WIYN 0.9 M OBSERVATORY

Start-up Check List and Handy Hints for the WIYN 0.9m

Koopmann & O'Donoghue, 4/7/2011
Updated by Durbala & Koopmann, 10/27/2016
Last updated by RIT folk, 1/15/2017

HDI:
0.43 arcsec/pixel
FOV 29′ X 29′

Wind limit: 45 mph
Humidity limit: 90%

Saturation at 30000

Useful websites/info:

KPNO General Overview: http://www.noao.edu/kpno/observer_info.shtml

Weather: http://www-kpno.kpno.noao.edu/Info/Mtn_Weather/
            http://observatories.hodar.com/kittpeak/index.html
            http://rammb.cira.colostate.edu/ramsdis/online/goes-west_goes-east.asp

    To start 4-m weather monitor, type in xterm on Sage computer:
            vncviewer 4m-weather
            password: (see whiteboard)

Astronomical Sky Calendar: http://www.briancasey.org/artifacts/astro/skycalendar.cgi
Hourly Airmass Table: http://www.briancasey.org/artifacts/astro/airmass.cgi

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Beginning of the night –- Arrive at dome at least 2.5 hours before sunset

1) Walk through computer room
   i) Check preload voltages on second rack to bottom left (voltage indicators should have positive values}
   ii) Check dry air … at least one dial should have positive value
2) Check dome for obstructions, make sure platform is down and cables are hanging freely without tangling
3) On the Olive computer, start ACE/TCS by double clicking on the ACE icon
   Log in as "Observer" password: (see whiteboard)
4) On the Emerald computer, set up data directory (you can start Step 5, preparing telescope for dome flats, at the same time)
   A) open web browser → HDI Command Shell
            observer Durbala   (only the first time)
            Type "help" for help on different commands
            "abort" & "cancel" don't work
            comment filter
            object name
            etime 60 (time in seconds)
            etype object/dark/bias/flat   (for both dome flats & sky flats – include type in comments)
            oneamp ur (only the first time, only if not already in one amp mode)
   B) open a terminal window
      - create a folder where you want to store all the data: /data/data1/durbala/20140423/
         (e.g,, mkdir 20140423 in /data/data1/durbala/yyyymmdd)

- **run the command hdi_follow.pl savedir**=/data/data1/durbala/20140423/
(this transfers the images as they are completed)

C) double-click on ds9 icon to start ds9 window

D) – in Terminal window, type
xgterm &
to create a window for IRAF.
- in the new xgterm window, start IRAF by typing
cl
- In the xgterm (IRAF) window:
cd /data/data1/durbala/20140423 (yyyymmdd) (all data files are here)

E) Set up telemetry: Socket Server should run by default on Emerald when you log in (may be behind main screen)
If Socket Server is not running: (kill socket server on Olive first)
-On Emerald computer: double-click on "Original ACE" icon
-On Olive computer: Network tab → StopSocket Server
-On Olive computer: Network tab → Start Socket Server
Try again if it doesn't work the first time.

5) To prepare for Dome Flats: Take Mirror Cover off & Dome Flat Park
i) On **ACE/TCS: Dome → "Home".** Confirm dome movement by listening to noises, and by monitoring the "Dome Azimuth" box in the ACE display. Dome flat position is roughly 74 degrees.
ii) click **Telescope → "Mirror Cover Park" →Move telescope"**
iii) When slew is finished, go into dome
iv) Raise platform, use ladder and take cover off

