




And on top of that, it will playback sound as well. When it comes to a screen on an action camera, this is perfect for me. Or rather, for my wife. I actually didn't use it nearly as much as her – who loved being able to see exactly what she was shooting and play it back without a phone (as was the case with her cannonballs seen later).

Now with all that praise, do keep in mind one thing: For most folks, the screen is merely used for framing a shot. So while the color is much appreciated, I wouldn't say it's a complete deal-breaker. I'm able to frame shots on the 1930's style black and white screen VIRB just as easily as the Hero4 Silver.

## VIDEO – 4K & 2.7K (BLACK/SILVER ONLY):




When it comes to video quality in an action cam, nobody has higher resolutions than the GoPro. Period, end of story. Well, at least today.

So what does that mean from a practical standpoint? Well with the Hero3+ Black, GoPro offered 2.7K at full frame rates. In this case, full frame rates are anything above 24FPS. Below that and you'll start to get degradation viewable to the human eye in most situations. So in the case of the Hero3+ Black, it had 4K footage…but at 15FPS.

With the Hero4, things simply shifted. The Hero4 Black got full 4K at 24/25/30FPS, while the Hero4 Silver got 2.7K at 24/25/30FPS, and 4K at 12.5/15FPS. So basically, the following happened:

> *Resolutions/FPS: Addition of full frame 4K = Hero4 Black*
> *Resolutions/FPS: Hero3+ Black = Hero4 Silver (+ a screen)*
> *Resolutions/FPS: Hero3 White = 2014 Hero Base (with a reduction of resolutions/FPS/features)*

Now with that in mind, how many more pixels do you get from 4K footage over traditional 1080p or 720p footage? Let's start with this:

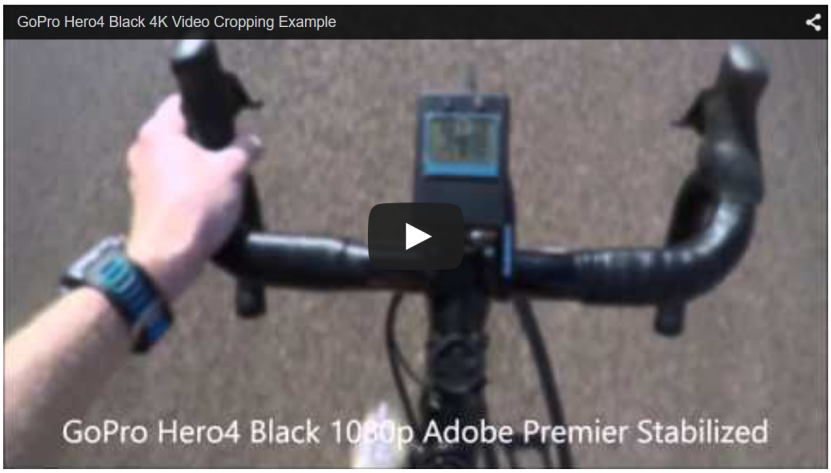
***4K:*** *3840×2160 – 8,294,400*
***2.7K 4:3:*** *2704×2028 – 5,483,712*
***2.7K 16:9:*** *2704×1524 – 4,120,896*
***1080p:*** *1920×1080 – 2,073,600*
***720p:*** *1280×720 – 921,600*

As you can see, it's a crap-ton more pixels.

But there's a small catch: The computer you're viewing this post on right now likely can't even display 4K footage. 4K capable computer monitors are in the $800 (and Apple's capable monitor/computer costs $2,500). Although, 4K TV's are much cheaper, starting around $400-$500US.

So if nobody has these devices, why shoot 4K? There are two reasons: First is simply to start collecting higher quality content knowing that over the next few years 4K resolution will become the norm. But the second is more important: It allows you to crop to a lower resolution.

This means that you can take 4K video and crop to a smaller portion of the image and then still maintain 1080p (or other lower resolution). Here, let this short video clip explain things a bit. In this case I wanted to shoot just the cycling head unit and have it be super-crisp and readable for another post I was doing. It's tough to do that though while riding and just hand-holding it. But with Premier afterwards I was able to crop down and stabilize just that portion of footage, and still get 1080p detail.




As you can see, I took the 4K video, but then cropped down just a chunk of it to 1080p. Note that cropping is different than downscaling. Cropping means you cut some of the image away. Whereas with downscaling (aka 'to downres'), you simply convert the entire video down to a lower resolution. You don't lose any of the picture, but you just lose quality.

