

Lhires III

Upgrade kit

Guiding & Calibration

User guide



Shelyak Instruments

73, rue de Chartreuse
38420 Le Versoud / France

Tél.: +33.4.76.41.36.81

<http://www.shelyak.com>

Email: Contact@Shelyak.com

Ref DC0026C
March 2015

1 Introduction

You just received your Lhires III upgrade kit – thank you.

This document will help you in upgrading, tuning and using your spectrograph.

The kit is in two parts :

- guiding port optical upgrade
- calibration module & guiding mirror upgrade

This user guide covers both upgrades even if they are independant from each other.

This upgrade is a delicate operation : we recommend that you remove the spectrograph from the telescope and remove both camera. Perform the upgrade in a clean and comfortable environment.

Note : The calibration module is not compatible as it is with the oldest generation of polished stainless steel sheet metal. If your Lhires III uses such a slit, you'll have to file down the bottom edge of the slit holder. In case of problem, please contact Shelyak Instruments.

2 Kits description

Lhires III upgrade kit is made of two parts :

2.1 Guiding port optical upgrade

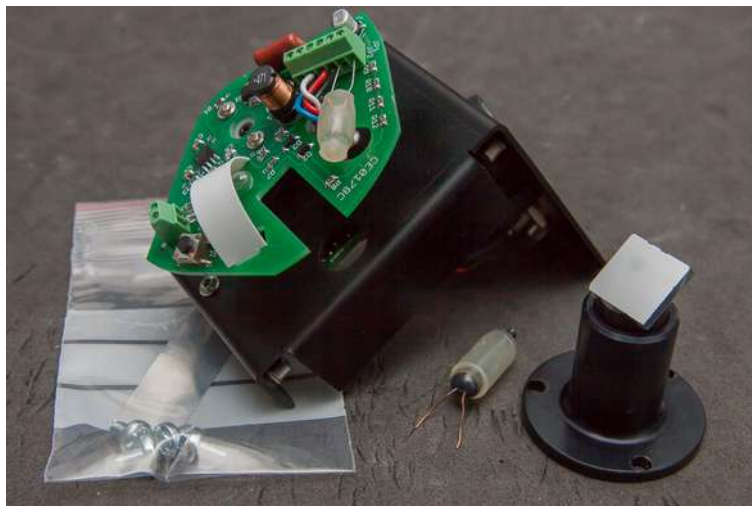
- guiding module
- bag with screws



2.2 Calibration & guiding mirror upgrade kit

- calibration module

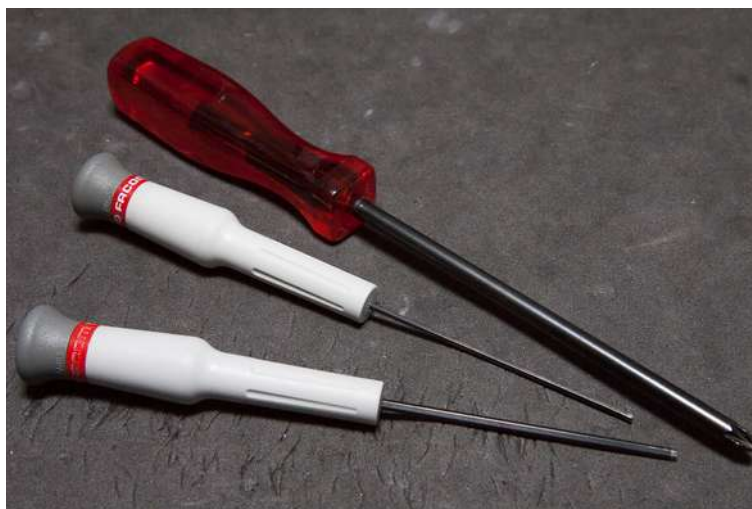
- guiding mirror
- Argon-Neon lamp
- bag with screws and tape
- 'Flat/Neon' sticker
- power cord



3 Required tools

To perform the upgrade of your Lhires III, you need the tools that have been provided with your spectrograph originally :

- phillips screwdriver
- 6 pans 2mm & 2.5mm tools



4 Guiding port

4.1 Installation

The guiding port can be changed easily without opening the Lhires III. First remove the four M4 screws holding the guiding port :

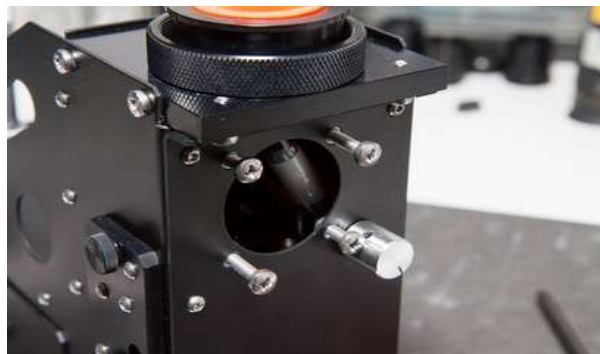


put in place the new guiding port module :



If you **also replace** the calibration module, use the provided M4x6 screws to mount the new module.

If you **keep the existing manual neon calibration module**, keep the two long screws (25mm, about one inch, long) which block the neon holder when you turn it manually.



4.2 Using your guiding port

The guiding port module has been designed to directly mount a C-mount camera which are the most used camera nowadays.

To install the guiding camera, first remove the internal optical tube by unscrewing the plastic cap screws :



Remove the protective cap :



Screw in, firmly but with care, your guiding camera - be very careful to not touch the visible lens with your finger.



Put it back inside the Lhires III guiding port.

Unscrew the knurled nut around the sheath and focus the camera on the slit by rotating the sheath while keeping the same camera orientation (make sure the

guiding port is moved all the way inside the sheath).



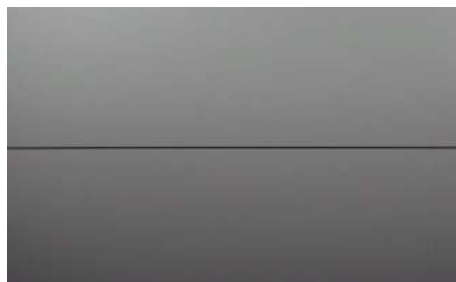
When focus is ok, lock the knurled nut :



Rotate the camera to align the slit with your image (horizontally or vertically, at your convenience), then lock the three plastic cap screws :



When adjustment are one, you should see a clean focused slit on your guiding camera image :



If your camera is CS-mount, we recommend that you add a C/CS extension ring (5mm spacer) which compensate for the difference in backfocus between C-mount and CS-mount. Without this spacer, you will have an acceptable but not optimal image.

