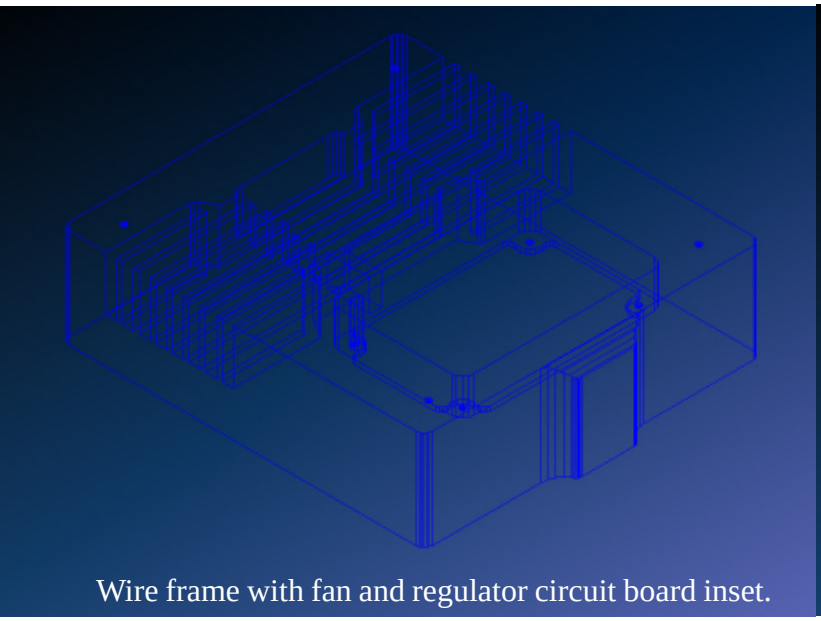
Pulsar Technologies & CAMERA BUG LTD

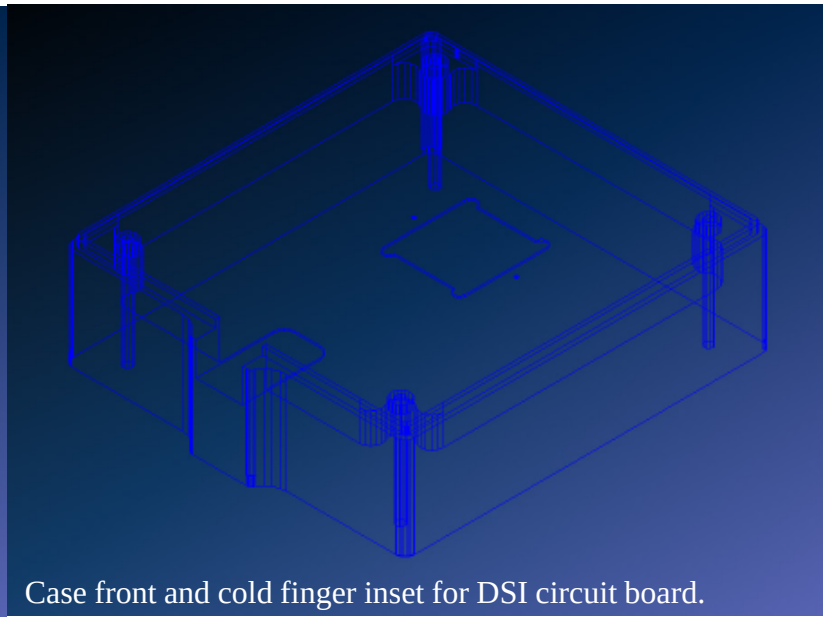
Release Notes

Regulated Active Coolers for all Meade DSI CCD Imagers!

