How to Print B&W Photographs in a Darkroom

by Weissensteinburg on March 29, 2008

Table of Contents

How to Print B&W Photographs in a Darkroom ................................................................. 1

Intro: How to Print B&W Photographs in a Darkroom .......................................................... 2

Step 1: Supplies ......................................................................................................................... 3

Step 2: Let's set it up! .................................................................................................................. 4

Step 3: The Chemicals - What do they do? ............................................................................. 4

Step 4: Parts of the Enlarger ..................................................................................................... 5

Step 5: WAIT! Try it out first .................................................................................................... 7

Step 6: Getting Ready ............................................................................................................... 7

Step 7: Bonus Step! .................................................................................................................... 8

Step 8: Focus your picture ....................................................................................................... 9

Step 9: Test Strips ................................................................................................................... 10

Step 10: Print the Photo ......................................................................................................... 11

Step 11: Developing Paper ...................................................................................................... 11

Step 12: Disposal of Chemicals ............................................................................................... 13

Step 13: Burning and Dodging ................................................................................................. 13

Step 14: General Warnings ..................................................................................................... 14

Related Instructables .............................................................................................................. 15

Comments ............................................................................................................................... 16

http://www.instructables.com/id/How-to-Print-BW-Photographs-in-a-Darkroom/
Intro: How to Print B&W Photographs in a Darkroom
I'm going to teach you the basics of printing in a darkroom, discuss the basic terms and processes, and explain the workings of the equipment you'll be using.

Developing a picture in a darkroom for the first time is a timeless experience that everyone should experience at least once in their life. The feeling that you get when you first see an image appear on a once blank sheet of paper is almost magical. The first time I printed a photo in a darkroom, I instantly forgot about the horrid smell of the chemicals (For the record, I now enjoy that smell), and just watched as my photograph appeared out of thin air.

For any general photography questions you have (terminology, mostly) that are not covered in this instructable, Check Here first, and if your question is still not answered, feel free to leave a comment here, or PM me with it.

- Note - Make sure to read the warnings in step 14, as well as all warnings on the supplies that you use before attempting any dark room work.

I hope you enjoy my entry to the Photojojo Photography Contest!
5. Raises/lowers head.
6. Gives access to Film Carrier.
7. Film Carrier
8. Timer

**Step 1: Supplies**

- A negative to print
- 100% Cotton cosmetic pad
- Rubbing Alcohol
- A light tight room (Must be well ventilated) (Bathrooms with towels shoved under the door can work well)
- Running water
- Safe light
- 4 Trays for chemicals
- Enlarger with a condenser head (and bulb)
- Paper easel (holds the paper in place under the enlarger)
- Timer
- Squeegee (Technically optional, but highly recommended)
- Drying rack/clothes line and pins
- Grain enlarger (optional)
- Emulsion paper - doesn't matter much what you use. I prefer fiber paper.
- Gloves and apron are optional.
- Chemical storage bottles

**Chemicals:**

- Developer - I use Kodak Dektol
- Stop bath - I use Kodak Indicator stop bath
- Fixer - I use Kodak Fixer
- Hypo clear - I use Kodak Hypo Clearing Agent

Bhphotovideo.com is an excellent source for all photography related supplies, I use them heavily, and they have a pretty complete darkroom kit for new photographers: http://www.bhphotovideo.com/c/product/128650-REG/Beseler__Cadet_II_Enlarger_with.html

You can also get used equipment from Ebay for a lot less.
**Image Notes**
1. Chemicals stored right above their respective trays.

**Step 2: Let's set it up!**
Most things are self explanatory, plug in your safe light. Plug your enlarger into the timer, and the timer into the socket. Follow all the instructions for making chemicals, and set them up in the following order, left to right:

Developer, Stop bath, Fixer, Hypo Clear

You also want your running water source to be nearby the chemicals.

Make sure you can get your entire print through fixer before going outside the darkroom, or else your print will be ruined. In other words, set up the dark room somewhere that the door can stay shut.

