

Version 4B ROM Upgrade to the ST-4 User Instructions

The version 4B ROM (read only memory) upgrade to the ST-4 adds many new features and enhancements to the stand-alone unit. No change will be noted in the use of an ST-4 as an imaging camera, except that the noisy line at the bottom of the screen now is zeroed. The version 4B ROM adds the capability of different calibration times in X and Y axes, making corrections based on the average of N cycles, and a larger track box for better performance with long focal length telescopes. The unit is now easily interruptable during long exposures and moves. The alarm can be set to go off after a selectable number of cycles. You can now return to the previous track position, which is very handy if you have to interrupt a long exposure due to some other problem. And, the ROM version number is shown upon power up. All of these changes were motivated by user comments. This memo describes the use of these new functions.

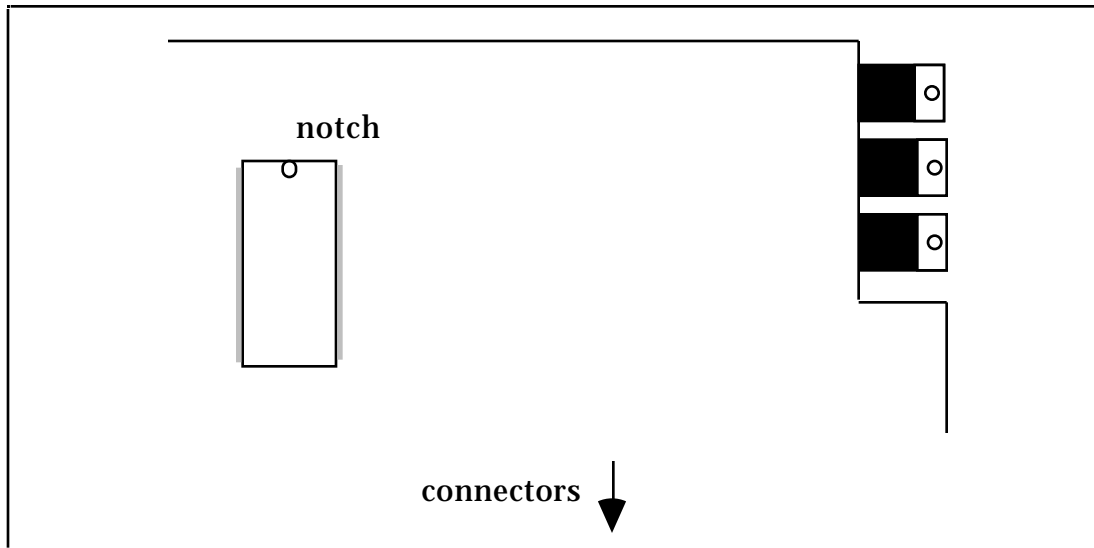
Installing the Version 4B ROM IC

If you are familiar with electronic components it is suggested you install the new ROM yourself. If you do not feel comfortable with this task, ask a knowledgeable friend or send the ST-4 box back to SBIG, where we will install it at no charge.

First of all, disconnect all the cables and take the back off the ST-4 box. Keep the screws in the same relative positions and they will be much easier to reinsert. Find the 28 pin IC (integrated circuit) with the label taped to it showing the version number and date (near the center of the board). Place the box on a padded table so that the notch in the chip is away from you and remove the IC. We provide an IC puller tool to facilitate removal of the old ROM. Please be careful when using this tool to insure that you do not get the lip of the tool under the socket that holds the ROM, but only under the ROM itself. Once you have removed the old ROM, place the new ROM on the socket:

**TAKE CARE THAT THE NOTCH IS IN THE SAME ORIENTATION AND THAT THE
PINS ARE LINED UP WITH THE SOCKET**

As shown in the figure below, the notch should point away from the 4 connectors along the bottom edge of the printed circuit board. Using both thumbs, press the IC into the socket. Once again, make sure the notch is on the same end as the neighboring large ICs (if it is not it will be destroyed by power-up), and reinstall the back cover. Reconnect the ST-4.



