Drip Kit

for the Time Machine

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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.

See:

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.

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
- 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 tripod from which to hang the water reservoir
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 baking dish filled with water for the drops to fall into

Hardware Setup

Set a small tripod on a work table. Screw the four inch plastic mounting plate to the top of your tripod with the 1/4-20 threaded hole in the center. Thread the stainless steel rod into the threaded hole in one edge of the mounting plate. 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.

Place a baking disk or similar container under the water valve and put an inch or two of water in it. Fill the water reservoir with water. The water may be colored with food coloring.

Place the Time Machine at the foot of the tripod. Place the control box next to it.

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.

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.

Using fluids

We don't yet know much about the lifespan of the valve. It's made for fluids and is not supposed to corrode or rust. 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. It might be wise to drip with deionized water if it's easy to acquire, just like you would use in a clothes iron for the same reasons. And be sure to rinse out anything (like milk) that leaves a residue when it evaporates.

After the water valve sits idle for some time it may stick and not open. If this happens, you can lightly 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. You could also use a needle or pin, but these have sharp ends and may eventually damage the valve tip.

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

Camera Setup

The arrangement of the camera and lighting is where you will express your artistic vision. But generally speaking, the camera will be placed on a tripod in front of the baking dish and focused on the spot where the drops will fall. To focus, place a bolt or other small object where the drops land. Then focus the camera on this bolt. 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 1/3 second, assuming the water valve is 16 to 24 inches above the water below. The exposure and focus modes of the camera should be set to manual.

A good way to arrange a single flash is behind the baking disk, pointed down at the water, to produce a diffused glare on the surface. This provides dramatic back lighting for the drops. But you will probably move the light around, add colored gels, use a second flash of a contrasting color, etc. to get different effects.

The Time Machine

You're now ready to use the Time Machine. First, be sure the Output Mode of the Time Machine is set to "Shutter". Also be sure "Force Flash" is set to "OFF". This is done with the Configuration mode of the Time Machine

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 rarely use more than 2.

Press BEGIN. If you requested more than one drop, the LCD screen will say something similar to:

Interval: 0.050

This is the time (in seconds) that will separate one drop from the next. You will want to experiment here. The value needs to be timed correctly to get a collision. It also depends on what fluids you use (water or milk) and what you want your collision to look like. But typically the value will be between .040 and .100 seconds. To increase the value, press the PLUS key. To decrease the value, press the MINUS key.

When you've set the interval, press BEGIN. 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 energized. The longer it is energized, 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.

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 may also need to be changed for different fluids.

It is possible to apply different nozzles to the spout of the water valve. The standard spout will probably work best with Drop Size values of .04 to .06. If you want to experiment with larger drops, a larger spout size can be slipped onto the water valve and larger values can be entered for Drop Size. This is still under development and experiment. Send me an email if you want to pursue this.

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 last 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 drop emitter, the type of fluid you're using, and whether you're shooting single drops or drop collisions.

To increase the number, 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 a little bit automatically, so instead of getting the same shot over and over yoju 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 delay is. To see it, when the Drops Mode is waiting for the next exposure, press the MINUS key. The LCD screen will show the current 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.

Note: When you’ve assigned a value to the “Advance” parameter, you can lose track of the total value of Flash Lag being used when you capture an image you like. But there’s a way to ask the Time Machine what the current combined values of Flash Lag and Advance are. When the Time Machine says “-= Armed =-” and is waiting for a trigger press, press the MINUS key. This puts the Time Machine in “Pause” mode. Usually the Time Machine says “Pause” in the Pause Mode. But when “Advance” has a positive value, the LCD screen will display the current total of Flash Lag and Advance. To return to normal operation, press BEGIN.

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

–= Armed =–

To release a drop, press the pushbutton that’s plugged into the Time Machine. The red LED on the Time Machine should come on and the water valve should activate and dispense the number of drops you have requested. If 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 pushbutton, 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 see the current value of “Flash Lag” plus any increment of “Advance”, press the MINUS key. Press BEGIN to return to normal operation.

