
USING BTZS TO CALIBRATE A VARIABLE CONTRAST COLD LIGHT

By
JB Harlin

Those that know me, are aware that I am not an advocate of testing. I would rather be scheduled for flogging than to have to go to the darkroom and test anything. Yet, I do acknowledge it is fact that in order to make acceptable images, you have to do some amount of testing. Understanding how to control the processes are essential for creating expressive images. Yet, I am a person of simplicity, and I firmly believe that testing should be as simple, easy and fast as possible.

Beyond the Zone System, by the late Phil Davis, has to be one of the most comprehensive studies on the subject of sensitometry ever published. A person could spend a lifetime studying all that is contained in this book. BTZS is far too complex for me, and besides, I am a Pyro user, and even Mr. Davis admitted that BTZS will not yield reliable film testing results with a staining developer. But BTZS and the BTZS Plotter software is a great tool for testing printing paper. . . especially Variable Contrast paper!

I have been trying for some time to devise a method. . . either difficult or easy. . . to, in some logical way, calibrate the settings of a VC Cold Light head to VC paper grade. While running tests on various papers using the BTZS Plotter software I suddenly realized I had all the information I needed to do an accurate calibration.

SOME BACKGROUND INFORMATION

A quick search on the Internet reveals that “Varigam” was the first Variable Contrast (VC) printing paper to be marketed. It was developed by Rowland S. Potter and introduced by DuPont in October 1940. This innovation, like many others, has been both a good and a bad thing. Like many advances in technology, sometimes there is confusion when things become more complicated. Suddenly there was another choice. All you needed to print with VC paper was some filters and one box of paper. The filters come in sets that are calibrated in such a way that they deliver approximate contrast grades on the VC paper.

If using filters is not complicated enough, then came another breakthrough printing innovation. . . the VC Cold Light (VCCL) printing head. Both Zone VI and Aristo make continuously variable printing heads for use with VC papers. The latest Zone VI head uses Light Emitting Diodes (LED) to generate the necessary light. The continuously variable VCCL head is extremely flexible and allows you to dial in any contrast you require. These heads allow you continuously variable contrast. But a real predicament arises when trying to find a standard starting point for one of these adjustable light sources. Manufacturers attempt to calibrate their control box to some standard, but there are no real standards. Every paper is different and requires a different setting. So, where do you start?

One method I have used to attempt to calibrate the VCCL head is to use a correctly exposed negative as a standard reference. I would make a print on #2 graded paper and then try to visually match the print on VC paper. This does work to some extent, but there is a lot of room for interpretation. Let's face it, different papers just do not look the same. A VC paper can look very much different from a graded paper, even if they are from the same manufacturer. I have always believed that there has to be a quantifying formula that describes what a paper grade actually should be. . . and there has to be a way to relate VCCL settings to this standard.

Calibrating a VCCL light source is not extremely difficult once you understand how it works. Most of these heads have control boxes that allow individual control of each of the lights inside. All you need is a dial or readout that allows you to repeat a particular setting. Once calibrated, you know what paper grades to expect from a box of VC paper, and how to set the VCCL head for any grade the paper is capable of producing.

HOW IT ALL WORKS

So, first of all, how does VC paper work? In the most simplistic terms, VC paper is sensitive to two colors of light. . . Blue and Green. A blue light prints high contrast and the green prints low contrast. By mixing blue and green light you can achieve any contrast in between the high and low contrast ability of the paper. What we need to know is how much light from each source is required to print grade #2. . . or any other grade?

The standard VCCL head has two neon grids. Yes, this is the same neon that you see in the storefront that says OPEN, except the glass tubing is bent back and forth to form a grid. In the VCCL head there are two grids, one is blue and the other green. There is a control circuit connected to each grid that is used to adjust its intensity. This control is very much like the dimmer on your living room lights.

Next we need to understand how paper grade is defined. In reality, there is little in the way of standards for paper contrast. As mentioned earlier, the late Phil Davis, in his book *Beyond the Zone System*, lays out more information on film and paper testing than any human will ever need to know. If you are really interested in the science, then I highly recommend that you pick up a copy of the book.

BTZS uses a proposed ANSI standard that is more than adequate for defining paper grades for the average photographer. Simply put, paper grade is determined from the Log Exposure Range (Log ER) of the paper measured from 0.04 above paper base white (Dmin) to 90% of maximum black (Dmax). You will need a calibrated step tablet and a reflection densitometer to perform the necessary tests.

To collect the necessary data, a series of exposures are made on several sheets of your chosen VC paper at different VCCL settings using the calibrated step tablet. When the paper is processed, each step is read with a reflection densitometer and the values plotted graphically. You can plot the results by hand or you can use the BTZS Plotter software that Phil Davis devised. Once plotted, you will have a family of paper curves

representing different contrast grades of the paper that correspond to each VCCL grid setting.

