ISIS User Manual

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1) Rename files

- a) In the Bulk Rename Utility program select which files you would like to rename.
- b) In the 'Replace (3)' section, replace zeros and unneeded hyphens to the format 'starname-sequence#.fit'
- c) The renaming process is the same for flats and cal

| 2 DVD RW Drive (E) Audio CD + | | | | | | |
|---|-----------------|--|------------------|----------------------|--------------------------|--|
| < m | F 4 | | m | | • | |
| RegEx (1) R | Repl. (3) Repl. | Remove (5) Remove R | Add (7) - R | Auto Date (8) - R | Numbering (10) | |
| Match | Replace | irst n 🛛 🛨 Last n 🔍 🛨 | Prefix | Mode None 💌 | Mode None 💌 at 0 🕂 | |
| Replace | With | rom 0 ÷ to 0 ÷ | Insert | Type Creation (Cur 🕶 | Start 1 ÷ Incr. 1 ÷ | |
| Include Ext. | Match Case | Chars Words | at pos. 0 | Fmt DMY - | Pad 0 🕂 Sep. | |
| -File (2) R | Case (4) | Crop Before - | Suffix | Sep. Seg. | Break 0 🕂 🔽 Folder | |
| Name Keep 💌 | Same 💌 | Digits High Trim | Word Space | Custom | Type Base 10 (Decimal) 💌 | |
| | Excep. | D/S Accents Chars Sym. Lead Dots Non - | i word Space | Cent. Off. 0 | Roman Numerals None 💌 | |
| Move/Copy (6) | | R B | Append Folder Na | me (9) 🔽 R | Extension (11) | |
| None 💌 1 🕂 | None 🕶 1 🕂 | Sep. | Name None - Se | p. Levels 1 | Same 💌 | |
| Selections (12) | | | | New Location (13) | R Reset | |
| Filter * | Folders Hidden | | | Path | | |
| Match Case | Files Subfold | ders Path Len Min 🛛 🕂 | Max 0 🛨 | Copy not Move | Revert | |
| ** Working on multiple computers? Synchronize your files across computers with ViceVersa PRO. Click Here To Find Out More | | | | | | |
| 17 Objects (14 Selected) | Favourite | | | | 10 | |

2) Copy Masters into folder

- a) M_Bias_2x2-15C.fit
- b) M_Dark10s2x2-15C.fit
- c) M_Dark600s2x2-15C.fit
- d) Hot_Pix_Map.lst
- e) response_starname_mm-dd-yy
- f) 6532start.lst
- 3) Settings Tab
 - a) In the <u>Settings tab</u> and choose '...' below Working directory to choose the desired folder.

| SIS - V5.9.3 | | |
|---|----------------------------|--|
| Image 2. General 3. Calibration 4. Go 5. Profile | 6. Gnuplot Masters | Tools Misc Instruments Settings |
| Spectrograph model | Language | FITS extension |
| LHIRES III V | ○ French | nglish |
| Working directory | Interpolator type | Addition mode for individual profiles |
| | ⊖ Bilinear | pline O Standard |
| Spectral database directory | Spectral calibration image | Assistant |
| c:\users\molly.vitalesullivan\desktop\isis_database_v7 | Standard Late | eral 🗹 Check file names consistency |
| GNUPLOT software directory | Spect | ral domain for profile scaling |
| c:\users\molly.vitalesullivan\desktop\gnuplot | Lam | bda 1 : 6620 A Lambda 2 : 6625 A |
| Observatory | | Erase automaticaly intermediate files |
| Longitude : -105.53153 deg. Latitude : 32.90411 deg. Atitude : 2202 | m | |
| (positive longitude at the east) | | Name of output spectral files |
| Display Display Rainbow Lambda 1: 3500 A Lambda 2: 8500 A | Coef. cosmic rays filter | Add your observer name to file name |
| | | ISIS Version 5.9.3c (C) 2018 Christian |

