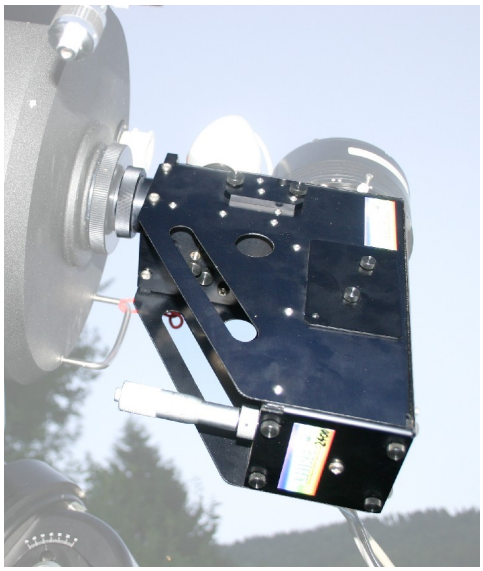


Assembling Procedure

Shelyak Instruments
Les Roussets
38420 Revel / France

Phone: +33.476.413.681
http://www.shelyak.com
Email: contact@shelyak.com

Ref. DC0002A
(December 2006)

Table of contents

1) Introduction to the assembling process

Assembling your Lhires III will take around 4 hours. This lists all the steps to assemble it correctly. If you have questions, do not hesitate to ask on the Spectro-L list (http://groups.yahoo.com/group/spectro-l/) where we will bring your support.

All the instructions required for the successful assembly of your Lhires III spectrograph can be found in the following pages. Although the various components are modular in nature and allow you easily to change the construction of the different sub-assemblies, the assembly sequence suggested below is the most logical.

Before we get to grips with the details, here are a few general considerations for you to be aware of:

- First of all, you should verify that you have received all the components for the spectrograph in the shipment. Compare the components in your delivery with the photos of the various components shown below, and confirm that you have the component.
- The kit also includes the principal hand tools that you will need, but you will also need the following materials:
  - A pair of scissors.
  - A Stanley knife or similar cutting knife.
  - A vice to insert the knurled knobs on to the BTR screws (a small hammer, if used with care, will also do the same job but you must at all costs avoid bending the screws). Some advice: put pieces of wood in the vice to protect screws and plastic part!
  - Some universal or neoprene adhesive (one drop for fixing the guiding doublet lens in its holder, and an other one to glue the micrometer end onto the micrometer).
  - Some Scotch tape for fixing the light diffuser (small piece of tracing paper) in front of the neon lamp.
- A few words about the screws. All the screws needed for the assembly of the spectrograph are included in the kit, including a few extra just in case. These are all metric M3 or M4 stainless steel screws. As a general rule, the external panels (the chassis) of Lhires III are attached using M3 x 10mm round-head screws. Whenever additional strength is required, M4 x 10mm round-head screws are employed. All remaining screws are for specific requirements, e.g. the M3 nylon types as locking screws, countersunk screws for the M42 holder, M4 x 25mm screws for adjusting the 45º webcam mirror, etc. Knurled head screws are employed whenever frequent adjustments are needed as, for example, with the grating mount, doublet lens refocusing, slit removal, webcam mirror focusing, etc. These are BTR type screws upon which knurled heads have been added for ease of turning.
- Some components are extremely fragile and require particular care and attention:
  - The diffraction grating. It goes without saying that the grating will be rendered totally useless if you place a greasy fingerprint on its surface! If you have come this far in amateur astronomical spectroscopy to be interested in building your own spectrograph, you should already know this!!
  - The optical components (achromatic doublets and return mirrors) are similarly fragile. Do NOT touch the optical surfaces and only handle them by the edges. Use gloves provided in the kit...
  - The slit is made of polished stainless steel. Avoid touching it with your fingers. If the faces of the slit have become stained or dirty in any way, you can clean it safely with a Q-tip, cotton-bud soaked in iso-propanol or some similar cleaner.
  - Some cautions:
    - Some metal parts are cut very sharp. Be very careful when assembling and using the

Lhires III spectrograph!

- Keep away all the parts from children as those are not toys for kids. For exemple, do not swallow them.
- The Lhires III spectrograph has been designed to do spectrography, especially behind a telescope. Any other use is not allowed.

Okay! We have finished with the warnings and general considerations.... now it's on to the details of construction!

