Rampmaster®

Control Operating Manual

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Thank you for purchasing a Rampmaster equipped heat treating oven from Evenheat. The Rampmaster is preferred by many for heat treating as it allows up to 12 custom user programs, numerical keypad and alarm features not found on our Set-Pro control. To dive right into programming see our Quick Start Programming on page 2. For an in-depth discussion of programming check out Custom Mode Programming on page 6. Don't forget to read the rest of the manual! There are some very cool features that allow you to take full advantage of the Rampmaster and you don't want to miss them.

CAUTION: The Rampmaster is used to control temperature, it is not a safety devise. Never leave the oven unattended while firing. Check on the oven at the end of the heat treat process to ensure the heat treat program has completed as planned.

CAUTION: Throw control power switch, located on oven control panel, to the OFF position (O) when not in use.

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Use this Quick Guide to Immediately Begin Programming Your Heat Treating Program

This Quick Start Guide to programming is a fairly straight forward, key-by-key approach to programming your heat treat program. It doesn't go into much detail beyond what keys to press for most heat treating programs. **If you were to rip a page out of this manual and tack it to the wall, it would be this page.** For more detailed programming instructions check out page 6.

The Custom Mode allows the creation of your own, individual heat treating programs. You choose the rate of temperature increase, the temperature you want to achieve and any hold time once you're there. These 3 items, taken together, create what's known as a segment. Generally speaking, heat treat programs use only 1 segment.

Quick Start Steps for Programming of a Heat Treating Program

1. Throw the power switch on the oven control panel to the On position

2. The Rampmaster begins its initiation process and the display will illuminate.

3. The Rampmaster will finish the initiation process and then display **STbY** (Standby).

4. Press the Develop key one time. **PROG** is displayed along with some number.

5. Use the Numerical keys to choose. You're choosing which of the 12 user program numbers will be used to store your heat treat program. Think of it as a program number. Your choices are 1 thru 12.

6. Press the Enter key. **SEGS** is displayed along with some number.

7. Use the Numerical keys to choose. You're choosing the total number of segments used in the program. Most heat treat programs will use only 1 segment. Your choices are 1 thru 32.

8. Press the Enter key. **RA 1** is displayed along with some number.

9. Use the Numerical keys to choose. You're programming the temperature rate (°/hr.) for this segment. Rate of temperature increase for most heat treating is usually As Fast As Possible. If you would like to go As Fast As Possible simply type in 9999 for rate.

10. Press the Enter key. **°F 1** is displayed along with some number.

11. Use the Numerical keys to choose. You're programming the temperature set point for this segment. This is the temperature at which your metals will harden or temper.

12. Press the Enter key. **Hd 1** is displayed along with some number.

13. Use the Numerical keys to choose. You're programming the hold time for this segment. This sets the amount of time your metals will remain at your hardening or tempering temperature.

14. Press the Enter key. Repeat steps 9 thru 14 for all remaining segments, if you have more than 1, until the display reads **ALRM**.

15. Use the Numerical keys to choose alarm temperature. *Choosing 9999 turns the alarm feature off*.

16. Press the Enter key. The display will read **CPL** then **STbY**.

17. Press the Run/Stop key and then press the Enter key.

The Rampmaster is now running your program.

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Rampmaster Operating Manual
Heat Treat ver. RM3 – Feb 2017

Rampmaster Key Layout

The Rampmaster key layout and key functions are designed to provide easy and uncomplicated use. All programming functions are located to the left side while all "On-the-Fly" features are located to the right. It's a very intuitive design that works well in the heat of battle. We've also minimized keystrokes by using dedicated, single function keys where we can. Display terms are understandable and we've chosen key graphics to help express what's really going on. Check out the Rampmaster Key Descriptions on the next page, along with a Key Function Table starting on page 19, for detailed key information.

Display - Large, bright LED display can be seen from a distance. The display terms are understandable.

F or °C - The Rampmaster can be set to display in either Fahrenheit or Celsius.

RUN/STOP - Starts and stops the actual firing.

DEVELOP - Begins the Custom Mode programming process

RECALL - Retrieves Custom Mode programs 1 thru 12.

EX - Begins the Express Mode programming process.

SCROLL - Displays choices for current programming function

BACK - Allows you to move back to previously entered data for inspection or changes.

MENU - Allows access to the Power Tame feature as well as configuration features.

RAMPMASTER - Model RM3
The Rampmaster is the original multi-segment control and continues to set the standard.

ADD TEMP - "On-the-Fly" - Adds temperature to the programmed hold temperature. May be used on any segment.

ADD TIME - "On-the-Fly" - Adds time to the programmed hold time. May be used on any segment

SKIP AHEAD - "On-the-Fly" - Moves the firing to the next segment. Great for moving directly to anneal but can be used on any segment.

