Acquisition box

version: 3.0
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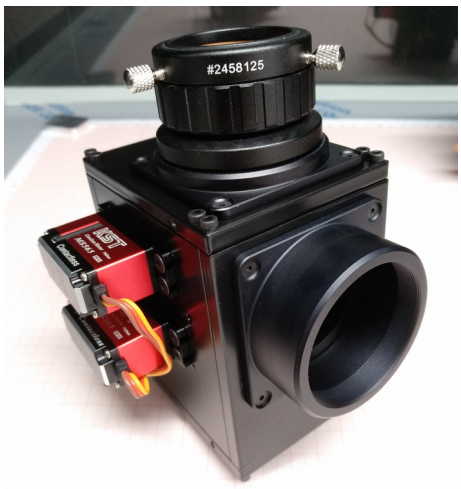
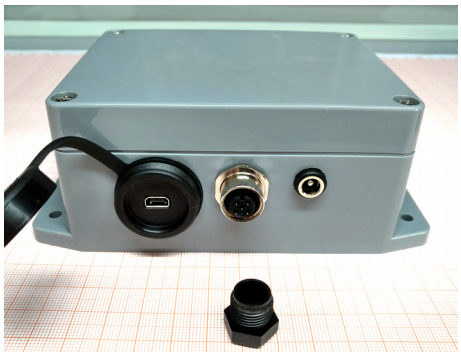
Short manual

1. Parts list

	1x the acquisition box
	1x electronic control box
	1x mini USB cable

	1x signal cable
	1x power adapter

2. The acquisition box specification

main components:

- 1x Thorlabs 10:90 non-polarizing cube beam-splitter 1"x1"x1" size with anti-reflection coating optimized for 400-700nm
- 3x KST MS563 micro digital servo, coreless motor, contactless sensor, 2 ball bearings, working frequency: 760us/560Hz
- 2x Thorlabs FC/PC fiber connector, wide key (2.2mm)
- 1x Baader 1.25"/T-2 eyepiece holder with helical micro-focuser (6.7mm focus travel)
- 1x Thorlabs 1/2" visible achromatic lens, f=19.0mm with anti-reflection coating optimized for 400-700nm

connections:

- female 1.25" for guiding camera (CMOS 1.25" diameter guiding camera recommended)
- male 2" for telescope
- FC/PC for spectrograph fiber
- FC/PC for calibration lamp fiber

regulations:

- 8 push-pull screws at the bottom for calibration lamp fiber collimation and focusing at the bottom of the acquisition box
- micro-focuser rotating ring and locking knobs

3. The electronic control box specification

main components:

- Pololu Micro Maestro 6-channel USB servo controller

connections:

- mini-USB female socket – connects with PC
- M12 5-pin female socket – to connects with acquisition box
- power female socket 5.5/2.1 mm (+ inside) – connects with power brick

4. Power adapter specification

- input: AC 100-240V 50/60Hz
- output: DC 7.5V 2.93A
- input plug: european
- output plug: 5.5/2.1mm (+ inside)

5. Cables specification

- USB type A to mini USB cable, 1.5m length
- M12 5-pin male-female signal cable, 2m length

6. Initial setup

In order to test the acquisition box on the desk, before connecting with the telescope, the following steps should be followed:

1. Download and install “Maestro Servo Controller” from the website:
   https://www.pololu.com/product/1350/resources
2. Connect M12 signal cable to the electronic box and the acquisition box
3. Connect USB cable to the electronic box and the PC with “Maestro Servo Controller” installed
4. Connect power cable to the electronic box
5. In “Maestro Servo Controller” select your controller in the main drop-down list.
6. Set the parameters in “Maestro Servo Controller” according to the following list:
   - Channel Settings tab
     - Servos available: 3
     - Period (ms): 10
     - In positions from 0 to 2 set the same parameters:
       - Mode: Servo
       - Min: ~496
       - Max: ~1008
       - On startup or error: Go to 760
       - Speed: 0
       - Acceleration: 0

        - 8-bit neutral: 760
        - 8-bit range (+/-): 476.25
- Serial Settings tab
    - Serial mode: UART, fixed baud rate: 9600 (works under linux Kubuntu 16.04LTS)

7. Now you should be able to move servos individually in “Maestro Servo Controller” in Status tab. Some parameters listed above may be changed if necessary.

7. Focusing guider camera

In order to focus the guider camera you first have to make sure that your star images are focused at the spectrograph fiber entrance. For that purpose use your spectrograph exposure meter or primary camera to measure the flux level coming from the fiber into the spectrograph. Then try to move (using slow motion corrections) or focus the stellar image to get the best possible signal. During that process multiple trial and error attempts are usually necessary. Note that you will first have to make sure that you are pointing correctly at a selected, bright star, then try to correct the telescope focusing and so on.

After finding the correct telescope focus you can verify if your guiding camera is in focus at the same time. If not, simply correct it by loosing the locks and moving the camera inside or outside the focuser. If you are close to the correct focus you can use the micro-focusing ring for fine adjustments.

Guider camera focusing can only be done at night when the acquisition box is connected to your telescope. It is also recommended to power the acquisition box on so the servo motors will go into neutral/zero position during the focusing process.

8. Focusing calibration lamp fiber

First make sure that the servo motors are in neutral/zero position. They should go to that position automatically after connecting the electronic box and its power adapter with the acquisition box. After that you need to use your spectrograph’s exposure meter or primary camera to measure the flux level coming from the fiber into the spectrograph. The focusing is done by trial and error method using the 8 screws located around the calibration fiber connector at the bottom of the acquisition box. The 4 screws with large head are used to pull the focusing lens, the 4 screws without head are used to push the focusing lens.

The acquisition box calibration lamp fiber has been set in focus before sending the acquisition box. Nevertheless, small corrections might be necessary.

Calibration lamp focusing can be done without installing the acquisition box on the telescope. You should only take care to cover all places where the light could enter the acquisition box and disrupt the focusing process.