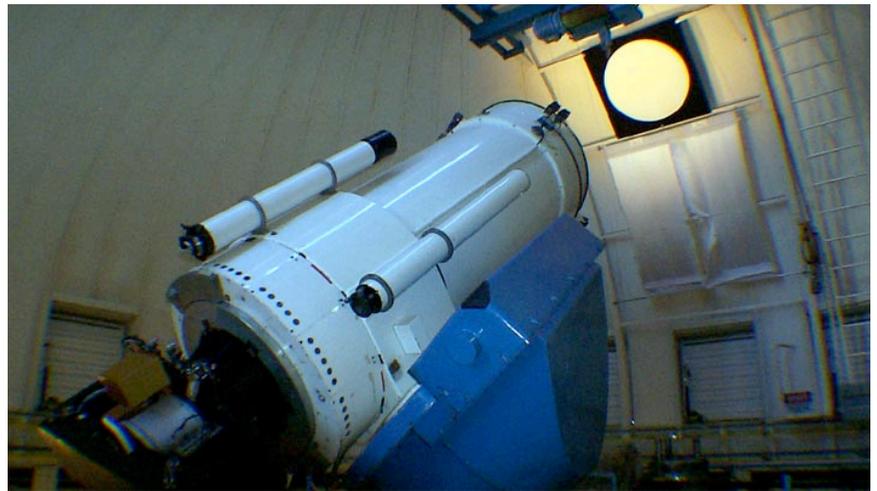v) Stow cover, move platform back down

vi) Start rear dome exhaust fan if RH < 70% (plug it in)

vii) Aim telescope at dome screen

viii) On ACE/TCS click "Reset" in the Safety Interlock window

ix) On **ACE/TCS** click **Telescope → "Dome Flat Park" → "Park" → "Move Telescope"**

x) turn off dome lights

6) Take Biases

On Emerald, in the browser's "**HDI Command Shell**" tab:

i) **etype b** (Note: you can use semicolon to write all commands on same line, e.g. etype b; object bias)

ii) **object bias**

iii) **etime 0.001** (otherwise it will put 60 seconds in the fits header)

iv) **comment bias**

v) **go 5** → take five exposures to clear the chip

vi) check the counts in ds9:

      disp name.fits[1] 1

      imexam → click l, c (line or column) or   **imstat** c6771t0099*b00.fits[1]

                                                  (name*.fits[1])

            (counts should be around 2900 - 3000)

vii) **go 11** (if everything goes well)

7) Take Dome Flats

First, make sure the telescope is pointing at the reflective white spot; go up to dome, use handpaddle to move dome if necessary.

In the browser's "**HDI Command Shell**" tab:

i) **etype f**

ii) **object dome flat**

iii) **etime 4** (use 4 for R & 14 for all Hα)

iv) **comment dome flat 6660 ha8** (name of the filter)

v) **change filter in** *Auxiliary Instruments window* **(if not present, choose "Instruments -> Filter Wheel) on Olive computer:**

      Wheel 1:R & Wheel 2:Empty -- if you observe R

      Wheel 1: Empty & Wheel 2: 6660 -- if you observe hα

vi) **Turn on lamps**

- in Computer room, on first rack, "Flat Field Illumination Control"

- Flip switch THEN turn dial to appropriate setting (reverse to turn off)

- Use following settings for flats

Hα filter names:
6620 ha4
6660 ha8
6700 ha12
6740 ha16

	Filter	Lamp	Lamp Setting	Exposure Time
Lamps can be variable. Check the counts before doing a **go 10** sequence (e.g., if counts are too low, increase the exposure time)	All Hα	High Intensity	50%	12 sec
	R, r	Low Intensity	100%	4 sec
	V	Low Intensity	100%	7 sec
	I	Low Intensity	100%	4 sec
	B	Low Intensity	100%	12 sec?
	U	High Intensity	100%	25 sec

vii) **go** → to do one exposure

To check the counts use (in cl window): (counts should be below 30000)
displ name.fits[1] 1 → **look at the image to see if it's symmetric**
imexam → **click l, c (line or column) near center** → **look at the profile to see if it's flat**

If the image is <u>not</u> symmetric and the profile has a gradient make sure the telescope is perfectly aligned with the screen. Move dome either to the left or to the right.
Donuts should be circular if well-aligned.

