



User Profile: John Sexton

Successful Sheet Film Processing With JOBO Rotary Processors Using JOBO Expert Film Drums

For the past six years I have been processing my sheet film on either a JOBO [AutoLab](#) or JOBO [CPP-2](#) rotary processor. I exclusively utilize the JOBO Expert film drums for this purpose. The results I have obtained with this equipment have been of extremely high quality - the evenness of development is the best I have ever been able to obtain, and the consistency and repeatability of the processing is unsurpassed.

For years I very carefully tray-processed all of my sheet film by hand. This procedure, if carefully executed, yields excellent results; however, it requires considerable handling of the film. This presents the opportunity for occasional scratching of the films which can be disappointing, to say the least! In addition, it is a most labor intensive procedure. It takes a lot of time in the dark, with careful concentration throughout the entire time of the process. It was not something that I would do late at night after arriving back from a long day of photography. I had learned over the years that even though I was most anxious to see the results of my photography, I could do a far better job the next day in a rested and refreshed state. Consequently, I seemed to always have a huge, and growing, backlog of negatives awaiting processing.

When JOBO Fototechnic contacted me about experimenting with their equipment I was skeptical. Much to my surprise, the initial runs utilizing the Expert film drums with my 4x5 negatives were excellent. Whenever I make a change in my standard processing procedure I always conduct tests (utilizing sensitometry and test images) before processing valuable images. I was amazed at how quickly I was able to begin processing "real" negatives with my JOBO.

I have been asked if the constant agitation that occurs with rotary processing doesn't increase the contrast of the film, and at the same time increase the grain. The answer is yes! - if you were to process the film for the same time as other processing procedures with less vigorous agitation. The constant agitation will require the use of a shorter developing time, and perhaps a more highly diluted developer. Once these adjustments are made the contrast and grain is identical, in my experience, having processed thousands of sheets of film in my JOBO. In the table below I have provided some suggested developing times (in minutes) for the films that I use in my own work. These are only starting points. Each photographer must test to find the right combination to produce negatives that work for them.

These processing times should produce negatives that are suitable for use on a diffusion light source (cold light or dichroic color head). If a condenser light source is to be used, the above times should be reduced by about 15% for T-Max films and approximately 20% for Tri-X.

For those not familiar with the Zone System notations of Normal, N-1, and N+1, a brief explanation may be helpful. Normal development times should produce normal contrast negatives from normal contrast scenes. N-1 refers to Normal, minus one zone contrast reduction. This adjustment is about the equivalent of lowering the contrast by one paper grade, and would be used if photographing a high contrast scene. N+1 refers to Normal plus one zone, and increases the contrast of the negative by about one paper grade. This would be used if photographing a low contrast subject.

I use all of my developers one-shot, discarding them after one use. I prefer to work with fairly dilute developers that allow me to have processing times longer than 5 minutes. Processing times

shorter than 5 minutes should be avoided to ensure even development of the film. Because I am often working with dilute developers, I use a greater volume of chemistry with the Expert drums than suggested by JOBO. For the 6 sheet #3006 drum (6 sheets of 4x5" film) I use 560cc of solution, and with the #3010 drum (10 sheets of 4x5" film) I use 850cc of solution. You will need to check the literature supplied with various developers, or conduct tests, to determine the amount of stock developer needed to process a given number of square inches of film with a particular developer. Remember, it's not the total volume of solution, it's the amount of stock developer that counts. (Hopefully your tap water will NOT develop film by itself!!!)

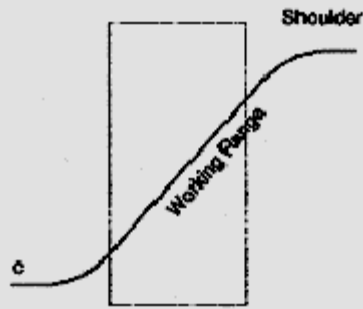
You will note that the developing times with T-Max RS developer are calculated at 75°F. Developing T-Max films with this particular developer yields better middle-value contrast at this higher temperature. In addition, please note that I always use fresh D-76 developer with T-Max films. If the developer has been stored for more than 3 weeks after mixing from powder I discard it. As D-76 ages, a new chemical compound, hydroquinone monosulfonate, is formed that produces much higher contrast, especially on T-Max films.

