

GROUND CONTROL[®] BREWING GUIDE

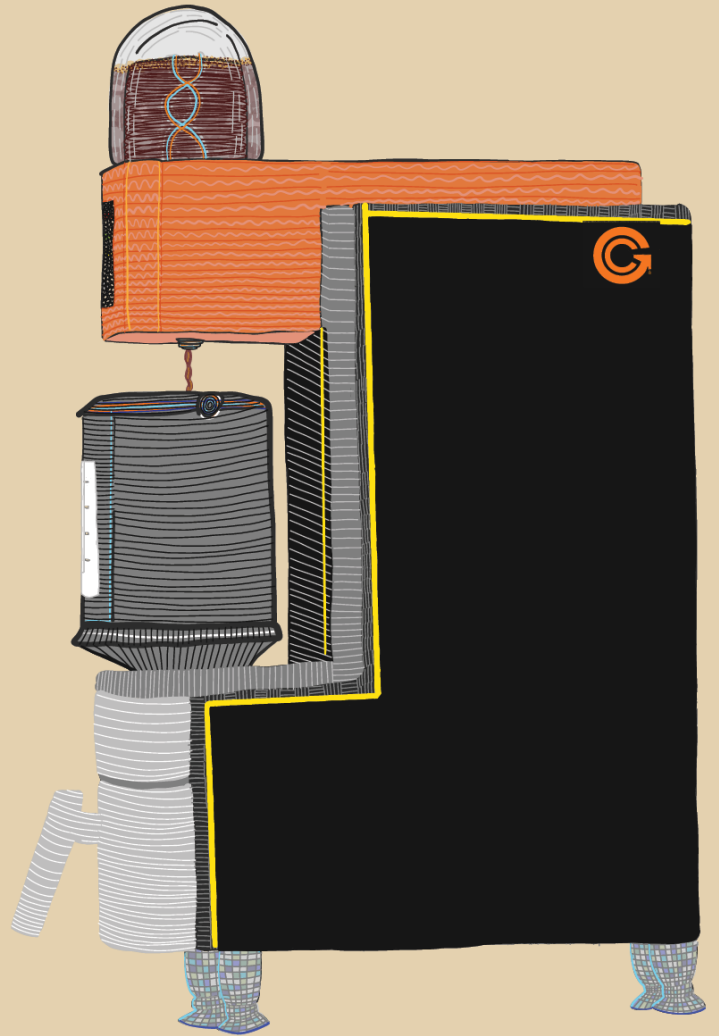
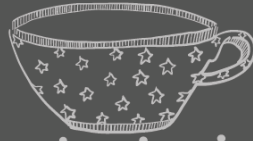


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Introduction

Ground Control® is one of the most versatile brewers in existence. Small changes in parameters that are unique to Ground Control® can result in meaningful, reasonably predictable changes to the resulting cup profile. By breaking up the brewing process into multiple, separate mini-extractions, Ground Control® is able to provide a noticeably sweeter, cleaner cup and meaningful flavor profiling capabilities that are unavailable with other methods. Because of this, Ground Control® enables you to brew multiple high-quality coffee offerings in batch, each to their own optimal flavor profile. Ground Control® is able to faithfully and beautifully brew coffees that other batch brewers often stumble with, like hard to brew Geishas and natural processed coffees.

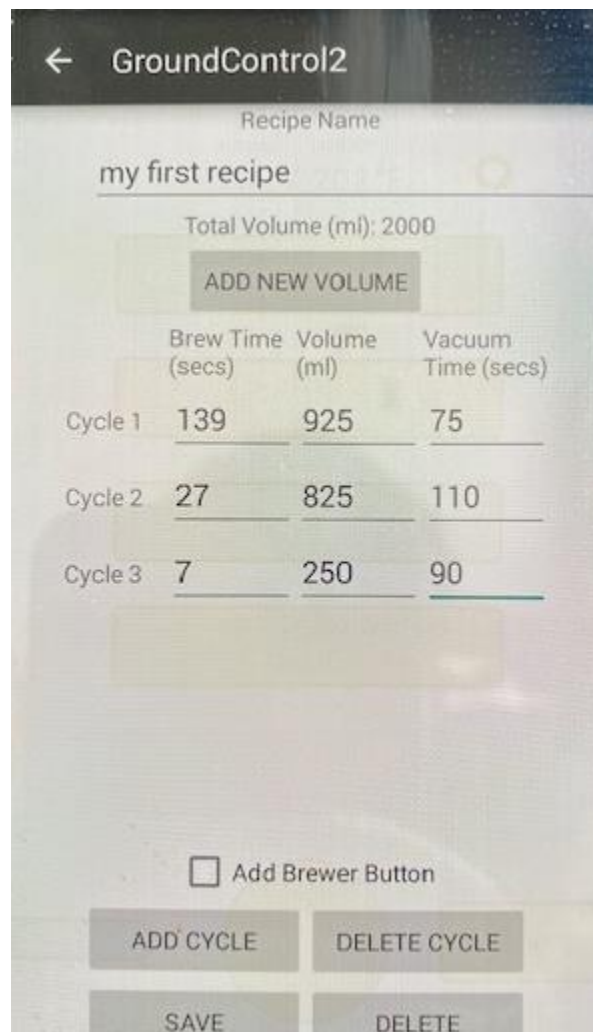
Intuitively, one way to think about the Ground Control® brewing process is to compare it to the espresso "rainbow shot" technique. As one prepares an espresso, one can separate the resulting shot into the first third that comes out, the middle third, and the final third, by collecting each third in a separate shot glass and evaluating them separately.

