

Chapter 3 - Negative Control

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Chapter 3 - Negative Control

Sensitometry

created 1993, updated April 2001

The apparent values in a photographic print or negative can be quite different from the actual physical densities. Part of this is due to the fact that any value will influence the appearance of another value it is next to. Another consideration is that a particular value may feel right for the context of a particular image.

Knowing the density of a spot on a negative or print is not necessary for producing the highest quality Pt/Pd prints. So too is any line, curve, or number. These terms may be used to talk tough, but that's not a photograph. A d-logE curve will not provide the real information as to how the photograph is seen or felt. A densitometer will provide a unneeded number at great expense.

Getting an absolute black means nothing. Claims are made that such-and-such is better because it provides a blacker black (or "it's D-max is better"). Black is not absolute. Even the deepest shadow, even in the middle of the night, is not absolute black, especially with the platinum palladium process. Let it be known right here that if a blacker black is desired, then one should try the gelatin silver process. Different papers, as well as variations in chemistry, will provide different blacks. It would NOT be wise to select a paper (or worse discard a paper) based only on its blackest value (or D-max). And, surprise, the blackest black in the print will never be the blackest possible with those materials. (Note: If not surprised, a good amount of printing experience must be at hand.)

Zones (as from the Zone System), like blacks, are also misunderstood. A Zone is a zone. Not a particular value, a Zone is a range of values. By definition the size of a Zone has been set to the range of values between the relative end points of a one stop range of exposure. The exact value is selected by the photographer for that particular print. A Zone may differ in the next print or with the next subject. Zones become useful in understanding relative increments of exposure and development and the relative placement of tonal values.

Might as well continue with a description of whites. With the platinum palladium process, many papers are available for selection. Each paper will have its own white. Optical brightening agents may alter the paper white. The platinum palladium process may not produce a white as brilliant as a gelatin silver print. If that's what is needed, print in gelatin silver. It is sometimes thought that Zone X or XI is paper white. This is not the case, especially with pure palladium. Zones X, XI, XII and XIII may be distinguished and still not be paper white. The upper values are extremely important to a print. Finding and using the proper materials can make all the difference.

All one needs to know about the sensitometric qualities of film and materials can be had by making, fine tuning, and studying the Matrix described in the next section. Notes of the original scene at hand, the Matrix of negatives, and the Matrix of prints all laid out upon the table provide a wealth of information. From these one can see the smallest amount of density that will just separate a tone from the darkest density in the print ("speed point", zone I). It can also be seen at what density in

the film the print will stop exhibiting texture ("contrast point", zone VIII) or just remain as plain as paper base ("upper limit"). If the print captures the quality that the photographer feels then it must be right. So too, the negative may be read as to containing such feeling.

Most importantly, the Matrix is based on a subject of familiarity to the photographer enabling them to intuitively grasp the nuances of the effects of exposure and development on the materials selected. To see a photograph, the photographer must know what the print looks like, and what kind of negative produced that print, and what kind of seeing lead to producing that negative. This only comes through experience and with much practice.

Simultaneous Exposure and Development Control

created 1987, updated April 2001

To expand one's creative ability to the maximum, one must have a disciplined mind and a disciplined procedure. Disciplining one's mind takes much practice. A disciplined procedure for the simultaneous control of density and contrast follows.

Note: It is assumed that the reader has a basic understanding of the Zone System. Several books are available on this subject.

<p>= The Matrix = Making a Rough Matrix Evaluating the Rough Matrix Fine Tuning the Matrix Evaluating the Fine Tuned Matrix Normalization with the Matrix Evaluation with the Matrix</p>
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Making a Rough Matrix of Exposure and Development Times:

Each piece of photographic equipment has unique qualities and may produce different results. So, use the equipment that is normally used immutably. The rough version of the Matrix will require 12 sheets of film or three rolls (12 frames/roll) of film.

Notes: These amounts are chosen to conserve film. It is strongly suggested to start with these amounts. More film may be used later to repeat and fine tune the Matrix.

It is important that each sheet film holder is numbered. It will also be helpful if each sheet has a corresponding number exposed onto it.

- ✓ Select a subject typical of one's work that satisfies the following:
 - Neither the subject nor lighting moves.
 - Zones 0, I, II, VI, VII, VIII, & IX are represented in large areas.
 - Zones III, IV, V, & X may be present.

Notes: It may help to place some large panels of uniform value into the scene.

The best location for finding all these zones will be where the subject is both in direct sun and deep shadow.

If one's typical source of light is artificial, then use that light instead of the sun.

- ✓ The camera is fixed upon a tripod.
- ✓ Carefully visualize how the print is expected look, and take notes. Sketch a diagram of the subject and label the values to be metered later.
Note: This is a very important step.

