

Apex Series

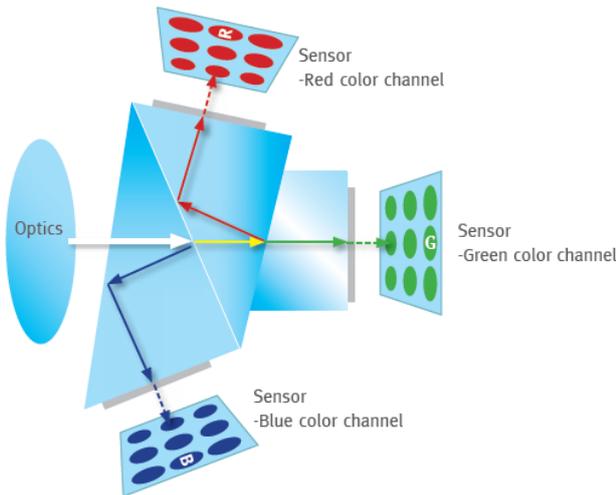
3-CCD area scan cameras providing better color fidelity and spatial precision than traditional Bayer color cameras

For more than a decade, JAI has provided 3-CCD area scan cameras whose high color precision provides distinct advantages over both Bayer mosaic alternatives and competitive 3-CCD cameras, when absolute color accuracy is required. Now, JAI has extended these advantages with a new series of cameras that utilize a 3-CCD prism block supporting a larger sensor format (1/2" or 1/1.8") and higher resolution than our original 3-CCD RGB models.

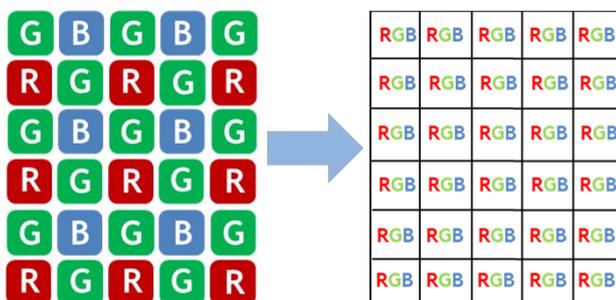
The AT-140 models offer 1.4-megapixel resolution (1392 x 1040) with 1/2 inch CCDs, while the AT-200 models provide 2-megapixel resolution (1628 x 1236) based on three 1/1.8-inch CCDs. All the cameras use dichroic prism optics to split incoming light into three distinct color channels for precise RGB values with full spatial resolution. The new models are available with Camera Link or GigE Vision interfaces, and include a range of advanced features that maximize the advantages of the 3-CCD concept.

Color fidelity - Bayer mosaic color cameras use a pattern of color filters and an interpolation process to estimate the approximate RGB value of a given pixel. With 3-CCD technology, a specific R, G, and B value is captured for each pixel. This inherently produces higher color precision in the 3-CCD output.

Principle: Prism-based 3-CCD camera:

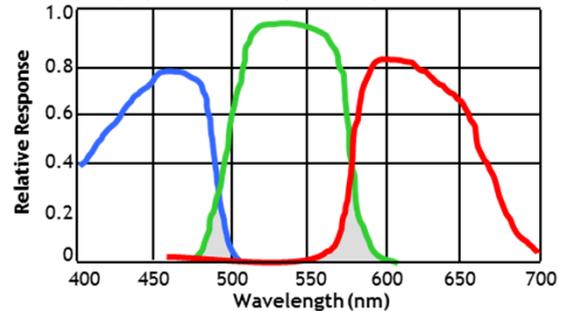


Principle: Bayer filter on a 1-CCD color camera:

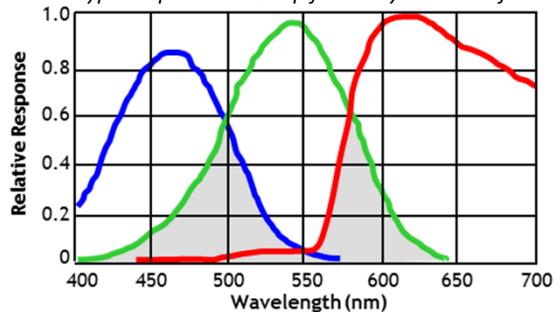


Furthermore, the spectral curves resulting from the hard dichroic prism coatings are much steeper than the curves from the soft polymer dyes used in Bayer filters. This enables the 3-CCD cameras to produce exceptionally accurate color data without the uncertainty that comes from the overlap regions. (The areas with grey tone in below illustrations).

