Instruction Manual

RDK-300B Supplementary Manual

Version 1.1 (May 20, 2024)

1. Introduction

This is a supplementary manual for the RDK-300B hot runner coil heater. Only the advanced parameter settings will be covered in this manual. Please check the main instruction manual for a quick guide. Advanced parameters are divided into groups and can be accessed by entering a special access code.

2. Overview

2.1 Operating Mode

There are two operating modes: Standard Mode and Boost Mode.

Standard Mode	* Controller heats the coil heater to the current set temperature. * Adjust the set temperature at any time by using the control knob.
Boost Mode	* Controller heats the coil heater to the current set temperature. * Quick cycling between pre-programmed standby and boost temperature. * Adjust standby and boost settings in the 122 menu. * Three pre-programmed boost modes available.

2.2 Parameter Menu

All parameters are grouped into three menus; each menu has its access code.

Code	Menu
122	Boost mode parameters
166	Temperature control parameters
155	System parameters
366 *	Power button setting

Note: * The 366 menu is only available in firmware v2.2.0.

2.3 Basic Operations

2.3.1 Switching Operating Mode

To switch between the Standard Mode and a Boost Mode, please follow the operations described in the table and the flow chart below:

1) Rotate the control knob in either direction for at least 180° to bring up the mode-selection menu.
2) Turn the knob slowly to change the mode (a dot will be flashing at the lower right corner).
3) Select the mode by pressing down the control knob.

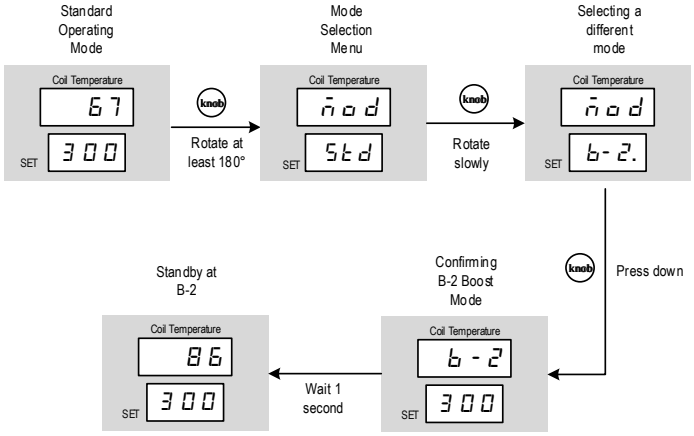

Figure 1. Flow chart of how to switch operating mode.

2.3.2 Adjusting Set Temperature

Operations to change the set temperature are different in standard mode and in boost mode. Please see the operations described in the table below.

Adjusting Set Temperature	**Standard Mode**	1) Press down the control knob to bring up a flashing dot at the lower right corner. 2) Turn the knob in either direction to change the value. 3) Save the new set value by pressing down the knob.
Adjusting Set Temperature	**Boost Mode**	1) Press down the control knob to switch between the standby temperature and the boost temperature. 2) If you want to change the standby temperature or boost temperature, go to menu 122.

2.3.3 Accessing Parameter Menus

To access a menu, please follow the steps below:

1) Press down the control knob for 5 seconds to bring up “LCK” to the top LED.
2) Turn the knob to change the number in the lower LED to the access code of a menu you want to enter.
3) Press down the knob to confirm and enter the menu.
4) Turn the knob to change the value of parameter; press down the knob down the confirm the change and go to the next parameter.

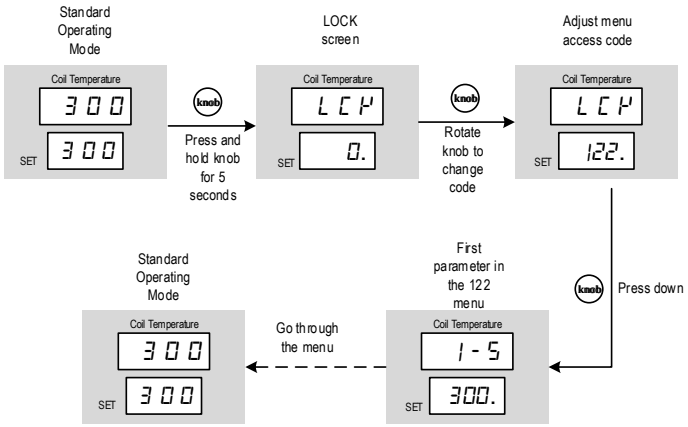

Figure 2. Flow chart of how to access a menu.

