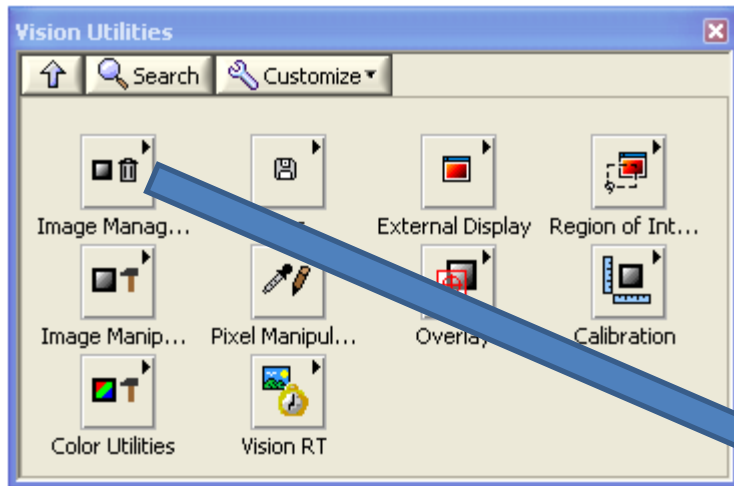
This is the same camera reference used by Measurement & Automation Explorer



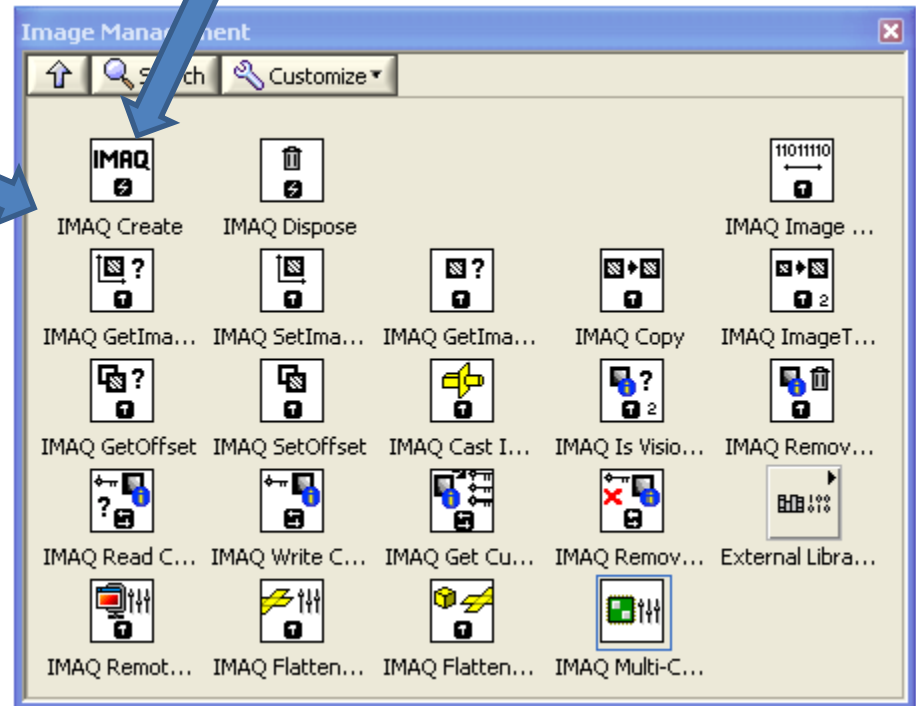
Require the following sequence:

1. Open camera
2. Configure the acquisition
3. Grab image
4. Close camera

Image management in LabView

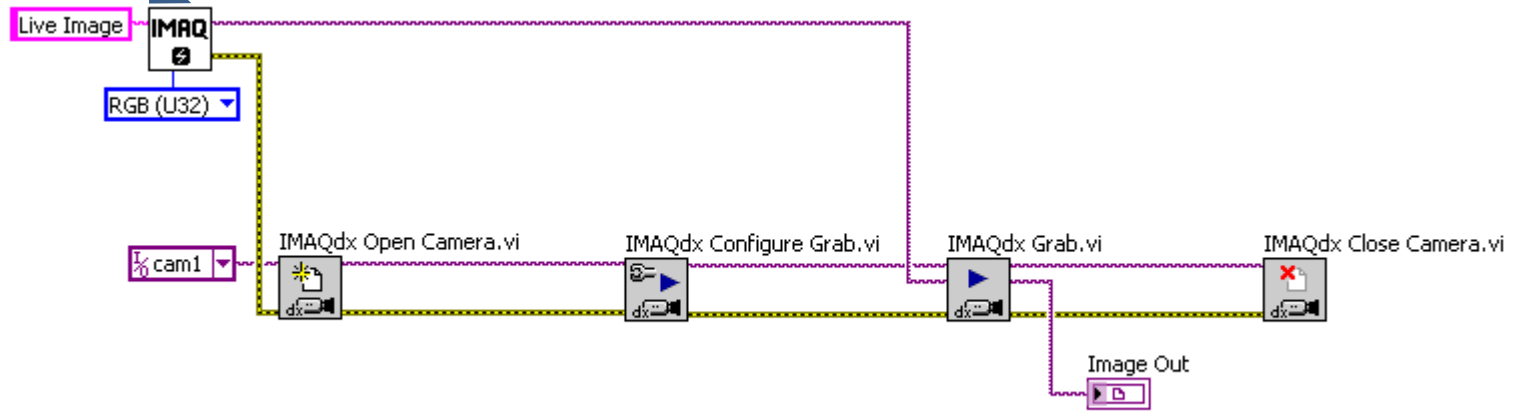


Use "IMAQ Create" to reserve memory for storing the image



Basic camera software

Need to provide a name for the image and specify its type (e.g. RGB, Greyscale etc.)



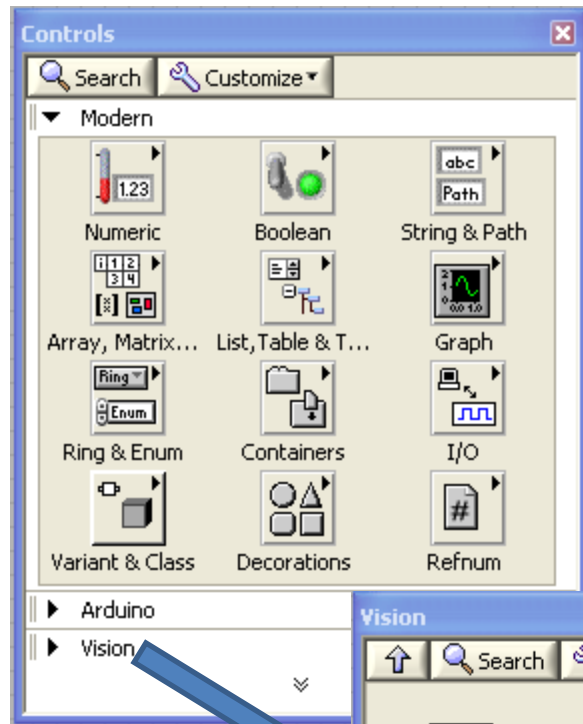
Need to provide an indicator for the image

Providing an image indicator

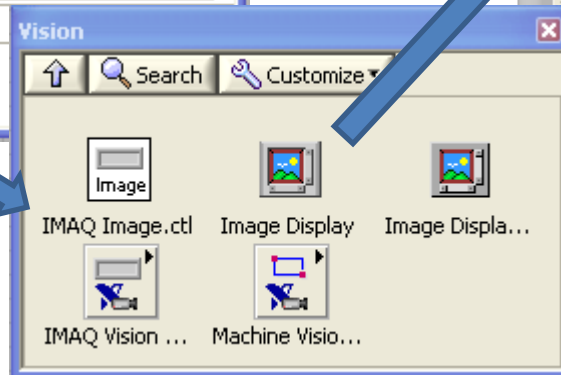
Image Out



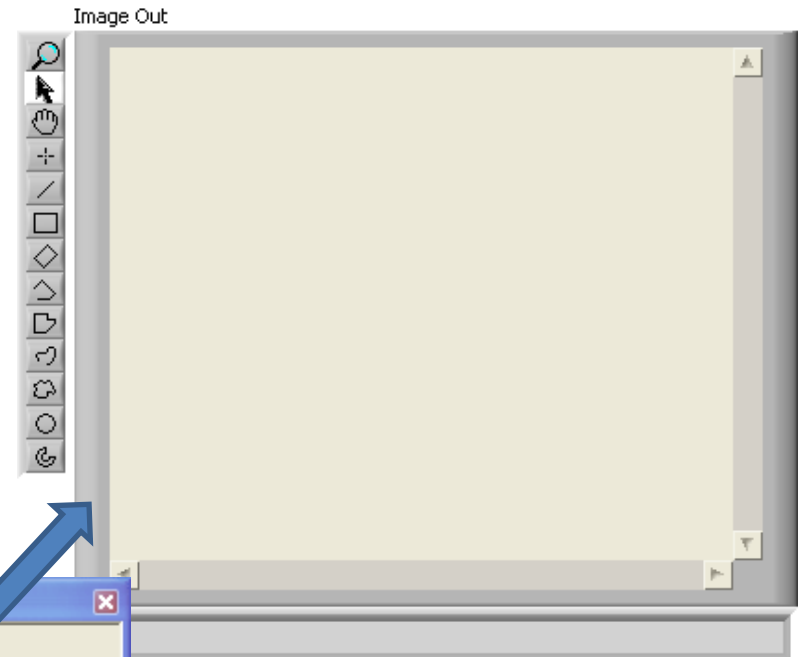
1. On front panel right click indicator and select “replace”



