

A page out of a future MoCoFiz Blackbox manual

Setup parameters for the Kuper system

Since the Preston FI+Z system operates on absolute position data, it becomes important that the axis setup parameters in the Kuper properly translate the absolute positions from the FI+Z hand-control unit to the incremental positions that Kuper relies on. These parameters are also important in translating the Kuper's incremental positions back to absolute positions for the FI+Z motor-driver unit (MDR).

Setting Motor and Encoder Channels

Each axis of the three MoCoFiz Blackbox axes can be individually jumpered for both encoder channel and motor channel. Usually, the motor channel and encoder channel of a particular axis are jumpered to the same channel number, but this is not required. Each lens motor channel simply needs to have assigned to it the correct hand-control encoder channel. The channels that a particular MoCoFiz Blackbox is jumpered to are usually indicated on the bottom of the unit.

Setting Joystick Sensitivity

The MoCoFiz Blackbox translates the full range of each FI+Z axis into 16,384 quadrature encoder positions and 16,384 motor step pulses. Because of this one-to-one relationship, the joystick sensitivity must be set to 1.000 (positive) to allow the range of each hand-control to match the range of the lens motor. If more sensitivity of a hand-control is desired, the Preston FI+Z Lens Scale Expand feature should be utilized, instead of modifying the joystick sensitivity.

Setting Pulses-per-Unit

The pulses per unit may be set to any positive number for the sake of the Kuper's position display. One should keep in mind, however, that the range of the Kuper's display would NOT change, even as you change lenses to ones with different amounts of travel. This has two advantages that make principle photography quicker and more reliable: First, when the camera assistant changes a lens, the motion control operator needs to do nothing. The ranging of the lens is done automatically by the Preston FI+Z. Second, since the positions saved as move data for post-production is consistent, regardless of the lens that was used, post-production personnel can extrapolate focus distance, zoom focal length and iris position from the move data and the camera report (which indicates which lens was used).

In order to easily extrapolate focus, zoom and iris data from the move file, we recommend that you set the pulses per unit to 16,384, so as to display 0.000 to 1.000 as each lens channel's range of travel. The direction switch on the Preston MDR should then be set so that 0.000 corresponds to infinity on focus, to shortest focal length on zoom, and stopped down on iris. Three simple equations then translate 0.000 to 1.000 into the actual lens values, based on the actual range of each lens. This approach follows the philosophy of

shifting more of the responsibility to post-production, where re-shooting is easier and the cost of mistakes is much lower.

In summary, to configure the Kuper to use the MoCoFiz Blackbox and Preston FI+Z, the following settings need to be set in the Kuper software:

1. Each lens motor channel must have the corresponding hand-control encoder channel assigned to it as a joystick.
2. The joystick sensitivity for each lens channel must be 1.000 and positive.
3. The pulses per unit for the lens channels may be anything, but must be positive. For convenience, if it is set to 16,384 pulses per unit, the position display will range from 0.000 to 1.000
4. All three lens channels must be configured in the Kuper software for the 'Sync' indicator on the MoCoFiz Blackbox to be operational. You do not need to have all three motors attached or plugged-in, however.

Operating the Kuper system with the MoCoFiz Blackbox

When operating the Kuper with a MoCoFiz Blackbox and a Preston FI+Z, the normal problems that a motion control operator needs to deal with will still exist, but they will be much simpler to deal with. This includes axis calibration, the homing of axes, and axis limits. The FI+Z and the MoCoFiz Blackbox handle much of this automatically.

Lens Calibration and Limits

The Preston FI+Z handles axis calibration and limits automatically. When the FI+Z is powered-up, or the lens is changed, the FI+Z 'ranges' the lens. It does this by moving the lens through its full range of travel, in both directions, and then translating that range over the 16,384 step pulses that the Kuper lens channels are configured to use. It also sets limits at the ends of the lens's travel. This relieves the motion control operator of having to change anything in the Kuper software when the camera assistant changes the lens. One toggle switch for each motor is located on the MDR to 'flip' the range of motion, allowing the operator to select which end of travel on the lens is position zero.

Hand-Control Unit 'Sync'

To 'Sync' the FI+Z refers to the process of sending the FI+Z motors and the associated Kuper positions to the positions set by the hand-control unit. It is usually required after a playback pass, when you wish to switch control of the lens back to the hand-control unit. The 'Sync' light indicates whether or not the FI+Z motors are in-sync with the hand-control unit. If the 'Sync' light is green, then all three of the FI+Z motors are at the same position as their associated hand-control. If any one of the three lens axes is not in the same position as its hand-control, the 'Sync' light is red.

When you need to sync the lens to the hand-control unit, you simply put the three lens channels into either RECORD mode or NEUTRAL mode, and then push the 'Sync' button. The MoCoFiz Blackbox will evaluate the lens motors positions and the hand-control unit positions, and then issue encoder pulses to the Kuper to move the lens to the positions dictated by the hand-control unit. The 'Sync' light will then be green and remain green as long as the lens follows the hand-control unit. While the lens motors are moving, the 'Sync' light will go out.