viii) **go 10** (if everything goes well)

ix) Change to other lamp (turn dial, then flip switch to turn off) and run flats for other filter.
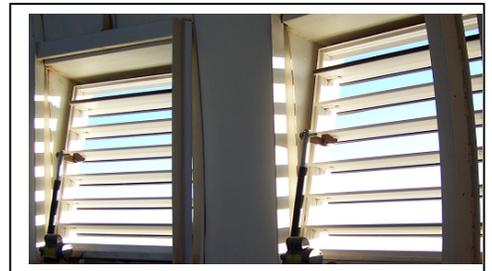
x) Turn off lamps

xi) Enjoy dinner! Plan to return to open the dome <u>half an hour before sky flats</u>, i.e. ~45 minutes before sunset
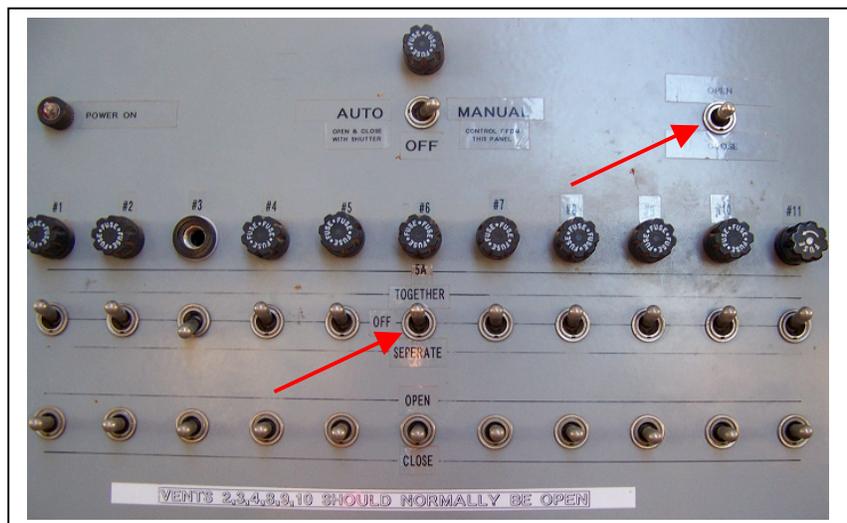
8) Preparing for the night (before sky flats)
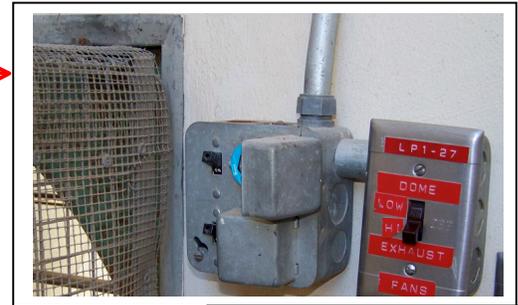
> NOTE: See Appendix for wind/exhaust fan instructions!

i) put telescope in Dome Flat Position (if it's not already)

ii) plug in exhaust fan at outlet CPI-21 on south side of dome

iii) turn dome vents (ckt. Breaker) ON
make sure center toggle switch is ON together & open
turn dome vents (ckt. Breaker) OFF

iv) turn dome exhaust fans ON (upstairs)

v) open dome

vi) turn off dome lights

vii) turn loading dock fan ON (across from the N$_2$ tanker- downstairs)

9) Take Sky Flats (be prepared to start 5 minutes before sunset)

i) **Go to HA -2, Dec of 31 (pointing east) 6 minutes before sunset**

(OR go to HA 0, Dec of 25   or   HA 2, Dec of 25 -- to go westward if it's getting dark)

turn on tracking right before starting (Telescope→ "Track Enable")

ii) On Olive computer **ACE/TCS Dome → "Autodome"**

On Emerald computer in the browser's "**HDI Command Shell**" tab:

a) etype f

b) object sky flat

c) etime 1

d) comment sky flat ha8   (name of the filter)

e) go   (start Hα, try 1 second exposures)

f) check counts

g) aim for 25,000, don't go over 30,000

- get at least 15,000 if possible

h) aim for AT LEAST 3 good ones in each filter (do 4 or 5)