VIEW - "On-the-Fly" - Allows viewing of segment data when firing. Also allows for reviewing of data before running.

EDIT - Allows for Modification and Restoration of Express Mode Programs.

ALARM - Allows setting of the Set Point Alarm temperature.

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Rampmaster Key Descriptions

RUN/STOP
The Run/Stop key starts and stops the heat treating process. *If a running program is stopped and then restarted, the Rampmaster picks up at the first segment containing the current chamber temperature.*

DEVELOP
The Develop key is used to begin the Custom Mode Programming Process.

RECALL
The Recall key allows the user to recall or bring up a previously programmed Custom Mode Program for use. The Rampmaster contains 12 programs in the Custom Mode. The Recall feature allows you to easily grab these stored programs for immediate use.

EX
Express Mode key is of no use in heat treating, see page 10.

SCROLL
The Scroll key is used to display programming choices during Menu Features selection.

BACK
The Back key is used to view previously viewed data. This gives you the opportunity to go back and inspect and change previously entered data if you wish.

ADD TEMP
Pressing the Add Temp key while holding at a temperature increases the programmed hold temperature for that segment. The factory default is set to 5°for every press of the ADD TEMP key. You do have the option of changing the amount of temperature added per press *(see page 17 for detailed information on customizing this feature)*. The Add Temp feature does not change your stored program, it simply adds temperature for that particular moment.

ADD TIME
Pressing the Add Time key while holding at temperature increases the programmed hold time for that segment. The factory default is set to 5 minutes for every press of the ADD TIME key. You do have the option of changing the amount of hold time added per press *(see page 17 for detailed information on customizing this feature)*. The Add Time feature does not change your stored program, it simply adds time for that particular moment.

SKIP AHEAD
Pressing the Skip Ahead key running a program moves the program to the next segment. The Skip Ahead feature is available for use on all segments in Custom Mode.

VIEW
The View key will display the entire heat treat program when at the Standby position and the current segment data while running. We suggest using the View key before running any heat treat program. It gives you the opportunity to inspect your programmed data before you actually commit.

MENU
The Menu key allows access to the four Configuration Menus: Options, System, Diagnostic and Factory.

ALARM
The Alarm key gives direct access to the Set Point Alarm temperature setting.

EDIT
Edit key is of no use in heat treating, see page 10.

NUMERICAL KEYS
The Numerical keys are used to key-in specific data. The Numerical keys also allow for various "On-the-Fly" features (see page 11).

ENTER
The Enter key is used to store displayed data. During programming, the Enter key stores the displayed data and moves the programming to the next step.

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Custom Mode Programming

The Custom Mode is a method of programming that allows you to precisely define every aspect of the heat treating process. You're creating a custom program designed for the work at hand.

During programming you will be asked to enter in data for rate of temperature increase (or decrease), the set point temperature you would like to reach and hold time at the set point temperature. Most heat treat programs are simple, 1 segment affairs that ramp up to temperature and hold that temperature for a period of time, then shut off. The Rampmaster does allow for heat treating applications that involve multiple firing steps. We have included some basic heat treat data at the end of this manual to assist you developing your heat treat programs.

First Things First: What's a Segment?

You will create your heat treat program using a segment(s). A segment consists of 3 things: How fast do you want to get to temperature? What temperature do you want to go to? And, once you're there, how long should you stay there? These 3 questions make up 1 segment. It's quite likely that most of your heat treating programs will contain only 1 segment.

You may also have programs that require multiple changes in rate and temperature (this is rare for heat treating). For these programs it will be necessary to use two or three or even more segments to accomplish the work. Not a problem, the Rampmaster allows you to use up to 32 segments for a program. The Rampmaster simply runs the through each segment, one after the other, performing all ramping and holding procedures in each segment until the end of the program.

Programming Your Heat Treat Program

Beginning the Custom Mode programming process is easy: with the display reading **STbY** (Standby) simply press the Develop key one time.

PROG is displayed. The Rampmaster is asking which of the 12 available locations you would like to store your program. In other words: a program number. You're choices are 1 thru 12. Use the numerical keys to choose and press the Enter key.

SEGS is displayed along with some number. The Rampmaster wants to know the total number of segments you would like to use for the program. Most heat treat programs use 1 segment, so the simple answer is 1. If your heat treat program requires more than 1 segment (which is rare) you can use up to 32 segments for your program. Your choices are 1 thru 32. Use the numerical keys to choose and press the Enter key.

RA 1 is displayed. RA stands for Rate and the 1 means you're programming the rate of temperature increase for segment 1. Rate means speed and you need to tell the Rampmaster how fast you want the temperature to increase. Rate is programmed in degrees per hour (°/hr). Most heat treat programs ask for a rate of temperature increase of As Fast As Possible. To program a rate of As Fast As Possible in the Rampmaster simply key in 9999. Use the numerical keys to put in your rate and press the Enter key.

