SAVANNAH STOKER v4 TEMPERATURE CONTROLLER
FOR THE WOOD PELLET GRILL

Thank-you for purchasing the Savannah Stoker Pellet Grill Control System. The Savannah Stoker is a PID based artificial intelligent temperature controller that allows you to control your wood pellet grill or smoker with *"simplicity but infinite control"*.

FEATURES

- Set the desired cooking/smoking temperature from 150°- 550°F or the max temperature your grill can reach in 1° increments.
- Typical temperature swings are 5-10°F when cooking above 250°F and 10-15°F when smoking below 225°F.
- Hardwired permanent installed temperature sensor, compatible with the OEM temperature sensor.
- Cool-down cycle. The fan runs until the grill temperature drops below 120°F.
- Auto-relight. The controller will attempt to relight the fire if the grill temperature drops too low below the set temperature. If the fire does not relight; the cool down cycle automatically starts.
- 3 Phase Cooking Program: Smoke, Cook, Hold. Set the time and temperature for each phase in the cooking process.
- Food Probe: For use with the cooking program or standalone to monitor the food temperature.
- Auger Bypass. Press a button and the auger runs 100% to get to grilling temperatures faster.
- Optional interface with the STOKER® Power Draft System from Rocks Bar-B-Que. Add the features of the STOKER like remote temperature control and monitoring from a computer or Smartphone or graph the cook with StokerLog running on a PC. Requires an optional cable. The STOKER is available from http://www.rocksbarbque.com.

Compatibility

The Savannah Stoker is a direct replacement temperature controller for most Traeger Wood Pellet Grills but it will not fit in the Traeger Junior or the PTG. It will also control most smokers made by Smokin Brothers, Blaz'n Grills Works, Royall Wood Pellet Grills (except the tailgater), Camp Chef Pellet Grill & Smoker, and Smoke Daddy Pellet Pro. The Savannah Stoker maybe compatible with other wood pellet grills but may requiring modifications to the grill or wiring connectors.

WARNING Electrical Shock Risk!

Electrical power is present to the controller anytime the grill is connected to an AC Power Source. Before attempting to remove or install the controller the grill must be disconnected from the AC Power Source. Failure to do so could result in personal injury from electrical shock and/or damage to the controller. When not in use the grill should be disconnected from the AC Power Source. The controller should be protected from moisture at all times. It is highly recommended the grill be connected to a GFCI outlet or other protected circuit when in use.

SPECIFICATIONS

Grill Temp Sensor RTD	Compatable with the OEM RTD 1000 ohm
Accuracy	0.75%Full scale
Display Resolution	1°F or 1°C
Control Modes	Automatic Control using PID based algorithims Manual Control 3 Step Cooking Program STOKER® Control (optional interconnect cable required)
Fan Output	Zero crossing SSR, 85-240VAC/3A
Auger Output	Zero crossing SSR, 100-240VAC/3A
Igniter Output	Zero crossing SSR, 100-240VAC/10A
Power supply	100-240VAC 50-60Hz
Power consumption	> 300 Watts at startup, 50 Watts normal operation
Ambient temperature	0~50ºC, 32~122ºF
Fuse	5A ATO-ATC blade fuse.
Food Sensor	Stainless steel probe, 750° wires

LIMITED WARRANTY

Sound Solutions, LLC, warrants to the original purchaser, the controller to be free from defects in material and workmanship under normal use for a period of one (1) year from the date of original purchase. The temperature sensors and the STOKER® interface cable are warranted for a period of ninety (90) days.

The warranty shall not apply: (i) to any controller subjected to accident, misuse, neglect, water damage, alteration, acts of God, improper handling, improper transport, improper storage, improper use or application, improper installation, improper testing or unauthorized repair; or (ii) to cosmetic problems or defects that result from normal wear and tear under ordinary use and do not affect the performance or use of the product. If the controller develops a covered defect during the warranty period, Sound Solutions, LLC, will, at its option, either repair or replace the controller, the temperature sensor or the STOKER interface cable at no charge, provided that the controller and/or temperature sensor are returned to Sound Solutions, LLC, during the warranty period

To obtain warranty service contact Sound Solutions for an RMA # by phone: 1-252-746-3367 or email: savannahstoker@suddenlink.net
Return the component(s) along with a copy of the sales receipt to:

Sound Solutions, LLC
4205 Holly Street
Ayden, NC 28513

THE ABOVE STATED WARRANTY IS EXCLUSIVE AND REPLACES ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOUND SOLUTIONS, LLC WILL NOT BE HELD LIABLE FOR ANY OTHER DAMAGES OR LOSS INCLUDING INCIDENTAL OR CONSEQUENTIAL DAMAGES AND LOSS OF PROFITS OR REVENUES FROM WHATEVER CAUSE, INCLUDING BREACH OF WARRANTY OR NEGLIGENCE.

1. Installation

1.1 Required tools.
Medium Size #2 Phillips Head Screwdriver
Small/Narrow Flat Blade Screwdriver
A small towel

1.2 Unplug the grill from the power source.

WARNING Electrical Shock Risk!