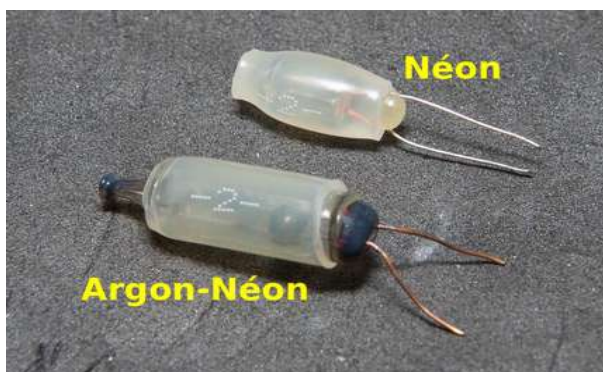
If your camera is another format like T-thread (M42x0.75), you will then need an adapter to convert to C-mount ; an optional M42x75 to C-mount adapter is for exemple available from Shelyak Instruments – check our web site for more details.

5 Calibration module

5.1 Installation

The calibration module upgrade kit is made of two main parts : the calibration module itself and the guiding mirror. Both elements need to be changed and this require to open the Lhires III spectrograph to remove the old components.

When you assemble your calibration module, you have the choice of wavelength calibration lamp : either a neon lamp (like you had before, but now motorized) or an argon-neon lamp :



Argon-neon lamp covers a broader spectral domain with more emission lines in the blue when compared to neon only. But its lifetime is significantly lower than the neon lamp and its intensity fainter.

If you plan to work mainly in the red portion of the spectrum, in particular around H_{α} , best is to use the neon lamp. If you work in low resolution and/or want to explore the blue spectral domain, use the argon-neon lamp knowing that you will have to replace from time to time (lifetime is a few dozen hours of

operation – this is still good enough for a large number of observations).
Here are low resolution spectra comparing the two lamps with similar conditions :



Lampe Néon

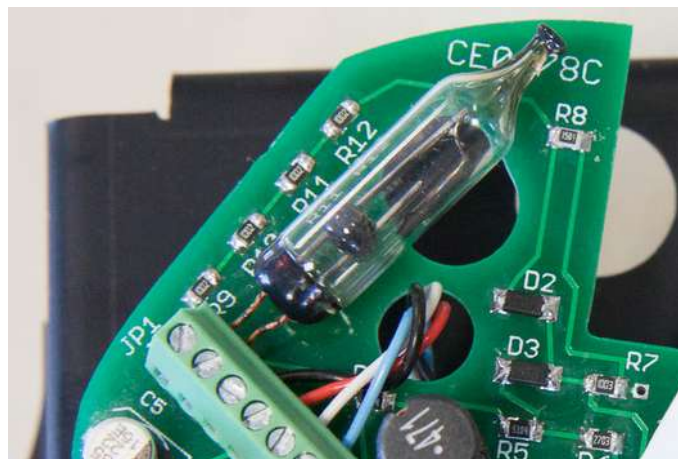


Voyant Argon-Néon

To change the lamp, select the bulb you want and mount it on the electronic board, make sure the lamp is in front of the hole :



Caution: The Argon-Neon lamp is not symmetrical. To ensure the maximal lamp lifetime, it is recommended to mount the lamp in the below position (on this picture, we've removed the diffuser around the lamp, to better show the inside) :



The Neon lamp, however, is symmetrical – you don't have to take care of the orientation.

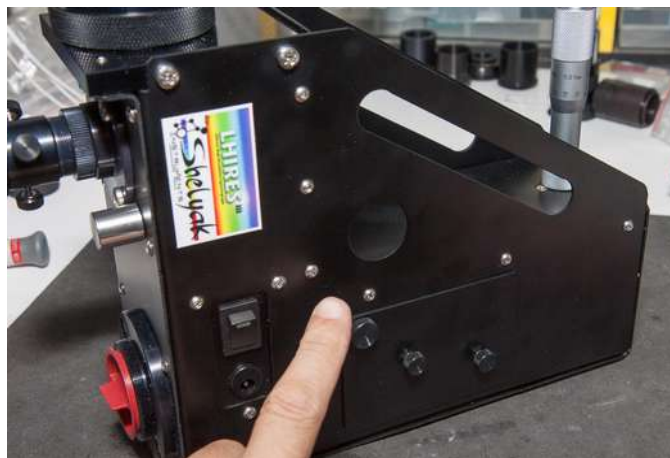
Opening your Lhires III

First, unplug the 12V power.



Remove the slit (unscrew the two plastic cap screws) and put it aside in a clean (no dust, no shock) environment.

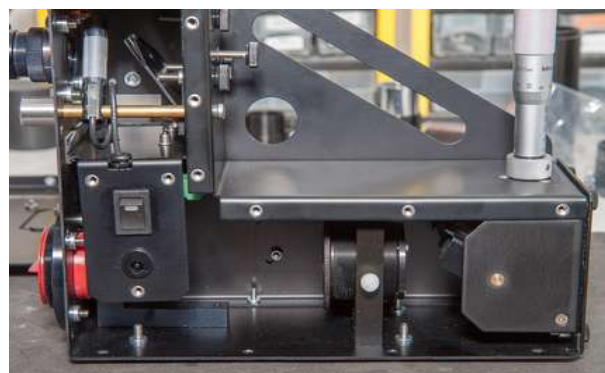
To open your Lhires III, remove the side cover on the 12V plug side :