**Image Notes**
1. Not a typical safe light, these are considered to be some of the best safe lights in the industry. But then, it's a school darkroom. Yours will probably be a bulb.

**Step 3: The Chemicals - What do they do?**

**Developer**
Developer activates the light sensitive crystals that make up the emulsion on your paper. When the crystals come into contact with developer, any parts of the paper exposed to light will become some shade of black.

**Stop Bath**
The Stop Bath is an acid that deactivates the developer. As you put a print into the stop bath, it stops turning black. Water and lemon juice can both be used instead of stop bath, but are not nearly as effective.

**Fixer**
Fixer removes the unexposed crystals on the emulsion, making the paper light safe. Paper that has been through fixer can then be taken into open light without worries of turning black. Insufficient fixing will turn a picture yellow over time.

**Hypo Clear**
Hypo is not always used, but it helps insure uniform drying, so that you won't have any drying marks later on.

**Image Notes**
1. Safe light with lights off
Step 4: Parts of the Enlarger
Before you do anything, scope out the enlarger. You're going to have a few different knobs and levers, and you'll need to know what each one does. Because all enlargers are different, I'll just tell you a few different parts there will be, and leave it to you to figure what each one does. This will help you feel much more comfortable when actually printing.

- **Focusing knob** - this will move the bellows (and lens) up and down (closer and farther) from the negative to focus it.
- **Head knob** - This knob will either loosen the head so you can slide it up or down (changes how large the picture is), or it will mechanically move the head up and down.
- **Aperture Ring** - This ring should be located on the lens, and changes the aperture. If the enlarger is turned on, you will notice the light get dimmer and brighter as you turn it.
- **There may also be a lever to raise or lower part of the head to give you access to the negative carrier. Some enlargers don’t require anything to be done before you can remove the carrier.**
- **Negative Carrier** - This goes between the lens and bulb, it's what carries your negative. Not much more to it than that.

### The Timer

Timers can be different, but their purpose is always the same: to accurately control the exposure time of an enlarger.

There are generally two switches on a timer:

- If both switches are turned on, the light remains on.
- If one of the switches (It does matter which one) is turned on, the enlarger will be on for as long as the timer is set to.

Having the light on continually is used for focusing your picture

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**Image Notes**

1. Opens the head - Gives access to the film carrier.
2. Focusing knob
3. Raises/Lowers the head to change photo size.

http://www.instructables.com/id/How-to-Print-BW-Photographs-in-a-Darkroom/
1. Grain enlarger  
2. Easel  
3. Lens  
4. Focusing knob  
5. Raises/lowers head.  
6. Gives access to Film Carrier.  
7. Film Carrier  
8. Timer

**Image Notes**

1. The knob that gives access to the film carrier has been opened.

**Image Notes**

1. Lens  
2. Aperture ring (part of the lens)

**Image Notes**

1. Enlarger plugged in.  
2. Goes into outlet.  
3. The Timer
1. Condenser
2. Condenser
3. Bulb
4. Inside of the head.

Step 5: WAIT! Try it out first
Before you print an actual photo, you may want to try a photogram. Photograms are easy ways to introduce yourself to developing in the chemicals. To make one, follow these steps:

- Make sure the enlarger's light covers the entire easel
- Load the easel with paper
- Arrange some objects in a fun pattern on the paper
- Expose the paper at your widest f-stop for approximately 10-15 seconds
- Develop the paper as you normally would (more about this later)

Step 6: Getting Ready
Now that everything is set up, and you know how to use it all, let's get ready to print!

The first step is to clean the negative:

- Put a little rubbing alcohol on a cosmetic pad and wipe down both sides of your negative.
- Wave the negative back and forth until completely dry.
- Last, wipe off any remaining cotton fibers with your clean fingers

Next we're going to load the negative:

- Take out and open your negative carrier
- Slightly bend the negative (hot dog style), and put it under the pegs that will hold it in place.
- You'll need to put the negative in emulsion side down. Your negative should appear backwards, and upside down. (But will look normal when projected)
- Adjust the negative so that you can see the photo you want to print.
- Close the negative carrier and insert it back into the enlarger.
**Step 7: Bonus Step!**

In the previous step, you may have noticed that the negative needs to be put in *emulsion side down*. But what does that mean?