Electrical power is present to the controller anytime the grill is connected to an AC Power Source. Before attempting to remove or install the controller it is important the controller is in the OFF position and disconnected from the AC Power Source. Failure to do so could result in personal injury from electrical shock and/or damage to the controller. When not in use the grill should be disconnected from the AC Power Source. It is highly recommended the grill be connected to a GFCI outlet or other protected circuit.

1.3 Assembly of the controller.

If you received the controller in the in our "Green Packing", you will have to attach the controller to the face plate and the wiring harness to the back of the controller.

1) Place a small towel on a flat surface to work over.
2) Remove the controller from the box.
3) Loosen the screws on the metal retainer clips on both ends until you can remove the metal retainer. The screws do not have to be completely removed.
4) Place the controller through the printed side of the faceplate.
5) Replace the retainer clips. The back side of the retainer clip slides in a grove on the controller. Tighten the screws, but not too tight.
6) On the back of the controller loosen the screws at terminals #10, #12, #13, #15, and #16. Each terminal is labeled including with the matching wire color.
Slide the spade connectors under the terminal clips making sure to match the corresponding wire color. Tighten the terminal screws to secure the wires.
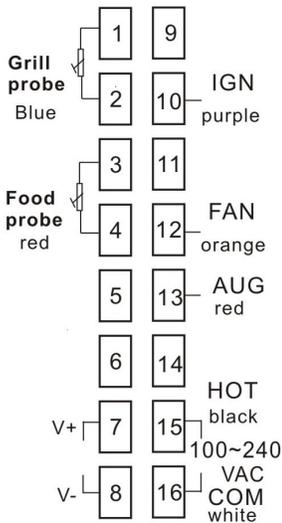
Grill probe Blue — 1, 2
9
10 IGN purple
3, **11**
Food probe red — 4
12 FAN orange
5, **13** AUG red
6, **14**
V+ **7**, **15** HOT black 100~240
V- **8**, **16** VAC COM white

**Figure1.
Terminal Labels**

CAUTION

The wiring must NOT interfere with the draft fan or the auger cooling fan.

If the wires are not connected to the correct terminals the controller will not work properly and could damage the controller when powered up.

1.4 Removing the existing controller.
Your process may vary. The following is for most Traegers.

1) Remove the two screws holding the controller to the pellet hopper saving the screws for use later.
2) Gently pull the controller away from the hopper while sliding it slightly to the right. Rotate the left side toward you so the circuit board (PCB) can clear the hopper opening.
3) Once the PCB is clear, pull apart (disconnect) the 4 wiring connectors by reaching up from bottom side of the hopper with one hand and through the opening with the other.
4) If the controller has 2 white wires connected to the back, remove them using the narrow screwdriver. The 2 white wires run to the Remote Temperature Detector (RTD) located in the cooking chamber.

You can use the existing RTD or install the RTD included with the SSv4. If using the existing RTD go to step 1.7.

1.5 To remove the existing Remote Temperature Detector (RTD).
1) Remove the grill grate and drip tray to provide access to the left side of the grill.
2) Remove the RTD, by removing the screw and lock nut located to the left of the RTD.
3) Pull the RTD up and feed the wires through the hole in the side of the grill and the end rail until the wires are removed.

1.6 Installing a new RTD.
1) Uncoil the wires to the sensor.
2) Tread the wires through the second hole in the end rail (same hole the RTD was in) and then through the hole in the left end of the grill about 1" below the end rail and above the drip tray support. You will have to fold back one of the wire tips on the cable as both will not fit through the hole at the same time.
3) Continue feeding the wires downward between the pellet hopper and the grill body, then up and out the controller cutout.
4) Secure the sensor mounting bracket to the left end rail with the enclosed machine screw.
5) Connect the exposed wire tips of the sensor wire to the back of the Savannah Stoker to **TERMINAL #1** and **TERMINAL # 2** marked **GRILL Probe** see Figure 1. Either wire can go to either **TERMINAL.** Tighten the terminal screws to secure the wire tips..
6) Coil the sensor wires and secure together with a plastic tie.

1.7 Installing the Savannah Stoker.
1) Place the wiring harness of the Savannah Stoker in the hopper opening. Reaching up from the bottom of the hopper, reconnect the wiring matching the correct color coded connector.

RED   = AUGER MOTOR (Small Fan Blade)
ORANGE = DRAFT FAN (Large Fan Blade)
PURPLE = IGNITER (Fiberglass Insulation)
CLEAR   = POWER (Black/White Wires)

2) Place the controller in the hopper opening and re-install the top and bottom faceplate screws and tighten.
3) Working from under the hopper, secure the temperature sensor wires and the controller wires with wire ties to the underside of the hopper so the wires do not interfere with the fans.

2. Quick Start Guide

Yep, instead of reading the rest of the manual you're in a hurry to fire up the smoker and see what the Savannah Stoker can do. Right? Well, for everyone just like you this Quick Start Guide was prepared. So, what are you waiting for! Time to smoke something even it's just air. (air=empty grill)

2.1 Start-up.

NOTE: Refer to your smoker's owner manual for recommended start-up and safety procedures. Always start with a clean smoker for best results.