The first third of the shot often contains the majority of the sweetness and the acidity of the beverage. The middle third contains the character and aromatics of the shot. The final third is responsible for the body and the grip, or "tension" that carries the slight astringency or bitterness that some customers seek. This range in flavors that come out at different stages is caused by the different rates at which different flavor compounds extract into hot water.

Now imagine if you could change the total volume of each of the three portions of your rainbow shot and combine them to make the perfect ratio of what you're looking for in your espresso. Just the right amount of brightness, ample character, and just enough body and bitterness to round out the shot. That is what Ground Control® achieves, in a nutshell. Except that Ground Control® can also amplify or diminish the characteristics of each of the extraction phases, as we'll soon see.

Your First Brew

The easiest way to learn about Ground Control® is to start brewing as soon as possible. Pick a grind size that approximates filter auto-drip, grind 115 grams of coffee, and let's brew a 2L batch together. On your brewer settings gear, set your temperature to 203F and your stir time to 14 seconds, and let's create a basic recipe:



The screenshot shows the 'GroundControl2' app interface. At the top, there is a back arrow and the title 'GroundControl2'. Below this is a 'Recipe Name' field containing 'my first recipe'. Underneath the recipe name is a 'Total Volume (ml): 2000' label and an 'ADD NEW VOLUME' button. A table follows with three columns: 'Brew Time (secs)', 'Volume (ml)', and 'Vacuum Time (secs)'. The table contains three rows for 'Cycle 1', 'Cycle 2', and 'Cycle 3'. Below the table is an 'Add Brewer Button' checkbox. At the bottom, there are four buttons: 'ADD CYCLE', 'DELETE CYCLE', 'SAVE', and 'DELETE'.

	Brew Time (secs)	Volume (ml)	Vacuum Time (secs)
Cycle 1	139	925	75
Cycle 2	27	825	110
Cycle 3	7	250	90

Each cycle number of the recipe above represents the corresponding brew cycle's brew parameters. In this first recipe, we have three brew cycles. Let's go over what happens when you hit the brew button, in depth, so that you can have a detailed understanding of what's happening under the hood as you brew.

Before hitting the brew button, make sure to place a paper filter in your brew basket, place the grounds in the filter, and insert the basket into the system. Always make sure your brew basket is in the system prior to hitting brew or clean. You will also want to make sure that you have an empty airport that can hold at least two liters in place. ***Note that for carafes and presspots with thin straws***

that transport brewed coffee to the bottom of the pot, you may need to brew with the straw removed, as the coffee will come out of the bulb at a much faster rate than with a drip brewer!

When you hit brew, the first cycle begins and 925mL of water that is 203F inside the water tank will immediately be dispensed into the brew basket at a rate of approximately 100 mL/sec. Within ~9 seconds after hitting brew, all the water for the first cycle will be dispensed into the basket. As soon as the water is dispensed, the water tank refills with cold water from the water line, and the actual temperature on your screen may drop twenty degrees or more. This is normal, and represents the temperature of the water in the tank as it refills with cold water, not in your much hotter brew basket. All of the water for the first cycle **was already dispensed into the basket at your set temperature**, and the water in the water tank will reheat to set temperature (e.g. 203F) prior to the second cycle. Also note that the temperature of the water when it actually contacts your coffee will be less hot than the water temperature in the tank, as it cools through its travel. We find that brewing at a tank temperature of no higher than 203F is optimal for extracting the best flavor profile across nearly all light roasts, while darker roasts may benefit from brewing in the 204-206F range.

Once the water is fully dispensed for your first cycle, brewing will continue for 139 seconds, as per the recipe. When the water is fully dispensed, the stirrer will activate and stir for 14 seconds, per our global setting that we've set in the general settings menu. Once 139 seconds have elapsed, the vacuum will activate for 75 seconds, per the recipe.

Once the first cycle vacuum is complete, the brewed coffee from the first cycle will exit the glass collection chamber and flow into the airpot. 825 mL of water will simultaneously flow into the brew basket, commencing the second cycle. Once water is dispensed, the stirrer will activate, and the water will immerse the grounds for 27 seconds before the vacuum activates. Once the vacuum activates and 110 seconds have elapsed, the coffee brewed during the second cycle will flow from the collection chamber into the airpot, combining with the first cycle brew. 250mL of water will enter into the brew basket once the second cycle vacuum completes, commencing the third cycle. After brewing and vacuuming, the third cycle will combine with the first two mini-brews in the airpot, completing the brewing process. You may notice that more coffee is released after the third cycle than the 250 mL in the program. This is because a portion of the second cycle remains in the glass collection chamber during the third cycle vacuum period. This is because the third cycle is too short to allow all of the second cycle liquid to pour into the airpot, in this recipe, and some of the second cycle remains in the bottom of the bulb (which is not visible).

If you've selected the proper grind setting, when you remove the brew basket, the grounds should be meaningfully dry. **For the Ground Control® system, meaningfully dry means that the basket does not have any visible puddles of water. It does not mean that the grounds will be completely dry to the touch, or not moist.**

This completes the first brew. You are now ready to enjoy your first brew on Ground Control®!

Cycle Brew Times, Generally

Now that you've completed your first brew, we'd like to share some thoughts on the significant importance of each cycle's specific brew time on a coffee's flavor profile.

Ground Control® is unique among other brewers, because it uses multiple extractions, instead of a single extraction. This provides a powerful way to control flavor profiles in your coffees. You can often select specific flavor components of your coffee and either accentuate them or remove them entirely in your final beverage.

