Copy of HIRES Setup Instructions to be sent to Keck Support Astronomers (8 Feb 2018):

Setting Up HIRES

- Check WEB-based Status of HIRES before starting. When HIRES is released, you may begin.
    - http://www2.keck.hawaii.edu/realpublic/inst/siastng/release/web/Sias/siasEh.php?host=mysqlserver&table=datebook
- From tan background, drag & click on HIRES CONTROL MENU
    - Drag over to: START all HIRES GUIs w/ hexpocon
    - Answer questions:
        - "Do you wan to continue running the setup script?" type y and return
        - Enter observer names
    - Confirm data directory (/s/sdata125/hires1/20??monDD/)
        - Use the current UT date. (typically one day later than local calendar date), hit enter.
            - If we have 2nd half ONLY, the append "_B" to the data directory.
        - Set starting observation number at 1 on first night of run.
        - Now appearing on the 3 screens:
            - 1) HIRES dashboard,Exposure meter DashBoard, terminal
            - 2) XHIRES GUI, dewar level window
            - 3) SAO image: ds9
- Check dewar level. In a terminal type: ln2
    - If no terminal is present, right click on tan background and goto: Keck Menu > Xterms > Xterm (needs corrected)
    - The dewar level is also visible when using "START all HIRES GUIs" in the window with the XHIRES GUI.
    - Top off dewar (if level is below 70%) by: right-clicking on tan background,
        - drag to "HIRES Control Menu" and "Initiate HIRES Dewar Fill"
        - dewar evaporation rate is 5% per hour and auto-refills at 10%. Always try avoid an autorefill.
        - If the dewar is filled after 5pm Pacfic Time, then it does not need refilled near sunset.
- START THE IODINE CELL
    - Select from desktop pulldown: "HIRES control menu > Iodine cell menu > Start Iodine Cell"
    - Cell takes 45 minutes to warm up fully. A warm cell reads:
        - tempiod1 | 65 degrees
        - tempiod2 | 50 degrees (+/- 0.1 degree)

- Open the Mirror Covers
    - From XHIRES GUI > click ETC > Click OPEN RED
- **First** Night of run: Set up data directories.
    - On HIRES dashboard, click on yellow "Start Here" button.
    - Click on "retrieve" to install directory for raw data and frame number.
    - Update "Filename root" with current run number. (j2??)
        - If second (or later) night, round file number up to next hundred
    - Click on "Commit" to set values.
    - At the command line, create all of the directories needed for the **entire** run.
        - for example: /s/sdata125/hires1/2016nov15/ UT Date
        - If second half only, append "_B" to the directory name for that UT date.
    - Double-click to the right of "FULL FRAME" button on HIRES DashBoard to view CCD control panel.
        - Make sure Binning is set to 3x1 by clicking on binning button : "x3y1"
    - Double check all values in logsheet header are correct.
        - (i.e., copy most recent logsheet file, update to new name (e.g. j239.logsheet1))
- **Second** night of run or later,
    - In HIRES Dashboard, change the "Data directory" by clicking on "User Config"/"Start Here."
        - Update Data Directory with UT date of observation
        - Press 'Commit'
    - Increment the frame number to the next even hundred.
    - Update Observer names
    - Double check all values in logsheet header are correct.

Cut to the Chase Check list

- Once the appropriate GUIs are up and running, step through:
    - All commands must be run in lehoula window.
- check dewar level: ln2
- top off dewar (if necessary):

        - click on tan background, drag to HIRES control, drag to "Initiate HIRES Dewar Fill"
- XHIRES GUI:
    - From 'etc' button on xhires upper-left: open-red
    - Slit should read 14.08" (m slitname = opened)
    - Filter1 = clear (m fil1name = clear; using gui okay) (Formerly KV370)
    - Filter2 = clear (m fil2name = clear; using gui okay)
    - Collimator = red (This should always be set by SA)

