

Gates AX700 / Z90 Housing and the Philippine Islands

by Karen and John Ellerbrock

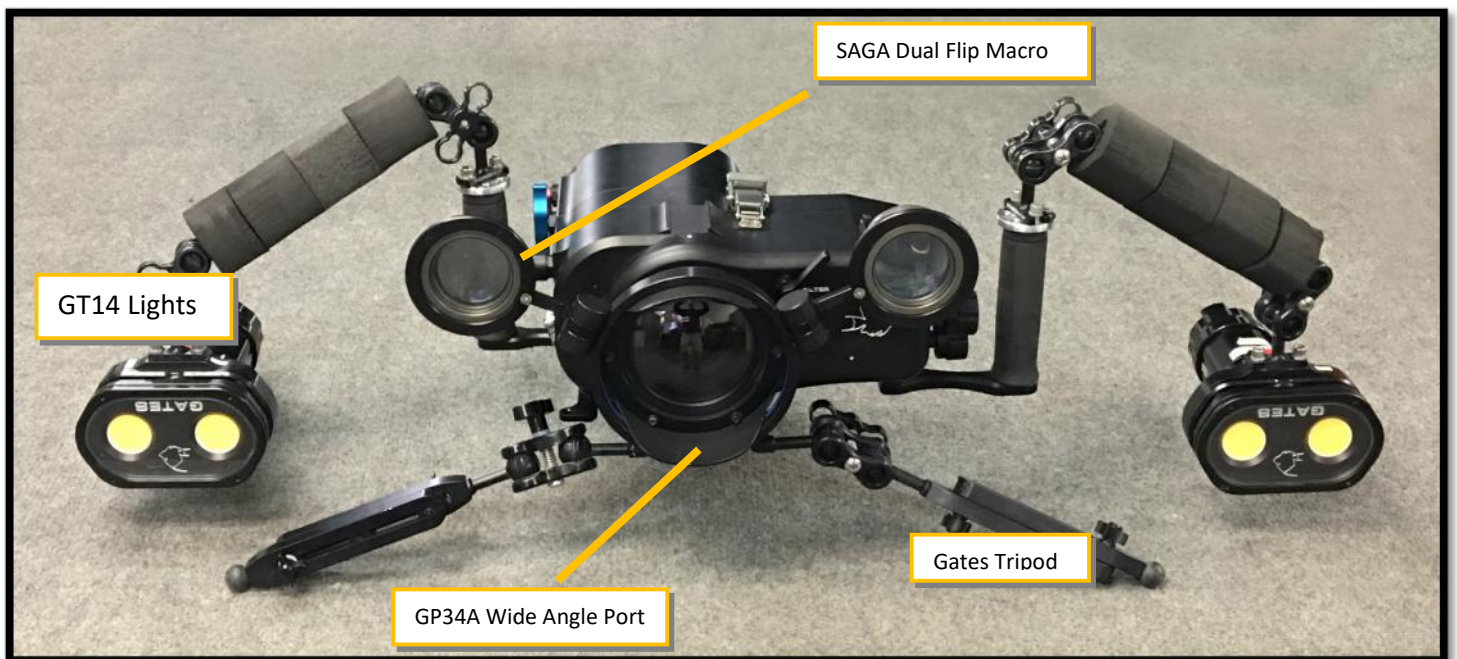
Over the course of two weeks in April 2018, Karen and I had the opportunity to dive the new AX700 / Z90 housing system in real world conditions. Numerous aspects of this system were considered and are reported here. In particular we look at the Sony FDR-AX700 camera manual white balance capabilities, which is so critically important for underwater motion imaging.

We elected to use specific settings for all images, expecting good results based on testing by our friend Juan Miguel.

- Resolution: 3840 x 2160 30P
- Picture Profile: REC2020, HLG 140Mbps
- Exposure. A good compromise to minimize motion blur & noise while maintaining reasonable DOF.
 - Shutter: 1/60. Iris: f8 / f9 Gain: Automatic
- AE Shift: -0.2EV. This setting underexposes all shots by just a bit. Why? In general colors are slightly richer, more depth. This is a long-held and time tested technique.
- Autofocus. There is no practical need to manual focus shots with the AX700. It is fast. Locks onto a subject and tracks. The days of a 'hunt and seek' autofocus are over.