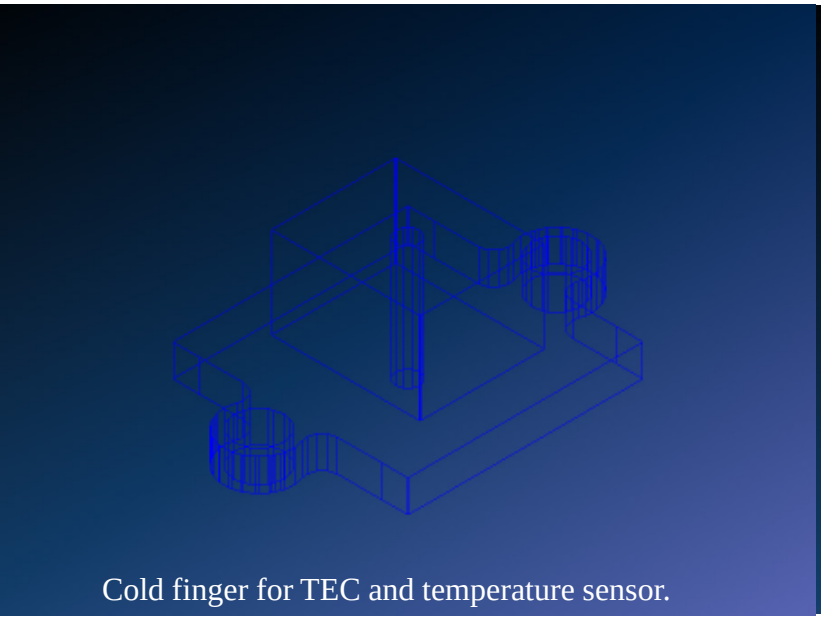
Pulsar Technologies has developed a full series of active coolers to be distributed by Camera Bug LTD. We have a cooler for every model of Meade's DSI Imagers! The units are all CNC milled from Billet T6 Aluminum for precision and durability. The model V6RCD2 works with all original DSI Imagers as well as the DSI II both color and mono. The model V6RCD3 works with Meade's newest DSI III color and mono imagers. Both models include high efficiency thermal electric cooler modules. All models will work with a power supply of (7) through (12) Volts DC. This allows a broad range of power options in the field. Both include the same circuits that controls the selected temperature to within 1 degree Celsius. Each has a built-in active voltage regulator which is over (93) percent efficient and produces almost no heat! The modification to your current Meade Imager is a very simple process and you can view step-by-step instructions on-line. Without going into full detail here, it is almost as simple as removing 4 screws, lifting off the standard heatsink, putting on a new drop of thermal paste and setting on the new Pulsar Cooler and reinstalling the 4 screws. At current, it is the only complete professional solution to turn your Meade DSI Imager into a fully regulated and actively cooled super CCD Imager! The improvement in noise reduction and calibration level of dark frames is but one of the major benefits of this cooler. You can now take a full set of dark frames at each selected temperature and never take dark frames again. This can be done during the day or a rainy night, so the next time you go out to image you will spent time imaging, not taking dark frames! With the reduced noise, you can also capture betters images in less time than with your un-cooled imager!



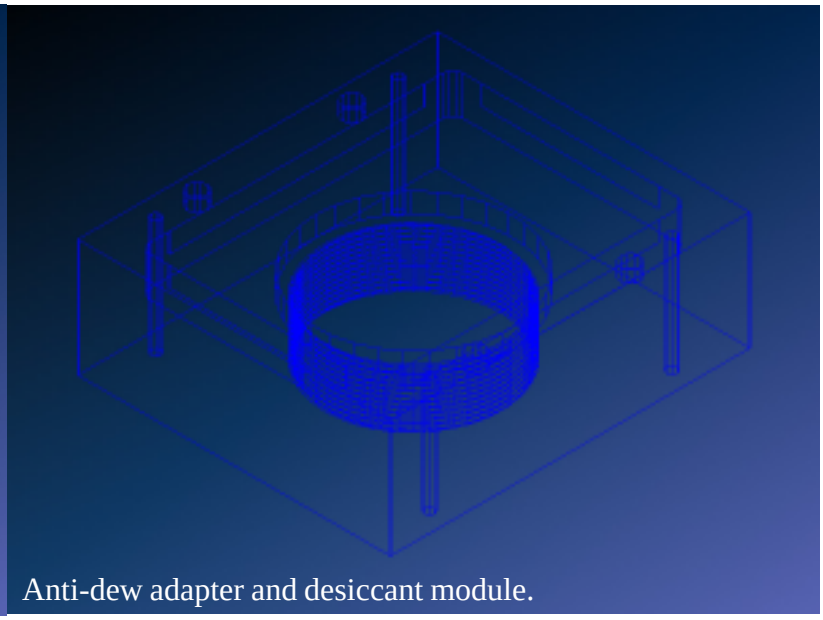
Wire frame with fan and regulator circuit board inset.