2. Select “Vision”



3. Select “Image Display”



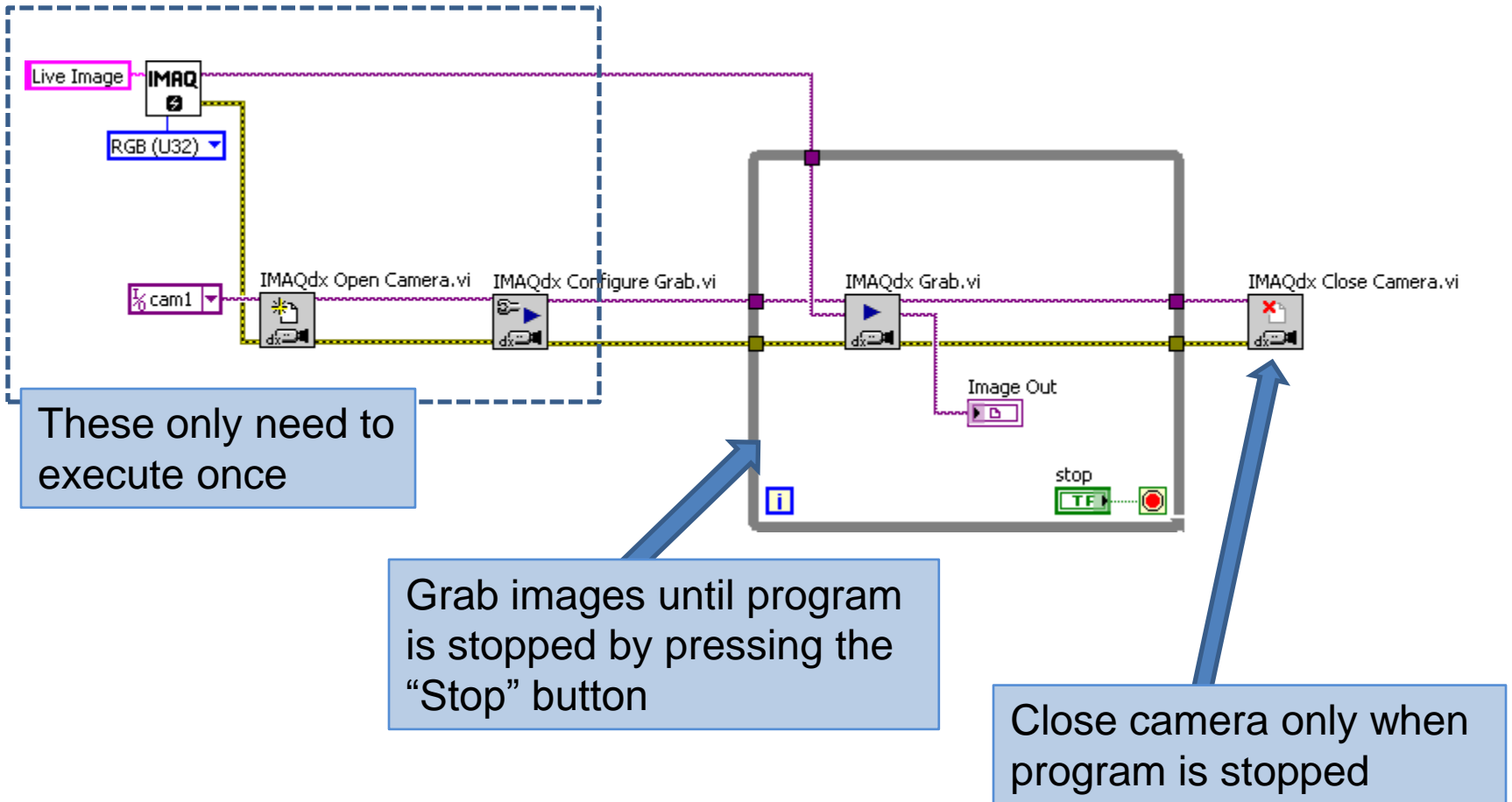
Run program – snapshot image

Run program once.

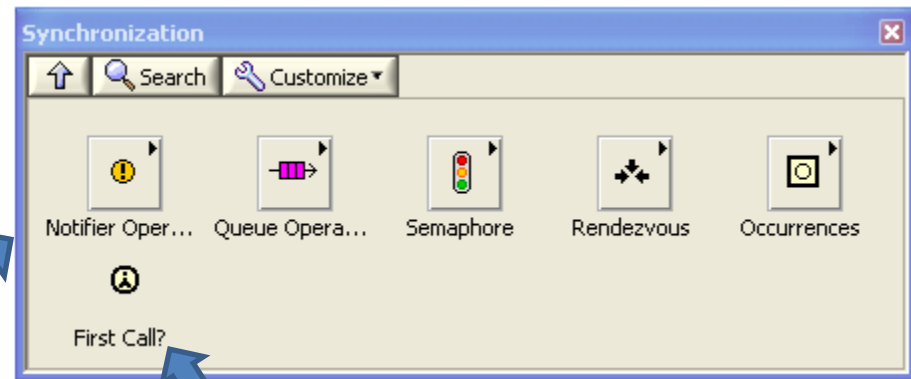
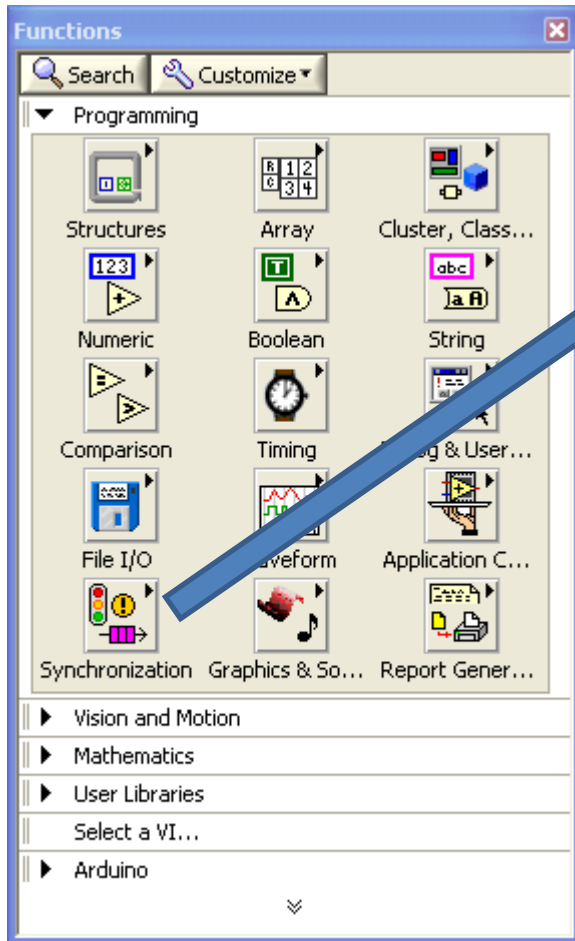
Program initialises the camera, grabs a single image then closes the camera.



