

# Using the Calibration Gui for WIFIS

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## ABSTRACT

This document outlines how to use the gui that controls the various components of the calibration unit for WIFIS. It also goes briefly over the set up of these components.

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## 1. Setup

This section goes over how the physical elements of the calibration unit must be set up (or at least the parts that I've thought worth going over here).

### 1.1. Mirror Flippers

There are two flip mirrors used in the calibration unit (Thorlabs MFF101). In order for everything to work they must have the correct programming have the mirror attached properly and be in the right place.

### 1.1.1. Internal Programming

Each of the flippers has been programmed already but if for some reason they revert the following section outlines how to program them again.

1. Find a Windows computer with Thorlab's "APT System Software" installed. (available here: [https://www.thorlabs.com/software\\_pages/ViewSoftwarePage.cfm?Code=Motion\\_Control&viewtab=0](https://www.thorlabs.com/software_pages/ViewSoftwarePage.cfm?Code=Motion_Control&viewtab=0))
2. Attach one flipper using a micro usb cable (each flipper came with one, in a pinch there should be one connecting the temperature / humidity sensor to the usb hub that can be borrowed. )
3. Run the APT software (programs → Thorlabs → APT → ATP User. You should see a window that looks like that shown in figure 1.

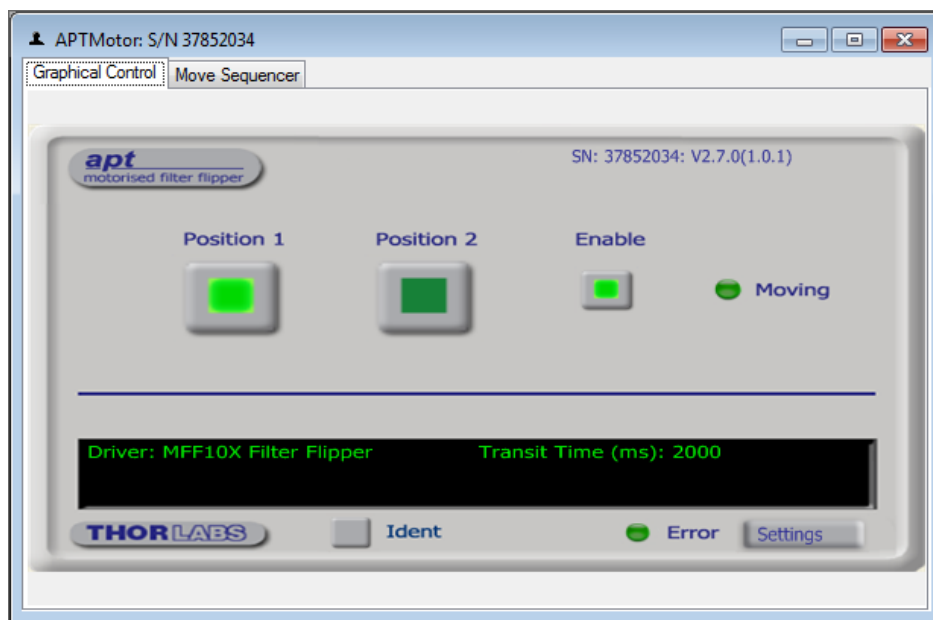


Fig. 1.— The APT control software for the MFF101 flippers used for the mirrors in the Calibration Unit.

4. Press the 'settings' button (bottom right hand corner of the gui as shown in figure 1). You should see a window like the one shown in figure 2.
5. change the following settings: 'transit time' should be about 2000 (desired transit time in ms) for digital I/O Pin 1
  - 'Operating mode ' should be "input: go to position"
  - 'Digital Signal Mode' should be "Logic Edge Input (Swap Pos.)"

