



## Issue #2- JQ9402

# User Profile: Steve Traudt

## Workshop E-6 Processing With JOBO Equipment

The popularity of photography workshops is at an all-time high. Yet one factor often separates the truly educational workshops from the pretenders. That factor is the availability of E-6 processing. The most successful workshops offer a trilogy of lectures, field work and slide review. The synergy of this method propels students forward, both in craft and art. This article explains how I use JOBO equipment and chemicals in my workshops.

I began conducting photo workshops in Nebraska in the late 70's. In those days, I had to stage the workshop in an area close to a large city with E-6 processing. Even then, there were problems. I needed someone to drive the film back and forth, the lab often had to work overtime, and the slides came back late at night. The system did work but I was frustrated because processing was the only factor over which I had little or no control. Yet as time went by, I realized even more strongly the value of same-day processing as part of the learning experience.

Moving to Colorado in 1987, I opened a photography gallery and darkroom. I carefully surveyed the market for processing equipment. It was soon obvious that JOBO represented the best in terms of value, reliability, portability, and ease of use. I purchased a JOBO [CPP-2](#) and JOBO lift. The CPP-2 is JOBO's best manual processor.

I now have complete control of my own E-6 needs and can also offer on-site processing at workshops. As photographers become more skilled and sophisticated, they seek workshops set in exotic areas. Unfortunately, exotic areas seldom have E-6 labs. For example, my popular wildflower workshop is set in Ouray, Colorado, a town of 800 residents, but the portability of the JOBO processor lets me easily develop slides in a motel room or even a large bathroom.

When judging a potential room site for processor use, there are several factors to consider. I first look for a motel room with a kitchenette. Since the JOBO lift works to the left side, look for a sink area with about 3 feet of counter space to the right of the sink. For protection, cover the counter tops with plastic trash bags. Use a small spirit level and cardboard shims to level the processor. Second, check the bathroom since you'll be loading film reels there. I prefer a bathroom with no exterior windows. I just tape up a piece of black darkroom cloth over the door. I carry a piece of plywood to put over the toilet or bathtub to create a small work space for loading reels. Try to visit the motel beforehand, but if this is not possible, ask the manager to send some photos of the room in question.

(Editor's note: An alternative is JOBO's Film Changing Tent #6775, which has room for loading large film tanks and folds like an umbrella.)

Although some photographers consider the traditional 7-step E-6 process the best, I always use the [JOBO 3-step process](#) when in the field. I can easily train someone with the 3-step and it is harder to make mistakes with fewer steps. I personally pre-mix the three solutions back in the relative calm of my darkroom and transport the working strength chemicals in gallon plastic jugs. Since the processor has room for 6 one liter bottles, I can have two complete sets of chemistry warmed up. This allows two consecutive processing runs. For this reason, I have two complete sets of drums and reels. Two runs yield 16 rolls of film which is sufficient for a typical workshop size. Occasionally, if time permits, I'll make a third run that day, but the reels must be very

thoroughly dried with a hair dryer. I use a small timer that is set to start the processor about 1½ hours beforehand to allow complete warm-up and equilibration.

After processing, briefly rinse each reel in a small container of distilled water. Whether you use 3-step or 7-step, you then must use a formalin based stabilizer for the final rinse. Without this stabilizer treatment, the slides can turn green. Be sure to mix the stabilizer with distilled water. The film must be off the reel before stabilizing. Carefully remove the film from the reel and place it in the stabilizer for at least 1 minute. Then lift the film, let it drain for a few seconds, and squeegee the excess solution off the film. Be careful to wet your film wiper in the stabilizer solution, or water, so you're not wiping wet film with a dry wiper - this helps prevent scratching. Since formalin contains formaldehyde (some people may be allergic to this bath) use safe darkroom gloves to prevent skin contact. Use formalin with good ventilation.

At first, I air dried the film. In the dry mountain air of Ouray, this technique worked fairly well but dust was a problem and the film took quite a while to dry. I then bought a JOBO [Mistral 2 Dryer](#) and my dust and time problems were over. I can dry 8 rolls in about 20 minutes with the Mistral 2. Fujichrome films, especially Velvia, curl more than Kodak E-6 films. It is best to run the Mistral 2 on the room air setting or the lower of the two heat settings. Do not over-dry. If you do get excessive curl, place a tray of very hot tap water in the bottom of the dryer. In about 5 minutes, the film will relax.