Continuous image acquisition



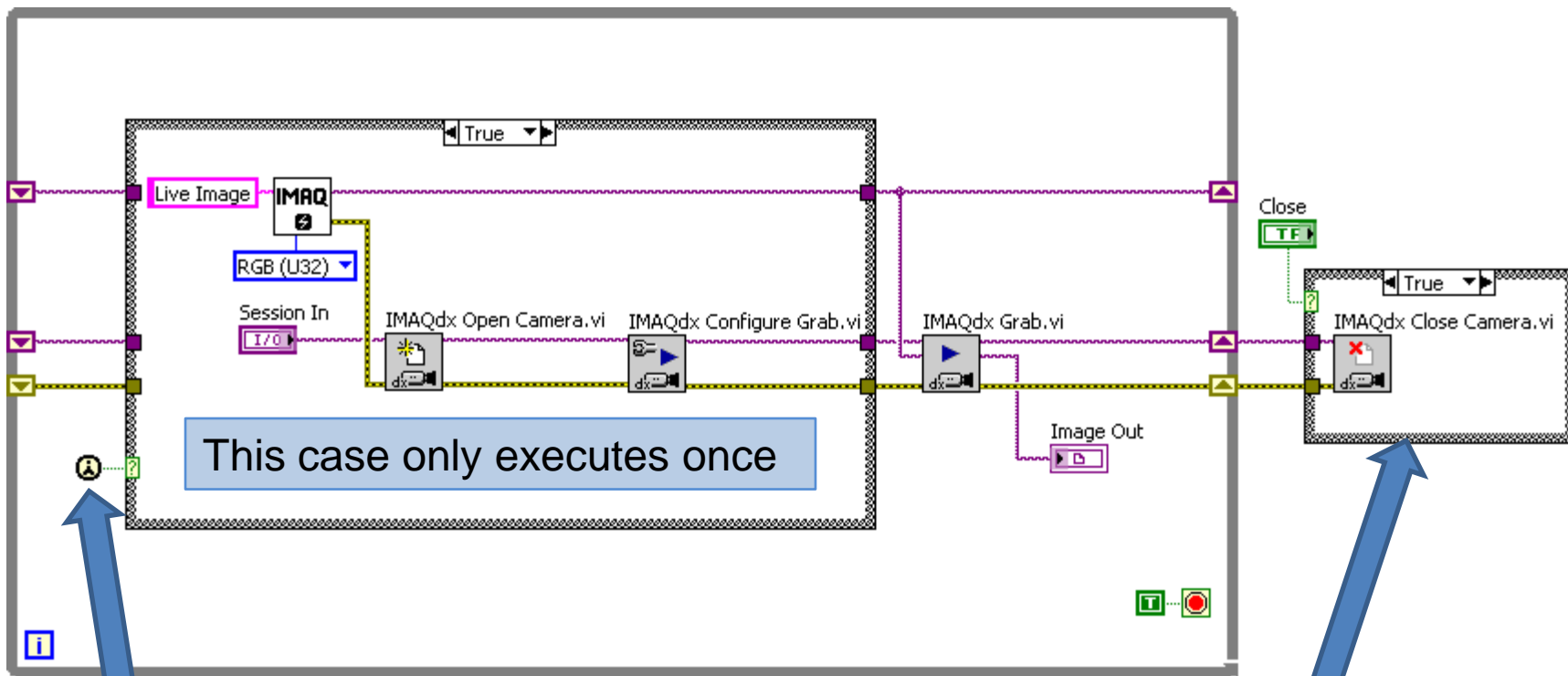
Creating a sub.vi – first call



Returns a Boolean true when vi is called for the first time

Creating a camera sub.vi

True cases



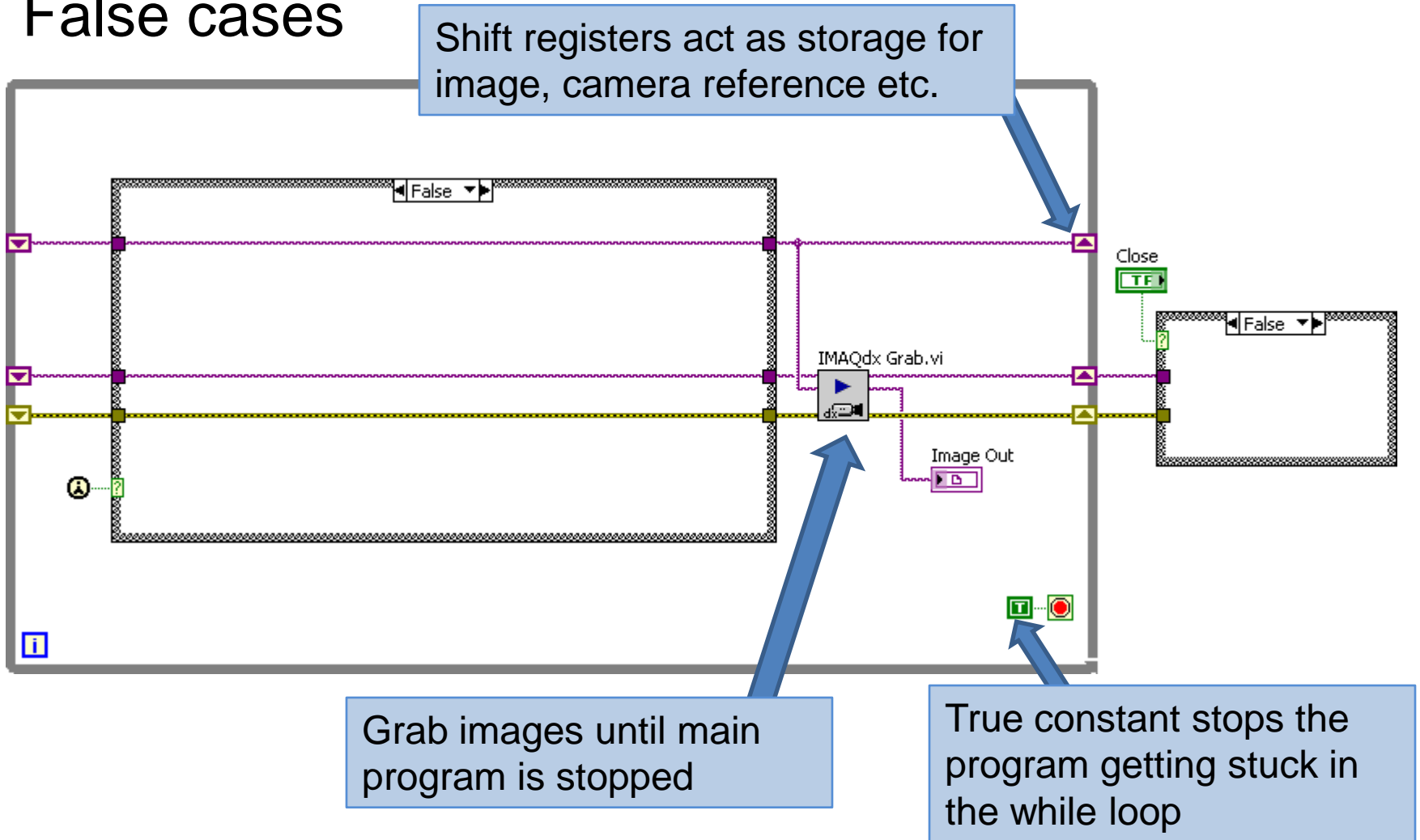
This case only executes once

First call

Camera closes when main program is stopped

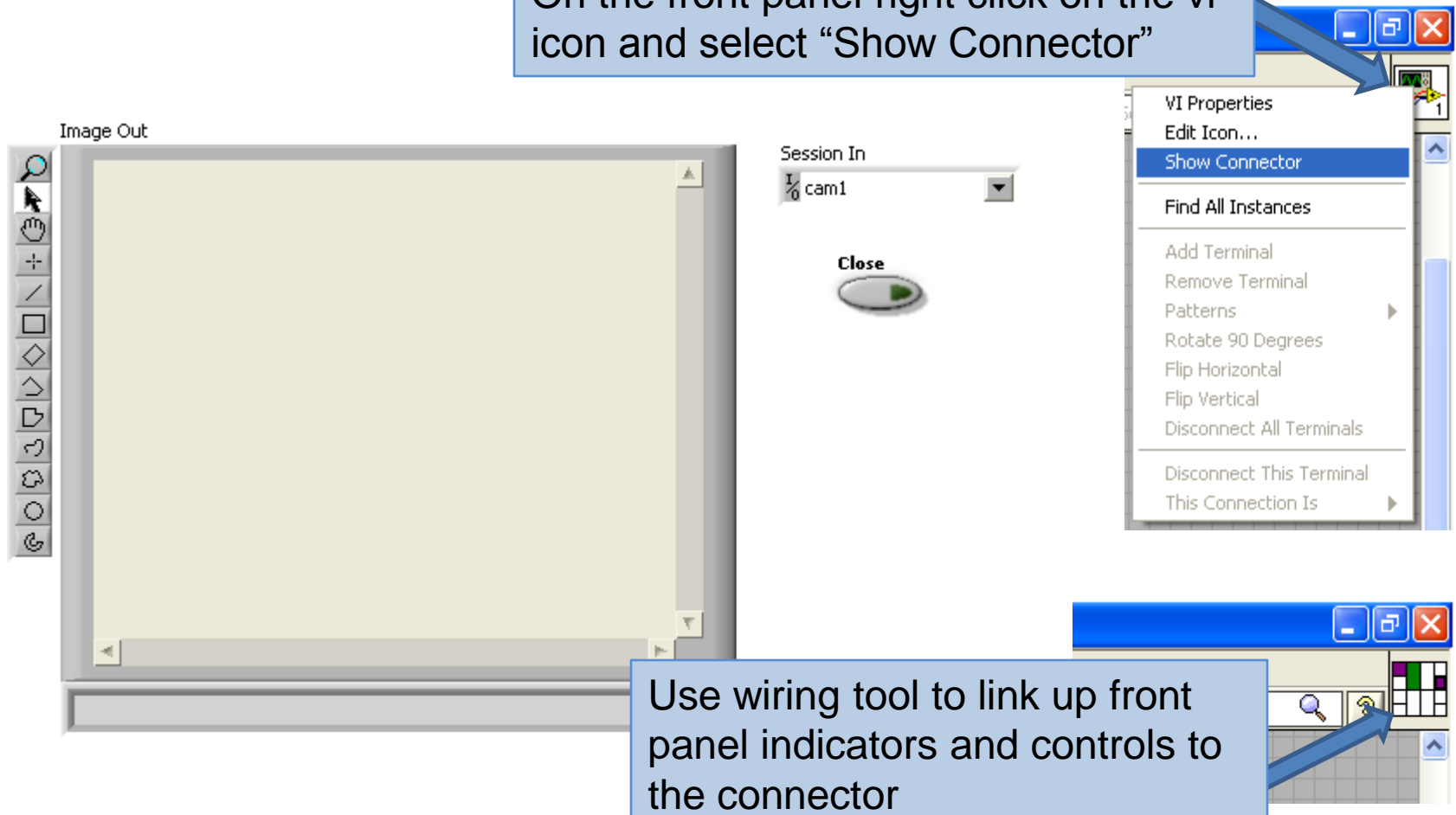
Creating a camera sub.vi

False cases



Setting up the connections

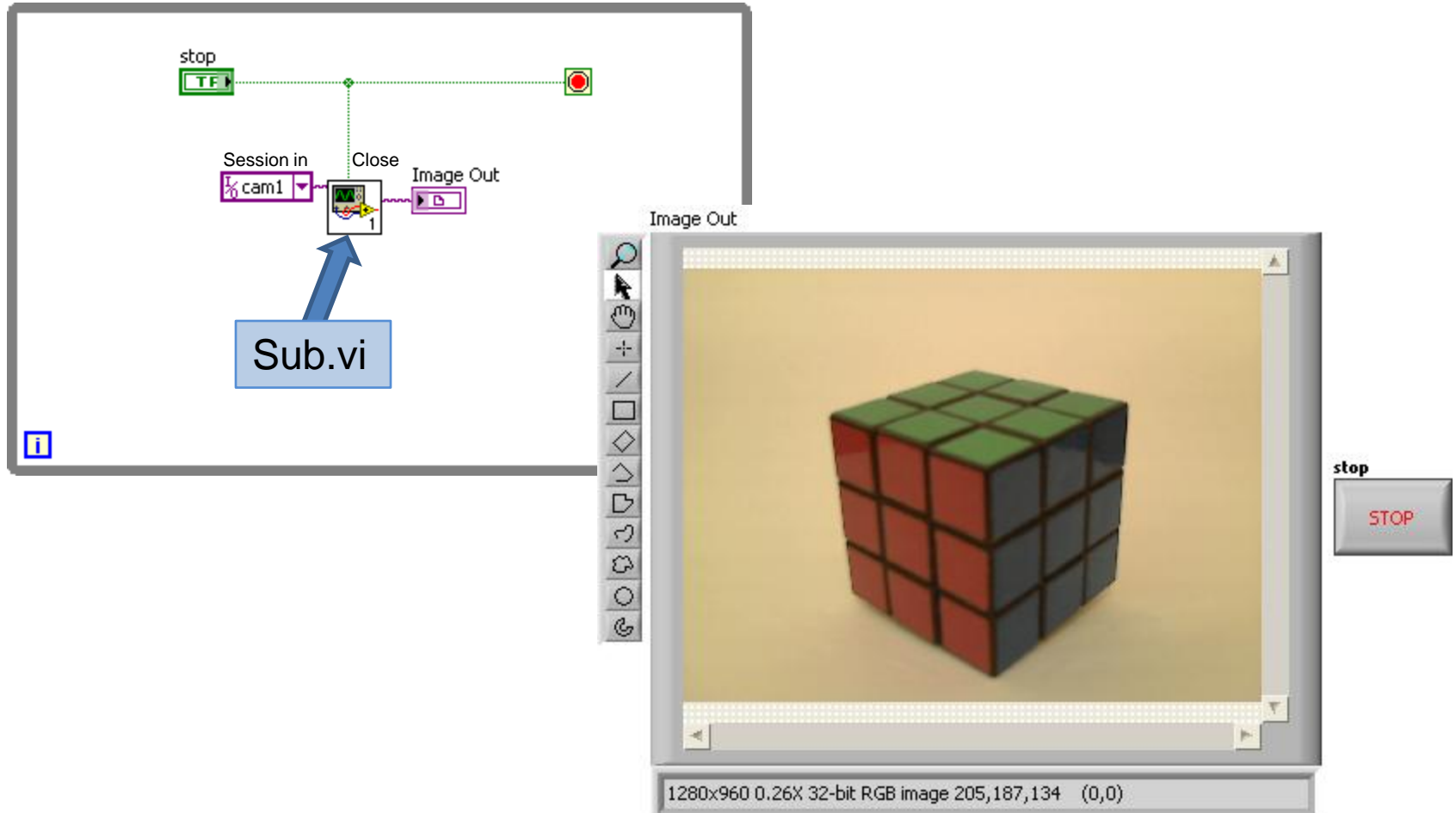
On the front panel right click on the vi icon and select "Show Connector"



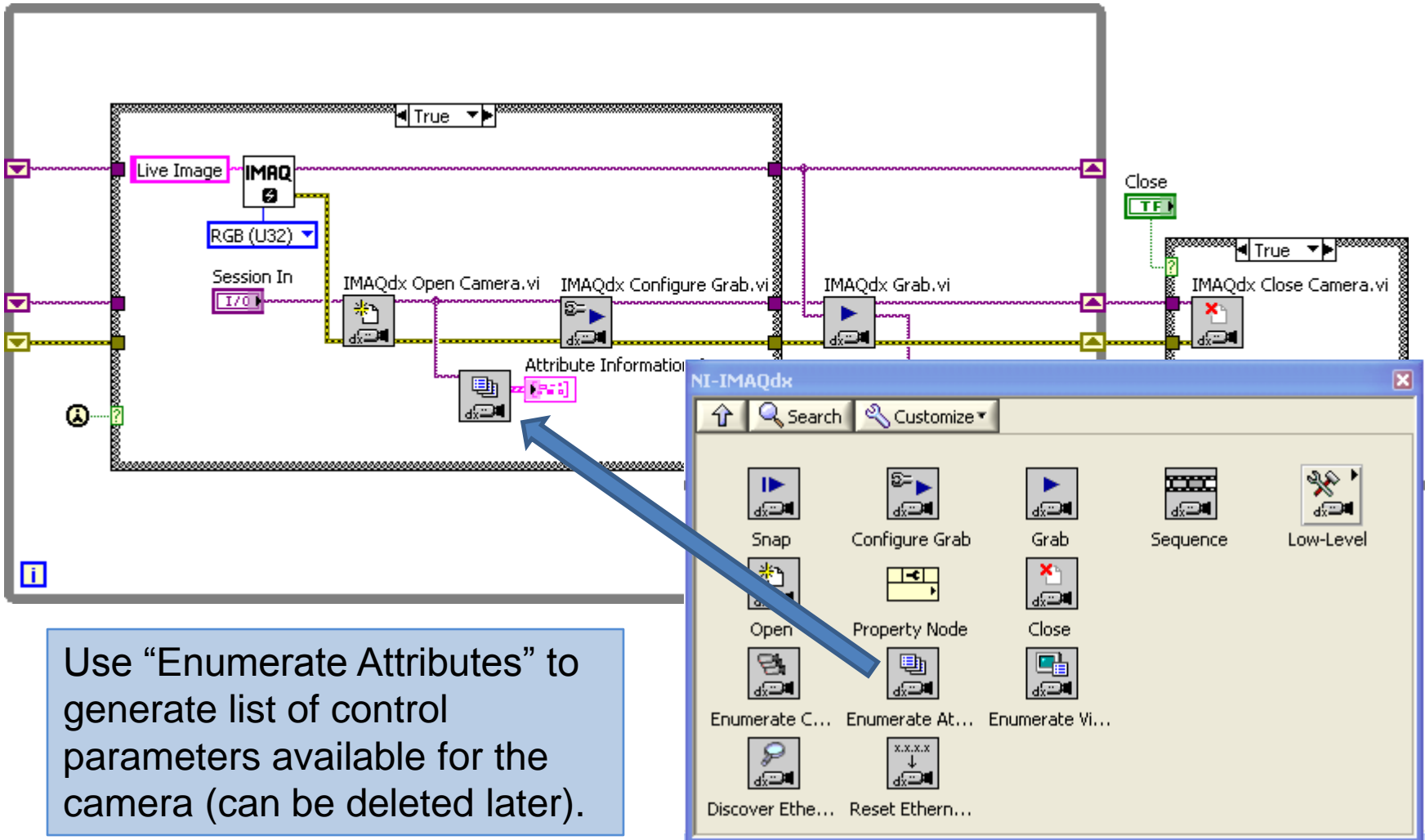
Adding a sub.vi to main program

The image shows two windows from the LabVIEW software interface. On the left is the 'Functions' palette, which is organized into categories like 'Programming', 'Vision and Motion', 'Mathematics', 'User Libraries', 'Select a VI...', and 'Arduino'. A blue arrow points from the 'Select a VI...' option in the 'Select a VI...' category to the 'Sub.vi' file in the 'Select the VI to Open' dialog box on the right. The dialog box shows the current directory as 'USB Web Camera Software' and lists several files: 'Camera Example.vi', 'Camera.vi', 'Main Program.vi', and 'Sub.vi'. A text box with a blue background and black text is overlaid on the dialog box, pointing to 'Sub.vi' and containing the text: 'Select sub.vi to include in main program. Any *.vi program can be inserted as a sub.vi'. The dialog box also includes a 'File name' field, a 'Files of type' dropdown menu set to 'All LabVIEW Files (*.vi;*.ctl;*.vit;*.ctt;*.lvclass;*.lv)', and 'OK' and 'Cancel' buttons.

Running sub.vi from main program



Adding exposure & gain controls



Use “Enumerate Attributes” to generate list of control parameters available for the camera (can be deleted later).