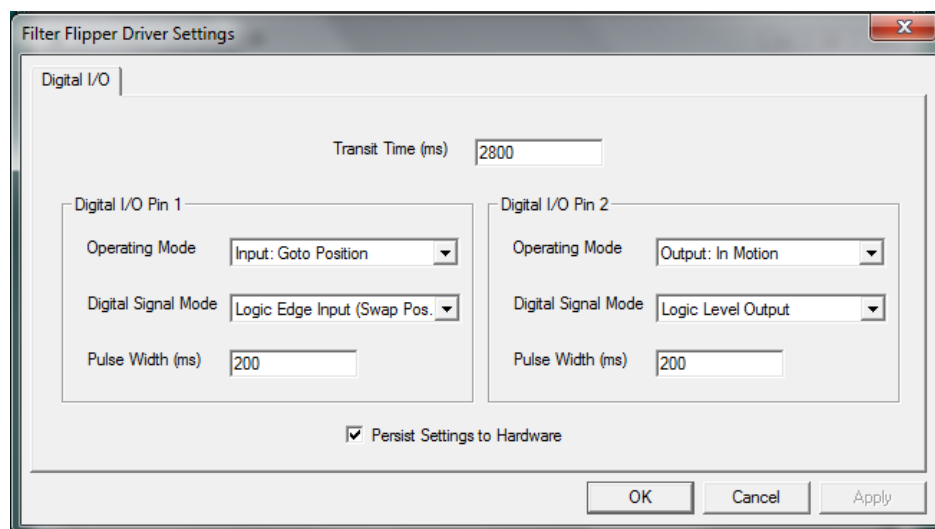


Fig. 2.— The screen to change the internal programming for the for the MFF101 flippers used for the mirrors in the Calibration Unit. Other than the transit time, the settings on both flippers should look like those shown here for the calibration control to work properly.

- ‘Pulse Width (ms)’ is not used so doesn’t matter
- for digital I/O Pin 2
- ‘Operating mode ’ should be ‘Output: In Motion”
  - ‘Digital Signal Mode’ should be “Logic Level Output”
  - ‘Pulse Width (ms)’ is not used so doesn’t matter
6. Check the “Persist Settings to Hardware” box. If not the unit will forget these settings. Then hit ‘apply’ or ‘ok’.
  7. Repeat steps 2 to 6 with second flipper.

### 1.1.2. Physical Setup

This will probably be taken into account in other places but I will go over here as well since it’s better to have it in instructions twice than to get it wrong.

Both of the flippers must have the mirrors attached in the right configuration. The internal programming is the same on both so until the mirrors are added the flippers are interchangeable.

Figure 3 shows the mirror set up for the flipper that will be mounted in the calibration box (called Flipper 1) and Figure 4 shows the set up of the flipper mounted on the top plate of WIFIS

(called Flipper 2). Once the mirrors are attached it's important that each flipper be mounted where it's supposed to be :p.

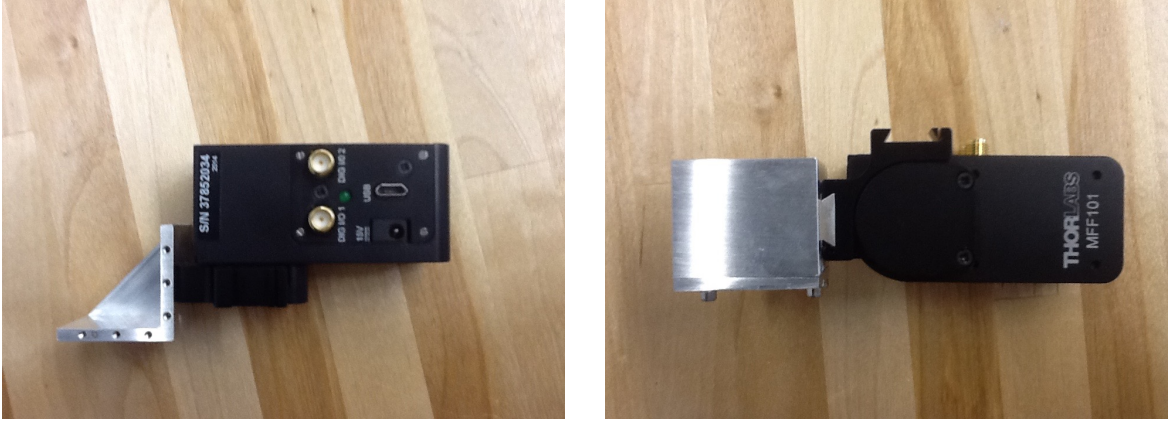


Fig. 3.— The way the mirror needs to be attached for the flipper mounted inside the calibration box (Flipper 1).

