DEIMOS User Interface: A User's Guide

DRAFT: December 12, 1997

1 Introduction

The DEIMOS Graphical User Interface (GUI) was designed to provide the observer with clear and easy control of a complex instrument. We have attempted to balance several goals in the final product. These goals include:

1. Clear visual indication of current status of stages (i.e., ready, moving, move failed);
2. Clear visual distinction between *current* and next-requested (or *desired*) stage positions;
3. Visual cues of pending moves and overall system state of readiness;
4. Compact format, with all *routine* operations being controllable from a single window;
5. Integration of spectrograph and CCD control in a single window; and
6. Automation of common procedures, such as multiple exposures with telescope offsets.

Compactness is required in anticipation of a second panel for Beam B of DEIMOS: for remote observers, both panels should fit on a single screen with some remaining space for window icons. In order to meet this requirement, we have placed certain desirable but non-routine options in popup subpanels, each associated with a particular optical element or subsystem.

The DEIMOS GUI is built on the Tcl/Tk (X11) application "DashBoard" (Clarke & Allen 1996), and was initially tested using "ksim," the DashBoard KTL instrument simulator (see Appendix).

2 Basic Use: The Main Panel

The main panel, shown in Figure 1, can control all normal DEIMOS operations. The panel consists of three major sections: **Configuration**(top),

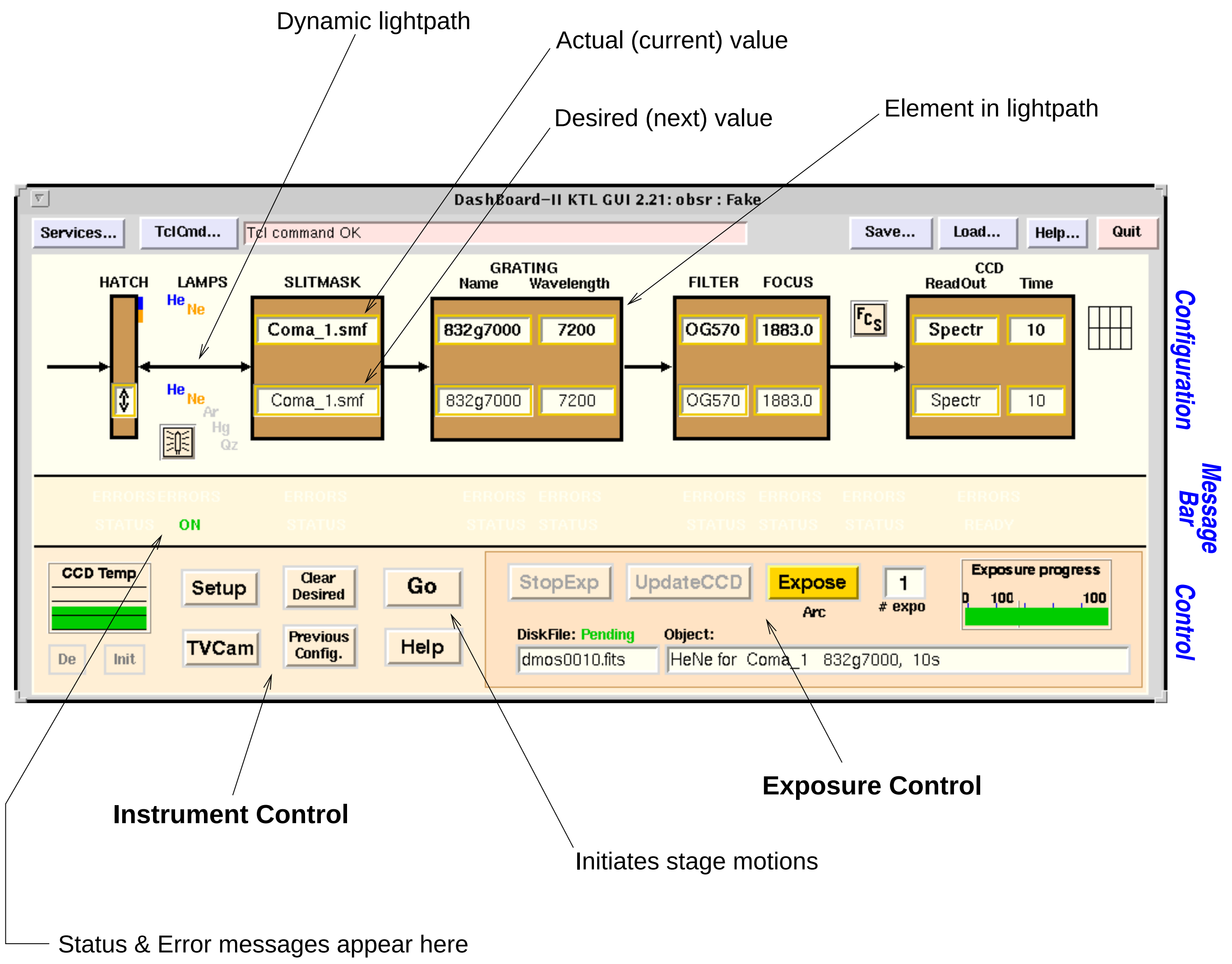


Figure 1: The Main Panel

Control(bottom), and the **Message Bar**(middle). The Control section contains both instrument and exposure subsections.