Note that the 'Sync' light is only one indicator, trying to indicate the state of all three lens channels; so all three channels must be enabled in the Kuper for the 'Sync' light to have meaning. All three motors do not have to exist at the camera, however. Unless you are recording different lens channels on different passes, it is good practice, when changing modes, to switch the three channels together. Alternately, if you know that you will not be using a channel, such as iris, you may simply leave it's mode set to NEUTRAL.

Homing the Lens Axes

Homing is done only once at power-up. After that, the Kuper and the FI+Z motors stay synchronized, even as you change lenses and swap-out motors. You can even disconnect or power-down the Preston Motor-Driver (MDR) without losing synchronization; The MoCoFiz Blackbox holds all information necessary to maintain synchronization. Homing is accomplished with the 'Zero-All' functions within the MoCoFiz Blackbox and the Kuper software.

The 'Zero All' function on the MoCoFiz Blackbox does more than just zero positions; it also moves the lens motors and Kuper lens channels to the positions selected by the hand-control unit. It is used in conjunction with the Zero-All function of the Kuper to synchronize the FI+Z motors to the Kuper, and the Kuper to the FI+Z hand-control unit. The procedure is as follows:

1. **Put all three of the FI+Z channels in RECORD mode or NEUTRAL mode** on the Kuper. This is necessary because the MoCoFiz Blackbox synchronizes the Kuper to the FI+Z hand control unit by sending encoder pulses to the Kuper.
2. **Execute a Zero-All command** ("za") on the Kuper, or individually zero the three lens channels. This will set the Kuper's initial positions for those channels to 0.000
3. **Push the 'Zero-All' button** on the MoCoFiz Blackbox. This will set the MDR motor positions to zero, to match the Kuper positions. If the hand-control unit is attached, the MoCoFiz Blackbox will issue encoder pulses to the Kuper to bring the Kuper's positions in line with the positions of the hand-control unit. You will see the positions displayed on the Kuper count up to reflect this. As a result of these encoder pulses, the Kuper will send step pulses to the MoCoFiz Blackbox to drive the lens motors to these same positions.

The hand-control unit, the Kuper and the lens motors will now all be at the same positions, as determined by the hand-control unit. If you now move on of the hand controls, the lens will follow, as will the position display on the Kuper.

A few things to note about the 'Zero-All' function: First, the Preston hand-controls may be at any position in their range, but **must not move** between the time the 'Zero-All' command is issued to the Kuper and the 'Zero-All' button is pressed on the MoCoFiz Blackbox. Second, the motors do not have to be engaged to the lens. They do not even have to be plugged in. For that matter, the MDR doesn't even need to be powered-up. The absolute positions are stored in the MoCoFiz Blackbox, and it will send the motors to the correct position after the MDR has ranged the lens. Third, the 'Zero-All' function need only be done once, at power-up. All positions are then tracked, even when switching between record and playback modes, such that the Kuper and the lens motors should never be out of sync. Fourth, the three lens channels need be in RECORD or NEUTRAL mode during the 'Zero-All' procedure only if the Preston hand-control unit is going to be used for lens

control. If the lens channels are not in RECORD mode or NEUTRAL mode, their positions will remain at zero.

Record and Play with the Hand-Control Unit

One of the most useful features of the Kuper / MoCoFiz / FI+Z combination is how it emulates a non-motion control environment. The camera assistant operates the lens controls as he would had it not been motion control. The Preston hand-control unit is a key component of this feature.

When the three lens channels are set to RECORD mode in the Kuper, the hand-control unit behaves as it normally would. The fact that all lens control passes through the Kuper is transparent, and 'Camera-Run' can be operated from both the hand-control unit and from the MoCoFiz Blackbox.

During a record pass, the MoCoFiz Blackbox makes the hand-control unit appear as three encoders to the Kuper. As the camera assistant moves the hand-controls, the Kuper passes that encoder activity on to the lens motors in the form of Step/Direction pulses. The Kuper also records that activity for motion playback or for post-production.

When the Kuper has the three lens channels in PLAY mode, it will control the lens motors, and the hand-control unit will be ignored. In PLAY mode, the Kuper lens channels and the Preston hand-control unit will not necessarily be at the same positions. When you wish to put the lens channels back in RECORD mode, you will want to send the lens motors to the positions indicated on the Hand-control unit. Whether the three lens channels in the Kuper and the three hand-controls are at the same positions is indicated by the 'Sync' light on the MoCoFiz Blackbox. If the motors are currently moving, the light is out. Once they stop, if the positions that the motors came to rest are the same as the positions of the hand-controls, the 'Sync' light is green. If the positions do not match, the 'Sync' light is red. Remember that you cannot be in 'Sync' unless you are in RECORD or NEUTRAL on all three FI+Z axes.

To re-synchronize the Kuper to the hand-control unit after playback, simply put the three lens channels back into RECORD or NEUTRAL mode and push the 'Sync' button on the MoCoFiz Blackbox. The MoCoFiz Blackbox will then issue encoder pulses to the Kuper to instruct it as to where the hand-controls require the motors to be.