Remember the rainbow shot from the example in our introduction? What if the middle part of the espresso shot happened to taste bad? We could throw that part of the espresso out, and combine the first third of the brew and the last third to create our ideal espresso shot.

By manipulating the brew times on each of the three cycles in our first recipe, we can similarly control the final flavor profile of our coffee in a way that is intuitive and more powerful than other brewing methods.

Through dialing in coffees with Ground Control®, you often don't need to worry about constantly modifying settings like temperature, agitation, or grind size for new coffees. You can exceptionally dial in nearly any coffee by only changing cycle brew times in your recipe. This new way of dialing in coffees opens up the possibilities on the varieties of coffee that can be brewed properly on GC in a commercial setting. You can create recipes that will beautifully brew any coffee in batch, exactly how you want it, without needing to adjust grind, temperature, or any variables other than the brew times on your recipe button. By simply hitting a different recipe button on the brew screen, you can brew a totally different coffee optimally, because the new recipe button has been pre-programmed with that coffee's optimal brew cycle times.

Of course, once you are familiar with Ground Control® and the cycle time dial in method, you're welcome to experiment with variables like grind size, temperature, and agitation. But we think you'll be surprised by how powerfully you can profile your coffees through brew cycle times alone.

A Quick Note on Cycle Vacuum Times

VERY IMPORTANT: Care should be taken in developing any recipe to ensure that towards the end of each cycle's vacuum period, little or no coffee is exiting the coffee tube in the glass collection chamber. In other words, the spray that you see in the glass collection chamber at the beginning of the vacuum period should slow over time to a very slow trickle with no spraying at least five seconds before the vacuum stops and the coffee drops from the glass collection chamber to the airpot. This ensures that the ground bed is meaningfully dry before the next cycle begins. If coffee is still spraying out the coffee tube in the glass by end of a cycle, that means that there is still liquid in the brew basket at the end of the brew cycle, which will negatively impact the coffee quality. It will be less sweet, more astringent, and less nuanced.

You will either want to coarsen your grind or increase your vacuum time on any cycle that doesn't fully dry so that the coffee fully dries in future brews. Although over-vacuuming won't negatively impact the cup, it will increase brew time, so you'll want to minimize how long you vacuum, as long as you're fully drying each cycle. There can be minor variation in vacuum times required to dry a

cycle on a given recipe, so we suggest vacuuming with at least five extra seconds at the end past the drying point you observe to ensure consistency across batches.

Failure to dry the ground bed will result in meaningfully reduced quality, and you should not taste coffees that don't fully dry during brewing when determining how to change your brew parameters, as they are incomplete brews.

Modifying the First Cycle

Once you've completed your first brew, give the resulting beverage a taste. Is it under-extracted, over-extracted, or just right? Symptoms of under-extraction include a malty flavor, or a light consistency or concentration, lacking complexity or nuance. Over-extracted coffee might be bitter, astringent, overly and assertively sour, or flat. Both under and over-extracted coffee can be lacking in nuance, but for different reasons. Under-extracted coffee is often simple, light and possibly watery. Over-extracted coffee tends to be one-dimensional, but with a stronger and somewhat bitter or overly sour characteristic.

If the coffee from your first brew is just how you like it, then excellent! We can now experiment with the recipe and see what an under or over-extracted cup tastes like on Ground Control® for future reference. If the cup needs modification, resist the temptation to touch your grinder or other settings on the unit! Your patience in sticking with the cycle brew times will pay off.

Was your cup under-extracted? If so, experiment by adding one more second to the first cycle brew time and brewing with the same amount of coffee and grind settings as our first brew. Now let's brew the coffee, with our minor change to the recipe, and see what happens.

Only one more second???

Many of us are used to making changes of at least five seconds when brewing coffee. But because of the Ground Control® multi-cycle process, small changes (especially in the first cycle) can make a meaningful impact.

Once the coffee is fully brewed, compare the second batch to our first brew. You'll notice that the cup is meaningfully rounder, less watery, and more flavorful. Because we adjusted the first cycle (more on the second and third cycle changes later on!), you will find that the cup is noticeably sweeter and "brighter," expressing more acidity.

But isn't acidity bad? Won't it hurt my stomach? Not necessarily. All coffee has a slightly acidic flavor. In small amounts, acidity can accentuate sweetness and also bring out some of the coffee's subtle characteristics. It's a little bit like adding a spritz of lime to a beer. It won't make the beer sour, but it can highlight other aspects of the drink.

Depending on the roasted coffee, increasing the first cycle by one second might not be enough, and you can try a new recipe, brewing the coffee for 141 seconds on the first cycle. If the taste continues improving, keep increasing the first cycle until you find your preferred sweet spot.

What if we reduced a second on the first cycle, because our cup was over-extracted? You will notice a meaningful change in the new batch. The coffee will be less bitter, more balanced, and the flavors

will be more clear and easier to distinguish. Depending on the roasted coffee's characteristics, you may find that you need to reduce the first cycle even further and try again!

What if you don't know if the coffee is over or under-extracted? We suggest trying increasing the first cycle brew time one second on the first cycle and tasting it. If the flavor improves, the coffee was probably under-extracted originally, and may benefit from an additional experiment batch increasing the first cycle yet again to see if the improvement continues. If adding one second to our first brew recipe's first cycle results in a worse cup or no change, then try reducing the first cycle brew time by one second on the first recipe template and try it.

For the first cycle, stick to a range of 138-141 seconds on washed coffees unless you really know what you're doing! For darker roasted coffees, try brewing towards the higher range (starting at 141). For delicate coffees, you may find your sweet spot at 138 or 139. For natural coffees, please refer to the "Two Cycle Recipes" section of this guide.

