

# eFinder cli

## Basic Functionality

### Local Sync / Align

On demand from a host device over USB, the eFinder will image, solve and report back true sky RA & Dec. Depending on sky conditions this can take about 0.5 sec to complete.

Experience has shown that displaying number of stars found and solve time can be useful for the observer. This allows the observer to slightly change exposure time if needed to suit changing skies. See Focus & Exposure Utility below.

### Offset Calibrate

Performed at the start of each observing session, after main scope is collimated.

The main scope is pointed accurately at a bright star (Polaris recommended). Offset Calibrate is commanded over USB, whereupon the eFinder will image, solve and report the name or designation of the brightest star found in the image. If not correct the user repeats, after checking with the Focus & Exposure Utility. The offset between eFinder and main scope is saved to disk and used thereafter until re-calibrated.

The current offset values being applied can be requested over USB. The offset can be reset to 0,0 if required.

### Focus & Exposure Utility

Performed at initial commissioning. Repeated if 'fail to solve' becomes a problem.

The main scope is pointed accurately at a bright star (Polaris recommended). On demand over USB, the eFinder takes an image, and attempts to solve. The peak star signal (0-255), the number of stars found, a thumbnail image of the brightest star and a PSF plot across that brightest star, are all then available to be downloaded over USB.

It is preferable to display all this data on one screen, with the option to increase or decrease exposure (0.1 sec steps) and repeat the process.

The observer can then adjust focus and exposure as required. Once set, focus rarely if ever needs adjusting.

The aim is to get a peak signal around 220 and around 30-50 stars. Over-saturated star images may be ignored by the solver. This is generally OK for local syncs, but not for Offset Calibrate where the wrong 'brightest star' may be reported. Auto exposure is currently being explored.

# Communication Protocol, iss15

To eFinder	Command	Return string	Function
getVersion	:GV#	:GVdd.dd#	Returns the eFinder firmware version number
incExposure	:SEsd#	:SEdd.d#	Increments and returns new exposure value [secs]
GetAutoExp	:GX#	:GXdd.d#	Runs the auto exposure routine. Returns value determined [secs] Send back with :SX to accept, use and save.
SetExp	:SXdd.d#	:SX1#	Set and saves Exposure [secs].
incGain	:SGsd#	:SGdd#	Increments and returns new gain value
doOffsetCal	:OF#	:OFnamestring, HIPid, d.ddd, d.ddd#	eFinder takes exposure, solves and reports name of star found (or if not named "") or 'fail', HIP number, x offset [degrees], y offset [degrees]
doSolve	:PS#	:PSd#	eFinder images and plate solves. Reports '1' (success) or '0' (fail)
doFocus	:FS#	:FSd#	eFinder takes image, attempts to solve. Returns solve '1' (success or '0' (fail)
getOffset	:GO#	:GOd.ddd,d.ddd#	Returns current stored offset value x offset,y offset [degrees]
resetOffset	:SO#	:SO1#	Resets offset to 0,0. Returns '1'
getStars	:GS#	:GSddd#	Returns number of stars found
getPeak	:GK#	:GKddd#	Returns peak signal of brightest star 0-255
getPSF	:GP#	:GP+Byte array	Returns PSF (32x32 array as bytearray)
getThumbnail	:GI#	:GI+Byte array	Returns thumbnail image of brightest star (32x32 array as bytearray)
getScopeAlt	:GA#	:GAdd#	Returns the approximate telescope altitude [degrees] or, '-1' if below horizon, '99' if past zenith or '-2' if no sensor fitted.
getRADec	:GR#	:GRddd.dddd DD.dddd#	eFinder reports the RA & Dec of the last successfully solved image. J2000 epoch
getSolveTime	:Gt#	:Gtdd.dd#	Returns solve time for the last successfully solved image [secs]
imageSave	:ISd#	:ISd#	d=1, on solve, a contrast stretched image will be saved and accessible via the browser. Returns 'IS1'. d=0 turns it off, with return 'IS0' Stops automatically after 100 saves, 'IS0' is returned.
setWifi	:SW#	:SWdd#	Returns eFinder wifi status First digit is on '1' or off '0' Second digit is '1' Hotspot, '0' Infrastructure
	:SWd#	:SWd#	Switches between Hotspot '1' or Infrastructure '0'
	:SQd#	:SQ1#	Turns wifi on '1' or off '0'
	:SHxxxx yyyyyyyy#	:SHd#	Turns Hotspot on with SSID 'efinderxxxx' and password 'yyyyyyyy'
setLed	:SBddd#	:SB1#	Sets running brightness level of LED, 0 - 100
sendToAux	:SCxxxxxxxxx#	:SCyyyyyyyyy#	Sends the text 'xxxxxx' on to the Aux usb port (if fitted), returns the next reply on that port.
setTestMode	:TSd#	:TS1#	eFinder test solves using stock images. d = 'N' for northern hemisphere, 'S' for southern.
TestModeOff	:TO#	:TO1#	eFinder uses camera to get image.

Note: the number of digits 'd' returned may vary for some commands. It is advisable to use the '#' character to bound the reply.

## Notes on communications.

After booting, the eFinder will send 'ID=eFinderLite' over USB.

Thereafter it will be ready to receive commands. All commands will be sent a response, whether the requested data (getRADec), or a simple single digit (doSolve). Do not send a new command until the previous response has been sent by the eFinder. Time to respond can vary from a few milliseconds to a couple of seconds. doOffsetCal, doSolve and doFcous all require imaging and solving and hence take upto a second.

The star thumbnail and PSF are downloaded as bytearrays. They are row ordered.

## Operation Considerations

The eFinder is powered via the USB cable. It draws about 180mA but surges during boot to nearer 500mA.

On an average sky, an exposure of 0.1 seconds and gain of 30 will produce an image that's solves in around 400ms. Gain can normally be left and exposure adjusted to achieve optimum performance.

Example:

A typical sequence. Host computer needs an updated RA & Dec from a plate-solve

:PS# after about 0.5 sec eFinder returns, :PS1# (solved) or, :PS0# (failed to solve)

:GR# if solved, get RA & Dec solution

Optional ...

:Gt# Gets solve time

:GS# Gets number of candidate stars found in image

:GK# Gets peak signal in image