HERMETHEUS

COFFEE

Installation and User Guide

Contents

Introduction

The Roaster Co-Pilot Dual Control (DC) was created to boost your productivity by automating the heat control of your roaster. It will also assist in achieving the perfect roast profile, batch after batch. Whether you are trying to achieve a gentle, declining Rate of Rise curve for a floral Geisha, or you simply want to ensure a CONSISTENTLY roasted coffee regardless of the operator, the Roaster Co-Pilot DC is the answer. It leverages the popular Artisan Roaster Scope software. Artisan software has supported PID temperature control for quite some time, but the hardware and technical configuration have prevented many people from utilizing it. The Roaster Co-Pilot was designed to bridge this gap. It is a self-contained unit with the following connections:

- Power
- USB
- Temperature probes (2)
- Roaster Interface

It also ships with pre-configured Artisan settings files specific to your Coffee Crafters roaster. The result? You can be up and running with the Hermetheus Roaster Co-Pilot DC in under 30 minutes!

WARNING: The Roaster Co-Pilot DC should NOT be considered "unattended automation". You MUST monitor the beans and roaster throughout the entire roast as you manually adjust the loft. If the beans stop floating on a loft of air while the heater unit is on, there is the potential for a fire hazard, just as there is when manually roasting. By using this kit, you are assuming all risk and responsibility for maintaining a safe and controlled roast. While the Roaster Co-Pilot DC retains the high-temperature safety cutoff built into every Artisan roaster, the main heat power switch on the Artisan roaster should be turned OFF in the event of a hardware or software malfunction.

Because Artisan software is open-source, I STRONGLY encourage everyone to support the project by donating at https://www.paypal.me/MarkoLuther

You can also support the Artisan project by using their wonderful Artisan Plus inventory management system for your green coffee. Not only does this cloud-based platform keep track of your inventory, it seamlessly integrates with Artisan software so that every individual roast automatically subtracts that roast from your inventory. There are reports on forecasting, yields, energy consumption, and more. It's a wonderful tool that is certainly worth looking at.

Artisan Scope Software

NOTE: The fastest, easiest installation of the Roaster Co-Pilot is designed for a Windows 10 or Windows 11 64-bit computer, but Artisan also supports MacOS 10.15+ and Linux glibc 2.31. Both MacOS and Linux installations will require additional configuration that is not necessary on a Windows 10/11 computer with a C drive.

Installation

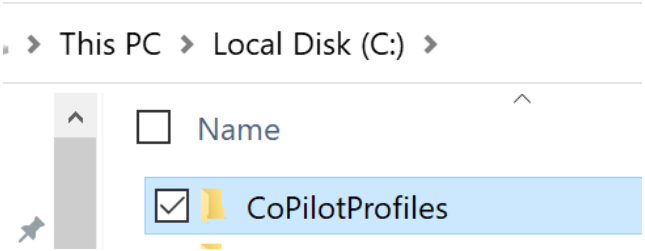
1. **Install Artisan Scope software.**
    a. Insert the supplied USB thumb drive into your computer.
    b. Navigate to the "Artisan_Installers" folder.
    c. Open the folder for your computer's OS (Windows or Mac) and complete the standard installation for your OS. Co-Pilot setup is more straightforward on a Windows PC, but if you are installing on a Mac, make note of the following installation instructions from Artisan:

        i. Mount the installation .dmg archive with a double-click, then drag the contained Artisan.app to your “Applications” folder
        ii. You may need to (temporarily during installation) tick "Allow applications downloaded from Anywhere" in the Security & Privacy Preference Panel to start the app. The first time you open Artisan, Mac OS X might warn about “unidentified developer”. See https://support.apple.com/kb/PH21769 on how to open an app from an unidentified developer. After first application start, tick again "Allow applications downloaded from Anywhere" in the Security & Privacy Preference Panel.

    d. Detailed installation instructions (including hardware and OS requirements) are found on the Artisan GitHub site here: https://github.com/artisan-roaster-

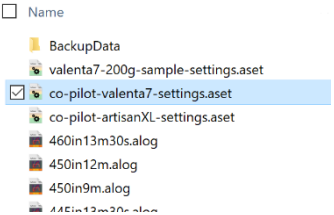
scope/artisan/blob/master/wiki/Installation.md

2. **Copy files and configurations to your hard drive.**
    a. From the supplied USB thumb drive, copy the ENTIRE "CoPilotProfiles" folder.
    b. **Paste to the ROOT of your C: drive.** You should now see the following folder in the root of your C: drive:



    c. **NOTE:** Copying to the root of your C: drive makes the overall setup fast and easy. However, if your hard drive uses some letter OTHER than C, or if you're installing on Linux or MacOS, some additional configuration will be necessary. We'll cover those in later steps.

3. **Load Roaster Co-Pilot settings into Artisan.**
    a. Open Artisan Scope software (installed in step 1).
    b. Select Help>Load Settings..." from the Artisan menu.
    c. Navigate to the "CoPilotProfiles" folder copied in step 2 and select the file for your specific model of roaster, such as "co-pilot-valenta7-settings" if you have a Valenta 7.



d. If you're on Windows and copied the folder to your C: drive, your configuration is DONE! Skip to step 5. Easy, eh?

   If you're on a Mac, Linux, or have a Windows machine with a drive other than C:, we'll need to do just a bit more configuration. Continue to step 4.

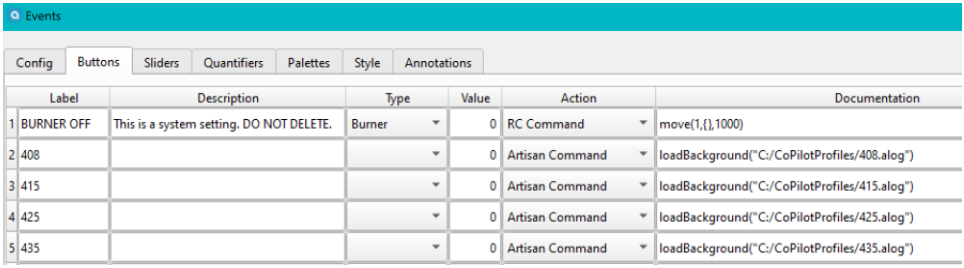
4. Non-standard configuration for MacOS and Linux.

a. The goal of this step is to point Artisan to the *actual* location of the *CoPilotProfiles* folder that we copied in step 2. For most Windows users, this is C:/CoPilotProfiles, and this has already been included in the configuration file loaded in step 3. But for Mac/Linux, we need to find the actual location of your "CoPilotProfiles" folder, then update this in Artisan software. This will vary from computer to computer.

b. In Artisan, select "**Config>Events**".

c. Select the "**Buttons**" tab.

d. Find the column named "Documentation". (You might have to scroll horizontally or re-size the window.) This is where we've configured all of the buttons that make it easy to load background profiles.



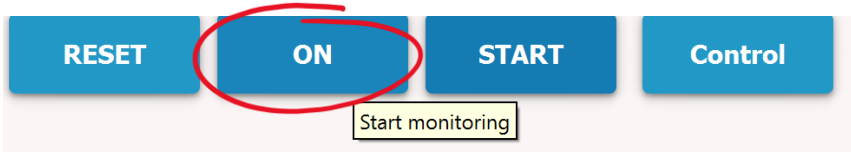
e. Do you see where we point each button to "loadBackground("C:/CoPilotProfiles/<some_filename>)"? You need to change this to match where your "CoPilotProfiles" folder ACTUALLY lives. A couple of examples follow. Note that you only need to pay attention to changes highlighted in yellow below.
   i. **If you're on a Mac** and you copied "CoPilotProfiles" to your "Documents" folder, then you would **change this**: loadBackground("C:/CoPilotProfiles/408.alog") **to this:** loadBackground("/Users/YourUsername/Documents/CoPilotProfiles/408.alog")
   ii. If you're on Windows and you have a D: drive instead of a C: drive, you would **change this:** loadBackground("C:/CoPilotProfiles/408.alog") **to this:** loadBackground("D:/CoPilotProfiles/408.alog")

f. Do this for each button in the list.

g. **FINAL NOTE:** While using a backslash \ is acceptable in some operating systems, Artisan requires us to use a FORWARD slash / in our file paths. If you use a backslash in your path, Artisan won't throw an error, but it won't correctly load your profiles. Only use forward slashes.