If you have access to a refractometer, a device for measuring brew concentration, you will want to increase or decrease the first brew cycle until your extraction percentage is ~20-22% for your first brews. In certain recipes, as your roast allows, you will be able to experience extractions that exceed 26%. While a refractometer can be helpful in some cases, it is not necessary.

Modifying the Second Cycle

Now that you've dialed in a cup of coffee that is "well-extracted" by dialing in the first cycle, you should notice that your cup is not meaningfully bitter, has a reasonable amount of sweetness, and doesn't feel "light." At this point, you should compare your Ground Control® brew to the same coffee bean prepared using your previously preferred brewing method. You might notice that your coffee brewed on Ground Control® is missing some things that you like in the other cup. The other cup might have flavors that are missing in Ground Control®, or a mouthfeel or body that you prefer. Because we used a generic recipe for our first recipe and only played with the first cycle, we are missing out on the flavor profiling possibilities that the second and third cycle offer.

The second cycle is typically responsible for the character of the coffee. In high quality coffees, the second cycle is often where the unique and desirable qualities of the coffee first present themselves. This could mean nuances like fruit flavors, subtle smokey flavors, complex herbal or spice notes, etc. In coffees that might have "off" flavors that we want to avoid, like over-roasted flavors, "green" vegetal flavors like grass, and ferment flavors, these flavors often first present themselves in the second cycle, as well.

At this point, if you'd like to better acquaint yourself with the difference between the first and second cycle, prepare your own rainbow shot with Ground Control®. You can try the first cycle by itself by capturing some of the liquid as it comes out of the nozzle of Ground Control® when the first cycle is complete. Similarly, you can try the second cycle by itself when it flows out of Ground Control®. Additionally, you can taste the first and second cycle combined by removing a small amount of the combined cycles from the airpot after they've combined. **WARNING:** if you take out some brewed coffee from the system prior to the completion of the brew, you cannot properly evaluate the final, combined brew to make decisions about how to dial in. This is because removing

coffee from the system mid-way dramatically impacts the ratio of each of the cycles in the final brew. If you are evaluating each cycle individually, either for diagnostic or educational purposes, be sure to do an additional brew with the same recipe and no mid-brew tasting. You can only properly make informed changes by evaluating the brew that did not involve mid-brew tasting.

Now on to adjusting the second cycle. How do you change the second cycle, once you've locked in a well-extracted cup that focuses on the first cycle? The first thing to know is that because our well-extracted cup from our prior brewing is neither over nor under-extracted, any change to the second cycle brew time will result in a less than ideal cup by bringing our extraction out of balance. An increase in second cycle brew time will over-extract, and a decrease will under-extract. So what do we do?

We suggest changing the first cycle brew time in conjunction with the second. Because the first cycle occurs earlier in the brew process, it is much more powerfully extracting than the second (or third cycle). A general rule of thumb is that each second of extraction in the first cycle is equivalent to two or three seconds of extraction on the second cycle or third cycle. One way to think of the first cycle is as a big knob you can turn, that generally sets the total extraction for your brew. The second cycle is a fine adjustment.

Let's assume that our first recipe resulted in a perfect extraction, but we'd like to explore what happens to the cup when we either increase or decrease the second cycle. By properly adjusting the first cycle brew time in the opposite direction of the second cycle brew time, we can achieve a new brew profile that extracts different types of nuance from the coffee.

Let's start with the case where our coffee is missing nuances that we experience using our alternative brewing method (or would like to see if we can accentuate). For example, our coffee from our first recipe might taste fine, but might not be presenting a nuanced note as strongly as desired. In that case, we can reduce the first brew cycle by one second, to 138, and increase the second cycle by two seconds, to 29. Without changing the second cycle, the change to the first cycle would result in an under-extracted brew. But we now add two seconds to the second cycle to bring the extraction back into balance. Once the change is made, brew the coffee and evaluate the total extraction. It is unlikely with a two second increase in the second cycle that we will over-extract, because a change of one second to the first cycle is equivalent to two or three seconds in the second cycle. Once we evaluate this brew, we might find ourselves wondering if we can get a little more flavor out of the coffee, even though the total brew time for the coffee was increased by one second from the first recipe (we decreased the first cycle by one second and increased the second cycle by two seconds). In that case, re-brew the recipe by adding an additional second to the second cycle (for a total of three additional seconds in the second cycle over our first recipe, and one less second in the first), and the coffee may now improve over our prior two second addition to the second cycle. Try the coffee and evaluate it. Did the nuance you were looking for increase? Great! If you're where you want to be at, we are set. If you'd like to see more, we have two options.

One option would be to increase the second cycle one additional second (for a total of four additional seconds over our first recipe). But wait? Wasn't our first recipe well-extracted, meaning that this coffee will over-extract? Not necessarily! Because the second cycle is less powerful in extracting, as compared to the first, it may still be possible to make small fine-grained adjustments (1-2 seconds) without over-extracting.

The other option would be to make an even larger change to the second cycle by "borrowing" more time from the first cycle. For our first recipe, we brewed for 139 seconds on the first cycle. But we could also consider brewing for 137 seconds on the first cycle, and increasing the second cycle brew time to 31 seconds, for example. In our experience, 137 seconds is on the low end of desired extraction, but this can be addressed by meaningful increases on the second cycle brew time.

At some point, you will either experience diminishing returns, or notice that your cup is starting to miss things that you want from the first cycle. Reducing the first cycle can reduce the sweetness or acidity level of your coffee. It's your goal to find the optimal balance of sweetness/brightness and nuance by adjusting the first and second cycle brew times. If you find that you can't amp up the nuance of your coffee without losing the desired level of sweetness or acidity, you will need to increase your total coffee weight (see section on this below).