- ✓ Carefully meter the subject:

Important: The light meter should be chromatically corrected for film sensitivity, such as the one available from Zone VI Studios Inc. If not, make sure that all readings are taken from neutral gray, white, or black cards.)

 - Spot meter from as close to the film location as possible.
 - It is most important to find Zone VIII.
 - Make sure Zones 0, I, II, VI, VII, VIII, & XI are represented and recorded.
 - On the sketch made above, indicated all of the metered values.

- ✓ Calculate the exposure:
 - Use one's presently known film speed or a speed slightly slower.

Note: Do not worry if the speed is accurate at this point; the film speed will be found by evaluating the matrix. Typically the film speed when printing with the Pt/Pd process is roughly found to be one stop slower than the manufacture's recommendation.

 - Use the Zone VIII reading to calculate the exposure.

Notes: This is very important.

Remember that meters are calibrated to read everything as ZONE V. Thus, the meter reading of Zone VIII will provide an exposure setting three stops different from the actual setting required. (Take the meter reading and add three stops more exposure.)

- ✓ Expose film for the calculated exposure and for one stop above and below the metered exposure.

Exposure	
For sheet film:	For each roll of the 3 rolls of roll film:
Expose 3 sheets at the calculated setting.	Expose frames 1-3 at the calculated setting.
Expose 3 sheets at one stop over the calculated setting.	Expose frames 4-6 at one stop over the calculated setting.
Expose 3 sheets at one stop under the calculated setting.	Expose frames 7-9 at one stop under the calculated setting.
Reserve 3 sheets unexposed.	Do not expose frames 10-12.

Notes: Complete all the exposures as quickly as possible so that the chance of any variation is minimized.

It is important to note exposure data for each sheet or frame.

Using a constant shutter speed and changing aperture will likely be more accurate than changing the shutter speed.

Fine tuning will be based on previous results, so the accuracy of data is important.

- ✓ Develop film with developer normally used for the time normally used and for times 25% shorter and 25% longer.

Development	
For sheet film:	For roll film:
Develop one of each of the 3 exposures plus one of the unexposed (4 sheets) for the "normal" time.	Develop one roll for the "normal" time.
Develop one of each of the 3 exposures plus one of the unexposed (4 sheets) for 25% more than the "normal" time.	Develop one roll for 25% more than the "normal" time.
Develop one of each of the 3 exposures plus one of the unexposed (4 sheets) for 25% less than the "normal" time.	Develop one roll for 25% less than the "normal" time.

Notes: If negatives are being produced for the Pt/Pd process for the first time, normal development should be approximated at about twice the time for silver printing.

A developer should be chosen that has enough strength for the plus developments and is fairly linear for time versus concentration.

Keep development times between 3 and 6 minutes (no less than 3 for good uniform development, and no longer than 6 to reduce base fog). Double or half the concentration of the developer (and correspondingly half or double the time of development) to stay within this 3-6 minute range.
(This works well for Kodak HC-110, but may not for other developers.)

For "normal" development of 4x5 Kodak Tri-X 4164 film (using a film speed index of ASA 200), try a concentration of 64 ml/l (64 ml Kodak HC-110 developer with 936 ml water) for 5 minutes. Kodak HC-110 works well at concentrations as high as 256 ml/l and as low as 16 ml/l. It can be used as high as 512 ml/l but may not retain a linear relationship of time and concentration. Below 16 ml/l one must be careful of exhaustion (a possibility would be to use twice the volume if the concentration is 8 ml/l).

Tray development is recommended with consistent, continuous, gentle agitation for the entire development. This helps assure repeatable results.

Development is affected by temperature. Temperature must be constant and standardized. This means that the temperature not be allowed to change during development. Also, the same temperature must be used whenever developing. For all time! (and at any time of year.) Or, one must re-calibrate (or normalize) the Matrix. The best solution to standardize temperature is to use a temperature compensating timer such as the one manufactured by Zone VI Studios Inc.

Keep all other processing conditions constant.

Fine tuning will be based on previous results, so accuracy and consistency are important.

- ✓ For each development time, determine the exposure to print Maximum Black with the unexposed film. This exposure (for each condition) is called the Printing Exposure.

Notes: Maximum Black is the darkest value that will exist in the print. The Maximum Black is not the maximum density possible with the materials. An exposure in which it is thought that there is a distinction between Maximum Black and maximum density is close to the proper exposure.

Use the printing method and materials that are typical, because results may vary for differing methods and materials.

Do not be surprised if Printing Exposures increase for the plus developments. This is most likely due to an increase in base fog.