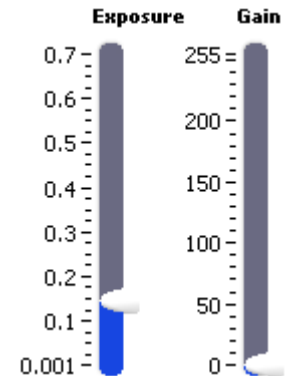
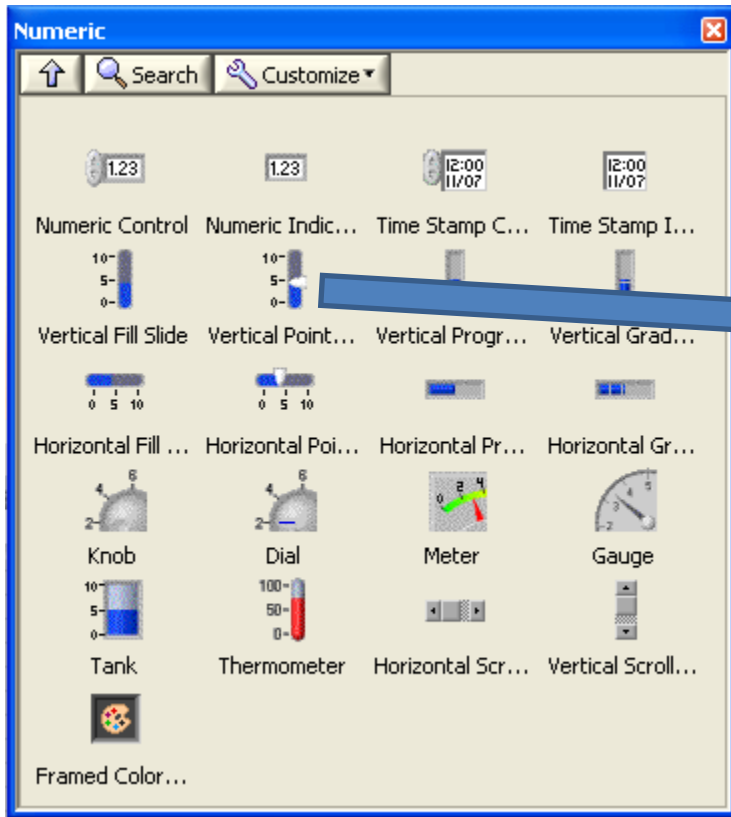
Adding exposure & gain controls

The screenshot displays a software interface for camera control. On the left, a window titled "Image Out" shows a live video feed of a Rubik's cube. Below the image, technical details are provided: "1280x960 0.26X 32-bit RGB image 255,255,255 (0,0)". To the right, a "Session In" dropdown menu is set to "cam1", with a "Close" button below it. The "Attribute Information Array" panel lists various camera attributes. Two blue arrows originate from a text box at the bottom left, pointing to the attribute indices 25 and 27.

Index	Attribute Name	Attribute Type	Readable	Writable
25	CameraAttributes::Exposure::Value	DBL	Yes	Yes
27	CameraAttributes::Gain::Value	I64	Yes	Yes

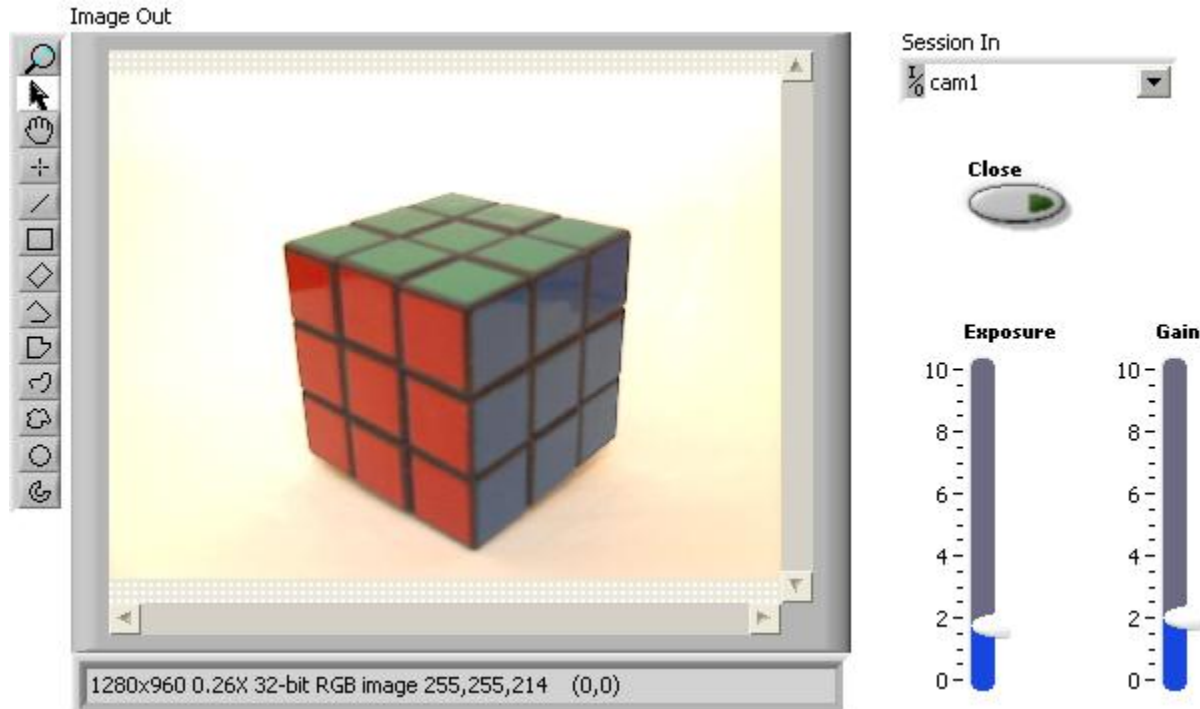
Index through the attributes to find those corresponding to exposure & gain. Take note of the attribute names and data types.

Adding exposure & gain controls



Place 2 numerical sliders on the front panel. Label them "Exposure" & "Gain".

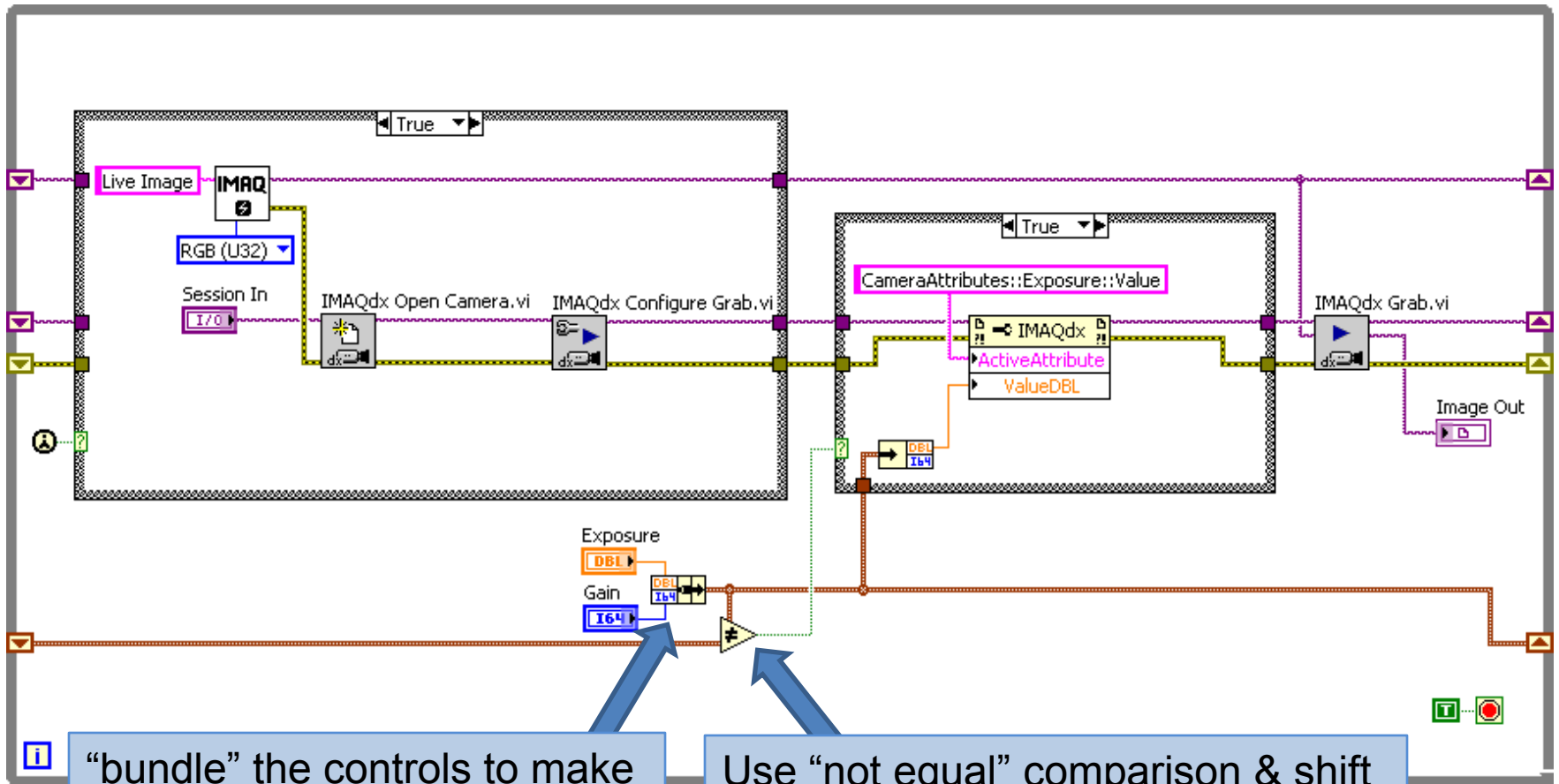
Connecting up the controls



Enumerate Attributes can now be deleted once the names and data types are known

Now need to link the controls to the LabView program and set the max & min values.