- a) In the *Masters tab,* click the box next to image number to double check that ISIS is reading the correct number of flats.
- b) Click 'Go' and the M_Flat.fit file will be added to the folder

| ISIS - V5.9.3 | | – 🗆 X |
|---|--|---|
| 1. Image 2. General 3. Calibration 4. Go | 5. Profile 6. Gnuplot Masters | Tools Misc Instruments Settings |
| Compute an offset image Generic name : Image number : Result : offset Go Compute a dark image Generic name : Offset image : offset Dark coef : I Image number : Image number : I Image number : I Image number : Image | Compute a cosmetic file Dark image : Threshold : 500 Cosmetic file : Go Compute a flat-field image Generic name : Dark image : Offset image : Offset image : Offset image : Offset image : | Compute an uniform image (synthetic flat-field) Name : Constant : Go Compute a mean image Generic name : Image number : Result : Go |
| Result : Go | Coordinate Ymax of validity zone : 0 Coordinate Ymin of validity zone : 0 Image number : 1 Result : Go | Compute a PRNU map Generic name : Dark image : Offset image : Image number : Result : Go |

5) Image Tab

- a) Choose the correct folder and select the first image.
- b) Go through all the images to make sure they are all appearing correctly. Remove any outcasts.
- c) Can adjust 'Hi:' for better quality of the spectra.
- d) Click Next to go to general.

| 1. Image | 2. General | 3. Calibration | 4. Go | 5. Profile | 6. Gnuplot | Masters | Tools | Misc | Instruments | Settings |
|--------------|------------|----------------|-------|------------|------------|---------|-------|------|-------------|-----------|
| Image name : | | | | Display | • | • | Next | | | Save |
| | | | | | | | | | | Header |
| | | | | | | | | | | Graticule |
| | | | | | | | | | | FWHM |
| | | | | | | | | | | Statistic |
| | | | | | | | | | | Tilt |
| | | | | | | | | | | Slant |
| | | | | | | | | | | Line PSF |
| | | | | | | | | | | X: Y: |
| | | | | | | | | | | 1: |
| | | | | | | | | | | Dom |
| | | | | | | | | | | 327 |

6) General Tab

- a) Make sure the Root name and the Object name match the star name
- b) Insert cal_1 file into calibration box
- c) In the "Files name prefix and suffix" section make sure to put a hyphen in the object suffix box
- d) In the "Spectral Calibration" box is where you choose which wavelengths you're spectra will include. The predefined mode: 2400 grooves/mm (3 lines) will start you at the hydrogen alpha

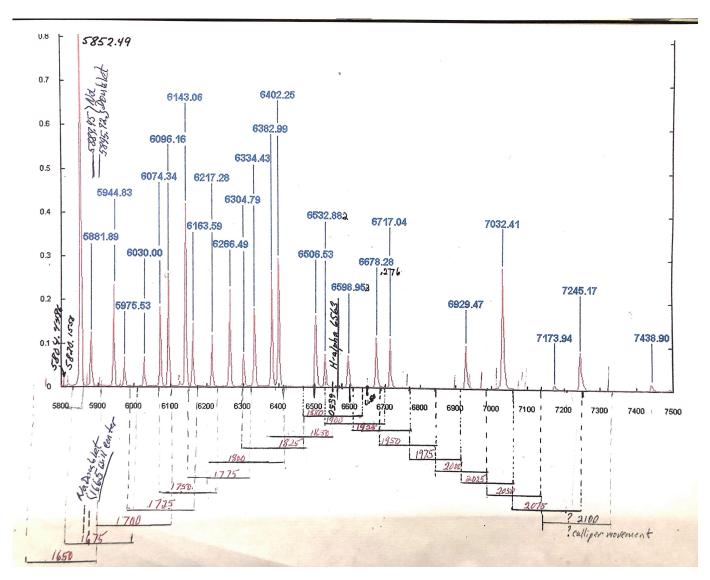
- e) If you want to do custom mode, you will have to make a Dispersion number .lst file in notepad and insert the name of the file (omit .lst) in the box beside
 - i) The dispersion number conveys how wavelength changes as you go across pixels. You have to manually change the part of spectra you want to look at (between which wavelengths you collect), take the spectra, and then tell ISIS what wavelengths. Make sure to type the starting wavelength in the X Coordinate of Line at Wavelength box in *Calibration* Tab. To do this, you gotta make a notepad document with the following
 - ii) Subtract the third (highest) wavelength from the first (lowest) wavelength
 - iii) Go to calibration tab as display the calibration photo from the spectra
 - iv) Put cursor over the middle of the first line on the red line to find the x coordinate of the middle pixel
 - v) Put cursor over the middle of the third line on the red line to find the x coordinate of the middle pixel
 - vi) Subtract the third pixel coordinate from the first pixel coordinate
 - vii) Divide the change in wavelength by the change in pixels. This will be your dispersion number