2) Part List

BA / Adapters / Rings

BA0001
2'' adapter(50.8mm)

BA0002
C8LX Interface

BA0003
Ring C8LX

BA0004
Eyepiece holder

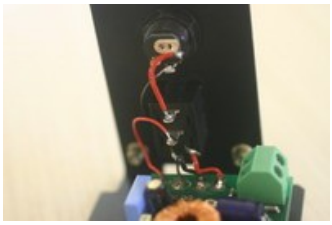
BA0005
ST7/8/10 adapter

BA0006
ST7/8/10 ring

BA0007
Standard Audine ring

CE / Electronic

Electronic



Detail of electronic

EL / Miscenalleous

EL0001
Micrometer

EL0002
Plastic feet

EL0003

EL0004
Neon switch

EL0005

EL0006

EL0007
Neon lamp

EL0008

EL0009

EL0010

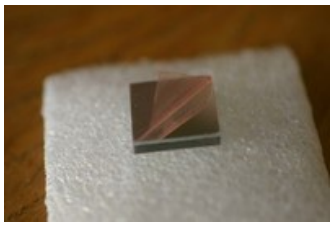
EL0011

OP / Optical parts

OP0001
Grating (2400 lines/mm)

OP0002
Main Doublet

OP0003
Guiding Doublet



OP0004
Mirror

OP0005
Mirror Slit (x2)

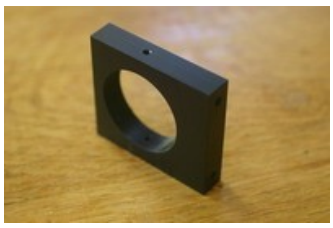
Assembled mirror Slit

PU / Machine parts

PU0001
M42 (SLR camera) plate

PU0002
Guiding camera holder

PU0003
Main plate



PU0004
Doublet holder

PU0005
Doublet case

PU0006
Doublet case lock ring

PU0007
Primary mirror base

PU0008
Primary mirror support

PU0009
Slit base

PU0010
Slit holder

PU0015
Micrometer holder

PU0016
micrometer cap

PU0017
Neon lamp axis

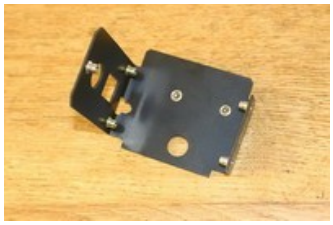
PU0018
Neon lamp holder

TO / Sheet metal parts

TO0004
Cover

TO0006
Door (x2)

TO0007
Door inside plate (x4)



TO0010
Neon circuit holder

TO0011
Guiding mirror support

TO0012
Guiding mirror base

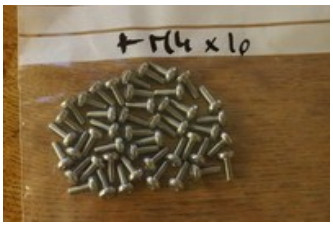
TO0013
L base

TO0014
Right plate

TO0015
Left plate

VI / Screws

VI0001
M3x10 hexa



VI0002
M4x10

VI0003

VI0004

VI0005 / VI0006

VI0008 / VI0009

VI0010

VI0013

VI0014

VI0018

VI0022

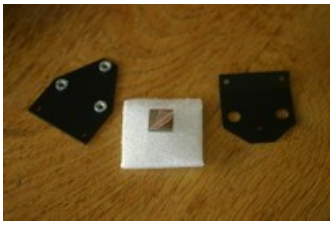
3) Assembling

First, use a large empty table to assemble your spectrograph, preferable in a quiet part of the house. Also, fix the plastic buttons on the M3 and M4 BTR screws.

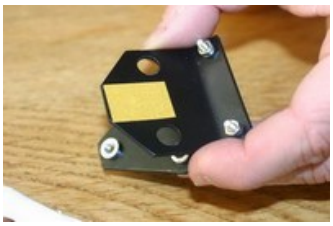
Assemble the Webcam mirror mount:

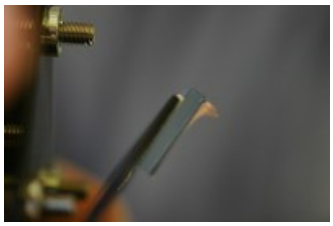
*Materials: Webcam mirror supports 1 and 2, square mirror, 2 M3*10 round-head screws, 2 M3 locking washers, 2 M3 nuts.*

- Attach the two mirror supports together with 2 M3 bolts.
- Attach the mirror onto its support with the double-sided tape, ensuring it extends over by 2mm (refer to photo).
- Avoid touching the reflective surface of the mirror with your fingers and remove the protecting film at the last minute (but do not forget it!).