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

Optical sensor
It's possible to order the Drip Kit with an optical sensor. When an optical sensor is used, the timing of the flash is based on when the drop falls past the sensor, not when the water valve is opened. Theoretically, this might give a more precise result if the drop "lets go" of the spout faster or slower sometimes. It has not been my experience that there is much variability in this time. But the optical sensor is available for those who want maximum control.

The optical sensor is mounted to a plastic arm that is arranged below the water valve. It plugs into a special jack on the Time Machine that's above the Sensor In jack.

In the Drop Mode, when you push the button and a drop falls, the LED on the Time Machine will come on. When the optical sensor is aligned so that the drop falls between the two arms of the sensor, the LED will go off and the Time Machine will begin timing the delay for the flash to fire. The srop must pass between the sensitive tips of the two arms. You can twist the optical sensor forward and back, or move its position on the threaded rod to get it aligned under the water valve.

If the drop does not fall past the sensitive part of the sensor, the Time Machine will keep waiting for it and the LED will stay lit. You will have to release the Time Machine manually and move the sensor to get proper alignment. To release the Time Machine, put something in the sensor to trip it, or press the PLUS button on the Time Machine. Then try again with another drop.

If you decide that you don't want to bother with the optical sensor sometimes, you can swing it out of the way and put something over one arm of the sensor to block the light. The Time Machine will think that a water drop is always in front of it and won't wait. It will begin the flash lag as soon as the water valve has closed.

DripKit +
The Drop Mode has an "enhanced" level of operation. The enhanced features are selected as an option in the Time Machine "Configuration" settings. To get to the Configuration settings, hold down the "Options" key as you hit RESET or as you turn on the Time Machine. Press the Options key again to advance through the different options until you see "DripKit +" on the LCD screen. Press PLUS to turn the enhanced features on; press MINUS to turn them off.

When the enhanced features are enabled, the resolution of the Flash Lag value is increased to a tenth of a millisecond. This allows you to set the delay in much finer increments.

The enhanced features also add a “Timeout” function at the end of the Drop Mode settings. This keeps the Drop Mode from responding to another trigger command until after the number of seconds you specify. You can set a “Timeout” of several seconds and lock the trigger switch on. This will cause the Time Machine to shoot drop images one after another all by itself, waiting for the splash pool to settle each time. If the “Advance” value is larger than zero, each drop will be captured a little later than the one before.

Some people may appreciate these enhanced features. For others they will add unwanted complexity. You can configure your Time Machine to work the way you prefer.

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 practice. 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.

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.

You might be tempted to just “shoot in the dark” and look for good drops, but that’s the hard way to go about it. Without a general understanding of what are reasonable settings, you’re likely to take a lot of uninteresting pictures and you’re likely to have no idea which way to adjust your settings to get better results. This comes from personal experience.

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 up a single drop well.

By the way, that spout that forms where your drop falls is not a bounce. The falling drop pushes the water out of the way as it lands 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 large glass 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.

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 my Canon 580EX-II 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. Aim for an ISO of 100 and an aperture of F/16.

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. Naturally, the height also affects what the splashes look like. You'll have to experiment to see what you like. Right now I'm 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. I'm using a camera exposure of .4 seconds.

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 action.
5) At the end of its own exposure time, the camera shutter closes automatically.

Sample settings

You can start with these settings, but the values may not work the same for you. It's an Art, not an exact science. That's why it's fun …. you can do the same thing over and over and get a different result.

Distance from drip spout to drop tank: 15 inches
Drop Count: 1
Drop Size: .050
Shutter Lag: .285

Exposure setting: .4 or 1/2 second

Focus
Setting the focus is critical and must be done manually. The drops happen much to fast for the camera to find an automatic focus. I have a 3/8" hex head machine screw that's about 2" long. I 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 end of the bolt. Then focus the camera on the bolt threads at the height you will be photographing. My camera has a "live view" mode that previews the image on the LCD screen. I can 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 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. It may be 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're likely to 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 drip 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 drip 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 drip tank. This means the drop has penetrated the water. If there's much disturbance to the surface of the water, it 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 drip 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 is the esthetic composition of your drop shots.

The spout or "bounce"
When you're ready to see the spout, set the Flash Lag to .100 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.

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.

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 drip 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.

