

Introduction

Observing with FLAMINGOS at the KPNO 2.1-m telescope is very much a do-it-yourself operation. The observers run the instrument to acquire their data, but they also are in charge of running the entire observatory, from checking N₂ bottles and opening and closing the telescope, to actually running the telescope control system (TCS) GUI to select targets in their observing caches. The operation of the telescope is pretty straightforward when using FLAMINGOS in imaging mode, however using it for spectroscopy is a bit more involved, as the observer additionally must setup the telescope guider.

This manual is comprised of snapshots of the 2.1-m telescope console controls that will be used for guiding, and which are referred to in the FLAMINGOS observer's guide. Except for the 2 flamingos on the first page, all of the snapshots come from the on-line web manual 2-m Observer's Handbook, available at www-kpno.kpno.noao.edu/2m-manual, and are copyright of NOAO.

The guide camera is an intensified CCD (ICCD), and it is attached to the instrument-to-telescope mounting adapter on an extension on the North side of FLAMINGOS. It is fed by a folding mirror mounted at the periphery of the MOS dewar vacuum window. Don't hit your head on the mount when filling FLAMINGOS with LN₂, as the mount has sharp corners. Some of the figures in the on-line manual (and this manual) label the guider controls as being for a *slit guider*. FLAMINGOS does not have a slit guider—it just uses the same guide camera controls that *are* attached to a guide camera which is a slit guider *for a different instrument*.

Some additional notes:

1. The guiding field was approximately 160 arcseconds *North* and 1600 arcseconds *South* of FLAMINGOS's pointing center the last time it was measured. These values may change between installations of the instrument; check with the instrument startup person for the current values.
2. The guider should be confocal with FLAMINGOS (made so on the T&E night to the best that it could be made so). You *should not* need to adjust it; please check with the your instrument startup person if you believe it needs adjustment.
3. The images on the center of the guide camera field of view usually have a tight core and a noticable tail to the South.
4. North is up and East is to the right on the guider video display.
5. The guider plate scale is ~0.53 arcseconds per pixel, with a format of 640 pixels × 480 pixels, or 339 arcseconds × 254 arcseconds, or 5.65 arcminutes × 4.24 arcminutes. For comparison, the field of view of FLAMINGOS is ~21 arcminutes.
6. FLAMINGOS is too heavy for the telescope rotator, and the instrument is fixed to the telescope such that the slits have a Position Angle of ~0 degrees.
7. Additionally, there are no wavelength calibration lamps or quartz flatfield lamps in the instrument mount. Consequently, wavelength calibration must be done from the OH sky lines, and flatfields must be done using the imaging flatfield lamps and a blank piece of dome (not necessarily the *white spot*). Please read the FLAMINGOS observer's manual carefully for more details regarding flatfielding.
8. IR spectra are usually taken by either walking the star along the slit, taking images at several different locations, or by using one of FLAMINGOS's dither scripts. These dither scripts nod the telescope back and forth between two beams, A and B, taking images in each beam. The beams are symmetrically located about the initial pointing center for the target on the slit. The dither scripts use guider lock positions (not required if taking spectra manually); please see the pages on this manual about the *TV Guider* GUI, and the FLAMINGOS observer's manual for the details about using these scripts.

