

## A 3.2X TELEPHOTO ADAPTER FOR SONY CAMCORDERS

© 2006 Carroll F. Lam

### Overview

This short paper describes a method of combining two telephoto adapters to achieve higher magnification than either of them alone. The described assembly was developed and tested on the Sony HVR-Z1U HDV camcorder but I am quite sure it would also work equally well on other Sony "prosumer" camcorders - the HDR-FX1 and the VX2000, VX2100, PD150, PD170 series.

The idea was triggered by a thread on the *DV Info Net* Sony Z1U/FX1 forum. Specifically the thread was <http://www.dvinfo.net/conf/showthread.php?t=51686> in which John Jay described how he had combined two Canon telephoto adapters using appropriate step-up/down converter rings to provide an overall magnification of 1.6 times 1.4 or about 2.2X.

I have a *Century Optics* 2X telephoto adapter for my Sony PD150 and a *Century* 1.6X telephoto adapter for my Sony Z1U so I thought I would see if the two could be combined in a way such that they could be used on the camcorder together.

### The Lenses

Here are pictures of the two lenses.



Century 2X



Century 1.6X

The *Century* 2X has a mounting thread size of 58mm and a 52-58mm step-up ring is normally used with it to mount it on the PD150 which has 52mm front threads. The 2X unit has a 72mm front thread.

The *Century* 1.6X has a bayonet mount for the Z1U and a 95mm front thread.

## The Lens Assembly

The front threads on the Z1U standard lens are 72mm so a 72mm-58mm step-down was needed to affix the 2X adapter to the Z1U. This is a relatively common step-down ring size. Thus mounting the 2X teleconverter to the Z1U is no problem.

The front barrel of the *Century 2X* fits precisely within a circular groove on the rear of the *Century 1.6X* lens. Therefore, if the two lenses could be held together longitudinally they would automatically be aligned radially.

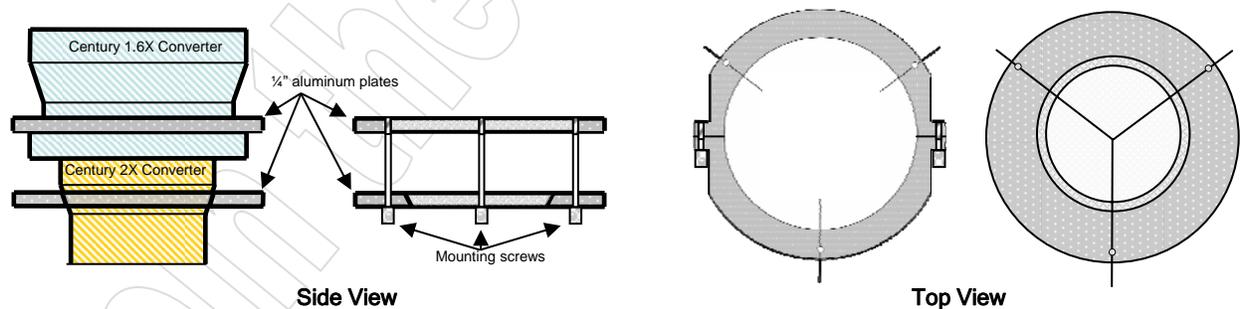
The real challenge then was how to secure the two units together longitudinally for use as a single assembly.

Before committing to any major design and construction activities I decided to temporarily combine the two teleconverters using "gaffer's" tape. I wound several layers of tape around the two lenses until I had a reasonably tightly coupled assembly. I mounted this assembly to my Z1U camcorder using the step-down mounting ring and ran some qualitative tests. These quick tests indicated that image quality of the video collected with the assembly should be quite good.

These results prompted me to consider how a more substantial mount could be devised that would securely hold the two adapters together and to the Z1U.

## The Mount

The mount that I conceived is illustrated in the following drawing.



There are two rings made of 1/4" aluminum. One is split so that it can be fitted around the *Century 1.6X* lens just above the bayonet mounting flange and is held together around the 1.6X teleconverter by two thumbscrews. The second has a tapered hole that slips onto the tapered part of the *Century 2X* lens. Three screws are used to pull the two plates toward each other which secures the two lenses together longitudinally.

Here's a picture of the finished assembly with the two lenses secured by the two rings and connecting screws.

After attaching the plates and screws the assembly makes a solid unit.

It was now time to try it on the Z1U.



The combined assembly.

### Mounting the lens assembly

The combined lens assembly is not light – about three pounds! Left unsupported I believed it would place too much stress on the front barrel and threads of the Z1U so I acquired a *Bogen Manfrotto* telephoto lens support. Here's what that device looks like.



Bogen Telephoto Mount

This mount allows the camcorder and lens assembly to be supported at two different points and eliminate any torque applied to the Z1U's lens barrel.

This mount can then be mounted on the tripod at approximately the center of gravity of the camcorder-lens assembly.

### The finished installation

This is what the finished assembly looks like fully assembled, screwed into the Z1U's front threads, added to the Bogen support, and the full assembly mounted on a tripod. Pretty impressive if I must say!



The combined assembly mounted on the Z1U.

Imaging results with the combined adapters will be discussed in the next section.

### Results

The following pages show images of reduced resolution from the original frame grabs from the .m2t video files using Vegas 6. If you are interested in viewing the full-resolution images you can see them here:

<http://www.clamcamvideo.com/telephoto.html>.

#### Standard Z1U lens alone

The first image is with the Z1U lens only at maximum zoom. As others have found there is a modicum of chromatic aberration at the outer edges of Z1U video at maximum zoom. You can see the slight green fringing on the left side of this image.



Frame grab with standard Z1U lens at maximum zoom.

**With Century 1.6X teleconverter**

The next image was taken with the *Century 1.6X* lens only mounted. The image quality appears to be just as good as that of the standard lens. No additional chromatic aberration seems apparent although the standard lens's aberration seems magnified as would be expected. This is a very nice telephoto converter which permits full "zoom-through".



Frame grab with standard Z1U lens and Century 1.6X converter.

There's no vignetting with this converter even with the Z1U lens set to maximum wide-angle.

**With Century 2X teleconverter**

The next image was taken using the *Century 2X* converter only. Essentially the same comments can be made as those for the 1.6X lens. The essential results are the same at slightly more magnification.



Frame grab with standard Z1U lens and Century 2X converter.

There is very little zoom-through with this combination. The Z1U must be used a just about maximum zoom.

There's no apparent vignetting at maximum zoom.

**Combined 3.2X assembly**

Finally, the results of the full two-converter-lens assembly are shown here. As best as I can tell the image quality is essentially equal to that of the standard lens alone. I could not visually detect any loss in contrast using the full assembly although there probably is. I just didn't have the timeto perform any quantitative



Frame grab with standard Z1U lens and the combined 1.6X and 2X converters.

resolution or contrast measurements.

There is essentially no zoom-through capability with the combined lens assembly.

With the Z1U at full zoom there is no apparent vignetting on the Z1U's LCD viewfinder in underscan-mode although there does appear to be a little "shadowing" on the right-side corners of the collected video imagery. Note the slight darkening of the upper and lower right-side corners of the preceding image.

The closest the combined assembly can be focused is about 18 feet.

### **Conclusions**

The combined assembly appears to provide the desired magnification while maintaining the original HDV image quality.

Little or no vignetting is present at maximum Z1U zoom. But unless vignetting is acceptable the Z1U must be set a maximum zoom.

The combined lens assembly can be focused as close as 18 feet.

I believe the combined lens assembly will prove useful.