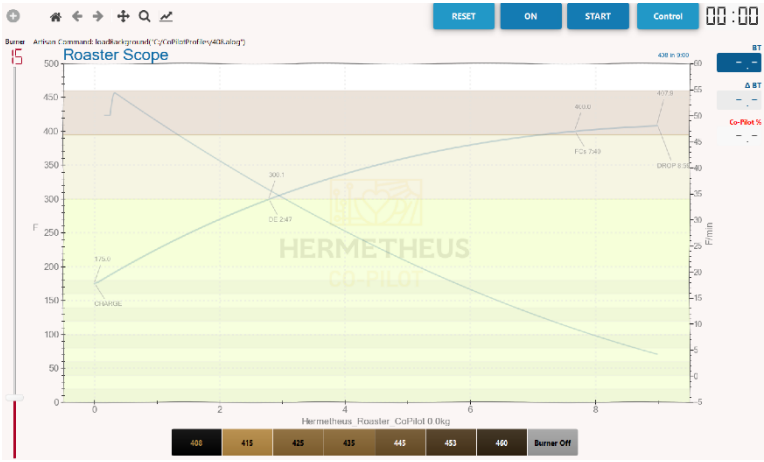
5. Let's test those buttons!

a. In Artisan, click the “On” button in the upper-right:



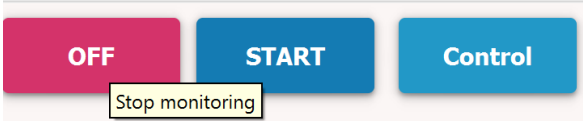
b. You will now see a number of buttons below your graph. These buttons are different roasting profiles that are ready to use! Click any one of the buttons (it doesn’t matter which… we’re just testing):

c. You should see a graph of the selected profile load in the background (notice that there’s now a curve graphed out.



If these buttons don’t load a profile, re-visit steps 3 and/or 4 to ensure that you have the CoPilotProfiles folder copied to the correct place, and that Artisan is looking there. Also ensure that you don’t have any spaces in your filename, and be aware that Artisan is case-sensitive.

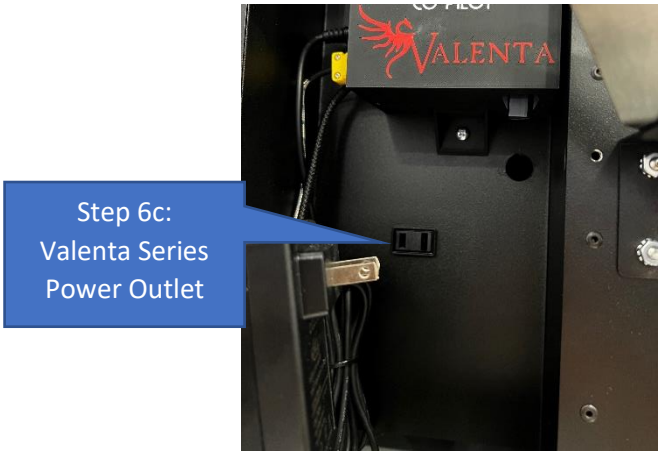
d. In Artisan, select the OFF button from the upper right:



6. **Install the Hermetheus Roaster Co-Pilot DC**
   NOTE: The Co-Pilot Dual Control is pre-installed at the factory for Valenta 15 roasters. If you own a Valenta 15, skip to step 7.
   a. Open the Roaster Co-Pilot DC access panel on your roaster (just underneath the "Auto/Manual" toggle switch). **For customers installing the retrofit kit for Coffee Crafters Artisan roasters, please refer to the separate installation instructions that shipped with your kit.**
   b. Plug your roaster's yellow thermocouple plug into the "BT" port (You'll no longer use the portable temperature display that shipped with your roaster). The prongs of this plug are different widths, so there's only one way to connect it.

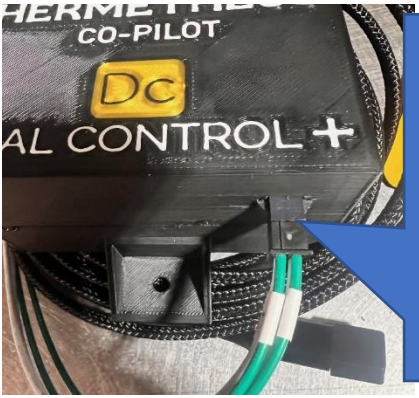
c. OPTIONAL: You can plug an auxiliary temperature probe into the “AUX” port on the Co-Pilot. For Valenta 7, 15, and 18 roasters, this port is used to monitor the intake air temperature. This allows you to monitor the preheating effect on the incoming air, which will help you determine your maximum batch size.

d. Plug the power jack into the Co-Pilot. (Make sure the other end of the jack is plugged into the power outlet in the mounting box.)



Step 6c: Valenta Series Power Outlet

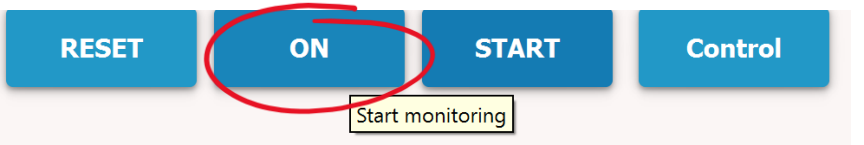
e. Plug your roaster’s 4-wire Molex plug into the bottom of the Roaster Co-Pilot DC:



Step 6d: Molex terminal. Plug the harness from your roaster here. NOTE: one of the 4 pins is a different shape to prevent plugging it in incorrectly. Do not force the plug if it doesn’t seem to fit. When properly inserted, the green wires will be facing you as pictured.

f. Mount the Roaster Co-Pilot DC into the enclosure of your Coffee Crafters roaster using the provided two Phillips screws. The top mounting screw should secure the spade connector into place. This is a ground wire that guards against thermocouple ground loops.
g. Close the Co-Pilot access door on your Coffee Crafters roaster.

7. **Connect the Roaster Co-Pilot DC to your computer:**
   a. Plug the Co-Pilot DC USB cable into your computer. **Wait about 30 seconds for Artisan to recognize your Co-Pilot and configure things in the background.**
   b. In Artisan, click the "On" button in the upper-right:



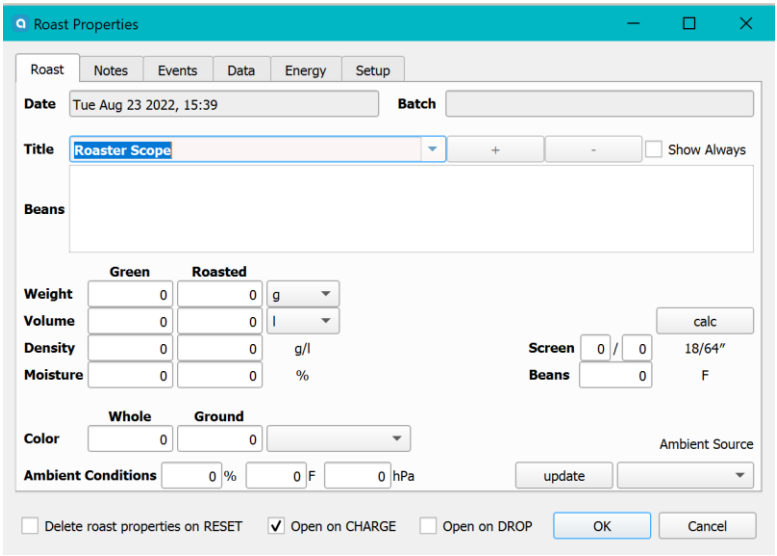
   c. You should now see a "BT" temperature in the upper right of Artisan. This stands for "Bean Temperature", and at this point, it should be showing the ambient temperature of your room/roaster. On a Valenta roaster, you will also see an "Intake Air" temperature reading.
   d. On the left side of the Artisan screen, drag the "Burner" slider up and down a couple of times. You should hear the Co-Pilot robotics in action! (**NOTE**: While your roaster's power switch does not need to be on, your roaster must be connected to power for this step to work. The USB cable cannot provide enough power to run the Roster Co-Pilot DC.)
   e. If you don't see a temperature reading or hear your Co-Pilot robotics moving, completely close Artisan and restart. Sometimes it takes a restart to get it to recognize the new hardware. **Note that you will not see a temperature reading in Artisan until you click "ON".**