- **offset -120 RA** (westward) between exposures (ACE)

- do only 2 Hα filters/night if possible

- don't need to come back to the original position when

   you start the next filter, just keep moving westward

i) then do R (start around 1 sec)

j) to check the counts use (in cl window):

imstat name.fits

displ name.fits[1] 1

imexam → click l, c (line or column profile)

> If doing morning sky flats, follow same procedure but do R, then Hα.

10) Check Pointing (about 25-30 minutes after sunset) & check focus + seeing

i) Choose a Bright Star from the catalogue on Olive ACE

a) Right click anywhere on the screen:

→"Open Existing Catalog"→ select ACE_BSC5.cat

b) click on RA column, choose star near zenith
- RA ≈ LST, Dec ≈ 31° (latitude)
- 5th magnitude star
- Double-click to select   → "Go to" to move telescope
ii) Take a 10 sec test exposure (in R filter):
etype o
object pointing
etime 10
comment pointing
go
iii) Check that star is near center of HDI –– if not, find offset and enter before each exposure
iv) check focus (see step 11) & seeing (see step 13i-d)
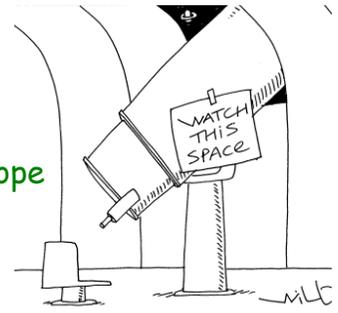
11) <u>Focus (in the same field as pointing)</u> →could look at stars from pointing field

If temperature is similar to the preceding evening, hopefully the focus will be close. Start with the focus equal to the initial value from the night before. (If it is the first night, check the board to see if the previous observer wrote the starting focus.) Examine the pointing fields (as well as any sky flats that have stars) to check the focus. If not in focus, try adjusting on the fly. This can be done as the standard stars are observed.

If focus is not close, you can run a focus sequence:
i) On ACE/TCS, open focus control under "Telescope" pull-down menu (if not already open)
ii) Decide what focus values to check. Start with the current setting
(current setting = the initial best value from the night before)
and determine 5-7 focus settings in steps of 50, e.g., 7 exposures with focus ranging from 32500-32800
iii) Set focus to starting point. Set jog+ to 50
iv) Set **etime** to 10 seconds and write appropriate comment
v) Enter 'go 7' to take a series of 7
vi) As first exposure is reading out, jog focus
vii) Repeat through 7 exposures
viii) Examine images and determine best focus
Decide best focus, input in TCS, then Go to Focus ...
a) after finding best focus run a Test exposure to test solution. Adjust as necessary
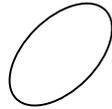b) focus is perfect
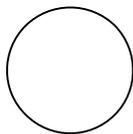
Use **displ** and **imexam** ("r", "e") to display the image & measure the seeing (FWHM).

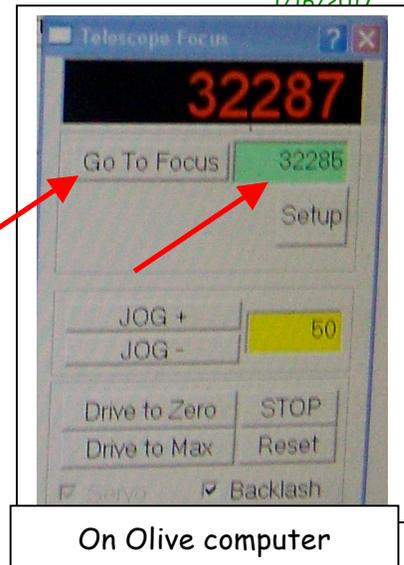When raising or lowering the focus use a minimum of 25.