To explain some of the differences between the two resolutions, here's a segment where I had all three cameras mounted side by side. Here's the Hero4 Black (be sure to set the resolution to 4K):



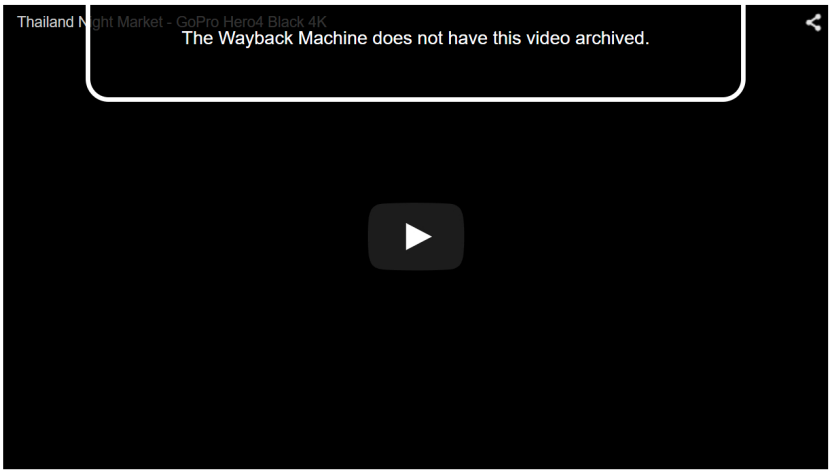

Now, let's skip down to the Hero base (be sure to set the resolution to 1080p):





Can you tell the difference? For most on smaller screens – probably not. But that's likely just because you're viewing it on a device too small to notice the differences. But, this is a key point in deciding whether or not it's worth the money to pay extra for what is 4K/2.7K over just 1080p resolution found on every other device out there.

Of course, you're not just paying for resolution – you're also paying for low light performance. Take for example this video shot in a night market in Thailand. It's a simple compilation of various food stalls shot at 4K. Despite the low light conditions things came out quite nicely, and I was just hand-holding everything:




Now when it comes to resolutions, keep in mind that while GoPro has action cam dominance today, tomorrow that might change (hence why it's always good to check out the Product Comparison Tool). In general, I wouldn't expect any changes between now and the end of 2014. But I fully expect that to change starting with CES the first week of January. CES is the annual and massive Consumer Electronics Show, where everyone in the gadget world comes out with their new stuff. Typically speaking you don't see new products available that same week – but rather announced at CES and then available in the months that follow. I'd be happy to bet we'll see a flood of 2.7K & 4K players announced then. Of course, whether or not they'll be any good is a totally different question.

## VIDEO – HIGH SPEED:




In addition to high resolution video, the GoPro series can also do high speed video. High speed video refers to the idea of increasing the frame rate (frames per second) recorded in order to then play it back at 'regular' speed and achieve a slow-motion effect. Take for example 120FPS footage. It's captured (wait for it) at 120 frames per second. But, when it comes to playback, it might be played back at 30FPS, which then results in that one-second moment of action taking 4 seconds to play back. Thus achieving gloriously smooth slow-motion.

Smooth slow motion is a factor of how many FPS you can capture at, combined with the resolution you can capture. In general, each year the bar gets moved higher and higher for capture rates.

So like past years, once again we saw a bump in resolution. This becomes important when trying to incorporate slow-motion video into normal HD programs. With these higher frame rates at higher resolutions, you're no longer having to make sacrifices in quality or frame rates for slow-motion footage.

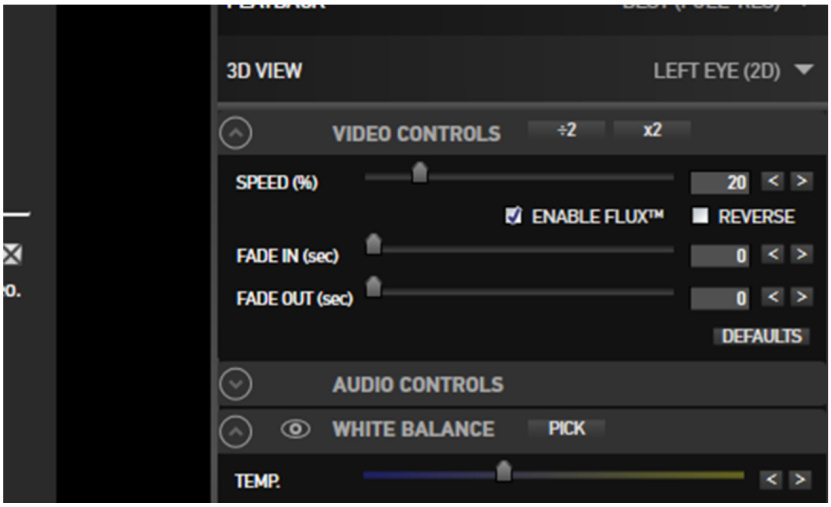
Like other settings, on the GoPro you can modify these within the app, or within the camera itself. In the case of base GoPro Hero, you're only getting 1080P-30FPS, or 720P-60FPS.