All of the suggested development times are based on a five minute water pre-soak of the film. This pre-soak is recommended by JOBO, and helps ensure even development of the film. The following speed settings were used with the Expert Drums: CPP-2 and CPA-2 = #3½; AutoLab 2 Plus and AutoLab 3 = 50 RPM.

I am thrilled with the enhanced productivity that my JOBO processor has given me. The Expert sheet film drums do a beautiful job giving even and consistent development of my film. The Kodak T-Max films I like to work with are process sensitive. Variation in temperature, time, or agitation yields noticeable contrast changes in the negatives. This is valuable to the photographer who wants to alter the contrast of different negatives, but can cause frustration if variables are added to the process without the photographer knowing it. The JOBO processing system helps ensure my processing is consistent from one run to the next. I have been so pleased with the results that I am now using the 1500 series of tanks with the JOBO stainless steel reel system for my small amount of roll film work.

The JOBO rotary processor, along with the Expert series of film drums, has allowed me to achieve a key philosophy I have had relating to the craft of photography: **"PROCESS FILM WITH PRECISION... PRINT WITH COMPASSION!"**

<u>D-76 Developer</u>			
Diluted 1:1 at 70°F (21°C)			
<u>FILM</u>	<u>N-1</u>	<u>Normal</u>	<u>N+1</u>
T-Max 100	6.5 (EI 50)	8.0 (EI 64)	10.5 (EI 80)
T-Max 400	6.5 (EI 200)	8.5 (EI 250)	11.0 (EI 320)
Tri-X	NR*	6.0 (EI 160)	8.5 (EI 200)
<u>Kodak T-Max RS Developer</u>			
Diluted 1:9 from the concentrate @ 75°F (24°C)			
<u>FILM</u>	<u>N-1</u>	<u>Normal</u>	<u>N+1</u>
T-Max 100	6.5 (EI 50)	8.0 (EI 64)	10.5 (EI 80)
T-Max 400	6.25 (EI 250)	7.75 (EI 320)	10.25 (EI 400)
Tri-X	NR*	6.0 (EI 200)	8.5 (EI 250)
* Processing times shorter than 5 minutes are not recommended			



Best of luck!!!

Note from the Editor on John's new book "Listen to the Trees": John Sexton's magnificent photographs of trees are the heart of his black-and-white work. These elegant and understated images are a gentle and intimate vision of the natural world. Interwoven with Sexton's luminous photographs in this lavish book will be prose and poetry excerpts, along with an introduction by Stewart L. Udall, an essay by James Baker and an essay and photographer's notes by Sexton.

If you would like to purchase John's latest book, contact your local bookstore, or call 1-800-759-0190.

Feature Article: Understanding The H&D Curve

By Darryl C. Nicholas (The Grand Ol' BAT, Himself!)

Come on, now, it isn't as bad as all of that! If you learned how to set shutter speeds and f-stops, you can certainly manage to understand H&D Curves!

The D-Log E Curve, or H&D Curve (as it is more commonly called) is named after a couple of British physicists named Hurter and Driffield who devised it as a way of graphically showing how a photographic emulsion performs, and why.

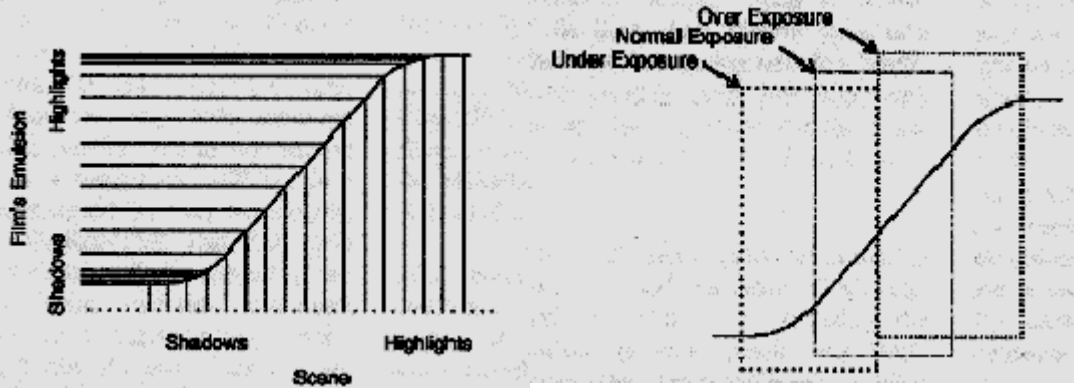
All manufacturers of photographic emulsions publish H&D Curves for their products. By studying the H&D Curve, you can learn a lot about the way the emulsion will perform.