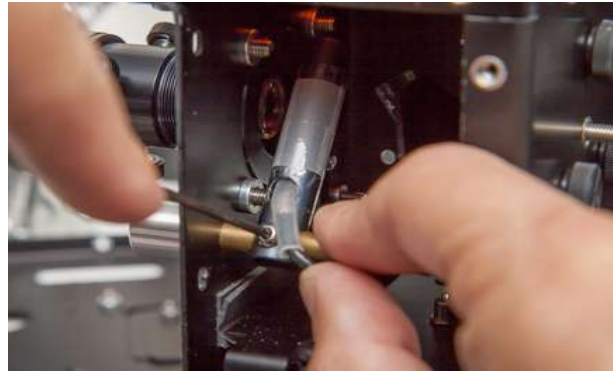
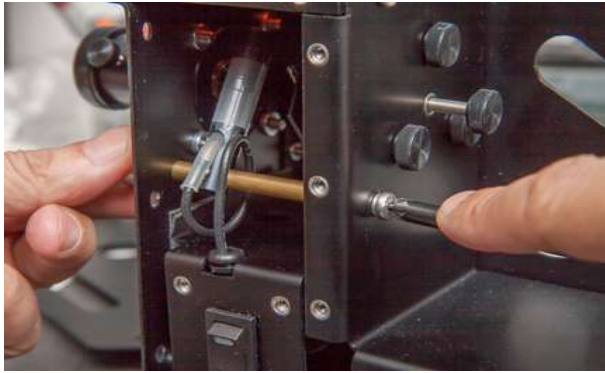
Remove 17 M3 screws and 2 M4 screws :



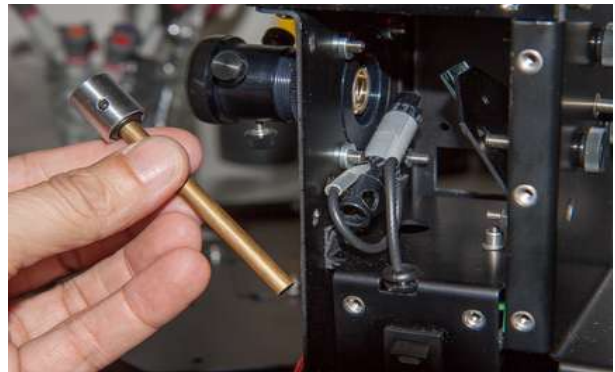
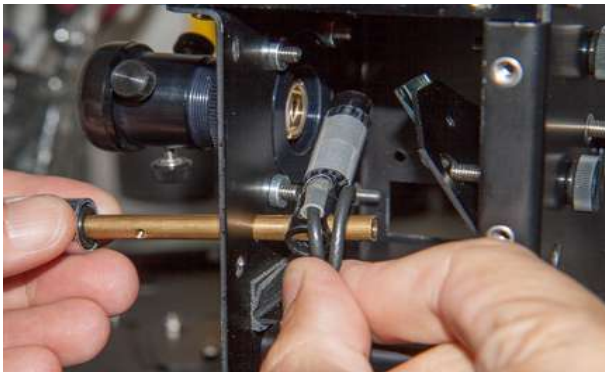
When all screws are removed, the side cover can come up freely :



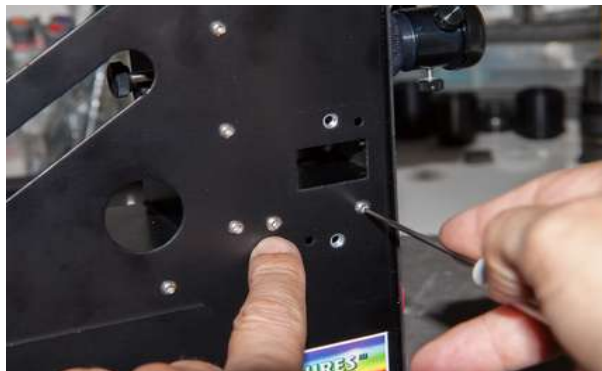
Remove then the old neon lamp ; remove the screw on the axis (phillips screwdriver) and the screw holding the lamp sheath on this axis :



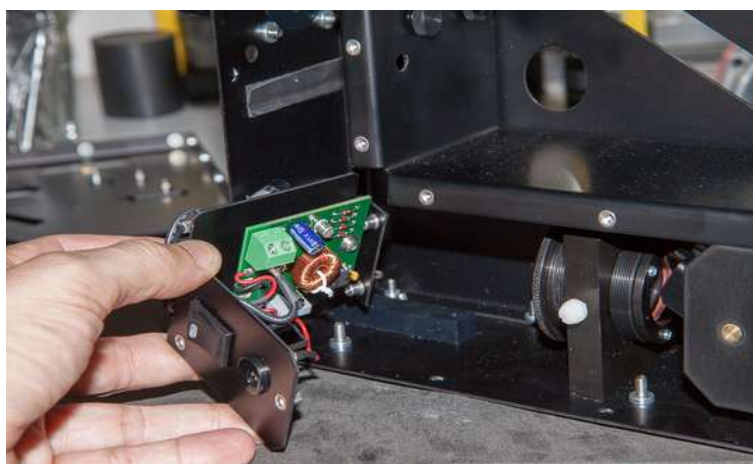
You can then slide the axis out of the Lhires III case.



Remove the old calibration module by removing the two screws close to the slit opening and holding the calibration module :



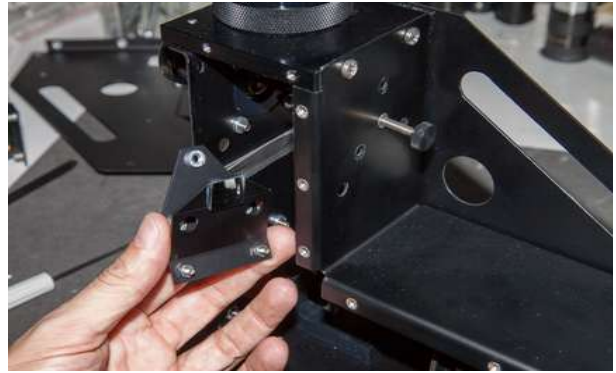
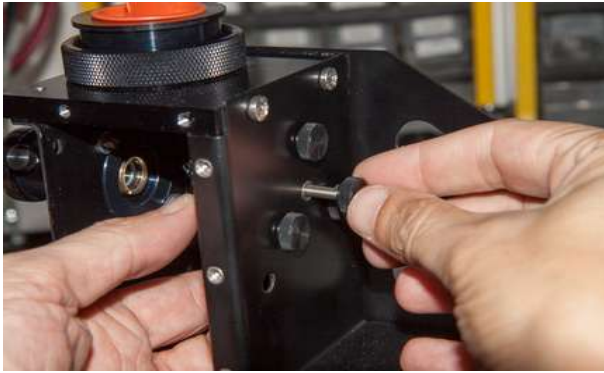
To remove the calibration module, turn it slightly and slide it out of the casing (be very careful to not touch the main mirror) :