8. **Let's roast some coffee. Remember that at ANY time during ANY roast, you can always flip the switch to "Manual" mode and control the heat yourself by using the heat knob on the roaster. If there's ever a software hiccup, bean temperature probe failure, or some other anomaly that causes the Co-Pilot to malfunction, simply switch to manual mode and guide the beans using the heat knob.**
    a. For your very first roast, it's great to start with old "throwaway" beans if you have them. If not, load your hopper with a roughly ½-capacity batch size. A ½ batch size is large enough to roast normally, but won't break the bank if something goes awry (but that doesn't happen often!).
    b. On your roaster, move the toggle switch down to the "Auto" setting.
    c. In Artisan, click the "On" button in the upper-right.
    d. **CONFIRM YOU SEE A BT READING.** Make a habit of this. This should be done before each and every roast. If you do not see a BT reading (or if you see "- -" or "UU"), your Co-Pilot cannot guide the roast. (But remember that you won't see a BT reading until you click the "ON" button.) While it's rare to have an issue with the BT reading, in most cases, simply unplugging the USB cable from your computer and plugging it back in will re-establish connectivity with Artisan software.
    e. Select a roast profile by clicking one of the buttons below the graph. They range from a light roast that ends at 408 degrees to a dark roast that goes to 460 degrees. Just choose a roast that you think will match up well to your bean of choice. You should see a semi-transparent graph of the roast show up on the graph.
    f. In Artisan, click the "START" button in the upper right. This will start graphing the current temperature, but the roast has NOT officially started. Don't worry about the Artisan timer that's already running… the graphing will reset to 0:00 when we OFFICIALLY start roasting.

g. Establish loft on your roaster as you normally would, using the loft control knob to establish a steady loft.

h. Simultaneously click the “CHARGE” button in Artisan **AND** turn on the power switch to your roaster’s heat control. **Don’t forget to do both**. It’s easy to click “CHARGE”, yet forget to turn the heat on.

i. A “Roast Properties” window will open automatically. Fill out any applicable information you’d like to record, such as the bean name, batch size, and other data you might like to capture/record.



j. You are now roasting your first batch of coffee on the Roaster Co-Pilot DC! You will initially see the unit jump to 100% heat since the bean temperature is below the desired “Set Value” curve in the background. As the bean temperature starts to reach the background profile curve, the Roaster Co-Pilot DC will start to modulate the heat, and it should track the background curve with relatively small deviations after a few minutes.

k. Carefully monitor your loft throughout the roast. Beans get lighter as they lose moisture, and you might have

to turn down the loft… but if you go too low, the loft can "collapse", which can be a fire hazard. If the loft collapses, quickly turn the loft up to re-establish the loft.

l. When your beans begin first crack, select the button "FC Start".
m. Select the "FC End" and "SC Start" buttons if applicable to your roast. This isn't mandatory, but it adds a visual indicator to your roast to show when these events took place.
n. When the roast has reached the desired temperature, select "DROP**". This will automatically turn your burner heat to 0**, so there's no need to turn the heat switch off.
o. Select "OFF" in the upper right of Artisan, and you'll be prompted to save the roast. It's a good idea to save every roast you do.

That's it! You have now successfully roasted your first batch of coffee using the Hermetheus Roaster Co-Pilot DC kit! As with all coffee roasting, personal taste and preference plays a large part of what tastes "best". Blind cuppings should be a regular part of your roasting regimen. Try out different profiles on the same beans, then cup them blind. Can you tell the difference? Does one test better than another? If so, what makes it different? Continue to shape and hone your tasting skills to help guide your future roasts. We wish you the best on your coffee roasting journey!

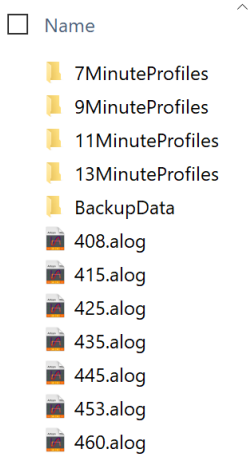
Choosing the Duration of Roast Profiles

While there are 7 roast profile buttons including with the standard settings we provide, there are actually 28 roast profiles included on your thumb drive! The default settings will give you 7 different profiles that are all **11-minute roasts**. However, we include similar versions of those 7 profiles in 7-minute versions, 9-minute versions, and 13-minute versions.

Why would you want to change roast duration? There could be several reasons. While the percentage of time spent in each phase is SIMILAR, there are slight differences between the 7, 9, 11, and 13-minute roasts, even at the same drop temperature. You might find that slightly longer development time can diminish grassy, underdeveloped notes in a bean.
Another reason you might want to change roast duration is efficiency! If you primarily roast smaller batches of light roasts, you might find that a 7-minute roast allows more hourly production with excellent results. Conversely, if you do near-capacity batches at very dark roast levels, you might find that it's a necessity to use the longer roast profiles. For instance, on a Valenta 7, you will not be able to roast 7lbs of beans to 460 degrees in 7 minutes. There simply isn't enough heat capacity.

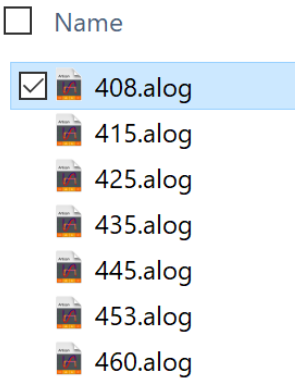
To change the duration of a roast profile for a given button, follow these simple steps:

1. Open your "CoPilotProfiles" folder on your computer.
2. You will see folders for each family of profiles, organized by roast length:



3. Open the folder with the length of roast you want. For instance, if you want your "408" profile to roast in 7 minutes, open the

"7MinuteProfiles" folder. You will see 7 profiles in each folder:



4. **COPY** the profile you would like to use, then **PASTE** it in the main "CoPilotProfiles" folder. When prompted by Windows, choose the option to OVERWRITE the existing file.

That's it! Your button will now load the profile you chose.

If you'd like to create your own roast profile, we have more information about that in the "Troubleshooting and FAQs" section below.

Using the Trainer Mode:

Trainer mode teaches new roasters HOW to successfully modulate the heat on their new roaster. Learning the process of coffee roasting is normally a process of trial and error. Not with the Roaster Co-Pilot DC! Simply follow the steps in Section 7 above as if you were using the Co-Pilot Automatic heat control… **but leave the toggle switch set to "Manual".**

By doing this, YOU are controlling the heat, but the Co-Pilot will indicate the "correct" heat percentage in the "Co-Pilot %" reading of Artisan. If the Co-Pilot % indicates 50%, that's approximately where your heat knob should be (or at least where the Co-Pilot THINKS your heat should be). Don't worry… it's not necessary to micro-manage the heat knob. The Co-Pilot will update its suggested heat level once every second, but you only need to change it a handful of times throughout a roast. Simply use the Co-Pilot % display as a general guide to see how well you can follow the background curve in Artisan software!

200g Sample Size Setting (Experimental… but promising!)

NOTE: This feature is only functional on the Valenta 7 roaster.

Please do not use this setting without fully reading this section. It is an advanced feature that is still being refined. We highly recommend using a bean that you already stock (because you might have a few batches that don't go according to plan). Once your settings are dialed in, this setting should work well for standard 200g sample sizes that are often provided by green coffee suppliers.

The Challenge: There are two main challenges in automatically roasting just 200g of green coffee beans in a 7lb roaster:

1. With over 8kw of heating power, the Valenta can quickly scorch a small 200g sample size.
2. 200g of green coffee beans do not even touch the bean temperature thermocouple probe.

The “200g Sample Size” button addresses the first challenge by capping the maximum power output of the Valenta to just 60% power. This is still a very powerful heat setting, so we further tame that by loading dramatically different PID control settings. But even with these changes, **you should expect to see fairly large oscillations in the indicated bean temperature up until at least Dry End.** We’re continually tuning these settings, so we’re very open to hearing (and seeing!) your results when trying this experimental mode. The more feedback we get from adventurous end users, the more data we’ll have to make this setting more effective.

However, the second challenge above remains a challenge. I**n a 200g sample batch, we are not measuring the actual bean temperature.** We know this because the beans are not in constant contact with the bean temperature probe. We have addressed this challenge through trial-and-error testing and mapping of the INDICATED bean temperature (what the probe is sending to Artisan) and the ACTUAL bean temperature. We discovered a *relatively* linear correlation between the indicated and actual bean temperatures. In short, you could roast a 200g sample batch using the standard settings, but you would probably find that your beans would hit first crack at least 50 degrees earlier than normal. (They would start first crack around an indicated 340 – 350 degrees, then start second crack around 390-395 degrees.)

Our solution is to digitally “correct” the indicated bean temperature so that first crack occurs somewhat close to an indicated 400 degrees. (Again, your feedback and data will help us refine this correction even further.) This digital correction multiplies the bean temperature reading, which has the side-effect of amplifying the Co-Pilot heat control. This means that oscillations early in the roast are to be expected. We’re working on taming them.. but it is still a challenge!