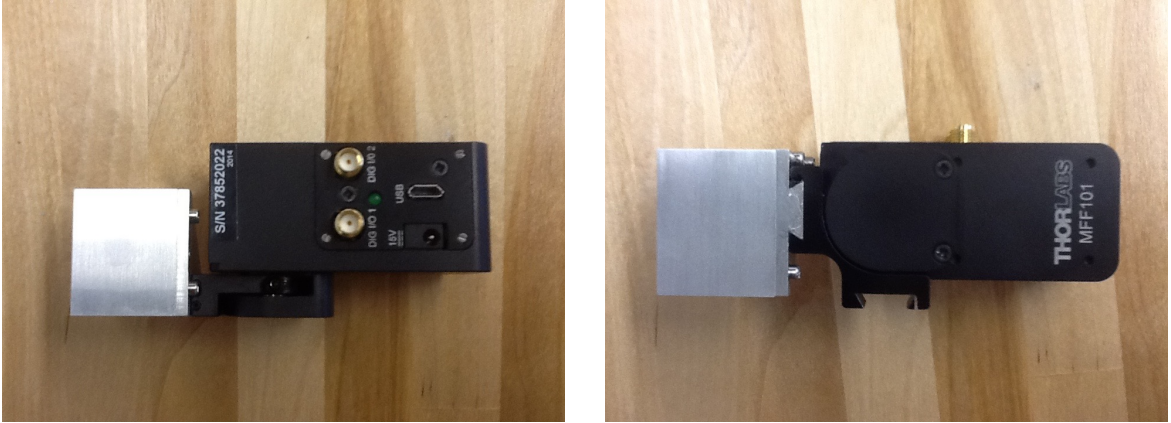


Fig. 4.— The way the mirror needs to be attached for the flipper mounted on the top plate of WIFIS (Flipper 2).

## 1.2. Arduinos

There are two arduinos being used for the control of the calibration system, one attaches via SMA to the two mirror flippers the other controls the integrating sphere power supply via TTL.

### 1.2.1. Programming

Each of the arduinos must be programmed with the correct code using the Arduino Software (IDE) (currently installed on the control computer, in a pinch can be downloaded here: <https://www.arduino.cc/en/Main/Software>). The codes for the control of each of the arduinos can be found on the Git repository “WIFIS-code” (<https://github.com/CANMoose/WIFIS-Code>) in the directory ‘control/Calibration\_Control’. “Arduino\_script\_flipper.ino” is the code that must be loaded onto the arduino controlling the flippers (to avoid all confusion it is depicted in figure 5. “Arduino\_script\_sphere.ino” is the code that must be loaded onto the sphere arduino.