2.1 Configuration Section *(top)*

The Configuration section consists of a schematic diagram of all the elements in the DEIMOS optical path: Hatch, Slitmask, Grating, Filter (including the Focus stage) and CCD. Each element is represented by a brown box encompassing text boxes showing both the current stage setting(s) and desired (next) stage setting(s). There are also areas representing the internal lamps, controlled by a menu button, and the Flexure Compensation System (FCS), also controlled by a menu button. The light path is indicated by a series of arrows running through the center of the diagram.

There are three **basic rules** in this section of the GUI:

- Current stage positions are shown *above* the lightpath (see Figures 1 and 2); desired (next move) settings are shown *below* the lightpath. Desired settings may be changed, either by typing in the text boxes (grating tilt, exposure time) or by means of pulldown menus (Hatch position, Slitmask, Grating, Filter, CCD readout mode; the menu button is labelled with the desired setting). The exception is Focus, which is slaved to the selected Filter and for safety cannot be edited from the front panel (but may be edited in the Filter/Focus subpanel — see below). Whenever a stage's desired setting differs from the current setting, its text box lights up bright yellow to indicate a pending move.

- No action is immediate in the configuration section: the user must press the GO button in the Instrument Control section to send the move commands, and the GO button also turns bright yellow to show that a move has been requested. Stages move in parallel, and all requested moves can be initiated by pressing GO once.

- The popup subpanel for each element is brought up by double-clicking on its brown box. These subpanels provide specific and immediate control of all related stages, as well as diagnostic messages for each stage.

When a stage is in motion, the representative box for that element drops slightly out of place to indicate the light path may be blocked; when the move is finished, the box returns to its normal position. (Text messages reflecting