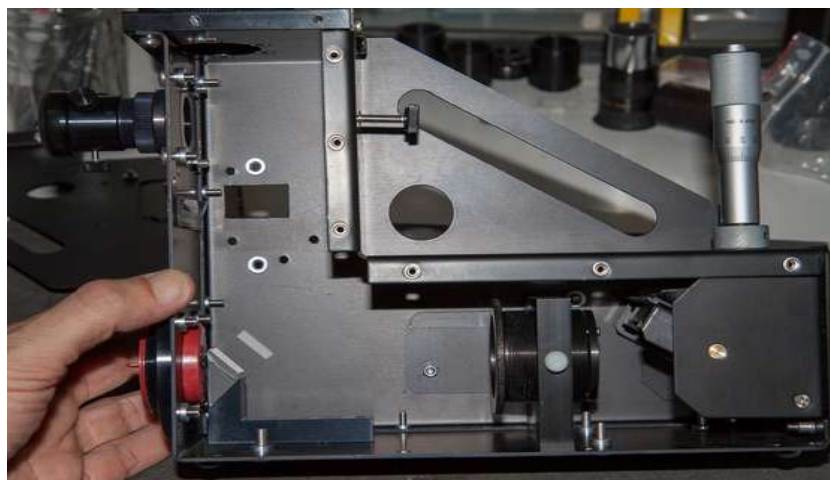
Remove then the guiding mirror which is mounted by four plastic cap screws in the L shape of the Lhires III housing.



Leave the central screw but unscrew it almost completely – it will be useful with the new guiding mirror element. Hold the old mirror assembly while you remove the three screws :

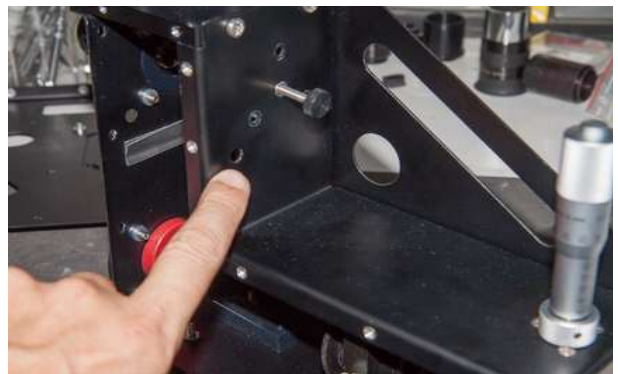
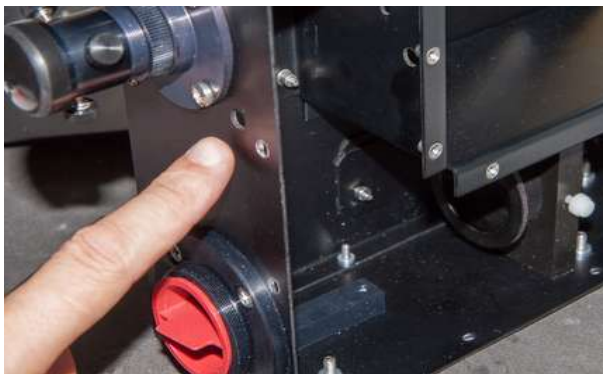


The Lhires III housing is now clean from all old elements :



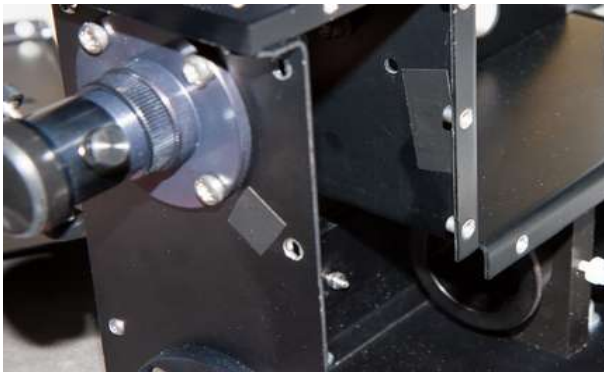
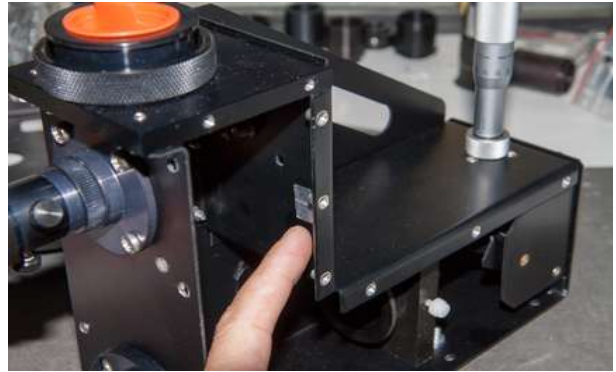
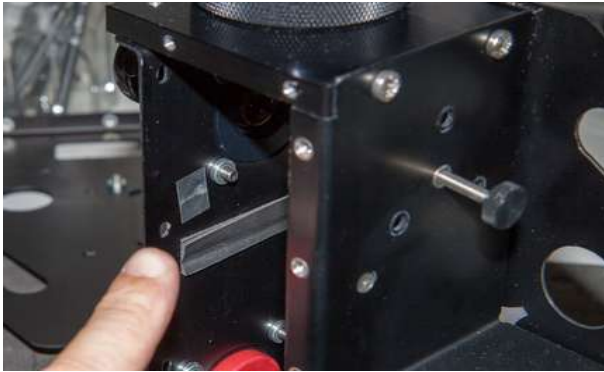
If needed, you can take advantage of this by cleaning the interior of the Lhires III with a dry air bomb.

First, close the two holes left by the old calibration lamp axis.