Case front and cold finger inset for DSI circuit board.

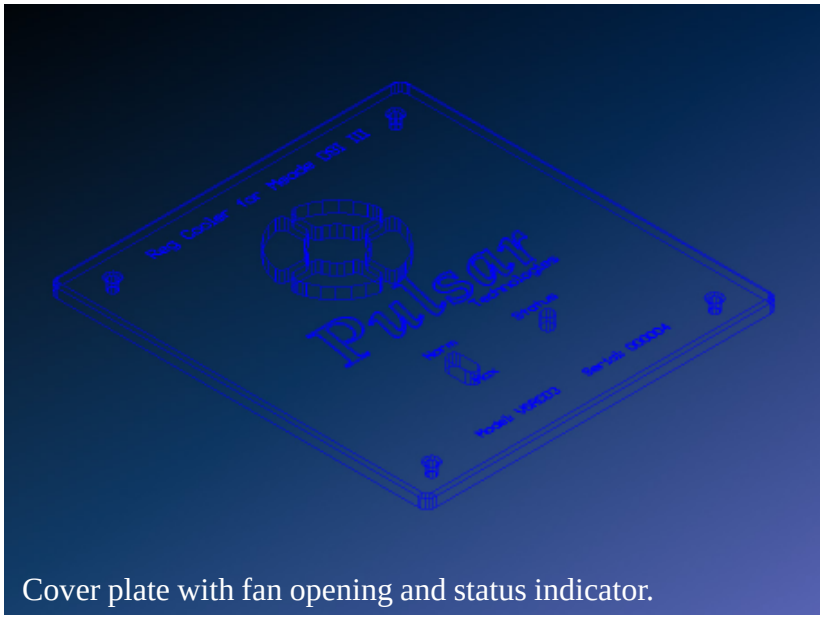


Cold finger for TEC and temperature sensor.



Anti-dew adapter and desiccant module.

All parts are CAD designed tested and machined on a CNC milling machine with tolerances to a thousandth of an inch. This is very important for proper focus of the image across the whole sensor. It insures that the optical axis and sensor face are 90 degrees to and square with the optical image. This provides the best edge of field sharpness you can get. We have seen DSI models where one side of the image is in focus and the other side out of focus due to the casting not having a flat and square surface in contact with the imaging sensor.



Cover plate with fan opening and status indicator.

Key Features and Benefits of the Pulsar Active Regulated Coolers!

- Fully calibrated dark frames using less pixel count and leaving more full well capacity.
- Dark frames can be taken at any time at set temperatures as a one time process.
- Greater dynamic range than the non-cooled DSI Imagers.
- Reaches fainter magnitude limit in less time.
- Cut noise to 1/16th of the non-cooled DSI Imagers.
- Slow warm-up when turned off, no shock to the sensor due to drastic temperature change.
- High efficiency TECs with minimum current drain, longer battery life.
- Simple controls, simple installation, user can install.
- Two year warranty, more than twice what most competitors offer.
- CNC milled to high precision, provides optimal optical axis alignment for sharp focus across whole sensor.
- Cuts imaging time in half due to dark frames need only be taken once.
- Removes amp glow problems seen in most all DSI models.
- Allows your DSI imager to perform like imagers costing hundreds to thousands more.
- Operates on a wide selection of voltage for flexible field use.
- Produces better images quicker by requiring a smaller number of stacked images.
- Preserves the look of your DSI Imager and maintains a smooth profile. No sharp edges or exposed wires.
- Milled from the highest quality T6 aluminum for precision and durability.
- All noncorrosive parts made of aluminum and stainless steel.
- Cool dispersion heat design, no thermal back shock, preserves sensitive electronics.
- Each comes with nose adapter with desiccant to correct dewing problem seen in other DSI coolers. Nose filter adapter also provided for the mono versions. All T-mount and accessories work as before.
- Design by people who love Astronomy and use what we build.