Procedure to determine Maximum Black or Printing Exposure:

- ▶ Trim the edge of the unexposed and developed piece of film with a clean edge (such as with a good rotary cutter). Use of this edge (away from the original film edge) will help assure an accurate determination.
- ▶ Make a typical Pt/Pd coating and place one of the unexposed and developed pieces of film covering half the coated area (use the cut edge of the film as delineation).
- ▶ Expose at various times incremented by 0.5 stop intervals (steps). Choose times so that at least two steps are identical between the areas covered and uncovered by the film;
- ▶ Process and dry the print.

- ▶ Select the step with the longest exposure that is identical between the areas covered and uncovered by the film;
- ▶ Including and starting with the selected step, make another print with at least five exposures at increasing increments of 0.1 stops;
- ▶ Select the step with the longest exposure that is close to identical between the areas covered and uncovered by the substrate. This is the Maximum Black. The exposure of this step is the Printing Exposure. This will assure that Maximum Black is possible in the print with the shortest exposure. The black chosen for Maximum Black will likely not be the absolute black the materials are capable of producing, but should be reasonably close.

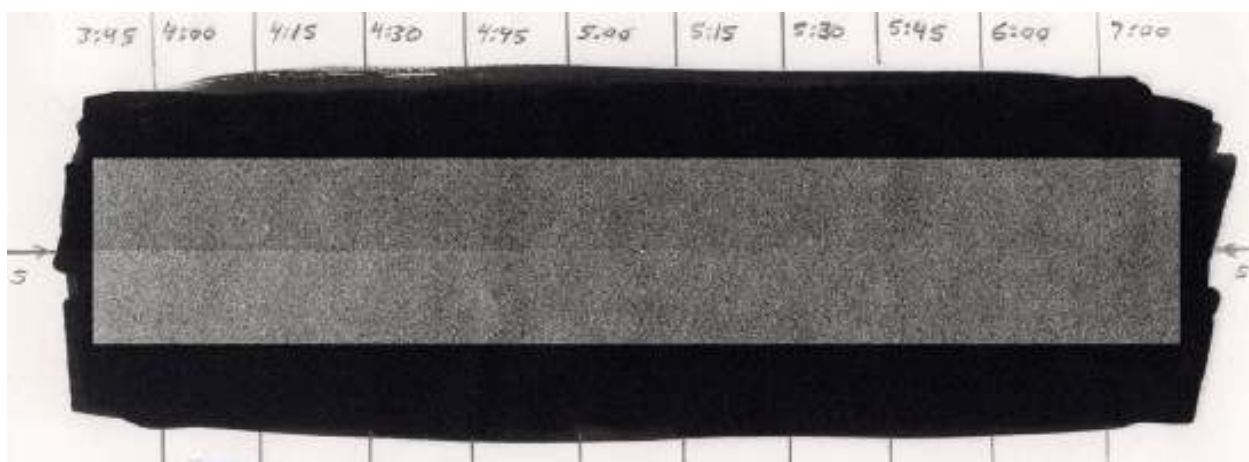


Figure 3.1 Determining the Printing Exposure to give Maximum Black for the substrate used. The rectangular inset is an enhancement in order to better discern differences. Note the horizontal pencil marks on the sides (marked "s") indicating the edge of the substrate. For this example, the Total Printing Exposure is interpolated to be 5:10 minutes (as 4:45 minutes shows lighter, 5:00 minutes shows slightly lighter, and 5:15 minutes is about the same). Note that it is typical that the materials produce more density beyond Maximum Black.

- ✓ Print each of the exposed films at the Printing Exposure determined for each film development time. It is important to be consistent and accurate.
- ✓ Evaluate all prints when dry.

Evaluating the Rough Matrix:

Negatives should be laid out on a light table such that one axis represents increasing exposure and the other increasing development. Prints should be laid out the same on an opaque background with good frontal illumination (similar to display illumination). A decision is now made as to which print

best represents the subject as visualized to be "normal" before exposure. Interpolate between selected exposures and development times if necessary. It is critical to refer to the notes made during setup and exposure.

- Zones 0, I, & II will provide information on film speed.
 - Zones VII, VIII, & IX will provide information on film development.
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- ✓ Interpolate the "normal" exposure and development. (Print Zone I should be Zone I from notes; print Zone VIII should be Zone VIII from notes.)
 - ✓ Verify that exposure changes corresponds to changes in the print along the exposure axis.
 - ✓ Calculate N-1 and N+1 development by interpolation along the development axis.
 - ✓ Rough estimate N-2, N+2, N+3, and N+4 developments by assuming a linear relationship following the N-1, N, and N+1 developments.
 - ✓ Rough estimate any exposure differences for the seven developments. Carefully examine the Zone I of the plus and minus developments. Most likely these differences will not be significant except for extreme plus and minus developments.