Put the aluminium adhesive tape inside the housing, covering the holes. Do not use any black tape as those are transparent to infra-red light. But you can cover the aluminium tape with a black tape to avoid internal reflection and for

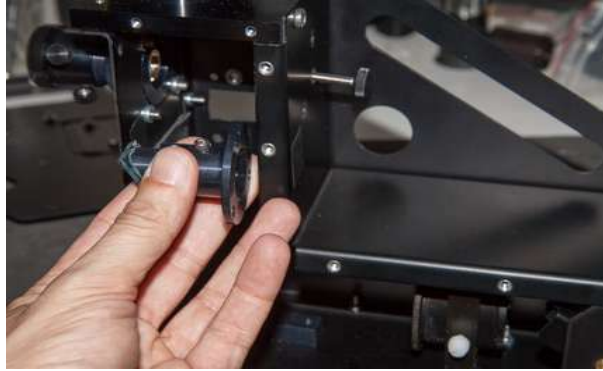
general aesthetic :



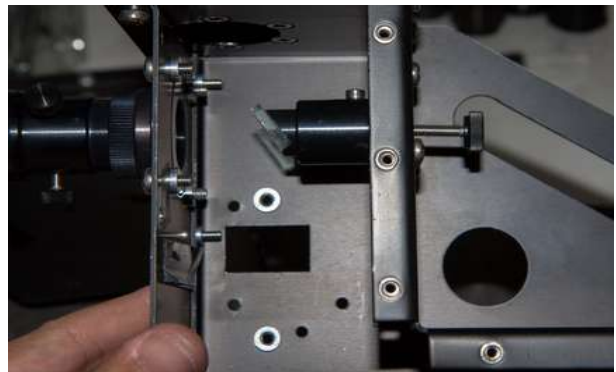
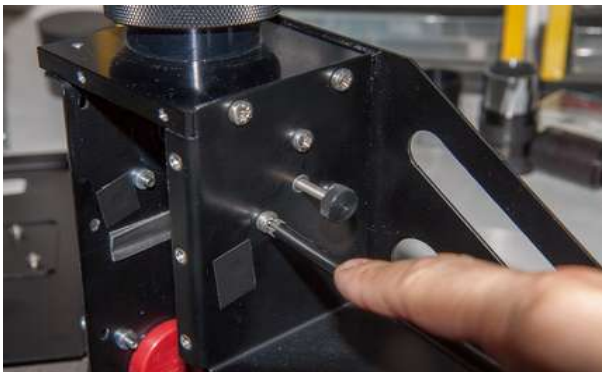
Remove carefully the protection tape from the guiding mirror (usually blue or pink). Take care to not put any finger print on the mirror itself.



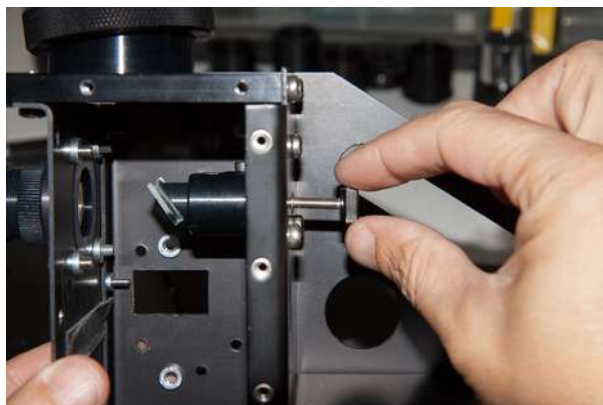
Put then the new guiding mirror with proper orientation : the mirror should face down and the adjustment screw toward the spectrograph entrance :



Use the three M4x6mm screws provided with your kit, they should not extend inside the Lhires III housing :



Slightly turn the central plastic cap screw (the one you left from the old system) :



We will see how to adjust this mirror later on...

Calibration module installation

Before inserting the new module, we recommend that you check how it works. Connect a 12V (center positive, 2.5mm plug) power supply, the same as the one you use before, using the adapter provided with the upgrade kit.

Activate each switch and you should see the lamp moving and switching ON. Nothing should block the movement of the electronic board.

Attention : do not touch the electronic board while in operation to avoid damaging it ; the wavelength calibration lamp is also powered with 300V but very low intensity (few mA) – so best is to avoid all contact.

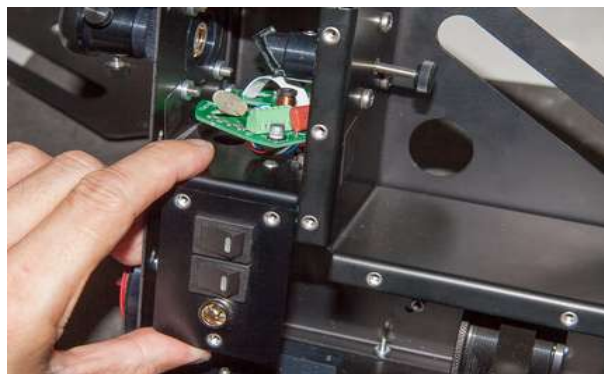
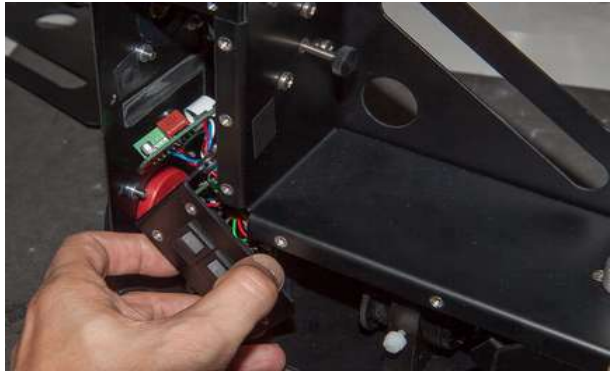


Note : It may happen that in some positions, or if you try to move the circuit manually, you hear some crackling noise. It is due to the servo-motor that cannot reach its target position, probably because a wire or any part is obstructing the movement. In such a case, look carefully around the circuit, and correct the issue.