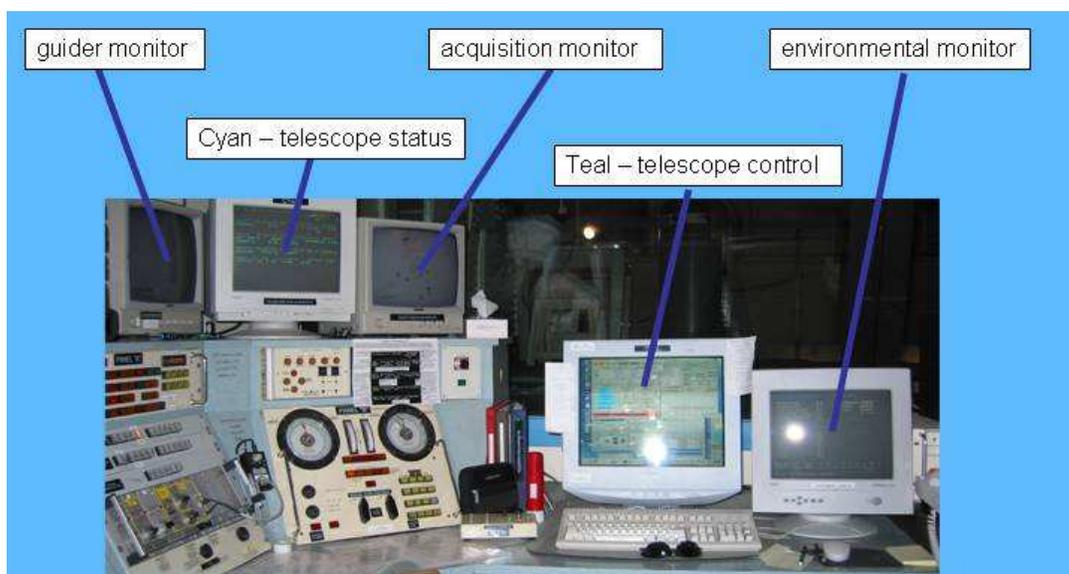


Figure 1—Operator's Station

The telescope operator's station is shown, with the video displays of the telescope control and status computers *teal* and *cyan* shown; these displays are replicated at the three monitors above the instrument control computer, *azure*, across the control room. For spectroscopy the additional monitors for acquisition and guiding (on either side of *cyan's* monitor) need to be turned on.

PANEL B, with the two round Selsen dials is to the left of *teal*, and PANEL A is at the bottom left of the image.



Figure 2—Panels A & B

A more direct view of PANEL A and PANEL B are shown. Guider controls are on PANEL A, and are explained in detail in a following figure.

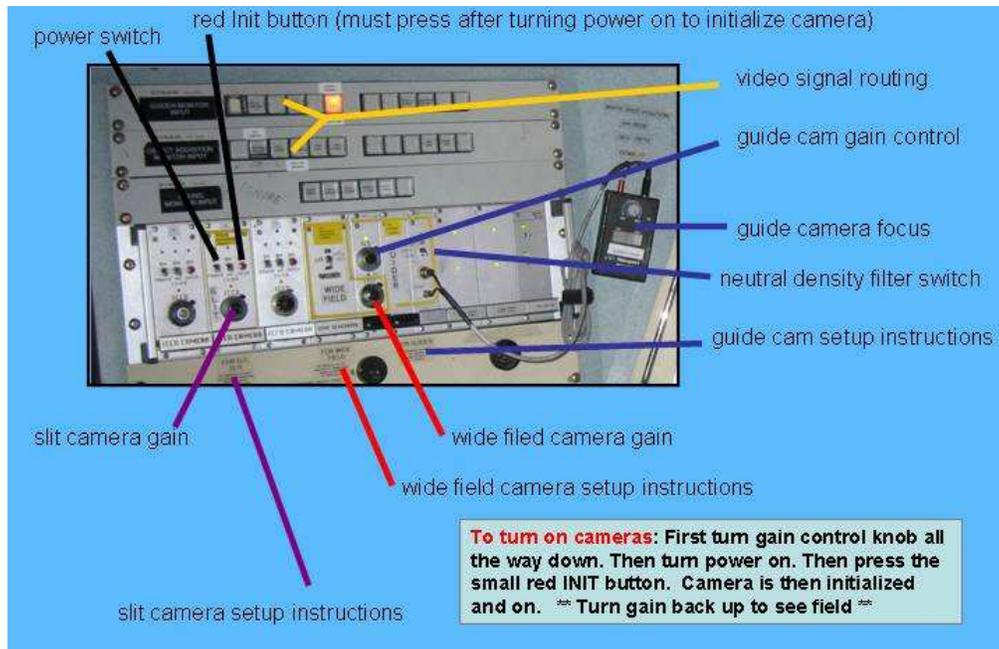


Figure 3—Acquisition and Guide Camera Initialization

The controls for the FLAMINGOS guiding camera reside on PANEL A on the second ICCD control unit from the left, labeled SLIT CAMERA in this picture; there should also be a label at the top which calls the control unit CAMERA B. When used with other instruments it really is a slit viewing camera, but with FLAMINGOS it is actually an off-axis acquisition and guiding camera. The control unit labeled GUIDE CAMERA is not used with FLAMINGOS, and should be left off.