Fine Tuning the Matrix:

Make a new Matrix with exposures of:

- none (unexposed film, to calculate printing time)
- 1 stop
- ½ stop
- interpolated normal speed
- +½ stop
- +1 stop

and developments of (as rough estimated):

- N-2
- N-1
- N = interpolated normal development
- N+1
- N+2
- N+3
- N+4

Notes: This will require 42 sheets of film. A smaller Matrix, requiring 30 sheets, may be made by eliminating the N-2 and N+4 developments.

Remember to make accurate and complete notes.

Additional fine tuning may include more extreme developments or ½ step developments.

Fine tuning of the Matrix is only necessary to half exposure stop and half development step increments. It is easy to interpolate quarter stop or quarter step differences and difficult to be more accurate with any equipment or processing.

An exposure stop is that difference in exposure which results in a full zone change for all values (example: from f8 to f11). A development step is that difference which results in a full zone change of a Zone VIII value (example: from N to N+1).

Development differences will affect other zones differently (the lower the zone, the less change).

Evaluating the Fine Tuned Matrix:

Negatives and prints should be laid out the same as with the Rough Evaluation. A decision is now made as to which print best represents the subject as visualized to be "normal". Interpolate between selected exposures and development times if necessary. It is critical to refer to the notes made during setup and exposure of the fine tuned Matrix.

- Zones 0, I, & II will provide information on film speed.
 - Zones VII, VIII, & IX will provide information on film development.
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- ✓ Interpolate the "normal" exposure and development. (Print Zone I should be Zone I from notes; print Zone VIII should be Zone VIII from notes.)
 - ✓ Verify that exposure changes corresponds to changes in the print along the exposure axis.
 - ✓ Calculate N-2 (optional), N-1, N-1/2, N+1/2, N+1, N+3/2, N+2, N+5/2, N+3, and N+4 (optional) development by interpolation along the development axis.
 - ✓ Estimate N-2, N+4, developments if optional by assuming a linear relationship of the other developments.
 - ✓ Calculate any exposure differences for the developments. Carefully examine the Zone I of the plus and minus developments. Most likely these differences will not be significant except for extreme plus and minus developments.

One should now have the exposure (film speed) and development (time and concentration) criteria for the materials, equipment, and printing procedure they utilize.

If one makes mature and honest decisions, then one will arrive at the best possible statement of the original, objective interaction of subject and photographer. But keep in mind that when creating

each photograph, one must be prepared to make slight variations to the exposure, development, and printing established above because each interaction with a subject can differ.

Normalization with The Matrix

created 1987, updated April 2001

Now that one has a Matrix, what if they change equipment, film type, processing, or printing materials? Easy, if one has a Matrix. For any change or combination of changes, do the following:

- ✓ Select a subject typical of one's work in which Zones I & VIII are represented in large areas.
Note: It may help to place some large panels of uniform value into the scene.
- ✓ Carefully visualize how the print should look, and take notes.
Note: This is a very important step.
- ✓ Expose and develop and print for "normal" as determined by the Matrix.
- ✓ Compare this print with the Matrix.
- ✓ Find the Zone I that matches along the exposure axis.
- ✓ Find the Zone VIII that matches along the development axis.
- ✓ Calculate the adjustments need to bring this test to "normal".

Example: If Zone I matches the Matrix at "normal" plus half a stop, and Zone VIII matches the Matrix at "normal" minus half a stop, then, to compensate for the change of equipment, film, printing, or whatever, decrease the exposure by half a stop and increase the development by +1/2.

- ✓ To verify, re-photograph the subject with the corrected exposure and development times.

Zones I and VIII should now match the "normal" of the Matrix.

This procedure is really handy whenever a new paper is used with the Pt/Pd process. All the previous work of making the matrix is preserved and can be utilized.

Evaluation with The Matrix

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The primary advantage of the Matrix is that one can develop an intuitive feel for both the negative and the print as well as the results of various processes and materials. Negatives should be laid out on a light table such that one axis represents increasing exposure and the other increasing development. Prints should be arranged in the same orientation on an opaque background with good frontal illumination (similar to display illumination).

- ✓ Study the "normal" print.
Notes: Remember "normal" only means the print closest to that desired which matches the original seeing and feeling.)

Studying should include individual values as well as combined effects of values.

- ✓ Study the corresponding negative.
- ✓ Study the surrounding prints to learn how changes in exposure and development of the negative result in the print. (If the "normal" print is not surrounded by other prints, then the matrix should be expanded to include those examples.)
- ✓ Study the negatives that produced the surrounding prints.
- ✓ Photograph and study prints and negatives from various subjects.
- ✓ Repeat these steps until the feeling for how a print and negative look becomes second nature.

This technique can be used to gain control over materials and processes to most accurately create the statement one wishes to make. Before the camera is set up, one can know what materials and processes, exposure and development will produce results closest to those desired.