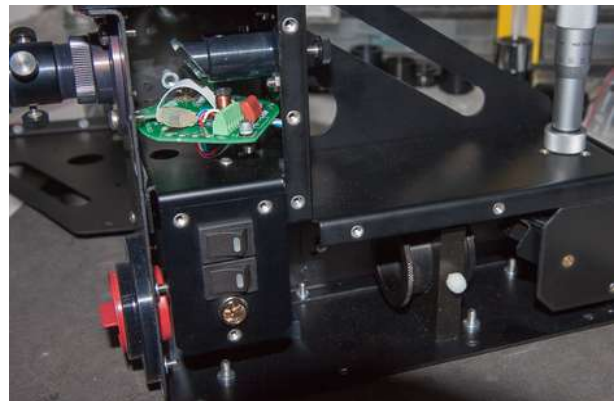
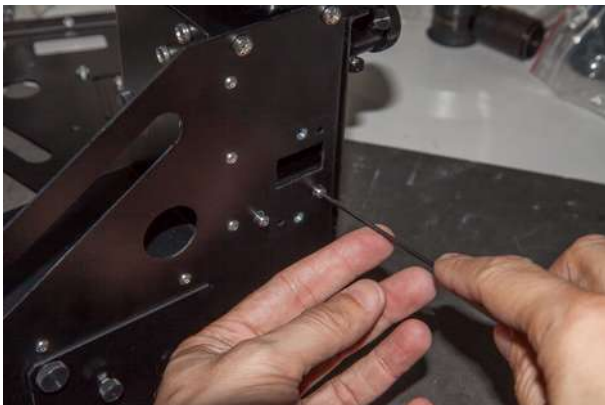


You can also try switching both switches at the same time : lamps are OFF but the circuit board remains in the « flat » position blocking some the telescope light – it can be usefull when taking dark frame for exemple...

After you checked everything is working fine, put the new calibration module in place. This is a very delicate operation, with the same rotation movement you used when moving the old module out.



The exact position of the module is given by the two screws near the slit opening. Put back those screws loosely for the moment.



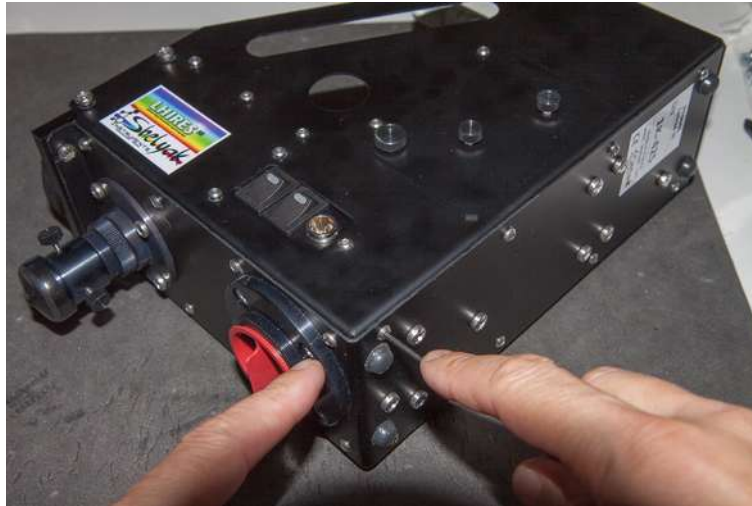
You can now put back the side cover and close the Lhires III housing. The cover should move back in place without force :



Put back the two M4 screws and the 17 M3 screws (loosely for the moment), starting with the three one on the new calibration module :



Then start by tightening the screws in the corner of the frame near the acquisition camera.



Tighten firmly (without excess!) all other M3 screws, plus two on the opposite side, holding the calibration module.

Installing the calibration module is now done. You can put the sticker indicating the operation for each switch (neon is the one closer to the spectrograph entrance) :



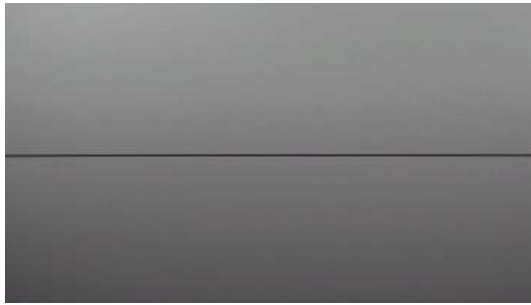
5.2 Adjustments

The guiding module has been adjusted during the manufacturing process and should not require any adjustment on your side.

Check otherwise the calibration module and the three positions ; if the positions are not centered, check the annexe for the adjustment procedure.

The guiding mirror requires a simple adjustment so the slit is well positionned on your guiding image.

With you guiding camera in place, focus approximately the slit while looking at a diffuse light source through the spectrograph (typically your ceiling, gray sky...) ; the slit should appear as a black line on a gray background on your guiding camera image.



1. Illustration: Image correcte



2. Illustration: Fente mal réglée

If the slit is not well positionned in the middle of the guiding image, do the following :

Remove the telescope front plate (8 M4 screws to remove ; the two below the frame can be left in place slightly loose).



When the front plate is remove, you have access to the guiding mirror adjustment. Unscrew just a little loose the guiding mirror screw then turn clockwise the central large plastic cap screws outside the Lhires III housing - it will push the mirror toward the guiding port :



Look on the guiding camera image and check if the slit is moving toward the center of the image. Continue if this is the right direction. Otherwise, unscrew the central screw and push the mirror support toward the screw (using a screw

driver).

Note that moving the guiding miroir will impact the focus ; when the right position of the mirror is found, lock the mirror in position by tighten the screw and refocus the guiding camera properly (see « optical guiding port » section).

5.3 Using the new calibration module

The calibration module has two separate switches to control the flat light (tungsten lamp) and the calibration lamp separately. To preserve the life of the bulbs, they are turned off automatically after 30 minutes (if the lights stay on for such a period, it's probably an oversight). At this time, the LED on the switch will flash quickly. Just turn OFF and back ON the switch to turn the lamp ON again.

If you activate both switches at the same time, both LEDs flash at the same time. This is an indication of the "dark" mode: the telescope beam is obstructed by the PCB, but no light is on. This position is provided as an help to obstruct the telescope when taking acquisition CCD dark frame.

In normal operation, each LED light indicates which one is active in the spectroscopy; in this case, the corresponding LED is lit continuously. If an LED is blinking, the corresponding lamp has been active for more than 30 minutes and has been automatically switched OFF to save bulb lifetime. If both LEDs are flashing, it indicates the « dark » position.

An important point: the electronic board position is activated by a servo motor. It requires a constant 12V power supply. As long as it is not moving it does not consume anything, but if the power is off, the circuit remains in the position where it is located. For this reason, consider switching OFF both switches before disconnecting the power supply: this will avoid surprises at the next use (the telescope beam will be obstructed then).