°F 1 is displayed. °F stands for the temperature set point (°C is displayed if you're using Celsius) and the 1 means you're programming the temperature you would like to reach in segment 1. This is temperature at which your metal is hardened or tempered. The choice is yours. Use the numerical keys to put in your temperature and press the Enter key.

Hd 1 is displayed. Hd stands for Hold (a.k.a. soak or dwell) and the 1 means you're programming the amount of time you want the temperature to stay at the segment 1 temperature once you reach it. Hold time is programmed in hours and minutes. Use the numerical keys to put in your hold time and press the Enter key.

If you are using 1 segment for your heat treat program the display will now read **ALRM**, which stands for Alarm. If you are using more than 1 segment for your program the display will read **RA 2** in which case **RA 2** is asking for the rate for segment 2. Simply continue to program all remaining segment data as you did previously. When you have completed all remaining segment data the display will read **ALRM**, which stands for Alarm.

The Alarm feature allows you to set a temperature at which the alarm sounds (set point alarm). It could be any temperature you want. To disable the alarm, key in 9999 and press the Enter key.

CPL is displayed briefly followed by **STbY**. *CPL stands for Complete and means programming is now complete.*

Programming is complete! Your heat treating data is now stored in the User program number you've selected and is ready to go.

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Custom Mode Programming Continued from Previous Page

To run the program, press the Run/Stop key one time. Four horizontal dashes will appear.

Press the Enter key.

- ON- will appear briefly and then chamber temperature. The Rampmaster is now running your Custom Mode program.

When the heat treat process is complete the display alternates between **CPLT**, current chamber temperature and total process time. Pressing the Run/Stop key at this point will return the display to the **STbY** (Standby) position.

You may always stop the heat treating process at any time by pressing the Run/Stop key. **STOP** is displayed briefly and then **STbY**.

*To run a program previously stored in one of the 12 user programs simply press the Recall key (with the display reading **STbY**), choose the program number that contains the desired program and press the Enter key. Start the heat treating process as you would with any other by pressing the Run/Stop key one time and then pressing the Enter key.*

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Programming & Use Features

Beginning of Process Hold Alarm

The Beginning of Process Hold Alarm automatically sounds once the firing has reached the process hold period. The process hold is the point in the operation where you have reached tempering or hardening temperature. The purpose of this alarm is to notify you that you have reached process temperature. This comes in handy for those of you who load only once temperature has been reached (loading hot). The Beginning of Process Hold Alarm was factory set to be active. If you decide you do not want this alarm feature active you may disable it. See page 17 for details.

> The Beginning of Process Hold Alarm is sounded as a repeated series of two short chirps.

> To Quiet the Beginning of Process Hold Alarm - Simply press the number 1 key to silence the alarm.

Evenheat offers an optional loud alarm devise that simply attaches to your oven control panel to provide a loud, 80+ decibel alarm. This optional alarm is great for cutting through shop noise so you'll never miss the opportunity to quench at the right time. Contact your oven dealer or go to shopevenheat.com to get yours today. The Loud Alarm option is for use with ovens having a serial number of 107120 or greater.

End of Process Hold Alarm

The End of Process Hold Alarm automatically sounds once the process hold period has completed. The process hold is the point in the operation where you have reached tempering or hardening temperature. The purpose of this alarm is to notify you that your work has been heat treated and it's time to quench. It's a very useful alarm indeed. The End of Process Hold Alarm was factory set to be active. If you decide you do not want this alarm feature active you may disable it. See page 17 for details.

> The End of Process Hold Alarm is sounded as a series of single chirps.

> To quiet the End of Process Hold Alarm - Simply press the number 1 key to silence the alarm.

Evenheat offers an optional loud alarm devise that simply attaches to your oven control panel to provide a loud, 80+ decibel alarm. This optional alarm is great for cutting through shop noise so you'll never miss the opportunity to quench at the right time. Contact your oven dealer or go to shopevenheat.com to get yours today. The Loud Alarm option is for use with ovens having a serial number of 107120 or greater.

Set Point Temperature Alarm

The Set Point Temperature Alarm allows you to set any temperature at which an alarm will sound, for whatever reason.

To set or quiet the Set Point Temperature Alarm press the ALARM key one time, **ALRM** is displayed along with the current Alarm temperature. Use the Numerical keys to choose the desired alarm temperature and press the Enter key. *Setting the Alarm to 9999 disables the alarm.*

The BACK Key

The BACK key has a very simple function: it takes you back to what you were viewing previously. It's helpful during programming to check previously entered data and it comes in handy when going through the Menu options. Just press it to go back!