Look at Figure #1 (to the right)

Figure 1 shows a "common" H&D Curve. The curve has some names for its various parts. The "toe" of the curve is the low part. The "shoulder" of the curve is the high part. The straight-line part between the toe and the shoulder is the "working" part of the curve. The angle of inclination that is formed by the working part of the curve tells us about the contrast range of the emulsion. The steeper and more vertical the working part of the curve is, the higher the contrast. When the working part of the curve lays down on a more horizontal angle, the emulsion will have a lower contrast. The slope of the straight line portion of the curve, or, said another way, the "angle" of the working part of the curve is referred to as the "gamma" of the emulsion.

When you develop films, the exact development techniques you use establish the contrast of the emulsion's image (the "gamma"), and can be graphically indicated by the angle of the H&D Curve. The steeper the curve, the higher the contrast. Kodak publishes technical data for all their films that show how the H&D Curve is affected by various types of developers as well as by various developing time and temperature combinations. This is particularly appropriate for B&W films which have are lots of different developing agents and techniques. But, the principles hold true for all films.

Ready for some more? OK! Look at Figure #2:



Down at the bottom of Figure #2 we have represented the scene that is being photographed onto the film. The highlights of the

scene are represented on the right hand of the sketch, and the shadow tones are represented on the left hand of the sketch. The sketch assumes that the scene has been evenly illuminated. Now pretend that the vertical lines leading up to the actual curve are beams of reflected light coming from the scene. Notice that the beams of light coming from the shadows are just as evenly separated and clearly defined as the beams of light that are coming from the highlights of the scene. Everything is nice and uniform as it comes from the evenly illuminated scene.

But then the image coming from the scene hits the emulsion of the film, and is "changed," according to the particular way in which the particular emulsion performs. In this case, the nicely separated highlights and the nicely separated shadows get clumped together, or compressed, because of the performance of the "toe" and the "shoulder" of the H&D Curve. In other words, the nicely separated highlights will be recorded on the emulsion as a washed out white glob, with no detail visible. The nicely separated shadow tones will be recorded on the emulsion as a blocked up black glob, with no detail visible.

Actually, in a "negative" film, highlights in the scene are recorded as DARK tones and shadows in the scene are recorded as LIGHT tones. Don't get all hung up on that right now!

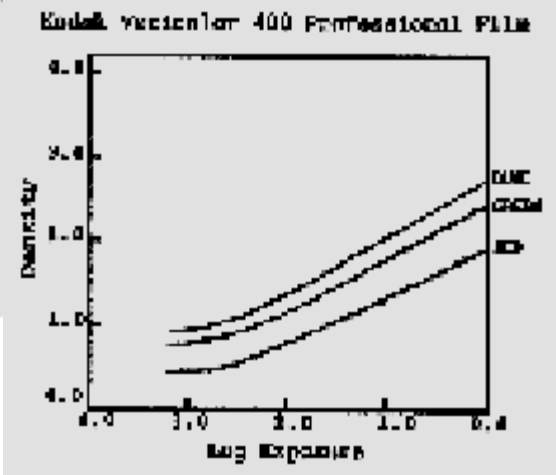
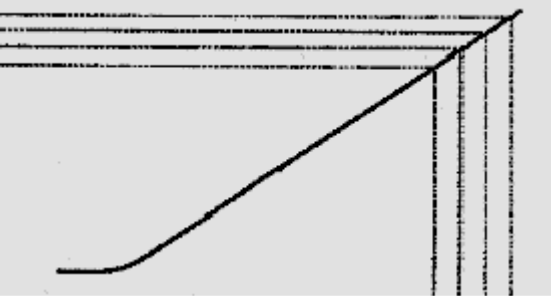
Of course, not ALL of the highlights and not ALL of the shadow tones become distorted. Only the brightest of the highlight tones and only the darkest of the shadow tones become distorted. The point where the distortion begins establishes the "range" of the film, or how big a tone range the film is capable of recording. Color slide films are capable of recording a greater range of tone values than color negative film. Both color negative film and color slide film are capable of capturing MORE tone range than any color paper is capable of reflecting back to your eye!

