

Drip Kit

for the Time Machine



Liquid Drop Art.com

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Parasol Launch
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Time Machine Group On Flickr

There is a user Group for the Time Machine and Drip Kit on Flickr. It's a forum for people to share ideas and images. Join the Group and share your pictures and ideas about drip photography.

<http://www.flickr.com/groups/timemachine/>

Drip Kit

The Drip Kit is used to photograph single or multiple water drops with the Time Machine and an electric water valve accessory. It allows you easily photograph single drops and splashes or more complex drop collisions. The Time Machine's Drop Mode allows you to define the parameters of drop size and spacing, and then triggers the camera shutter and an off camera flash to capture the precise instant you want. The Drip Kit was designed to be the easiest way to set up water drop photography and shoot spectacular images.

To use the Drop Mode you must first set up the Drip Kit, which contains the following items:

- A water reservoir and valve
- A mounting plate or bar
- A threaded rod
- A control box
- A push button to trigger a drop sequence
- A cable to connect the water valve to the control box
- A cable to connect the push button to the Time Machine
- An "add-on" spout to emit larger drops
- A short plastic rod with which to clear a stuck water valve

You'll also need:

- A Time Machine
- A support from which to hang the water reservoir (more on this shortly)
- A camera and shutter cable for the Time Machine
- A tripod for the camera
- An off-camera flash (or two) and cable(s) for the Time Machine
- A drop tank filled with water for the drops to fall into

Hardware Setup

There are several easy ways to support the drop bottle. One may be more convenient for you than the others. All of these are easy to set up, and will take just a couple of minutes to assemble if you already have the parts. Here are the basic types:

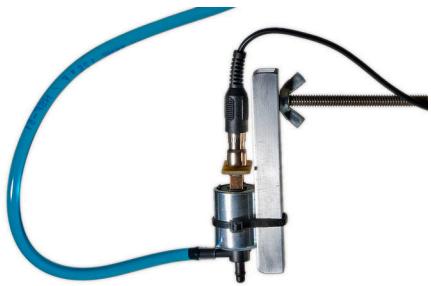
- You can use a standard tripod to support the water valve.
(We have included all the parts you need to use this method.)
- You can use a standard photographic copy stand to support the bottle.
- You can make a simple support from 1/2 iron plumbing pipe.
- You can build a support structure from wood. This is considerably more work.

The water valve is available joined to the drop bottle or separate from it. The joined arrangement is the easiest to use, because you only need one support for both. Just slip the bottle over the threaded rod and you're ready to go.

If you got the valve and bottle as separate components, thread the valve bracket onto the threaded rod and tighten the wing nut to hold it in place. You will need to find a separate location for the drop bottle. If you are building your own wooden structure to hold the valve and bottle, you can mount the valve with a wood screw through the hole in the bracket. The advantage of the separate bottle is that you can raise or lower it relative to the valve, and change the pressure of the water coming through the valve.



Valve attached to the bottle



Valve separate from the bottle

Using a standard tripod
Set a small tripod on a work table. Thread the stainless steel rod that came with your Drip Kit into the threaded hole in one end of the included mounting plate or bar. Screw the plate onto the top of your tripod with the 1/4-20 threaded hole at the other end. Slip the water reservoir over the end of the threaded rod, with the water valve on the outside. Plug one end of the power cable into the top of the water valve.





Using a copy stand

If you have a copy stand that's about 18" tall, it makes a handy valve support. At the time of this writing, you can buy a 12" x 19" desktop copy stand from B&H Photo for \$58.

Screw the threaded rod into the side of the plastic mounting block at one end. Fasten the block to the copy stand with the hole at the other end of the plastic block. Hang the drop bottle from the threaded rod.



Using 1/2" plumbing pipe

These parts should all cost less than \$35. Purchase the following at a hardware store:

An 1/2" iron pipe nipple, 18" long.
An 1/2" iron pipe nipple, 6" long.
A 1/2" iron pipe union.
Two floor flanges to match the pipe.
A board to mount this to. For example,
a melamine covered shelf board.
Four 3/4 inch pan head sheet metal
screws to hold the flange to the
board.
Four large diameter "fender washers"
for the screws, big enough to cover
the holes in the flange.

Mount the flange near one edge of the
board with the screws and fender
washers.

Drill a 1/4" hole through the middle of
the 1/2" union. Or, if you're able, drill
a #7 hole and tap it 1/4-20.

Join the two pipes with the union.
Screw the long pipe into the flange.
Cut a section of the shelf board for the top shelf.
Screw the other floor flange to this.
Screw the top shelf onto the short pipe.

Screw the valve bracket onto the threaded rod, and slide the threaded rod into the hole in the pipe. Put the drop bottle on the top shelf. If you don't have a separate valve, just slide the drop bottle onto the threaded rod.

After you have hung the drop bottle...

Place your drop tank (a baking dish, bowl, or coffee cup) under the water valve and fill it with water. Fill the water reservoir with colored water.

Place the Time Machine and Drip Kit control box in a convenient location near the drop tank.

Note: There is a 9-volt battery inside the control box. This battery powers the water valve. You will not need to change it very often, because the water valve is only on for small fractions of a second. But don't forget that the battery is needed and is inside the control box. To change the battery, remove the two screws in the bottom of the control box. If you don't use the control box for a month or more, you may want to remove the battery to prevent it from leaking.

The following diagram illustrates how the various components are connected.