The MENU Key

The Menu key is dual function key. At **STbY** (Standby) it gives you direct access to various configuration settings. Pressing the Menu key one time takes you to this area. Pressing the Menu key while running a program brings up a feature called Power Tame (displayed as **PCT**). The Power Tame feature is not available for use on Evenheat heat treating ovens. A full explanation is given starting on page 17 of this manual.

Storing a Custom Mode Program

As you go through the Custom Mode programming process and complete it, your program is automatically stored in the program number you selected at the beginning of the programming process.

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Programming & Use Features Continued from Previous Page

Recalling a Custom Mode Program

You may choose to run a previously stored Custom Mode program. With the display reading **STbY** simply press the RECALL key one time. The display will read **PROG** and some number. Use the numerical keys to choose the correct program number and press the Enter key. The display will then go back to **STbY** (Standby). The program data in the chosen program is now selected to run when you start the heat treating process.

Writing Over Data

You will want to change the data in your heat treat programs at some point. We expect this as you try new techniques and fine tune your skills. When you do, you'll see the old data as you're programming in the new data. Simply key in the new data as though the old never existed.

Degrees per Hour

All rates are programmed in degrees per hour. Most heat treating programs call for increasing the heat As Fast As Possible. To go As Fast As Possible simply key in 9999 for your rate.

Initialization (Boot-Up)

When the Rampmaster is powered up it goes through an initialization process. **WAIT** appears on the display until the initialization is complete.

Programming a Time Value

The Rampmaster accepts time as Hours and Minutes. When programming a time value, a red dot will illuminate in the middle of the four display digits. Numbers to the left of the dot indicate hours and numbers to the right of the dot indicate minutes.

Reviewing Your Program Before Running

It's always a good idea to see what the oven's programmed to do before it does it. The Rampmaster has a Review Program feature just for this purpose. The Review Program feature automatically displays the program settings for your review. This feature does not start the program, it simply allows you to see what's programmed to run when you do. You should use this feature before every use.

To Review the currently loaded program press the VIEW key while the display is reading **STbY**. The Rampmaster will display all programmed data and return to the Standby position (**STbY**). If it all looks good, go ahead and run the program. If not, you have the opportunity to reprogram with the correct data!

Standby (STbY)

Standby simply means the Rampmaster is not running any programs at the moment.

Two Key Run

The Rampmaster is set at the factory to run the heat treat process after two separate keys are pushed. This "Two Key Run" adds a level of security against inadvertent starting from curious fingers.

To run the program: with the display reading **STbY**, press the Run key one time. The display will show four horizontal dashes. Press the Enter key one time. The display will briefly read **–ON–** and a series of audible clicks will be heard. The Rampmaster is now running the program. You do have the option of changing to a single key run if you would like, see page 18 for more information.

12 User Programs in Custom Mode

The Rampmaster allows you to save up to 12 Custom Mode programs in memory. Your programs remain in these 12 locations indefinitely and can be recalled for use or changed as you desire.

Number of Segments per Custom Mode Program

Most heat treat programs use 1 segment to accomplish the heat treat process. While heat treating operations using more than 1 segment are rare, they are possible with the Rampmaster. The Rampmaster allows you to use up to 32 segments for each Custom Mode program. It's a ridiculous amount of segments for any type of firing, let alone heat treating! Just know that if you need more than 1 you have it.

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Programming & Use Features Continued from Previous Page

Delay Start Feature

The Rampmaster can delay the start of your heat treat program for up to 100 hours. This feature becomes valuable when different electrical rates are charged at different times of the day.

To use the Delay Start feature: With the display reading **STbY** press the Menu key one time. Press the Scroll key repeatedly until **OPT** is displayed. Press the Enter key. Press the Scroll key until **dELA** is displayed. Press the Enter key. **dELA** is displayed along with the currently programmed delay start time. Use the numerical keys to select your desired delay start amount and press the Enter key. **STbY** is displayed.

When the program is run you will see the delay start amount displayed. This time will count down to 0.00 at which time the program will actually begin to run.

Maximum Programmable Temperature

The maximum temperature that can be programmed in the Rampmaster is 2200°F (1204°C). This maximum is factory set to limit oven operation. This maximum can be set higher for other applications. Please consult Evenheat if you wish to adjust this setting.

Brief Power Failures

Brief power failures do not stop the heat treating process unless the oven temperature drops more than 250°F. If a brief outage occurs the display will alternate between **ErrP** and normally displayed data. The **ErrP** simply tells you that a brief power outage occurred. The program continues to run. You don't have to shut it down, or restart it, or anything else. You can if you like, but you don't have to.

The assumption here is that brief power outages are just that, brief. They're generally not long enough to cause a problem so the controller picks up the process and keeps going once power is back on. It's a nice feature.