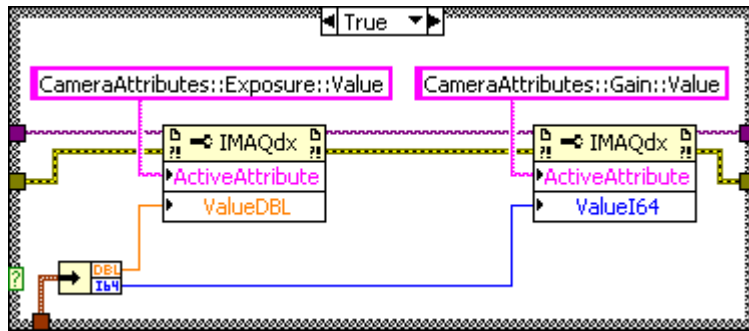
Using IMAQdx property nodes



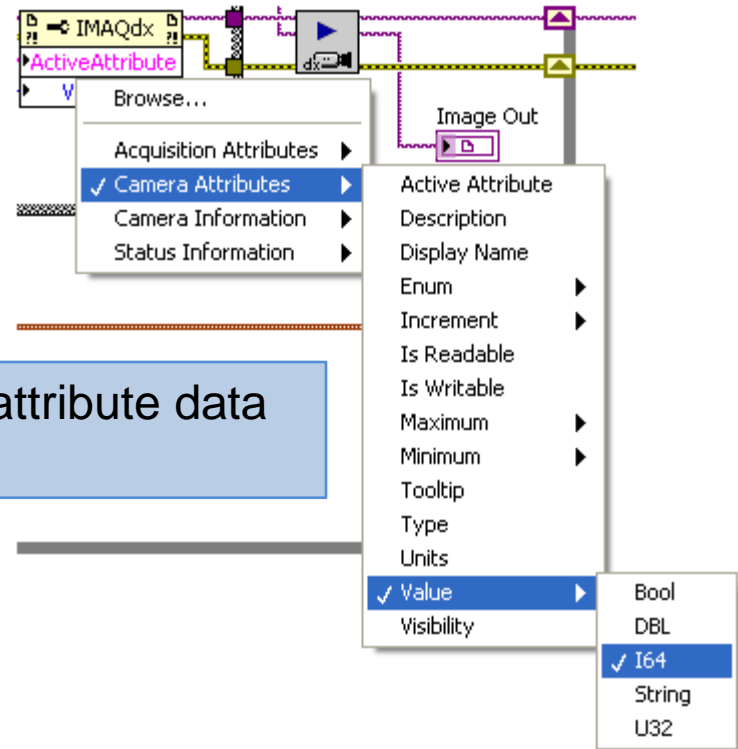
“bundle” the controls to make code more manageable

Use “not equal” comparison & shift register to test for changes to the controls (only updates properties when values are changed).