- In a terminal:
    - Set Collimator focus: m cofraw = +70000 ; Use 's cofraw' to show value
    - Set Camera focus: m cafraw = 0 ; Use 's cafraw to show value'
    - Update Echelle and Cross disperser angles with "A" button
- Next to each element on XHIRES GUI. Use values from a recent logsheet.
    - Set Echelle
    - Set Cross disperser
        - Avoid single movements > 0.5 to help prevent oscillations. Move in multiple steps if needed.
        - If no response, in lehoula: stop_cd_drift
        - If oscillating, from background: HIRES control menu > Stop Cross-disperser Oscillation
- TV filter: BG38 + ND0.01 (BG38 is important, ND up to OA)
- On HIRES Dashboard:
    - Double-Click on brown "CCD" rectangle, right of "FULL FRAME"
    - CCD Binning: Enter in the left box: X = 3 , Y = 1 or click on "Binning" and pull down to "X3Y1".
    - No Need to set any other params in CCD window.
    - Check/Set OUTDIR: directory for raw data
    - Check/Set OUTFILE: prefix of filenames, i.e. j160
    - Check CCD readout mode:
        - Gain = "low" (default)
        - Speed = "fast"
- Check that iodine cell is on and temperature window appears.
    - If trouble, try: setenv DISPLAY lumahai:0.0
    - xshow -s hires tempiod1 tempiod2 &
    - Set ObsType name field on brown CCD rectangle as "Object."

Logsheets

- Copy a recent logsheet to a new one, i.e.,
    - cp j200.logsheet1 j201.logsheet1
    - Update Observers,run number(first night of run)
    - Update UT date(eg 15 May 2011) (NOT 14/15 May 2011)
    - Periodically note the seeing with column cut: FWHM: 0".38/binned
        - This is a check of the seeing measured by eye.

MID-TIME DETERMINATION

- Login to a Keck machine (e.g., on your laptop – instructions above)
- To determine the weighted midpoints, and print an nice line for the logsheet run mtfits.pro
    - cd ~gmarcy/focus (on keck computer)
    - In IDL,
        - IDL> mtfits,inpdir='/s/sdata125/hires1/YYYYmonDD/','j420023',n=5
    - Prints logsheet line for j420023.fits and subsequent four exposures.
    - Copy output of MTFITS into logsheet.
    - Put any flux-weighted midpoint error messages in comment field of logsheet entry for that observation.
    - If there are issues running mtfits.pro on the Keck computers, it can also be run from /mir3/focus/ if the raw data is present on cadence.

Focus

Focus using Thorium Lines

- Turn OFF Exposure meter
- Lamp : Th-Ar #2
- Lamp Filter: NG3 filter
- In terminal window:
    - m deckname = D5 (in lehoula window)
- Iodine : Out
- ObsType = Object
- Texp : 10 sec (in brown "CCD" window, enter exposure time. Click "UpdateCCD")
- Click "EXPOSE"
    - **Perform focus in IDL.**
        - cd to focus directory
        - To specify a file for focus:
            - **IDL> foc,inpfile='jnnnxxxx.fits',/mark,/plt**
        - If necessary, compare lines to list included at the end of this document.
        - Check instructions from focus program and move echelle and cross-disperser as needed.
        - If focus program crashes, you may need to move echelle or cross disperser manually.
        - If note regarding 'Counts in lines too low' appears. Re-position lines manually.

Manual Grating/Echelle Move Manually

- Grating Move:
    - Horizontal: +0.001 deg of echelle rot moves lines left by 1 column
    - Vertical: +0.002 deg of X-disp rot moves lines down by 1 row
    - + As a last resort change cafraw or cofraw on command line to focus
        - (using m cafraw= and m cofraw=). Try cafraw first; steps of ~10,000 are needed in cafraw to make any appreciable difference in focus.
    - Record nominal FWHM, echelle position, and X-disperser values in the logsheet.

Calibrations

- THORIUM Exposures w/ B5
    - Turn OFF Exposure meter
    - Lamp : Th-Ar #2
    - Lamp Filter: ng3
    - m deckname = B5 (0.85 x 3.5 arcsec, ==> 4.0 pixel projected slit)
        - WARNING: use m deckname=B5, NOT the HIRES GUI.
    - Iodine : Out
    - Exposure : 1 sec (take 1 or 2 at begin and end of night)
- THORIUM Exposure w/ B1
    - Turn OFF Exposure meter
    - Lamp : Th-Ar #2
    - Lamp Filter: ng3
    - m deckname = B1 (0.57 x 3.5 arcsec, ==> 3.0 pixel projected slit)
    - WARNING: use m deckname=B1, NOT the HIRES GUI.
    - Iodine : Out
    - Exposure : 2 sec (take 1 or 2 at begin and end of night)
- Iodine Cell Calibrations w/ B1
    - Make sure cell is fully warmed up (see p.1) before taking these.
    - Turn OFF Exposure meter.
    - Lamp : Quartz2
    - Lamp Filter: ng3
    - Aperture : B1 (0.85 x 3.5 arcsec, ==> 4.0 pixel projected slit)
    - WARNING: use m deckname=B1, NOT the HIRES GUI.
    - Iodine : In
    - Exposure : 3 secs
        - *check saturation*: < 20,000 counts on middle chip?
        - *Check I2 line depth*. In center of chip, it should be ~30%
    - column cut with DS9: Region > more... > proj
- Iodine Cell Calibrations B5
    - Make sure cell is fully warmed up before taking these.
    - Turn OFF Exposure meter.
    - Lamp : Quartz2