Version 4 Operation

When the ST-4 is powered up, the LED display will momentarily read Fr 4. This stands for Firmware revision #4. The ST-4 will then go into FIND AND FOCUS mode. If you interrupt it and go through the menu, you will see the following options.

EA - Exposure Adjust. Sets exposure; no change from before.

b - Boost. The boost setting controls the gain of an internal amplifier in the ST-4. A boost of 1 is best for bright stars, and 4 for faint stars. Use the boost setting to obtain displayed star brightness of 10 to 70. The displayed values at long exposures (more than 10 seconds) at a boost of 4 become sensitive to dark current drift in the CCD and may cause the ST-4 to lose track in multi-hour exposures with weak stars (<10).

bA - brightness Adjust. Same as before. An A for average will generally work but for faint stars an F setting may be better. In the F mode each pixel is replaced by the sum of the 3 by 3 box centered on that pixel.

SA - Scintillation adjust. Number of pixels error between successive corrections required before ST-4 assumes calibration factors are off and starts modifying them. Experiment with this number. A factor of 1 means the ST-4 modifies the calibration factors much of the time while a factor of 10 effectively turns off this correction. Longer focal length telescopes or poor nights require a greater factor. If factor is too low the drive may "run away" and lose the star.

FL - Focal Length. The settings are S for short and L for long. Use L when the guide telescope focal length is greater than 50 inches. The short setting causes the track box to be 9 by 9 pixels, and the long setting produces a track box of 33 by 33 pixels. The long setting is better when the telescope is slightly defocused or if the seeing is poor. As a general bit of advice when using the ST-4, if you plan on tracking for long periods of time (greater than 1 hour) using the Long Focal Length mode, try to avoid using the Boost of 4 mode where the star brightness is less than 20 counts. For long

tracking episodes please spend the time to either find a brighter tracking star, or increase the exposure time (EA parameter) to have a minimal star brightness of 20.

C1 - Calibrate time 1. Move duration in calibrate mode, x axis. Set to 1-20,30, or 40 seconds.

C2 - Calibrate time 2. Move duration in calibrate mode, y axis. Set to 1-20,30, or 40 seconds.

H1- Hysteresis time 1. This is the number of tenths of a second required for the drive to take up the backlash when reversing direction in the x axis. Once again, some experimentation is advised. Setting this number too low or to zero slows down the correction, but this is generally not a problem.

H2 - Hysteresis time 2. Backlash time in Y direction.

AA - Averaging Adjust. This is the number of exposures the ST-4 should average before making a move (1 to 10). Very good drives will benefit from setting this parameter to a value greater than 1. Poor drives drift so fast that averaging exposures merely lets the star drift farther from the center. Values of 2 to 4 are recommended for initial experimentation. Display shows an A when averaging, but not correcting.

AL - Alarm. This is the number of cycles where the star is lost before the alarm sounds. Setting the value to 1 allows one to terminate an exposure immediately if the star is lost, and salvage the picture.

One other feature is also available. If you interrupt tracking and wish to return the guide star to the same pixel location again hold down the MODE key and press TRACK. When you see the first track error displayed release the mode key. The ST-4 will drive the telescope back to the previous position over the next few cycles.

Future Upgrades

Please keep us informed of features that you would find useful in future upgrades, or software bugs that we did not encounter. We have to strike a balance between number of options and ease of use. The menu list is already somewhat long, but we feel the added features are worth the increased complexity. We've included a short list of commands that can be taped onto the back of the ST-4 to serve as a reminder.

Command List

EA	Exposure Adjust
b	Gain Boost
bA	Star Brightness Adjust (Average or Faint)
SA	Scintillation Adjust
FL	Focal Length (Short or Long)
C1	Calibration Time , X Axis
C2	Calibration Time, Y Axis
H1	Hysteresis, X Axis, tenths
H2	Hysteresis, Y Axis, tenths
AA	Averaging Adjust
AL	Cycles between Alarm Beeps