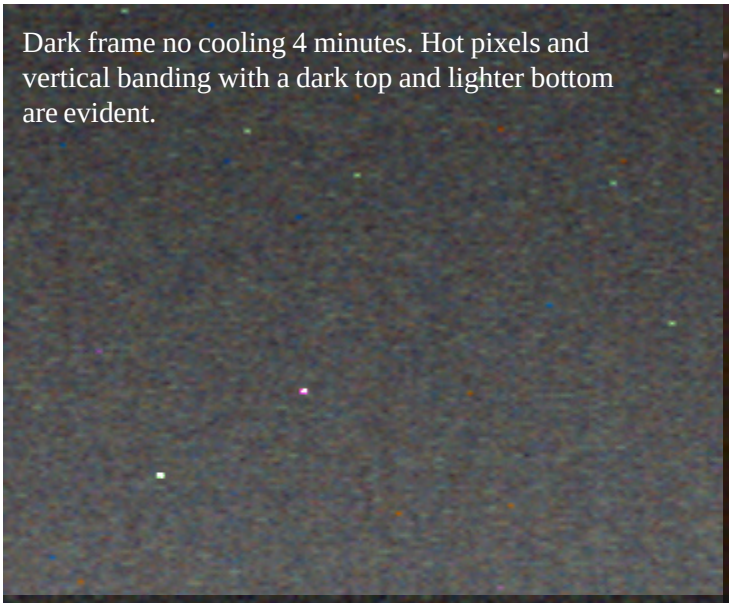
Specification:

Model	DSI or DSI II	DSI III
Input Voltage DC	7-12 Volts	7-12 Volts
Max Current @ 12VDC	300 mA	1.2 Amps
Normal Temp Standard*	45 degrees	45 degrees
Max Temp Standard*	35 degrees	35 degrees
Temp Regulation	+/- 1C	+/- 1C
Power Connector	2.1mm Barrel	2.1mm Barrel
Weight Installed	10 oz	20 oz
Size of Cooler	3.25 x 3.25 x 1.125”	3.75 x 4 x 1.25”
Retail Price	$549.00	$699.00

Specifications subject to change without notice.

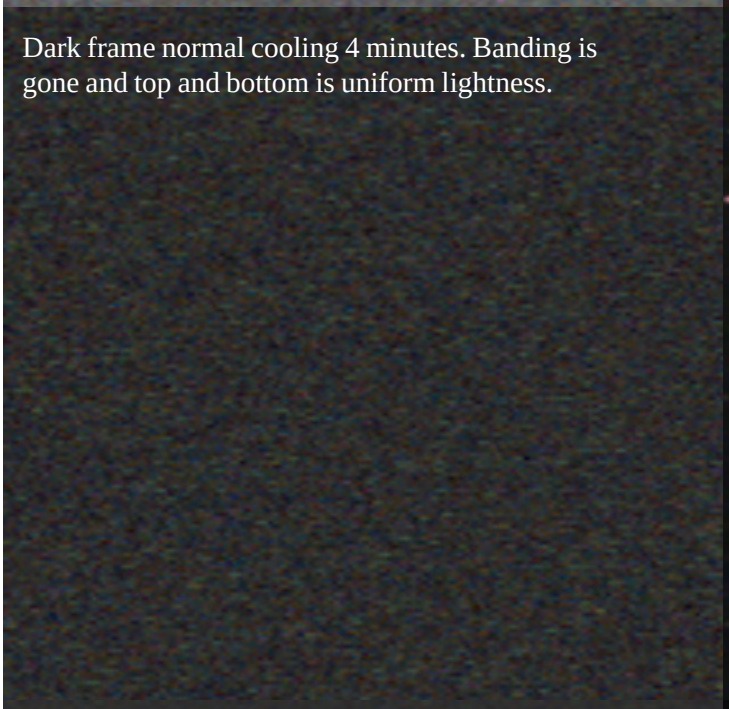
*Other temperature set points can be requested at time of order.