- 1) Plug the cable from the control box into the Shutter Jack of the Time Machine.
- 2) Plug the extension cord from the push button into the Time Machine Sensor Jack.
- 3) Plug the power cable from the water valve into the control box.
- 4) Plug the shutter cable for your camera into the control box.
- 5) Plug your off-camera flash into the Time Machine Flash Jack.

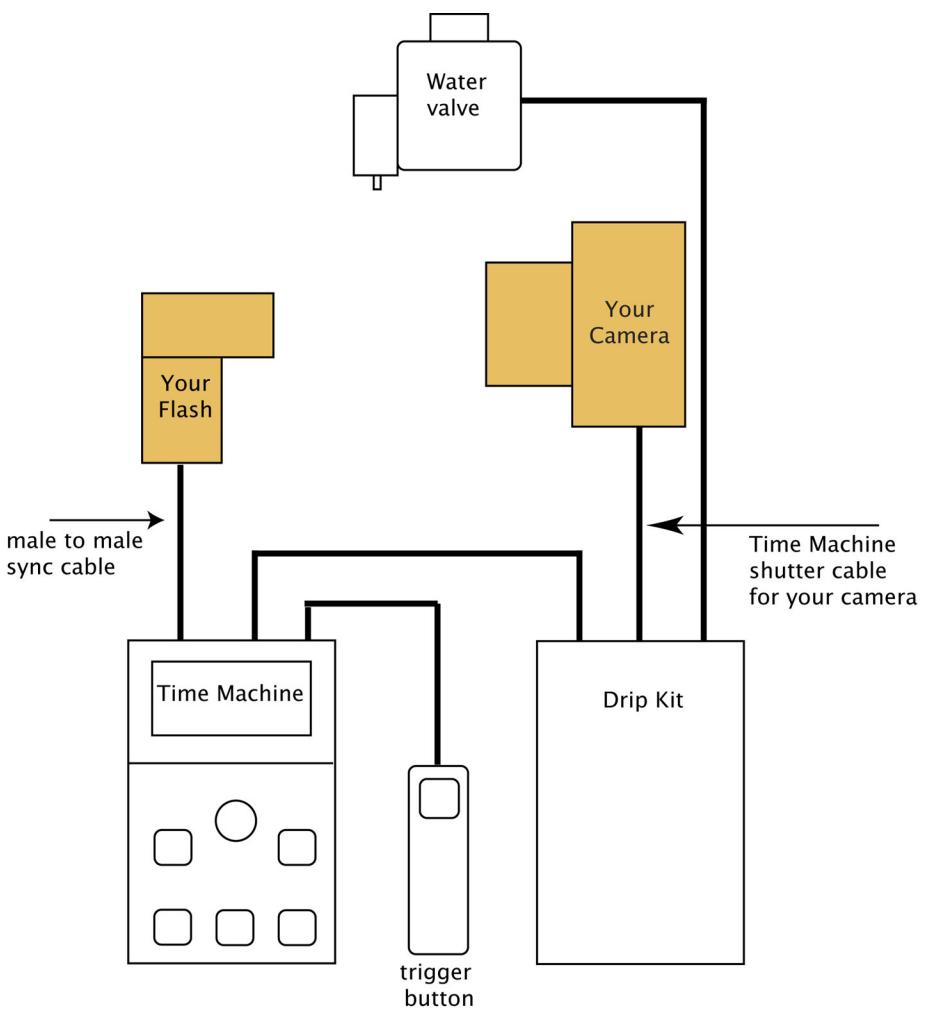
To test your setup, turn on the Time Machine or hit RESET. Water should stream out of the valve for about one second. Hit reset a time or two to confirm it's working and the valve is ready to drip.

This completes the setup of the hardware.

Care of the water valve

The water valve in the Drip Kit is very durable and we've been using them for several years. But it's easy to imagine that hard water will leave a residue that will eventually cause the valve to fail. There's no way around this. If at all possible, use deionized water, like you would use in a clothes iron for the same reasons. And be sure to rinse out drip fluids (like milk) that will leave a residue.

To clean the valve at the end of a session, rinse the drop bottle with clean water, then fill it with warm water and put it on your stand. Press the MODE button on the Time Machine



until the LCD screen says “Bulb Flash...”. Press BEGIN four times, and the valve should open. Let the water drain out of the drop bottle. Hit MODE to stop the flow. Refill the drop bottle with clean water, and press BEGIN again to flush the valve a second time.

If the water valve sits idle for some time it may stick and not open. If this happens, you can press a thin object into the bottom opening and free up the valve. We have included a short length of thin nylon rod for this purpose.

If the valve fails we can replace it. But it would be prudent to consider preventive care.

Camera Setup

The camera will be placed on a tripod in front of the drop tank and focused on the spot where the drops will fall. To focus, place a bolt or other small object where the drops land. Then manually focus the camera on this bolt. Keep the camera in manual focus.

Set the camera to an exposure time that's a little bit longer than the time it takes a drop to fall. You can probably start with an exposure time of 1/2 second, assuming the water valve is about 18 inches above the drop tank. This is the typical arrangement. When the Drip Kit is triggered, the shutter will open for half a second, giving time for the drops to fall and the flash to fire. Then the shutter will close automatically.

The best lens to use for water drops is a macro lens. A typical lens for Canon users is the 100mm macro. But you can use what you have, as long as the drop nearly fills the frame, and your camera is not so close that it gets splashes on it.