Film is made of two major components:

- A plastic strip
- Emulsion

It’s as simple as that; a plastic strip with a thin layer of emulsion on it. The plastic serves as a base for it, when the unused crystals are washed off by the fixer, the plastic remains to give the negative substance.

You can tell which side is emulsion, because the plastic side is shiny and smooth.
**Step 8: Focus your picture**

Alright, so we've got the negative in, since you already know how to focus the enlarger from step 5, this step is mainly for people who purchased grain enlargers.

- Turn on the enlarger, and open the f-stop to the widest aperture (the light will be brightest)
- Position the easel underneath your enlarger, and raise/lower the head so that you like how the picture is copied on it.

- If you don't see any picture, but the light is on, check to make sure it's not tremendously unfocused.
- If you don't have a grain enlarger, this is where the road (or step) ends for you. Just focus the image to the best of your ability (Don't worry, you can usually do pretty well without one) and then turn it off.

If you do have a grain enlarger, follow these steps:

- Place it under the enlarger (with the light turned on)

*Be careful not to block the light with your head*

- Find a bright white dot through the eye piece of the grain enlarger - you may only be able to find it by backing up a bit
- Slowly get closer to it. looking at the white dot, once you're all the way up to it, you'll be able to tell whether or not it is focused. If it is, each and every dot (pixel, for those of you used to digital) will be clearly visible. If you can't see the grain, turn the focusing knob until you can.
- Voila, you're focused! Go ahead and put the grain enlarger away, and turn off the enlarger.

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**Image Notes**
1. Focused. There is no negative in the enlarger, otherwise it would be hard to take a picture of it.

**Image Notes**
1. Notice that the light comes to the edges of the top an bottom of the easel, and the left and right go past it. The light will cover the entire paper - that's good.
2. There should not be paper in the easel at this point.

**Image Notes**
1. Look through here.
2. Light from enlarger hits here.
Step 9: Test Strips

Test strips are used to determine how long to expose your photo for. They are simply strips of your photographic paper that you expose for different amounts of time.

Take one sheet of paper, and cut into ~1in strips. To use the test strip:

- Set your f-stop to the smallest aperture (you’ll get the best quality this way)
- Lay one strip diagonally across the easel.
- Set your timer to 30 seconds
- Using a piece of something opaque, expose about a quarter cm every 5 seconds. - You will have bars on the paper when you develop it, one exposed for 5 seconds, one for 10, one for 15, etc. all the way up to 30.
- Process the test strip as usual through fixer (more on this later)
- Wash it off
- Take it out into the light and find which bar looks the best. If the best would be a mix between 5 and 10, go for 7 or 8.
- The time that you pick will be how long you expose the entire photo for.

If all the bars are too dark, make another test strip that goes from 1 second to 5 seconds in increments of 1. If they’re all too light, make a test strip that goes from 60 to 30 in increments of 5.
Step 10: Print the Photo

Finally - The moment you've been waiting for! You're ready to make your first print.

- Set your f-stop to the smallest aperture (you'll get the best quality this way)
- Insert a full piece of paper into the easel
- Set the timer to the time that you picked from your test strip.
- Turn on the timer and allow the paper to be exposed
- Process the paper through the chemicals (more on this in the next step)
- Don't move anything on the enlarger until you've gone out and seen the picture in normal light (after it's been fixed), just in case there's something about it you don't like.