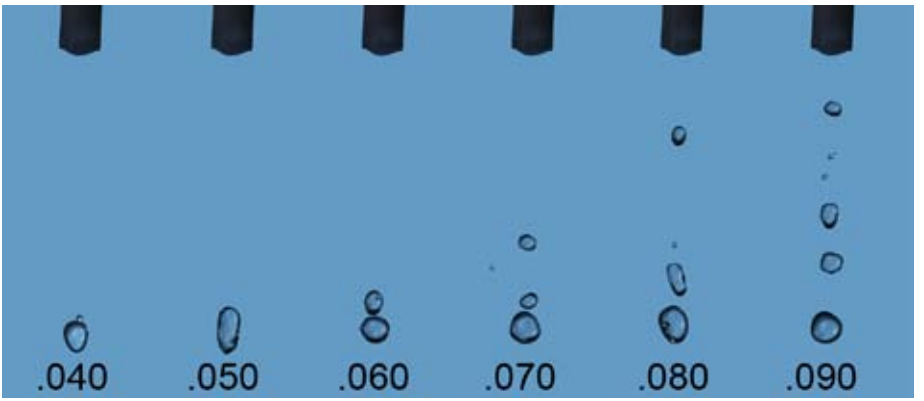
Fluid level

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.

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 .100. 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. In the preceding 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. The additional droplets increase the energy with which the drops strike the water and contribute to the character of the spout. But 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 drops from, and the depth of the water in the tank. But when the threshold is reached, the spout is likely to 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're very 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 a big 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. 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 very 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".

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 lighting and exposure for a good image.

To start a collision, change the Drop Count from "one" to "two". Then you must also choose an "Interval". You will want to experiment with a range of values for Interval, but a reasonable place to start is .050. Timing of the Flash Lag for a collision is measured from the moment the second drop is emitted. So the value of Flash Lag will be SMALLER than you used for a single drop spout. For a single drop spout you wait until the drop has fallen, struck the pool, and risen back up. For a collision you only wait until the second drop has fallen near the surface and collides with the previous spout. For a

ballpark figure, set Flash Lag to a value .100 seconds less that was used for the single drop spout.

Take a couple of pictures and examine the results. With practice you'll learn what the phases 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 collision forms a small splash at the point of contact. A later collision will form a larger splash. A collision 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 very skillful drop photographer like Corrie White. In the beginning you may flail around without understanding how to direct the drops. Corrie sees an image and knows from experience what parameter to change to more quickly 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.

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.

Add-on Spouts

The behavior of the drops can be substantially effected by the shape of the spout on the water valve. The valve itself has a small opening in black plastic. It is possible to slip alternate spouts over this tip. I have been experimenting with different spouts to see what may have useful effects. The most basic alternate tip has a larger opening of about 1/8". A larger opening will let more water through more quickly and may form larger drops. But if the opening is too large, surface tension will not be strong enough to sustain the column of water in it and it will drain out, preventing good drops from forming.

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 an add-on spout 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 may 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 water 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 RESET 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 plastic 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. Or glycerin. Some people add small amounts of dishwasher "rinse aid" to change the surface tension of the water. Or small amounts of liquid soap. Some of these things will cause bubbles to form in the drip tank, which get in the way of the drops and can spoil and image. But they are things to experiment with in the pursuit of dramatic drops.

Color
Food coloring is an easy way to add color to your images. 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 told me about using a multicolored shopping bag from Trader Joe's.

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

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. A typical value is about .050 seconds. You may also wish to use the add-on spout to get a larger drop size. This will require a longer value for Drop Size.

I’m dropping milk and having trouble with it.
You’ll probably need to use a smaller value of Drop Size for milk, becuase it’s heavier. It will also fall faster, so the flash delay will need to be shorter to see the same event. Also, 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, lightly press a very thin obect into the valve opening. We have provided a short length of white nylon rod for this purpose. You can use a small pin or needle, but these have sharp ends and can damage the valve tip. It would be better to use a blunt object.

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

Feedback

Drop photography is a complex field and people are discovering new techniques and new images every day. If you learn something useful, please let me know so I can incorporate it into this body of reference material for other photographers.