3. Boost mode settings (access code 122)

A boost mode is an operating mode on RDK-300B that allows the user to quickly cycle between two set temperatures, a lower standby temperature and a higher boost temperature, by simply pressing down the control knob. There is no need to turn the knob back and forth to adjust for the desired set temperature. A boost mode also allows the user to set up a boost timer which automatically lowers the set temperature from boost to standby after a period of time.

Three (3) boost modes are available, which are named as "**b-1**", "**b-2**", and "**b-3**". There are three parameter settings for each boost mode: standby temperature (x-**S**), boost temperature (x-**b**), and boost timer (x-**t**), where "x" represents the boost mode number. A user can adjust and save customized settings for each mode in the menu of 122.

Table 1. Parameters for boost modes (code 122).

Symbol	Mode	Description	Range	Initial
1-S	b-1	Standby temperature	0 ~ Boost Temp.	300°F
1-b		Boost temperature	Standby Temp. ~ 999	550°F
1-t		Boost timer	OFF, 1-999	OFF
2-S	b-2	Standby temperature	0 ~ Boost Temp.	300°F
2-b		Boost temperature	Standby Temp. ~ 999	550°F
2-t		Boost timer	OFF, 1-999	OFF
3-S	b-3	Standby temperature	0 ~ Boost Temp.	300°F
3-b		Boost temperature	Standby Temp. ~ 999	550°F
3-t		Boost timer	OFF, 1-999	OFF

Details about each boost mode setting

x-**S**. Standby temperature. It is a relatively low set temperature at which the user feels comfortable to leave the coil heater for a long time when the heating system is not in use. The standby temperature must be lower than the boost temperature.

x-**B**. Boost temperature. It is a high set temperature at which the user is going to use the coil heater. The boost temperature must be higher than the standby temperature.

x-**T**. Boost timer. It is a timer for boost temperature. Once the timer is reached, the controller will automatically switch set temperature back to the standby temperature. A user can also deactivate the boost timer by setting it to "**OFF**", which means the set temperature will remain at the boost temperature till the user press down the control knob.

4. Temperature control parameters (access code 166)

This group of parameters is for adjusting the temperature control performance. Table 1 shows the list of parameters, their range and the initial factory settings. For most heating coils and nails on the market, the ***P***, ***I***, and ***d*** do not need to be changed. Please do **NOT** change them unless you are very familiar with manually tuning PID controllers. In most cases where the control result is not ideal, adjusting the "***oth***" should be able to solve the problem.

Table 2. Temperature control parameters and the initials (code 166).

Symbol	Display	Description	Range	Initial
P	p	Proportional band (in 0.1 degree)	0-999	125
I	I	Integral constant (second)	0-999	60
d	D	Derivative constant (second)	0-999	10
oth	OTH	Output high limit	0-100	100%
C-F	C-F	Temperature unit	C or F	F
APo	APO	Auto power-off timer	OFF, 1-999	60

Details about each parameter

- ***P***. Proportional band. The unit is in degrees. This parameter controls the output of the controller based on the difference between the measured and set temperature. The larger the ***P*** value, the weaker the action (smaller gain). For example, if ***P*** = 7, the proportional band is 7 degree. When the sensor temperature is 7 degrees below the set point, it is out of the proportional band, and the controller will have 100% output. When the temperature is 5 degree below the set point, the output is 71%. When the temperature is equal to the set point, 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 the both integral and derivative action stronger.
- ***I***. Integral time. The unit is in seconds. This parameter controls the output of controller based on the difference between the measured temperature and the set temperature integrated with time. The integral action is used to eliminate temperature offset. Larger number means slower action. For example, when the difference between the measured and the set temperature is 2 degrees and remains unchanged, the output will increase continuously over time due to the contribution of the integral term until it reaches 100%. If the temperature fluctuates up and down constantly (system oscillating), increase the integral time ***I***. If the controller is taking too long to eliminate the temperature offset, decrease the ***I***. Usually this parameter does not need to be changed.
- ***d***. Derivative time. The unit is in seconds. The derivative term 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 temperature change. The larger the ***d*** value, the faster the reaction. The derivative term changes the controller output based on the rate of temperature change rather than the net amount of temperature change. This will allow the controller to react to temperature change sooner. It can turn the heater to full power before the temperature drops too much. Usually this parameter does not need to be changed.