The exact frame rates offered for each resolution I've included within the comparison table at the bottom of the review.

So what does this look like? Well, no better way to test this than a canon ball into a swimming pool. The perfect way to illustrate slow-motion, in this case with a common 120FPS 720p clip (from the GoPro Hero4 Silver):



Now I could have gone to 240FPS on the Hero4 Black, but that downgrades the resolution to WVGA levels (480p). And in doing so, you tend to lose quite a bit of quality. I wouldn't normally use that method, but would instead look to slow it down further with the GoPro studio and take the hit on frame rates instead of resolution. In this case, I went with 20% speed playback.

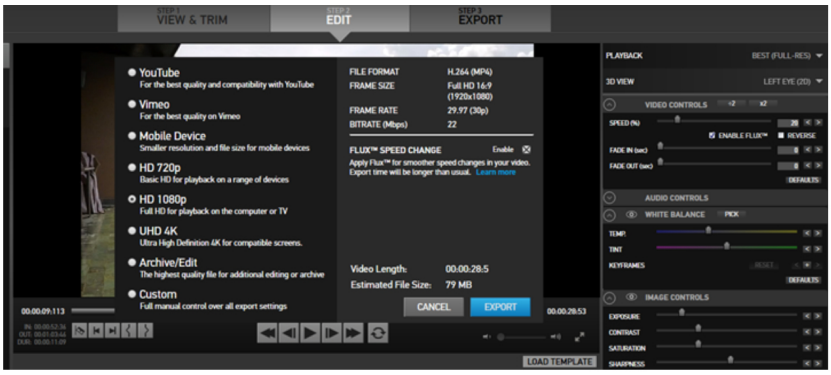



Note that the GoPro Studio offers the ability specify the exact moment in time that you switch from regular playback to slow-motion playback by simply splitting the clips. This allows you to keep at normal speed until just the moment of action, such as this where I kept it regular rates for the first few seconds, then slowed it down when she was mid-air, and then let it get back to half-speed towards the last few seconds.

Further, GoPro has also introduced what they call 'Flux'. The idea behind it is a bit smarter interpolation of the frames when slowing down video, allowing you to get cleaner video. In the above case I used Flux for the middle section of slow-mo, though, it's not really required since I shot at 120FPS already and there was plenty of slow motion as-is.

But it's more noticeable if you really wanted to slow things down even further than that. For example, if you wanted to turn what would have been 4-5 seconds at playback speed into 8-10 seconds. In that case you'd lose so many frames that it might be tough to get smooth video.

Note that Flux is all done after the fact within GoPro Studio, and is not something done on the camera itself. It does not require you do anything on the unit itself.




Ultimately, the Hero4 lineup offers the most diverse options in the marketplace today when it comes to high speed frame rate offerings as well as higher resolutions at those frame rates.

## PHOTO MODES (REGULAR/NIGHT/BURST):




The Hero4 introduced a new night capture mode to the lineup, which aims to compliment the other photo modes found within the unit. Before we dive into the night mode, it's probably good to start with a quick overview of all the major modes found on the Hero lineup:

> ***Single Shot Mode:*** *This is the most basic, you press a button, and a single photo is taken. I find this best when you know exactly what you're taking the photo of, without any action-sport ambiguity. For example, you might use this in a marketplace or other non-action setting.*
> ***Continuous:*** *In this mode it'll keep taking photos until you stop holding the button – or until 30 photos is taken. You can define how often it should take photos, but this is handy when you may have a chunk of time where you want to capture a range of activities that aren't going to occur super fast (for that, you'd want burst).*
> ***Burst:*** *This is is for capturing up to 30 photos in one second. Or basically, a burst of photos, as the name implies. This is best when you're capturing a quick moment of action and you don't know exactly what might make the perfect shot for later. You can tweak the capture rate a little bit over the course of upwards of 3 seconds. So you could do 10 photos/second for 3 seconds, for example.*
> ***Time lapse Mode:*** *This is technically a photo mode, but I've broken it out into its own little section, so we'll talk more about it in the next chunk. But essentially it allows you to create an automated interval of photos – such as every .5 seconds, or 5 seconds, where it just keeps on taking photos until you tell it to stop.*
> ***Night Photo:*** *In this case the unit takes the photo mode but adds the ability to customize the exposure setting. This means you can get more light into the camera and take clearer night photos, as well as get photos with light streaks and the sort. Again, more on that in a moment.*
> ***Night Lapse:*** *This is the same concept as time lapse, but with with night photos. In this case you can get longer exposure photos that can be merged later as part of a time lapse.*

Ok, with those basics out of the way, let's get to some shots and how I use it. In most cases, when I'm using the GoPro as a camera, I'm shooting in the highest possible megapixel arrangement with the wide option. This is because the way the GoPro works is that even if you were to select a medium crop image, it's simply taking the 12MP wide image and cropping that automatically. Thus it's much better to take the higher resolution and do the cropping yourself.

For example, below if I wanted just the fish from this GoPro image, I could crop to just the fish and the sea anemone.





Such as this:



But what situations would you want medium over wide? Well, for those where you didn't want to deal with cropping. For example, The Girl (aka, my wife), borrowed the GoPro Hero4 Silver for the day while snorkeling. She didn't want the super-wide shots that were coming in on wide mode, and instead preferred the zoomed in aspect of the medium mode. For her, she's not going to want to deal with cropping the photos afterwards on the computer or her phone. She just wants to be able to take them and post them to whatever platform she wants – no editing.

The good piece is that both options are there (see table later in review for exact options per model), so you can do whatever you'd like.

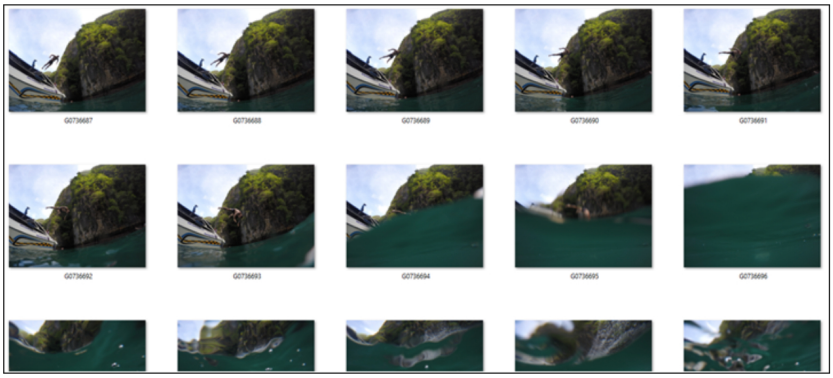
Next, when it comes to how many photos to shoot for each button press, I tend to go with three photos. That allows me a bit of flexibility in case I fudge the shot, and since sometimes they might be slightly-action based (riding or running), I can pick the best out of the three.





And while I could simply shoot more photos at once, I find that a bit of a pain in the butt later on trying to sift through photos after my activity.

Next, you've got burst mode. As I noted earlier, this is ideal when you just want to capture a single action-filled moment. For example, jumping off something, where you don't know if you'd have the precise timing to get the exact photo in just one still. Take the below sequence which I shot of a person jumping off the boat, as an example:



And again, the same here:



In these cases I could then go through each photo to find the 'best' photo of the action. Had I just taken my usual three photos, I'd have far fewer choices.



Finally, let's look at some night shots.  In this case, I used the Night Mode to get a longer exposure with the unit.  I toyed around with a few different exposures (aside from Automatic), but decided that a 2 second exposure worked out the best.  Here's the un-edited shot from the Hero4 Black:



Now this doesn't mean that the camera can't shoot at night, here's the same shot from the GoPro Hero (un-edited), which lacks the night mode:



As you can see – the shot still came out quite nice, it's just that you lack the control over it.  It also lacks the ability to compile the time lapse and night modes together, which can be incredibly compelling in the right situations.

## TIME LAPSE MODE:

