KODO Controller

Polar Alignment Instruction Manual

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Introduction

The polar alignment functions of the Kodo controller are designed to simplify polar alignment of the mount in the northern hemisphere using Polaris as a target.

Getting Started

Press [Polar] at the Kodo controller's opening menu to start polar alignment procedure with the opening screen shown below. Functions are activated by pressing the labeled software "buttons" along the left, right, and bottom edges of the display.
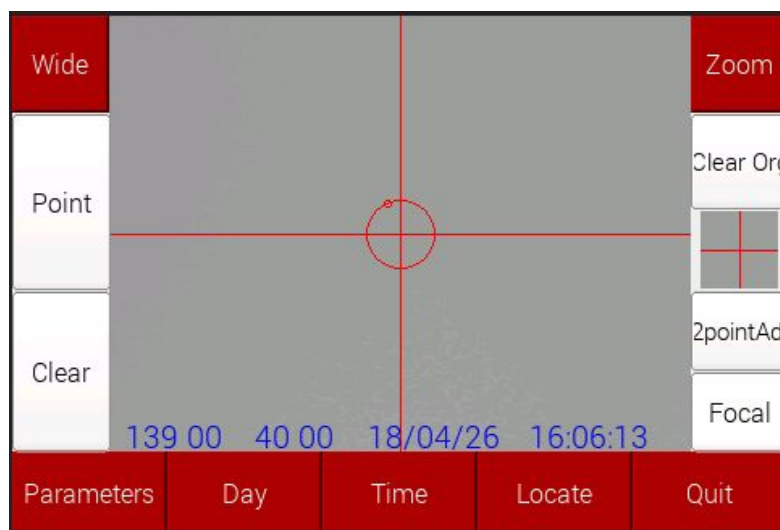
Along the bottom of the image display window in blue lettering are the current longitude, latitude, date, and time.

The menu functions are as summarized below:

Wide	Press [Wide] to enlarge the field of view to cover ~ 11 degrees.
Zoom	Press [Zoom] to zoom into the the center area.

| Point	Used for centering process.
Clear	Used for centring process.
Clear Org	Used for centering process.
2pointAdj	Measures the degree of 2 star separation. It is set at the factory. Users need not use this function.
Focal	Input lens focal length. The default focal length is set at the factory if the lens and the controller are purchased at the same time. This needs to be set only when a lens is purchased separately.

Parameters	Sets camera exposure time and gain.
Day/Night	Toggles between day and night operation mode. Day mode is used for initial setup.
Time	Sets the current date and time.
Locate	Sets the current location.
Quit	Exit the polar alignment operation menu.

Initial Setup

On first use, set Kodo polar alignment parameters using the bottom row functions of the menu screen above.

[Parameters]

Use the [Parameters] function to set the camera parameters using the screen pictured below. Set each parameter value using the corresponding [Up] / [Down] buttons.
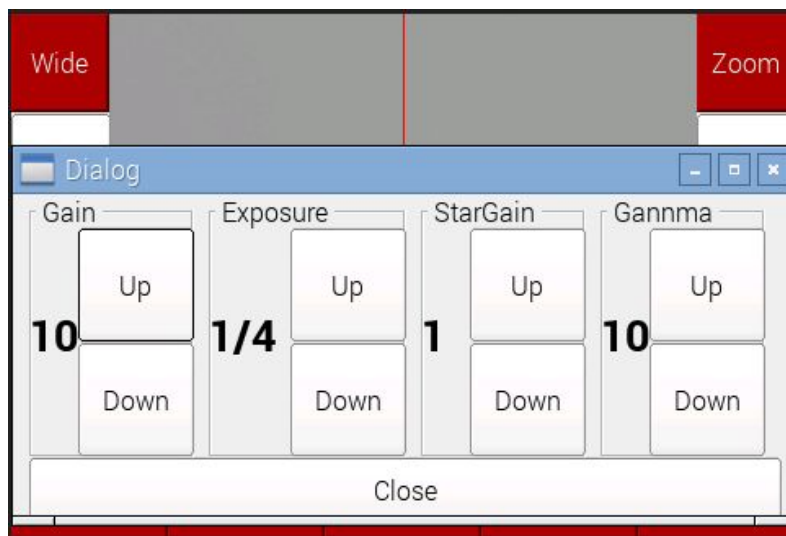
Gain	Set camera gain from 1 to 10.
Exposure	Set exposure time from 1/32 second to ½ second.
Gamma	Set gamma from 0 to 10.
StarGain	Adjust the star image contrast. The higher the value, the darker the background and higher contrast. Image noise also increases.

