Nightly AO on-sky checkout

Issue - 3.7

Al Conrad

December 3, 2018

Contents

1 Introduction 1
2 Scope 1
3 Procedure 1
A Revision History 5

1 Introduction

This document provides the procedure for an AO On-Sky check-out. This procedure is to be used immediately after sunset on LUCI/AO nights, but should not delay the upcoming science observing. The procedure references documentation on the wiki.¹

2 Scope

Members of the Observatory Support Associate (OSA) group are the intended audience for this document and, in particular, the procedure given in the next section. Background, history, and usage statistics are given in the companion document titled Status Report for AO On-Sky Check-Out (AO-OSCO). This latter document is for a broader audience at the observatory.

3 Procedure

1. 30 minutes before opening the chamber:²

   (a) Bring up the AO software and initialize AO for the night. Details are given in the first 3 subsections of Greg’s Operational AO manual:

      i. *Open Eng. GUIs*
      ii. *Ready AdSec*
      iii. *Prepare WFS*

   (b) Prepare for using IDL as follows³

1 Each text item that appears in light blue is a hyperlink that will bring up the referenced web page.
²Other steps to possibly include later: (1) Check system functionality using Greg’s script (Details TBD) (2) Tell anyone following along in Tucson to use `scry` in `/lbt/observer/bin/` to eavesdrop on the OSA screens.
³These steps were taken from Doug’s IDL Twiki Page for Preset.
i. Open a new xterm
ii. Login as LBTO@obs2 (3, 4, or 5)
iii. % idl

(c) Using the IIFGUI, authorize for LUCI/LUCI as usual.
(d) Wait for the indication in IIFGUI that the authorization is complete, then ...
(e) In the IDL xterm, type: IDL> iif.register,/TCS

(f) Confirm LUCI config:
   i. N30 Camera
   ii. N30 field stop in the FPU
   iii. Mirror selected
   iv. Filter wheels set to blind/blind.

(g) On the LUCI Readout GUI:
   i. Change $N_{DIT}$ to 1.
   ii. Select “Cube” from the Save drop down menu.
   iii. Select LIR mode.
   iv. Hit Submit to save these changes by taking a frame.

(h) While the blind/blind filters are in LUCI, collect a dark frame as follows:
   i. Go to the WFS Control GUI.
   ii. In entry field to the left of “Acquire PISCES Dark” enter the number of frames (usually just 1).
   iii. Click the “Acquire PISCES Dark” button.
   iv. In the log text box the tracking number (TN) will be displayed. Record this in your log.
   v. The LUCI image name (e.g., luci1.20180505.0078.fits) will appear in the log box on the LUCI interface. Also record this in your log.

After opening the chamber:

1. Wait for sunset + 10 minutes (if necessary).

2. Establish Pointing and Collimation
   (a) Restore the last known IE/CA for LUCI/LUCI.
   (b) Choose a bright pointing star (9-10th mag) with a bright guide star (see later), acquire using the normal procedure. Reduce exposure time to minimum (200ms). See AO449 as a good example.
   (c) Collimate using the normal procedure.

3. Acquire the AO reference star
   (a) Just like step 1b above. Use the same command, but with these parameters:
      i. TELMODE = Adaptive
      ii. AOmode = ACE (case sensitive)
      iii. AOref = 0 (case sensitive)

---

4. This IDL command checks with TCS to learn which instrument is authorized, and then sets up accordingly.
5. To protect from persistence. They should be switched to the crossed filter set up that reduces about 7 magnitudes before AO loops are closed to avoid light entering through other filters as they rotate into position.
6. Alternatively, perform by-eye active optics on defocussed pointing star.
iv. Choose a bright guide star ... GS = #\textsuperscript{78}

v. PA = 90

4. Close the AO loops

(a) Set up for intervention mode. Details are given in the Get Ready for Preset section of the Greg’s on line document to force intervention mode on the next preset.

(b) Use the following IDL runAO

\texttt{IDL> iif\_binoc\_runao,type=repoint}

or, if forced to work single-sided in monocular mode for some reason:

\texttt{IDL> iif\_runao,type=repoint}

(c) Follow steps 2.2 through 2.4 of the GT on line doc.

i. Center Star

ii. Center Pupils

iii. Check Flux

(d) \textbf{Warning: Be sure star is on the pyramid before proceeding to next step. Closing loop with no light will result in a shell RIP.}

(e) Close Loop. (Step 2.5 of the GT on line doc.)