Having said that, MANUALLY roasting a 200g sample is very likely to have even more oscillations… it can be done, but it's a challenge!

Using the 200g Sample Size – Valenta 7 ONLY

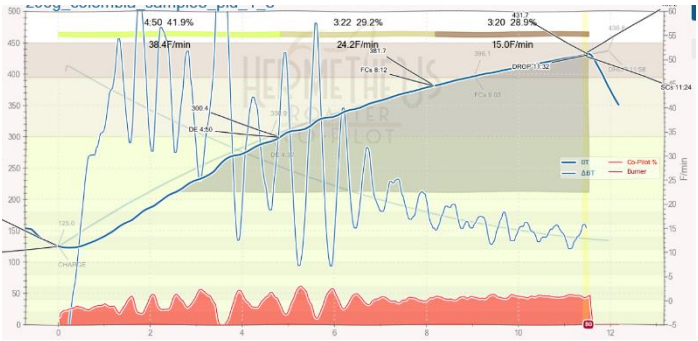
If you've read the section above and would like to use this cool feature (knowing that it might not be perfect at first), we commend you! Simply follow the steps below:

1. In Artisan software, clicking the "200g Sample Size" button simply provides a condensed version of these instructions.
2. **OPTIONAL:** If you have made ANY customizations to Artisan settings (such as configuring it for a Mac, changing buttons, or temperature probe corrections) select "Help>Save Settings". Save your settings to your main "CoPilotProfiles" folder. Name this file anything you'd like such as "abc sample roasting.aset".
3. Go to "Help>Load Settings…" in Artisan. Navigate to the "CoPilotProfiles" folder on your computer and select the file "valenta7-200g-sample-settings.aset"
4. **Artisan will switch to a black background to visually indicate that you're in 200g Sample Size mode.**
   Note: Any changes you've made to buttons and/or roast profiles will need to be done on your sample batch settings as well.
5. Select your background profile and start your roast as you normally would (selecting "ON", "START", then "CHARGE")
6. Your roast will proceed as a normal roast (though it will not track the background curve as tightly as normal batch sizes).
7. It's important to revert back to your standard batch size settings after you are done sample roasting. As a precaution, a reminder window will open every time you select "ON" in Artisan. To load your standard batch settings, simply go to "Help>Load Settings…" and load the settings saved in step 2 above OR the standard "co-pilot-valenta-7.aset" file.
   SHORTCUT: Once you've loaded your settings one time, you can quickly toggle back and forth between standard batch and sample batch settings by using "Help>Load Recent Settings>" in

Artisan. Both your standard and sample batch settings will automatically appear in that menu.

8. Did your results miss the mark? We'd like to see! Save your completed batch, and send us an email at coffee@hermetheus.com. The more data we get from early adventurous users like the you, the better we can make these settings.

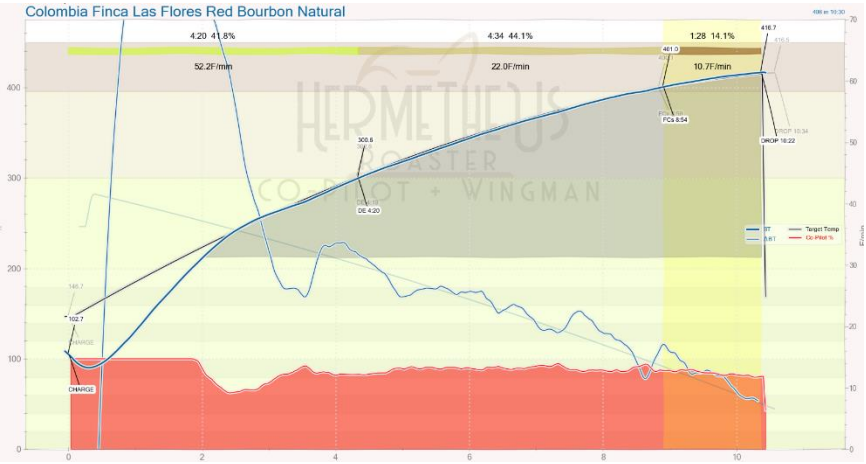
Here's a representative curve of what you might expect your roast to look like:



Note that there is a fair amount of oscillation in the early part of the roast, but by the more critical Maillard phase, we achieve a largely stable temperature. Remember, the temperature probe isn't actually measuring bean temperature here, but instead a corrected AIR temperature. Those fluctuations might look dramatic, but the fluctuation in actual bean temperature is much less pronounced. It's not perfect, but remember that we're roasting 200g of beans with an 8.6kw heating element. It's quite remarkable that this is even possible… and there's still room to improve!

Understanding the Artisan Graph

If you're new to Artisan Roaster Scope software, the default graph can seem a bit daunting. This section describes the graph, as well as some tips to customize the graph to only show the elements you care most about. The following completed roast shows a typical default Co-Pilot graph:



Let's dig into what all these lines mean.

BT: The bold blue line graphs your actual bean temperature (BT) in real-time as you roast. The values are aligned with the LEFT Y-axis. This is perhaps the most important line on the graph, because it shows your current bean temperature, and it's what you'll use to determine when to DROP your beans (i.e. dump them to the bean cooler).

ΔBT: The thin blue line is the Delta Bean Temperature line. It's also commonly referred to as the Rate of Rise (RoR) graph. This line is a visual representation of how quickly our beans are heating (or cooling). By nature, this graph won't be smooth like the BT graph. If you're just getting started with Artisan, you can even turn this graph off! To do this,

simply go to Config>Curves. On the “RoR” tab, simply UNcheck “ΔBT”. This will not have a functional impact on your roast. This graph aligns with the RIGHT Y-axis of the graph. The number indicates the degrees per minute that the beans are heating (or cooling). For instance, a delta BT of 20 means that the beans are currently heating at a rate of 20 degrees per minute.

Co-Pilot %: The red line graphs the roaster power being requested by the Co-Pilot. This graph aligns with the values in the LEFT Y-axis. In the previous screenshot, you can see at the beginning of the roast is a flat red line that aligns with the “100” mark on the Y-axis. This indicates that the roaster was at 100% at the start of this roast (which is very common).

Burner %: This line graphs ACTUAL percentage of heat power being delivered by your roaster. This graph aligns with the values in the LEFT Y-axis. In most cases, this is identical to the Co-Pilot % line. For instance, if the Co-Pilot requests 65% heat, the roaster will produce 65% heat. But for advanced users, it’s possible to limit the maximum amount of heat delivered by your roaster. So for instance, if you are roasting a less-than-50% batch of coffee, you might limit the maximum heat of your roaster to just 50% or 60% heat. This provides a gentler application of heat and helps prevent temperature overshoots and extremely high RoR values. This technique is described in great detail in the FAQ section.

Target Temp: This line graphs the temperature being TARGETED by the Co-Pilot. In most roasts, this will graph directly on top of the background profile itself. However, for more advanced Co-Pilot users, it’s possible to shift the background bean temperature curve left and right, and this black “Target Temp” line will record those movements as you make them.

There are a few other elements of the graph worth noting:

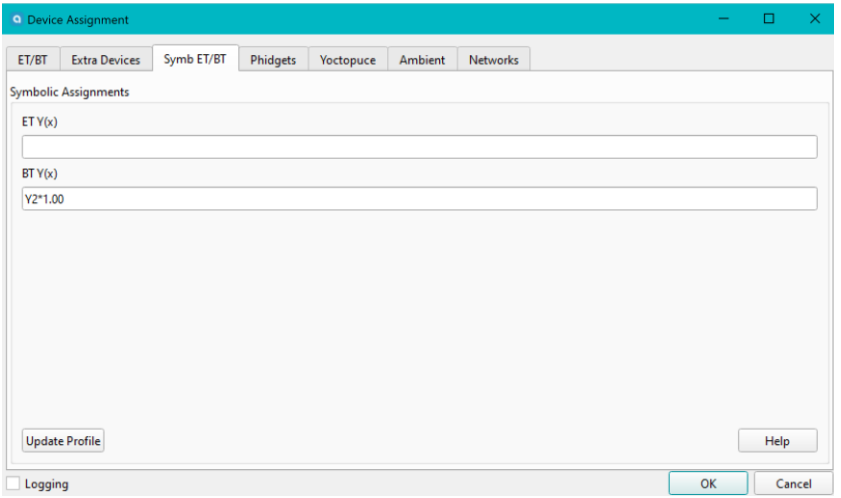
- DE: This stands for “Dry End”, and marks the point in the roast when the drying phase is largely completed and the actual roasting of the bean begins. GENERALLY, this happens at about 300 degrees, so the Co-Pilot is configured to automatically mark this point at 300 degrees. If you would like to manually control when to mark Dry End (using the blue button in Artisan), go to Config>Phases and UNcheck “Auto DRY”.
- FC Start: This indicator is placed on the graph when you manually click the FC START button in Artisan. This marks the point in your roast when your beans are actively popping/cracking. It normally happens between 390 – 410 degrees on a properly adjusted thermocouple. The FAQ section contains more detail on how adjust this if it occurs well before or after 400 degrees. Marking this will start the calculation of the Development Time Ratio (DTR) in Artisan. And while it’s always good practice to mark the start of first crack, it’s not detrimental to Co-Pilot performance if this isn’t marked.