What if our coffee has a weird nuance that doesn't taste good? A salty note? A roasty quality we want to mitigate? An expression of old coffee? We can similarly reduce the second cycle 2-3 seconds and increase the first cycle 1 second to achieve a new extraction balance where we taste the more "primary" flavors of the coffee in the final cup, but exclude the less desirable nuances. If we haven't fully removed the undesirable flavor after a single iteration process, we can try reducing the second cycle further.

Some undesirable flavors can't fully be removed, although in the vast majority of cases, you'll be able to reduce them to a far greater extent than with other brewing methods. In many cases, off flavors can be eliminated entirely.

For the second cycle, we suggest a brew range of 20-35 seconds. If you're not an expert, don't leave this range. If you are in the lower range of the second cycle brew time, you will likely find that you'll want a first cycle on the higher end of the range (e.g. 141 seconds).

Modifying the Third Cycle

The third cycle is responsible for the perception of body and "fullness" in the cup. It can also help extract more weight/bitterness/boldness, if that is what you seek. The danger with the third cycle is that extending it too far may create unwanted bitterness, astringency (rough or drying sensation in the mouth), or muddle the nuance of your coffee.

In lighter roasted or more nuanced coffees, you will likely want a lower third cycle – 6 or 7 seconds. For extremely light coffees roasted just past first crack, you might want to consider removing the third cycle altogether! For light coffees with more body, consider a third cycle of 8-9 seconds. For medium and dark coffees that present strong body, you may consider a wider range, up to 13 seconds. Like the second cycle, changing the third cycle changes total extraction, and often requires changes to the other cycle brew times.

For example, if you'd like to increase the body of a coffee while maintaining as much of the remaining

elements in the cup, increase the third cycle by two seconds while either reducing the second cycle by two seconds, or the first cycle by one second. The extraction power of the third cycle is similar, but slightly less, than the second cycle. A two second change on the third cycle may only require a one second opposite change on the second cycle, in some coffees.

If you find your coffee is too bitter or astringent, but otherwise well-balanced, the third cycle would be a good place to start adjusting the recipe. You might also consider just taking away two seconds from the third cycle brew time without touching the rest of the recipe at all. Often times, this change is enough to completely eliminate the bitterness and bring the cup into balance.

Changing Brew Weight

If you don't achieve the levels of sweetness/acidity that you want with the nuance you seek by manipulating the first and second cycle brew times, and you're unable to make gains through use of a finer grind, you can try increasing the overall sweetness and acidity levels by increasing the total weight of ground coffee. For our 2L example, we recommend changing brew weight by 5 grams at a time. Adding coffee will increase the amount of compounds you can extract, meaning that you will want to extract more time to achieve the same extraction percentage if you increase the weight. That said, you can use previously dialed in recipes as a starting point with your new weight and see where the profile needs tweaking by using the previously established guidelines for brew cycle times.

In contrast, if your cup is not achieving the delicate characteristics you're looking for, then remove five grams at a time and iterate on the recipe.

For standard coffees on standard grind settings, we do not suggest brewing with less than 95 grams on 2L. You can brew with up to 250 grams on 2L to achieve a balanced, super-concentrated beverage whose total dissolved solids (TDS) will likely exceed 2.5.

Changing Grind Size

We suggest only changing grind size to ensure that your coffees vacuum fully after each cycle over the vacuum time periods provided in the first brew recipe example, without vacuuming too quickly. We do not suggest regularly changing grind size to change flavor profiles, although you may find that you prefer grinding coarser or finer because of the general effect grind size may have on your cup's strength (finer) or clarity (often, coarser).

Because different coffees will react differently to grind changes, we do not recommend regularly changing grind to change the cup profile. You can often change nearly any cup characteristic through brew times.

If you have mastered the art of dialing in brew times, feel free to experiment with grind size to see how changes impact your coffees. A finer grind will increase extraction, if it's not ground so fine that you're unable to fully dry your bed after each cycle.

If your coffee is vacuuming too soon with the recommended brew times, it may mean that your grind is too coarse. This may result in general under-extraction.

Two Cycle Recipes

If you roast ultra-light coffees, or are brewing naturally processed coffees, you may want to consider trying a two-cycle recipe.

For ultra-light roasts, the amount of extractable matter is reduced, and therefore, it is easier to over-extract unwanted flavors. Reducing the number of brew cycles significantly reduces the total extraction power, because each additional cycle introduces new fresh water, which is a more powerful solvent than coffee that has been brewing.

In a sense, we are pulling back the total extraction a little bit, because lighter roasted coffees, the brewed coffee saturates with flavor compounds and develops an affinity for astringent, bitter and off flavors at a faster rate. Though we could reduce the total extraction power by reducing for example the first cycle, and remaining at three cycles, our experience suggests that a two-cycle recipe will result in a superior extraction.

For natural processed coffees, we suggest starting with 115-120 grams on a 2-cycle 2L recipe, with 1200 mL of water in the first cycle and 800 mL in the second. For this processing method, we suggest trying first cycle brew times of 142 or 143 seconds.

A good place to start with a two-cycle recipe is by selecting a first cycle brew time that you felt was optimal in an original attempt with a three-cycle recipe. For example, 139 seconds from our first recipe is a great place to start for any washed coffee. For the second cycle, consider a longer brew time to account for the loss of the third cycle: 33 seconds. You can then adjust the first and second cycles using the same principles as before. Because the second cycle is longer, it combines elements of both the second and third cycle in our prior example. For example, shortening the second cycle might both reduce body and nuance.

