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3 CCD Cooled Digital Color Camera

ORCA®-3CCD

3CCD Cooled Digital Color Camera

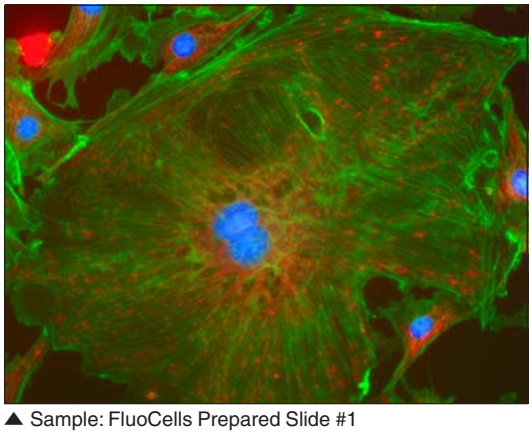


▲ Rear cable mount model (Type number : C7780-20)

The ORCA-3CCD cooled digital color camera incorporates three cooled CCD chips, providing the rapid readout, high resolution and superior S/N ratio of the Hamamatsu ORCA digital camera series. The three color CCDs employ an RGB prism to achieve extremely high quality color representation without color blur, a performance difficult to achieve with a single-CCD camera. The CCDs used are the same as those used in the ORCA series, providing proven high quantum efficiency and high resolution, cooled to 0 °C for high sensitivity detection. It is suitable for a wide range of applications, from brightfield (i.e., stained pathological specimens) to fluorescent specimens using GFP and fluorescent antibodies.

FEATURES

- **Total 4.13 million pixels**
- **Total 36 bit color resolution**
- **Cooling temperature of 0 ˚C**
- **Individual R, G, and B exposure settings**
- **8 × 8 binning capability**
- **9.1 frames/s full speed display**
- **Low readout noise (13 electrons rms typ.)**



▲ Sample: FluoCells Prepared Slide #1

APPLICATIONS

- **Color digital time-lapse recording**
- **Fluorescence Resonance Energy Transfer (FRET) studies**
- **Fluorescence In Situ Hybridization (FISH) studies**
- **Simultaneous imaging of multiply-labeled cell and tissue**

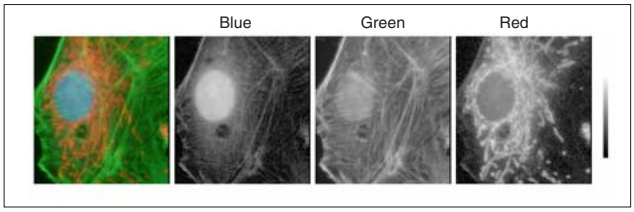
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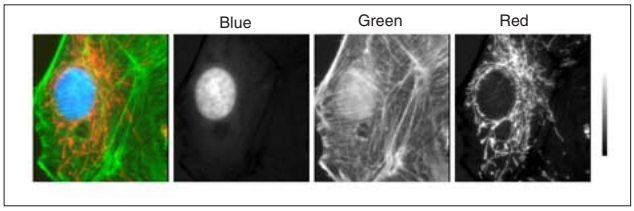
High performance R, G, and B separation

The ORCA-3CCD incorporates three color CCDs with a RGB prism to achieve color separation superior to that available with a conventional single CCD with mosaic filter for microscope use.

Trichrome stained DAPI (blue), BODIPY FL (green), and MitoTracker (red) specimens were observed simultaneously using a D-F-T triple band mirror cassette. Separation of the color image into B, G, and R revealed admixture of BODIPY FL (green) fluorescence in the B (blue) and R (red) channels when using the single CCD with mosaic filter; however when the ORCA-3CCD was used, skillful matching of the fluorescent dyes with the wavelength separation prism achieved excellent color separation.



▲Color separation of single CCD



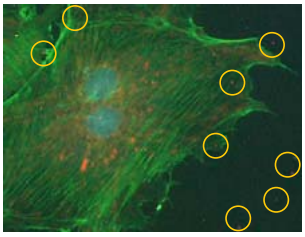
▲Color separation of ORCA-3CCD

Total 4.13 million pixels

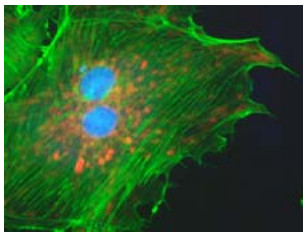
The use of three color CCDs in the ORCA-3CCD eliminates the deterioration in B (blue) and R (red) resolution which tends to occur with single color CCDs. The high spatial resolution of approximately 1.3 mega pixels for each of the R, G, and B channels allows acquisition of highly detailed fluorescent images.

Cooling temperature of 0 ˚C

The ORCA-3CCD employs Hamamatsu's own cooling technology* to lower the temperature of the CCDs to 0 ˚C. This significantly reduces the noise characteristics often associated with long exposures, thus allowing observation of faint levels of fluorescence.

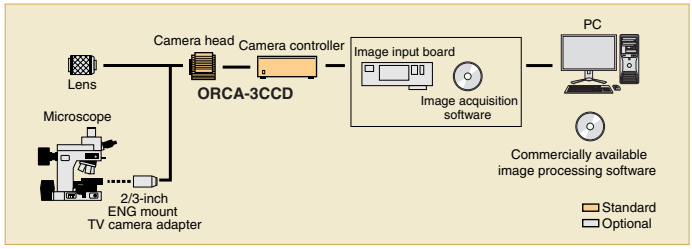


▲ Non-cooled digital color camera
Yellow circle: Location of dark noise



▲ ORCA-3CCD

SYSTEM CONFIGURATION



SPECIFICATIONS

Model name	ORCA-3CCD	
Type number	C7780-10	C7780-20
Signal output connector position	Front	Rear
Sensor structure	3 chip CCD with RGB prism	
Imaging device	Progressive scan interline CCD	
Effective number of pixels	1344 (H) × 1024 (V)	
Cell size	6.45 mm × 6.45 mm (square format)	
Effective area	8.67 mm × 6.60 mm (2/3-inch format)	
Pixel clock rate	16 MHz/pixel	
Frame rate	9.1 frames/s	
2 × 2 binning	18.1 frames/s	
4 × 4 binning	31.8 frames/s	
8 × 8 binning	51.5 frames/s	
Readout noise (rms)	13 electrons	
Full well capacity	18,000 electrons	
Dynamic range*	1384 : 1	
Cooling method	Peltier cooling with air radiation	
Cooling temperature	0 ˚C at +20 ˚C ambient temperature	
Dark current	0.5 electrons/pixel/s	
A/D converter	12 bit	
Output signal (digital output)	12 bit, 10 bit and 8 bit × 3 channels parallel output	
Exposure time	128 µs to 10 s	
External control	RS-232C (full remote for all camera functions)	
Sub array	yes	
External trigger	yes	
Lens mount	2/3-inch bayonet mount (flange back 48 mm)	
Ambient storage temperature	-10 ˚C to + 50 ˚C	
Ambient operating temperature	0 ˚C to + 40 ˚C	
Ambient operating/storage humidity	70 % max. (no condensation)	
Line voltage	100 V / 117 V / 220 V / 240 V, 50 Hz/60 Hz	
Power consumption	Approx. 140 VA	

* Calculated from the ratio of the full well capacity and the readout noise.

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