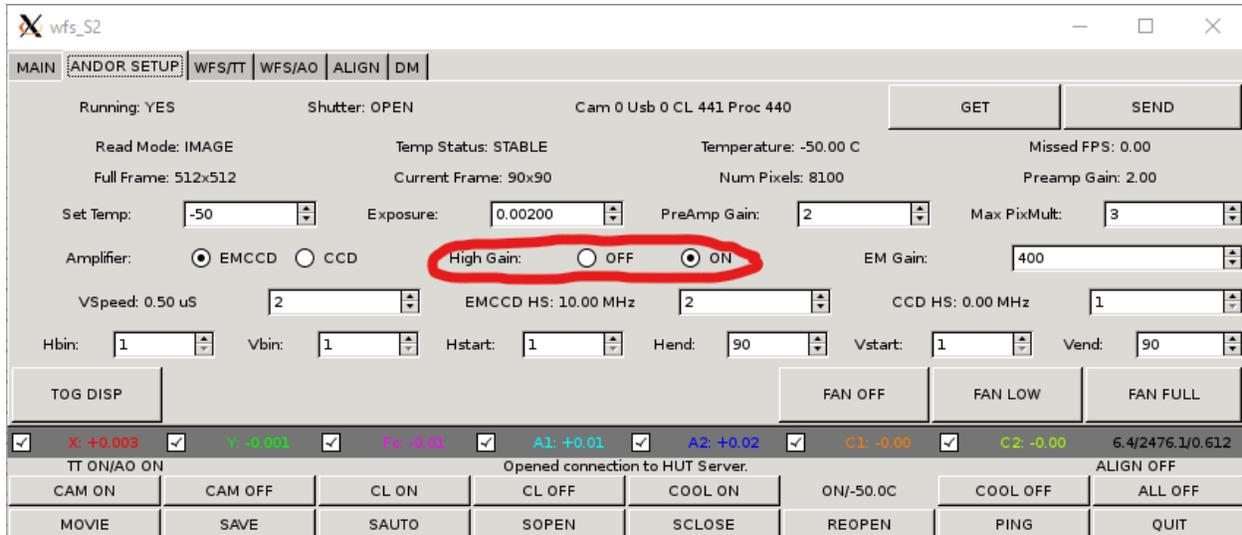


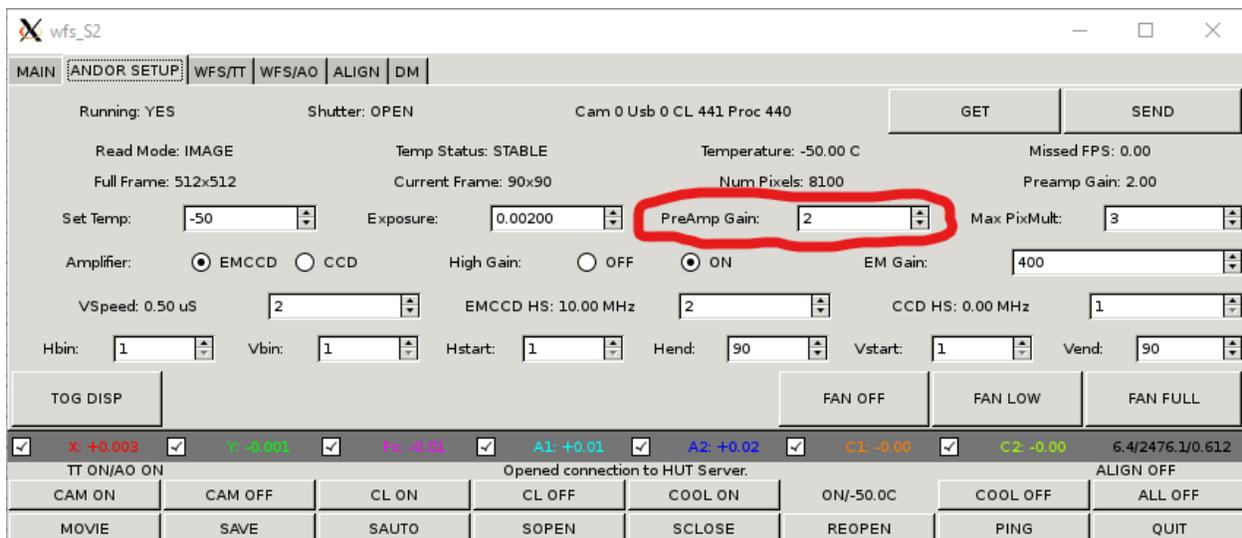
## Instructions for tuning TWFS cameras for faint objects. V / R mag > 11.0

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1. Begin by ensuring that the TWFS cameras are in High-Gain mode.



2. Increase EM gain. Turn the gain up as high as 800. If the object is still too faint, move on.
3. Turn the PreAmp Gain up to 3. (2 is the default)



4. Reassess if the object is too faint. If it is, turn the gain up. This time you turn the gain up as high as 1000.
5. Lastly, if the object is still too faint increase the exposure time.
6. It is important to return the camera settings back to defaults as soon as you move back to brighter objects or end the night.
  - a. PreAmp Gain: 2
  - b. High Gain: Off (Not important if you're continuing to observe)
  - c. EM Gain: < 300 (Not important if you're continuing to observe)

**WARNING: Running the TWFS cameras with an EM gain of 1000 and exposing it to the red beacon is dangerous for the camera and can result in permanent loss of sensitivity. It is critical that the EM gain be turned down as much as possible for the red beacon.**

**Example:**

NGC4151 V=11.48 mag extended object I run the camera on:

Set Temp: -75 Exposure: 0.05 PreAmp Gain: 3 EM Gain: 1000

I expect that these settings would work down to V=13 at least but have not tested it on point sources. Set temps lower than the default reduce the noise on the TWFS camera but require that the water coolers be turned on.

**Notes:**

Keep in mind that the TWFS at telescopes with AO should be run as close to the default exposure as possible to keep the AO correction optimal. This is a balancing act between living with high EM gains and the danger posed to the camera.

Running a TWFS camera with a set point lower than the default without the water cooling on can result in the camera going into thermal protection mode where it will become unresponsive until the electronics temperature has dropped to a safe level. There is no software indicator if the thermal safety is tripped, the camera itself emits an audible alarm, but you won't hear that from the control room. Cycling the camera power will not release the camera. Only waiting will fix the thermal safety cutoff. Basically, if the water cooler is not on the power GUI don't lower the set temp.

It is best practice to keep the camera exposure time fixed during a bracket. When I observe faint objects, I first set up the TWFS cameras on the faintest object and use lower gains as appropriate for the rest of the objects in the bracket.