

Application Note
Use and Maintenance of the SBIG Cooling Booster

SBIG Technical Memorandum
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The cooling booster for the ST-7E, ST-8E, ST-9E and ST-10E is a small module that goes inside the back compartment of the camera. The booster is optional on the ST-7E and ST-8E. It is standard equipment on the ST-9E and ST-10E. This memo is a step-by-step guide to using the booster.

1. Use of the cooling booster:

CAUTION! Please be sure that whenever the cooling booster is on (i.e., plugged into 12VDC), the camera is also powered up so that the fan is running. The fan is needed to dissipate the heat generated by the cooling booster. If you power up the booster by plugging it into 12VDC without the camera fan running it can overheat and damage the cooling booster system. This won't happen immediately if you happen to accidentally power up the booster before turning on the camera, but running it more than few minutes without the fan could damage the unit.

For users with fixed sites, or small observatories, water circulation and the attendant tubes and pump are easier to manage. For field use, however, you may wish to forgo water circulation and use the cooling booster with 12VDC only to simplify the setup. When using water circulation, the major problem one must deal with is routing the rather heavy water tubes off the mount to minimize perturbations to the mount during tracking. In general, try to route tubes (and wires) over the mount, rather than just let the tubes dangle from the end of a long tube. Water cooling is probably not necessary for most users when the air temperature is below 10 degrees C (50 degrees F), since the dark current is fairly low already. Think of it as a summertime accessory! We do not recommend use of water cooling below freezing temperatures, where antifreeze must be added to the water. It is simply not necessary then. There is no problem with using the cooling booster with only air cooling in the winter, though.

With the cooling booster installed on your camera, you have a choice of three levels of cooling. First, you can ignore the booster and operate the camera with single stage cooling only by simply not connecting 12VDC to the booster's power plug. Second, with the camera power on and fan running, you can also power up the cooling booster by plugging in 12VDC to increase the cooling capability of the camera without using any water circulation. Third, you can power up the cooling booster with 12VDC and use water circulation to further increase the cooling capability of the camera.

Without flowing water the cooling improvement is about 6 degrees C. With it the cooling improvement is about 15 degrees C. If you plan to use it without the water then you should disconnect the hoses from the camera and shake out the water trapped in the heat sink. Disconnecting the hoses will reduce the potential perturbation to your telescope mount.

To operate the cooling booster without water cooling, mount the camera to the telescope as before and simply plug the auxiliary 12 volt supply jack into the connection on the camera back plate. Turn on the TE cooling to 100% by giving it a target temperature of -50 degrees. After 10 minutes examine the camera temperature, and reset the set point to 3 degrees C above the current temperature. This 3 degree temperature margin will enable the ST-7/8 to regulate the temperature accurately.

To operate the camera with water cooling, the procedure is the same except that the water flow must be established before mounting the camera to the telescope, since the water pumps have limited pressure capability. To do this, put the camera at the same level as the water reservoir. Connect all the hoses, and make sure the water return goes back into the reservoir. Push the $\frac{1}{4}$ inch internal diameter (ID) hoses onto the nipples on the back of the camera so they seal. Attach one hose to the nipple onto the reducing connector which adapts the $\frac{1}{4}$ inch ID hose to the $\frac{1}{2}$ inch diameter hose from the pump.

Turn on the pump, and let the flow establish itself through the hoses. Next, mount the camera to the telescope. If you always keep the return hose outlet near the reservoir level the pump will have no problem raising the water 2 meters (6 feet) off the floor. The limited pressure capacity of the pump is only a problem when you let the water fall back into the reservoir from a significant height above it, such a 0.3 meter (12 inches). Lastly, check for leaks!

When using water cooling, avoid the temptation to put ice in the water to get the camera even colder. As the cooling booster is designed, the camera will not be cooled below ambient temperature if ambient temperature water is used. If colder water is used, the head may fog or frost up, depending on the dew point. . The exposed electronics inside the ST-7/8 will get wet, and corrode. The hoses will start dripping condensation, and you will have a mess. Keep the ice for a cold drink!

At the end of the evening, stop the pump, and raise the outlet hose above the camera to let all the water drain out of the system. Blowing it out with gently pressure helps clear the water. You can leave the hoses full of water, but if a leak occurs while you're not there you may have a problem.

When packing the camera for a long time, or at the end of summer, disconnect the hoses and blow out the heat sink to allow the enclosed spaces to dry out and minimize long term corrosion.