(f) Optionally complete steps 2.6 and 2.7.\textsuperscript{9}

i. Optimize Gain

ii. Apply Optical Gain

5. Make a Log Entry: Write up a brief summary of the on-sky check out and put it into the nightlog. If time is of the essence, this can be simply either "AO-OSCO successful" or "AO-OSCO unsuccessful."

6. Take LUCI Images:\textsuperscript{10}

(a) Configure the LUCI filters:

i. Use \textit{OH1060} and $z$, if the magnitude of the reference star is $R < 6$ or

ii. Use \textit{He-I} and $z$, if the magnitude of the reference star is $R > 6$.

(b) Once the filters are in place, take a $2.51 \times 1 (DIT \times NDIT)$ image on the READOUT GUI.

(c) On the Real Time Display (RTD) - Go to the menus drop-down on the top of the screen, click \textit{Overlay}, then select \textit{Phot}, click on the star in the field (you may have to adjust the stretch with the pixel button on the right side of the RTD screen).\textsuperscript{11} Note the X and Y values of the star.

\textsuperscript{7}Since we are still in early twilight, the ACE preset still needs to find an off-axis star before we can start the runAO sequence.

\textsuperscript{8}Note that we do not set PA since IRAF/newpoint will put the GS on the Y axis. If you choose to set the PA explicitly, choose an appropriate PA for the selected GS.

\textsuperscript{9}These last two steps are optional because they could be a waste of time training-wise. Once Arectri has automated these two steps the procedure for the OSA will change. The advantage would be that the IQ would be more valid and so monitoring could start earlier. So this needs some discussion.

\textsuperscript{10}N.B. - The procedure for step 6 is evolving and will be simplified as we automate portions. For now, only proceed to this step if (a) 15 minutes are still available before handing over to science and (b) a sciops staff member is available to assist.

\textsuperscript{11}Other methods that can be used to find the X and Y coordinates of the object are cursor in GEIRS or DS9 w/IRAF.
(d) We will want a $128 \times 128$ subframe, so compute $x_0 = X_{\text{center}} - 64$ and $y_0 = Y_{\text{center}} - 65$. These two values are used in the next step to set up the subframing.

(e) Start subwin as follows:

- Open a new instrument shell from "Modules" on GEIRS
- At the prompt enter: `subwin SW 1 x0 y0 128 128`
- At the prompt enter: `subwin auto on`

(f) Take a test exposure with GEIRS to verify.

(g) Put the [FeII] and clear filters into place

(h) Take a 0.3 second test exposure as follows:

- Bring up the READOUT GUI.
- Set DIT to 0.3.
- Set NDIT to 1.
- Click SUBMIT.

(i) Bring up an AOeng@flao-dxwfs (or sx) terminal.

(j) `$ cd /home/aoeng/auxloops/scripts`

(k) `$ ./luci take three.py` (This will collect a LUCI image and, simultaneously, AO telemetry data.)

(l) In the terminal output, the TN will be displayed. Record this in your log.

(m) The LUCI image name (e.g., luci1.20180505.0078.fits) will appear in the log box on the LUCI interface. Also record this in your log.

(n) Turn off sub-framing:

- Return to the GEIRS instrument shell opened in step 6(e) above.
- At the prompt enter: `subwin off`
- At the prompt enter: `subwin clear`
A Revision History

- v3.3, 08-May-2018, ARC, Step 1(a) expanded to reference 3 sections instead of one.
- v3.4, 31-May-2018, ARC, Changes to 3.5 to reflect Doug’s new script and corrections following the 21-May-2018 run through.
- v3.5, 03-Jun-2018 Changes following the 02-Jun-2018 run through.
- v3.6, 23-Oct-2018 Broke out the last of four steps in 4c (close loop) into 4e with a warning after 4c and before 4e.
- v3.7, 03-Dec-2018 The step for taking LUCI Images (now step 6) was modified extensively and two historical appendices were moved from this document to Status Report for AO On-Sky Check-Out (AO-OSCO) version 1.1.