Color printing papers, both positive (for printing slides directly) and negative (for printing color negatives), are basically "reflective" material. All reflective material has about the SAME RANGE of what it is possible to "reflect." The range is LESS than either color negative film or color slide film is capable of recording. Therefore, just because you might capture a wide range of data on a slide film, a reflective print made from the slide will not be able to "show" any more of the range than a reflective print made from a color negative of the same scene.

I know that's hard to believe, but it's true. Shooting slides and then making "Ciba" prints does NOT produce greater detail in the print than you would obtain if you shot color negative film in the first place. What you DO GET from printing slides is distorted color CONTRAST. This distortion causes colors to be rendered in higher, richer saturation levels than color negative film would normally produce. Unfortunately, such high color saturation also results in a LOSS of highlight and shadow DETAIL.

Look at Figure #2 again. What if you didn't even try to record the most extreme highlights and the most extreme shadow tones? Well, in that case, the film would work fairly well! In fact, that is exactly how most films do work. Most films just aren't capable of recording the extremes. There are always limits to everything. Most films have a "working range." Look at Figure #3:

In Figure #3 we have drawn three rectangles. Each rectangle represents the approximate range in which the film is capable of working. The position of the range can be shifted around a little. The "NORMAL" range is the area in which the film "works" when you expose it "properly",



happens to the position you over-expose the under-expose the film. the exposure ISO level, the "range" of the film the H&D Curve, (and slightly to the left or right). When you move up the H&D Curve, you are OVER-exposing the film. When you move down the H&D Curve, you are UNDER-exposing the film.

according to the manufacturer's recommended ISO rating. We have also shown you what of the "range" when film, or when you When you change you effectively move either up or down

In Figure #3, in the normal exposure ISO range, both the highlights and the shadows would be properly recorded, since neither of them would reach out into the "toe" or the "shoulder" of the H&D Curve.

In Figure #3, in the "over-exposure" ISO range, the highlights would have no detail and would be washed out since they would be recorded up in the curve's shoulder. However, the darkest of the shadows would be properly recorded since they would be up in the straight line, or working range, of the curve. You might want to intentionally over-expose a scene if it contains a lot of dark, shadow tones that were important to record.

In Figure #3, in the "under-exposure" ISO range, the shadows would be "blocked up" in a black glob since they would be recorded in the curve's toe. However, even the brightest of the highlights would be properly recorded since they would be up in the straight line, working range, of the curve. You might want to intentionally under-expose a scene if it contained a lot of bright, white, highlight tones that were important to record.

What if the curve had a "different" shape, and you intentionally over, or under-exposed the film? Well, look at Figure #4:

In Figure #4, we have drawn an H&D Curve that doesn't have a "shoulder". The curve just goes straight off the chart, no shoulder! If you had a film whose H&D Curve was shaped like that, you could easily OVER-EXPOSE it, and not lose any of the highlight detail!! You would be sure of capturing ALL of the dark shadows when you over-exposed it, and since there was no "shoulder" to compress, or block up the highlight tones, you'd still record all the highlights! Wouldn't that be a neat idea!!!

Surprise! Look at Figure #5.

Figure #5 is a fair reproduction of Kodak's published H&D Curve for Vericolor-400 color negative film. The film has very little shoulder, therefore allowing you to over-expose it up to 4 f-stops and still not lose highlight detail! By over-exposing it, you GUARANTEE that you will always capture all the darkest of the shadow tones, and since you don't lose any of the highlight tones, it's a GREAT film for use where you are trying to capture BOTH highlights and shadows in the SAME image! For example, imagine trying to capture all the deep, dark, shadow tones of a black tuxedo standing next to a bright, white wedding dress just filled with delicate lacy highlight details! I use Vericolor-400 Film for those kind of jobs.