The power connector has two additional contacts for controlling the calibration module remotely. This is actually a new feature with this new module. If one of the two input is supplied with 12V, this has the same effect as pressing a switch. Thus, all the functions of the calibration module can be used remotely with two remote controlled 12V power supplies and the use of the 4 wire connector of the new module (one for ground, one for permanent 12V, two for remote controlled 12V power supplies).

6 Annexes

6.1 Connector schematics

The new connector brings in 12V power to the calibration module but also allow a remote control operation. It is a Tiny XLR (4 contacts). Wiring is the following

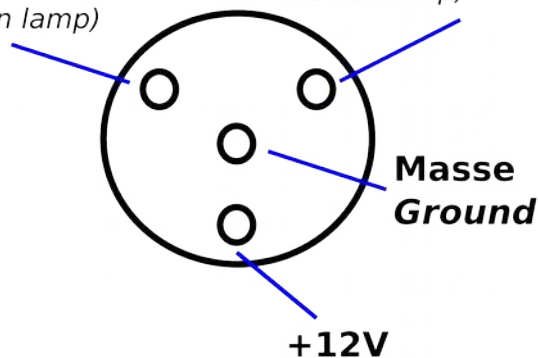
(view from outside the Lhires III) :

Commande d'étalonnage
(alimenter avec du +12V
pour activer la lampe
d'étalonnage)

Calibration control
(supply +12V to switch on
the calibration lamp)

Commande de Flat
(alimenter avec du +12V
pour activer la lampe de flat)

Flat control
(supply +12V to switch on
the flat lamp)



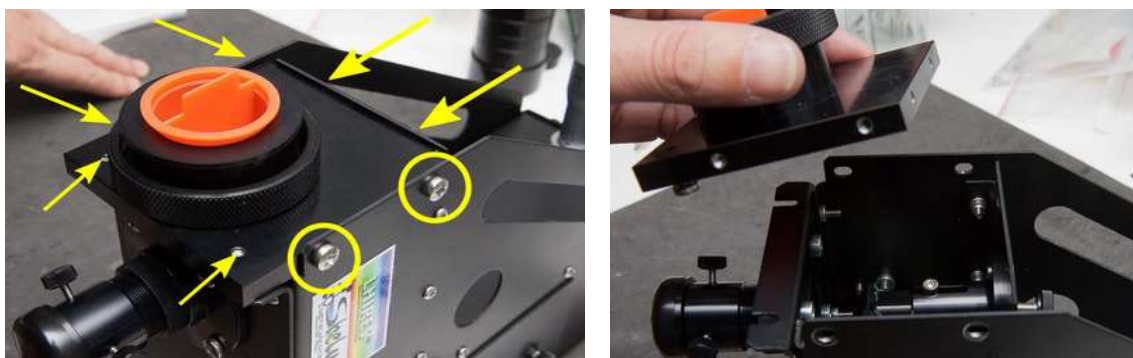
To be able to use your new module with your previous 12V power supply, in a manual mode, a special adapter is provided with the following schematics :

6.2 Replacing a light bulb

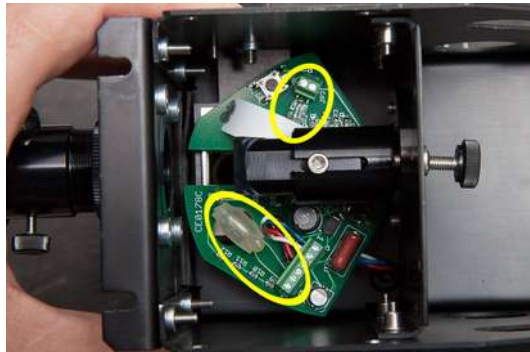
If you need to replace one of the calibration lamp (flat = tungsten lamp or wavelength calibration = neon or argon-neon lamp), here is the procedure :

Power the module (12V connector) and switch OFF both lights, the electronic board should be in neutral position. Remove the power supply plug then.

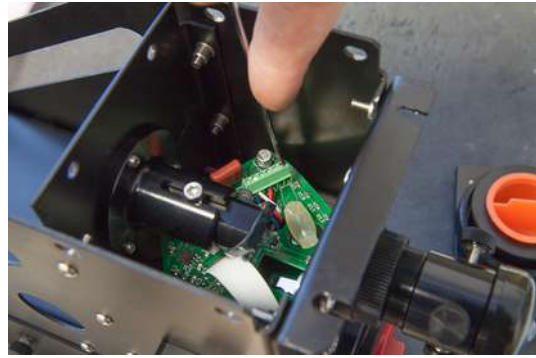
Remove the Lhires III telescope front plate (six screws to remove, two to keep loose).



From Lhires III entrance, you can see both lamps and their mounting.



To replace a lamp, slightly unscrew the lamp terminal block with a small screwdriver (do not press too much to avoid damaging the printed circuit board who is maintained from its central point only).



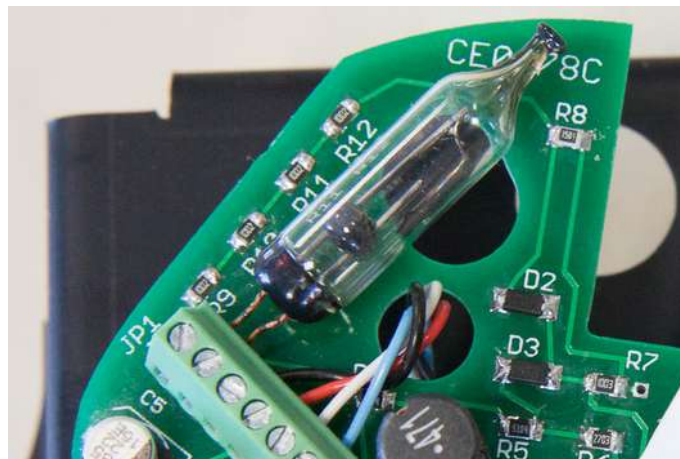
If possible use long nose pliers or tweezers to remove and replace the lamp.



When the new bulb is in place, tighten the board mounting block and test the lamp by powering the module before reassembling the Lhires III front plate.