- Lamp Filter: ng3
- Aperture : B5 (0.85 x 3.5 arcsec, ==> 4.0 pixel projected slit)
    - WARNING: use m deckname=B5, NOT the HIRES GUI.
- Iodine : In
- Exposure : 2 secs
    - *Check saturation:* < 20,000 counts on middle chip?
    - *Check I2 line depth.* In center of chip, it should be ~30%
- column cut with DS9: Region > more... > proj

Wide Flat-Fields

- Turn OFF Exposure meter
- Lamp : Quartz2
- Lamp Filter: ng3
- m deckname = C1 (0.85 x 7.0 arcsec, ==> 4.0 pixel projected slit)
    - WARNING: use m deckname=C1, NOT the HIRES GUI.
- Iodine : Out
- Exposure : 1 sec (check saturation: middle chip should have 10,000 < counts < 20,000)
- Take 50 exposures at the beginning of the night
    - Check one test exp for saturation (<20k counts), then take multiple exposures with command:
    - exp_acq 49 ; m lampname=none ; m deckname=C2
        - Concatenates commands to turn off lamp after flats finish.
- Top off LN dewar if necessary.

Observations of Stars

- Iodine : IN (check I2 temp: 50C)

- ~30 min before sunset:
    - top off LN dewar if necessary (definitely refill if level is < 100.0... drops ~5% per hour)

- Just before observing on screen 4(right-most, left–most at CIT):
    - From tan background click and select K1 Guider Eavesdropping > Start Observer UI
        - type y, enter
    - From tan background click and select K1 Telescope Status Menu > FACSUM
    - From tan background click and select K1 Telescope Status Menu > XMET

- Start exposure meter.
    - Click on the upper left button "System Start" on exposure meter.
    - Click on "Arm" in upper left of right panel to start target monitoring.
    - Default exposure level is 250000 equivalent to SNR ~200

- Set max exposure to 500s (in HIRES Dashboard CCD ExpTime)
- Expected Exposure time:: At V=8, S/N=300 in 300 seconds
- Remember to open HIRES hatch
- Check that
- Check with OA that "slit guiding algorithm" is being used.
- Add a "fiducial mark" at the position of the star by right clicking the magic guider snapshot at the desired location
- Double check:
    - that Iodine temperature is 50/65C, and iodine is running
    - vertical angle mode is on and set to 0.
    - Filter #1 is "clear"
    - Filter #2 is "clear"
    - TV filters are "bg38" and "nd_0.01"
- Iodine : IN

- In Twilight:

        - m deckname = C2 (0.85 x 14.0 arcsec)
        - If seeing is > 2.0", then begin observing only 10 minutes before 12deg twilight and use B5.
        - Likewise if seeing > 2.0" at the end of the night, use B5 in twilight and end 10 minutes after 12deg
        - WARNING: use command line, NOT HIRES GUI

- Non-twilight:
    - m deckname = B5 (0.85 x 3.5 arcsec, ==> 4.0 pixel projected slit)
        - WARNING: use command line, NOT HIRES GUI
- Poor seeing > 2 arcsec
    - Stick to V < 10 stars (throughput)
    - Use B5 decker. Sky subtraction does not work well when stellar PSF fills the slit (seeing > 2.5").
- Telescope wrap limits
    - From the south wrap, moving through the west, the north limit is an azimuth of 325 degrees.
    - From the north wrap, moving through the west, the south limit is an azimuth of 235 degrees.

END of NIGHT Procedure

- Turn off exposure meter.
- Close the hatch
- Take B1/B5 iodine exposures.
- Take B1/B5 thorium exposures.
- Turn off lamps, but leave everything else open, if not last night of run.