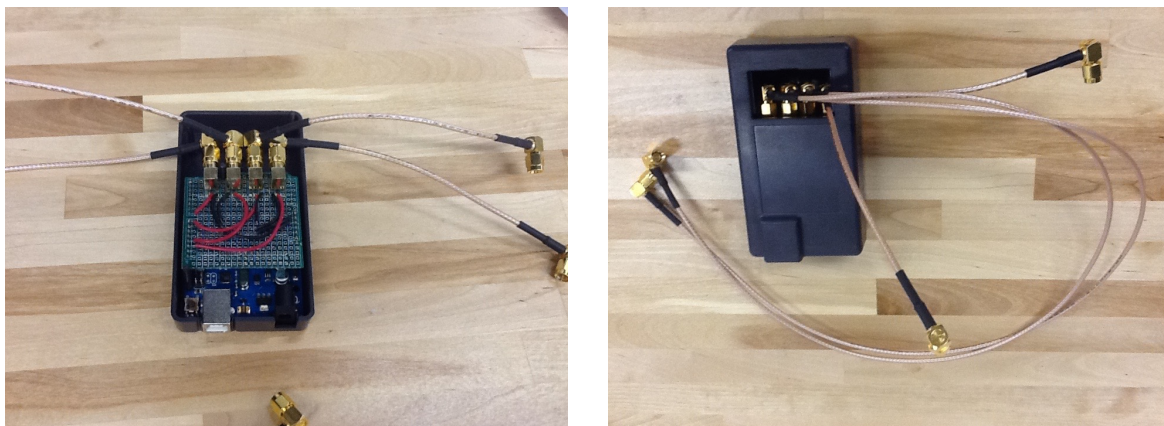


Fig. 5.— Arduino that controls the two mirror flippers shown both in its box (right) and out of it (left).

### 1.2.2. Physical Setup

The flipper arduino is housed in a largish black box that should be screwed onto the top of the calibration box. There are 4 SMA cables that need to be screwed into the 4 SMA plugs on the board and then plugged into the correct port on the correct flipper. I will number each of the SMA ports on the arduino starting from the one on the end closer to the USB connector, in reference to figure 5 1 is the farthest left and 4 the farthest right.

1. This plug should have one of the longer SMA cables. It needs to be plugged into the Dig I/O 2 pin on flipper 2.
2. This plug should have one of the longer SMA cables. It needs to be plugged into the Dig I/O 1 pin on flipper 2.
3. This plug should have one of the shorter SMA cables. It needs to be plugged into the Dig I/O 2 pin on flipper 1.

4. This plug should have one of the shorter SMA cables. It needs to be plugged into the Dig I/O 1 pin on flipper 1.

The sphere arduino is housed in a smaller box that lives beside the sphere power supply on the electronics rack. A cable is connected to it that plugs into the sphere power supply via a 2.5mm audio jack.

## 2. Control via the GUI

This section outlines how to use the GUI I wrote to control the various aspects of the calibration unit.

### 2.1. Setup

The gui relies on two pieces of code both of which can be found on the Git repository “WIFIS-code” (<https://github.com/CANMoose/WIFIS-Code>). ‘calibration\_control\_toplevel.py’ is the main code (found in the directory ‘control/Calibration\_Control’). It relies on “dlipower.py” a code I took from <https://pypi.python.org/pypi/dlipower> and which can also be found in the WIFIS-code git repository in the directory ‘control/Power\_Control’.

Running ‘calibration\_control\_toplevel.py’ should start the GUI. If not I’ll cover a bit of trouble shooting in section 2.3

### 2.2. Using the GUI

When ‘calibration\_control\_toplevel.py’ is first run a window should appear like that shown in figure 6. The column to the left contains all of the buttons for normal operation. Buttons are shown as elevated if they can be pressed at a given time and depressed if they cannot. The column on the right displays the status of the various components and can be used to control the individual components if needed. The Mirror Flipper section tells you if the mirrors are in motion or not. Note that messing with what position the mirrors are in or if the light sources are on or off with these buttons could mess things up, unless you are sure, just use the buttons on the left.

**First the ‘Enter Calibration Mode’ button should be pressed.** It turns on power to the flippers, turns on power to the Integrating sphere, moves the mirror mounted on WIFIS into the calibration position that feeds light from the calibration unit into the instrument and blocks light from the telescope. The gui should now look like figure 7.