Troubleshooting and FAQs

Q: My “First Crack” temperature doesn’t seem right. What can I do?

A: While there is some variance from bean to bean on precisely when first crack will occur, it should GENERALLY happen around 400 degrees F. If you’re hitting FC within a few degrees of this, that’s okay. But if you’re hitting FC at an indicated 380 degrees or 420 degrees, we should make a change in the software to account for that discrepancy. Math and Symbolic Assignments to the rescue! (Don’t worry… it sounds scary, but it’s easy.)

In Artisan, go to “Config>Devices”, then select the “Symb ET/BT” tab. That’s short-hand for “Symbolic Environment Temp/Bean Temp”.



Divide 400 by your INDICATED first crack temperature. Did you hit FC at an indicated 380? Then 400 divided by 380 = **1.05** (and a lot more decimal points we don’t care about).

Did you hit FC at an indicated 415? Then 400 divided by 415 = **0.96** (and a lot more decimal points we don’t care about).

Just find *your* magic number in bold. Then in the BT Y(x) field, replace the 1.00 portion in the field above with your number. For instance, if

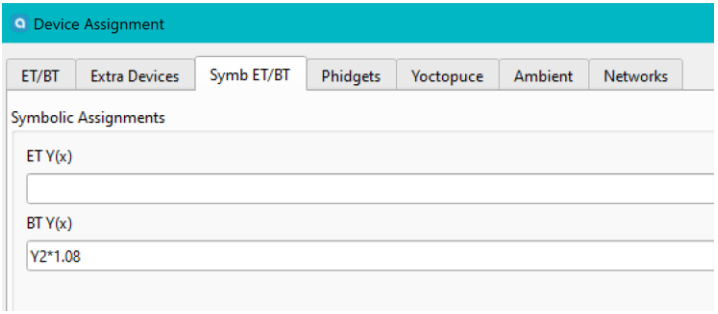
you hit FC at 380 degrees, your formula would be:
Y2***1.05** (replace the number in bold with YOUR specific number from the math above).
IMPORTANT: The "Y" in the formula above is case-sensitive. You MUST use a capital "Y".

Then simply click "OK" to save the value, and your first crack temps should now be spot-on!

Special calculation for 200g Sample Size corrections (Valenta 7 Users ONLY):

Sample roasts are harder to CONSISTENTLY crack at 400 degrees. A variance of +/- 5 degrees should be expected. Regardless, the steps are as follows:

1. In Artisan, go to "Config>Devices", then select the "Symb ET/BT" tab. That's short-hand for "Symbolic Environment Temp/Bean Temp".



2. Divide your indicated FC temperature by 1.08.
3. Divide 400 by the result of step 1.
4. Replace the 1.08 in the screenshot above with the result in step 2.

For you math types, the three steps above are represented by this formula
400 ÷ (IndicatedTemp ÷ 1.08) = NEW VALUE to use in formula

EXAMPLE: Let's imagine that you tried a 200g sample batch and you hit first crack at an indicated 375 degrees. Step 2 above tells us to divide 375 by 1.08. This equals 347.2.
Step 3 tells us to divide 400 by 347.2, which equals 1.15 (and more decimal points we don't care about).
Thus, our final formula would be Y2*1.15

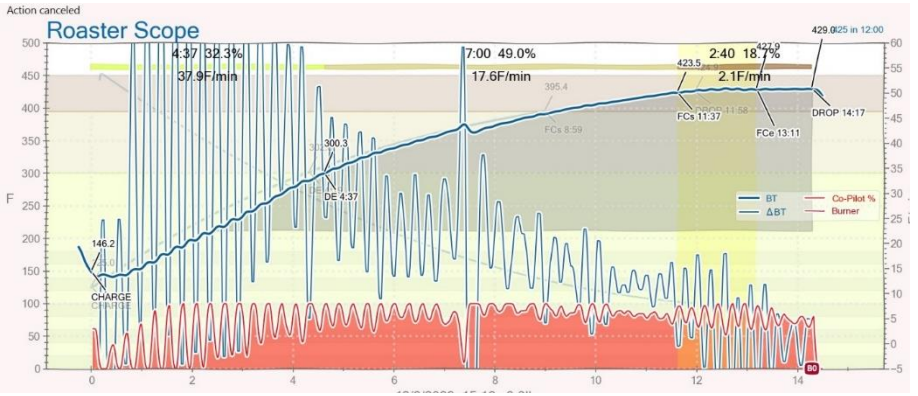
Then simply click "OK" to save the value, and your first crack temps should now be spot-on!

IMPORTANT: The "Y" in the formula above is case-sensitive. You MUST use a capital "Y".
Before starting your next batch, be CERTAIN that you see an indicated Bean Temperature (BT) value. If you see "UU" in the display, it likely means you have an error in your formula.

Then simply click "OK" to save the value, and your first crack temps should now be spot-on!

Q: My first crack temperature is off by more than 10 degrees … what's wrong?

A: This is only applicable to ARTISAN series roasters (not Valenta roasters). We can answer this in two words: PROBE PLACEMENT! The placement of the thermocouple (temperature probe) is critical to get an accurate bean temperature reading. It's often necessary to move the probe by a few millimeters (or even as much as 20mm!) to get a good temperature reading. An inaccurate bean temperature reading will lead to an inaccurate roast profile. Here's an actual Co-Pilot roast that shows what happens with a temperature probe is pushed into the hopper TOO FAR:



There are two telltale signs of the probe being pushed in too far:

1. The rapid oscillations of the temperature curve indicate that the probe is directly in the hot air stream.
2. First crack occurred at an indicated 423.5 degrees… far too high to be accurate.

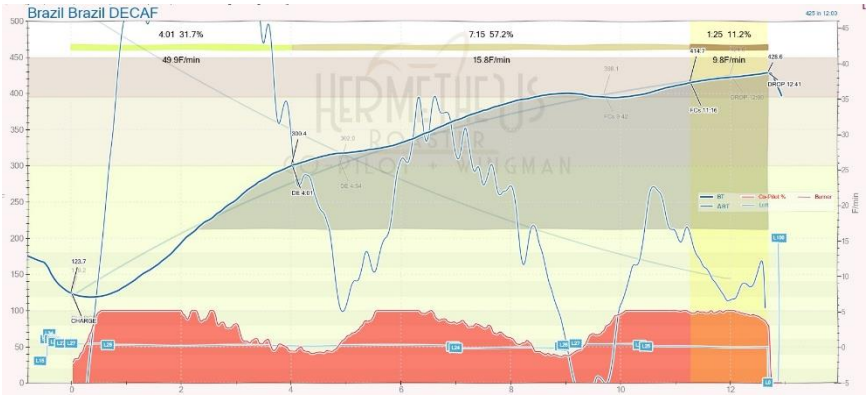
In this scenario, the probe was pushed so far into the bean hopper, it was in the direct path of the hot air, leading to an overly hot and fluctuating bean temperature. For the graph above, loosening the compression nut on the thermocouple and pulling it OUT of the hopper by about 15mm fixed the issue. Note that 15mm was a very large adjustment to make… it's more common to move it by only 5mm at a time.

Conversely, if you are hitting first crack 15 or more degrees BELOW 400, then your probe isn't pushed into the bean mass far enough. In this case, move your probe further into the bean hopper by about 5mm and repeat the roast. This technique is only applicable to the newer style of temperature probe placement on Artisan roasters that goes through the side of the bean hopper. This technique does NOT work on the older style of probe that enters the bean hopper from the top. If you have this legacy style thermocouple, we strongly recommend upgrading to the new style of probe placement by ordering the kit directly from Coffee Crafters. They also have a YouTube video showing the installation

process (which will require drilling through the side of the stainless steel bean hopper).

Q: Can I limit the maximum heat delivered by my roaster for smaller batch sizes?