All framed grabs in this section are 'as shot' images, except as noted. Full resolution images can be downloaded here: [GATES AX700 WB IMAGES](#)

THE AX700 RIG





WHITE BALANCE

Before evaluating the FDR-AX700 white balance performance, a quick review of the tools we have available to deal with color loss underwater is in order. There are three:

- **White Balance** (in camera);
- **Color Correction Filters** (in the housing); and
- **Post color grading** (on your computer)

In this section I am solely focusing on **White Balance**.

Underwater there are three distinct lighting situations we care about, and for which a camera should be able to white balance:

- 1) **Sunlight only.** Acquiring Mantas, dolphins, reefs and other big, wide subjects are typically done with ambient light.
- 2) **Lights only.** Conversely, the use of artificial light for macro and night imaging is most common.
- 3) **Sunlight + Lights.** This is arguably the toughest scenario as the camera tries to figure out color from two disparate light sources. Lighting the foreground of a larger reef scene, for example. Most cameras are unable to cope. But hang on for AX700 details....

Puerta Galera and Dumaguete are renowned for macro imaging. Muck diving in limited visibility, which presented ample opportunity to test the AX700 with lights – in this case, Gates GT14's. Certain subjects (e.g. anemone on a small reef outcropping) worked well to assess performance of sunlight + lights. And finally, in the absence of big subjects, we tested the AX700 white balance in ambient light with a few reef shots and macro critters.

Before delving into details, we make note of a two AX700 / Z90 performance characteristics:

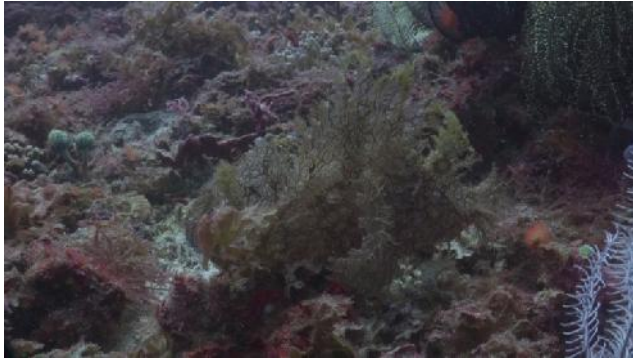
- ***In nearly all scenarios, the Sony FDR-AX700 manual white balance established proper color.***
- ***Equally important, it did so without the aid of a white reference (e.g. white slate).***

Yep – the AX700 consistently locked on the same color observed with our eyes. It wasn't perfect of course, but consistent. And a nice surprise. Why? With a new sensor and Bionz processor engine. the AX700 is notably improved over its predecessor, the AX100. Juan Miguel predicted this, and based on our results, he was right. The AX700 faithfully acquired color in all scenarios.

And yet, there's more. The AX700 / Z90 WB SET function can be mapped to a camera assignable button -- another key difference from the AX100 which did not have this capability. In turn the assignable buttons are readily accessible – and I mean fingertip accessible – on the AX700 / Z90 housing. Which of course made the process of establishing white balance quick and slick. Let me repeat: setting White Balance on the AX700 / Z90 system is a single, fast, fingertip action. It could not be easier or more accurate.

Sunlight only white balance

Given the previously mentioned lack of big subjects in clear blue water, we tried to find critters worthy of shooting in ambient light to test the AX700 capability. Here are a few frame grabs.



These images are flat, washed out. Unremarkable, except for one thing: they have *color*. Unlike many other cameras that would produce a flat green / blue image, these have more. How do we know? I loaded each frame grab into Photoshop and performed a one-step 'auto contrast' correction. The colors immediately popped out. See below.