Lighting

The arrangement of the lighting is where you will express your artistic vision. This is a very rich field that cannot be covered briefly. Many people on the internet describe their lighting arrangements, and you can get some good ideas there. To help you get started, one common arrangement is to put a couple of flashes on each side of the drop tank pointed at the drop. Or, you can put a white (or colored) card behind the drop tank and bounce your flashes off of that. Or you may put a sheet of translucent glass or plastic behind the drop tank and put the lights behind it, pointed towards the drop. Or you may use a combination of these. You can also put colored filters over the flashes. This is an area ripe for experimentation and developing your vision. Start with a setup and try to imagine how your image might be improved by moving the lights around.

The Time Machine Drops Mode

You're now ready to use the Time Machine. First, be sure the Output Mode of the Time Machine is set to "Shutter". This is one of the "Configuration" settings described at the beginning of the Time Machine instruction book. Also be sure "Force Flash" is set to "OFF". This is also done with the Configuration mode of the Time Machine. These settings will already be correct unless you have changed them.

Press the MODE button on the Time Machine until the LCD screen says:

Drops...

Press BEGIN. The LCD screen will say something similar to:

Drop count: 1

This allows you to choose the number of drops that will fall for each picture. To increase the value, press the PLUS key. To decrease the value, press the MINUS key. Use "1" for single drops or "2" for drop collisions. You can enter as many as 255 drops, but you'll probably never use more than 2, or maybe 3. In the beginning use "Drop count: 1".

The LCD screen will say something similar to:

Drop size: 0.050

The Drop size is the time (in seconds) that the electric water valve will be open. The longer it is open, the larger the drop will be. Typical values are from 0.04 to 0.080 seconds. You may wish to experiment with different values. To increase the value, press the PLUS key. To decrease the value, press the MINUS key. Also make these changes in small increments to judge the effect.

If the value is too big, you'll get a messy drop. If the value is too small, you'll get no drop at all. The larger the drop, the faster it will fall. The value will also need to be changed for different fluids. Thick fluids will need a larger value.

Though the setting is called "Drop Size", this is not entirely accurate. The actual size of the drop is determined by physics. When the drop has enough weight to overcome the surface tension that holds it up, the drop will fall. If the valve is open longer than this, additional droplets will form and fall too. These additional droplets are very useful.

The drop size is affected by the nozzle on the water valve. I have experimented extensively with different nozzles, and the brass tip supplied with your Drip Kit is the best I have found. But you can take it off, and the smaller nozzle will make smaller drops.

When the LCD screen shows the value you wish to use for Drop Size, press BEGIN. The LCD screen will say something similar to:

Flash lag: 0.300

This is the amount of time the Time Machine will wait after the drop is emitted before it fires the flash. You can enter any value from zero to 9.999 seconds. You need to enter a number that causes the flash to fire at the precise instant you want to capture. You'll have to arrive at this value by trial and error, and by watching where the drop is when the flash fires. The value will depend on the height of your water valve, the type of fluid you're using, the setting of Drop Size, and whether you're shooting single drops or drop collisions. (It may also depend on the temperature and humidity. You will probably find that the settings that worked one time will not work exactly the same on another day.)

To increase the Flash Lag, press PLUS. To decrease, press MINUS. If you hold the BEGIN button down while the PLUS or MINUS buttons are down, the delay value will change by hundredths of a second. If you hold the MODE button down while the PLUS or MINUS buttons are down, the delay value will change by tenths of a second. However, you must be careful not to press MODE or BEGIN without the PLUS or MINUS keys, because that has a different effect if you press MODE by itself, the Time Machine will return to the beginning of the Drops Mode. If you press BEGIN by itself, the Time Machine will advance to the next setting.

When the LCD screen shows the Flash Lag value you wish to use, press BEGIN. The LCD screen will say something similar to:

Advance: .0000 secs

This setting allows you to enter an increment of time that will be added to the flash lag after each exposure. It allows you to change the image you get automatically, so instead of getting the same shot over and over you get a little variety. Or you may wish to capture a planned sequence as the drop is captured a little lower each time.

When shooting with a value for “Advance”, it’s easy to lose track of what the total flash delay value is. When using this feature, if you see a memorable image, you may want to know what the current total value of flash lag is. To see it, when the Time Machine says “-= Armed =-” and is waiting for the next exposure, press the MINUS key. The LCD screen will show the current total value of “Flash Lag” plus “Advance”. Press BEGIN to return to normal operation.

If you use the value “.0000” for Advance, no increment is added.

If you wish to reset the added increment and start over, press MODE to restart the Drops Mode.

After you have set the value you want for Advance, press the BEGIN key. The LCD screen will say something similar to:

Timeout: 0 secs

This means the Time Machine will wait no time at all before accepting another trigger press. If you want to make the Time Machine wait a little while before it accepts another button press, use the PLUS key to increase the timeout. This will prevent duplicate drops from being triggered too soon.

After you have set the value you want for Timeout, press the BEGIN key. The Machine will now be armed and ready for the first water drop. The LCD screen will say:

-= Armed =-

To release a drop, press the push button that’s plugged into the Time Machine. The red LED on the Time Machine will come on and the water valve will activate and dispense the number of drops you have requested. If you’re just getting started and the valve has not had time to fill with water, the first press or two may not pass water, but you should hear the valve respond with a sound. If the valve becomes clogged from inactivity, you may need to tap it or press the button a few times to get it going again.