Attention : do not touch the electronic board while in operation to avoid damaging it ; the wavelength calibration lamp is also powered with 300V but very low intensity (few mA) – so best is to avoid all contact.

Note: The Argon-Neon lamp is not symmetrical. To ensure the maximal lamp lifetime, it is recommended to mount the lamp in the below position (on this picture, we've removed the diffuser around the lamp, to better show the inside) :



The Neon lamp, however, is symmetrical – you don't have to take care of the orientation.

6.3 Finetuning the three circuit board positions

The printed circuit board which hold the lamp is moved by a servo-motor. The three positions (neutral, flat/dark and wavelength calibration) are stored in the microcontroller memory which drives the module. Those positions can be modified if required by following a special procedure.

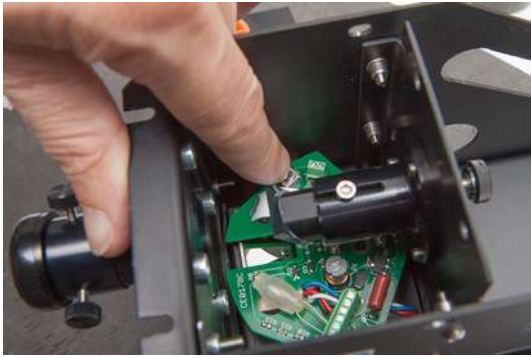
First step is to switch to « programming » mode. It would be easier – but not mandatory – to remove the Lhires III telescope front plate to do to (see previous section on how to replace light bulbs).



Start by powering the module, switching OFF both lamp to be in neutral positions then remove the power plug.



On the printed circuit assembly, there is a small push button. To switch into programming mode, press that button while you power ON the electronic (ie : plug in the 12V main power supply).



If the programming mode is active, both LEDs are permanently ON even with the switch OFF.

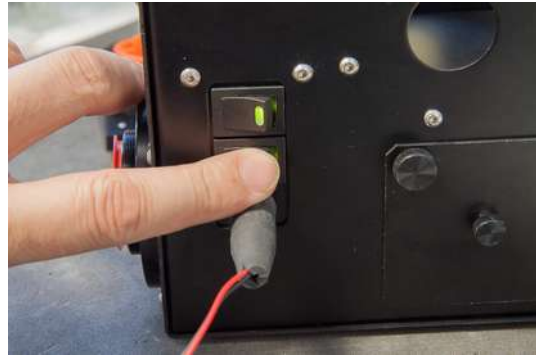
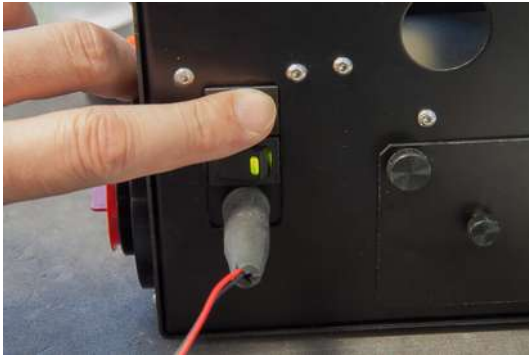


Attention : do not touch the electronic board while in operation to avoid damaging it ; the wavelength calibration lamp is also powered with 300V but very low intensity (few mA) – so best is to avoid all contact.

In this mode, pressing the push button for one second at least will move to the next position. Pressing this way three time should bring you back to neutral position.



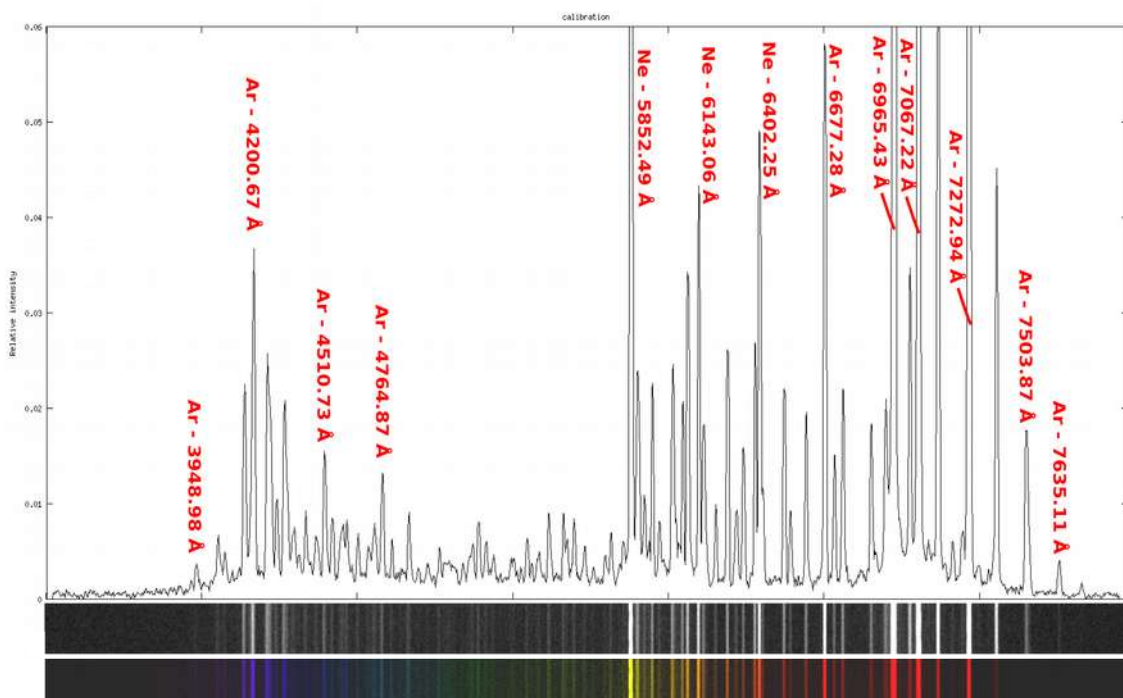
In each of those positions, you can use the switches (normally used to power ON/OFF the lamps) to move the circuit board one way or another by small steps.



When you are at the right position, just press one last time the push button ; it will permanently store that position in the controller memory.

You can come back to the standard by simply unplug the power cable, waiting a few seconds, and plug it back. You're now back to normal behavior.

6.4 Main wavelength calibration lines



End of document