The Mistral 2 normally fastens to your darkroom wall with 2 screws at the back of the dryer head. For field use, I took a piece of 1x8" board, cut it about a foot long and put the two screws in it. I put a 1/4 x 20 t-nut on the other side which accepts a standard ball head. It is all supported on a Gitzo 320 tripod. *I highly recommend the Mistral 2 film dryer.*

Mounting slides is the last logistical problem. Some workshops simply hand each student their strip of film and some slide mounts, but I feel the risk of scratches is too great. I now use a Pakon Mini-Mounter which mounts a roll of 36 exposures in about 2 minutes. Although the mounter costs as much as the JOBO equipment, it gives professional results and is easy to use. It does not number the mounts so each student numbers the mounts while the slides are still in order. Lacking a mounter, place each film strip in a plastic sleeve for protection. These strips can then be examined on a light box. This is not as desirable for group teaching, but works for individual critiques.

At each workshop, several students offer to help process, dry and mount. Encourage this help as it increases their involvement and shortens the time until the group bonds together. The beauty of the JOBO is its ease of use. I regularly train non-darkroom oriented people. Perhaps the hardest part is loading the reels. Have them learn with a practice roll in daylight first. Make sure the reels are absolutely dry and your hands clean. Clipping the end of the film corners helps the loading process. Don't force the film; if it gets "stuck," back it out and start again.

The actual processing is very easy to teach, especially the 3-step process. It is no harder than following a recipe in a cookbook. I tape the processing steps to the side of the JOBO Lift. Although more sophisticated timers exist, I use a GraLab 300 timer; its analog face is less intimidating to novices.

In a typical workshop, we have field trips during the day and develop film while students dine. With 2 or 3 assistants, we can have 16 rolls of slides ready to view in about 3 hours. The evening is devoted to slide critiques. Besides the obvious benefits of same-day feedback, there is another reason for offering processing. In every group, there is at least one camera malfunctioning, or someone who has not shot much slide film and does not know how to properly expose it. The first slide review session lets me get everyone on track. This really boosts the confidence of the students and makes the remaining days much more productive.

The recent introduction of the JOBO [ATL-1000](#) represents another choice. It has a smaller footprint and is automatic. Once loaded, you push the button and walk away. It uses the same reels but only does 5 rolls at a time. It is roughly double in cost to the manual CPP-2 but certainly merits consideration.

I'm convinced a major reason for the success of my workshops is fast, quality E-6 processing. No matter how good my instruction is, no matter how well I have scouted the area, if the processing is sub-par, my reputation suffers. Happily, JOBO equipment has never let me down.

## **Feature Article: Processing Transparencies - Or Sliding Into E-6**

*By Paul Rowe, Technical Manager*

Most of us would like to think that slide processing is an easy, effortless process providing instant gratification, but the handling and processing of E-6 comprises, by far, the greatest number of questions we receive at JOBO Customer Service. Regardless of the reasons for needing, or wanting, to process transparency film, we quickly find that we are in a complex process requiring more attention to detail than we have ever applied before. This does not mean that the task is impossible, but we must apply ourselves and be willing to learn the process and its variations. Failure to do this shows up very quickly in the quality of the results.

The E-6 process came into being in the early 1970's as a replacement for the E-4 process. It offered several advantages, including chemical reversal, shorter process time, higher operating temperature, and several steps that are more environmentally friendly. While the process has not appreciably changed, the 20-plus years that have passed have given us a fabulous array of emulsions from all of the color film manufacturers. There is hardly a shooting condition that can be conceived without a film emulsion capable of handling it. Now if this situation were a one-sided coin, everything would be easy. How many of you have ever seen a one-sided coin??

In order to get the most out of the emulsions available it is necessary to understand and learn to control the E-6 process. I can best describe this as akin to peeling an onion. There seems to be a never ending supply of layers that one must learn and work with, and under the one you just finished-behold-another layer !! Let's go through the E-6 process step by step, and with it we will talk a little about JOBO's recommendations for rotary processing, and the "why" of these.