Test results using the original Meade DSI color imager without and with the Pulsar Cooler!



Dark frame no cooling 4 minutes. Hot pixels and vertical banding with a dark top and lighter bottom are evident.

Image of M52. No cooling, 25 x 10 seconds. A lot of chroma noise and low contrast.



Dark frame normal cooling 4 minutes. Banding is gone and top and bottom is uniform lightness.

Image of M52. Normal cooling, 25 x 10 seconds. Chroma noise is all but gone and contrast is much better!

Dark frame max cooling 4 minutes. Same as image above but with even less noise and smoother image.

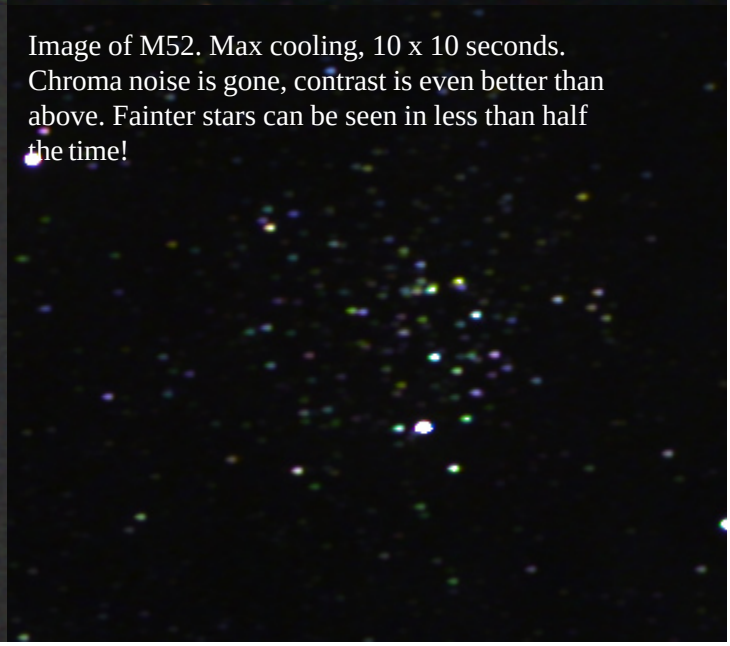


Image of M52. Max cooling, 10 x 10 seconds. Chroma noise is gone, contrast is even better than above. Fainter stars can be seen in less than half the time!

- - - - - - - - - - - - - - - - - Histogram set the same for all images - - - - - - - - - - - - - - - - -

DSI II lens covered with dark frame subtracted. 20 x 10 secs.

DSI II lens covered normal cool with dark frame subtracted. 20 x 10 secs.

DSI II lens covered max cool with dark frame subtracted. 20 x 10 secs.

DSI II lens covered with no cooling and no dark frames subtracted. Stack of 60 x 10 seconds.

DSI II lens covered with normal cooling and no dark frames subtracted. Stack of 60 x 10 seconds.