Almost all color negative films tend to have a "soft" shoulder. Obviously, Vericolor films have probably the "softest", or most shoulderless, H&D Curves. But all color negative films still have a very definite "toe" to their curves. They all look a lot like the curve in Figure #4. While you can

easily over-expose color negative films and still get a great picture, you dare not under-expose them, since that would cause some of the data to get recorded down in the toe of the curve where the shadow tones would get all crowded together, or compressed, into one big black glob.

Almost all color slide films have very pronounced toes and shoulders to their H&D Curves. They all look a lot like the curve in Figure #1. You dare not over- or under-expose such films or you will DEFINITELY lose some portion of the image. Such films MUST be exactly, properly exposed, there is NO ROOM for error. If you make a 1/2 f-stop error when exposing a slide film, the image doesn't turn out very well.

Incidentally, the H&D Curves shown in the various drawings are all representative of NEGATIVE films. POSITIVE films, such as slide films, would have curves shaped like the MIRROR image of these curves. But all of the principles still hold true.

Also, color films and color papers really have THREE curves, one for each of the three principle color-recording emulsion layers. Figure #5 shows the three curves of Vericolor 400 Film. For simplicity's sake, I've used only ONE curve in my sketches. B&W films and B&W graded papers have only one curve, since they have only ONE image-recording emulsion layer. Multi-layer B&W films, like Ilford's XP-2 400, have TWO curves, one for each of their image-recording emulsion layers. Variable contrast B&W papers have TWO curves, one for each of their image-recording emulsion layers.

If all of this has whetted your appetite for more information on contrast, density, etc, try reading Kodak's pamphlet, Practical Densitometry, E-59, list \$2.00. My copy is dated 1985. They may have a newer revision out by now.

Darryl Nicholas owns and operates a portrait studio, writes for "Shutterbug", "Darkroom & Creative Camera Techniques", and "Photo Lab Management" magazines. He also publishes a newsletter called the ColorBAT (Color By Additive Technique) written specifically for Beseler 45A enlarger users but is helpful for anyone using an additive enlarger (see ad). For subscription information call 717-872-2183 between 1-9pm EDT M-F.

Article II: B&W Rotary Basics

By Paul Rowe, Technical Manager

The last time we wrote about black & white film processing was in 1988. Kodak's T-Max films were still exploding into the market place, and interest in black & white was at a fever pitch. Telephone inquiry for B&W was about equal to E-6 interest. I fully expected this interest to cool off, to see a big decline in the number of calls about B&W, and the interest swing back to color. But the number of calls on B&W has decreased only slightly.

While the interest in B&W has waned a little, it is still the second most popular process. (E-6 appears to hold the #1 spot.) Even the switch to RA-4 color printing, and the flurry of interest in this new process, did not threaten the continued attention to B&W. Today there are more people doing their B&W in rotary processors, both individuals and small labs, than ever before. In addition to Kodak's T-Max films, there are some other great new emulsions that have entered the market, notably the Ilford HP-5 Plus, FP-4 Plus, Delta 100, and Delta 400. Agfa has upgraded their B&W line, and we see the Fuji Neopan 400 and 1600 regularly.

If you are just looking for a quick suggestion of how to do B&W in rotary, nothing has changed since our last writing 6 years ago. Our suggestion is:

Rotation Speed:

CPE-2 Plus, and all ATL's = 75

CPE-2 (2 speed model) = Speed #2

CPA/PPP-2 = #4 or "P"

Temperature:

68°F (20°C.), or as recommended by the film manufacturer.

Time Step

5:00 Prewet

X:XX Your Normal inversion time (Diffusion enlarger) OR

Y:YY Your Normal inversion time less 15% (condenser enlarger)

1:00 Stop Bath (2% Acetic Acid)

F:FF Fixer (Time depends on fixer you are using)

5:00 Wash (10 changes of water over the film, at 30 seconds per change)

Bear in mind that this is a STARTING POINT ONLY. Choose your final developer time based on *your* testing and printing with *your* darkroom setup. All the information and testing we publish is no substitute for your work in arriving at a negative acceptable and printable by you.

If all you are looking for is a starting point for your B&W, you need go no further. On the other hand if you would like more information and background, read on.