To turn on the camera:

1. Turn the camera gain all the way down. The number on the dial should be at its lowest value (~1).
2. Check that the correct video routing push buttons are selected. I think the second-most button from the left in each row should be pushed in.
3. Flip up the left-most toggle switch; this is the power switch. Prior to this step you may also flip up the second toggle switch, which is attached to a neutral density (ND) filter, in order to provide some more protection to the camera.
4. Finally, press the red init button on the right side of the control unit.
5. If no stars appear on the acquisition video display, take out the ND filter (toggle switch down).
6. Now turn up the gain until stars begin to appear on the acquisition monitor (to the right of the TCS output display on cyan, cf. Figure 1). If no stars appear, it may be that there are no stars available for the current telescope pointing.

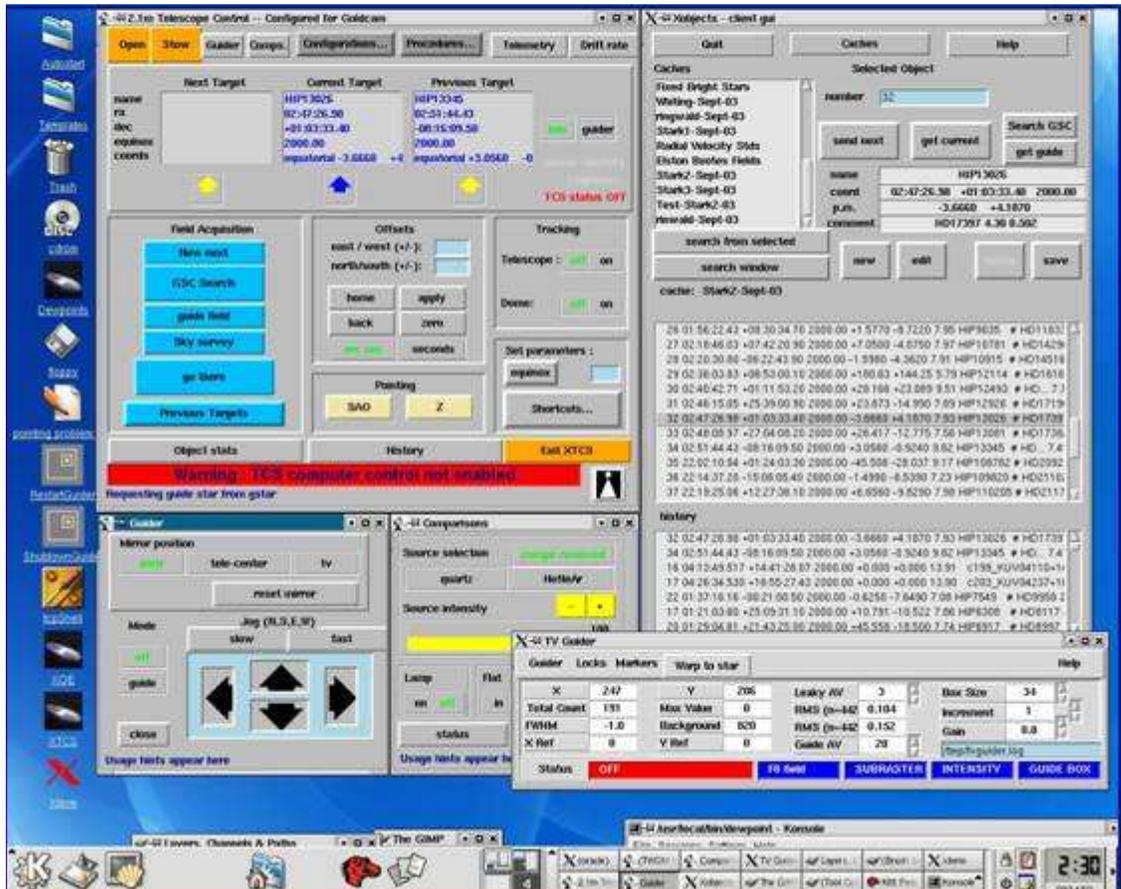


Figure 4—XTCS GUIs on teal.

The main windows of the XTCS control GUI are shown. The two GUIs on the lower left, labeled *Guider* and *Comparisons* may be closed, as they are not used. The GUI on the lower right, labelled *TV Guider* is the GUI for the Linux guider, and is the one used with FLAMINGOS. Two of the illegible shortcuts on the lefthand side of the screen are used for shutting down and restarting the Linux guider, and are shown in the next figure.