Defining attribute names & types

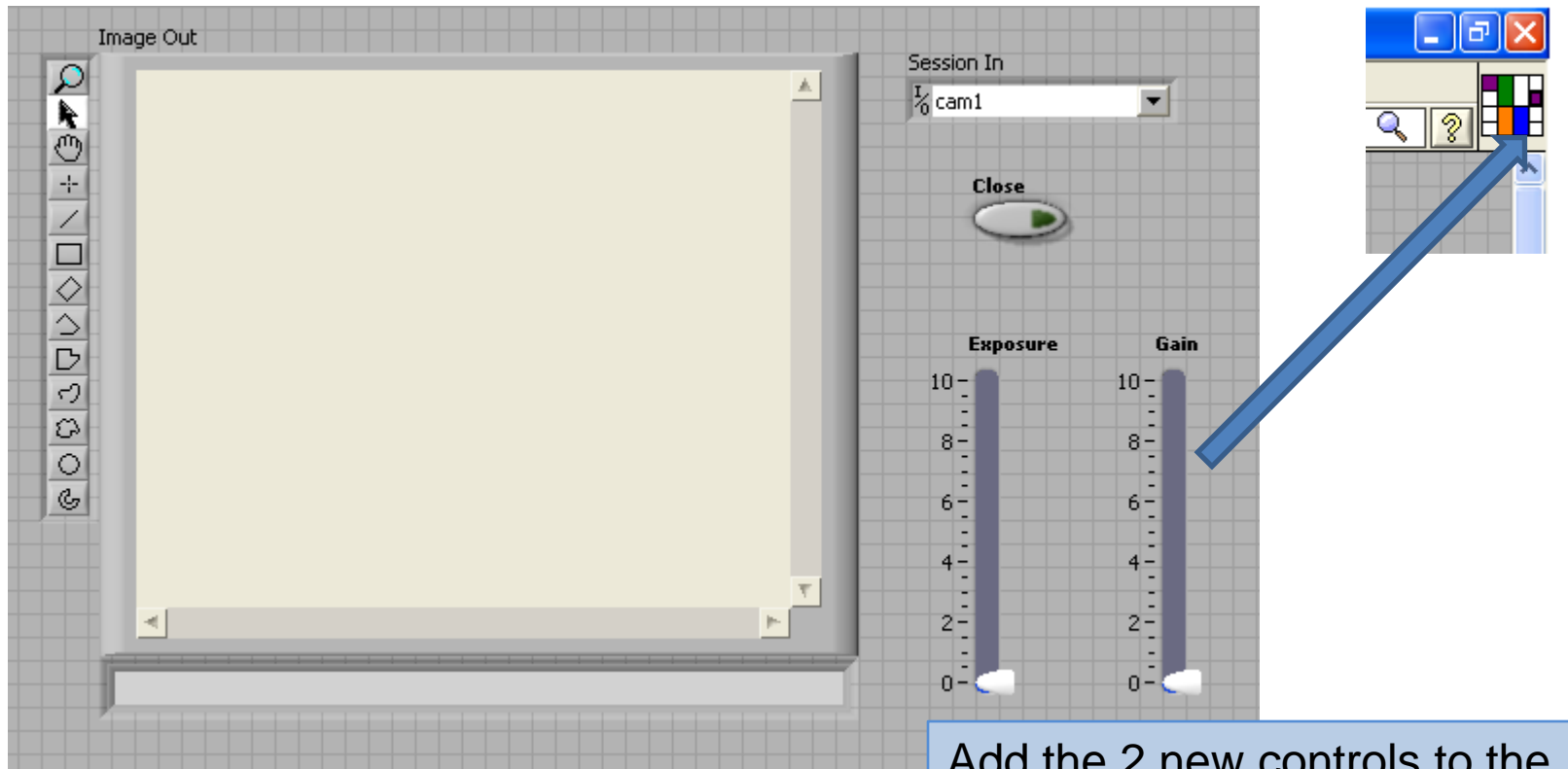


Setting the attribute names



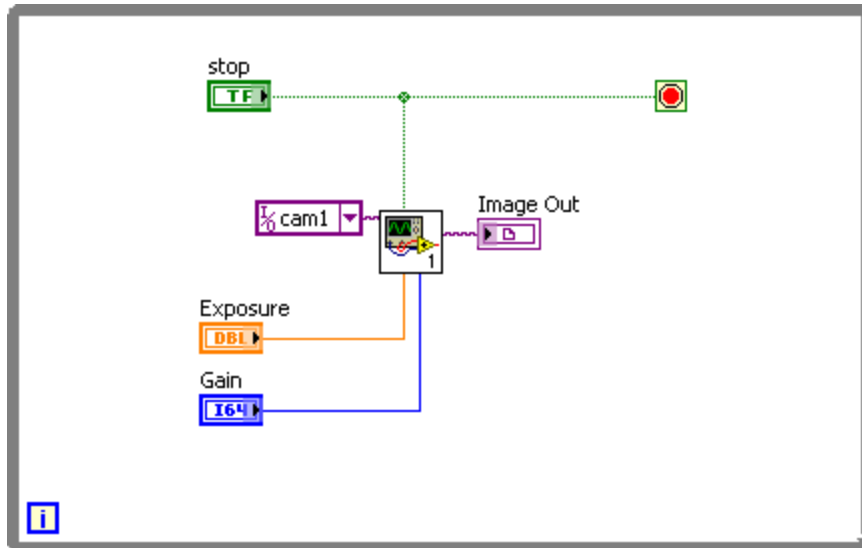
Setting the attribute data types

Updating the terminal connections

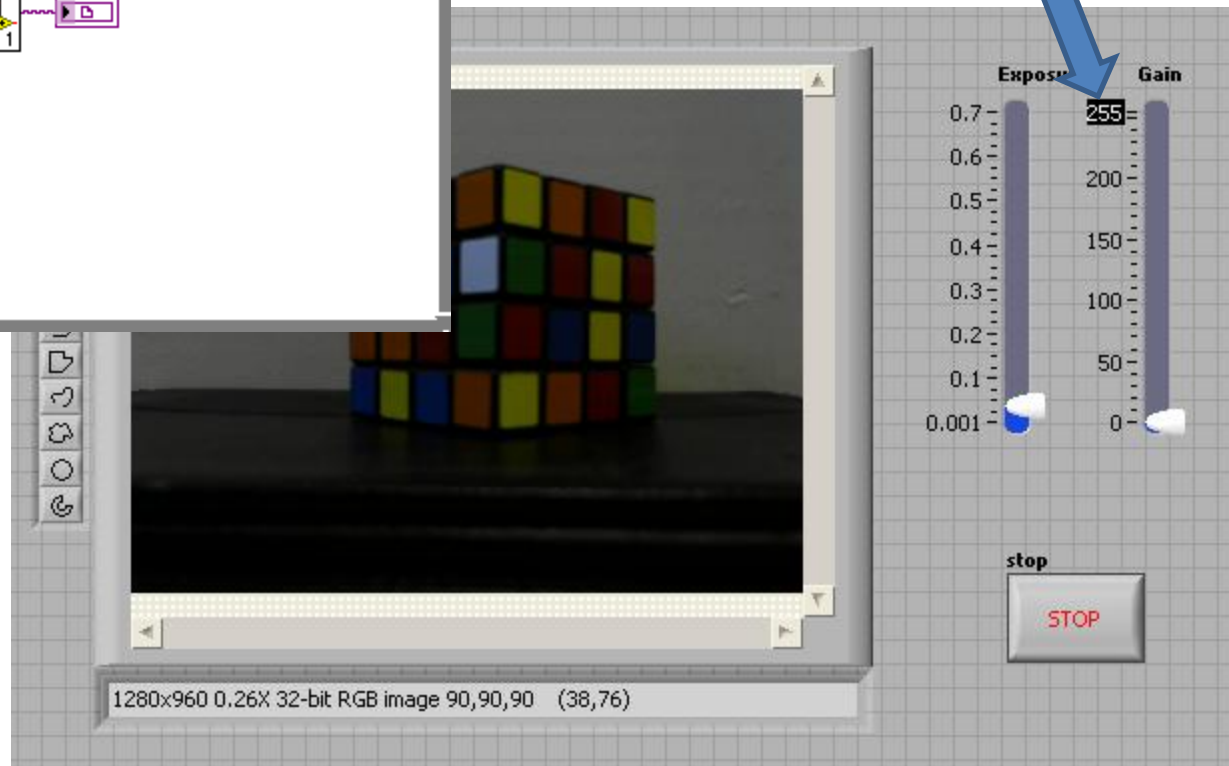


Add the 2 new controls to the connector terminals using the wiring tool

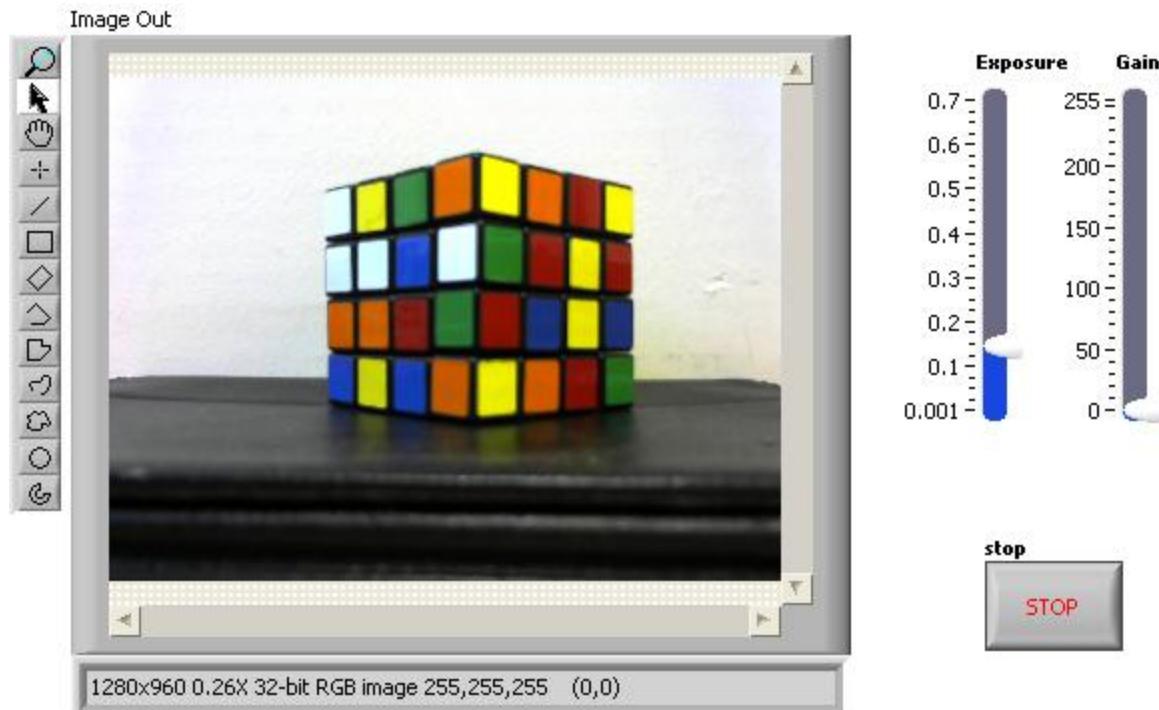
Updating the main.vi front panel



Double click to change scale limits



Testing the main.vi

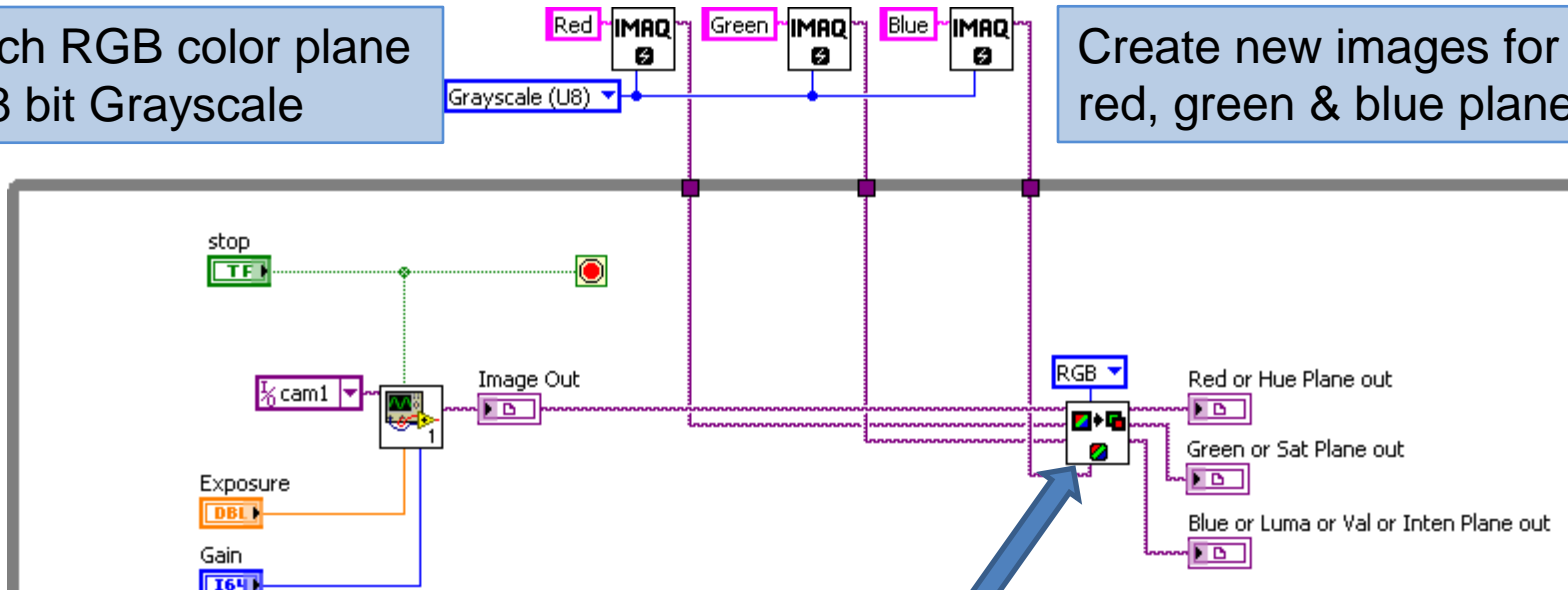


Exposure & gain can now be controlled while vi is running

Working with color

Each RGB color plane is 8 bit Grayscale

Create new images for the red, green & blue planes



The Vision Utilities palette is shown, containing various image processing functions. A blue arrow points from the 'Color Utilities' icon in the palette to the 'Color Utilities' window.

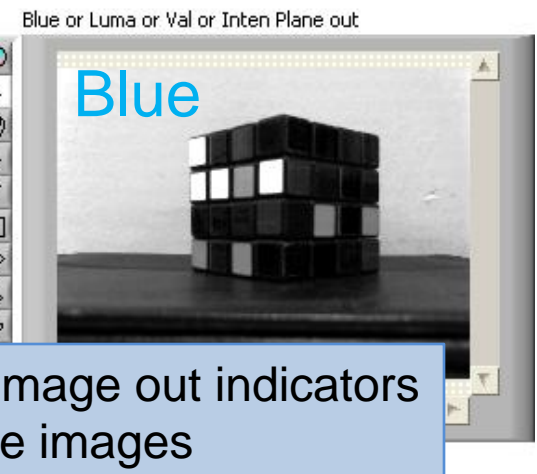
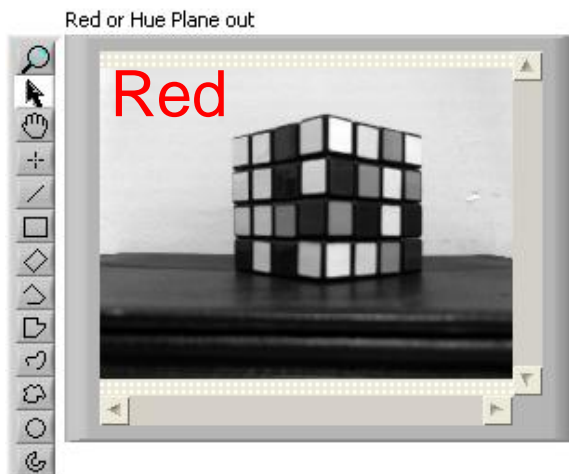
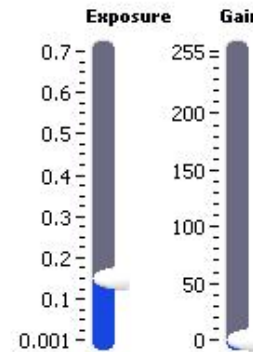
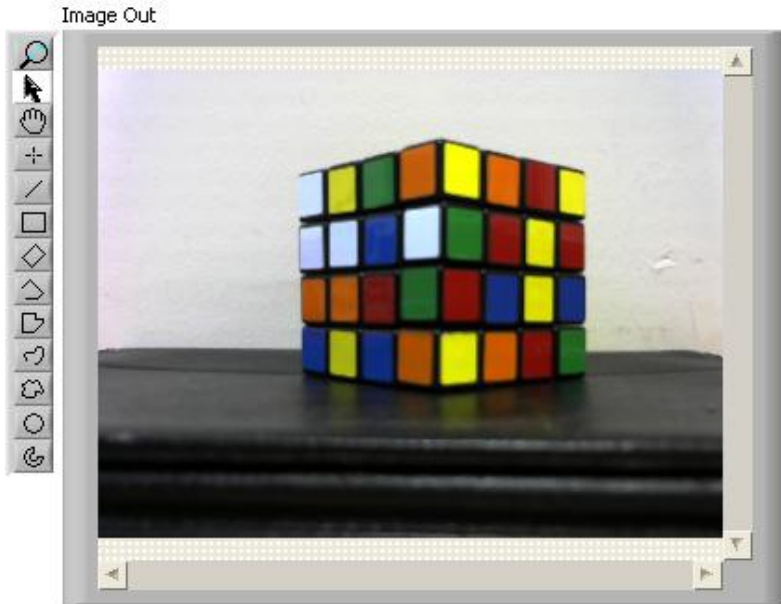
- Image Manag...
- Files
- External Display
- Region of Int...
- Image Manip...
- Pixel Manip...
- Overlay
- Calibration
- Color Utilities
- Vision RT