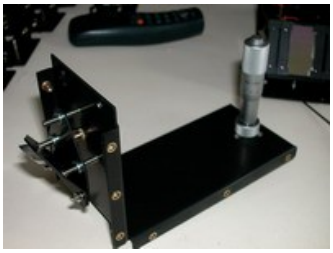





Mounting the mirror onto the spectrograph cover:

Materials: pre-assembled mirror on mount (see above), cover, 4 M4 BTR screws with plastic caps.

- Attach three "push" screws and one "pull" screw.
- The mirror support center screw should be located about 1.3 cm from the side of the cover. Support itself should be 1cm from the metal base (parallel to the base side).

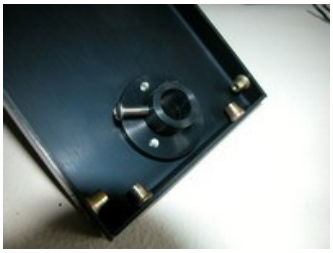
Attach the micrometer screw to its cover.

*Materials: cover, micrometer thread collar with locking screw, micrometer, micrometer end 1 M3*10 & 3 M3*6 screws.*

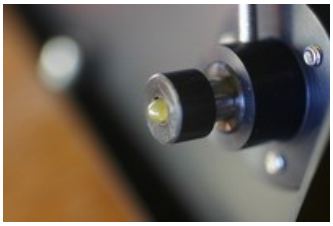
- Attach the micrometer collar onto the support with 3 M3 screws.
- Slide the micrometer through its collar and block it with the locking screw. The vernier scale

graduations should be visible and the micrometer bar pushed as far as it will go in the collar.

- The vernier scale should be turned towards the short side.
- Glue the tip of the micrometer



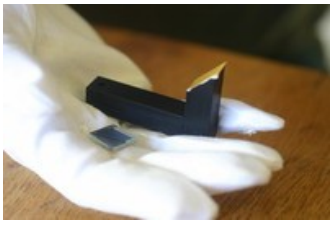
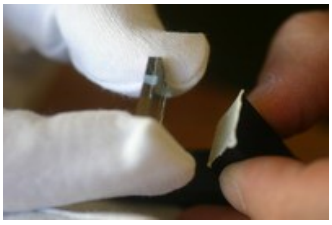


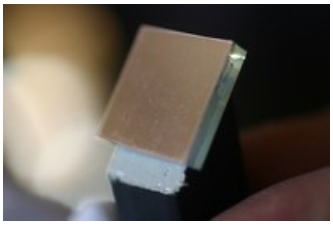
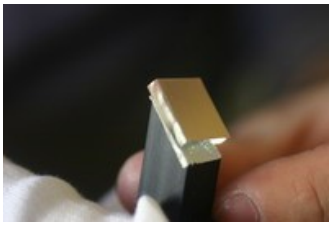
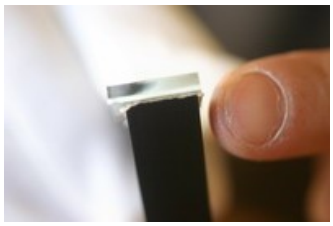
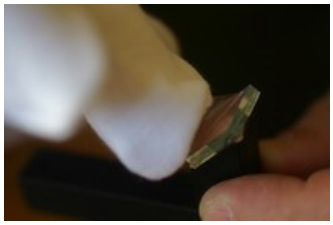




Mounting the main mirror:

Materials: Main mirror holder, squared mirror, 2 M4x 16 round-head screws, 2cm double-sided tape.

- Attach the main mirror with double-sided tape and flush with the base (use provided gloves!)
- Attach the whole assembly to the main spectrograph body with 2 M4 x 16 screws.

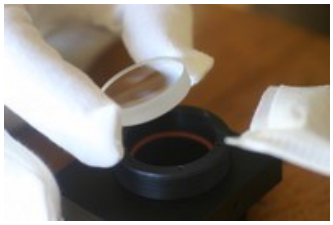

Assembly of the Collimator support:

Materials: Collimator lens tube, lens collar, two fibre O-rings 27x30mm, collimator doublet lens, locking ring, 6 M2 x 6 screws, nylon locking screw, 2 M4 x 10 screws.

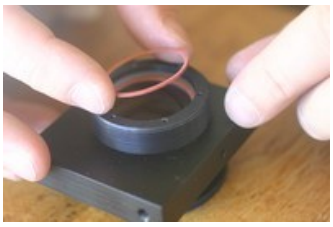
- Attach the lens tube in the plastic collar at about the mid point of its adjustment range.
- Add one of the fibre o-rings.
- Carefully place the lens in the tube.