The values above are the factory default recommended values.

[Time]

Use this function to set the local date and time using the parameter controls below:

The date and time settings are stored in an on-board battery-backed clock so the time need not be set each time.

From this screen, use the [Local Time] button to set the UTC offset so UTC can be calculated from the time set above.

[Local Time]

Use this function to set the UTC offset of your local timezone (e.g. PST is UTC-8, PDT is UTC-7).

[Locate]

Press [Locate] to set the current latitude and longitude:

Latitude and longitude values are set in degrees and minutes using the [Up] / [Down] buttons. For longitude, select the appropriate [East] or [West] direction for your location. The [Save] buttons on the right side allow up to 4 observing locations to be stored for future use. Recall locations using the buttons to the left of the [Save] buttons. Each is labeled with the stored latitude and longitude values.

[Focal]

If the Kodo controller was purchased as a package with the polar alignment camera, the camera's focal length should already have been set at the factory. If a new camera is being integrated with the Kodo, use the following screen to set the camera lens focal length in mm.

Camera Leveling Setup

Before polar alignment can be accomplished, the polar alignment camera's level position must be set. This is done by first leveling the mount itself. Then rotate the mount's RA axis and camera to point to the horizon and mark the RA axis position so that it can be used during the polar alignment procedure. This is best done during the daytime when the horizon can clearly be seen. Follow up in the evening by determining the center of rotation of the polar camera's field of view using Polaris as a target since it is relatively stationary.

Camera / RA Axis Centering Setup

Determination of the RA axis center of rotation as seen by the polar alignment camera is necessary prior to running a polar alignment procedure. If the mechanical relationship between the RA axis and polar alignment scope is not disturbed between observing sessions, this need only be done once. Otherwise, to insure pointing accuracy, it should be done each time the mount is set up.

At night, with the mount RA axis pointing approximately at the north celestial pole, verify that Polaris is visible in the polar alignment camera. It need not be exactly centered for this step, but should be visible to the polar alignment camera no matter which way the RA axis is rotated. In the procedure described below, three observations of Polaris will be recorded with the RA axis rotated about 90 degrees each time, after which the software will calculate where the RA axis center of rotation is located in the camera's field of view.