1) Plug the smoker to a GFCI protected AC outlet, it's a safety thing. The Stand-by indicator will illuminate RED indicating power is present at the controller.
2) Press the Power KEY ⏻. The Stand-by indicator will go OFF. Both displays will flash, and then the top display (PV) will show the current temperature inside the cooking chamber. The bottom display (SV) will be 225. If both displays continue to FLASH the temp sensor is not properly connected. If the temperature in the top display is bouncing around, then you have a bad temp sensor or a loose connection at the terminal screws. The AUG and IGN indicator lights will be ON.
3) After several minutes the pellets will start to smolder and whitish-gray smoke will billow out then change color to that thin blueish smoke. You've seen this before.
4) When the cooking chamber reaches 130°+ the IGN indicator will go OFF, so did the Igniter.
5) The AUG indicator light will cycle ON and OFF.
6) It is normal to overshoot the start-up temperature by 20°+. It will take several cycles for the temperature to stabilize.
7) It's time to cook something! While you're just sitting and watching the controller's displays and smelling the smoke for the next hour or so you could cook some sausage for tomorrow's breakfast.

2.2 Setting the Cooking/Smoking Temperature (SV)

At start-up the temperature (SV) is set to 225° to preheat the grill. After the controller is ON the temperature can be set between 150° - 550°F in one (1°) degree increments. To change the Setpoint Value (SV) press/release the ▼ or ▲ KEY. The decimal point on the lower right corner of the display will start to flash. Press the ▼ or ▲ KEY to change SV until the desired temperature is displayed. The decimal point will stop flashing after no KEY is pressed for 3 seconds. You can press the **A/M KEY** to move the flashing decimal point to the desired digit that needs to change. Then press the ▼ or ▲ KEY to change SV starting from that digit.

2.3 Shut down

1) Set the cooking temperature (SV) to 225° or lower.
2) Once the grill temperature is below 250°, Press the POWER KEY ⏻. The top display will flash "HOT" and the FAN indicator will blink until the temperature (PV) drops below 120°.
3) Opening the cooking chamber door during the cool down cycle will help to eliminate any possible burn back in the auger tube.
4) The controller will power-off and the Stand-by indicator will illuminate RED indicating power is present at the controller.
5) Disconnect the power source.
6) Store the grill & cover. The controller should be protected from the elements. Water damage is not covered under the warranty.

3. The Front Panel

3.1 Understanding the Front Panel.

The number in the circle before each feature refers to Figure 2.

① **Stand by indicator:** Light is on when the controller is connected to a power source but not running. When the controller is running the light will go off and the displays will be on.
② **PV display:** The temperature inside the cooking chamber; commonly referred to as Process Variable or Process Value (PV).
③ **SV display:** When in normal operation mode this is the target temperature; it is commonly referred to as Setpoint Value (SV). When in display mode 2, it indicates the mode the controller is in (Automatic or Manual) and the output value (%).
④ **FAN indicator:** Light blinks when in "Cool Down".
⑤ **IGN indicator:** Light is on when the IGNITER is on.
⑥ **A/M indicator:** Light is on when the controller is in MANUAL MODE.
⑦ **AUG indicator:** Light is on anytime the AUGER is running.
⑧ **A/M KEY:** Automatic/Manual function KEY; Data shift KEY
⑨ **Decrement KEY ▼:** Decreases numeric value of the SV display.
⑩ **Increment KEY ▲:** Increases numeric value of the SV display.
⑪ **SET KEY:** Pressed momentarily, the controller switches the lower display (SV) between setpoint value and percentage of output. When pressed and held for two seconds the controller will enter the Cook Mode, hold the SET for 8+ seconds to access the Operational Parameter setting mode.
⑫ **AUG KEY:** When engaged, the auger runs continuously.
⑬ **Power KEY ⏻:** When the controller is off and the Stand by indicator is RED, press the Power KEY to start the controller. When the controller is ON, pressing the Power KEY will start the "Cool Down" cycle. See 4.1.
⑭ **Food Probe Jack** is located just below the controller.

Figure 2. Front Panel

4. Basic Operations

4.1 Turning the Controller On/Off

To turn the Controller ON:
Connect the smoker to a GFCI protected AC outlet. The Stand-by indicator will illuminate RED indicating power is present at the controller. Press the Power KEY ⏻ . The Stand-by indicator will go OFF. Both displays on the controller will flash. The top display (PV) will show the current temperature inside the cooking chamber. The bottom display (SV) is the desired cooking temperature.

To turn the Controller OFF:
Press the POWER KEY ⏻ , the controller will start the "COOL DOWN' cycle. The top display will flash "HOT" and the fan light will blink until the cooking chamber temperature drops below 120° (the value of Fant). The controller will power-off and the Stand-by indicator will illuminate RED indicating power is present at the controller.