A: Yes, and we strongly encourage you to do this! If you own an Artisan 6 or larger roaster, you might experience some oscillation of the heat when doing half batch or smaller loads (especially on less dense beans such as decaf). Ever had a roast that looks something like the following graph?



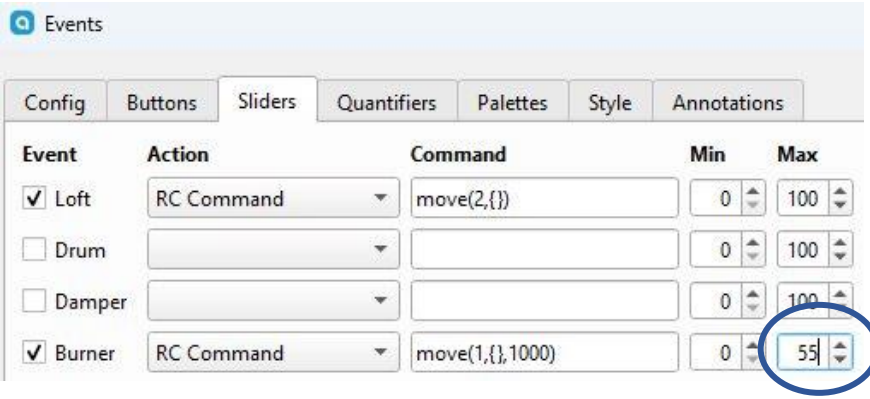
The answer isn't in changing your PID settings... it's reducing your roaster's heat power! You see, the Co-Pilot doesn't know what your batch size is. If you put 4lbs of beans into an Artisan XL hopper, the Co-Pilot will ask for full power at the beginning of the roast. But 10kw is FAR too much power for 4lbs of beans!

The fix for this is incredibly simple, and it's something that nearly everyone can benefit from. In Artisan, go to Config>Events>Sliders.

On the "Burner" slider, you will see values for "Min" and "Max", which are 0 and 100 by default. These two values represent the maximum and minimum heat levels that your roaster is allowed to use.

Simply reduce the "Max" value of 100 to something much lower. For instance, on a 4lb batch on an Xe, I find that just 50 or 55 is perfect. If I do a 2.5lb batch, I might go as low as 40 or 45.

This screenshot shows the setting to change, and the screenshot includes a "55" to indicate where I've changed this for a 4lb batch size.



After making this change, you'll find your smaller batches come up to temperature in a more controlled manner. They won't overshoot the curve and begin the cycle of overshooting and undershooting.

The best part is that you can change this value on the fly! If you set your Max value too low and your beans can't get up to the curve, just change this value during the roast... it'll immediately take effect.

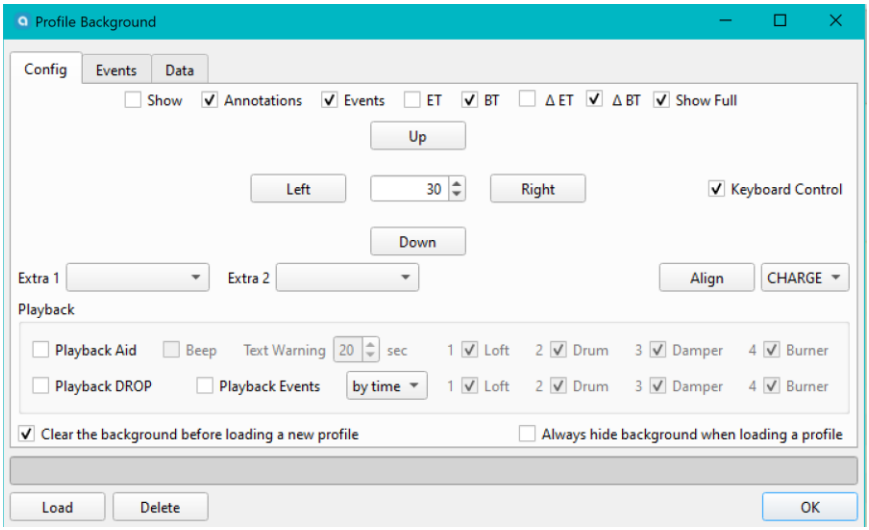
Note that your "Co-Pilot %" field will still register 0-100%. This is by design. The Co-Pilot is still ASKING for 100% heat. But we've capped our max heat level to something lower. Thus, you might see the Co-Pilot % at 100%, but your slider is only at 55 (assuming we set the Max to 55). In essence, the Co-Pilot is saying "Give me everything you've got!" And your roaster responds with "Okay, but that's only 55% power." The gold “Burner %” line on your graph will accurately graph the ACTUAL heat being applied to your beans.

Q: Can I move my background profile if I’m not able to accurately track it?

A: Yes, you can shift the background profile left, right, up, or down as needed. There are times when your BT will overshoot or undershoot the

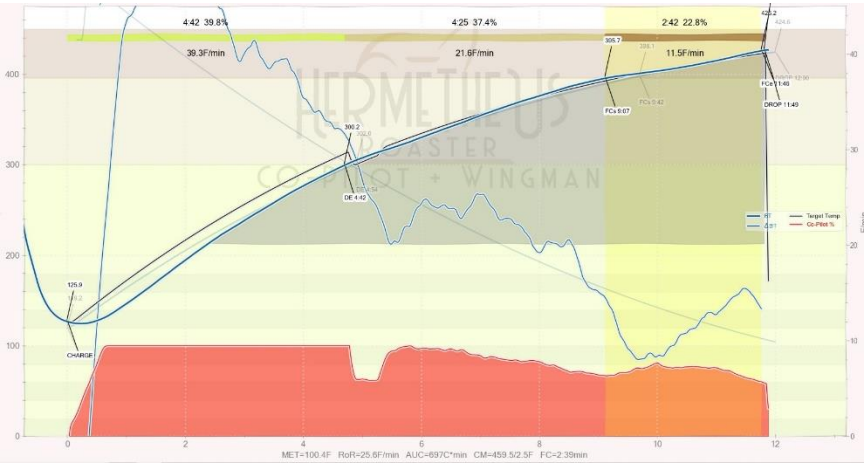
target bean temperature. For instance, if you overload your machine, your roaster won't have enough heat capacity to follow the background profile. Conversely, after hitting first crack, you might find a sudden "spike" in your Rate of Rise and corresponding bean temperature. In both of these cases, moving the background profile gives you extra control in "tuning" your roast!

You do this by selecting Roast>Background, then clicking the left, right, up, or down button:



The value of "30" in the middle of these buttons refers to the number of seconds the profile will move if you shift left or right. Conversely, it refers to the number of degrees the profile will move if you shift up or down. In either case, we recommend reducing this number so a value much smaller, such as 5 or 10.

Shifting the profile is an advanced technique, but can really help you adapt to roasts that don't go exactly as planned. As an example, the following roast was intentionally loaded with too much coffee for the roaster:



Notice that for the first 5 minutes of the roast, the heat is at 100% (the flat red line), but our blue BT lagged well below the target temperature (the black line). Our roaster simply can't heat these beans fast enough to stay on the curve. In the roast above, the background curve was shifted RIGHT at about the 5 minute mark. If you look at the black "Target Temp" line, you'll see it dropped in response. You see, shifting the profile to the RIGHT has the net effect of EXTENDING the total duration of the roast, and at the same time reducing the target temperature of our beans to something our roaster is capable of.
You might also notice on the screenshot above that at about the 5:30 mark, the black "Target Temp" line actually *increases*. This is because the graph was shifted LEFT at this point. When the graph was initially shifted right, it was moved too far… you can see our heat power dropped off pretty dramatically (too much, in our case). So shifting the background curve to the left moved the Target Temp *just* above our actual bean temp and allowed this too-large batch of coffee to finish in a reasonably successful manner.

Shifting the background profile is difficult to envision when reading a guide like this. We also have a short video that shows this in action

during a roast:

https://youtu.be/3Bot-QDL2t8?si=LF3LRzCB-WGapUji

Q: Can I manually control a roast using the Co-Pilot DC once a batch has started?

A: Yes, and it's easy! Just flip the switch on the left side of the roaster to "Manual", and you are now in control of the heat knob. You can switch back and forth during a roast if you'd like.

Why would you want to do this? Maybe you have a bean that gets particularly tricky at first crack. We have a lovely wet-hulled Sumatra that crashes the bean temperature HARD at first crack. It drops the indicated bean temperature by several degrees. The Co-Pilot, in response, cranks the heat to try to get the beans back on the curve… but by the time they finally catch back up, the temperature overshoots. We've tried exhaustive variations of PID tuning to address this, but at the end of the day, this particular Sumatra is just a "crashy" bean. So, we manually take over at first crack. We apply a GENTLE heat to the bean after first crack, and this seems to be the best approach for this particular bean.