### **Pre-warm**

JOBO suggests a five minute pre-warm. (This is done by rotating the tank, loaded with film, in the water bath without any liquid inside the tank.) The purpose is to raise the temperature of the tank and reel to close to the processing temperature. The next step, first developer, is temperature dependent, and a cool tank/reel will chill the first developer and cause underdevelopment. While some use a pre-wet to accomplish this, we do not suggest a pre-wet because of the danger of color shifts in the film. Pragmatically, if you have been using a pre-wet with no adverse effects I would continue to use it.

### **First Developer**

The most critical step in the process, it is essentially a black/white developer that yields a negative on the film. Time and temperature need your attention to yield a transparency with the correct density and contrast. Many who are new to E-6, or who want everything cast in stone, are upset by the fact that Kodak and Fuji will tell you to operate at 38° C and then give you a window of acceptable times between 5:30 and 7:30. The fact is, you need to fine-tune your process and then repeat that time/temperature combination every time. There is nothing sacred about a 6:00 or 6:30 developer time any more than there is something wrong with a 7:05 time. What is "wrong" is processing inconsistency.

## **First Rinse**

This rinse, between the first developer and the reversal bath, stops the action of the first developer, and prevents carry forward of the developer into the reversal. The time is specified at 2:30, but can be extended. JOBO suggests that this wash be broken into 30 second segments (a 2:30 wash time would equal five 30 second rinses). Rinse temperature is important!!! You can affect density and create a color shift. This is an area where the investment in a temperature control panel for your wash water can pay big dividends in consistent results from your process. Oddly enough, users of manual JOBO processors seem to do better with rinse temperature because they personally draw off the rinse water, and can measure and control the temperature. AutoLab customers, on the other hand, will often hook a water line that is not temperature controlled to the processor. This can yield great fluctuations in rinse temperature, and wide color shifts in the finished transparency.

## **Reversal Bath**

The reversal bath uses a chemical agent to replace the physical light re-exposure used in older processes. Do not use a rinse after the reversal bath. The film needs the residual chemical carried forward into the next step, Color Developer. When you are mixing reversal bath be sure to read the fine print in the directions. Both Kodak, Fuji, and JOBO suggest that you use a 60% of normal concentration when using a rotary processor. There is more than enough chemical activity at that concentration and the constant agitation can quickly oxidize the higher concentration of the reversal. Normal process time for reversal is 2:00. Failure of the reversal will yield a green shift in the slide.

## **Color Developer**

The silver salts remaining in the film are reduced to metallic silver, and the color couplers form the final pigments of the slide. Errors in the color developer can affect maximum density, contrast, and color balance. The general time for the color developer is 6:00, HOWEVER, in rotary processing we suggest a reduced time of 4:00 to 5:00 minutes because constant agitation can hasten the oxidation of the developer.

## **Conditioner Bath**

(In the present Kodak E-6 process this is called "Pre-Bleach".) In this step, metallic silver in the film is prepared for oxidation and removal. There should be no rinse between the conditioner and the bleach. Residual conditioner on the film is needed for the bleach to work properly. If your conditioner concentration is too high, it can result in reddish shadows in the final transparency. Comment must be made at this point about Kodak's "Pre Bleach". In addition to the work of the conditioner, the pre-bleach uses a sequestered formaldehyde (little or none is released to the environment) to establish stabilized color in the transparency. This is proprietary to Kodak, so none of the other chemical manufacturers offer it.

## **Bleach Bath**

In this bath the metallic silver formed in the developers is transformed into silver halides (for removal in the Fixer). Problems in the bleach can result in silver residue remaining in the transparency, red/magenta highlights, and yellow fogging. Silver residue can be removed after-the-fact by re-bleaching and re-fixing. All of these defects can usually be eliminated by being sure there is enough oxygen in the bleach bath. Shake a part-full bottle vigorously before using, or introduce air to the solution with a fish-tank bubbler. In short, be sure that the bleach is well mixed with air before use. Normal time for the bleach bath is 6:00 minutes.