4.2 Changing the Cooking Temperature

Recommended start-up temperature is 225° to preheat the grill, but any start-up temperature can be set between 160° - 550°F in one (1°) degree increments. To change the Setpoint Value (SV) press/release the ▼ or ▲ KEY. The decimal point on the lower right corner of the display will start to flash. Press the ▼ or ▲ KEY to change SV until the desired temperature is displayed. The decimal point will stop flashing after no KEY is pressed for 3 seconds. You can press the **A/M KEY** to move the flashing decimal point to the desired digit that needs to change. Then press the ▼ or ▲ KEY to change SV starting from that digit.

4.3 Changing the Display Mode

Display Mode 1
When the controller is first turned ON it will be in **Display Mode 1.** The PV display (top) shows the temperature inside to cooking chamber. The SV display (bottom) shows the target temperature of the cooking chamber. If the Food Sensor is connected it will display the Food Temperature. When the Cook Program is running the display will alternate between Display Mode 1 and the Cook Program displays.
Refer to Section 6 for using the Cook Program.

Display Mode 2
If you want to watch the controller in action press/release the **SET KEY** to enter **Display Mode 2.** The SV display changes to show the auger's output as a % of the cycle time (t). Example: If the SV display is "A 60", the "A" indicates the controller is in the "Automatic Control Mode", and "60" indicates the auger is running 60% of the cycle time. This value typically changes at the start of each cycle.
When in **Display Mode 2**, press/release the **A/M KEY** and the "A" in the SV display will change to what looks like an "M" to indicate **Manual Control Mode** and the "**A/M" indicator light will be on**. Press/release the A/M KEY to change back to **Automatic control mode**. Press/Release the SET KEY to return to Display Mode 1.

Refer to the Section 5.2 on the use of "Manual Control Mode".

4.4 Using the Auger Bypass Feature

Press/release the **AUG KEY** to run the Auger continuously bypassing the Control Modes. The (SV) display will flash "ACC" and the last set temperature when the Auger Bypass feature is being used. Press/release again to return to normal operation. The Auger Bypass feature is typically used for high temp grilling or to raise the grill's temperature more quickly than Automatic Mode.

⚠️ **Caution: When using Auger Bypass Mode the cooking chamber, drip tray, and the grease drain system should be clean. Cooking at high temperatures increases the risk of having a grease fire. Never leave the grill unattended. Always return the auger to normal operation before turning off the grill.**

4.5 Using the Food Probe.

The Food Probe can be used with the Cook Program or independently to monitor the food temperature. The probe can be connected or disconnected at any time to the jack on the faceplate just below the POWER KEY ⏻ . When connected to monitor the Food Temperature the displays will cycle between the Grill and the Food Temperatures

4.6 Running Auto-tune.

In most cases the controller is very adaptive and works well with the default parameter values, but every grill and cooking condition are different. If temperature swings at 225°F are consistently greater than 10-15° then running Auto-tune may improve the controller's performance. To start Auto-tune, let the grill's temperature stabilize for 20-30 minutes @225°. With the temperature above 225° but descending, Press and Hold the SET KEY for 8 seconds; the top display changes to "IGN" and the bottom display to "130". Press/release the SET KEY twice to advance to the "AT" parameter. Use ▲ or ▼ KEYS to change the lower display value to 2. This will start Auto-Tune. During the process the displays will flash. Once complete the displays return to normal operation. This could take 30 minutes or longer.
Refer to the Section 7.3.2 on the use of "Auto-tune".

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5. Control Modes

The controller operates in 4 different Control Modes:

AUTOMATIC: The controller maintains the set temperature.
MANUAL: The user manually sets the auger feed rate (runtime).
STOKER: Using the STOKER® Power Draft System from Rocks
Bar-B-Que to control the cooking temperature www.rocksbarbque.com .
PROGRAMABLE COOK: Unattended 3 phase cooking process.

5.1 Automatic Mode

Automatic Control Mode is the normal operational mode of the controller. Every time the controller is turned on it will be in Automatic Control Mode where the controller maintains the desired temperature typically within 5-10°F when cooking above 225°F and 10-15°F when smoking below 200°F. Every grill and cooking environment is different so your results may vary.

How it works, if you really want to know.
   The controller measures the temperature of the sensor in the grill, compares it to the target temperature, and then runs the auger a percentage of the cycle time (t) to maintain the target temperature. The controller uses "PID control Software" to determine the auger runtime %. The controller also runs the auger a minimum amount each cycle time to maintain the fire much like a pilot light.

Cycle Time Defined.
   Cycle time is a time period (in seconds) the controller uses to calculate the auger's runtime. Example: When the cycle time parameter is set to t=20, and the controller has determined the output for the next cycle should be 25%, the auger will run for 25% of the cycle time, being 5 seconds at the start of the next cycle and will be off for the remaining 15 seconds of the cycle. The default cycle time is 20 seconds.