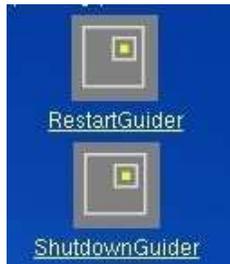


Figure 5—Linux Guider Icons

To shutdown the guider, click on the bottom icon once, then wait for the cursor to revert back to a normal cursor. This may take 10s of seconds; do not attempt to restart the Linux guider (the top icon) until the cursor is normal again. The top icon should launch the *TV Guider* GUI, and initialize the guider video display unit, to the left of the TCS output on cyan (cf. Figure 1).

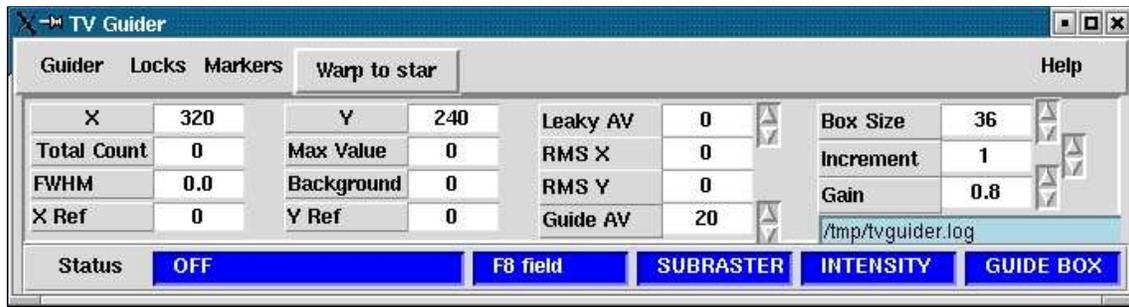


Figure 6—Linux TV Guider GUI

This GUI should appear when the Linux guider has been successfully restarted; the values shown are the initial default values. The guide box appears at the middle of the video display screen, at (X,Y) = (320, 240) pixels, and is 36 pixels (~19 arcseconds) square (the aspect ratio on the video display does not visually look like it is square, though). The guider averages 20 frames (bottom of the second column) from the guide camera, and the gain is 0.8.

The WARP TO STAR button will cause the guider to automatically move the guide box to the brightest star in the guider FOV. You should look at the star and decide if it is too close to the North or South edges of the guider FOV, as the spectral acquisition scripts will dither the telescope along a North-South axis, and the telescope beams need to lie within the guider FOV.

If the star selected by the WARP TO STAR button is poorly placed, you can move the guide box manually by placing the cursor over the TV Guider GUI, and then use the keyboard arrow keys to move the guide box. You should practice doing this, as it will be required during the steps to setup the lock positions for the two beams used by the FLAMINGOS dither scripts.

When the guider is on and guiding the bottom left blue status field which says OFF should be green, and claim that it is guiding. Use caution, and make certain it does not say Calculate Only—in this mode it is *not* guiding.

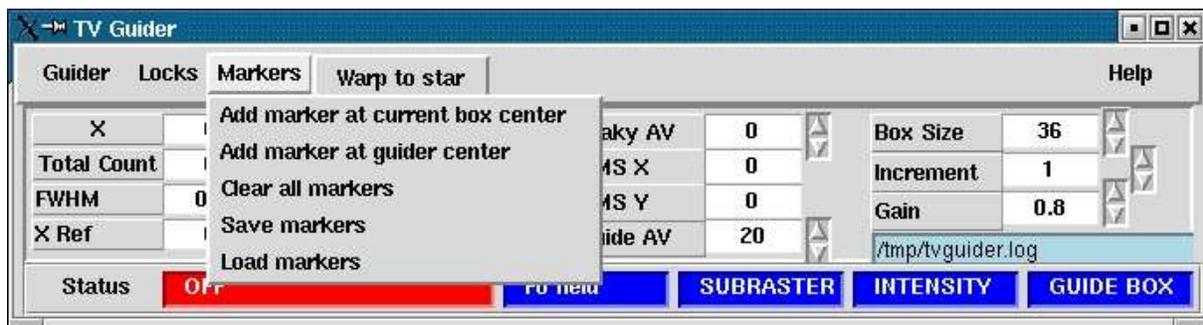


Figure 7—TV Guider Markers Pull-down List

The options on the MARKERS pull-down are all pretty self-explanatory. The markers will appear on the guider video display, and appears as a plus mark, approximately 36 pixels across. For FLAMINGOS we usually do not save or load the markers, but that doesn't mean the observer cannot play with these functions.