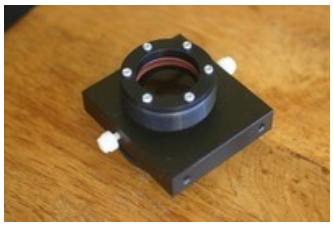
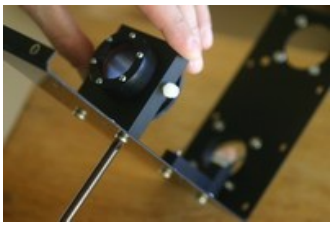
  NOTE: the lens goes one way to mnimize aberrations. Look at it and there should be one side which is flatter than the other; put that one so it's directed toward the 45° mirror. In other word: the flat side goes inside the collar and the round side is on top.
- Add the second o-ring.
- Add the locking ring.
- Carefully tighten down the locking ring using 6 M2 x 6 screws, ensuring even screw pressure around the ring.
- Add the 2 nylon locking screws onto the side of the collar.
- Mount the complete assembly onto the reference L side of the spectrograph with 2 M4 x 10 screws, ensuring that you have chosen the correct side.



Rounded side on top!


Stick the 4 rubber feet at the corners of the main body (L-Ref)

Attach the right hand side panel onto the main body (L-Ref)

Materials: L-Ref (already fitted with the main mirror assembly and the doublet), right hand side panel, 8 M3 screws.

Fix the top cover onto the right hand panel:

Materials: previous assembly, top cover (including the Webcam mirror and the micrometer screw assembly), 6 M3 x 10 screws.

Assembly of the telescope interface:

Materials: Previous assembly, telescope coupling flange (depending on your instrument, this is either the 2 inch (50.8mm) adapter, or the fixing collar + threaded ring), 6 M4 x 16 countersunk screws, 8 M4 x 10 round-head screws.

- Attach the adapter of your choice to the coupling flange using the 6 M4 x 16 countersunk screws.
- Attach the flange to the left side of the spectrograph body with 6 of the 8 M4 x 10 round head screws (the last two screws will be screwed in later).

2'' adapter

SCT adapter

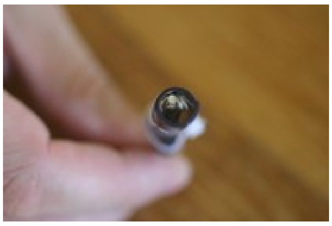
Assembly of the Neon lamp:

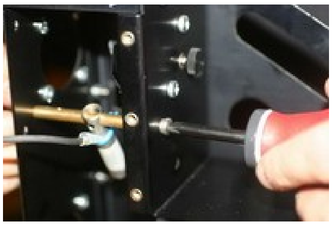
Materials: Neon lamp, coax cable, neon lamp holder, neon lamp axle pin lamp push-button, heat-shrink tubing, cable-tie.

- Pass the wire through the lamp holder and slide the lamp to the correct position in front of the hole in the holder. The heat shrink cable should exit the holder from a hole opposite of the window side.
- Attach the cable firmly with a cable-tie to prevent the lamp slipping in its holder.
- Tape a small piece of matt tracing paper to the lamp window to diffuse the light.
- Attach the above assembly to the spectrograph, in same time as the axis.
- Add one M4 x 10 screw + washer to inside of the spectrograph.
- Add two twisted o-rings to the axle pin from the outside of the spectrograph and attach the cap, tightening such that the lamp pin turns somewhat stiffly (see later when the body panels are to be closed).
- Insert one M3 x 10 screw to fix lamp holder along the rotation axis of the lamp.
- Pass the wire through the strain relief grommet.
- Plug the wires on the connector on the PCB (both ways work).
- Attach the Ne lamp switch support onto the spectrograph cover using 2 M3 x 10 screws.

  NOTE: 12V connector is provided in the kit. When assembling, note that Ground is on the outside of the connector. Circuit is protected is go wrong - so you do not risk anything!