Steep spectral curves from JAI prism camera:



Typical spectral overlap from Bayer mosaic filter:



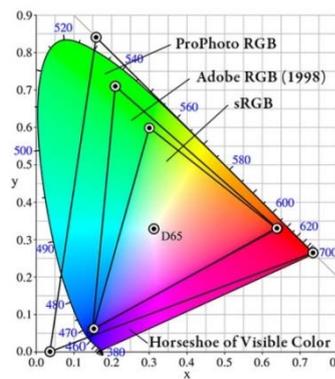
High Dynamic Range - In addition to reducing color precision, the overlap in the color filter response also results in part of each pixel's well capacity filling with photons resulting from the crosstalk, thus decreasing the available well capacity. Precision responses from the dichroic coatings enable each channel to efficiently use the full well capacity of the pixel, allowing the maximum possible dynamic range.



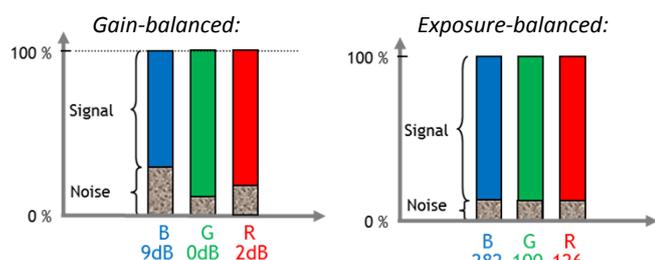
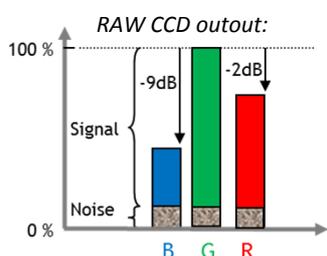
See the possibilities

Precision Alignment - JAI 3-CCD cameras are co-site aligned, meaning each of the three imagers are aligned within a fraction of a pixel relative to each other along the common optical axis. JAI provides an industry leading ¼ pixel alignment tolerance (roughly 1 µm accuracy), giving the precision needed for even the most demanding machine vision applications.

Low noise white balancing - Even compared to other 3-CCD cameras, JAI's AT-140 and AT-200 are focused on providing image quality advantages. For example, the AT-140 and AT-200 have white balancing functions (manual and automatic) that use gain to adjust the color values of each channel. This is the same method used by typical competitive 3-CCD products. But the AT-140/200 cameras also give users the ability to white balance the output using individually programmable exposure for the R, G, and B color channels. As shown in the diagram below, this enables noise to be kept at an absolute minimum in situations where the highest image quality is required.



The End Result - The two images below compare the results from a 5-megapixel Bayer color camera (left) with the 2-megapixel AT-200 (right). Despite having 2.5X the resolution, the 5-megapixel camera's soft polymer dye color filters and the required Bayer interpolation process results in significant color contamination, less differentiation between similar colors, and reduced sharpness of the image.



Notice for the gain-balanced system, the available signal for the higher gain channels is reduced, while exposure-balancing restores the full signal range. The combination of maximizing the signal in each channel with lowering the noise, further increases dynamic range and color fidelity.

Color space calibration - The AT-140 and AT-200 include a sophisticated linear color matrix circuit which enables precise color matching between camera data and calibrated printers, monitors, and other devices. Built-in presets are provided to output color information in the proper format for the sRGB or Adobe RGB industry standard color spaces.

Applications that rely on precise color calibration can choose the appropriate color gamut, whether it is more associated with color monitors (sRGB) or the wider gamut of CMYK printing colors (Adobe RGB).



5-megapixel Bayer image 2-megapixel AT-200 image

Target customer applications

With their high resolution and high color fidelity, the AT-140 and AT-200 are ideal for a wide range of applications where color is critical, including:

- Print inspection
- Paint matching
- Medical diagnostics
- Flat panel quality verification
- Semiconductor production
- Food sorting

Available models:

Model:	Pixels:	Format:	FPS:	Interface:
AT-030MCL	0.3 MP	659 x 494	120 fps	Mini Camera Link
AT-140CL	1.4 MP	1392 x 1040	25 fps	Camera Link
AT-140GE	1.4 MP	1392 x 1040	20 fps	GigE Vision
AT-200CL	2.0 MP	1620 x 1236	20 fps	Camera Link
AT-200GE	2.0 MP	1620 x 1236	15 fps	GigE Vision



Mini Camera Link



Camera Link



GigE Vision

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See the possibilities