Guider On	<F3>
Calculate Only	<F2>
Guider Off	<F1>
Guider Lock	<F12>
Warp to star	<F8>
Calibrate guider	
Autotune guider	
Normal guiding	
Goldcam slit guiding	
Measure background	
Subtract background	
Snap image	
Quit	Ctrl+q

Define lock position 1 (target=current)
Define lock position 2 (sky=current)
Define lock position 3
Define lock position 4
Goto lock position 1
Goto lock position 2
Goto lock position 3
Goto lock position 4
Clear lock positions
Save lock positions
Load lock positions

Figure 8—TV Guider GUI Guider and Locks Pulldown Lists

The GUIDER pulldown list is shown on the left, and the LOCKS pulldown list is shown on the right. The functionality of the tasks on each list is self-explanatory.

For the GUIDER pulldown list, the FLAMINGOS observer only usually needs to use Guider On, Guider Off, and Warp to star. For the LOCKS pulldown list, they only usually use the Define lock position for positions 1, 2, and 3, Goto lock position 1, and Clear lock positions.

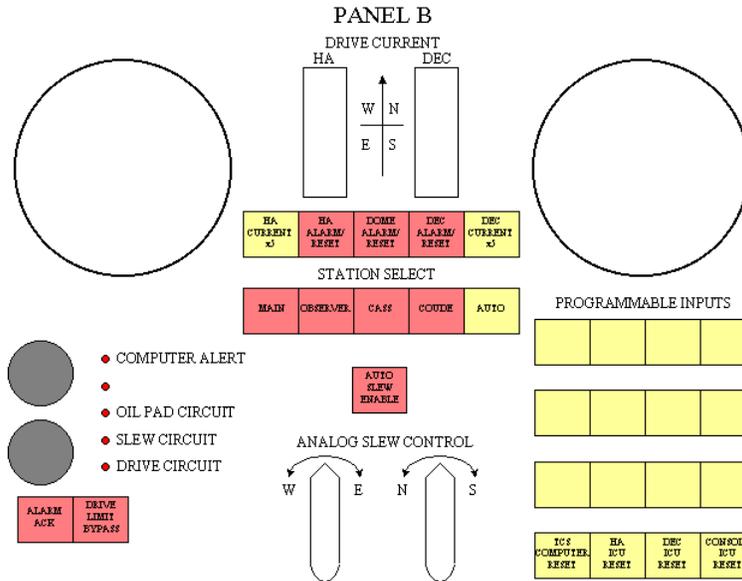


Figure 9—Schematic of PANEL B & Setup for Spectroscopic Dome Flats

Since the instrument mount does not contain a lamp source, the imaging quartz lamps and a blank piece of dome must be used for spectroscopic flats. The flats should be taken with the instrument and telescope conditions the same as for any target spectroscopic object, in order to account for any flexure between the slit and detector. This means that the imaging white spot will not be usable (*cf.* the FLAMINGOS Observer's Guide).

Thus, acquiring spectroscopic flats requires the observer be familiar with the XTCS GUI (telescope control; *cf.* Figure 4), and with PANEL B. When ready for flats:

1. Turn the dome tracking OFF in the XTCS GUI.
2. Enable the MAIN button on PANEL B, to take the telescope out of AUTO.
3. If the source target observation was quite long, consider disabling telescope tracking, and then slew the telescope back to the mid-point of the range of Hour Angles covered by the observation.
4. Now use the hand paddle (see the next figure) to rotate the dome until a relatively blank section of silvery dome is completely in front of the telescope. This is usually a 2 person operation.

If the target is too close to zenith, the flats must be taken with the telescope looking at the dome slit, either fully or partially closed. This is tedious, as for safety to the telescope primary the telescope must be taken to zenith and the mirror covers closed before the dome slit is closed. Then, after fiddling with the slit, the mirror covers may be reopened and the telescope repositioned to the correct Hour Angle and Declination. See the FLAMINGOS Observer's Guide for some more notes on this subject.

5. *N.B.:* do not turn on a bunch of lights (other than the flat field lamps) in the dome with the long slit open at night, as the other observers on the mountain will get very grumpy about scattered light from the 2.1-m observatory.