make focus higher

make focus smaller

On Olive computer

In the Iceweasel Browser→ **Apr 24** tab:
etype o
etime 10 (exposure time)
object focus
comment focus R
go

IF it's Photometric (no clouds…):

12) <u>Observe Standards</u>
   i) may be done in astronomical twilight beginning and end
   ii) can also be done in middle of night (adjust according to target schedule and airmass)
   iii) 2-3 Landolt Standards, R only per night, at range of airmasses
   iv) 2-3 spectrophotometric standards in each filter per night
       - beginning of the night -- Do R before Hα filters
       - end of the night -- Do Hα before R filters
    v) In the Iceweasel Browser→ **Apr 24** tab:
           etype o; etime 10; object star's name; comment R; go
                   (exposure time)

Identify the stars in the field, check if they're saturated & the counts are < 30,000
Beginning of the night –do Landolt before spectrophotometric standards
End of the night - do spectrophotometric standards before Landolt

IF it's Photometric or not … as long as you're open:

13) <u>Observe Targets</u> (Can start R in astronomical twilight**)**
  i) **<u>Point to target, confirm field, check focus & seeing</u>**
       a) Write RA & Dec in ACE/TCS → slew telescope to your target;
          OFFSET RA 300   DEC 0   (in April 2016)
       b) do a 60 second exposure in R to confirm field:
          On Emerald computer in the Browser's "HDI Command Shell" tab:
                   etype o
                   object *name of the galaxy*
                   etime *60*
                   comment *R*
                   go

c) confirm field, use SDSS or Skyview to compare
    (Skyview: north - up, east - left; Emerald: north - up, east – left
     after doing *invert X* in ds9)

d) check focus (see step 11) & seeing:
                displ image[1] 1
                imexam
                click "e" → contour & click "r" → radial profile
    You can do steps i (b-d) while you search for guide star.

ii) <u>**Start Guider**</u>: (Guider can be started <u>earlier!</u>)
    On Moss computer set up Guider in MaxImDL:
        Setup tab -click **Connect → Cooler ON**
        (Check setpoint; if cannot reach setpoint, click on **cooler**, and raise
                    Pick a temperature so the cooler works no higher than 80%.)
        After Cooler is ON, wait about 5 minutes to click Track in step 13-iii!

iii) <u>**Find a guide star**</u>:
    a) On Moss computer in **MaxImDL**:
        - **Guide tab** → Check **Expose**, Exposure = 5 (or 1 depending on how bright the star
            is; can range from 1-10, better not to exceed 5-6 s) → **Start**
        - Guide star automatically selected by Maxim. Use cursor to find star in the
          picture according to pixel coordinates (x & y) in Maxim, If you prefer a
          different star, double-click on it.
        - If guide star is faint, can increase binning – click Settings, then change
          binning to 3
        - Offset as necessary if needed to find star:
            (e.g., increase Dec to go northward, increase RA to go eastward)
            <u>**Offset**</u> **Dec -10 or 10 (or RA -10 or 10) if you cannot find a guide star**
                        S   N   W   E
            (<u>North is up & East is on the left</u> on the Moss computer)
        - **Track**, click on star (optional), then click **Start**   **(<u>Never Calibrate!</u>)**
   Note: You could change the focus by 200 if the guide star is out of focus, then **GO TO**
              F=10000 (Camera 1 – N), F=17000 (Camera 2 – S) suggested, but 2015 values
              were different
        - **Guide tab** → **Options** → check **Tracking Error Graph**

    b) On Olive computer, on **Guider** click correct camera then **ON**
                (N is Camera 1, S is Camera 2)
            The big picture on Moss will become very little and will show only the
            star in the middle.
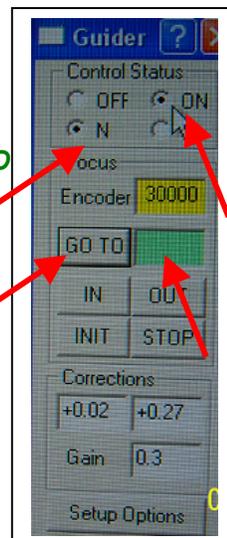
iv) <u>Do exposure</u>