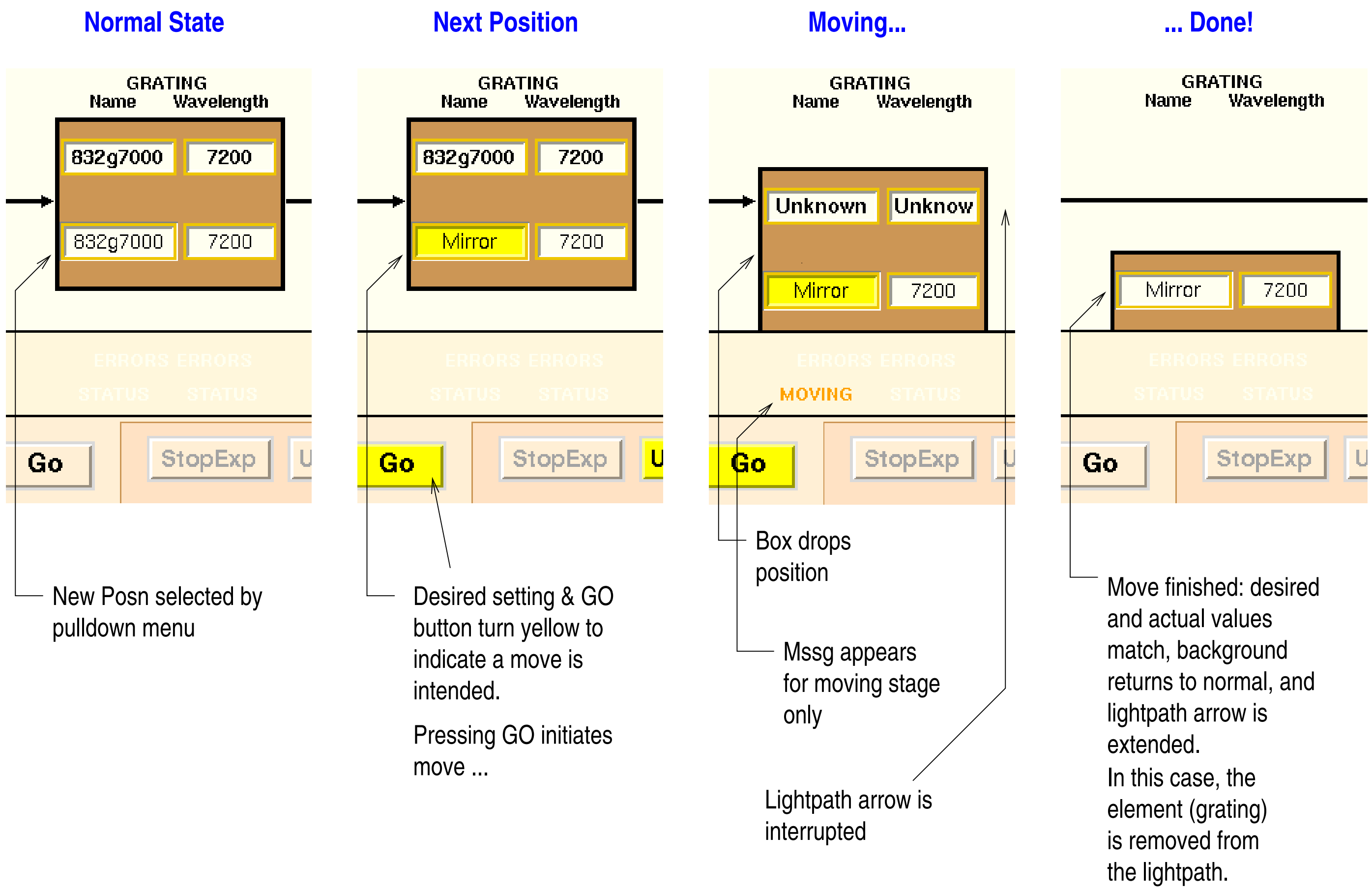


Figure 2: Behavior of the Grating Element Box during a Move Sequence. Here the mirror is moved into place, i.e., the grating is *removed* from the beam.

status also appear in the Message Bar — see below.) Some elements (Hatch, Slitmask, Grating) may be removed from the optical path entirely, and in this state their boxes are moved out of the schematic lightpath.

An additional indicator of system status is provided by the **dynamic lightpath arrows**. The arrows will pass through an element only if the stage(s) are in correct position. If the lightpath arrow reaches the CCD, then all motions have been successfully completed and light is reaching the detector shutter. If a move fails or the Hatch is closed, the arrows will stop at the element where the actual lightpath is potentially broken.

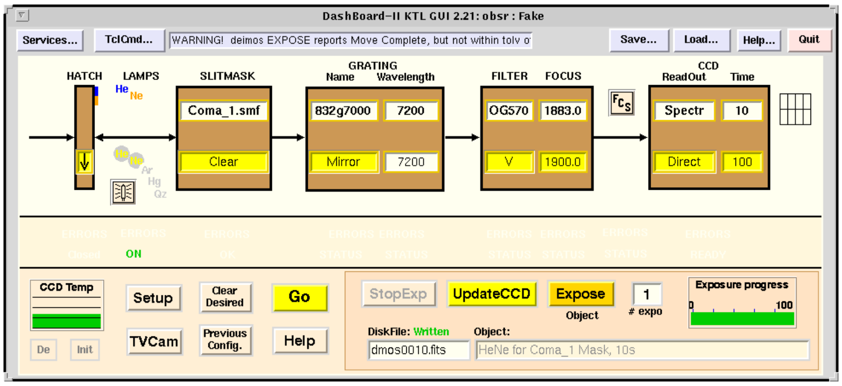
The **internal lamps** are not associated with a moving stage, but their status is displayed in a consistent manner, with current status above the midline and desired status below it. Above the midline, lamps that are currently ON appear as brightly colored text; lamps that are OFF do not appear at all. This behavior is reflected below the midline, except that lamps that are OFF fade into pale grey rather than completely disappearing allowing the user to always see the options. In addition, if the desired lamp state differs from its current state, a dot appears around the text: yellow with black text indicates a desired ON state, pale grey with yellow text indicates a desire to turn the lamp off. The pulldown menu button allows the desired state to be toggled (first time selects ON, second time OFF, etc.); the menu also includes options for requesting turning all lamps off, and for bringing up the Lamps subpanel (see below). As above, no lamp is turned on or off until the GO button is pressed. This and several other features are illustrated in Figure 3.

The **FCS** is controlled by a menu button which is located *above* the midline — this is because its action is immediate, unlike the rest of the subsystem control in the configuration section. *[At this time, the FCS control has not been firmly characterized. It may become a button in the Instrument Control section which brings up a subpanel.]*

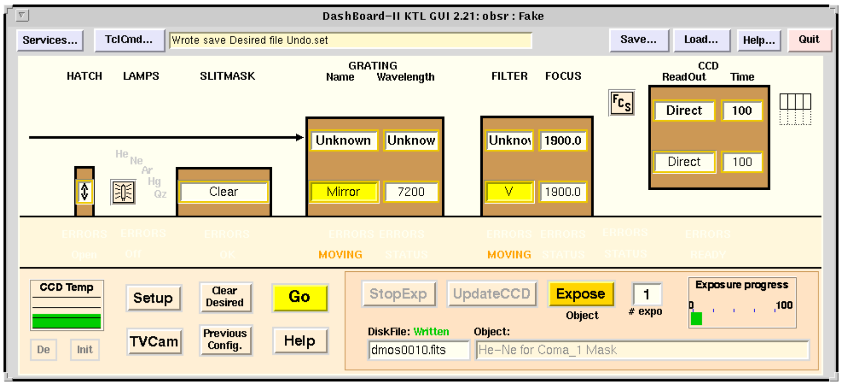
The **CCD** has no motions, but does change "state" as it goes through an exposure. The various exposure states are illustrated by the changing color of the CCD box at each phase of the expose sequence (pale grey while erasing, green while exposing, black for dark integrations, red during CCD readout). There are several standard readout modes (Direct, Spectroscopic, Longslit, Alignment) that control which CCDs in the mosaic are actually read out, and this readout mode is reflected both in the text box and by an icon (to the right of the CCD box) representing the mosaic. The readout mode is selected by a pulldown menu. The same pulldown menu selects