## **Fixing Bath**

In this bath the remaining silver salts are converted to soluble compounds and removed from the film. Treatment of the used fixer by silver recovery equipment can yield the metallic silver. Incorrect fixing also can contribute to the yellow fog mentioned in the bleach bath section. Normal fixer time is 4:00 minutes.

## **Final Rinse**

The final rinse removes all the remaining developing substances in the film emulsion. As with the first rinse, JOBO suggests a series of 30 second rinses and changes of water. Normal time is 4:00 minutes. Insufficient final rinse can reduce the life of the finished transparency.

## **Stabilizer Bath**

(In the present Kodak E-6 process this is called "Final Rinse".) The stabilizer contains both a weak formaldehyde and a wetting agent to facilitate drying. The formaldehyde combines with the pigments in the slide and improves their color stability. Since film is not rinsed again after stabilization, the process should never be done in the processor. Residue of the stabilizer can have an adverse effect on the first developer. If you find it necessary to stabilize on your reels, be sure to establish a regular cleaning regimen. Use JOBO Processor Clean II, a tank and tray cleaner (like Edwal or Kodak), or soak the reels overnight in a dilute solution of household bleach. (Mix a cup of bleach to a gallon of water.) For most users, this cleaning on a once-a-month basis will take care of any residual stabilizer problem. If you think that using the stabilizer is a "pain", the omission of it is a greater problem. Unstabilized transparency film is like a time-bomb. Three to twelve months after processing you can go to your files and find green slides!!

At this point some of you are thinking that all we are going to do is cover the 7-step E-6 process. Not true, but the problems that can arise in three step are the same (and in some cases greater) than 7-step. We will talk about three step later.

## **Recommended process times for E-6 in a JOBO Rotary Processor**

### **Temperature 100° F (38.2° C)**

Pre-warm - 5:00

First Developer - 6:30

(may vary 5:30 to 7:30)

Rinse - 2:30

(may increase to as much as 4:00)

Reversal Bath - 2:00

(mix as a 60% solution)

Color Developer - 4:00 to 5:00

Conditioner - 2:00

(same time for Kodak Pre-Bleach) Bleach - 6:00

Fixer - 4:00

Rinse - 4:00

Stabilizer - 1:00

(Same with Kodak Final Rinse. This step is not time/temperature critical. Time may be longer than 1:00, may be ambient room temperature.)

## Process Control

Both Kodak and Fuji make "Control Strips," which are pre-exposed strips of 35mm film that are 5 to 7 inches long. The pre-exposed areas yield information on D-Max, High Density, Low Density, and D-Min. The only problem with these is that most of us can not afford the \$2500 to \$3500 required to purchase a densitometer, and visual examination of the strip does not yield enough information to enable you to make decisions regarding your process. If you call Kodak, and to a lesser extent Fuji, with an E-6 problem, and you are not running control strips they feel there is little help they can offer you. Both companies have a manual that covers E-6, and the latest editions offer some help in analysis through visual examination, but they are aimed at the user who is running Control Strips. Further, Kodak and Fuji films respond differently in similar situations, so one manual does not necessarily give you answers to the other company's film. For your information, Kodak's Manual is Z-119 and the Fuji Manual is Fuji Film Processing Manual-Process CR-56/E-6. If you now feel like you are walking through a mine field you are not far from the truth.

~~If you want some type of help to guide you through this maze, consider the JOBO E-6 Handbook (Part #4192) at \$61.00. This book was written in Germany. It gives you great aid in solving problems through visual examination, covers differences in Kodak, Fuji, and Agfa films in their response to various problems or contamination, and outlines a way that you can use your favorite film as a type of "control strip" by using the Color Control Card that is included with the manual. I know this sounds like a bare faced commercial for the JOBO product, but the product is good, and it will help you with E-6 when you have no place else to turn. (The #4192 E-6 Manual has been discontinued as of 07/01/99)~~

## Commonly Reported Problems

### Magenta/Red Shift

This shows mostly in the highlights, and can be either slight or heavy. Be sure your water temperature in the first rinse is as close to 38° C as you can keep it. Extend the time of the first rinse from the recommended 2:30 to 4:00. Next, aerate the Bleach. With Fuji film it may be necessary to add 5N solution of Sodium Hydroxide (about 5-7 ml/liter) to the Color Developer. Do not overlook the possibility that your film (especially if you just change emulsions) may be the problem rather than your process.