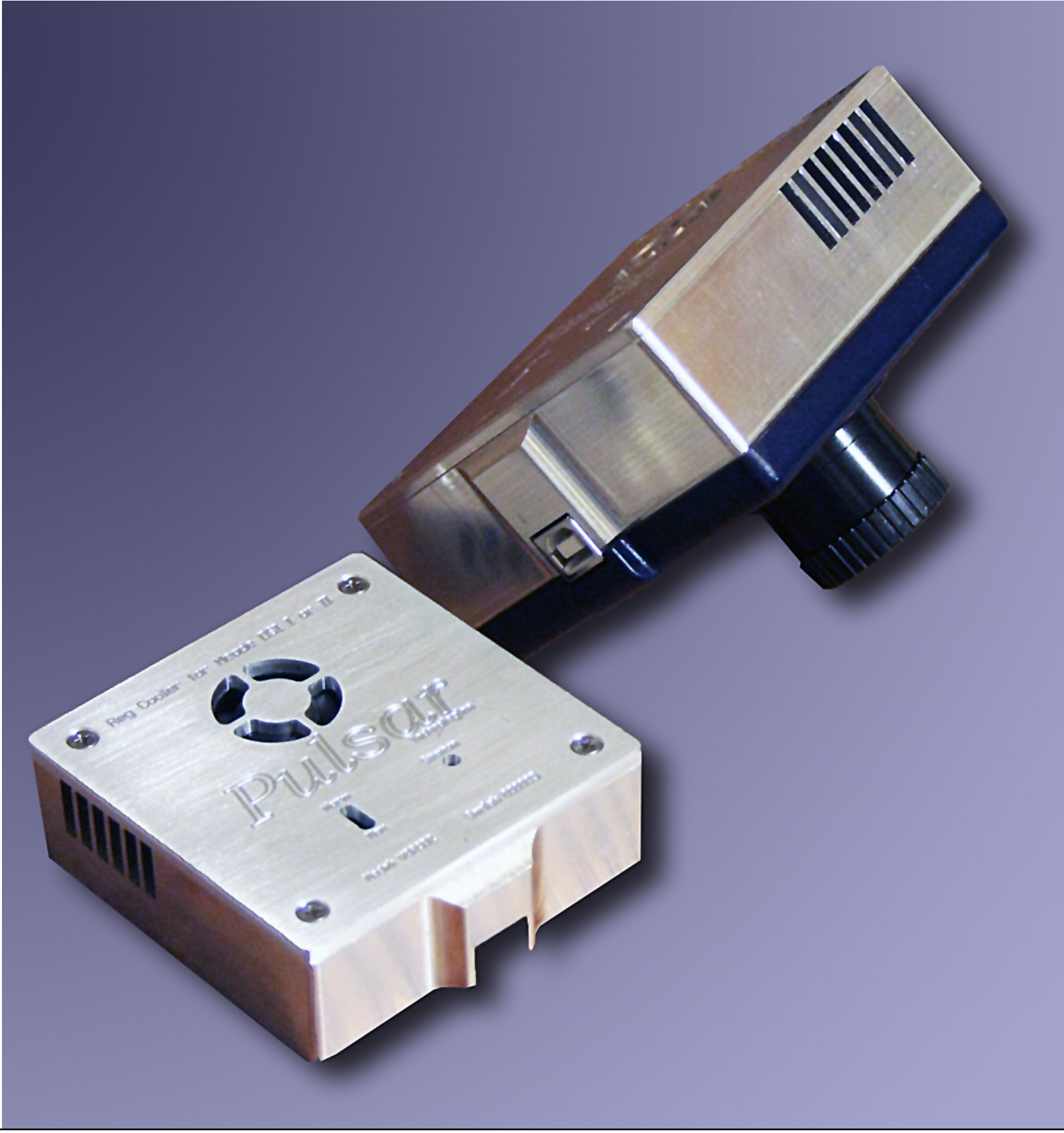
TECH TALK:

The full story behind the DSI Imagers and how the Pulsar Cooler Works!