DEIMOS RECONFIGURATION:

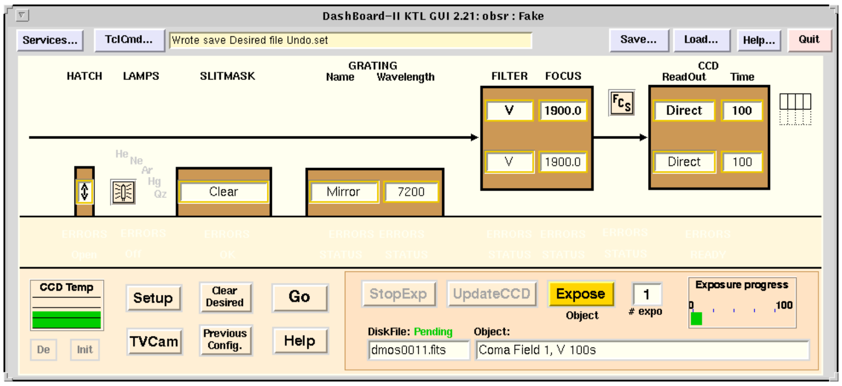
MultiSlit Spectrocopic (Internal Arc) Setup to Direct Imaging Setup.



1. Desired values set. Note the two lamps (on) which are to go off. Waiting for GO.



2. GO has been pressed, stages are moving (note text flags in Message Bar).



3. Final configuration has hatch,slitmask and gratings out of the light path.

Figure 3: Reconfiguration Sequence for Main Panel. In this example, DEIMOS is reconfigured from an internal-lamp + slitmask spectral mode to a direct imaging mode.

an observation type (bias, dark, domeflat, arc, etc.) that determines the behavior of the detector shutter, as well as characterizing the images for data reduction. Also displayed are the requested integration time and (during the expose sequence) the elapsed integration time. Consistent with the rest of the GUI, observation type, readout mode, and requested exposure time are updated by the Go button, but they may also be changed with the Update CCD button in the Exposure Control section. (See Exposure Control below for further discussion of the exposure sequence.)

2.2 Instrument Control Section *(bottom left)*

This section consists of a series of simple buttons. The most important is the Go button that initiates ("commits") any pending stage motions. Clear desired resets all desired values to the current settings. Previous config loads the previous instrument configuration into the desired values. TVCam opens a subpanel for the Guider camera system. Setup brings up a subpanel (Figure 4) for setting various parameters that change rarely (such as OBSERVER or the path to the data directory), and for selecting various options.

The current options are:

- GO on Readout: initiate pending stage motions at start of CCD readout;
- GO on End Read: initiate pending stage motions at end of CCD readout;
- Audible Alert on Exposure Ended: beep at the start of readout;
- Audible Alert on Readout Ended: beep at the end of readout.
- *[Dither Multi's will integrate small telescope offsets into a multiple exposure sequence — not yet implemented.]*

In addition, the option of storing data to disk or discarding it is set by the Disk Write Enabled button. Data storage and observer information is given in the text boxes, and changes may be cleared or applied with the Cancel and Commit buttons, respectively. Init.Run is used to reset all options and values to defaults settings at the beginning of a new observing run.