Second cycle recipes will taste noticeably different than three cycle recipes. You are also limited to ~3L total volumes on these recipes, because the brew basket and glass bulb have a ~1.5L capacity per cycle.

Modifying Stirring

Stirring time sets the general extraction level. Increased stirring time increases the total general extraction level. If you'd like to see the impact of stirring time, dial in a recipe at one stirring setting, and then modify the stirring in 3 second increments with all else left unchanged to see what this does to the flavor profile of your coffees.

Warning: stirring for longer pushes more fines to the bottom of the filter, slowing the vacuum. You may find that you need to meaningfully increase your vacuum times or brew using coarser grind if you increase stirring time.

Changing Temperature

Changing temperature on Ground Control® has a similar effect on flavor to changing temperature with other brewing methods. If you brew too hot, you can often scorch your coffee. You may find it interesting and potentially rewarding to brew your coffees at lower temperatures, because the Ground Control® multiple extraction approach allows for a greater extraction at lower temperature. This will allow you to brew longer and often extract more sweetness and other desirable flavors, but it will also likely reduce total acidity in the cup.

Modifying Volumes

Typically, changing water volumes per cycle does not have a dramatic impact on flavor profiles, but choosing wisely in this regard will help optimize your extraction.

For specific recipes, it may be desirable to change water ratios per cycle because of the total weight of coffee used. For example, if you are using large coffee weight (eg 250 grams or more), the amount of space in the brew basket will limit how much water can be added per cycle.

A few tips in selecting water dispense volumes per cycle:

1. If you'd like to maximize temperature of your brew, ensure that each cycle exceeds 1200mL in volume. **1200mL cycles will have meaningfully higher temperature!** For smaller volume brews, such as 2000mL brews, consider keeping the total number of cycles at two to ensure maximum temperature. With that said, you can still perform (for example) three cycle, 2L brews using less than 1200mL per cycle. There will simply be a noticeable decrease in temperature, which may be desirable for some customers.
2. Always try to use the same or a similar brew volume on the first and second cycle. This will ensure that no coffee will stick to the sides of the filter and miss out on extracting in future cycles.
3. Always brew subsequent cycles using the same or less water. For example, don't brew 1200 mL on the first cycle and 1300 mL on the second, unless you are a pro. Our experience suggests this will result in a less desirable flavor profile in the majority of cases.
4. Consider using meaningfully less water in the third cycle, which least impacts the final cup's profile. For example, if we'd setting a 3L recipe, start off with a recipe that is 1150 on first cycle, 1150 on second, and 700 on the third. This is also best practices, because **the vacuum takes longer to pull the same amount of brewed coffee in later cycles.** This is caused by the earlier vacuum cycles sucking fines into the bottom of the filter.

A Note on Grinder Burrs

One of the most common reasons for slow vacuum times using grind settings that would otherwise work for most batch brewers is the increased presence of fines. This can be caused by dull burrs

that need changing, or, poorly calibrated grinder. If you see that large amounts of fines are collecting on the top of the filter or its sides, consider changing burrs. One way to confirm this problem is to observe the power of the vacuum when running only water through the system (eg clean cycle). If you observe a powerful spray with water, but observe slow vacuum with coffee that seems otherwise suitably coarse, that means that the fines are obstructing the vacuum.

Scaling Up Recipes

Ok, we've perfected our 2L recipe. How do we get a 3L or a 3.8L recipe?

We suggest you start by keeping brew times the same, and simply tweaking volumes. For 3L, consider 1.15L on the first and second cycle, and .7L on the third. For 3.8 L, consider 1.4L on the first and second cycle, and 1L on the third. For brew weight, simply scale up the weight you've been using. For example, if you used 110grams for 2L, you can use $110/2*3=165$ grams for 3L. More than likely, because of the volume changes, you'll find that increasing volumes on a previously dialed in over-extracts slightly. Because of that, you may want to reduce a few seconds on the second and/or third cycle, based on the same techniques we previously discussed, to bring the cup back into balance.

A word of caution: if you are setting recipes that are over 1300mL on early cycles, consider dialing them in and brewing the first time with the brew basket top off. This will allow you to peer in the brew area during brewing, and ensure the basket is not overflowing. This is especially important for recently roasted coffees, which can rapidly bloom and overflow. If you have an overflow, simply hit cancel, wash the overflowed areas, carefully reduce the water level in the brew basket using a small cup, and dump the excess liquid in the sink.

Cold Brew

Ground Control® is capable of brewing up to a gallon of cold brew roughly every eight minutes. The way Ground Control® achieves this feat is by leveraging its unique multi-stage high extraction approach at a low temperature. This produces a batch of coffee that extracts the smooth, chocolatey flavors that cold brew is famous for, but through a process that is much simpler, using less coffee, and that can produce batches that respond to customer demand in real-time.

To set up for a cold brew, you will need to go into settings and set the temperature to 110F. Note that reducing the temperature below 110F may result in a reduced drying capacity for the pump (and potentially, wet grounds at the end), as the flow characteristics of brewed coffee change at lower temperatures. The higher you set the temperature past 110F, the more challenging it will be to obtain the classic cold brew flavor profile in your cup.