Extended Power Failures

Extended power failures stop the heat treating process. If power is lost and the oven temperature drops more than 250°F before the power comes back on, the Rampmaster will not restart the process once power comes back on. The display will read **PF** and the oven cools naturally. Press any key to clear the display. **STbY** is then displayed.

Disabling Some Error Codes

The Rampmaster uses many parameters to determine if all is going well during use. Under normal conditions exceeding these parameters indicates a problem. When this happens the Rampmaster stops the program and displays an error code describing the problem (see page 21 for a detailed listing of all error codes). However, there are times with heat treating that you can create circumstances that appear as though the oven is malfunctioning when it's not. Opening the door to pull your work is one example that tends to violate the "rules". With this in mind, the Rampmaster allows you to turn off (disable) a select group of error code functions. See page 18 for instructions to disable error codes.

Useless Rampmaster Features

The Rampmaster contains a few features that are absolutely useless when it comes to heat treating. The Rampmaster Model RM3 was designed to work with both our heat treating ovens and glass kiln lines. While both processes parallel each other in terms of programming and use, the glass side of the equation allowed for a special preset style of programming. This special programming feature is called Express Mode and it contains preset programs based exclusively on glass and its firing properties. So……………..

Disregard the Express Mode key. Express Mode is exclusive to glass and it has nothing to offer heat treating.

Disregard the Edit key. This feature allows changes to be made to Express Mode preset programs.

Disregard Italicized Rampmaster Display Messages on Page 13. Of course the useless features come with their own set of display messages. We've italicized these and you can disregard them as well.

If you inadvertently wander into either the Express Mode or Edit key features just press the Run/Stop key to get back to **STbY** (Standby).

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On-The-Fly Features

The Rampmaster contains a set of features that allow you to adjust the process while it's actually running! We've dubbed these as "On-the-Fly". With these features it's possible to add a little bit of time to a hold if needed, add a little bit of temp to a hold or just leave the segment entirely and move to the next segment in the program.

Adding Temperature

The ADD TEMP feature increases the hold temperature by 5° (factory default) every time you press the ADD TEMP key. Once you press the ADD TEMP key the Rampmaster will take the temperature to the new, higher temperature.

We set the amount of temperature added per press to 5° at the factory. You do have the option of changing this to any value between 1° and 9° if you desire. Refer to page 17 for detailed information.

The ADD TEMP feature only functions when you're Holding at a temperature. You know your Holding at a temperature when the display reads the chamber temperature along with a time value. You are welcome to use the ADD TEMP key as many times as you like. Keep in mind that every press of the key adds additional temperature to the hold temperature. The ADD TEMP feature does not affect your programmed data. It's a temporary change and affects only the current moment.

   To Use the ADD TEMP Feature

   Press the ADD TEMP key one time. **Add TEMP** is displayed briefly. The display then shows current chamber temperature and hold time.

Adding Time

The ADD TIME feature increases the hold temperature by 5 minutes (factory default) every time you press the ADD TIME key. Once you press the ADD TIME key the Rampmaster will extend the hold time by that amount.

We set the amount of time added per press to 5 minutes at the factory. You do have the option of changing this to any value between 1 and 9 minutes if you desire. Refer to page 17 for detailed information.

The ADD TIME feature only functions when you're Holding at a temperature. You know your Holding at a temperature when the display reads the chamber temperature along with a time value. You are welcome to use the ADD TIME key as many times as you like. Keep in mind that every press of the key adds additional time to the hold time. The ADD TIME feature does not affect your programmed data. It's a temporary change and affects only the current moment.

   To Use the ADD TIME Feature

   Press the ADD TIME key one time. **Add TIME** is displayed briefly. The display then shows current chamber temperature and hold time. You will notice that the remaining hold time has been increased by the value of the Add Time Key.

Skip to Next Segment

The SKIP AHEAD feature does what it sounds like: it skips the process ahead to the next segment.

   To Use the SKIP AHEAD Feature

   Press the SKIP AHEAD key one time. **SKIP TO SEG** is displayed along with the segment number you are skipping to. The display also indicates the rate for the skipped to segment, its set point (**SETP**) temperature and the board temperature. *If you have VIEW set to MAX in the System Menu you will also see a review of your entire program.*

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On-the-Fly Features Continued from Previous Page

Suspend

The Suspend feature works much like the Add Time feature, but with a twist: you may suspend the program (cause the temperature to hold) during a ramping portion of the process. The suspend feature temporarily interrupts the ramping operation and holds at the currently displayed temperature. Once the Suspend is cancelled, or times out, the heat treat process begins where it left off.

Once a Suspend is activated it will remain active for 30 minutes or until you cancel it, whichever comes first. It does not suspend indefinitely. Once it is cancelled or times out, the process resumes at the point where the Suspend was activated.