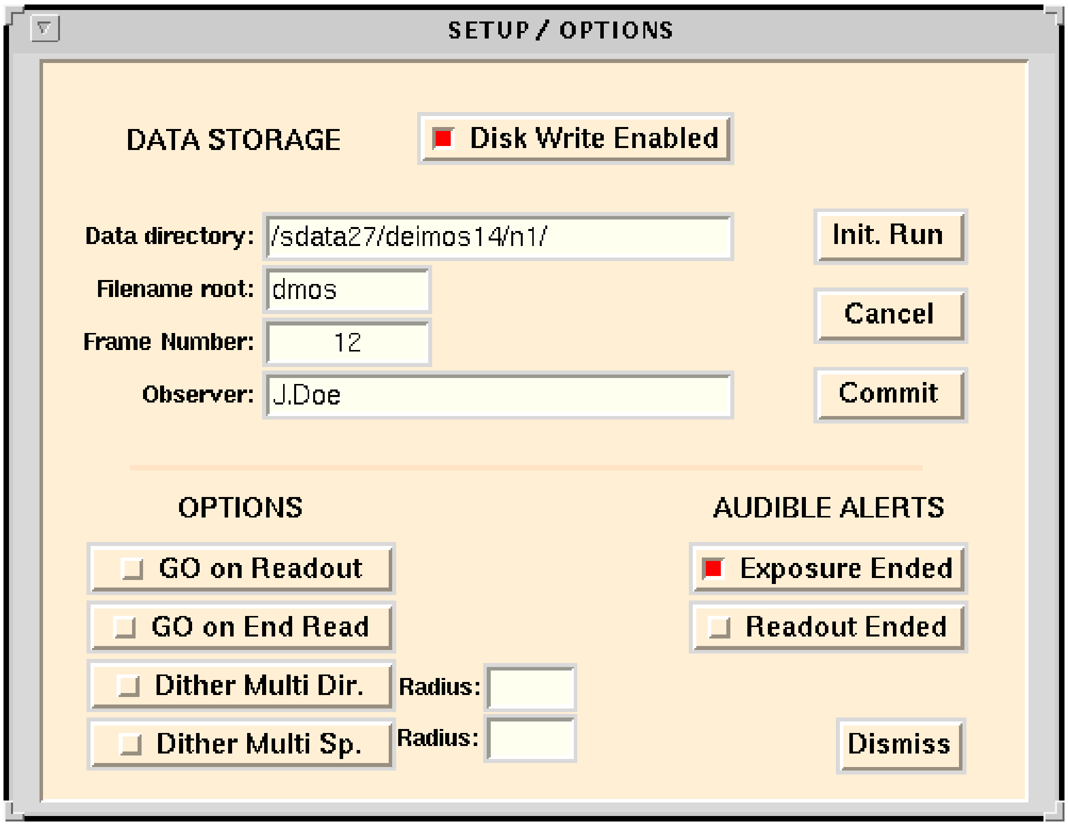


Figure 4: The Setup Subpanel

2.3 Exposure Control Section *(bottom right)*

The Exposure Control section consists of the **Expose/Pause/Resume**, **UpdateCCD** and **StopExp/Abort** buttons, some text boxes and an exposure progress meter (see Figure 5). The buttons sometimes share different functions, and for safety are disabled whenever they are irrelevant.

The EXPOSE button initiates an exposure sequence. The type of observation requested is shown in small text under this button. Once an exposure starts, the button becomes PAUSE to temporarily stop an integration by closing the shutter (and if the exposure is paused, the button becomes RESUME to reopen the shutter).

ABORT is active only during an exposure sequence. Its action during the erase and readout cycle is immediate. During the actual integration, the ABORT button becomes STOPEXP whose action is to terminate the integration, so that the user must confirm a real abort (i.e. no data saved) by