There is a potential pitfall of using Manual mode and then switching to Auto. It can take up to a minute for the Co-Pilot to fully adapt after flipping the switch to "Auto". Here's why. When you choose "Manual" mode, the Co-Pilot doesn't "know" that it's not in control. It is still making heat adjustments. Imagine a scenario where you START a roast in Manual mode, and the Co-Pilot was at 0% heat. Imagine that you turned the heat knob up to 100% on your roaster for the first minute of the roast, then you flip the switch to "Auto". At this point, the Co-Pilot will likely be at a very low heat level. This is because when it started at 0%, the bean temperature was rising adequately… but ONLY because

you had the heat turned to 100%. Thus, during this first minute of the roast, the Co-Pilot thinks that near-0% heat is enough to heat the beans (because it seemed to be working for the first minute of the roast). When you suddenly switch to Auto, you might see a crash in temps while the Co-Pilot re-adjusts to the correct level of heat necessary to guide the roast.

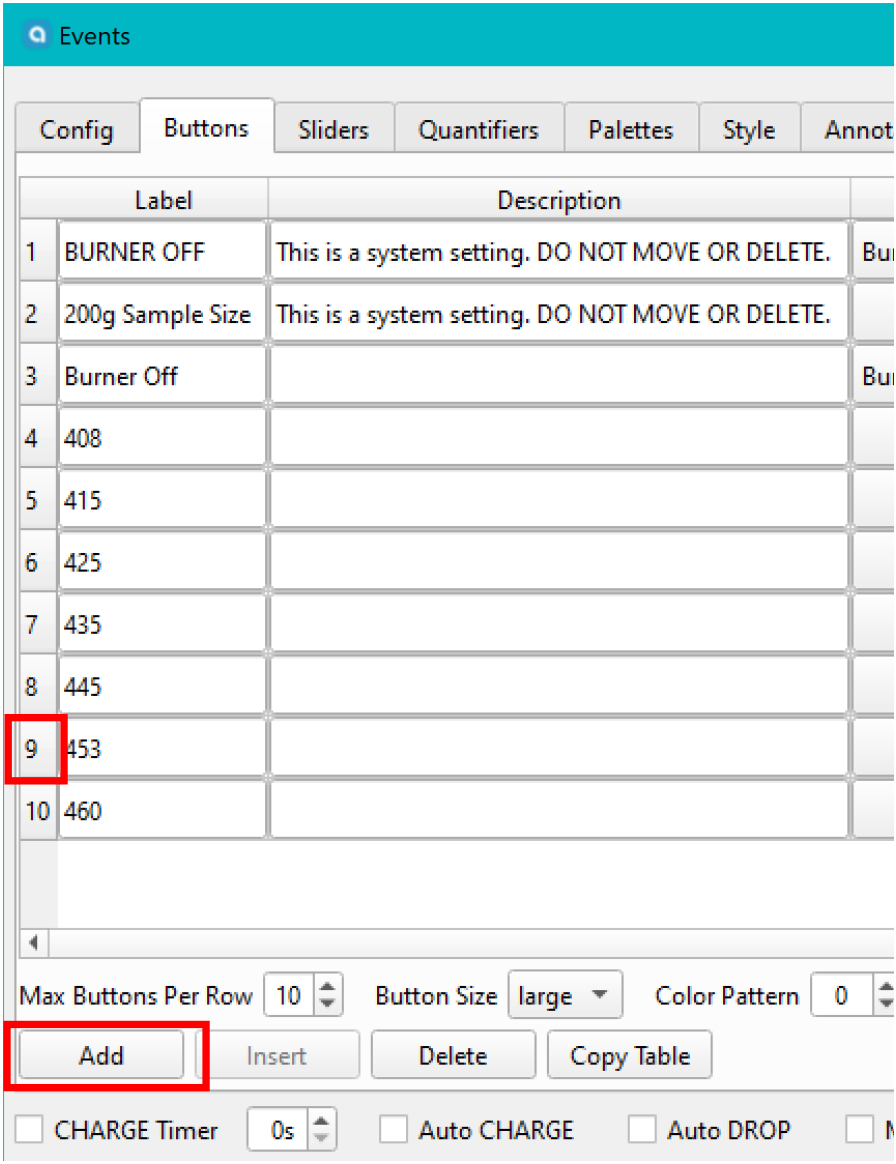
Q: Can I add or remove roast profiles, or do I have to live with what you gave me?

A: Of course you can add your own! In fact, it's our sincere hope that you do! It can seem a bit complicated at first, but we've created an in-depth tutorial video on exactly how to do this. You can view this 30-minute video here, or if you're using the printed guide, you can scan this QR code to view the video on your phone (but it's probably easier to see some of the text elements on a computer screen).

Although the video covers the entire process of creating a profile AND adding/editing buttons, the following steps can serve as a printed reference on how to modify the buttons:

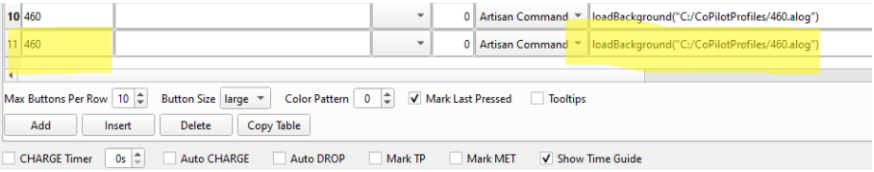
Once you have already your custom roast profile and saved it as an "alog" file, we recommend saving this to the same RoasterCoPilot folder that you copied in Step 2 of this guide (where you'll also find the profiles that were included with your kit). Let's further assume that you've named this "myroast.alog".

To add this new button, simply go to “Config>Events” in Artisan, then click the “Buttons” tab. Scroll to the bottom of the buttons and **select the last roast profile in the list,** as shown below, then click “Add”:



(*By first selecting the row, the "Add" button actually **COPIES** that button, commands and all*.)

The moment you click "Add", you'll now see a new row in the list!



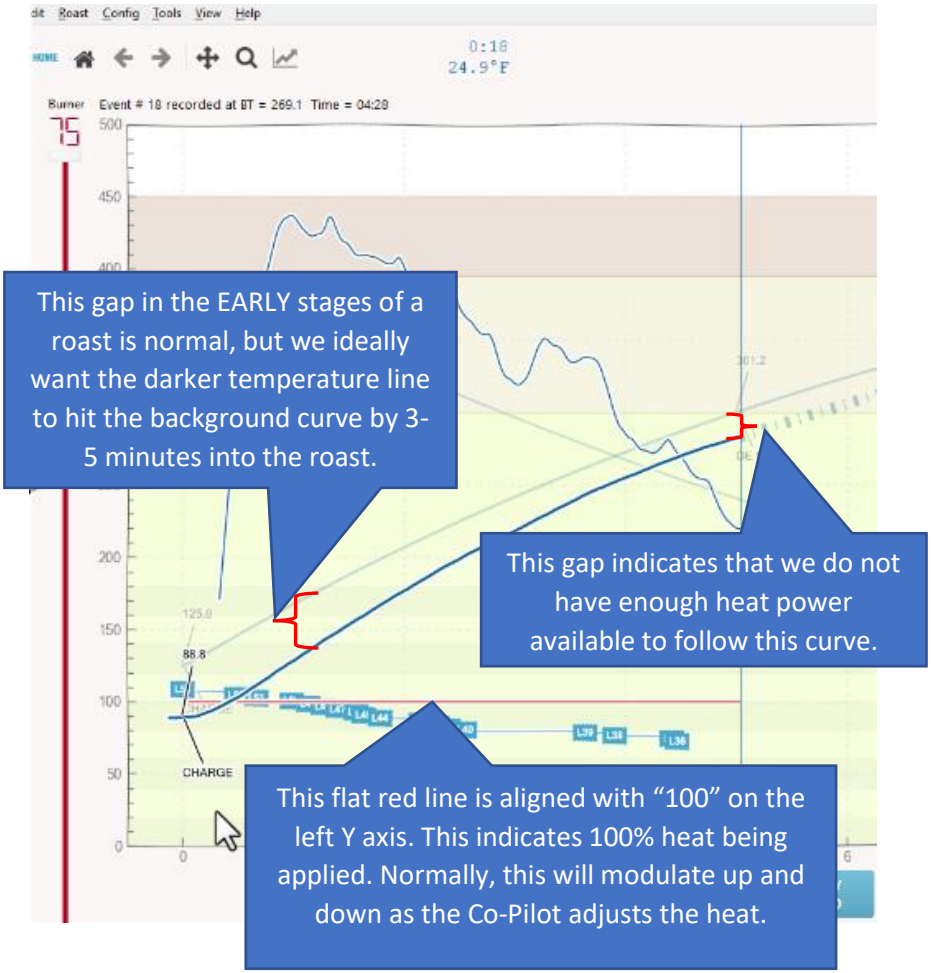
Now you simply want to modify the values highlighted in yellow above. The value on the left is the name of your button… call it anything you want. The highlighted part on the right is the path to where you stored "myroast.alog". Just make sure the path is right.

