# 3 CCD Cooled Digital Color Camera

# ORCA®-3CCD

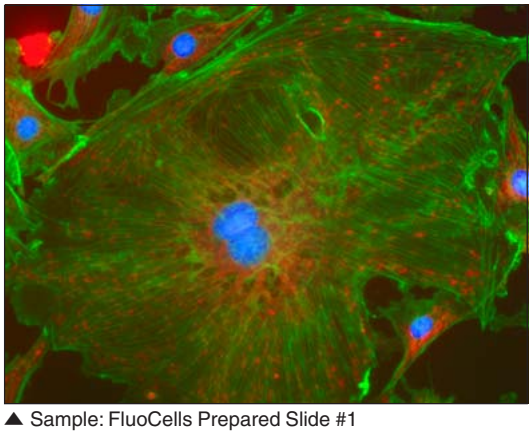
## 3CCD Cooled Digital Color Camera


▲ 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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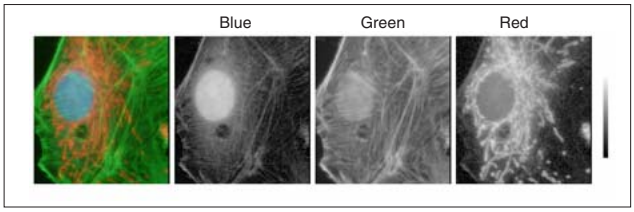
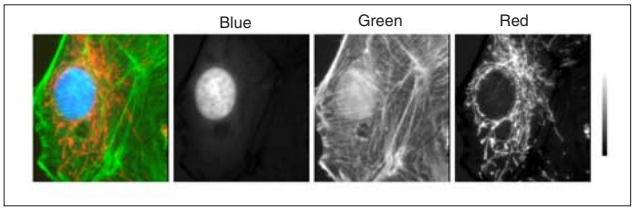
## High performance R, G, and B separation

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



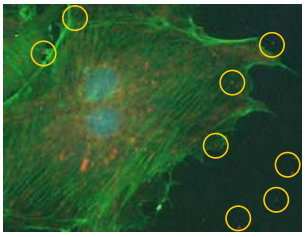

▲Color separation of ORCA-3CCD

## Total 4.13 million pixels

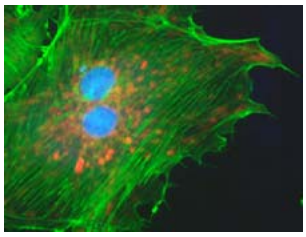
The use of three color CCDs in the ORCA-3CCD eliminates the deterioration in B (blue) and R (red) resolution which tends to occur with single color CCDs. The high spatial resolution of approximately 1.3 mega pixels for each of the R, G, and B channels allows acquisition of highly detailed fluorescent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

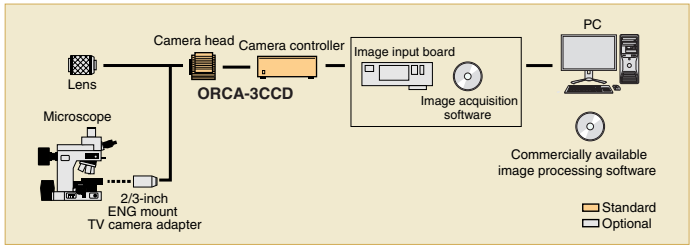


▲ Non-cooled digital color camera
Yellow circle: Location of dark noise



▲ 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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