## **Green Shift**

This color shift is almost always a problem with the Reversal Bath. Try mixing fresh Reversal. You should note that Reversal bath can almost be called capricious. I have had a fresh mix go bad between morning and afternoon runs. Green cast or a bright green color can also be contamination of either First or Color Developer.

## **Blue-Yellow Shift**

If you have some familiarity with Kodak slide film you are certainly familiar with the old "Ektachrome Blue" problem. This exists to a much lesser extent today, but old perceptions linger long after the fact. When you get into this area of correction, much more than with the magenta and green shifts, you are also involved in personal taste. You may want a warm feel to the slide, rather than neutral or cool tones. This personal preference affects the amount of correction you apply. Some Fuji emulsions, and the new "X" Ektachromes (like 64X, 100X, etc.) have a warm bias built into the film. If you are looking for dead neutral renditions, of course you won't even choose these films. However, to correct from a blue or yellow bias toward neutral, proceed as follows: To shift from yellow toward blue-Add sulfuric acid to the color developer. Use a 5N solution. The addition of 1ml/liter will yield an approximately 5CC shift (.05 densitometric units). To shift from blue toward yellow, add sodium hydroxide to the color developer. Use a 5N solution. The addition of 1 ml/liter will yield an approximately 5CC shift. Mixing instructions for the 5N solutions are in the Kodak Manual Z-119, or contact us at JOBO.

## **One-Shot Processing**

You can not have read this far without the realization that quality E-6 processing is greatly dependent on the chemical solutions being used. Large volume processors, like the dip and dunk types that the large labs use, contain a large volume of solution in each step, and there is a certain inertia in these quantities that helps keep the process stable. Even with this stability, the condition of the baths is checked several times a day with control strips and a densitometer, and adjustments are made as necessary.

In a small processor like the JOBO you do not have this luxury. The quantity of solution required is so small that it is almost impossible to use replenishment, and the greatest consistency comes from using the chemicals "one-shot." This puts a burden on the user, since care must be taken in mixing. With such small quantities (often less than a liter) even a few milliliters discrepancy in measuring the components can result in a drastic difference in the quality of your solutions.

On the positive side, even using the solutions "one-shot," you are still using a minimal amount of chemical. Also, you do not have to risk the danger of over- or under-replenishing such small solution quantities. The process can be fine-tuned to the requirements of the film you are using.

## **Three-Bath Chemical Kits**

As many of you know, there are a number of kits to process E-6 Film that have only three baths rather than the conventional six steps that we have been talking about for the last several pages. (Note that the term 3-bath may be a misnomer, since all of these require a stabilizer step as the last or 4th step of the process, just like the full E-6 process.)

~~JOB~~ distributes Photocolor Chrome Six, Kodak has the Hobby Pak, Unicolor makes Rapid E-6, and Beseler has CS-6 a 4-step. All the chemical activities that take place in the full E-6 process must also take place in the 3- and 4-step processes. The makers have combined steps to reduce the number of chemicals to be mixed, and, to some extent the time of the process. The shortened process can not be replenished (use one shot only), and you cannot make the adjustments in the pH of the color developer.

JOB currently distributes [Tetenal Chemicals](#).

Making the choice of the 3- or 4-step kits is a matter of your own experience and the effect the limitations have on you.

## **New Films & 3-Bath Chemistry**

Earlier I had mentioned the fabulous assortment of emulsions available for transparencies. With some of the newer emulsions, however, comes a warning from the film manufacturers. Kodak, within the past year, has introduced Lumiere and Elite. In both cases they do not feel that you will receive optimum processing of the film if a 3-bath is used.

The situation with Fuji Film is even more strict. Velvia is the transparency film with an apparent advanced grain technology. Few have as yet had an opportunity to test the new emulsions they are to offer, such as Provia. Regardless of the Fuji product in question, they advise against using a 3-bath. To quote one of their expert technicians, "...three bath is *not* E-6 processing."