To Activate the SUSPEND Feature

While ramping, press the number 4 key one time. **SUSP** is displayed along with the current temperature. The display continues to alternate between **SUSP** and temperature to indicate the Suspend Feature has been activated.

To cancel the SUSPEND Feature

While Suspending, press the number 4 key one time. **CANL** is displayed briefly indicating the Suspend has been cancelled. Normal operation commences.

Viewing the Current Segment Data

When running a program, the Rampmaster displays current temperatures and times, it does not display your program settings. Doing so would overwhelm and confuse, and we don't want to do that. However, this information is nice to know when you want to know it. The VIEW key allows for this.

The VIEW feature will display the data you programmed for the current running segment. This can be useful to remind you of what you programmed. Was it 1880° or 1900°? Was it 15 minutes or 20 minutes? What segment am I in anyway? These questions are answered with the simple press of a key.

Using the VIEW Feature During the Ramping Portion of the Segment

Press the VIEW key one time. Programmed rate is displayed for the current segment along with the current traveling set point (traveling set point is the temperature the control wants to be at, at that particular moment). Actual temperature of the electronics is also displayed.

Using the VIEW Feature During the Holding Portion of the Segment

Press the VIEW key one time. Programmed hold time is displayed for the current segment. The Hold temperature is also displayed along with the actual temperature of the electronics.

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Rampmaster Display Conditions

The LED display of the Rampmaster displays different data depending upon what's happening. Listed below are the possible display conditions.

Display Alternating Between STbY (Standby) and Temperature — Program is not running: oven chamber temperature is displayed.

Display Reading Temperature - Program is running and is ramping to temperature: oven chamber temperature is displayed.

Display Alternating Between Time Value and Temperature - Program is running and is holding at temperature: oven chamber temperature is displayed along with the time value counting down remaining hold time.

Display Reading a Decreasing Time Value—Program is running with a delay start: the time value counting down is the remaining delay start time.

Dot Displayed Between the 10's and 100's Digits — Indicates the value being displayed is a time value.

Dot Displayed to the Right of the 1's Digit — Indicates that a Celsius temperature is being displayed. If no dot is displayed the Rampmaster is displaying in Fahrenheit.

Display Alternating Between Any Value and ERRP — Indicates a brief power failure has occurred. In this condition the Rampmaster continues to run the program.

Display Reading PF—Indicates an extended power failure has occurred. In this condition the Rampmaster stops running the program.

Rampmaster Display Messages

Add TEMP	Add Temperature, page 11	FACT	Factory, page 17	PF	Power Failure, page 10
Add TIME	Add Time, page 11	FAIL	Fail, page 21	RA x	Rate, page 6
ALRM	Alarm, page 12	FAST	Fast, N/A	RALL	Restore All, N/A
bd T	Board Temperature, page 19	FLLd	Full Load Voltage, page 19	ROR	Rate of Rise, page 19
°C x	Temperature, page 6	FUSE	Fuse, N/A	RSTR	Restore, N/A
CANL	Cancel, page 12	Hd x	Hold, page 6	SEGS	Segments, page 6
CAST	Cast, N/A	Id	Identification, page 18	SETP	Set point, page 11
CHG°	Change°, page 18	LAM	Laminate, N/A	SKIP TO SEG	Skip to Segment, page 11
Co82	COE 82, N/A	LEdS	LED's, page 19	SLOW	Slow, N/A
Co90	COE 90, N/A	MAX	Maximum, page 18	SOFT	Soften, N/A
Co96	COE 96, N/A	MEd	Medium, N/A	STbY	Standby, pages 9
CPL	Complete, page 6	MIN	Minimum, page 18	STOP	Stop, pages 7
CPLT	Process Complete, page 7	MODX	Modify Express Mode, N/A	SUSP	Suspend, page 12
dELA	Delay Start, page 17	N-A	Not Available	SW V	Software Version, page 19
dIAG	Diagnostics, page 17	NOLd	No Load Voltage, page 19	SYST	System, page 17
EdIT	Edit, N/A	OFF	Off, pages 18	TEMP	Temperature, page 17
ERCd	Error Codes, page 18	ON	On, pages 18	TIME	Time, page 17
Err	ERTF Related, page 19	-ON-	On, pages 7	VIEW	View, page 18
ErrP	Brief Power Failure, page 10	OPT	Options, page 17	VOLT	Voltage, page 19
Errx	Error Code, page 21	OUTS	Outputs, page 19	WAIT	Wait, page 13
ERTF	Error Temp. & Time of Error, page 19	OUT1, OUT2, OUT3, OUT4	Outputs, page 19	XSLO	Extra Slow, N/A
°F x	Temperature, page 6	PCT	Percent, N/A	2KEY	Two Key, page 18

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Key Function Tables

RUN/STOP		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Pressing once begins to run the currently loaded program	Pressing once completely stops currently running program and returns the Rampmaster to Standby	Returns the Rampmaster to Standby

DEVELOP		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Pressing once begins the Custom Mode Programming Process	No Function	No Function

RECALL		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Pressing once begins the loading process of a stored, Custom Mode Program.	No Function	No Function

EX		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Not Useful for Heat Treating See page 10	No Function	No Function

SCROLL		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	No Function	When viewing Menu items, Scrolls through menu choices Use the SCROLL to toggle Menu choices

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BACK		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	No Function	When programming using Custom Mode and when viewing Menu options, pressing BACK will display the previous selection.