Figure 10—Main Hand Paddle Controls for Dome Orientation for Spectroscopic Flats

The main hand paddle, located at *teal* is shown above; another similar hand paddle is located at the instrument control computer, *azure*, across the room.

The telescope focus is adjusted with either of these hand paddles; the focus value readout appears on telescope status.

The dome rotation buttons are used for setting up for quartz spectroscopic flats; the azimuth position of the dome may be read on *cyan's* status screen.

The white spot is at Dec = $-28^{\circ} 15'$, HA = 0^{h} , and Dome Azimuth = 0° , however the white spot is probably not usable for spectroscopic flats except if the target object's declination is very close to -28° . As an additional reference position, the dome slit should be at Dome Azimuth = 180° .

Instead of the white spot, a clear silvery patch of the dome should be placed in front of the telescope by disabling dome tracking and rotating the dome into position (*cf. Figure 9*). If the target is too close to zenith, say in the range of declinations from $+5^{\circ}$ to $+60^{\circ}$ (approximately), there probably will be no good clear patch of the dome accessible except for the dome slit.

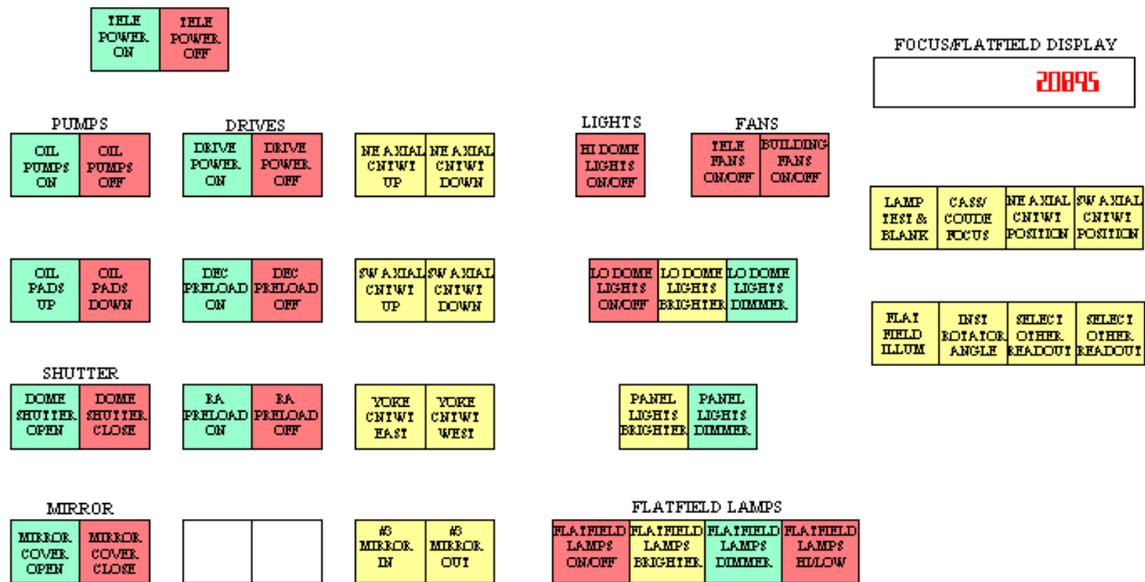


Figure 11—Schematic of PANEL A Controls Used for Spectroscopic Flat Fields

The buttons shown schematically in this figure are clearly seen at the lefthand side of Figure 2 (PANELS A & B), and reside above the controls shown in Figure 3 (Acquisition and Guide Camera Initialization). A close-up photograph of the righthand side of PANEL A also appears in the next figure.

The current value of the the telescope focus is shown in the lighted display at the top right. The button titled CASS COUDE FOCUS (second button from the left in the first row below the display) should be pressed in for the present focus value. To take flats, press in the button titled FLAT FIELD ILLUM (first button from the left on the next row down) and the voltage applied to the flat field lamps should appear when the lamps are turned on.

There are four buttons in a row at the bottom of the next column of buttons, to the left of the display controls. The first button turns the lamps on, the next two buttons control the voltage on the lamps, and the last button toggles between the faint and bright quartz lamps. The value in the FOCUS/FLAT FIELD DISPLAY should change when the brighter/dimmer buttons are pressed; the maximum value shown on the display is ~84 V.



Figure 12—Close-up Photograph of FOCUS/FLAT FIELD DISPLAY CONTROLS.

See the previous figure for details about these control buttons.