As soon as you press the push button, the camera shutter should open. If the camera has gone to sleep, it may only wake up on the first drop and you may need to release another drop to get the shutter to open.

After the drop falls, the flash should fire after the programmed delay interval. The shutter should close after the set exposure time, and you can evaluate your image on the camera’s LCD screen.

The Time Machine will then be ready for another button push.

To stop the Drop Mode mode at any time and start over, press the MODE key.

Multiple drops

The sequence is a little different when multiple drops are used for collisions. The Time Machine will let you program different sizes for each drop and different delays between

them. Press the MODE button on the Time Machine until the LCD screen says:

Drops...

Press BEGIN. The LCD screen will say something similar to:

Drop count: 1

Use the PLUS key to choose two or three drops. Press BEGIN and the LCD screen will say something similar to:

Interval: 0.050

or

Delay 1: 050

This is the setting for the delay value between drops one and two. Use the PLUS and MINUS keys to change the setting. When satisfied, press BEGIN. If you had selected three drops, you will be asked for:

Delay 2: 050

This is the setting for the delay value between drops two and three. Use the PLUS and MINUS keys to change the setting.

When you have entered the delay value, press BEGIN. The LCD screen will say something similar to:

Size 1: 0.050

This is the setting for the size of drop number 1. Each drop can have a different size if you wish. Use the PLUS and MINUS keys to change the setting. When you have entered the size you want, press BEGIN. The LCD screen will say something similar to:

Size 2: 0.050

It is now asking for the size you want to use for the second drop. You can use any value you want, it does not need to be different than the first drop. When ready, press BEGIN. If you requested three drops, you'll be asked for the size of drop number 3. Otherwise, or afterward, you will be asked for the value of "Flash Lag". From here everything is the same as for one drop, and you will enter the "Flash lag", "Advance", and "Timeout".

Optical sensor

Some people think an optical sensor is needed to trigger on the falling water drop. My experience has been that this is not only unnecessary, it's an inconvenience. It adds another cable to the setup, and another doodad to hang in your drop rig. The Time Machine already knows when the drop is released, because it opened the water valve. The valve we use is precise and releases the drop at the same instant every time. You can confirm this by the regularity of images taken with the same setting.

Getting started with drop photography

The Time Machine and Drip Kit make it easy to take pictures of water drops. But getting spectacular photographs is (as always) still challenging. Arrangement of the lighting is very important, and choosing the right delay settings for the Time Machine will take some experience. You will need patience and a willingness to experiment. It takes time to understand what you see in your pictures, and which way to shift the settings to steer your results towards more dramatic images. There is no substitute for experience.

I'll get into more detail in a moment. But the following "Quick Start" procedure may help you shoot something soon.

Quick Start

Start with one drop to master the spout. Don't worry too much about cosmetics as you learn the basics. Use a water glass to drop into, with simple lighting. You can develop fancy lighting and setups after you learn to manage the drops. Place a white card behind the drop glass and point your flash at the card, so the background is illuminated. You will see the drop in front of this lighted background.

Go to the "Drops" mode in the Time Machine and set the "Drop Count" to "1". Set the "Drop Size" to "0.050". Set the "Flash Lag" to "0.300". Set the "Advance" to ".0000". Be sure the camera and flash are ready, and press the trigger button to release a drop, trip the camera, and pop the flash. Look at the image and try to understand where it is in time. Is the drop still falling? Then the Flash Lag is too small. Is there a crater in the water but no spout? Then the Flash Lag is probably still too small. If there is a spout but it's very short, you could be too early or too late. You need to adjust the Flash Lag and take another picture until you see a spout that seems as tall as it will get. To do this, increase the value of Flash Lag by about ".010" and shoot a couple of images. Then increase it again and shoot a couple more. Do this over and over until you can see where the maximum height occurs, and how long it lasts. The spout probably stays at the top for several tens of milliseconds.

Change the Drop Size to see how it affects the timing and the size of the spout. Change the height of the water valve to see how it affects the spout.

Once you get the maximum spout, add a second drop. Hit "Mode" on the Time Machine to restart the Drops mode, and set "Drop Count:" to "2". Set the "Interval" to "0.050". Set "Size 1" (the size of the first drop) to ".050" and set "Size 2" (the size of the second drop) to the same value. Leave "Flash Lag" where it was and "Advance" at ".0000". Press the trigger button to release two drops and pop the flash.

Try to get an image that shows the second drop above the spout. This makes it easier to understand where you are in time. If, instead of a round drop above the spout, you see a spout that is deformed from a collision, increase the size of the Interval by about .005 seconds at a time until you see the second drop an inch above the spout. Then begin to decrease the Interval by .002 or .003 seconds at a time. You should be able to shoot images with the round second drop coming closer and closer to the spout. Get a feeling for how much the relationship of the drops changes for every .002 or .003 seconds of "Interval".

When you get close, change the Interval by a smaller amount. You should be able to bring the second drop right on top of the spout, so it kisses the spout and begins to merge with it. At this point you are on the verge of a collision. A collision happens right after the image you have captured.

Think about what's happening. The second drop is falling fast, but the spout is nearly stationary. When the spout rises up, it tends to pause and hold its altitude for several tens of milliseconds at the peak before it collapses and falls back down.

Once you see the second drop close to the spout, the collision is happening even if you don't see it. It happens right after you took the picture. To capture the collision you can increase the value of "Flash Lag", to make the flash fire later. The second drop will continue falling into the standing spout, the flash will go off, and you'll capture the collision. The more you increase the Flash Lag, the later you will see the collision. It will start small and horizontal. The "older" it gets, the more it will spread out and droop down. At the end, the sheet of water will collapse into chaotic individual droplets.