Step 11: Developing Paper

All of your times will vary based on what chemicals you use. Always follow the instructions given to you on the packaging. The work flow to follow when developing goes as follows:

- Put paper in developer, agitate (rock the tray back and forth) for the required amount of time.
- Rinse print in water (isn't your picture neat?)
- Put paper in stop bath, agitate for the required amount of time.
- Rinse print in water for ~30 seconds
- Put paper in fixer, agitate for the required amount of time.
- Rinse print in water
- Put paper in hypo clear, agitate for the required amount of time.
- Rinse print for ~10 minutes to make sure all the chemicals are off the paper
- Squeegee the paper to get most of the water off
- Hang the print for drying

Here are a few tips/explanations:

- Rinsing between each chemical prevents cross contamination of chemicals, making them last longer.
- Once the chemicals start taking longer to work, they're pretty much spent, and are ready for disposal (more on this later). Indicator stop bath will change colors when it's ready to toss.
- In a home dark room, you could use the shower to squeegee in.
- Fixer is the one chemical that it's most important to use for the full amount of time. Prints do turn yellow over time if not properly fixed.
Image Notes
1. Whirlpool wash sink
2. Squeegee board.

Image Notes
1. Drying racks

Image Notes
1. What happens if you don't fix completely.
**Step 12: Disposal of Chemicals**

Developer and Stop bath are generally mixed together and dumped with water down the drain.

Fixer contains silver released from the paper during processing, and therefore needs to either have the silver removed and dumped, or disposed of as hazardous waste. Jephy suggests asking a professional lab (like a one hour developer) to dispose of it for you.

Hypo clear can be dumped down the drain.

Kodak has a decent chemical safety guide located [here](http://www.instructables.com/id/How-to-Print-BW-Photographs-in-a-Darkroom/).

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**Step 13: Burning and Dodging**

Sometimes part of your picture is unproportionately lighter or darker than the rest of your picture. This may be a sky that's too bright, or a shadow that's too dark, but whatever it is, you don't want it like that. If this happens, burning and dodging is called for. The concept of burning and dodging is that you allow part of your picture to be exposed longer than the rest of it.

- If you want part of it to be darker, expose that part longer
- If you want part of it to be lighter, expose that part for less time

Different implements can be used to accomplish burning and dodging, including your hands, a cut out shape, etc.

- Use a test strip to figure out the different times needed for different parts of the picture.

Whatever you use to block light from touching part of the paper, make sure to wave it back and forth some, to avoid sharp lines of light. For example, if you cover someone's head with your finger, it will not look natural, but like a finger. If you wave your finger back and forth, there will be a gradient that only lightens and darkens the part of it, without any visible shapes.

It's important to not give up when burning and dodging, it can take a few prints before everything is just right. You also may need to expose multiple areas for multiple times.

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Image Notes

1. We use these to store fixer.
**Image Notes**

1. You can cut out part of a print to use as a burning and dodging tool. If you do this, fixing completely is not necessary.

**Step 14: General Warnings**

On Skin Protection

- The chemicals used in developing can cause dry rashes, warts, etc to some people. You can wear gloves or use tongs, if you want - but be careful not to contaminate the chemicals with each other.
- Developer can cause brown fingernails...
- Don’t swallow or get any of the chemicals in your eyes

Staining

- Fixer stains clothing. You can either designate clothes for printing, be careful, or wear an apron.
- Be sure to clean up, if you let chemicals sit on surfaces, they will discolor eventually.

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Do not consume food or drink while printing

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Paper Warnings

- Be careful not to bump the easel while the paper is being exposed
- Always put your paper in the black bag it comes in before taking it out of the dark room
- Safe lights can eventually expose your paper, so don’t leave it out, even in the dark room. Take out paper as you need it. Also, use as weak of a light as possible.

Phew, we're finally finished! I hope you've enjoyed my entry to the Photojojo Photography Contest, and maybe even learned a thing or two. Let me know if you've got any questions or suggestions.
Revolving light tight door. These are used in dark rooms that multiple people will work in at once.

Related Instructables

- Developing Black & White Photo's at Home by Jitch
- Electrophotograph (Photos) by CameronSS
- Electrophotograph - now with added Kirlian! by CameronSS
- Developing Black and White Film at Home by greyhathacker43
- Pocket Instamatic by iectyx3c
- Begin photography and work your way up to pro... by diybro_1
ebrahimebram says:
hey very helpful...but where do you get all that stuff...how much would it cost about

Sep 9, 2009. 10:13 AM

Weissensteinburg says:
Equipment can vary a lot. Enlargers can be bought used at pawn shops, garage sales, craigslist, etc. Check BHPhoto.com for prices on new equipment or chemicals.