On Emerald computer in the browser's "**HDI Command Shell**" tab:

> **etype o**
> **object** *name of the galaxy*
> **etime** *180* (180 s for R & 1200 for Hα)
> **comment** *filter*
> **go**

v) <u>Do the other filter</u> -- repeat step ii-v (You don't need to turn off the guider if you don't offset)

 - <u>decrease</u> the Focus by 100-ha4, 88-ha8, 80-ha12, 110-ha16, when you go
        from R to Hα!!! →Go To Focus (on Olive)
 - monitor focus & seeing & adjust focus if necessary (section 11-viii)

vi) <u>Turn the Guider OFF to offset to new dither or move to new target</u>

 - On Olive computer, on **Guider** click **OFF**
 - On Moss computer under "**Guide**" → click **STOP**
 - Offset or move telescope, then repeat steps ii-v for new field

<u>NEW Dither pattern – HDI (or adjust for needs of field, e.g, avoid bright stars):</u>

```
Dither 1    0       0
Dither 2   +30    -30
Dither 3    0     +60
Dither 4   -60     0
Dither 5    0     -60
```

4
● (-60,0)

3
● (0,+60)

1
●

5
● (0,-60)

2
● (+30,-30)
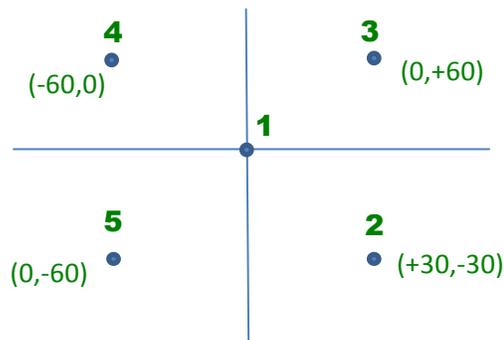
14) <u>Disconnect guider at the end of targets</u>: Setup tab → Cooler OFF → Disconnect

15) Take the remaining standards - OK in astronomical twilight.

16) - Fill out **night log** at end of every night:
 - At the end of the observing run (e.g., 5-day observing run) fill out the **Observing Run Evaluation**
    Both forms found at: http://www.noao.edu/0.9m/observe/observing.html
        Username: wiyn09m
        Password: (look on the whiteboard)
17) If 4m doesn't call, call them & report before leaving.

18) Shut Down (no morning sky flats)

    i) Dome→Homedome (UNLESS windscreen is up, then Dome→Azimuth→270)

    ii) Move telescope to "Mirror Cover Park"

    iii) Turn off dome fans (including rear fan)

    iv) Close dome shutter, lower windscreen

    v) Close vents if open

    vi)   Place cover back on telescope

    vii)   Reset the Safety Interlock in ACE

    viii)   Move telescope to "Zenith Park"

    ix)   Move dome to "Home" if necessary

    x) Log off ACE (User tab)

    xi)   Turn off the lights as you leave!

    xii)   Dream of photometric skies!!

19) Take Darks → this can be left running after the shutdown

  In Browser's "**HDI Command Shell**" tab:

  i) etype d; object dark

  ii) **etime 1200**

  iii) comment dark (counts should be around 2900 - 3000)

  iv) go 11

20) Transfer the data

    A) open Filezilla

        host: emerald   username: 36inch   password: (see whiteboard)

          Go to /data/data1/durbala/20140423

 or B) scp -r 36inch@emerald:/data/data1/durbala/20140423 .

 or C) rsync –av –e ssh 36inch@emerald:/data/data1/durbala/20140423 .