I know that many of you are taking exception to the Kodak and Fuji attitudes. Every week customers tell me they are using 3-bath and "love" the results. However I also talk to customers who are having problems. The best I can do is report the approach the film makers are taking and let you decide your course of action.

The information here is meant to remove some of the mystery from the E-6 process. You can approach with confidence the vast array of transparency films. There is nothing in the process that you cannot master, and the end product will be more great color images than have ever been available to you before.

## **Article II: Mixing Chemicals**

Comments about mixing chemical solutions are always appropriate, but we often don't want to say anything. It is assumed the questioner knows how to do it, and would be offended if you questioned such a basic skill.

Since we are writing about E-6 in this issue, which has the greatest number of steps of any of the processes, it is an ideal time to mention some basics of mixing.

1. Make sure all your mixing vessels are CLEAN. This includes the graduates used to measure concentrates, the stirring rods, and the storage bottles for the working solutions. If you have any



questions (could someone else have used them and not washed them, or did you not wash them after the last use?), take the time to wash them again.

2. If you can afford it, have a graduate and a storage bottle dedicated to each of the solutions to be mixed. This eliminates the question of cross contamination between solutions.

3. Wash your stirring rod after each use. DO NOT wash it and then lay it in the sink! Consider the bottom of your sink a highly contaminated area.

4. Devise a system which you always use to differentiate between clean and contaminated graduates or vessels in your sink. I will only allow clean graduates ready for use to stand upright in the sink. Any used or contaminated item is laid flat in the sink until it is washed.

5. Pay strict attention to the chemical manufacturer's directions for mixing. If they tell you to stir for 10 minutes, DO IT. Countless problems have been solved when the worker finally started following the instructions. Some components contain chemicals that are more difficult to get into solution, and the full mixing time is needed.

6. If the instructions call for starting with a quantity of water and then adding the concentrates to that water, be sure to follow these instructions. Some components (such as those in E-6 Color Developer) have vastly different pH, and the reaction of the mixing can be violent if these components are not diluted with water.

7. After all the mixing is done, make sure of the following:

- A. The caps are tightly fixed on any bottles of partially-used concentrate. Squeeze as much air as possible from these bottles before fixing the cap.
- B. The caps are tightly fixed on any bottles filled with the working strength solutions you have just prepared.
- C. All graduates, stirring rods, and bottles that are empty, are washed, dried and put away. Don't leave clean vessels in a sink where they can be splashed and contaminated.

## **Tips & Techniques**

*By Paul Rowe, Technical Manager*

### **Print Color & Density Problems**

If you are having trouble with film or paper that is showing unusual color or density, look for the unusual in your darkroom. Close yourself in with no light on at all for 5-10 minutes. Try to perceive if there is any light source, however dim, that you have not accounted for.

We had several situations this Fall and Winter in which space heaters imparted a red glow that, no matter how comforting, registered on any film or paper exposed. Other light sources of which to be aware: telephones, motion detectors, timers, analyzers, and even the readout window of your JOBO Processor if it is in the right location in the darkroom.

The brightness of the digital readout of the [CPP-2](#) and the [AutoLabs](#) is controlled by a sensor that dims the display when the room lights are turned off, and brightens the display when room lights

are turned on. This feature, which helps control light levels in the darkroom, can be misunderstood as a malfunction of the processor.

If the light level in a darkroom is low even when the light is on, the sensor can be confused and the processor display may flick on and off. Your processor can be checked for correct operation of the display by using a flashlight. Turn off all lights in the darkroom and the display should be dim. Then shine the flashlight directly on the display. It should brighten so that it may be read even in the intense light of the flashlight.

## **Curling Film**

During the heating season we have an increased number of calls because of film curl during drying. The air in most homes and businesses has an extremely reduced moisture content during the winter heating season. Film is taken from the final bath and hung in a dryer to be dried. The dryer is now blowing *heated dry* air over your film. One option is to place an open tray of hot water in the bottom of the dryer cabinet to re-humidify the curled film. Another option is simply reduce the heat setting to ambient.