What does this mean? It tells us that while the red end of the spectrum is compromised in ambient light conditions, the AX700 is compensating. It adjusts. We need only push contrast to make the image come alive.



Note: The Xenia image was acquired using the built-in flip color filter. This is obvious by the filter not being fully engaged, and visible in the upper right corner. We tested the AX700 manual white balance performance both with and without the CC filter. It didn't seem to matter: the AX700 captured color fine either way. So, we continued shooting most of the trip without using the CC filter. *This does not mean* a color correction filter is unnecessary with the AX700 camera, just not for our particular water conditions and subjects.

In this part our goal was to evaluate the AX700 performance in ambient light conditions. Given these results, we can reasonably expect the AX700 and Z90 cameras to perform well in clear water with big animals. Naturally this is no guarantee, actual field tests are necessary.

Lights-only white balance

The next scenario using Lights is the most predictable. We used the Gates GT14 Underwater lights to produce full spectrum illumination. Up to 14,000 lumens, 90 CRI and 5000°K color temp. What camera wouldn't love that? The AX700 surely did. Here are a few frame grabs.



As expected, sharpness and contrast are excellent. A natural benefit of ample lighting. We used two GT14's, the benefit of which are a) no distracting shadows and b) good cross-fill lighting of subjects to aid the camera auto-focus tracking. Note in the photo of the AX700 rig the lights are extended about 16 inches from the housing. This helps with reducing backscatter. Lights positioned this way allow control the light beam edge, and *not* illuminate the water / particulate between camera and subject. Not all subjects cooperated and allowed such technique, but we employed it whenever possible.

Sunlight + GT14 Lights

Lastly we turn to another challenging scenario. Sunlight is always filtered by water, absorbing red and yellow preferentially, leaving blues and greens. We already know the AX700 handled a sunlight only condition well, but what happens when we add a full light spectrum from GT14's?

Before proceeding it's important to ask the question "What should the image look like?" The answer can be different depending on the subject. For our particular diving – muck and reefs in limited visibility – I wanted a wide angle shots to have a dimensional feeling. That is, the foreground subject illuminated and colorful while the background more blue / green. This is how I view the scene naturally. So I would like the camera to do the same. I therefore set up shots to *illuminate the foreground well and in balance to the background ambient light.*

This is where experience is handy – knowing how to shoot a particular subject like this. The GT14's come in handy, too, with adjustable light output to balance with ambient background. Further, I note that only the widest shot required full 14,000 lumen output from the GT14's. Most of the time a lower light setting was sufficient.

(Side note: experience also tells me that cloudy, overcast days are best for these types of shots in the murky waters encountered. Direct sunlight means green water. Cloud cover makes for darker, bluer water. The latter is much preferred.)

In short, setting up the shot for the outcome is an important ingredient to achieve the results you'll see below. Don't get me wrong: the camera must do it's job, too, or the colors are wonked. But the AX700 performed admirably. It faithfully reproduced color in a mixed lighting situation. Here are the results.



A standout aspect of these images are the markedly different colors of the background water. As noted previously this is due to many factors: water clarity, depth, sun position, clouds, and more. This actually speaks well of the AX700 as it appears to faithfully capture the image just as it was viewed by our eyes.

In short I am impressed with the overall AX700 white balance capability. It was not perfect in all situations, of course. A few SUN+GT14 clips had too much red (which is easily corrected in post editing). But overall *more than 95%* of our shots are good, usable images with color.



Summary – AX700 White Balance Performance

- **Overall performance.** In nearly all scenarios, the Sony FDR-AX700 manual white balance established proper color. Over 95% of our clips are usable for color.
- **No white slate needed.** The AX700 camera set manual white balance without the aid of a white reference (e.g. white slate).
- **Fast response.** The AX700 camera set manual white balance in less than one second.
- **Direct housing access.** Setting white balance on a shot took less than 2 seconds. The reason: WB SET (White Balance Set) function can be set one of three user-assignable button on the AX700 camera that are accessible on the housing. We used Assign 5, which put WB SET at our fingertip. Fast and easy.

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