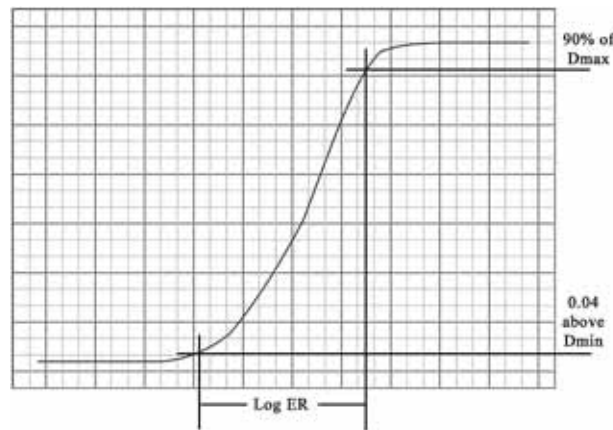


Figure 1

A typical plot of a paper curve showing the necessary parameters to calculate the Log Exposure Range (Log ER). From a family of curves like this, it is possible to generate a graph of all VCCL settings versus paper grade.

From these curves you can plot the equivalent paper grades for all VCCL settings. If you use the BTZS software, a plot will be drawn in the form of a graph that will reflect paper grades versus VCCL settings. Once you have a plot for each VC paper you regularly use, you will be able to choose a VCCL setting that will yield a contrast of known value.

GRADE	Log ER	MEAN
#5	0.50 – 0.65	0.57
#4	0.65 – 0.80	0.72
#3	0.80 – 0.95	0.87
#2	0.95 – 1.15	1.05
#1	1.15 - 1.40	1.27
#0	1.40 – 1.70	1.54

Figure 2

These values define paper grade as a function of Log Exposure. The Mean value is the average Log ER reading for each grade.

HERE IS HOW I PERFORM THE TEST

This is my test procedure. My wife and I are mostly contact printers, so the test is done by contact printing a 4x5 Stouffer 21-Step Tablet onto a 4x5 sheet of paper in a printing frame. I begin by setting up the enlarger as I would to proof negatives. This is a setting of the enlarger that would make an enlargement of a little more than 11x14.

I test seven (7) different settings of my VCCL head from Blue to Green light. It will take a few extra sheets of paper to find a good exposure for the test sequence. Both grids, blue and green, in the VCCL head are set to maximum setting of 10 (full brightness) for the

initial exposure test. What I am looking for is an exposure that will center the step tablet steps on the paper. There should be about equal amounts of solid black and solid white at each end of the steps printed on the test paper.

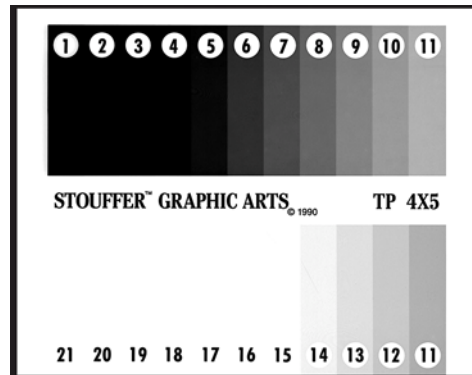


Figure 3

This is a scan of a properly exposed test paper with both green and blue grids at maximum. There should be about equal amounts of solid black and solid white at each end of the range of the step tablet.

Once I am satisfied I have a good exposure, I proceed to expose seven sheets of paper in a progression of VCCL settings. I don't worry about the exposure change as I vary the VCCL settings because I use a Zone VI Compensating Timer and the basic exposure will remain very constant across the range of settings.

With my control head each grid has a setting of 0 through 10, plus off. I note my settings as BLUE/GREEN in a progression of: OFF/10, 2/10, 6/10, 10/10, 10/6, 10/2, 10/OFF. The step tablet is calibrated in 1/2-stop increments and creates a series of print densities on the paper. Each step on the test paper is read with a reflection densitometer and the reflected values are recorded in a notebook.

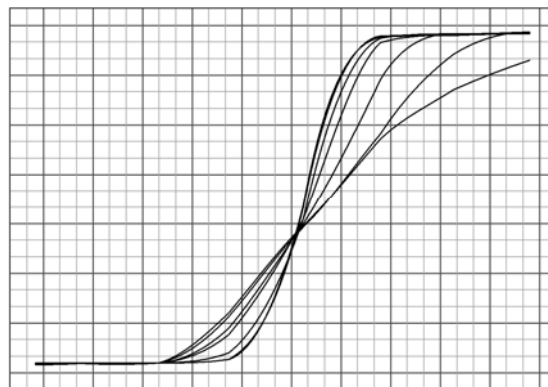


Figure 4

This is a typical family of paper curves plotted on a single sheet. Each plot represents a setting of the VCCL head from blue only to green only grid. From this set of curves, it is possible to calculate the equivalent paper grade for any VCCL setting.