The Color Utilities palette is shown, containing various color processing functions. A blue arrow points from the 'Extract Color Planes' icon in the palette to the 'Extract Color Planes' vi in the diagram.

- IMAQ Extract...
- IMAQ GetCol...
- IMAQ SetCol...
- IMAQ ColorI...
- IMAQ ArrayT...
- IMAQ RGBTo...
- IMAQ ColorT...
- IMAQ ColorV...
- IMAQ Integer...

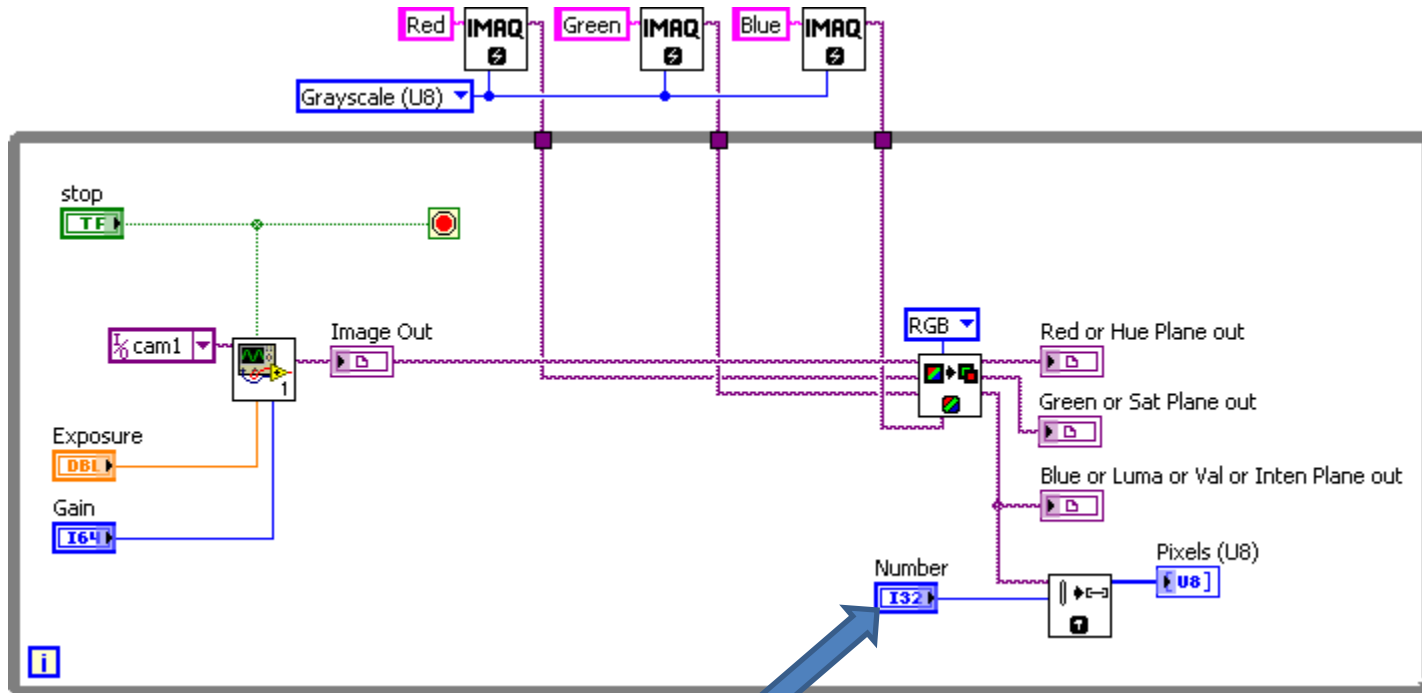
Select the "Extract Color Planes" vi

Working with color



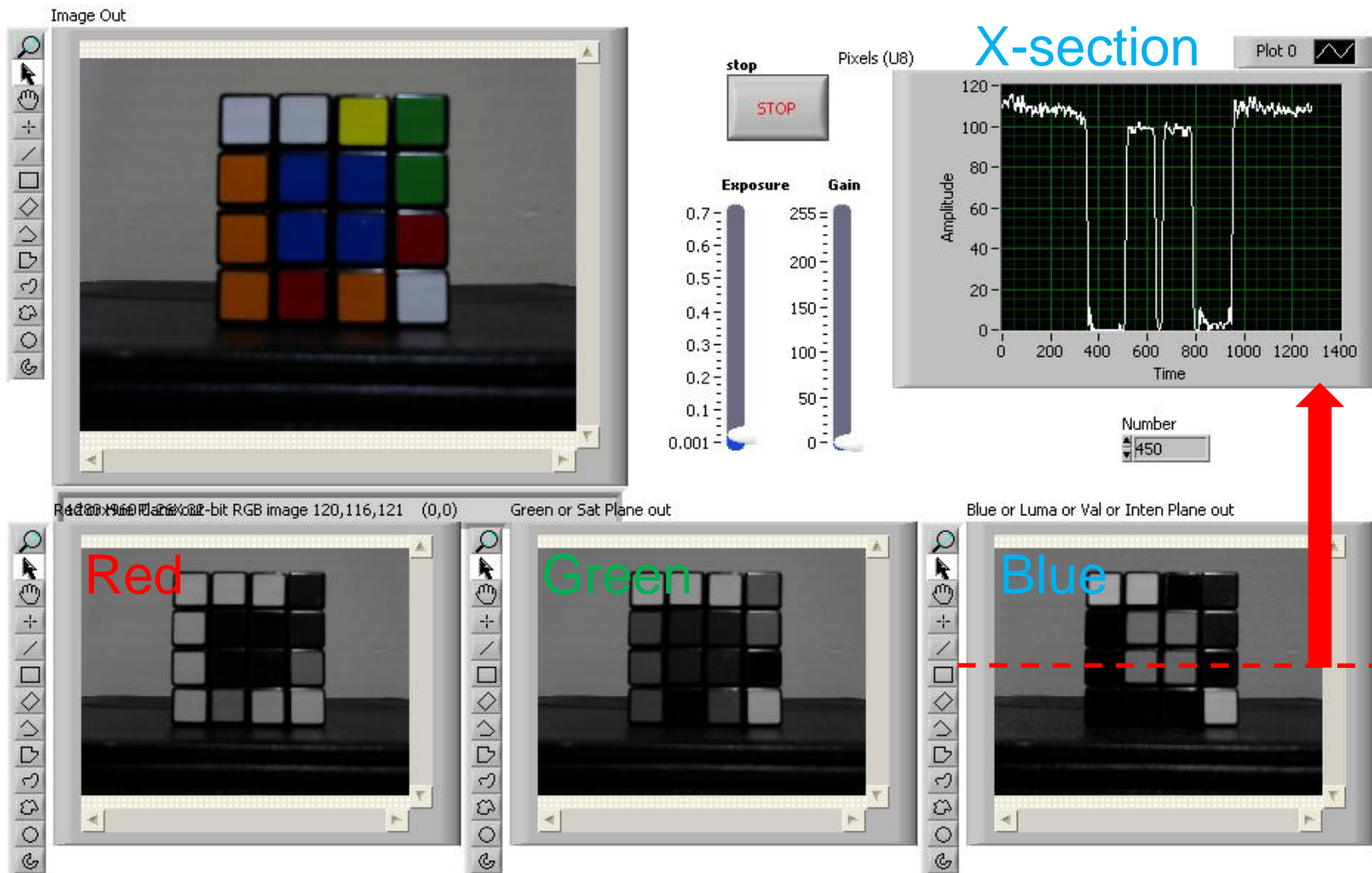
Update the image out indicators to display the images

Extracting a row from the image



Controls row position for extracting X-section from image.

Extracting a row from the image



Further reading

IMAQ™
IMAQ Vision
Concepts Manual

October 2000 Edition
Part Number 322916A-01