At this point you are ready to take flats and or arcs. **To take flats first press the ‘Prepare to take Flats’ button.** This moves the mirror in the calibration box to feed light from the

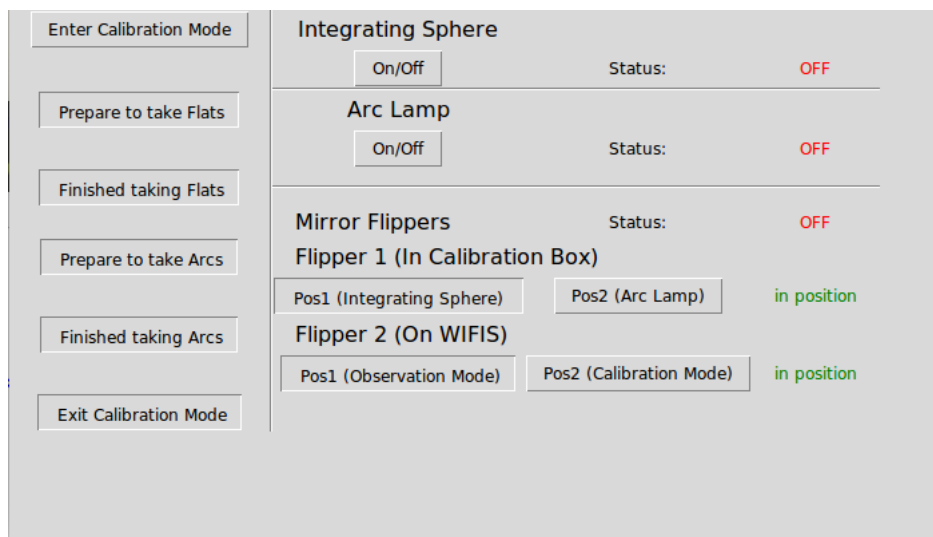


Fig. 6.— A screen shot of the Calibration gui when first turned on. The column to the left contains all of the buttons for normal operation on start up the only one of these that can be pushed is ‘Enter calibration Mode’ which is displayed as elevated. The column on the right displays the status of the various components and can be used to control the individual components if needed.

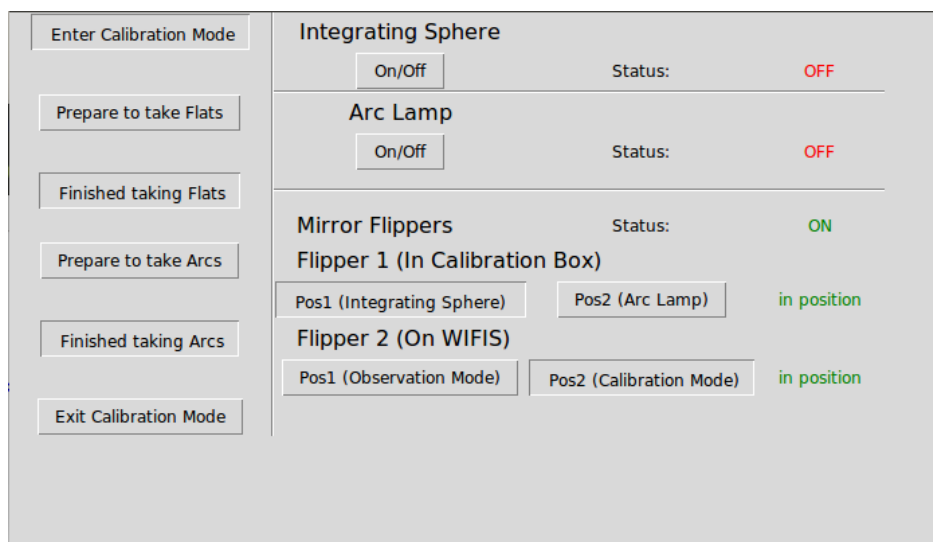


Fig. 7.— A screen shot of the Calibration after the ‘Enter Calibration Mode’ button is pressed. The power has been turned on to the flippers as well as the integrating sphere power supply, and Flipper 2 has been moved into ‘calibration mode’.

integrating sphere into WIFIS and turns on the integrating sphere using ttl connection. The gui should look light the left side of figure 8. At this point the only thing to do is press ‘Finished taking Flats’ when you are done to turn off the integrating sphere. **To take arcs press the ‘Prepare to take Arcs’ button.** This moves the mirror in the calibration box to feed light from the arc lamp into WIFIS and turns on the arc lamp. The gui should look light the right side of figure 8. At this point the only thing to do is press ‘Finished taking arcs’ when you are done to turn off the integrating sphere.