ADD TEMP		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	Pressing ADD TEMP, while holding at temperature, adds temperature to the programmed temperature set point.	No Function

ADD TIME		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	Pressing ADD TIME, while holding at temperature, adds time to programmed hold.	No Function

SKIP AHEAD		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	Pressing SKIP AHEAD moves the Program to the next segment.	No Function

EDIT		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Not Useful for Heat Treating See page 10	No Function	No Function

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VIEW		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Pressing once displays the currently loaded firing program data	Pressing once displays currently running segment data	No Function

ALARM		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Pressing once begins the Alarm setting process	If Alarm is not sounding, pressing once begins the Alarm setting process If Alarm is sounding, pressing once quiets the Alarm.	No Function

MENU		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
Pressing once displays the Menu choices. Menu's includes Options, System, Diagnostic and Factory.	***Not Useful for Heat Treating*** Pressing once allows for adjustment of a feature not available on Evenheat heat treat ovens	No Function

Numerical Keys		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	Pressing 4 Activates Suspend Feature, page 13 Pressing 0 Displays Elapsed Firing Time	Used for data input while Programming or setting Menu items.

ENTER		
While at the Standby Position (STbY)	While Running a Program	At Any Other Position
No Function	No Function	Used to store currently displayed data. In many instances, pressing ENTER also moves you to the next point in programming.

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Menu—Configuration Tools

The Rampmaster contains a variety of configuration tools that allow you to set preferences, modify performance and diagnose potential errors. These tools are divided into four Menus: Options, System, Diagnostic and Factory.

> **OPT**—Options tools include items you would possibly change from process to process.

> **SYST**—System tools include items you would generally set for use with all heat treating programs.

> **dIAG**—Diagnostic tools include features you would use in the event of control or oven problems.

> **FACT**—Factory tools include features accessible only with the assistance of an Evenheat technician.

To get to the various menu's: with **STbY** displayed, press the MENU key. Use the SCROLL key to display the various menus including Options (**OPT**), System (**SYST**), Diagnostic (**dIAG**) and Factory (**FACT**). Once the desired menu is displayed press the Enter key to access that menu.

OPT—Options

Options tools involve those things you might want to change from one heat treating process to the next. If you play at all with the various menus, Options will most likely be the one. Listed below are your choices for the Options Menu.

Use the SCROLL key to display the Options menu choices. Once you get to the menu item you would like to modify press the ENTER key, key in the change and press the ENTER key.

> **dELA—Delay Start** — The Rampmaster allows you to start the heat treating process at a later time. You may delay the start for up 99 hours and 99 minutes. For no Delay Start use 0.00. Please note that Evenheat recommends that the oven be monitored during the entire heat treating process, this includes the delay start time as well.

> **H-AL—High Alarm** — The Rampmaster contains alarm features that notify you of when your process hold has been reached and when it has ended. Being aware of when your chamber has reached temperature and when your heat treat cycle is complete is very important and these alarms help achieve that awareness.

> Your Rampmaster was factory set with both alarms to be enabled. You do have the choice of changing the alarm settings to Off, Both, End or Begin. Use the Scroll key to view the following choices. With your choice in the display simply press the Enter key to make it so.

>> **OFF** - Disables both the Beginning of Process Hold and End of Process Hold alarms (neither will sound)
>> **bOTH** - Enables both the Beginning of Process Hold and End of Process Hold alarms (both will sound)
>> **End** - Enables just the End of Process Hold alarm (Beginning of process Hold alarm will not sound)
>> **bEGN** - Enables just the Beginning of Process Hold alarm (End of Process Hold alarm will not sound)

> **TEMP—Add Temperature Value** — The Rampmaster is factory set to add 5° to the hold temperature every time the ADD TEMP feature is used. If you would like the temperature value to be different, you're more than welcome to change it. It can be set anywhere between 1° and 9°.

> **TIME—Add Time Value** — The Rampmaster is factory set to add 5 minutes to the hold time every time the ADD TIME feature is used. If you would like the time value to be different, you're more than welcome to change it. It can be set anywhere between 1 and 9 Minutes.

> **MODX —Modify Express Mode** — *Has No Use in Heat Treating*

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SYST—System

System tools involve preferences. Listed below are your options for the System Menu.