Sep 9, 2009. 10:46 AM

Meroki says:
omg i reconized everything in here xDDD im taking a class so im familiar with it all and wow dude thats a LOT of fixer :O one of my jackets still has a slight smell of fixer xDD

Dec 6, 2008. 11:40 PM

jephey says:
WARNING: It is dangerous and illegal to pour fixer down the drain! It contains silver which is dangerous to people and wildlife! If you have well water and a septic tank, this is a definite no-no as it can affect you and your loved ones!

Aug 30, 2008. 11:15 AM

What can i do?!
Pour your used fixer and developer into a container (with a lid) that can be easily transported by automobile. Take the container to a photo lab (or even a pharmacy with a one-hour lab) and ask the lab tech for it to be dumped in the Waste or Silver Recovery unit. Don't ask a cashier! If you can, call ahead and ask for the lab supervisor.

If they ask questions:
Say you do your film at home, that it should be safe to pour in, they can ask their supervisor, and it's more money for them because of the silver it contains. The people aren't giving you a hard time, there is often all sorts of warning signs about mixing chlorine/bleach containing chemicals, with another type of chemical, that is all Greek to them. Be patient and let them double check, it's worth it for the environment.

Why?
The unit at professional labs zaps the waste with electricity and using magnets collects the silver and the rest goes down the drain. Not only does the silver not make it into the water supply, it is saved in large canisters which are picked up for recycling!

In the United States: Both Federal and State government agencies regulate the handling and disposal of photographic chemicals. For more info on proper disposal of photographic chemicals, see here (PDF).

Additional Notes: Don't develop film in the kitchen where you eat, as this tutorial states for making prints, don't eat anywhere during the process! Also, don't pour chemicals out at all, and don't let them make contact with older porcelain it WILL stain any porcelain the finish has worn off of. If this does happen you need to find "Farmers Reducer" and scrub it with a brush, it'll take some elbow grease (Powdered cleanser with bleach might work too).

Issergold says:
Great information, just what I was looking for. Thanks IG

Jun 24, 2008. 1:53 PM

skimask says:
amazing. Just what i was looking for,

May 1, 2008. 5:25 PM

iamthemargerineman says:
really helpful.

Apr 28, 2008. 5:08 PM

Weissensteinburg says:
Thanks!

Apr 29, 2008. 12:46 PM

ledzep567 says:
oh my gosh... your darkroom looks almost identical to the one at our school... timers are on the same side of the enlargers, exact same chemicals, almost exact same trays, same chemical tray holder system thingy, scary... anyways, +1

Apr 27, 2008. 6:51 PM

LinuxH4x0r says:
hey w'berg, I was wondering if you could answer my question

Apr 21, 2008. 5:48 AM

GorillazMiko says:
Remember what i said on AIM? Looks like NachoMahma did what I wanted to do. :P Anyways... +1 vote. +1 rating. ;)

Apr 8, 2008. 9:17 PM
NachoMahma says:  Apr 9, 2008. 12:43 PM   
Have y'all been conspiring against me? Shame on y'all!

Weissensteinburg says:  Apr 9, 2008. 1:03 PM   
Alright, Gorillaz, wait till he's asleep and then...

Weissensteinburg says:  Apr 9, 2008. 3:28 AM   
Thanks =]

joejoerowley says:  Apr 8, 2008. 7:32 PM   
Great! Well Done! It really allows me to appreciate the significance of a digital camera. I love playing with my dads Canon Digital Rebel. Its a great camera! It allowed me to do my profile image:)

Weissensteinburg says:  Apr 9, 2008. 3:30 AM   
Yeah, you really notice it after having done digital and then starting film. I really missed being able to peak at the LCD screen, but then again, film images were always more likely to turn out just right than digital. (You especially notice how much more expensive the darkroom is)

laserSage says:  Apr 9, 2008. 6:33 AM   
you seen the cost of a photo quality printer? makes dark rooms look cheap