Change in Wavelength/ Change in Pixels

- viii) Open notepad and put the following
 - (1) 2 (This number is the polynomial. Since we have 3 wavelengths, polynomial is 2)
 - (2) Dispersion number
 - (3) List the three different wave length numbers
- ix) Save as a .lst file (Just type name and then .lst)

| <u> </u> | Start65 | 32.lst - No | tepad | _ | Х | |
|----------|---------|-------------|-------|------|---|----------|
| File | Edit | Format | View | Help | | |
| 2 | | | | | | \wedge |
| 0.11 | 164 | | | | | |
| 6532 | 2.882 | | | | | |
| 6598 | 3.953 | | | | | |
| 6678 | 3.276 | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | ~ |
| < | | | | | > | .d |

| ISIS - V5.9.3 | | – 🗆 X |
|---|------------------------------|---|
| 1. Image 2. General 3. Calibration 4 | . Go 5. Profile 6. Gnuplot | Masters Tools Misc Instruments Settings |
| Root name : HD37974 Object | : HD37974- Auto | Next |
| Images to process | | Spectral calibration |
| Generic name : HD37974- | Number : | Predefined mode 2400 grooves/mm (3 lines) |
| Calibration : cal-1 | Spectral calibration | O Predefined dispersion equation (see "Dispersion" tool in "Profile" tab) |
| Offset : offset Dark : | dark | O File mode : (type xxx.lst) |
| Flat : flat | | Output |
| General parameters | | Instrument : C14 LhiresIII_2400 Atik_460EX_bin2x2 V |
| Pixel size (microns) : 5.4 | Fixed Y value for sequence | Observatory : JD Mayhill-New Mexico |
| Cosmetic file : cosme | Sky not removed | Observer : Joe Daglen |
| Instr. responsivity : | Wavelength registration | Hourshift : 0 R : |
| Wavelength shift (A) : 0 | Cosmic rays filter | Files name prefix and suffix Object suffix : |
| Heliocentric radial velocity correction | Optimal binning | |
| Auto atmosphere AOD : 0.13 | Rejection coef. : 50 | Calibration suffix : |
| Atmo. transmission : | Automatic air mass computing | |



7) Calibration Tab

a) Click on the center of the spectra to set the vertical coordinate

- b) Draw a box around the center lines above and below the spectra, then click Tilt
- c) Next to Calibration Image, click Display. The calibration lines should appear
- d) Scroll to the leftmost calibration line and slide the Seuil haut to the left enough to decrease the width of the calibration line.
- e) Click on the center of the calibration line to set the X coordinate at wavelength ____ to A: ____ (pixels)
- f) Draw a box around the calibration line just inside the outer Binning Zone Adjustment lines, then click Slant
- g) Click Next

8) Go Tab

- a) Click Go!
- b) Display Profile. This will go to the **Profile Tab** and display the plot.
- c) Title the plot- with the standard naming conventions