Once you've set your **target temperature** to 110F in settings, you will then need to lower the **actual temperature** inside the water tank through the following procedure:

- 1) Place a clean paper filter in the brew basket
- 2) Press the clean button, and wait 15 seconds

- 3) Hit the cancel button
- 4) Remove the brew basket which is filled with hot water slowly and carefully, dumping the hot water in the sink
- 5) Repeat steps 2-4 **until the actual temperature on the main screen has reached 110F.**

The temperature reduction cycle typically takes 4-5 cleaning cycles. We hit cancel and drain out the water, because our goal is to draw out hot water from the water tank rapidly, and replace it with colder water from the water line. Note that after the first cleaning cycle, a paper filter is not necessary, as its purpose is to catch any grounds that are in the stirrer prior to the first rinse.

A suggested starting recipe for cold brew is below. You'll notice that vacuum times are higher than in a normal temperature recipe, because coffee takes longer to vacuum out at lower temperatures. Note that because we are brewing at lower temperature, which extracts less, we are starting off at a higher brew time for the first and third cycle. Feel free to brew using the same ratio you always have for cold brew. If you don't offer cold brew yet, 200 grams of grounds is a reasonable starting weight, and you can increase your weight if you'd like greater strength.



The screenshot shows the 'GroundControl2' app interface for configuring a 'Cold brew' recipe. The screen displays a table with three columns: 'Brew Time (secs)', 'Volume (ml)', and 'Vacuum Time (secs)'. The table lists three cycles: Cycle 1 (141 secs, 925 ml, 100 secs), Cycle 2 (28 secs, 825 ml, 120 secs), and Cycle 3 (11 secs, 250 ml, 110 secs). The '110' in the Vacuum Time for Cycle 3 is being edited. Below the table, there is a checkbox for 'Add Brewer Button' and four buttons: 'ADD CYCLE', 'DELETE CYCLE', 'SAVE', and 'DELETE'.

	Brew Time (secs)	Volume (ml)	Vacuum Time (secs)
Cycle 1	141	925	100
Cycle 2	28	825	120
Cycle 3	11	250	110

☐ Add Brewer Button

ADD CYCLE DELETE CYCLE

SAVE DELETE

You can modify the recipe brew times to manipulate the flavor profile, just like with a hot temp brew. One common recipe tweak is to increase the third cycle by 3-4 seconds, to enhance the chocolatey flavor and body of the cold brew.

You'll notice that with Ground Control®, much less water is retained by the grinds, compared to more traditional bucket-based cold brew systems. The process is also dramatically faster, and you can brew much fresher cold brew for your customers during the afternoon slow period.

When you are done brewing cold brew, you can simply return to normal brewing temperature by changing the temperature in settings, and once the water is heated to temp, you'll be ready to resume brewing hot filter coffee on your system. No other steps are needed to switch back.

DO NOT CLEAN THE SYSTEM FOR YOUR DAILY CLEAN AT LOWER SET TEMPERATURE. YOU MUST CLEAN YOUR SYSTEM FOR YOUR NIGHTLY CLEAN USING A SET TEMPERATURE THAT EXCEEDS 190F TO ENSURE PROPER SANITATION.

Iced Latte Concentrate

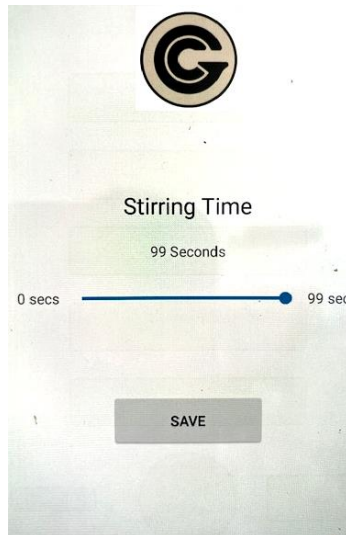
Ground Control® is the only commercial coffee brewing platform that can brew high TDS concentrate at commercial scale. This concentrate can be used to produce upwards of 550 oz of iced lattes per hour, with about five minutes of barista effort. This high TDS extraction is achieved by using the ability of Ground Control® to extract more from coffee while minimizing bitterness, with its multi-phase extraction.

The first step in brewing iced latte concentrate is to set your grinder to the finest setting you can, while still being able to dry the grounds in each stage. On our EK-43, we use the following factory-calibrated setting, which resembles espresso grind:



Using the finest grind setting possible that will still result in a dry bed will ensure that you extract sufficiently to ensure a rich iced latte that is indistinguishable from one made using an espresso machine.

Next, you'll want to set your stirring time to 99 seconds in settings, to maximize the extraction in a scenario where the water is saturated with grounds. Note that for regular brewing on Ground Control®, such extensive stirring can result in over-extraction.



You may also wish to raise the temperature to 206F or 207F to increase extraction further, although you can also try 203F or 204F if you find that higher temperature extractions do not deliver a sufficiently smooth profile.

For our first recipe, we will try three vacuum cycles, with an 120 second pre-infusion cycle (zero vacuum time). This recipe uses 330 grams of finely ground coffee and produces approximately 1L of concentrate:

The screenshot shows the 'GroundControl2' app interface. At the top, there is a back arrow and the title 'GroundControl2'. Below this is the 'Recipe Name' field, which contains 'iced latte concentrate'. Underneath the recipe name is the 'Total Volume (ml): 1500' label. A button labeled 'ADD NEW VOLUME' is positioned below the total volume. The main part of the interface is a table with three columns: 'Brew Time (secs)', 'Volume (ml)', and 'Vacuum Time (secs)'. The table lists four cycles: Cycle 1 (120, 500, 0), Cycle 2 (110, 300, 85), Cycle 3 (150, 400, 110), and Cycle 4 (120, 300, 120). Below the table, there is a checkbox labeled 'Add Brewer Button' which is currently unchecked. At the bottom, there are four buttons: 'ADD CYCLE', 'DELETE CYCLE', 'SAVE', and 'DELETE'.

