Technical Application Note TAN2008013

How Point Grey Tests for White Blemish Pixels
Revised January 9, 2009

1.1. Subject

Technical Application Note (TAN2008013): How Point Grey Tests for White Blemish Pixels

1.2. Applicable Product(s)

- **All Point Grey Camera Products**

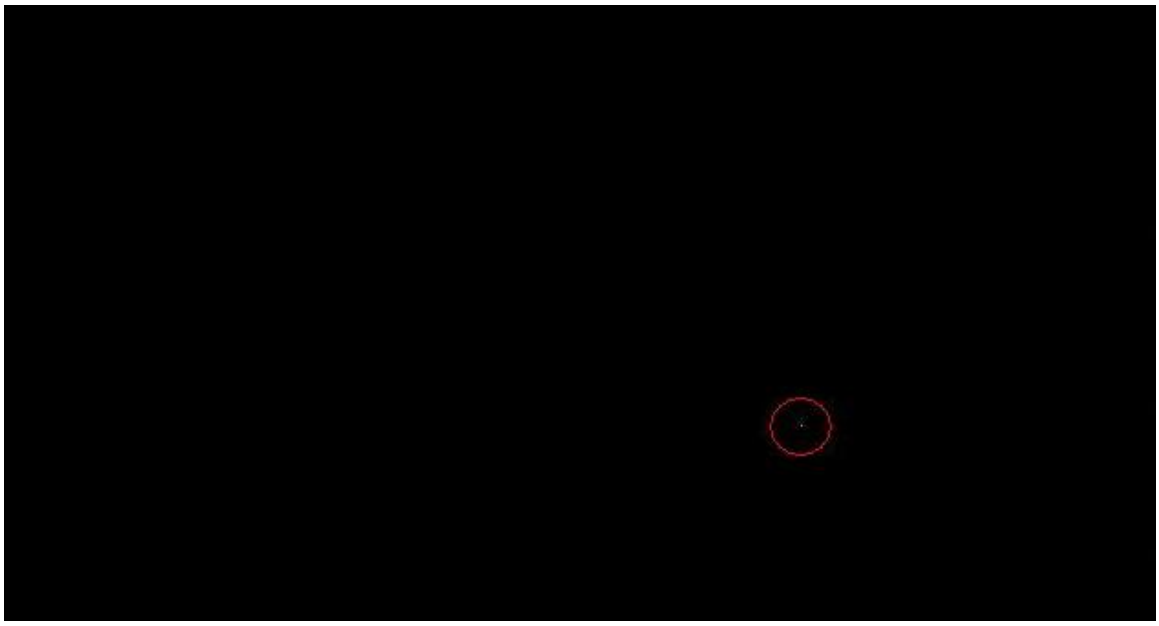
1.3. Application Note Description

This technical application note explains how Point Grey Research identifies and corrects white blemish pixel defects; how to get white blemish pixel information about your camera; and what to do if you are concerned about blemish pixels from your camera.