Appendix:

- **Wind Instructions:** < 10 mph -- open all vents

             10 - 15 mph -- open all vents half way (or open every other vent)

             > 20 mph –- close all vents

             > 25 mph – raise wind screen →

             45 mph -- close the dome

Dome azimuth 270º

DOWN   UP   PUSH ON   PUSH OFF

Windscreen control   04/15/2015   04/15/2015
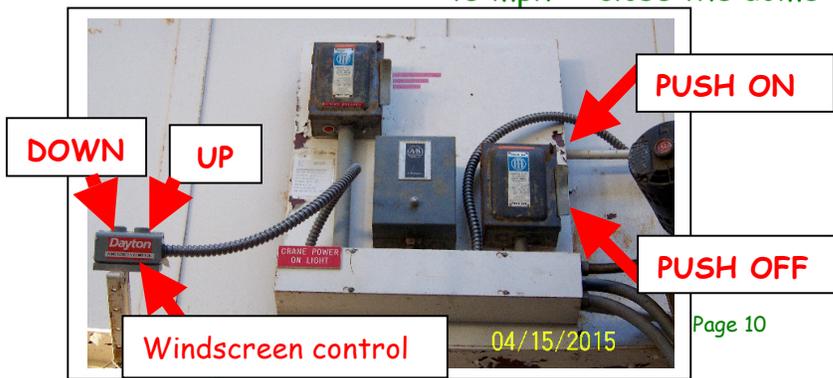
• **Exhaust Fans:**   no wind -- exhaust fans on High

                            < 15 mph -- exhaust fans on low

                            > 20 mph -- exhaust fans OFF

Useful websites:

http://www-kpno.kpno.noao.edu/observer_info.shtml : LTO reports, WYIN night logs,
Know Your Observing Assistants (under *Site and Weather Information*) &
Observing Assistant Calendar (under *Calendars*).

SDSS: http://skyserver.sdss3.org/dr9/en/tools/chart/navi.asp
Skyview: http://skyview.gsfc.nasa.gov/cgi-bin/query.pl

Printable log sheets: http://www.noao.edu/0.9m/observe/observing.html
                     (WIYN 0.9 m website at the bottom of the page)

Phone numbers:
Observing room WIYN 0.9m telescope - 520-318-8637
Observing room 4m telescope - 520-318-8620
WIYN 0.9m house - 520-318-8714

Troubleshooting:

- If Emerald computer restarts and some of the images are not transferred, use:
    hdi_grab.pl 2014-04-25 02:20:00   -- in order to copy all images taken more recently than
                                UT2014 April 24 02:20:00.
- If IRAF crashes on Emerald: **ctrl C**, then type **flpr** twice in the cl window.
- If telescope drive refuses to move, cycle power on breaker, to left on wall of computer room
    (immediately after entrance)
- Lightning shutdown procedure is posted on bulletin board
- If Emerald crashes (e.g., arrive in control room to find it showing "power-saving" mode), cycle
    power on Emerald box in computer room. Emerald is black computer on bottom shelf. DO NOT
    CYCLE POWER on HDI server, which is second flat server on second shelf (on top in 2016)
- If staff tests HDI, they may leave it in 4-amp mode. Use command "oneamp ur" to get back to 1
    amp.
- Sometimes the dome is unresponsive. Wait ~20 minutes and it usually returns to normal.

October 2016 – Note from Flynn:
- So, we are using the old Emerald that was in use as of a few years ago.
- **All icons you need are in the lower left corner of the desktop**.
- **The socket server was tricky to get working, but it is working**. The catch is that when you
    start up Emerald's side ("Original ACE" icon), you will NOT see the telemetry displayed to the
    screen even though it is transferring into the headers.
- Since this is the old Emerald machine, it is a bit prone to crashing (this is why we replaced it), so
    just be aware you may have to deal with this. **The box for this pc is the mid-sized black tower
    on the bottom of the far computer rack in case of needing a hard shutdown/restart.**