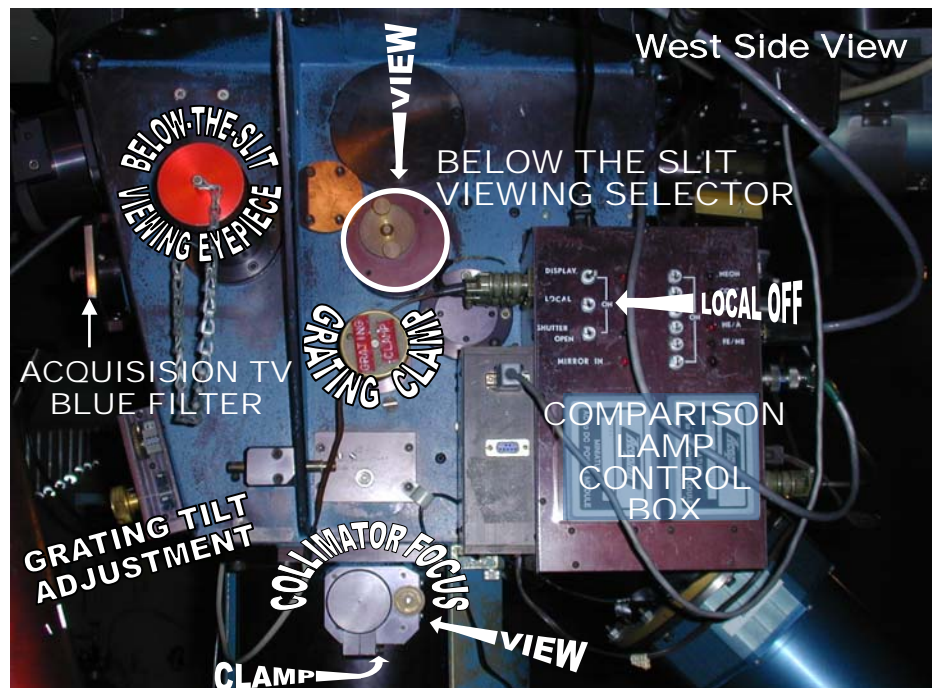
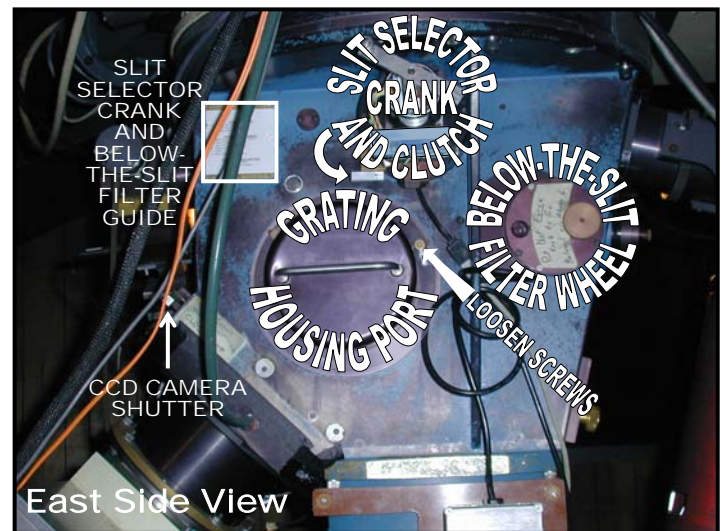




## Bok 90'' Boller & Chivens Spectrograph Start-up Checklist (Nstars)

- I. Following the light path (labels in CAPS)
  1. **Close CCD CAMERA SHUTTER!!**
  2. **ABOVE-THE-SLIT FILTER WHEELS**  
6 slots on N & S sides  
remove any filters
  3. **COMPARISON LAMP ASSEMBLY**  
remove any filters (except on FeNe)
  4. **SLIT SELECTOR: 2.5''**  
Don't forget the clutch!  
instructions posted to left
  5. **GRATING**  
loosen screws to remove cover  
600 l/mm, 6681 [red] for Nstars,  
2nd order most efficient at 3340 Å
  6. **BELOW-THE-SLIT FILTER bolt: Shot8612**  
instructions posted with slit selector (4)
  7. **GRATING TILT** (loosen clamp!)  
-- HeAr 4471 Å on CCD column 690  
-- set initially at 17.05  
-- check with HeAr spectrum
  8. **ACQUISITION TV BLUE FILTER:**  
"in"
  9. **BELOW-THE-SLIT VIEWING SELECTOR:**  
"thru"
  10. **COMPARISON LAMP CONTROL BOX:**  
"local" off
  11. **COLLIMATOR FOCUS** for testing  
initial at 6.0 or 8.0, up from 0.0
  12. **Open CCD CAMERA SHUTTER** for tests