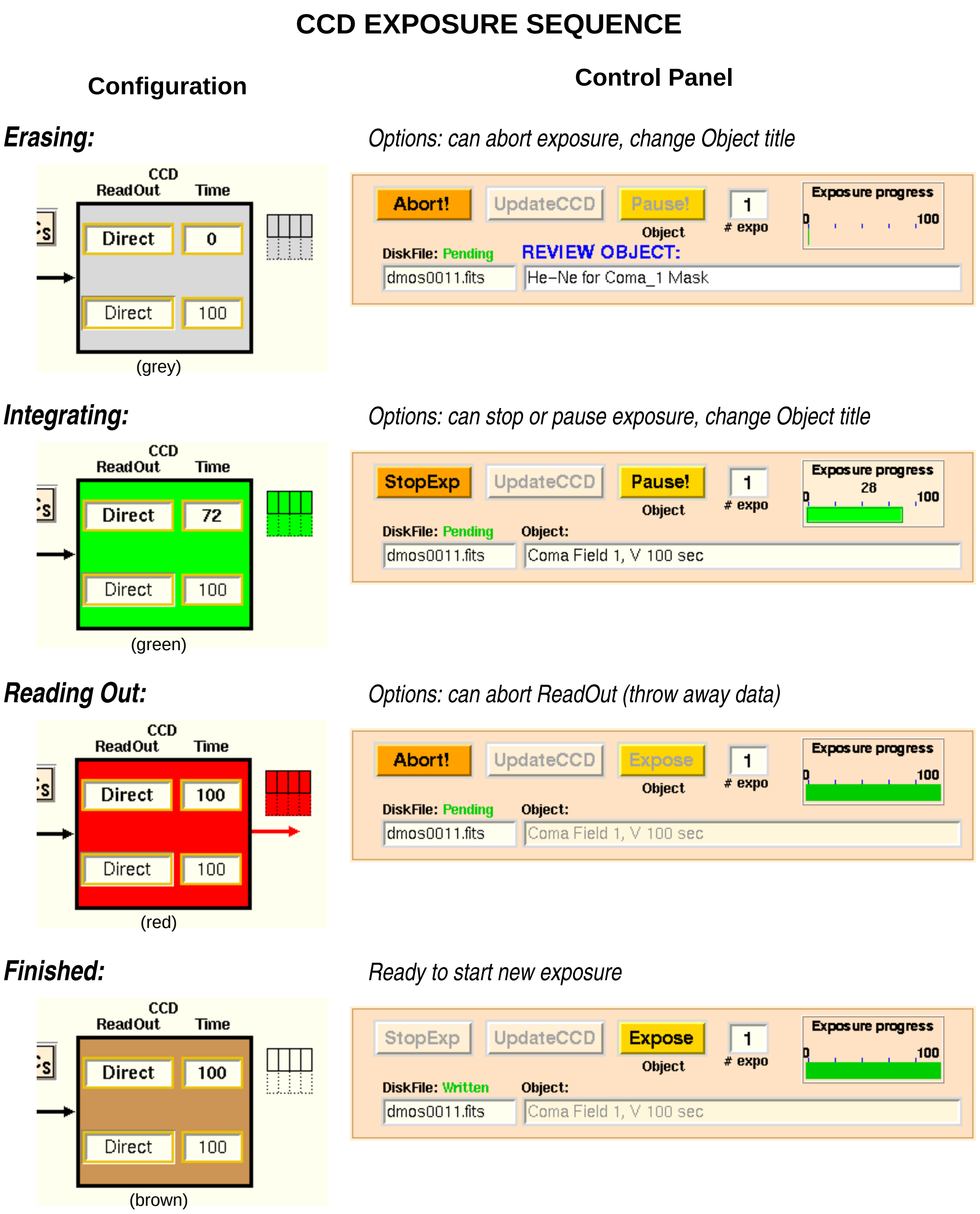


Figure 5: Behavior of the CCD Configuration element and the Exposure Control section during an exposure sequence.

pressing the button a second time during Readout. Otherwise, StopExp is useful for truncating an exposure.

Update CCD forces an *immediate adoption* of the "desired" integration time and CCD readout mode — *even during an exposure in progress*. Outside of an exposure sequence, the button is useful if the observer wishes to change exposure/readout parameters without moving any mechanical stages. If the button is orange (rather than yellow) it means the new time and readout mode will apply to the exposure *in progress*.

The progress of the exposure can be monitored by the bar meter showing percent complete, as well as the superimposed countdown in seconds.

Multiple exposures are selected via the text box beside the Expose button; when more than one exposure is selected, the number "counts down" to 0. At the end of any multi-exposure sequence, the count is returned to 1.

The name of the disk file and its associate object title are displayed at the bottom of this section. The object title can be edited before and during the exposure; however, it is captured *at the start of CCD readout* and once captured the text entry box becomes inactive.

The behavior of relevant sections of the GUI during a full exposure sequence is illustrated in Figure 5.

2.4 Message Bar *(middle)*

The message bar displays status and error messages. Only *unusual* status messages are shown, that is, normal "resting" states are indicated by the absence of a message. This is to draw the attention of the user to important messages during a quick scan of the message bar.

3 The Subpanels

The subpanels are popup windows that give specific and *immediate* control over the various DEIMOS stages. Repeat: these moves are immediate and do not wait for the Go button to be pressed! These subpanels are *not* intended for routine control of the instrument, as stages can be moved even during an exposure!

The subpanels also display message strings returned by each stage's motor controller for diagnostic purposes. Thus, they provide additional information on a subsystem, as well as greater control.

Each subpanel is brought up by double-clicking on the appropriate brown box in the configuration section (or by menu for lamps and FCS), and each is put away using the Dismiss button in the lower right corner of the subpanel.

3.1 Hatch

Hatch open/closed is selected by push button.

3.2 Lamps

Each lamp can be turned on/off by pressing the appropriate button. There is also a button for turning off all lamps collectively.

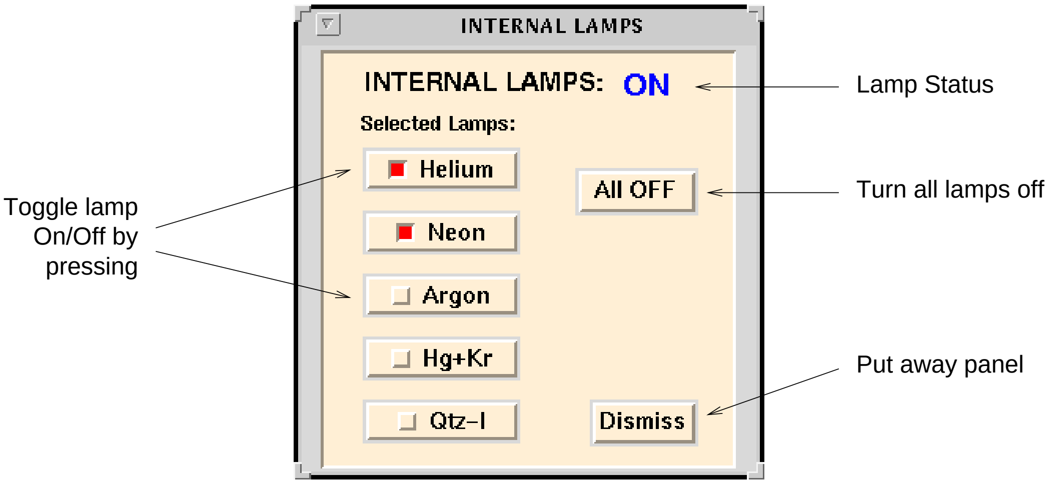


Figure 6: The Lamps Subpanel

3.3 Slitmask

A slitmask can be selected by pressing its button.

