

Imaging Sensors: Dust, Blemishes, Dead and Hot Pixels

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Imaging sensors need to be kept clean to ensure images free of artefacts. Dust is the most common cause of such problems. Fortunately dust can be removed from a sensor with the right tools.

However it is still important to be able to identify any *marks* on the sensor as dust, stains or dead pixels.

You first need to ensure that dirt lies on the sensor surface and not on the lens/telescope you use. To do that bring the dirt into focus and rotate the lens telescope independently of the camera. If the dirt does not move on the screen then the dirt is on the sensor. If the dirt moves then the dirt is on the lens you use in which case you would need to clean the lens.

Dust Particles



The image on the left shows a dust particle that has landed on the camera sensor.

When focused dust particles will look blurred once the image has been magnified. Expect the centre of the dust particle to remain very dark, i.e. black.

Liquid Stains



The image on the left shows a liquid (i.e. water) that has landed on the camera sensor.

When focused the affected area will show a level of semi-transparency. Expect a similar effect from other semi-transparent substances including glue or varnish.

Permanent Sensor Stains

We will not ship a camera if the sensor was found to have a permanent stain or the camera was not operational. The cameras and sensors are checked at the point of manufacture and assembly at the factory and once more prior to dispatch to customers.

A permanent stain would appear similar to a dust particle or liquid stain but could be impossible to remove by cleaning the sensor with a suitable cleaning agent, cloth used to clean photographic lenses and sensors or by displacing it with compressed air.

In general a permanent stain could be paint, varnish or glue that has landed on the sensor and has dried up.

Dead Pixels



The image on the left shows a 3x2 cluster of dead pixels on the sensor.

Dead pixels appear as clearly defined rectangular shapes with straight sides as this magnified image shows.

Hot Pixels

The number of hot pixels will increase as sensor temperatures rise during longer exposures. The single most effective way to combat this type of noise is by cooling the sensor. The ideal way to dramatically reduce the number of hot pixels is by cooling the camera sensor with a powerful Peltier/heatsink arrangement and a large fan to rapidly dissipate the heat from the heatsink. Peltier, heatsink and fan are all required for efficient cooling.

Hot pixels appear as clearly defined shapes with straight sides as this magnified images below show. Hot pixels vary in 'colour' and brightness depending on the temperature, type and quality of the sensor.



Cooled cameras will show a significantly lower number of hot pixels depending on the efficiency of the cooling subsystem.

Dust and Astronomy

Sensors are electrical charged devices and as such they will always attract dust. It is therefore important to know how to deal with dust on an ongoing basis and most important how to clean the sensor. In general the closer a particle of any type is to the sensor the greater the problem will appear to be.

Dust particles on the sensor, typically around 1/10mm in size, will appear as blobs of fair size on an image. On the other hand the same dust particle on the objective lens of a telescope will have a minimal effect and may be very difficult or even impossible to notice.

Sensor Cleaning

There are many ways and tools that can be used to clean a sensor including:

1. Compressed air, some solutions from **Green Clean** incorporate a vacuum cleaner.
2. The **Arctic Butterfly** battery operated sensor cleaner
3. **Dust-Aid** adhesive based sensor cleaner
4. Cleaning cloth used for cleaning photographic lenses and/or sensors
5. **Lens Pen**
6. **Sensor-Clean** for removing non-permanent stains

Compressed air works reasonably well for dislodging dust particles but probably the easiest way is to use the Dust-Aid adhesive pads or the Artic Butterfly products.



Please read the product description and instructions of use carefully before utilizing these or other such products to ascertain that this is the right product for you.