To capture the collision you can also reduce the size of the "Interval". This means the second drop will fall sooner, and collide with the spout sooner.

In fact, you should try both things (one at a time) to see how they behave. Change the values by small amounts, like .002 or .003 seconds, and approach the event gradually. Take several images with the same settings, and you'll see that each one is different. But the general relationship of the two drops should be the same, and you should capture different versions of the same event.

This is how great water drop images are created. Go slowly. Make a single change of a small amount. Shoot several images, and get a feeling for where you are in the cycle and what is happening. There are many parameters to change. You can make gradual changes to each of the following and learn where they take you:

- Drop size(s)
- Interval (drop delay)
- Flash lag
- Height of water valve
- Size of drop tank
- Fluid (water or milk)
- Additives (xanthan gum, soapy additives)

Great water drop images are the result of a process that's different every time. You have to be patient, methodical, and curious. Some days great things will happen. Some days nothing seems to work. Keep at it. If it's no fun, put it away and come back later.

Detailed Procedure

The following comments are the result of my personal observations and efforts to find a procedure that will direct you toward the “sweet spots” where amazing things can happen.

Start with a single drop

You have to get good settings for a single drop before you can think about what a collision with it will look like. Not only must your single drop spout look good, the lighting must be right too. So experiment first with where your components will be placed to show a single drop well.

By the way, the spout that forms when your drop lands is not a bounce. The falling drop pushes the water out of the way and forms a small crater. It's the surface tension of the water that pulls the crater closed and pushes the spout up.

Arrangement

A common arrangement is to have the camera shooting at about a 30 degree angle towards the drop tank so you see glare on the surface of the water. Arrange a flash behind a translucent screen at the other end of the drop tank, or put a white card at the far end of the tank and point the flash at the front side of the card. This will put glare on the surface of the water from the camera's point of view. The glare will reveal ripples in the water's surface and reveal the spout. The drop tank can be a glass, a bowl, or a large baking dish. The bigger it is, the easier it is to take pictures that don't show the front or back edge of the tank. A typical depth of water in the drop tank is one to two inches.

A dark pan or dark water (with food coloring) will give better reflections than clear water in a light colored tank. But you may choose to experiment with this. If you use a Pyrex baking dish, watch out for patterns or text molded into the bottom. Metal cooking pans may also have an embossed bottom. These can easily show up in your pictures. A dark bottom is better.

Also consider the height of the camera. A higher camera will look down on the drop and show less reflection. A lower camera will tend to look “under” the drop. Experiment.

Aperture and ISO

Your camera settings will depend on how much light you have (how bright your flash is). You'll have to experiment with aperture settings and ISO speed to see what gives you an adequate exposure. You'll want the flash to be fast, so place the flash in a manual mode and choose lower power settings. Lower power is less bright but is usually faster. A power setting of 1/64 on a modern Canon or Nikon flash is fast enough to freeze the drop.

You want a large aperture to get as much light as possible, but you want a small aperture to get as much depth of focus as possible. You just have to find some compromise between these two conflicting goals.

Exposure time

The exposure time on the camera must be long enough for the drop to fall and form a spout. How long this takes depends on how high the water valve is above the drop tank. The height also affects what the splashes look like. You'll have to experiment to see what you like. If you're working with a height of 15" from valve spout to water surface, it takes about .285 seconds for a drop size of .050 seconds to hit the surface of the drip tank.

The sequence of events

The Drop Mode in the Time Machine was specially written to control the Drip Kit hardware and to simplify the necessary settings for drop photography. The sequence is as follows:

- 1) You press the Drip Kit trigger button.
- 2) The shutter is triggered and the water valve is activated for the length of time you entered for "Drop Size".
- 3) The drop begins to fall, the shutter begins to open, and the "Flash Lag" begins to count down.
- 4) When the "Flash Lag" time has been reached, the Time Machine triggers the flash, freezing the motion and capturing the image.
- 5) At the end of its exposure setting, the camera shutter closes automatically.

Focus

Setting the focus is critical and must be done manually. The drops happen much too fast for the camera to find an automatic focus. I use a 3/8" hex head machine screw that's about 2" long. Stand the bolt on its head in the drip tank where the drops fall. Trigger a couple of drops to confirm that they land on the threaded end of the bolt. Then focus the camera on the bolt threads at the height you will be photographing. If your camera has a "live view" mode that previews the image on the LCD screen, magnify the live view to see a very close image of the bolt. This makes it easy to set the focus accurately. Remove the bolt from the drip tank and the camera is set to focus where the drops will fall.

First shots

When you first get started it may be easier to have the room fully lit. You may not be able to take good pictures this way, but it will be easier to judge where the falling drop is when the flash goes off. In the dark, the flash is very brief and tends to be disorienting. But in a fully lit room you can see the drop begin to fall and you can see when the flash goes off. This makes it easier to judge if the flash is early or late. If you hold your eyes still and focus on where the drop will be, you can see it frozen in mid-air by the persistence of vision when the flash fires. Use these observations to adjust the value of Flash Lag so the flash fires just as the drop hits the drop tank.