	Brew Time (secs)	Volume (ml)	Vacuum Time (secs)
Cycle 1	120	500	0
Cycle 2	110	300	85
Cycle 3	150	400	110
Cycle 4	120	300	120

Once this concentrate is ready, you can combine 3 oz of concentrate and 7 oz of milk to create a 10 ounce iced latte that tastes identical to one produced on an espresso machine.

Another recipe that you can try, and which produces better yields through a higher extraction, is the following four cycle recipe. For this recipe, you may find that you need to grind slightly coarser than the prior recipe, as the fourth vacuum cycle reduces the vacuum power of the system slightly. We suggest using 300g of coffee for this recipe, to produce approximately 1.2L of concentrate. For many coffees, **this recipe will actually produce a stronger concentrate than the first iced latte recipe, above, even though it uses less coffee.**

The screenshot shows the GroundControl2 app interface. At the top, there's a back arrow and the title 'GroundControl2'. Below that, the 'Recipe Name' is 'iced latte'. The 'Total Volume (ml)' is 1700. There's an 'ADD NEW VOLUME' button. Below this is a table with four columns: 'Cycle', 'Brew Time (secs)', 'Volume (ml)', and 'Vacuum Time (secs)'. The table contains four rows of data for Cycle 1 through Cycle 4. Below the table, there's a checkbox labeled 'Add Brewer Button' which is checked. At the bottom, there are four buttons: 'ADD CYCLE', 'DELETE CYCLE', 'SAVE', and 'DELETE'.

Cycle	Brew Time (secs)	Volume (ml)	Vacuum Time (secs)
Cycle 1	220	600	45
Cycle 2	160	500	90
Cycle 3	100	350	100
Cycle 4	70	250	100

Single Cup Brewing

Did you know Ground Control® is also a single cup brewer? To start brewing a single cup, ground 25 grams of your coffee at the finest setting possible (similar in fineness to the iced latte grind). Place the coffee in the brew basket, and position a cup on a stand so that the cup is right under the glass spout. Note that if you place your cup too low on the system, there will not only be a splashback from coffee flowing out, but you will also meaningfully reduce the temperature as the coffee flows through the air.

We recommend doing a single cycle for a single-cup brew, because any smaller volume will cool too quickly in the basket as it brews. Our tests were run at 203F.

You can start off with the single-cycle recipe below, and taste the resulting cup to assess tweaks to brew time and ratio.



Immediately before brewing, we recommend running a cleaning cycle with a paper filter in the basket, to pre-warm the brew basket. Because we are brewing a very small amount of coffee, the water in the brew basket will cool down faster than a normal brew without the preheat step.

Once you've hit the brew button, we strongly recommend waiting about five seconds, until all the water has been dispensed, then removing the basket (as in the photo below) and gently stirring the brew to ensure all grounds are fully wetted. This is necessary, because the system's stirrer does not reach down to the very bottom of the basket for such small brew volumes. It is possible to fully automate brews with the integrated stirrer for brews of 900mL or greater.



We recommend tasting the resulting cup, and making changes to the brew time in increments of 5 seconds, based on desired extraction level. For example, if your coffee is under-extracted, increase the brew time to 135 and try again. The dial-in process is very similar to dialing in an Aeropress, except that you can use a finer grind to accelerate extraction, and the end product is more consistent.

Mid-Temp Brewing

One style of brewing that we greatly enjoy is what we call “mid temp” brewing. We find that at mid-range temperatures, it’s possible to explore much higher extractions, while reducing unpleasant flavors that often extract at higher temperatures.

What that means in practice is that by brewing at mid-range temperatures, you can explore different aspects of a coffee, often with **dazzling results in the cup**. We don’t suggest using this method for coffee that is intended to be served with milk. However, mid-temp brewing produces an exceptional, ready-to-drink cup of hot coffee for those wishing to savor a single origin’s nuance, without additives.

To get started, we suggest setting the temperature on your system to 181F. For instructions on reducing the temperature of your system, please refer to the section of this guide on cold brew.

You can then explore with the recipe below. We suggest a slightly finer grind than you might typically use at higher temperatures, and starting off with 135 grams for the recipe below.

Note that because we are brewing at a lower temperature, we can explore much higher brew times on the first and second cycle.

The screenshot shows the GroundControl2 app interface. At the top, there's a back arrow and the title 'GroundControl2'. Below that, the 'Recipe Name' is '181 temp'. The 'Total Volume (ml)' is set to 2000, with an 'ADD NEW VOLUME' button. A table lists three brewing cycles with columns for 'Brew Time (secs)', 'Volume (ml)', and 'Vacuum Time (secs)'. Below the table, there's a checkbox for 'Add Brewer Button' and four buttons: 'ADD CYCLE', 'DELETE CYCLE', 'SAVE', and 'DELETE'.

	Brew Time (secs)	Volume (ml)	Vacuum Time (secs)
Cycle 1	160	925	80
Cycle 2	50	825	110
Cycle 3	10	250	100

Next Steps in Brewing Mastery

Congratulations! You now have the tools to produce exceptional coffees on your Ground Control® brewer. We suggest continuing to experiment and try new things with your recipes. Taste each cycle, try different grind settings, try a two cycle recipe, see what happens if you drastically change brew times. Maybe even try changing things up, reducing your first cycle to 120 seconds, and seeing what the resulting brew tastes like once you've dialed in the second cycle! All these steps will give you a greater understanding of the power of the Ground Control® platform and how to best dial in your coffees.