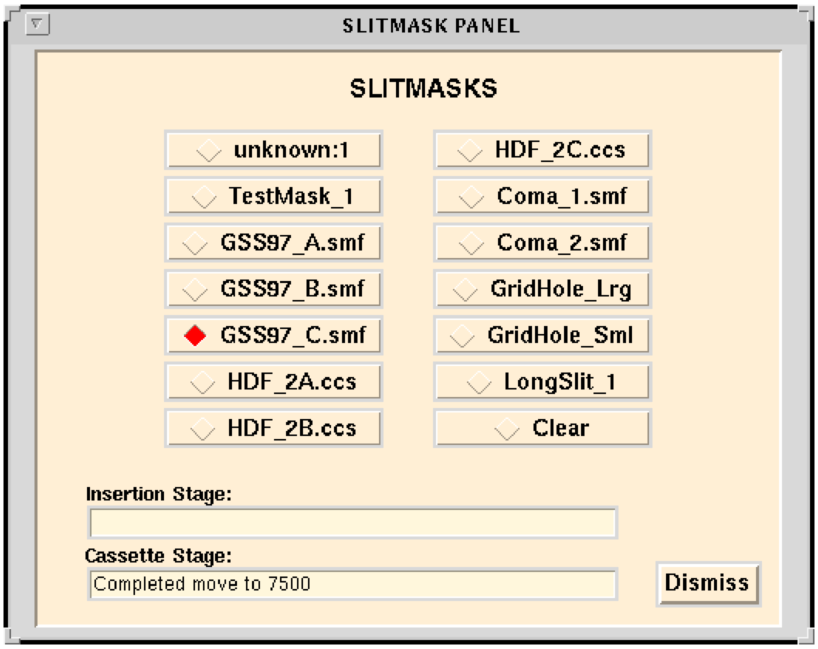


Figure 7: The Slitmask Subpanel

3.4 Grating

This panel (Figure 8) controls the grating slide and each of the grating tilt stages. Gratings are selected by pushing the appropriate button. Current and desired grating tilts for each grating are shown (the latter is editable) and may be immediately moved to the desired value by pressing the SET button for each stage, or the move may be delayed until the GO button is pressed on the main panel. *[Not yet implemented: ability to switch display from wavelength to angle to describe grating tilt. Also need to define what wavelength refers to — presumably the "longslit" wavelength.]*