NOW you can click the "11" next to your button and drag it/drop it wherever you want.

Finally, click OK, and your button should now appear and load your new profile. Easy, eh?

Q: The Co-Pilot is running at 100%, but my BT can't reach the curve… what can I do?

A: This happens from time to time as you're learning the capabilities of your roaster! Line voltage, bean density, moisture content, total roast time, and the temperature of your roasting room can collectively have a large impact on the maximum batch size that you can roast. A COLD Valenta 7 or Artisan XL will not be able to profile roast a full batch. We recommend starting with 5-5.5lbs for a cold Valenta 7 and 7-8lbs for a cold Artisan XL . Subsequent loads can manage higher batch sizes, although you will still need to find what YOUR maximum batch size is through a process of trial and error. When your roaster doesn't have enough heating capacity to follow the curve, you might see a roast that looks something like this:



While the Bean Temperature (BT) will lag the background profile at the start of every roast, we’d ideally like to hit the background curve by Dry End (roughly 300 degrees). In the screenshot above, you can see that the Co-Pilot heat is at 100% (the flat red line that aligns with “100” on the Y-axis). You can also see that the dark blue line is not able to hit the lighter blue background roast profile line.

If you see this happening, don’t worry! There’s a really easy way to “shift” your background curve on-the-fly (essentially giving you a longer roast time, while still maintaining your curve). We’ve created a SHORT

YouTube video on how to do this very thing, or you can scan the QR code below.

Q:I'm hitting "CHARGE" to start a roast, but the Co-Pilot is staying at 0% heat.

A: The most common reason for this is the bean temperature reading is HIGHER than the background roast profile. This commonly happens on back-to-back roasts. The roast chamber and thermocouple might still be well above the temperature of the background roast profile. For instance, your BT is an indicated 200 degrees at the start of your roast, but your background profile begins at 140 degrees. In this case, the Co-Pilot thinks it's over the temperature, so it will leave the heat at 0% until the BT drops below the background curve. There are a few ways to deal with this:

1. Cool the chamber between roasts a bit. Between batches, leave the loft on high while the heat is turned off. This can help cool down the BT probe.
2. Manually control the heat at the beginning of the roast to ensure heat is being applied. In this scenario, you would flip the control switch on the left side of the roaster to "Manual" at the start of your roast, then manually apply the correct amount of heat (which is often 100% for larger batch sizes). As soon as the indicated Bean Temperature (BT) matches or falls below the background curve, switch to "Auto" and the Co-Pilot will take over from there!
3. Modify your background roast profiles so that they start at slightly higher initial temperatures.

Q: What roast profiles work best with beans from <fill in the blank>?

A: Sadly, there isn't a universal answer here because both coffee beans AND personal taste preferences are all different! Generally speaking, our roasts that drop at the same temperature but different times should be nearly identical in the cup. (For instance, the "408" 7-minute profile should taste VERY similar to "408" 11 minute profile. If your batch sizes aren't very big, you can generally use the faster roast profile. But as your batch sizes grow, you will reach the heat capacity of your roaster, so it will be necessary to use a longer roast.

Aside from this guidance, there is some logic to the roasts profiles that ship with the Co-Pilot.

- The 408 degree profiles are light roasts, and they excel at bringing out fruity notes in naturally-processed coffees. But not all beans will be their best at this light roast level. Some beans might have a bit of an underdeveloped grassiness at this roast level.
- The 425 degree profiles are generally considered a "City" roast, and can often be a great profile to sample new beans. Why? It's still light enough so that some of the more floral/fruity notes can be detected, but it's developed enough to evaluate how the bean might change at darker levels.
- The 435 degree profiles can emphasize the sugary notes of some coffee beans. For instance, you might find that a Papua New Guinea has notes of brown sugar, molasses, or butterscotch at this level.
- The 445, 453, and 460 profiles simply take you to various stages of second crack roasts. At 445, you should be in the first few moments of first crack, and the resulting beans are generally free of oils, especially while they're very fresh. Obviously, 453 and 460 degree beans take you further into second crack territory, and will result in a VERY dark, oily bean.

Q: I'm having trouble "dialing in" a roast profile. What am I doing wrong?

A: If you are an experienced roaster and are skilled at cupping/evaluating coffee, the book "Modulating the Flavor Profile of Coffee" by Rob Hoos is an excellent read.

However, when we hear this question (and it IS a common question), it often comes from people who are just beginning their coffee roasting journey. Most of the time, the problem isn't the roast profile… it's an unrealistic *expectation* of the coffee! Your green coffee supplier likely has flavor descriptors of their beans. Often, these are straightforward descriptors such as "blueberry, milk chocolate, almond". Other times, they sound more like an over-the-top dessert, such as "freshly-picked strawberries dipped in 80% cacao glaze with a lingering finish of crème brulee and star fruit."

As a new roaster, it's important to temper expectations, especially with some of the more elaborate taste descriptors. While a Q grader should be able detect the notes that are part of the descriptors, the predominant flavor of most coffee is still… well… COFFEE! If your green coffee indicates that it has flavors of caramel, don't expect to taste an in-your-face blast of sweet Werther's Originals. There is a good chance that the caramel is a subtle note that is detected by an experienced taster.

Try to approach coffee tasting with a very simple question like "do these two (or three, or four) coffees taste IDENTICAL to each other?". If the answer is no, then then the challenge becomes finding taste descriptors to describe the differences. It's a subtle skill that is learned over time with a great deal of practice, guidance, and discipline. For instance, we often speak of "acidity" in coffee, but a trained Q grader has the ability to differentiate between 4 common acids found in coffee: acetic, citric, malic, and phosphoric. Furthermore, they are able to identify *combinations* of these specific acids.

You might wonder if these descriptors are largely worthless if they can only be detected by trained professionals… not at all! These descriptors are designed to ***objectively*** evaluate coffee. A table of Q graders should all agree (mostly) on the compounds detected in a coffee sample. However, this does NOT mean that they can agree on which one tastes BEST. That is a ***subjective*** measurement.

When getting started in coffee cupping/tasting/evaluation, I like to always go back to the simple question "Do these coffees taste *identical*?". It's generally easy to detect two coffees that aren't identical. But can you put words to it? Can you use a common language that explains why they are different? This is the more challenging part, and it's exactly why we now have a common language to quantify the differences.

These differences are more objective and prescribed than you might realize! For instance, you might see "tobacco" as a descriptor of a wet-hulled Sumatra. But what does that mean? There are many different types of tobacco. The World Coffee Research Sensory Lexicon defines it! You simply need 0.10 grams of tobacco from a Camel cigarette in a covered snifter, or 1 drop of essence Le Nez du Café #33 pipe tobacco. For raspberry flavors, the sensory lexicon defines Raspberry Jell-O brand dry gelatin powder as the flavor reference. For a "peanut" descriptor (which is in the "nutty" family), the sensory lexicon instructs us to bake raw, blanched peanuts on a parchment-lined cookie sheet at 425 degrees for 10 minutes. Then chop and measure 1 Tbsp into a snifter.

You see, the descriptors aren't meant to be intimidating. They're meant to help us calibrate our taste buds against something that we can all taste (such as a few granules of raspberry Jell-O) and then identify that specific characteristic in a coffee. For fun, we've included a PDF of the WCR Sensory Lexicon on your Co-Pilot thumb drive!

Additional Help

We recommend all of our customers to join the private Facebook group for the Hermetheus Roaster Co-Pilot at

https://www.facebook.com/groups/740068113761640/

While we're happy to offer technical support by email at coffee@hermetheus.com (or phone, if necessary), the Facebook group is full of friendly members who are not only happy to help solve issue, but also offer tips and tricks, such as modifying PID values for different bean types.

Thank you, and good luck on your roasting journey!

Jason Scott

Founder – Hermetheus Coffee