- ***oth***. Output high limit. The unit is percentage (%). It allows you to set the high limit of the output. It can be used when you have an overpowered heater to control a small subject. For example, if you have a 250 W heater and set the ***oth*** = 40, the heater will be used as a 100 W heater (250 x 40% = 100). User may need to change this parameter if your heater is not 250 watt and want to improve the performance. For example, set it to 50 if you have a 200 W heater; set it to 100 if you have a 100 W heater. Larger ***oth*** value makes the system heats up faster, but can cause temperature overshot and fluctuation. Smaller ***oth*** increases the heat up time.
- ***C-F.*** Temperature unit setting. You can set the display to either Celsius or Fahrenheit.
- ***APo.*** Auto power-off time. This parameter is defined for how long the built-in timer will automatically shut off the controller. This mechanism will preserve the coil life and make the system safer, in case the user forgot to turn the power off. This timer will start to count once this controller is turned on. By default, it is set to 60 minutes. It can be set to maximum 999 minutes, or you can turn this function off.

5. System parameters (access code 155)

Five parameters are included in this section: **PSL**, **HL**, **LL**, **VER**, and **RST**.

Table 3. System parameters (code 155).

Symbol	Display	Description	Range	Initial
PSL	PSL	Temperature correction coefficient	1.00-9.99	1.00
HL	HL	High limit, cut-off temperature	0-999	900
LL	LL	Low limit, cool-off temperature	0-999	100
uEr	VER *	Firmware version, display-only		
rSt	RST	Factory reset	n, y	n

Note: * VER parameter is only available for RDK-300B with firmware v2.0.9 or later.

Details about each parameter

PSL. Temperature Correction Coefficient, allows the user to adjust the displayed temperature so that it can closely show the surface temperature (of the object being heated by the coil heater) instead of the coil temperature. The temperature sensor, a type K thermocouple, is located at the tip of the coil. The actual temperature on the surface of the object is normally lower than the coil. Figure 3 shows temperature variations over the coil/nail assembly.

Figure 3(a). An Infrared thermal image of Auber 15.8 mm coil/nail assembly. SV =550F. The temperature reading at the top left corner is from circle at the center.

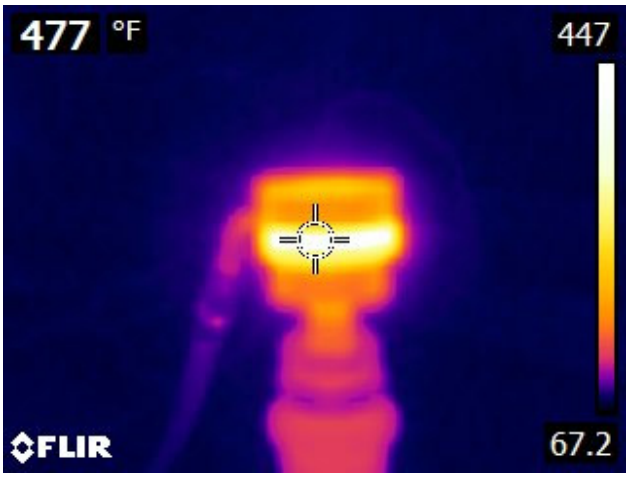

Figure 3(b). An Infrared thermal image of Auber flat coil/universal nail assembly. SV = 600F. Side view. The temperature reading at the top left corner is from circle at the center.

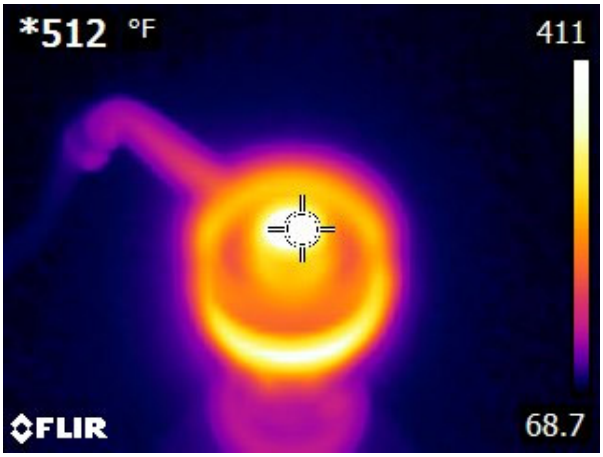

Figure 3(c). An Infrared thermal image of Auber flat coil/universal nail assembly. SV = 600°F (Top view). The temperature reading at the top left corner is from circle at the center.

The temperature difference is determined by the thermal conductivities, the surface/mass ratio, and the ambient temperature. This temperature difference between the tip of the sensor and the ambient temperature is proportional to the coil temperature over the entire heating range. The correction is done by multiplying the measured temperature by a coefficient ***PSL***. The default value is 1.00, which means no correction applied (see Table 4). **For the 15.8 mm coil and nail that we offer, PSL should be set to 1.28 if you want the display to show the nail temperature.**

Table 4. PSL for all Auber coils and nails combinations.