9) Gnuplot Tab

- a) Rename the plot to 'starname, date and time' or something to this idea.
- b) Click Plot and DONE! There should be a .png image in the folder now

| ISIS - V5.9.3 | | - 🗆 X |
|------------------------------------|------------------|--|
| 1. Image 2. General 3. Calibration | 4. Go 5. Profile | 6. Gnuplot Masters Tools Misc Instruments Settings |
| Plot | | Double plot |
| Title : | | File name #1 : |
| Lambda1: 0 Lambda 2: 0 | Automatic title | File name #2 : |
| Y1: 0 Y2: 0 | Automatic scale | Title : |
| | Plot | Lambda 1: 0 Lambda 2: 0 |
| 1 | | Y1: 0 Y2: 0 |
| Free plot | | Output image name (png) : |
| Name of file to plot : | | |
| Title : | | Plot |
| Lambda 1 : 0 Lambda 2 : 0 | | Plot size |
| Y1: 0 Y2: 0 | | Size X : 700 Size Y : 550 |
| Y1: 0 Y2: 0 | Double Y-axis | |
| Output image name (png file) : | | |
| | Plot | |
| | | |
| | | |

i) YOU DID IT Cheers!

10) Converting to Radial Velocity

- a) Under the *Profile tab* click on FWHM (full-width half max)
- b) If it is an absorption peak, choose absorption
- c) Double click on both sides of the peak at the same height
- d) Record the Position value and check the signal to noise ratio SNR (3)
- e) Under the *Misc tab* and under the Wavelength to Velocity section type profile name into Input Spectrum box, input starting wavelength you got from FWHM, and then title your output spectrum

| ISIS - V5.9.3 | - 🗆 X |
|--|--|
| 1. Image 2. General 3. Calibration 4. Go 5. Profile Heliocentric velocity Radial velocity Atmosphere Extinction Atmosphere | 6. Gnuplot Masters Tools Misc Instruments Settings Animation DAT -> BeSS MaxImDL -> ISIS Detector linearity Detector noise |
| Compute heliocentric velocity | Applied a spectral shift |
| Day : 1 Month : 1 Year : 2000 | Input spectrum : |
| Object name : Simbad | Shift value (km/s) : 0 |
| DA: 0 H 0 M 0 S | Output spectrum : Go |
| DEC: 0 * 0 * 0 " Go | Wavelength to Velocity conversion |
| | Input spectrum : _HD_50658_20190128_301_JoeDaglen |
| ^ | Lambda 0 : [6678.551] A Velocity step : [0.1] km/s [Inversion |
| | Output spectrum : Radial velocity_HD50658-He1 (DAT file) |
| | Go |
| | Precession |
| | RA: 0 H 0 M 0 S Epoch: 2000.0 |
| × | DEC: 0 * 0 . 0 " Go |

f) Turn this .dat file into .fit file by going to the <u>*Tools Tab*</u> under the Spectra 3 subtab in the convert file format of a spectra sequence and convert it. Put name in input file and the name you want in the output file

| ISIS - V5.9.3 | | | - 🗆 X |
|---|---------------|--|--------------------------|
| 1. Image 2. General 3. Calibration 4. Go 5. Pro Images processing 1 Images processing 2 Images processing 3 SLR | | Masters Tools Misc In ectra 1 Spectra 2 Spectra 3 | Settings Command line |
| Convert file format of a spectra sequence | | Spectrum resampling | |
| Generic name of input sequence : Radial velocity_HD50658-He1 | DAT -> FITS | Input name : | ● FITS ○ DAT |
| Spectra number : 0 | ○ FITS -> DAT | Output name : | Samp. (A/p) : 0.5 |
| Generic name of output sequence : Radial velocity_HD50658-He1fit | Go | Sinc Sinc | Go |
| Rename a spectra sequence | | Mirroring a spectrum | |
| Generic name of input sequence : | | Input name : | |
| Spectra number : 0 First index : 1 | | Output name : | |
| Generic name of output sequence : | Go | Pivot wavelength : 0 | Go |
| | | Flux density conversion (erg/cm2/s/A) | |
| | 6.8.0 | Input name : | Point at 5556 A |
| | | Output name : | O Bessel V band |
| | | V-magnitude : 0 | Go |
| | | | |
| | | | |

- g) You can display this new .fit file on profile. The radial velocity is now in place of the wavelength at the bottom of the screen.
- h) Figure out how to label the x-axis with the radial velocity (instead of Angstroms)