Weissensteinburg says:  Apr 9, 2008. 12:34 PM   
The alcohol shouldn't do anything to the negative..it's what my teacher's always done, and she's been in the field much longer than I've been alive. I'm sure she would have noticed by now if it did. Good point about the safe light, we actually do that, too. It's a pain that whenever you need to open the light up a bit (to look for something) there are a few students who insist it will ruin their paper.

flio191 says:  Apr 9, 2008. 6:37 AM   
something ive noticed in the darkroom, is that with film, the more time you take with it, it just feels better. its too bad so many people will miss out the... so to say... essence of the darkroom. qualitywise, i think film will always be true- black and white film has this contrast quality that you cant completely mimic even in photoshop.

joejoerowley says:  Apr 9, 2008. 4:50 AM   
Yeah no Joke. With digital I can snap away at my hearts content then upload on to the interweb and get printed for a cheap price.

Always Dance says:  Apr 9, 2008. 12:08 PM   
well done. I appreciate the thorough explanations and appreciate even more, the simplicity of digital photography!

a7xforlife says:  Apr 8, 2008. 6:31 PM   
Good instructable. Will the rubbing alcohol hurt the negative at all? I know in my photography class we just use canned air to blow off any dust and that works really well. Also a tip I find useful (and most of the photography classes at my high school) is use the safe light(s) as dim as you can while still being able to see, it makes focusing a lot easier both with and without a grain focuser.

flio191 says:  Apr 9, 2008. 6:34 AM   
well, the alcohol generally helps take off some waterspots and dust stuck on from drying, so it should be better. the only downside is if you dont use really good negative wiping cloth you can scratch your neg. using both alcohol, then blowing with canned air helps the most, i figure, the tip you have, i second! 'Do i even have a completely separate room for my enlarger, which is in complete darkness. it was originally for printing color, but those chemicals are le expensivo.

Weissensteinburg says:  Apr 8, 2008. 6:56 PM   
The alcohol shouldnt do anything to the negative. It's what my teacher's always done, and she's been in the field much longer than I've been alive. I'm sure she would have noticed by now if it did. Good point about the safe light, we actually do that, too. It's a pain that whenever you need to open the light up a bit (to look for something) there are a few students who insist it will ruin their paper.

CameronSS says:  Apr 8, 2008. 9:05 PM   
Interesting...the timer in your printing darkroom is the same as the one we use in our developing darkroom. For printing, we recently upgraded to digital timers-time is adjustable by 1/10 sec, and you can adjust the brightness from the timer.

Another slight difference: rather than move the card with the light on for test strips, we just set it to 3.5-4 seconds, and move the card after the light is turned off. Not saying it's better, just noticing a difference.
lasersage says:
it's usually better to leave the light on and move the card, or block with a shutter. actually switching the light off will cause it to be ever so slightly different brightness. keeping lamps hot keeps the brightness constant. you wouldn't detect it with your eye, but say you had it stopped down for a long exposure it can make a fair difference.

Weissensteinburg says:
Thanks, let me know what she says! I've seen digital timers before, but never really used one. I guess I kinda like how non exact traditional timers are...it leaves a little more up to what just feel right.

LinuxH4x0r says:
Wow! This explains why people went digital! Looks like a lot of work. Great job, voted

Weissensteinburg says:
That's not the half of it...ever developed film? thanks.

LinuxH4x0r says:
Nope! I would like to try, but honestly I'm happy to just plug it into my computer.

wertokz says:
Took me over an hour last time. I really need a watch =s. We've only got 3 darkroom weeks left for our As level photography coursework so I gave up with film and bought a dslr. Its awesome although I miss using the enlargers. i guess there are pros and cons to both.

lasersage says:
we used to dev films in about 20 mins. i guess half an hour with the final wash. and you could do up to 8 in a tank at once. this was at uni, in a student house with tinfoil on windows to make it dark. used to buy cheap chemicals off ebay, just out of date usually. film's the way forward. digis great for snaps, but if you want something of quality thats gonna last, film's awesome.

NachoMahma says:
. Great job!