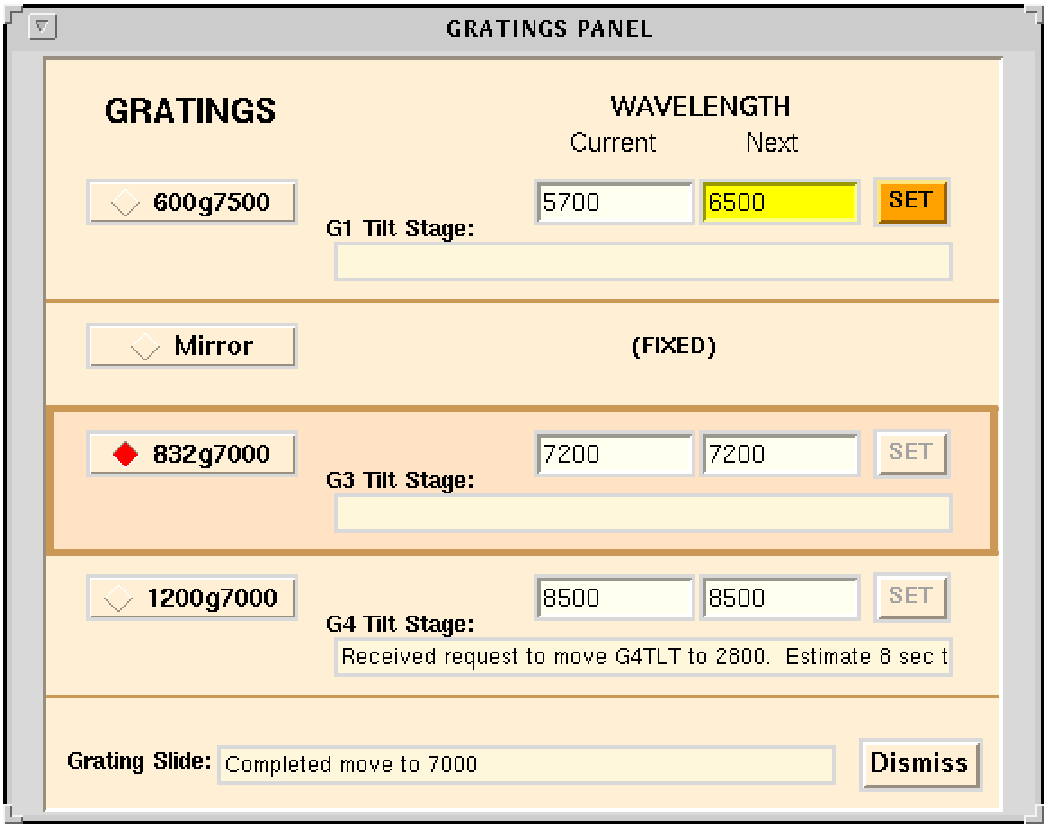


Figure 8: The Gratings Subsystem Subpanel

3.5 Filter/Focus

This panel (Figure 9) controls filter selection and associated focus setting. Since most focus changes are standard offsets to account for differing optical thicknesses of filters, we have slaved the default focus offset to each filter. The actual focus setting is the sum of the nominal focus value, a global offset selected by the user ("DELTA"), a standard filter offset from the database, and a user-selected adjustment ("Delta") for each filter. The total calculated focus may still be manually edited (lower right corner of panel). Immediate selection of a particular filter may be made by clicking on a filter button; immediate motion of the focus stage is initiated by clicking on the SET button beside the focus box.

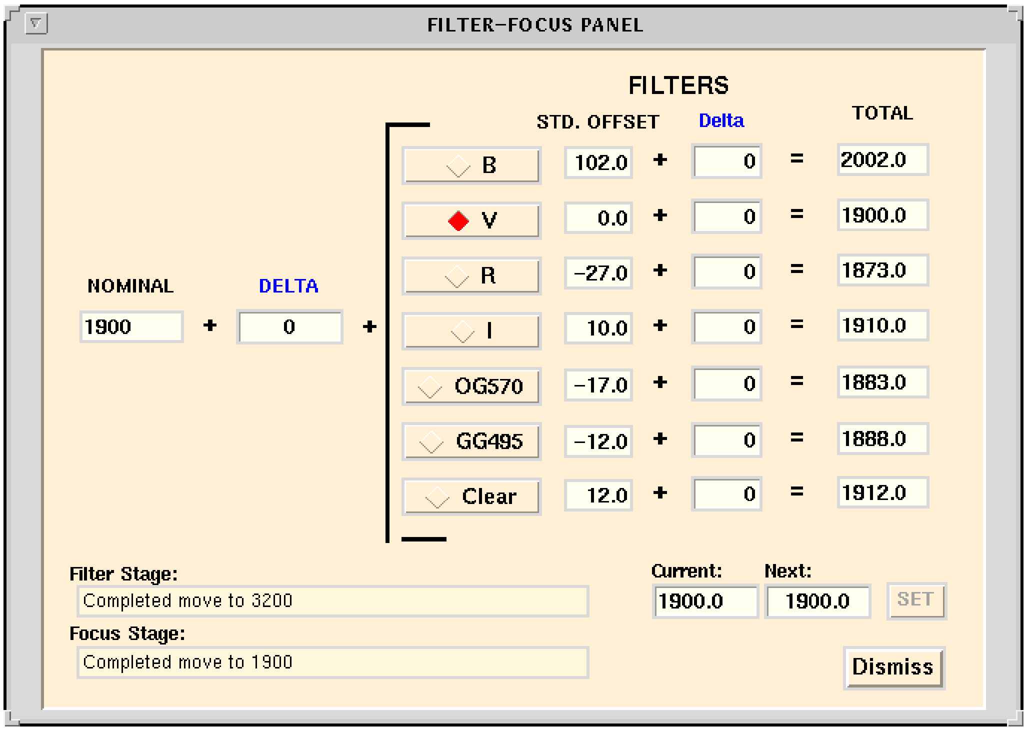


Figure 9: The Filter/Focus Subpanel

3.6 FCS: Flexure Compensation System

[This panel is not yet developed.]

3.7 CCD

[This panel is not yet developed.]

3.8 Setup

This panel is discussed above under Instrument Control.

4 Scripts/Setups

Setups may be saved to disk text files and later reloaded via the Save/Load buttons at the top of the GUI frame. Values are always reloaded as desired settings, so that Go must be pressed to perform the actual instrument reconfiguration. Since these are text files, they may be easily edited or examined with any text editor.

5 References

De Clarke & S. L. Allen, ADASS Conference 1996 (Virginia)

6 Appendix

6.1 Ksim

[Ksim is the instrument simulator. This section TBD.]

6.2 Hardware/Software Requirements

[Tested on DEC Alpha/OSF and Sun/Solaris. This section TBD.].

6.3 Starting up Ksim/DashBoard for demonstration

First, you must be running xauth for Ksim and Dashboard to communicate.

Execute /home/radec/phillips/cvs/deimos/bin/startup

When the Dashboard comes up, press the Init button (lower left of main panel).

To end, press Quit in both windows.