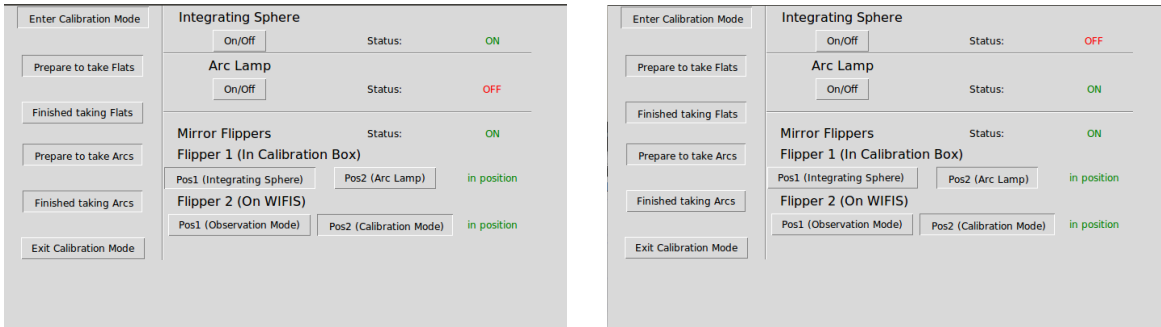


Fig. 8.— Screen shots from the Calibration Control Gui. Left: What the gui should look like when taking flats (after pressing the ‘Prepare to take Flats’ button). Right: What the gui should look like when taking arcs (after pressing the ‘Prepare to take Arcs’ button).

**At any time you can shut everything down and move the Flipper on WIFIS into observing mode again by pressing the ‘Exit Calibration Mode’ button.**

The right side of the gui gives more information and controls. The ‘On/Off’ buttons in the Integrating Sphere and Arc Lamp boxes toggle the power to the respective light sources. The status of each is also displayed (on or off). The box devoted to the mirror flippers has a status line at the top that shows if there is currently power being provided to the flippers. Below that are two buttons for each flipper. The depressed button is the current position of the mirror, pressing the other button will move that mirror. The text to the right is used to know when the mirror is in position or in transit.

### 2.3. Troubleshooting the GUI

The following list is a few of the things I anticipate going wrong when trying to use the calibration system via this gui, they are presented in no particular order and are definitely not a complete list!

**When ‘calibration\_control.toplevel.py’ is run the Gui doesn’t open** There are two causes of this that I’ve anticipated: one of the arduinos wasn’t found or one of the power bars wasn’t found. In either of these cases a Warning will be printed in python before the code terminates



telling you which thing isn't connected properly. If it's one of the arduinos make sure lines 46 and 49 have the correct paths to the arduinos. If it's one of the power bars make sure it is plugged into the network switch and powered on.

**The Gui Opens but the flippers aren't behaving right** This could either be a problem with the arduino or the flippers.

1. make sure the right programming is on the arduino. (see section 1.2.1)
2. make sure the SMA cables are connected correctly (see section 1.2.2)
3. make sure the flippers have their internal programming right (see section 1.1.1)

**The Gui Opens but the flipper and or integrating sphere controls are being weird** The code is written so that it should be able to sort out which arduino is which but it's possible this is freaking out. Make sure lines 46 and 49 point to the right arduinos. If this doesn't solve your problems reload the software onto each arduino as per section 1.2.1

**The Gui Opens but freezes when the flippers or the sphere are used** Using either the mirror flippers or the Integrating Sphere require reading output off of the arduinos. If the programming in the arduinos is't right (or something's gone terribly wrong) this can cause the script to hang infinity. Force stop it. Try reprogramming both of the arduinos as per the instructions given in section 1.2.1.

**The Gui Opens but things aren't powering on right** Make sure everything is plugged into the correct plug on the power bars. Also make sure they are all connected to their power sources properly.