Once all of the data from the test sheets are gathered, the numbers are entered into the BTZS Plotter software which in turn generates a family of curves for the paper under test. The software will also plot the effective paper grade in the form of a graph for each VCCL setting. This graph provides all the data needed to set my VCCL head to any paper grade within the range of the paper.

I test each VC paper that I use, then print out the graph of VCCL settings and keep them in a notebook in the darkroom. Whenever I need to set up my enlarger for a test or for printing, I refer to the graph for the paper I intend to use. If you are printing on one brand of paper and want to change to another, you know what an equivalent grade setting will be for the new paper. This is a simple and easy way to calibrate a VCCL head for printing on VC papers.

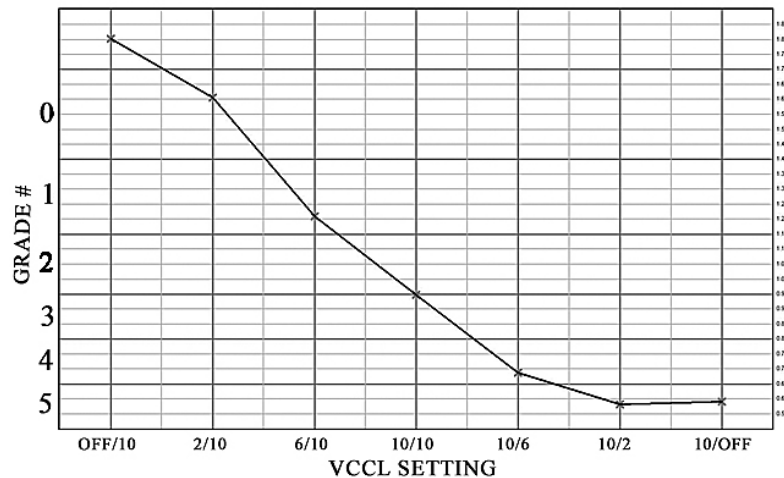


Figure 5

Graph generated using BTZS Plotter software showing VCCL setting versus paper grades. A graph like this is generated for each VC paper and kept in the darkroom for reference.

THINGS TO CONSIDER

As I mentioned earlier, my wife and I mainly contact print. If you enlarge, you should run your paper test by placing the Step Tablet in the negative carrier and enlarging it onto your test paper. There will be some difference in contrast between contact printing and enlarging. This is due to the enlarger, lens flare and the Callier quotient or Q-factor as described by Phil Davis. If you both enlarge and contact print, you should test both ways, just to be sure. Depending on your equipment, the difference may not be significant, but you need to know.

It is also possible to use a color dichroic head as a continuously variable light source for printing on VC paper. When using a color head you vary the intensity of the Magenta (hard contrast) and Yellow (soft contrast) filters in the head to set the contrast of VC paper. You can run the same test using various setting of each filter from hard to soft, then plot the data for the settings. Then you will know how to set the filters for any paper grade you may require.

Don't be surprised if some VC papers do not perform as you might think. Not all VC papers have a lot of contrast range. This kind of data is good to have if you are working with a problem negative that requires drastic deviation from the normal #2 grade. No need to waste your time trying a paper that will not work satisfactorily.

It is also a good idea to plot any graded papers you may use. Not all graded papers correspond to the exact grade marked on the box! This information is valuable if you ever need to move between graded and VC paper. You have an idea of what VC settings are a good starting point.

If you want to plot your paper readings by hand rather than using the BTZS Plotter software, I would recommend you purchase the book by Phil Davis, *Beyond the Zone System*. Plotting the data by hand is not difficult, but hand plotting does require an understanding of how to correctly draw and read the curves. For those that are interested, I use an X-Rite Model 400 B/W Reflection Densitometer for all paper readings.

Having a calibrated system in place will allow you to choose a known paper grade when using VC papers and will clear up the confusion about how to set a VCCL head. You will be able to proof and test to a known paper standard when using VC papers. After running this test, as Fred Picker used to say, "you have one foot on a rock."



JB & SUSAN HARLIN
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References

BTZS:

The book *Beyond the Zone System* by Phil Davis along with the BTZS Plotter software and Stouffer Step Tablets are available from The View Camera Store, Inc., P.O. Box 19450, Fountain Hills, AZ 85269
<http://www.viewcamerastore.com>

Beyond the Zone System [BTZS.org](http://btzs.org) B&W Photographic Community
<http://btzs.org>

VCCL Products:

Aristo VCL 4500 and VCL 810

Aristo Grid Lamp Products, 400 Captain Neville Drive, Waterbury, CT 06705, Tel: 203-575-3425 Fax: 203-575-3456
<http://www.aristogrid.com>

Calumet Zone VI LED 4x5 Light Source - Type 2, Calumet # EN6400 Calumet Photographic Inc.,
<http://www.calumetphoto.com>