Turn off the lights and take a couple of pictures. Then try to figure out what they show. You should see the surface of the drop tank illuminated by the flash. You should see the water drop. You might see the drop as a sphere suspended in air. This means your Shutter Lag is too small (early). You might see a crater frozen into the surface of the drop tank. This means the drop has penetrated the water. If there's a great deal of disturbance to the surface of the water, it probably means your flash is late and the Flash Lag is too big. Experiment with the value of Flash Lag to see some interesting images as the water first kisses the drop tank.

Think about the lighting. Try to get the “bright spot” directly behind where the drop hits, or in line with it but a little higher up. This forms the aesthetic composition of your drop shots.

The spout or “bounce”

When you’re ready to see the spout, set the Flash Lag to .130 seconds more than you were using when the drop just kissed the surface of the water. It takes about this long for the spout to form. You should now be able to photograph the spout. See if you can get good photographs of the spout. This will depend a great deal on your lighting. Experiment with larger and smaller values of Flash Lag to see if you’re getting the peak of the spout or an early or late part of it. Make changes to flash lag of .010 seconds at a time. This helps you keep track of where you are in the motion.



Learn what the different phases of the spout look like. This is an important skill. It is by knowing what phase of the splash you capture that you know which delay to change and in which direction to change it, to steer the images in the direction you want to go. This is a critical part

of the skill of drop photography. Generally speaking if you are early in the spout, the surface of the water will be less disturbed. If you’re late in the spout, the disturbance will be greater as the spout settles back into the pool. The spout itself lasts for a surprising length of time.

Think about where the camera is placed. If the camera is low, it tends to make the drop spout look taller. But it tends to show the front or back edge of the drop tank. If the camera is higher, the spout height is less dramatic but your field of view may be better. Think about how close you are to the drop and how the circle of ripples fills the frame. You may prefer a very close view or a wider view from farther away. Think about the orientation of the camera. You may want a wide frame or you may want to rotate the camera 90 degrees so the image is tall instead of wide, and the drop is aligned with the long dimension. Every time you move the camera you’ll need to get out the bolt and reset the focus.

If you have the money for it, an inexpensive LCD television with HDMI input is a fabulous preview tool for drop photography, if your camera has video out. I use a 24” TV standing on end to preview each shot. This produces big, bright images and makes it much easier to evaluate what I’m doing. It’s much better than trying to see that little LCD screen on the back of the camera.

Fluid level

Keep an eye on the level in the reservoir. When it has dropped half an inch the timing will change a little. To capture the same instant, the Flash Lag will need to be a couple

of milliseconds longer if the level is 1/2" lower. (A millisecond is .001.) I like to keep a "gravy fat separator" cup nearby with fluid to top off the reservoir. Any container of fluid will do, but a fat separator has a wide mouth to pour into and a small spout with which to refill the reservoir.

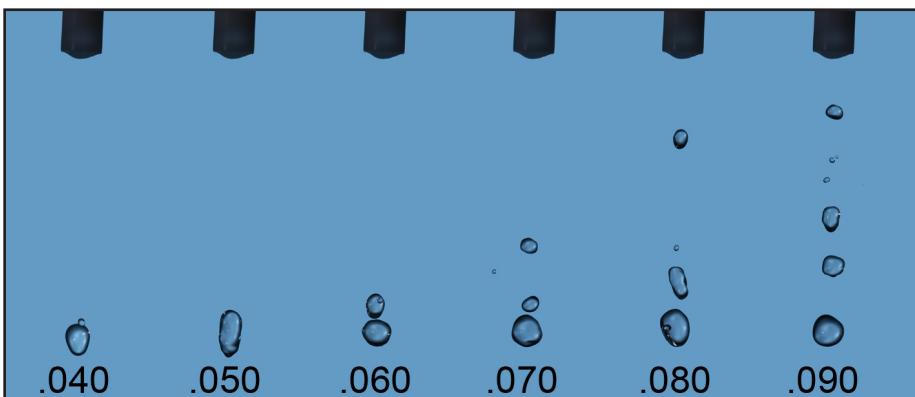
The height of fluid in the reservoir effects what the drops look like in subtle ways. This will be more apparent when you're shooting collisions. The higher the level, the more quickly the drops come out. With lower levels the drops come out at a more leisurely pace. Some people prefer to keep the reservoir only partly filled. This is a parameter to keep in mind when you have more experience and are looking at ways to change the character of your images. The changes in fluid level give you another dimension of control over the drops you shoot.

If your water valve is separate from the reservoir bottle you can raise or lower the whole bottle. This allows you to change the height of the reservoir above the valve. If you raise the bottle, the water will come through the valve with more pressure. This is another parameter you can experiment with.

Drop size

After you can photograph a drop spout and get an image that's presentable, experiment with the variables to see how you can affect the spout. First try changing the Drop Size. The bigger this value is, the longer the valve is open and the more water is dispensed. As the Drop Size gets bigger you need to decrease the Flash Lag to photograph the same phase of the spout. You might want to experiment with a Drop Size as small as .040 or as large as .120. The value you use will depend on many things.

The Drop Size value is the time, in seconds, that the valve is open. You will find that a single drop can contain a limited amount of water. With drop sizes larger than about .055, the water begins to form multiple droplets (this changes with different fluids and additives). In this image, the drop on the left was formed with a size of .040. The second one was size .050. Following this are .060, .070, .080, and .090. With larger settings of Drop Size you're likely to get "follower" droplets. The additional droplets increase the energy with which the drops strike the water and contribute to the character of the spout. They can also cause additional ripples in the drop tank.