What the heck is "PID"?
   A PID controller is a loop feedback mechanism widely used in automated processes like the cruise control on your car. As the name implies, the controller involves three separate constant parameters: the Proportional, the Integral and Derivative values. Simply put, these values can be interpreted in terms of temperature: "P" depends on the present "error", "I" on the accumulation of past "errors", and "D" is a prediction of future "errors", based on current rate of change over a period of time. The weighted sum of the PID values is used to calculate the auger runtime to maintain the temperature. This adjustment is made at the start of each cycle time.
   Refer to 7.3.3 for information about the PID parameters.

5.2 Manual Mode.

   Manual Control Mode allows the user to manually adjust the auger runtime as a percentage of the cycle time (parameter "t") between the values of parameters OutL and OutH.

   Placing the controller in Manual Control Mode
   This is best done in 2 steps.
   First with the controller in Display Mode 1 press/release the SET KEY to enter Display Mode 2. The SV display changes to show the auger's output as a % of the cycle time (t). Example: If the SV display is "A 60", the "A" indicates the controller is in the "Automatic Control Mode", and "60" indicates the auger is running 60% of the cycle time. This value typically changes at the start of each cycle.

Now press/release the A/M KEY to place the controller in Manual Control Mode. The "A" in the SV display will change to what looks like an "M" to indicate Manual Control Mode and the "A/M" indicator light will be on. Pressing the ▼ or ▲ KEYs will lower or raise the auger runtime %. Press/release the A/M KEY to change back to Automatic control mode.

Notes: Manual mode will be running the last output value when the controller was in Automatic Mode.
   The auger's runtime % cannot be set lower than the OutL parameter value.
   The A/M Key has 2 functions. It places the controller in Manual Mode or is used as a data shift key if press after either ▼ or ▲ KEYs were pressed to change the data.

5.3 STOKER® Control Mode

If you own the STOKER® Power Draft System from Rocks Bar-B-Que www.rocksbarbque.com you already know it's capabilities like food and grill temperature monitoring; accurate temperature control of a wood or charcoal smoker; web browser interface to access and remotely control the STOKER from any Smartphone or computer; and several third party programs and apps to make it even easier. You could use all of these features with a pellet grill except temperature control. But the game changes with the Savannah Stoker; just connect it to the Stoker with the optional interface cable to add remote temperature control of your pellet grill. The interface cable is available from Sound Solutions, LLC. Contact information is in the Warranty Section on Page 1.

Instructions on using the STOKER® Power Draft System with the Savannah Stoker are included with the interface cable.

5.4   Programmable Cook Mode

Programmable Cook Mode provides unattended cooking through a 3 phase cooking process: **Smoke, Cook,** and **Hold**. Since a pellet smoker produces more smoke at lower temperatures the **Smoking Phase** is used to smoke the food for several hours to impart that wonderful smoke flavor to the food. After the food is smoked at the specified temperature and time the controller will start the **Cooking Phase**. The smoker's temperature is automatically increased to the higher cooking temperature where the food is cooked for a set time or to a specific food temperature when using the Food Probe. After the cooking phase is complete the controller will change to the **Hold** temperature to keep the food warm**.**

COOK MODE Parameter Values.

Access the Cook Program by Holding the SET key for 3 seconds until the top display (PV) shows "**CPro**". Use the ▼ or ▲ KEYs to select one of the 3 options in SV display: **OFF, UPDATE**, or **RUN** then press the SET key to select that option.

OFF   = Turns the Cook Program OFF, and exits the menu.

RUN   = Used to start the Cooking Program. The user will set the time and temperature for the 3 phases in the program. Once all of the parameters are set, the Cooking Program will immediately start the Smoking Phase.

UPDATE= Allows the user to review and update the time and temperature parameter values for the 3 phases in the Cook Program without starting the program. If the Cook Program is running the values are updated.

Cook Mode continued from page 5

If **RUN** or **UPDATE** were selected the **Cooking Parameters** menu is displayed. The (PV) display shows the parameter name, the (SV) display is the current value. Use ▲ and ▼ to modify the current value. Press/release the SET KEY to advance to the next parameter. After the last parameter is displayed, press/release the SET KEY to exit. If RUN was selected the cooking program will start.
The parameter values are retained in memory and are not lost when the controller is turned OFF.

The parameters will appear in the following order.

Stp   = Smoking temperature (160-180°)
Stt   = Smoking time in minutes
FanS = Fan Speed: 3= normal, 2=medium
Ctp   = Cooking temperature
Ctt   = Cooking time in minutes
Food = Food temperature
Hold   = Hold Temperature (150-160°)

Refer to table #3 for suggested smoking times and temperatures to help get you started.

Notes about Table 3:
1) The temperature is in degrees Fahrenheit, time is in minutes.
2) The above Smoking and Cooking times and temperatures are approximate and should be adjusted to your cooking methods and desired level of doneness.
3) When cooking using the food probe it is best to undercook the food by several degrees because it can take 10-15+ minutes for the cooking chamber temperature to drop to the Hold temperature.
4) All food should be cooked to the minimum food temperature as recommended by the USDA.