To start the procedure, with Polaris visible in the Kodo display, press [Point] in the main menu of the Polar Alignment menu. The software will find Polaris and place a green cross on it as shown below:
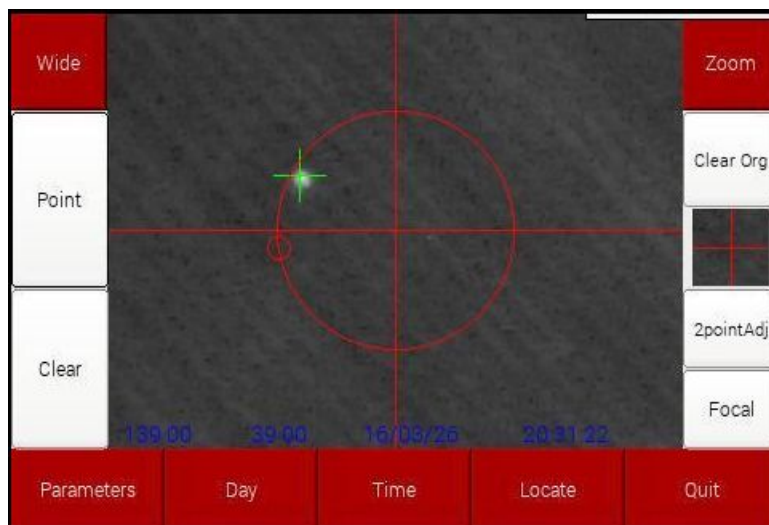
Now rotate the RA axis about 90 degrees and press [Point] again.
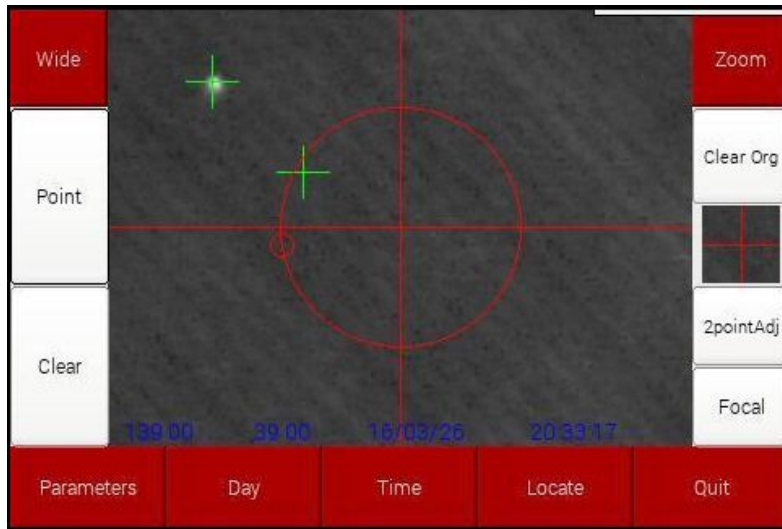
Rotate the RA axis another 90 degrees (to about 180 degrees from the original point) and press [Point] a third time so that 3 different positions for Polaris have been marked.
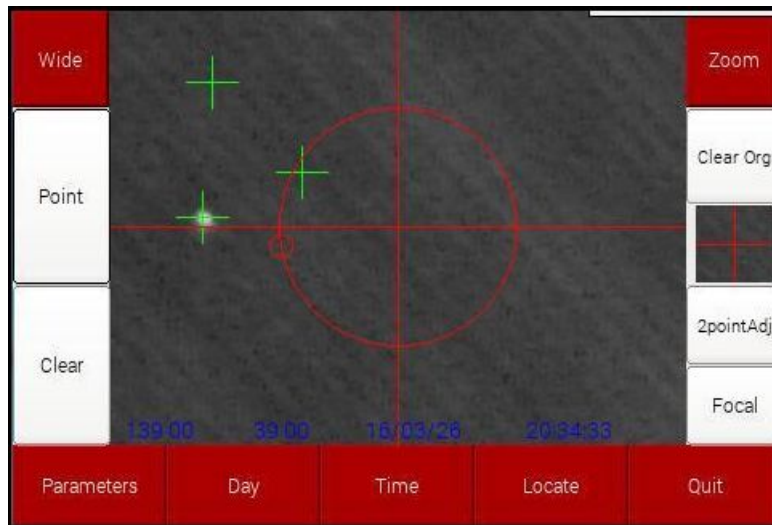
Press [Point] for a fourth time to calculate the center of the RA axis rotation. The display will shift the display screen to place the red crosshair on the center of rotation as shown below.
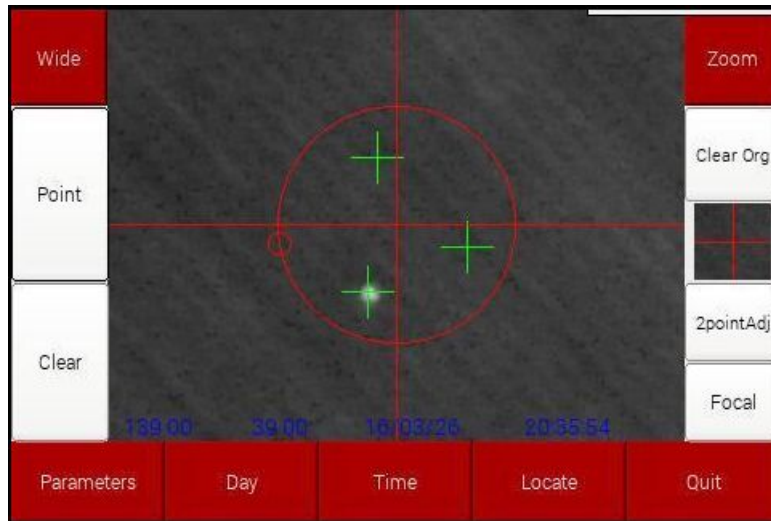
Press [Point] once more to accept the calibration (green crosses will disappear), or press [Clear] to back up to previous screens to re-do the pointing calibration. Press [Clear Org] to place the red crosshair back on the center of the camera's field of view.

Polar Alignment Procedure

Once the preceding setup procedures have been completed, follow the procedure below to fine-tune polar alignment of your mount.

1. Level the mount, roughly polar align the mount, and rotate the RA axis to the mark made during the setup procedure described previously.

2. Initially select [Wide] for the polar alignment camera view and bring Polaris into the field of view using the mount's altitude and azimuth (not RA and Dec) adjustment controls. Once the software has located Polaris, it will place crosshairs on the north celestial pole position and a small red circle on the correct position for Polaris.

3. Press [Zoom] and use the mount's altitude and azimuth adjustment controls to move Polaris (circled in green) into the red circle. The numbers shown in the upper left corner of the display show the pointing error in camera pixels. Once Polaris has been placed into the red circle, polar alignment is complete.