As the Drop Size gets larger you're likely to see higher spouts. It has been my experience that the spout is generally consistent up to some threshold value. The actual value depends on the fluid used, the height it falls from, and the depth of the water in the tank. But when the threshold is reached, the spout will become a jet and change from a height of an inch or so to a spout of 10 or 15 inches. Such conditions can create very dramatic images, but they may be irregular and hard to control or repeat.

As the Drop Size gets bigger, the Flash Lag probably needs to get smaller (shorter).

Valve height

Another parameter that has an effect on the appearance of a spout is the height from which the drop falls. The Drip Kit makes it easy to experiment with this parameter. If you're using a tripod to support the water valve, all you have to do is raise the tripod head from which the water valve hangs. Naturally, as the height gets greater, the Flash Lag must get longer. Also, you may need to increase the exposure time in the camera. If the Flash Lag is longer than the exposure time, your pictures will be black because the shutter will close before the flash goes off.

It can also happen that the camera doesn't respond sometimes. Some cameras will become inactive if you don't take pictures for a while, and you may need to shoot a black frame to wake the camera up again.

Keep notes

It's important to take notes as you shoot so you can learn what values work for you. If your camera shows each image on an LCD screen after you shoot it, along with the file number of that shot, it's helpful to write down the range of exposures that use a given set of parameters. Keep a record of the drop height, drop size, and flash lag for the session and create a text file with the settings to store on the computer with the images. This may come in handy next week or next month when you want to shoot with similar settings. This is your "inventor's notebook".

Two drop collisions

When you have mastered the single drop exposure it's time to think about drop collisions. For a drop collision to look interesting, it has to be based on a good spout. This is why it's worth your time to practice on single drops. A single drop is the foundation of a collision, and you must have worked out the timing, lighting, and exposure for a good image.

To start a collision, change the Drop Count from "1" to "2". Then you must also choose an "Interval" between the two drops. You will want to experiment with a range of values for Interval, but a reasonable place to start is .050.

When you use two drops you can choose a different size for each one. You'll be asked first for "Size 1", which is the Drop Size for the first drop. Then you'll be asked for "Size 2", which is the size of the second drop. They can be the same, or you may want to experiment with different sizes.

Take a couple of pictures and examine the results. With practice you'll learn what the phases of the event look like and be able to judge if your Flash Lag is too small or large.

In the beginning it may be handy to make the Flash Lag too small, so you can see the second drop suspended over the spout. Then you can increase the Flash lag by a couple of milliseconds and watch as the second drop approaches the spout. Each image will be different, but the general placement of the elements should be similar and you should be able to bring the second drop down into contact with the spout. Take several images at each setting to get a representative set with the current parameters.

In general you'll see that an early view of the collision forms a small splash at the point of contact. A later view will form a larger splash. A view that's very late may not look like a splash at all, but just a jumble of droplets because the splash has happened and collapsed. You'll want to learn how to judge what the image tells you about the collision timing. This comes with practice and experience. This is what separates the beginner from a skillful drop photographer. In the beginning you may flail around without understanding how to direct the drops. With experience you'll see an image and know what parameter to change to get to a range of values that is more likely to produce an interesting result. But it's still an art. You can't just set all the values and be guaranteed a great picture.

Three drops

If you choose to use 3 drops, you'll be able to enter a different size for all three of them. You'll also be able to enter a different "Interval" between the first two drops and the second two. When you set the "Drop Count" to "3", instead of being asked for the "Interval", you'll be asked for "Delay 1" (the interval between drops 1 and 2) and "Delay 2" (the interval between drops 2 and 3). The delays can be the same, or you may want to make them different for more control.

From this point on, the course of your photographs must be directed by your imagination and vision. You should have a concept of what the drops are doing in time, and you should try to understand how to shift the parameters to direct the collisions in a purposeful way. For example, we know that a larger drop size will contribute to a higher spout. This will require a change in the Flash Lag and will contribute to multiple drops and splatter. You might use a longer "Interval" for taller spouts and a shorter Flash Lag. But you'll want to experiment with a range of settings for each of these parameters to find something interesting.



What works for you today may not work tomorrow.

As you experiment with the different settings, keep notes on your exposures so you can more easily acquire a body of knowledge about which settings produce which effects.

Alignment

With drop collisions, it's important that the second drop fall on top of the first drop spout. It can happen that the drops are misaligned. Sometimes the drop will miss the spout completely. Other times the collision splash will seem to be consistently oriented away from the camera --- you can see good collisions, but not from the camera's point of view. In these cases you can twist the brass spout at the bottom of the water valve 1/4 turn and it is likely to affect the orientation of the collision. In general, try to keep the add-on spout straight under the water valve.

Fluids

You will also want to experiment with different drip fluids. A popular choice is milk because it's thicker than water and is opaque. You'll get different effects from whole milk, skim milk, or milk thinned with water. What about coffee? What about grape juice? You can experiment with different fluids, but be sure to clean the valve with clean water as soon as you finish. You don't want the valve to get gummed up with dried milk or juice inside. An easy way to flush the valve is to fill the reservoir with clean water, then press MODE on the Time Machine to go to the "Bulb Flash" mode. Press BEGIN a couple of times and the water valve will open and the water will pour out. Let it run for a while and then hit MODE on the Time Machine to stop it.

My advice is to not use corrosive fluids like salt water or harsh cleaners. I'm not sure what solvents will do to the internal valve parts. But if something goes wrong and you end up wrecking a valve it's not a big deal. The valve can be replaced at moderate cost.