Key points:

The Cooking Program can be stopped by setting Cook Mode "CPro" to OFF or cycling the controller OFF for 3+ seconds, then back ON. Once started, the Cooking Program cannot be paused, only Stopped. .

When the Cook Program is running the displays will cycle between the smoker's temperature and the time remaining in the current cooking phase or the food temperature if the food sensor is connected. When the Hold phase starts, the displays will cycle between the smoker's temperature and the elapsed time since Hold started.

When the controller is turned ON the Cook Program will be set to "OFF" and elapsed times of the cooking phases are reset to zero.

If the Food Probe is not connected to the controller the Cook Phase defaults to cooking by time.

The Food Probe can be connected to the controller at any time during the Smoking or Cooking Phase. The controller will automatically recognize the Food Probe and cook to the specified food temperature.

When cooking by food temperature it is best to undercook the food by several degrees because it can take 10-15+ minutes for the cooking chamber to drop to the hold temperature.

The time of the Smoking or Cooking phase can only be changed through the cooking parameters by setting "CPro" to "UPDATE" and paging though the parameter list to the parameter value to be changed. Once changed, the program will use the new value.

The temperature of the current phase can be changed by using the ▲ and ▼ KEYS on the front panel or through "CPro" as outlined above.

Food	Smoking Phase		Cooking Phase		Food	Hold Warm
	Temperature	Time	Temperature	Time	Sensor	Temperature
Whole Brisket	170°F	420	250°	480	203°	150°-160°
Pork Butt 7-10 lbs	180°	240	225°	600	202°	150°-160°
Brisket and Pork	180°	360	240°	480	203°	150°-160°
Full Slab Ribs	180°	60	250°	240	N/A	150°-160°
St. Louis Cut Ribs	180°	60	275°	180	N/A	150°-160°
Baby Back Ribs	180°	60	275°	150	N/A	150°-160°
Whole Chicken	180°	30	325°	120	165°	150°-160°

Table 3. Cook Program Suggested Times and Temperatures

7. Operational Parameters

7.1 Operational Parameters.

The Savannah Stoker has various operational parameters. The default values will control most pellet grills with satisfactory results. In some instants the values may need to be changed to achieve better results. Some users may also want to tweak the parameters. One example is changing the cycle time when smoking at 180°. Increasing the cycle time (t) will produce more smoke but will also increase temperature swings. Other parameters the user needs to access: "AT" to start Auto-Tune, "OutL" to change the auger's minimum runtime; OutH to change the maximum auger runtime; and FanS to change the fan speed.

7.2 Accessing and Changing Parameter Values.

Access to the operational parameters is gained by Pressing and Holding the SET KEY for 8 seconds until the top display (PV) changes to "IGN" and the bottom display (SV) to "130". The PV display shows the parameter name, the SV display is the current value. Use ▲ and ▼ KEYS to modify the current value. Press/release the SET KEY to advance to the next parameter. After the last parameter is displayed, press/release the SET KEY to exit. All of the new parameter values are automatically stored.

7.3 Operational Parameters Defined.

Figure 3 below shows the system Operational Parameters in order as they appear when paging through them as outlined above (6.2). Beside each parameters name is a brief Description, Setting Range, Initial Setting value, and Remarks. There is no retrieval of the default values once changed. If you need to restore the default values they have to be reset manually.

NAME	Description	Setting Range	Initial Setting	Remarks
IGN	Ignitor OFF temp	100-200 °C or °F	130	See 7.3.1
Hy	ReLite Hy Band	0~50 % of SV	5	See 7.3.1
At	Auto tuning	0~3	3	See 7.3.2
I	Integral	0~9999 Seconds	141	See 7.3.3
P	Proportional	1~9999 °	53	See 7.3.3
d	Derivative	0~2000 Seconds	35	See 7.3.3
t	Cycle time	2~125 Seconds	20	See 7.3.4
Pb1	Grill Sensor Cal	-50+50 °F or °C	0	See 7.3.5
Pb2	Food Probe Cal	-50+50 °C or °F	0	See 7.3.5
OutL	Output low limit	0~100 %	15	See 7.3.6
OutH	Output high limit	0~100 %	85	See 7.3.6
C-F	Temp Display	C, F	F	See 7.3.7
ASCH	Food Sensor Display	SV or PS2	PS2	See 7.3.8
Fanb	Fan Speed	1,2,3	3	See 7.3.9
Fant	Fan off Temperature	100-150	120	See 7.3.10

Figure 3.
Operational Parameters

7.3.1 "IGN" and "HY" Control the Igniter's ON/OFF Temperatures

The parameters IGN and HY are used together to control the igniter's functions.

IGN parameter: Value is in degrees. This is the grill temperature the igniter will turn off after startup.

HY parameter: Value is a percentage of the set temperature and is used in the relight program. A value of zero (0) will disable the relight program.