The Meade DSI Imagers are a great line of very sensitive CCD imagers. They have static cooling via passive heat dissipation through the back cover only. One problem seen on the test results page is vertical banding and lighter and darker portions in the image. With this passive cooling the top and bottom of the chip can be at very different temperatures, depending on orientation of the camera in the scope. In this configuration about the only way the whole CCD chip can be at the same temperature is with the camera pointing straight down. Not very good for imaging stars! This is also not actually true because there are other sources of heat, other electronics on the board close to the imaging chip. This heat from other electronics is induced into the sensor chip as has been seen to some degree in all DSI models, such as amp glow, etc. All of these things take away from the quality of the final image. We will tell you why! If the dark frame was a perfect calibrated dark frame some of the above would not be true, however, these imagers are at different angles when imaging different objects and therefore the heat from the other components can transmit heat to different parts of the chip. As the angle changes you now have an uncalibrated dark frame unless you took dark frames while pointing at the selected object. The other problem is full well capacity. If amp glow is inducing a lot of heat energy into one side of the chip, the dark frame subtracts that number of pixels and the remaining is reduced by that number. This number can be half or more of the total pixel count! If the position of camera has shifted, for example 90 degrees shooting an image to the east and the dark frames were taken with the camera level or pointing south, now you have subtracted the total number of pixels from a different portion of the image cutting off the magnitude level the image can reach in a different portion of the image. This is because all heat rises. Turning the camera 90 degree causes the rising heat to effect a different part of the CCD chip. Also, as a default, the window for dark frames is set to 5 degrees C. This is a window of 9 degrees F. The character of the CCD sensor can change by a high percentage over this range of temperature! On top of that, as you start shooting dark frames with the non-cooled DSI, you will see the temperature indicator change over a single set of dark frames, sometimes more than 1.5C. Another reason that the DSI imagers can not take fully calibrated dark frames is that the temperature sensor is located on the circuit board and not to the imaging sensor. The temperature of the CCD sensor influences the temperature sensor but so does the heat from the other components on the circuit board, so the imaging sensor can be at some what of a different temperature than that indicated on screen. The only way to have good results with the DSI non-cooled imagers, is to shoot new dark frames each and every time you start to image and pointing at the object you are going to image. You also, should image for at least 30

minutes before shooting the dark frame to make sure the camera has warmed up and stabilized. The end result, it can at times, all things being almost perfect, camera orientation, constant temperature, etc. yield O.K. results but with the above issues corrected it can yield very good to great results! This is why all professional imagers have not only active cooling, but regulated cooling.

Enter the Pulsar Coolers! With the Pulsar line of coolers the above issues have been corrected! Once you take a set of dark frames at each set temperature, you never need to take dark frames again! And these will be true calibrated dark frames! With the cooling running you will be able to produce better looking images with fewer exposures and the fact of not having to take dark frames, you can now get better results than before in less than half the time!! You can see the results in the testing on the previous page! And what a difference it makes! Now nothing is perfect because in fixing the above problems, we have created a whole new problem. As you may know from using your scope on a cold night and then bringing it into your warm home, it now looks like you just took it out of the shower. As we reduce the temperature of the CCD chip it has the ability to collect moisture on the optical window. All the Sony sensors used in the Meade DSI imagers has a built-in optical window as part of the CCD sensor. This optical window is very close to the CCD sensor and gets chilled as we cool the sensor. If we push the temperature to low or if there is extreme humidity in the air, it may condense on this optical window. This same issue is seen in many other production models made by many other manufactures. This is why the Pulsar coolers have a selector for the fixed temperature and why each comes with a front cell adapter which increases the distance to the optical window and houses a desiccant cartridge. If the user follows the directions and gets a proper seal there should not be any problems with moisture on the sensor. However if the desiccant needs changed or the seal has leaked and max cooling is selected and the optical window starts to condense moisture, your can select the normal cooling which in most cases will correct this issue. If the user does not wish to use the adapter they may remove the 1.25” nose piece from the DSI and remove the IR filter supplied with the imager. We can now reinstall the nose piece with a sealer on the threads and then install a standard 1.25” IR or AR filter with a sealer in the end of the nose piece. If these pieces are sealed good and heated via a hair dryer or heat gun as it is assembled, moisture condensation can be greatly minimized or eliminated. However we recommend using the supplied nose adapter. The kit also includes desiccant which is placed inside the camera to absorb the moisture that is inside the camera body. How well you seal the camera body determines how long you will be able to use your imager before replacing the pack. Detailed instructions are included to show each option and what can be done to make your imager practically service free. For other questions or information contact your Pulsar Cooler Dealer Today!



www.camerabug.com

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