PSL	Auber Coil	Auber Nail
1.28	15.8 mm coil	Either female nail or male nail
1.13	Flat coil	15.8 mm universal nail
1.03	20.0 mm coil	20.0 mm universal nail

Note: For coil and nail systems that are not provided by Auber, the user can measure the surface temperature of a nail with a thermometer. 1) The nail temperature can be measured by inserting a type K thermocouple with a fine tip such as Auber's TC-K5 to the hole on the nail. User should not use the reading from a single point infrared thermometer because it is very sensitive to the measuring location, as shown in Figure 3. 2) Then, divide the coil temperature on the controller by the nail temperature will give you the ***PSL*** ratio. For example, if the surface measures 580F while as the controller reads 700°F, then, ***PSL*** = 700 / 580 = 1.20.

HL is the parameter designed for setting a maximum controlling temperature. This feature can mechanically cut off the heater once the coil temperature got out of control; no matter it's due to an operation error or SSR failure. When reading temperature is over this cut-off temperature, the built-in relay will be activated to cut off the power to the coil immediately. This relay will be deactivated when reading temperature is equal or lower than **HL**. If your set temperature **SV** < **HL**, it has no effect on the control; but if your **SV** > **HL**, it will heat up the coil above **HL**. Controller will cut off the power to the coil once it reaches **HL**, which makes the coil cannot go higher than **HL**.

LL sets the low limit of the cooling off temperature. When the controller is turned off, it will display "HOT" till the coil temperature cools down below the temperature value set in LL. By factory default, LL = 100°F.

VER is a display-only parameter, which shows the controller's firmware version. This parameter is available in firmware v2.0.9 or later.

RST is the parameter to reset all parameter values back to factory settings.

6. Power Button Setting

Table 5. Power button setting (code 366).

Symbol	Display	Description	Range	Initial
Pbd	BPD	Power-button-disable	N, Y	N

Details about the parameter

PBD is the parameter that that allows a user to disable or enable the Power Button on the RDK-300B. Its default setting is "n", which enables the power button. This means that after the user connects the RDK-300B controller to a power source, they need to press the power button to turn on the controller. When **PBD** is set to "y", the power button is disabled. In this setting, the controller will automatically turn on when it is connected to a power source and turn off when it is disconnected. This function is suitable for users who want to use a Wi-Fi plug/switch or a timer plug to control the power without needing to press the power button.

7. Troubleshooting

1) Why the top LED show "***-H-***"?

No coil heater is plugged in, or no sensor is detected by the controller.

2) The coil can't reach the set temperature.

Before you connecting a coil to RKD-300B controller, please confirm the coil has the same pin assignment as the controller.

If the coil temperature won't rise at all, stays at room temperature, it could be that the coil's heater is not working, or the controller's output has failed.

If the coil can heat up to a temperature close to the set temperature but it won't converge to the set point, check the output status indicator. If the indicator remains blinking for a long time and won't turn solid, it is a PID parameter tuning issue. If the indicator gradually turns to solid but the temperature still won't reach the target, it's probably the heating element in the coil is not powerful enough to overcome the heat loss.

3) The coil appears to be red hot (or much hotter) than the set temperature on the controller.

If the tip of the temperature sensor in the coil heater (which is a type K thermocouple) is not properly installed to in the coil, or if there is a short on the thermocouple wires, the controller may read a low temperature than the true temperature on the coil. This can result the coil overheating.

4) The controller can read the coil temperature but the coil won't heat up.

Please try to determine which part is causing the problem: the controller or the coil heater. If you have another functional controller, you can plug this coil heater into it to see if the coil heater works. Alternatively, if you have another functional coil heater, you can plug it into this controller to see if the controller can heat the coil. You can also use a multimeter to check the resistance of the heating element in the coil heater to ensure it is within the normal range. The heating element is connected to pins #1 and #2 in the XLR connector. For

example, a coil heater rated for 100W at 120VAC should have a resistance of around 100 ohms when it is cold at room temperature. If the resistance is normal, the problem is likely with the controller. Please contact our tech support for further assistance.

5) The controller won't turn on.

If the controller doesn't turn on after you press the power button, or if there is no red light on the power button after the controller is plugged into an outlet, the controller is not functioning properly. Please contact our technical support.

8. What's new in RDK-300B

Firmware Version	What's New
Prior to v2.0.9	• Output status indicator. • Boost mode, and menu **122**. • Parameter **LL** and **RST** in menu 155.
v2.0.9 and v2.1.0	• Parameter **VER** in menu 155.
v2.2.0	• Menu **366** and • Parameter **PBD** in menu 366.

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