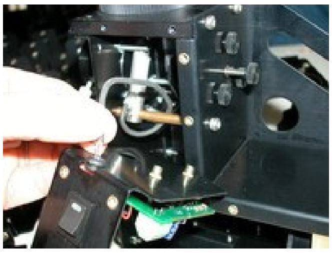
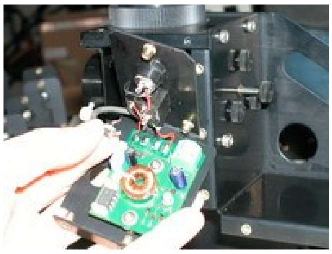


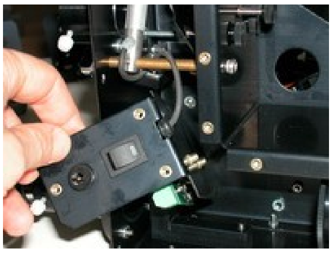









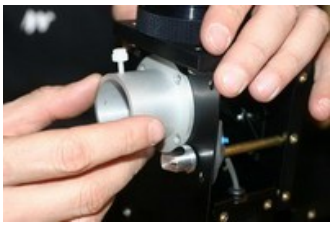






Assembly of the webcam holder

Materials: webcam mount, small lens, some universal glue

- Start putting the lens in its mount
- Put a smal glue point on the lens side
- Push the lens at maximum - use the gloves to prevent any mark
- Install the mount on the Lhires III chassis
- Put two screws M4x10 (one towards the neon axis, and the other at the opposite)
- Put two screws M4x25 (they will block the neon lamp on both sides)







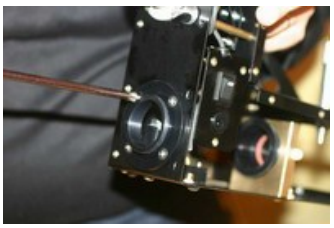


Assembly of the CCD camera holder

*Material: Camera mount, 4 screws M4*12, V-head*

- Tighten the holder on the Lhires III chassis

  NOTE: to mount a photographic camera, you will need a T-ring. First time you mount it, adjust the T-ring (there are usually small screws on the side) to rotate the camera and align it horizontally. You should have to do it only once normally.



Assembly, tuning of the slit

*Material: Slit support (1&2), 4 screws M3*10, 2 screws M4*12 with knobs, 2 half-slit, 4 screws M2*6*

- Put the knobs on the BTR screws
- Put 2 screws M3*10 in the support (they will act as guide)
- Assemble support 1 & 2 with screws M3*10
- Put the slit with 2 screws M2*6

- Refer to the slit tuning process (adjusting procedure,- can be done later)
- Put the slit holder on the chassis

Closing of the chassis and doors

Note: global geometry of the chassis can be modified when unassembled - tuning must be at least checked when you remove one of the main parts.

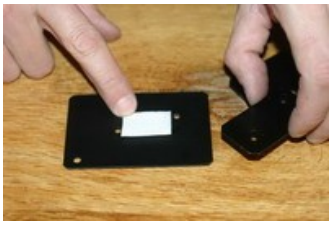
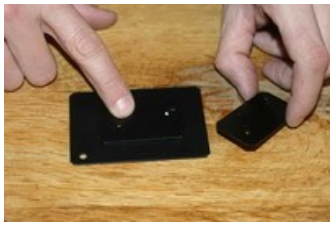
*Materials: 6 screws M4*10, 17 screws M3*10, 2 doors, and 4 door brackets*

- Put the left side on the chassis, and tighten all screws (2xM4*10, and M3*10)
- Put 2 door brackets on each door, with a gap between each. Tighten the parts together with screws M3*10 + knobs - you should a bold on screws before mounting, to put some gap between doors and screw head (this will help to catch the doors).
- Put the doors on the chassis

  TIP: look at the picture with the two doors to mount them correctly.

  TIP: use screw with button - it will be easier to manipulate them!



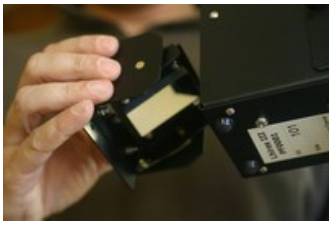




Final assembly

- Open the micrometer to the max (around 25mm)
- Ensure all base screws are a little bit loose
- Slide the grating mount, and tighten it with 4 screws M3 (with knob)
- Tighten all base screws (after this, you should be able to remove and replace the grating holder without having to touch any of the base screws but the fours on the back of the holder).
- Add 4 screws M4*10 on the bottom face of the Lhires III (these locations are made to put a "future" additionnal part to attache the Lhires III - feel free to use them!)
- Mount the eyepiece holder (or a CCD older, depending on your program)
- At this stage, you should check that neon lamp can turn when you move the button. If the neon cannot stay in place, tighten the button when pushing on it.








Go now to the User Guide for instruction and help in how to use your spectrograph.