How it works:

Every time the controller is turned ON the Igniter comes ON for 4 minutes and will remain ON until the cooking chamber temperature reaches the value of parameter "IGN". Once the grill's temperature (PV) is above the set temperature (SV) the relight program automatically starts monitoring the temperature drop. If the temperature (PV) drops lower than the set temperature by (SV*HY) the igniter will come back ON. If the temperature does not recover within 12 minutes the controller will start the cool down cycle. The controller detects if the cooking chamber door has been opened for an extended time and pause the relight program.

7.3.2 "At" Auto-Tune

Parameter **"AT"** is used to start the Auto-tune process.

At=1 Sets Auto-Tune in delayed start. The Auto-tune process is delayed until the A/M KEY is pressed. This is the preferred method to start auto-tune.

At=2 Auto-tune will start in 10 seconds.

At=3 Normal controller operation. After auto-tune is complete the controller automatically sets the value to 3.

When to Run Auto-tune:

In most cases the controller is very adaptive and works well with the default parameter values for P,I,D, but every grill and cooking conditions are different. If temperature swings at 225°F are consistently greater than 10-15° then running Auto-tune may improve the controller's performance by determining new values for the PID parameters.

Preferred Method to Start Auto-tune:

1) Write down you current values for I, P, and D for future reference.
2) Set the temperature (SV) to 225°F.
3) Let the grill's temperature stabilize for 20-30 minutes.
4) Set Parameter At=1
5) Start Auto-tune by pressing the "A/M" KEY when the temperature reading (PV) is above the target temperature but is descending.
6) The "At" symbol will blink in the lower display (SV) during the Auto-tune process.
7) If you need to stop the Auto-tuning process, press and hold the "A/M" KEY for about 2 seconds until the "At" symbol stops blinking in the lower display window.

During the Auto-tune process the controller will execute 2-3 cycles. The microprocessor in the controller will analyze the period, amplitude, and waveform of the temperature oscillations and calculate the optimal PID control parameter values. When Auto-tune is complete the controller will return to performing accurate artificial intelligence control using the new values.

If the Auto-tune results are not satisfactory, you can manually fine-tune the PID constants for improved performance. Or perform auto tune again. Sometimes the controller will get better parameters.

Operational Parameters Defined continued from page 7

7.3.3 PID Control Parameters Explained.

Please note the controller uses an enhanced version of PID control algorithms. Tuning of the controller is different than traditional PID controllers. The parameters are explained below.

If you are having issues with your grill holding the temperature within 5-10° when cooking above 225° or 10-15° when smoking below 200° then you should run auto-tune before adjusting the P,I, or D parameters.

Before making adjustments to the PID parameters make a record of your current settings. After making changes let the grill stabilize for 30-45 minutes and evaluate the results. What works best at 250° may not give the same result @180°. Keep good notes.

Proportional Band "P"

The unit is in degrees.

This parameter controls the output of the controller based on the difference between the measured and set temperatures. The larger the "P" value means the weaker the action (lower gain). For example, if P=20, the proportional band is 20 degrees. When the PV reading is 20 degrees or more below the set point (SV), the controller will have 100% output (or the value of OutH, see 6.3.7). When the temperature is 10 degrees below the set point, the output is 50%. When the temperature is equal to the setting, the controller will have 0% output (assuming integral and derivative functions are turned off). This constant also affects both integral and derivative action. Smaller P values will make both integral and derivative action stronger.

Typical values for "P" would be in the range of 20-40°F

If you change from Fahrenheit to Celsius, divide "P" by 1.8.

When changing "P" use small steps of 1 or 2.

Integral time "I"

The unit is in seconds.

This parameter controls the output of controller based on the difference between the measured and set temperature integrated with time. Integral action is used to eliminate temperature offset (both above and below set point, SV). A larger number means slower action. e. g. assuming the difference between the measured and set temperature is 10 degrees and remains unchanged, the output will increase continuously with time until it reaches 100%. When the temperature fluctuates more than 15° (when above 250°) an increase of the integral time may be needed. Decrease if the controller is taking too long to eliminate the temperature offset.

When I=0, the system becomes a PD controller.

Typical values for "I" would be in the range of 80-300 seconds, but the recommend setting for "I" is 4 times the value of "D", I=Dx4.

Derivative time "D"

The unit is in seconds.

Derivative action contributes to the output power based on the rate of temperature change. Derivative action can be used to minimize the temperature overshoot by responding to the rate of change. The larger the number, the faster the action will be, e.g. when the cooking chamber door is opened, the temperature will drop at very high rate. The derivative action will change the controller output based on the rate of change rather than the net amount of change. This will allow the controller to act sooner.

Increases to "D" will decrease overshoot, and improve settling time, Typical values for "D" would be in the range of 20-75 seconds. When changing "D" use small steps of 2-3.

If you change "D" also change "I" to 4 times the value of "D", I=Dx4.

7.3.4 "t" Cycle time

Cycle time **"t"** is a time period (in seconds) the controller uses to calculate the auger's runtime. This is also known as the duty cycle. Default is 20 seconds.

Example: If the cycle time parameter is set to **t=20**, and the controller has determined the output for the next cycle should be 25%, the auger will run for 5 seconds at the start of the next cycle and will be off for the remaining 15 seconds of the cycle.