- Logsheet:
    - Complete logsheet.
    - Make sure there are no missing or duplicate lines

Shutdown Sequence

- On last night of a run run the following:
    - From background pulldown, HIRES control menu > End of Night Shutdown

Odds and Ends

Logsheet Etiquette

- Change calibration names to 'focus','thar','iodine','wideflat'
- Try to use only these names for calibrations, unless running specific tests.
- Every calibration(except wideflat) needs its own line in the logsheet.

Tips, Tricks, & Troubleshooting

- Cross-disperser Oscillations:
- If cross-disperser values are oscillating, reset by right-clicking blue background and going to HIRES Control Menu > Stop Cross-disperser Oscillation.
- Avoid moving cross-disperser by increments > 0.5 to help prevent oscillations. Move in multiple steps if needed.
- The GUIs.
    - HIRES : DashBoard
        - Controls exposure lengths & file writeouts
- Appears with the "Start all HIRES GUIs" initialization sequence.
- Check dewar levels: ln2.
- Display cofraw, cafraw, lampname, deckname, etc.: s cofraw cafraw
- Change cofraw, cafraw, lampname, deckname, etc.: m lampname =
- Useful link with extra HIRES info:
    - http://www2.keck.hawaii.edu/inst/hires/startup.html

Useful directories:

- snaps images are 43" x 57" and have 0.15"/pix for 1x1 binning.
    - 1x1 binning: snap size is:[384, 288] pixels
    - 2x2 binning: snap size is [192, 144] pixels

    - 3x3 binning: snap size is [128,96] pixels
    - This is for OLD guider images. Needs updated.
- Snaps are transferred nightly to /mir3/snap/fits_todo/YYYYMMDD/.

ThAr Focus Linelist

Output from foc.pro on 9 Jan 2007, for D5, ThAr1, ng3, 4-sec exposure:

```
| Column Row Peak Cts FWHM FW@10% ASYM Delta Col |

| 1909 1372 6348 2.22 4.46 -0.15 4.53 |
| 590 1309 519 -Inf 14.00******************** |
| 2790 1334 1603 2.02 3.98 -0.03 -1.87 |
| 3095 1338 828 2.16 4.32 -0.11 -2.56 |
| 3323 1341 8001 2.29 4.32 -0.13 -2.60 |
| 3705 1347 4007 2.69 5.04 -0.32 -2.99 |
| 478 1260 273 2.75 8.22 -3.23 2.65 |
| 2148 1279 58415 2.58 4.28 0.00 -0.23 |
| 766 1218 17110 2.64 4.92 0.30 0.89 |
| 2271 1235 7144 2.01 3.86 -0.11 0.21 |
| 2968 1244 4744 2.13 4.04 -0.07 -1.66 |
| 2833 1198 375 2.33 6.74 0.93 -0.94 |
| 3043 1200 5020 2.19 4.02 0.00 -3.14 |
| 1490 1139 7276 2.45 4.38 -0.07 0.75 |
| 2010 1145 4382 2.21 4.46 -0.05 0.43 |
| 2713 1153 10029 2.06 3.90 0.06 -1.44 |
| 2485 1109 27365 2.11 3.98 0.03 -1.21 |
| 2284 1067 9564 2.16 4.08 -0.08 0.21 |
| 3031 1076 6247 2.17 4.04 -0.01 -2.20 |
| 1061 1015 25039 2.79 5.04 0.07 0.36 |
| 1852 1024 3250 2.49 4.78 -0.25 0.07 |
| 1380 981 6828 2.58 4.58 0.04 4.12 |
| 1926 987 701 2.33 5.06 1.54 0.33 |
| 3232 1001 15965 2.28 4.30 -0.13 -2.73 |
| 1178 943 780 2.60 6.66 1.32 1.97 |
| 3223 964 14145 2.28 4.24 -0.17 -2.76 |
| 1497 911 1186 2.48 4.76 0.00 1.21 |
| 1940 915 558 2.32 4.28 -0.21 0.18 |
| 2181 918 7569 0.02 0.00 0.00 3.01 |
| 2932 926 61596Sat 2.29 4.32 -0.02 -2.53 |
| 947 871 12924 2.85 5.24 0.20 1.67 |
| 1780 879 11996 2.43 4.48 -0.09 2.36 |
| 2634 888 61561Sat 2.27 4.26 -0.02 -1.62 |
| 1183 1315 719 2.87 5.56 -0.05 0.94 |
| 955 1220 1096 2.56 4.60 0.07 0.38 |
| 3538 1005 959 2.45 4.62 -0.16 -4.54 |
| 2558 1070 3028 2.06 4.00 -0.04 -2.79 |
```