If the valve gets stuck occasionally we have provided a thin white stick you can press into the bottom of the valve to free it.

Additives

Many people add substances to the drip fluid to change the properties of the fluid. For example, you might add food coloring. One of the most popular additives is xanthan gum or guar gum. These are vegetable based-thickeners that make the water more viscous and contribute to dramatic drops.

Corrie White is known for her dramatic, tall drops that are very viscous and fluid. All of these are shot with a Time Machine, two drops, and standard settings. She has discovered a special cleaning product sold in Canada that, when used with xanthan gum, becomes a "magic" additive to produce more dramatic drops. We're now selling small portions of xanthan gum and Corrie's magic additive for you to use.

These additives may cause bubbles to form in the drop tank, which can get in the way of the drops and spoil an image. You may need to clean the surface of the drop tank before each new exposure. But they are things to experiment with in the pursuit of dramatic drops.

These are some of the things people add to the drop water to change the way water behaves:

- guar gum
- xanthan gum
- carboxymethyl cellulose (CMC)
- methylcellulose
- glycerin
- “rinse aid”
- toilet bowl cleaner

Color

Food coloring is an easy way to add color to your images. Some people use ink sold to refill the cartridges of inkjet printers. You can also use colored filters on your flash head. These can be bought from camera stores, but a cheaper place is eBay or theatrical supply houses. A highly colored filter reduces the amount of light that gets through and makes it harder to get bright exposures.

If you’re using a white backdrop to shine your flash on, you can change it to a colored backdrop. Or a multi-colored backdrop. One customer uses a multicolored shopping bag from Trader Joe’s.

A Little History

Did you know that people began taking pictures of milk and water drops in the 19th century? A physicist named A. M. Worthington spent years photographing drops and published a book called “A Study Of Splashes” in 1908. It’s fascinating reading for the student of drop photography because he discovers (and shows examples of) all the things we see today. The book is available for free on the internet. Go to “www.books.google.com” and search for “A Study Of Splashes”.

An on-line copy can be read here:

<http://www.archive.org/stream/studyofsplashes00wortrich#page/n0/mode/2up>

Troubleshooting

If you have any problems or questions as you use the Drip Kit, be sure to give me a call. I'll be glad to help.

The valve is making messy drops instead of one clean one.

Try changing the Drop Size value. You may be putting out too much or too little water. But keep in mind that the drop is formed by gravity pulling it away from the valve. If the valve is open longer than is needed to form one drop, several drops will form. This is not a bad thing. Often multiple drops are needed. Corrie White's 3 drop collisions are formed with a Drop Size of "2". The "3rd" drop is the overflow of drop two.

I'm dropping milk and having trouble with it.

You'll probably need to use a smaller value of Drop Size for milk, because it's heavier. It will also fall faster, so the flash delay will need to be shorter to see the same event.

Make sure to clean and flush the water valve after using milk or anything other than water. If some fluid dries inside the valve, it can clog it.

The water valve is clogged and won't open

This can happen if it has not been used for a while or if you used milk or some other fluid that can dry with a residue. To unclog the valve, press a very thin object into the valve opening. We have provided a short length of white nylon rod for this purpose. Don't be afraid to press hard. The little nylon stick is not likely to damage the valve.

After I've been shooting drops for a while, I no longer get the collision I started with.

Many things effect the drops. The longer you work, the warmer the fluids get. If you have added more water or gum to the mix, the viscosity will change. If the fluid level in the reservoir drops, the water pressure will get less and the drop event will tend to happen a little later. (The easiest way to avoid this is to keep a small bottle of your fluid nearby, and when the level has dropped a bit, top it off.) It takes 400 drops to lower the fluid reservoir 25 ml, which is about 0.4 inches. It takes this much change in level to begin to have an effect on drop timing. If you're doing drop collisions, this means that you can shoot 200 pictures before you might refill the reservoir to get the exact same timing.

The bottom line is that water drops are an art and they cannot be "dialed in" by the numbers.

Good Advice

This is what Corrie White says about shooting great images:

"I have no secrets. I don't hide how I get the shapes. It's just that there is no direct route to get them and this is what is hard to understand. You have to play around with the settings, one setting at a time, to see what happens. For the series in the book, when I introduced the magic lotion, I ended up with the shape with the bubble at the bottom so this is where I stayed. In another series, it didn't work this way. You add gum, adjust the settings because of the extra thickness. Then add lotion and you have to dial the drop size way down, or stay with where it leaves you. There is no exact route and all the experienced droppers will tell you this. We are always changing the amounts of the additives. I remember one night trying to get the 3 drop splash for my Introduction picture. It took about two hours to finally get to it.

Today I did about 480 drops. Out of this I kept 105 which I liked. All the rest were duds looking for the proper settings with the addition of more additives, or they were not symmetrical enough for me. When I check them on the computer screen, I keep only the best shapes out of each series. Out of this, I will probably end up with around 25 so there are no identical ones. Out of this, I may post 3 or 4. There will be one or two that will make it to my website.

There is no definite setting to get the fancy shapes. You have to find them and that comes with practice and persistence. You have to learn how to use the tools and make the liquids do what you want them to do."

Corrie White has written an excellent ebook on how to do water drop photography, with a great many example photographs. It can be purchased here:

<http://www.liquiddropart.com/Publications/Ebook>



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Photography ©2013

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