Rotary Processing Questions

As soon as we deviate from the processing method we originally learned and with which we became comfortable, questions and doubts begin to flood in upon us. Often the questions are ones we never considered in regard to our original processing methods, but they have suddenly become important. The questions are: How does rotation speed affect me? What effect does rotation have on contrast, grain, or density? How can a compensating developer possibly work?

What effect does the prewet have?

Be assured we do not have definitive answers to all of the questions, but let's address them as much as possible.

Rotation Speed

Our experience shows that the rotation speed has little effect on either density or contrast. JOBO recommends a faster rotation speed, equal to about 75 RPM for most tanks, and about 50 RPM for the larger diameter 3000 series. This speed seems to give cleaner negatives, and less chance for undisturbed pockets of developer to contribute to bromide drag problems.

Contrast, Density, and Grain

Rotary processing's effect on these parameters are well documented in an article appearing in *Darkroom Techniques* magazine in 1987, and reprinted in *JOB*O's *Journal of Rotary Processing*, Vol.3, No.2., entitled "Myths of Black and White Rotary Processing" by Paul Schranz. (This is still available in the compendium issue, part #66032, at \$7.00.) We can't reprint his entire article, but we can cover some of his answers. Rotary processing does not increase overall contrast. Only highlight densities are increased. A reduction in development time is the easy fix.

With regard to grain, Paul Schranz wrote; "I could see no differences in visual granularity or sharpness. Even with an 8X loupe the differences were tiny, with a slight edge going to the rotary processed negatives." In talking about the compensating effect of developers, we will quote again: "There is no evidence to indicate that rotary processing inhibits compensation. It may even enhance it."

*JOB*O's recommendation of a 5 minute prewet of B&W film is probably one of the most disputed suggestions we have made. It causes many people to choose up sides. Certainly many people have chosen to use the prewet, and are more than happy with the continued excellent results they obtain. They have made the other necessary adjustments, and their process is clean and consistent. The original suggestion came from Germany, with the statement that the H&D Curves were closer to the manufacturer's curves when we used a prewet with rotary.

Several technical writers/lab technicians in Germany disagreed with the idea of prewet. Using a *JOB*O processor they produced a list of films and developers, with processing times, NOT using prewet. We have tried some of these combinations. Every one which we tried performed beautifully. The chart shows what they produced.

More information on the effect of prewet comes to us in an article in the May/June 1994 issue of *Darkroom & Creative Camera Techniques*. Phil Davis (*Beyond the Zone System*) has an article entitled "How Prewetting Film Can Affect the Image". While Phil is not dealing with rotary processing in his article, his findings apply. To quote his conclusions, "In most instances, prewetting will influence image formation to some measurable degree. The probable result will be some increase in image density and contrast, and occasionally a slight boost in film speed. It is also apparent that all films are not affected the same way, and an individual film's response to prewetting may not be the same in all developers."

Of course *JOB*O has a track record regarding the use of the five minute prewet, but it is apparent that this type of information was not available when we established the blanket 5 minute approach. The best advice that can be given is to echo Phil Davis and Paul Schranz. They were writing 7 years apart, but have said the same thing. I'll quote Phil Davis, "...it is a matter for the individual photographer to decide, so I leave it up to you to determine how prewetting affects the materials of your choice." What more can we say?

Tips & Techniques

By Paul Rowe & The Customer Service Dept.

JOBO Drum Print Separators

For most of the last 12 years JOBO has included two types of print separators in all of their paper drums. This has been a point of stress for most JOBO users. The separators are clipped onto the ridges in the paper drum. If not firmly placed, they can come loose and damage the tender emulsion of the prints, and the force fit is not an easy task either in the light or the dark. Personal experience has indicated that the separators are unnecessary if the prints are placed properly in the drum, and you run your finger along the ridge in the drum which divides the prints. This action assures that the paper is seated next to the ridge and is not overriding it. Further, as soon as prewet water or developer hits the paper it becomes plastered to the sidewall of the drum and movement is highly unlikely. Our parent company in Germany agrees with this technique and no longer includes the print separators in new drums. If you are using the separators, try doing some prints without them. (It makes a printing session much more civilized.) Further, if you buy new print drums do not expect to receive separators with them. There may be some units still in the pipeline of distribution which have separators, but shortly they will be a thing of the past.