## II. Setting up Bokobs (shaded sections on 1st night only)

1. Start BOKOBS, Reset? Yes  
login bokobs, password posted on white board.
2. Check disk space, clear if needed ( use !rm -fr \* in IRAF).
3. Make FITS images >set imtype="fits, noinherit"  
in login.cl file, uncomment "set imtype" line and change to fits, noinherit
4. Make data directory for observers + each night  
>mkdir /d1/bokobs/cyod/Nov26  
>cd /d1/bokobs/cyod/Nov26 **← In both Acquisition & Reduction windows!**
5. Edit parameter lists using printouts (in acquisition window):  
>epar displ  
>instrpars  
>detpars (use >ccdinfo to get info on the chip)  
>obspars (rootname & sequence change for test & observing)  
>telpars (telname changes for test & observing)
6. Test to see if system is bok is alive  
>test >>number = 1, type = zero  
no response ⇒ >ccdinf  
no response ⇒ reboot bokccd (icon on top left of screen)  
no response ⇒ hard reboot of bokccd (top right corner of bokccd rack)  
& CCD power supply (on telescope)  
no response ⇒ call Chris!

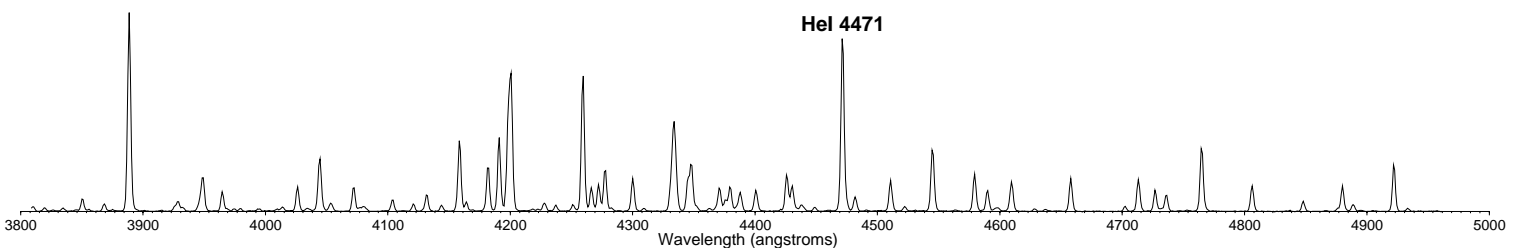
## III. Collimator focus (west side, view setting from lower right))

1. Check parameters  
>telpars (telname='`test')  
>obspars (rootname='`a', sequence=1)
2. Run a test image  
>test >>number = 1, type = zero
3. Observe HeAr lamp at different focuses from acquisition window  
>comps >>time = 15s  
>>comparison lamp = hear  
>>name = focusXX (e.g. 6, 8, 10 ...)
4. Run nmisc specfocus in reduction window  
> specfocus a\*.fits focus="6x2" (for starting on 6 & up by 2's)
5. Check focus plot, choose a little below the ideal focus to compensate for night cooling.
6. Observe HeAr lamp at chosen focus (> comps, use for grating tilt test next)

## IV. Grating tilt (west side)

1. Get HeAr line at 4471Å on column 690 (within 1 column)

Steward Observatory 90" HeAr Comparison Spectrum  
600 l/mm, 2nd Order



## V. Zeros

1. Check parameters  
`>obspars (rootname=`n", sequence=XXXX ... from observing program)`
2. Run zeros  
`>zeros >>number = 10`  
`>>name = zero`
3. Check for weirdness (1st is often weird)  
`>imstat a*`
4. Reboot bokccd if weirdness (inconsistent means) appears.

## VI. Quartz Flats

1. Run Quartz Flats  
`>comps >>number = 10`  
`>>time = 200s`  
`>>comparison lamp = quartz`  
`>>name = quartzflats`
2. Check gradient, weirdness, reboot bokccd if weird.  
`>implot a*`



## VII. Darks (best at end of 1st or beginning of 2nd night after camera has been working)

1. **Close the CCD camera shutter + Dome Lights OFF**
2. Run Darks  
`>darks >>number = 10` (... at least 7 if time is crunched)  
`>>time = 900s` (... longest exposure expected)

## VIII. Focus Telescope

1. **Open the CCD camera shutter.**
2. Check parameters  
`>telpars (telname=`bok")`
3. Get 7th magnitude star (RA=sidereal time, Dec=90-□) on slit  
`>test >>number = 1`  
`>>type = object`  
`>>time = 15 sec (10 for 6th magnitude)`  
  - put spectrum in middle of chip by moving source along slit ... mark`>implot test`  
  - use "c" to plot columns, check focus (X)
  - reduce focus by 50, bring up to 10 below start, test, come up by 5's, test for best.

## IX. Observing

1. **Open the CCD camera shutter.**
2. Check parameters (`>telpars (telname=`bok")`)
3. Play!  
`>observe >>type = object`  
`>>title = name`  
`>implot "c" shows clmns, "C" for #, ":l xx yy" displays lines`  

$$\text{snr} = \sqrt{[(\text{counts}@G\text{-band} - \text{bkgd}) \times (\# \text{ of lines}) \times (\text{gain})]}$$
`>comps >>time = 15`  
`>>lamp = hear`  
`>>title = hear`

**Close CCD Shuttter  
for Supper, Sunset,  
and maybe a snooze ...**