Notes: The default value for the cycle time is 20 seconds. This gives the best performance for most stock configured grills. The controller also runs the auger a minimum amount each duty cycle to maintain the fire much like a pilot light. The minimum amount is controlled by parameter "**OutL**", and the maximum limit is controlled by parameter "**OutH**".

If the cycle time is less than 20 seconds the auger may not run long enough during each duty cycle to maintain the fire. Before lowering the value of either the cycle time or OutL, refer to section 6.4 "How to Determine the Lowest Stable OutL Value".

Larger cycle times typically give larger temperature swings except on large insulated cookers where a cycle time of 45 or 60 may give the best performance.

7.3.5 "Pb" Sensor Calibration Offset

Pb1 is used to calibrate GRILL temperature sensor.
Pb2 is used to calibrate the FOOD probe.

Test the sensor against a reference sensor known to be accurate in slow boiling water or in an ice/water surly.

If the sensor is reading <u>lower</u> than the reference sensor, enter this as a positive value; reading <u>higher</u>, enter this as a negative value.

7.3.6 "OutL" and "OutH" Auger Runtime Limiters

OutL and **OutH** are runtime limits of the auger. The value is a percentage of the total cycle time, parameter "t".

OutL is the minimum % of the cycle time the auger will run at the start of each cycle. Default is 15%. A minimum run time is required to maintain the fire. See the top of the next column. Example: With a cycle time t=20, and **OutL**=15, the auger will run for 15% of the 20 second cycle time or 3.0 seconds.

OutH is the maximum % of the cycle time the auger will run.

Default is 100%. The high limit is used to help reduce temperature overshoots that will occur at start-up, after the cooking chamber door is opened, and after the target temperature is increased. The default value works well with most grills. On small grills better performance is achieved with a lower value of 70 or 80.

> **⚠ CAUTION:**
> **A pellet grill requires a minimum amount of fuel feed per cycle time to maintain the fire.**

If **OutL** is too low the fire will go out; too high and the smoking temperature will be too hot on very hot days. The default value will give satisfactory results with most stock pellet grills. **If you need to change the OutL value refer section 7.4.**

Operational Parameters Defined, continued from page 7

7.3.7 "C-F" Selecting Fahrenheit or Celsius

Parameter **C-F** is used to change between Celsius and Fahrenheit.
F= Fahrenheit (default)
C= Celsius
If changing to Celsius, Change the value of "P", See Section 6.3.3

7.3.8 ASCH Food probe display.

This is used to control the display of the food probe reading when using the food probe without the cooking program.

7.3.9 "FAnB" Fan Speed

FAnB is used to change the fan speed.

3= Normal fan speed

2= Medium Fan Speed (use for smoking below 200°)

1= Low Fan Speed. (only use when cold smoking)

Note: Before changes the fan speed can be made, the Cook Program has to be run. If you do not want to use the cooking program the work around for this is to select "RUN" in the cooking program, page through all of the parameters, then enter the cooking program again and select "OFF"

7.3.10 "Fant" Fan Shut Off Temperature

The unit is degree. When the controller is turned off, the fan will continue to run until the cooking chambers temperature is cools down to the temperature set by **Fant**. For example, if the **Fant** is set to 120, the display will flash between "Hot" and "current smoker temperature", until the smoker temperature drops to below 120 degree.

7.4 How to Determine the Lowest Stable Value for OutL.

1) Start the grill normally. Set the target temperature to 225°F. Let the temperature stabilize for 20-30 minutes.
2) Change the parameter values of: t=20 and OutL = 10.
3) Change the controller to Manual mode. See section 5.2
4) Press the ▼ or ▲ KEYs to set the value in the lower display to 15.
5) The grill's temp will slowly lower until it stabilizes. This could take 30-45 minutes or longer. If the grill's temperature (PV) drops below 160° raise the output value by 2.
6) After the temperature becomes stable; take the average temperature; then, do one of the following:

   If above 180° lower the SV value by 1, retest
   If above 190° lower the SV value by 2, retest
   If below 160° raise the SV value by 1, retest
   If below 150° raise the SV value by 2, retest
   If the average is between 160-170°, do nothing.
   You have a found the most stable value for OutL.
   Enter this value as the value of parameter OutL.

Space for your notes.

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USERS GUIDE

SAVANNAH STOKER v4

TEMPERATURE CONTROLLER
FOR THE WOOD PELLET GRILL

A PID based artificial intelligent temperature controller that allows you to control your wood pellet grill or smoker with *"simplicity but infinite control"*.

Compatibility

The Savannah Stoker is a direct replacement temperature controller for most Traeger Wood Pellet Grills but it will not fit in the Traeger Junior or the PTG without modifications to the grill or an adapter plate. It will also control most smokers made by Smokin Brothers, Blaz'n Grills Works, Royall Wood Pellet Grills (except the tailgater), and Smoke Daddy Pellet Pro. The Savannah Stoker maybe compatible with other wood pellet grills but may requiring modifications to the grill or wiring connectors.