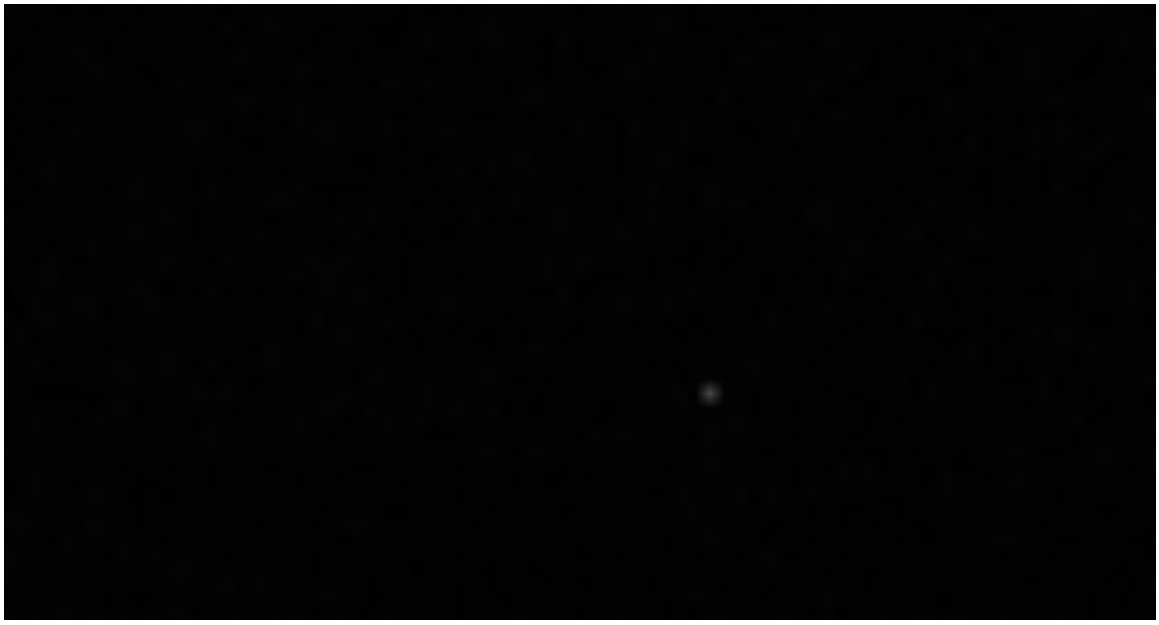
1.4. Overview

The suite of quality assurance tests that Point Grey Research performs on its cameras includes specifications for identifying and correcting white blemish pixel defects that originate from the camera imager. White blemish pixels can occur randomly in any imager and are believed to be caused by natural cosmic radiation. In some cases, an incidence of radiation can damage a pixel and cause it to generate a permanently high charge. As a result, the pixel takes on a permanently lit, or 'glowing,' appearance. This damage generally occurs after the sensor is manufactured, particularly during shipping and handling. White blemish pixels are sometimes referred to as 'hot,' 'burned' or 'bright' pixels.

In the following image, a single white blemish pixel may be seen near the lower right corner (circled).



The pixel is magnified in the following image:



1.5. Identifying and Correcting White Blemish Pixels

Testing and correcting white blemish pixels occurs during the unit test phase of camera production. This means that an array of blemish pixels is identified for each individual camera, and the mechanism to correct them is then coded into the camera firmware. Pixel correction, as such, becomes a part of the on-camera data flow for every image frame. The algorithm to correct blemish pixels involves applying the average color or grayscale values of neighboring pixels to the blemish pixel.

1.6. Test Specifications

The following table outlines the test environment in which Point Grey identifies blemish pixels. All tolerances meet or exceed those of the corresponding imager manufacturers. The temperature setting for all cameras is 23 C. All tests are performed with the lens cap on (darkness). White balance, where supported in color models, is applied according to the default setting of the camera on startup.

Camera Model	Gain (% of max)	Shutter Speed	Max Pixels Corrected	Tolerance in Pixel Values (ADUs)
Grasshopper-14S3	50%	133.3ms	64	50
Grasshopper - All others	65%	133.3ms	64	50
Flea2G	65%	133.3ms	64	50
Flea2-14S3	65%	133.3ms	4	25
Flea2 - All others	65%	133.3ms	4	50
Scorpion-14SO	65%	133.3ms	4	25
Scorpion - All others	65%	133.3ms	4	50
Dragonfly2	65%	133.3ms	4	50
Firefly MV	100%	16.3ms	4	50
Chameleon	65%	133.3ms	4	50
Dragonfly	65%	133.3ms	0	50
Flea	65%	133.3ms	0	50

Note that the maximum number of pixels corrected varies by camera model, depending on storage space and sensor size. If the number of blemish pixels detected exceeds the number that can be corrected, the camera is not shipped. In other words, it is Point Grey's policy to ship cameras with zero white blemish pixels.

1.7. Determining White Blemish Pixel Correction on Your Camera

To determine if blemish pixel correction is enabled on your camera (the default setting is enabled), and the number of pixels that are being corrected, read the PIXEL_DEFECT_CTRL register 0x1A60h. For more information about how to work with this register, consult the *Point Grey Digital Camera Register Reference*.

1.8. Minimizing the Effects of White Blemish Pixels

You may still encounter issues with blemish pixels, in spite of any correction that is performed on-camera. Keep in mind that blemish pixels can occur spontaneously after they leave Point Grey Research, especially during shipping and handling.

To minimize the effects of any additional blemish pixels, be aware that higher operating temperatures, higher gain settings, and longer shutter times can all contribute to an increased effect of white blemish pixels.

If you remain concerned about white blemish pixel defects on your camera, contact support@ptgrey.com.

1.9. Related Knowledge Base Articles

Article	Title	Address
23	Which image sensor is used on my camera?	http://www.ptgrey.com/support/kb/index.asp?a=4&q=23

1.10. Additional Downloads and Support

Access more Technical Application Notes on the web at www.ptgrey.com/support/downloads.

Point Grey Research Inc. endeavors to provide the highest level of technical support possible to our customers. Most support resources can be accessed through the Product Support section of our website: www.ptgrey.com/support.

Creating a Customer Login Account

The first step in accessing our technical support resources is to obtain a Customer Login Account. This requires a valid name, e-mail address, and camera serial number. To apply for a Customer Login Account go to www.ptgrey.com/support/downloads/.

Knowledge Base

Our on-line knowledge base at www.ptgrey.com/support/kb/ contains answers to some of the most common support questions. It is constantly updated, expanded, and refined to ensure that our customers have access to the latest information.

Product Downloads

Customers with a Customer Login Account can access the latest software and firmware for their cameras from our downloads site at www.ptgrey.com/support/downloads. We encourage our customers to keep their software and firmware up-to-date by downloading and installing the latest versions.

Contacting Technical Support

Before contacting Technical Support, have you:

1. *Read the product documentation and user manual?*
2. *Searched the Knowledge Base?*
3. *Downloaded and installed the latest version of software and/or firmware?*

If you have done all the above and still can't find an answer to your question, contact our Technical Support team at www.ptgrey.com/support/contact/.