PLANAR CORRECTION Firmware Module

This manual section applies to the **PLANAR CORRECTION** firmware module. With this module included in the firmware, the controller will support functions to establish a tilted focal plane by selecting three sample points. The controller can then be enabled to make a Z-axis correction such that commanded Z positions are specified with reference to the established plane. Joystick moves also follow the adjusted plane.

LCD Display

The status line of the LCD display (DIP SW 2 UP) will show the status of the Planar Correction three-point acquisition and enable state. A single character on the bottom line contains the state information. Usually it will look something like this:

HRR1000:000 00:45:23

State

or this, for systems with ARRAY MODULE:

1   IIIIII00:45:23

State

The meanings of the state indicators are described below.

State	Description
1	Awaiting selection of first point
2	Awaiting selection of second point
3	Awaiting selection of third point
Z	Z correction enabled
G	Z correction not enabled (points selected)

Establishing the Correction Plane

To establish the location of the correct focal plane, three linearly independent points need to be selected. The simplest procedure is to use the joystick to move to the three points near the edges of the sample region of interest, focus the sample, and select the points with the joystick button. The LCD display can aid in guiding the user through the process.

Using the Joystick Button to Select the Focal Plane

The button on the JOYSTICK, held down for three seconds, is used to select a correctly focused XYZ location. The HOME button, held down for three seconds, will turn off the planar correction and initialize the firmware for subsequent point selection. These are the steps:

1. Check LCD. State should be '1' indicating controller ready to accept points.
2. Move stage to first XY point; focus on specimen surface.
3. (Optional) Press ZERO button on controller. This will enforce Z=0 is on focal plane.
4. Hold down Joystick button for three seconds. Verify that the state indicator on the LCD changes to '2'.
5. Move stage to second XY point; focus on specimen surface.
6. Hold down Joystick button for three seconds. Verify that the state indicator on the LCD changes to '3'.
7. Move stage to third XY point; focus on specimen surface.
8. Hold down Joystick button for three seconds. Verify that the state indicator on the LCD changes to 'Z'. The focus plane has been defined and the correction is being used for all Joystick and Commanded moves.

Using the HOME Button to Disable and Reset the Focal Plane Correction

The HOME button, held down for three seconds (or six seconds if RING BUFFER is included in the firmware as well) will turn off the focal plane correction if it is currently enabled, and will reset the place selection processes if the correction is already disabled. When the planar correction is disabled, but the three points have previously been defined ('G' state), you can reenable the correction with a three second press of the Joystick button.

Using Serial Commands to Select the Focal Plane

The CCB command can be used to automate the focal plane selection process. In general, some method of autofocus would be required to find the Z focus locations for the three point correction. CRISP autofocus, software autofocus, or ASI's hardware video autofocus could be used. Please see the CCB command for more details.

1. M X=# Y=# Z=# - Move to point 1
2. CCB Z=1 - Set point 1
3. M X=# Y=# Z=# - Move to point 2
4. CCB Z=2 - Set point 2
5. M X=# Y=# Z=# - Move to point 3
6. CCB Z=3 - Set point 3
7. CCB Z=4 - Enable planar correction

Stage Control with Planar Correction

Once you have established planar correction, you can pretty much forget that you have anything special going on. The stage will respond to Joystick moves, and manual focus moves with the controller's focus knob as expected. Commanded moves will be with respect to the corrected surface, again more or less as you would expect. The main LCD display shows the corrected Z-position and the WHERE command responds with the corrected current position. If you are curious to see how much correction is actually being made at any particular point, the two-column LCD display mode (DIP SW 1 UP) will show the true encoder target position on the right side of the Z-axis line. For example:

$$Z\ 0.00005>\ 0.041295E$$

Corrected Position   Actual Stage Encoder Target

You will notice that as you move around in XY, the corrected position will remain constant, but the actual stage encoder target will change as the correction demands.

Known Issues

Whenever the coordinate system of the stage is changed, as is done with the ZERO or HERE commands, or with the ZERO button, the height of the correction plane will change. For the ZERO command and ZERO button, the focus offset is also set to zero at this location. Hence, if the slide is in focus, pressing the ZERO button will not change anything. The HERE command for the X or Y axes will change the height of the focus offset, although the planar tilt will not be affected. After a HERE command, you should expect to have to find focus again.

Saving a Planar Correction to Flash

You can use the planar correction to "level" a sample holder once, and then save the correction to flash and it can be used again on start up. The save settings command SS Z saves the current correction tilt variables along with the Enable status to flash memory. When the controller is power cycled or reset, the saved variables are used when the controller initializes.

Serial Commands

The CUSTOMB (CCB) command is used to control the planar correction module.

advanced feature, ms2000
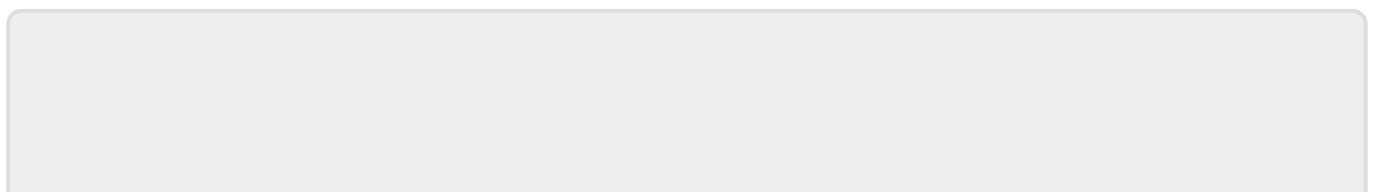
From:
- **Applied Scientific Instrumentation**

Permanent link:
https://www.asiimaging.com/docs/planar_correction

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