Use the SCROLL key to display the System menu choices. Once you get to the menu item you would like to modify press the ENTER key, key in the change and press the ENTER key.

> **CHG° - Temperature Scale °F or °C** — The Rampmaster allows for temperature display using either the Fahrenheit (°F) or Celsius (°C) temperature scales. Your Choices are F or C. Use the Scroll key to toggle between **°F** or **°C**, then press the Enter key.
>
> **VIEW—Viewing Options** —The Rampmaster gives you the choice of minimizing or maximizing the amount of data displayed when the View key is used when running a program.
>
> Use the Scroll key to toggle between MIN and MAX, then press the Enter key.
>
> > When MIN (minimum) is chosen the following information is displayed when the View key is pressed while running a program: Rate or Hold value at the currently running segment, current travelling set point temperature (**SETP**) and electronics board temperature (**bd T**).
> >
> > When MAX (maximum) is chosen the following information is displayed when the View key is pressed while running a program: Rate or Hold value at the currently running segment, current travelling set point temperature (**SETP**) and electronics board temperature (**bd T**), user program number (**USER**), number of segments in program (**SEGS**), all programmed rates, set point temperatures and hold times in all segments, programmed delay time (**dELA**), programmed alarm setting (**ALRM**) and whether error codes are on or off (**ERCD**).
>
> **ERCD—Error Codes** — The Rampmaster uses many parameters to determine if all is going well during use. Under normal conditions exceeding these parameters indicates a problem. When this happens the Rampmaster stops the program and displays an error code describing the problem (see page 21 for a detailed listing of all error codes). However, there are times with heat treating that you can create circumstances that appear as though the oven is malfunctioning when it's not. Opening the door to pull your work is one example that tends to violate the "rules". With this in mind, the Rampmaster allows you to turn off (disable) a select group of error code functions. The Rampmaster is factory set with the Error Codes on (full protection).
>
> Use the Scroll key to toggle between **ON** and **OFF**, then press the Enter key.
>
> > Error codes which are disabled when error codes are chosen to be disabled.
> >
> > Error 1—Chamber temperature rising too slowly (<12°F /hr)
> > Error 2—Chamber temperature too far above hold temperature (>50°F above hold temperature)
> > Error 3—Chamber temperature too far below hold temperature (>50°F below hold temperature)
> > Error 4—Chamber temperature too far above previous hold temperature when ramping down (>50°F above hold temperature)
> > Error 5—Chamber temperature too far below travelling set point when ramping down (>50°F below travelling set point)
> > Error D—Chamber temperature too far above travelling set point (>50°F above travelling set point)
> >
> > *Traveling set point is the calculated temperature that the oven chamber should be at any given point in the program.*
>
> **ID—PC Identification**—The Rampmaster is capable of connecting directly to your PC using our optional KISS software/hardware package. This system allows up to 50 ovens to be operated and monitored at one time. In order for your PC to distinguish between the connected ovens they are given an ID or identification number. This setting allows you to give the oven this ID number. Your choices are 1 thru 50.
>
> Use the numerical keys to choose and then press the Enter key.
>
> **2KEY—Two Key Start** —The Rampmaster has a special feature (factory default to ON) that requires the user to press two keys in order to run the heat treat program. With the Two Key feature enabled the user must first press the RUN/STOP key then press the ENTER key to run the program. You may disable this feature to allow for a single key start, in which case the setting would be OFF. With the Two Key feature disabled simply pressing the RUN/STOP key runs the heat treat program. Your Choices are **ON** or **OFF**.
>
> Use the Scroll key to choose and then press the Enter key.

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dIAG—Diagnostic

The Diagnostic tools contain a group of power service and oven performance information. This information can be helpful in determining possible causes of performance problems. While this information gives the informed user plenty of data to work from you'll want to contact Evenheat technicians for evaluation and technical advice.

Use the SCROLL key to display the Diagnostic menu choices.

> **ERTF—Error Temperature & Time of Last Error** — When a problem does arise it's always nice to know at what temperature and how far into the process the fault occurred. The ERTF feature displays the following: Temperature at which error occurred, elapsed time into the process at which the error occurred, rate of rise (**ROR**) for the ramp and the specific error that occurred. Press the Enter key while **ERTF** is displayed to display the information.

> **OUTS— Output Test**—Allows each output (signal to relays to turn heating elements On and Off) to be manually operated. Performing this test causes the relay associated with the given output to turn on and off. A noticeable, audible "click" will be heard as the relay turns on and off. These "clicks" confirm that the output from the Rampmaster is being sent to the relay and that the relay is responding correctly.

> The Rampmaster control contains multiple outputs. Current heat treat oven production utilizes Output 2 only. Outputs 1, 3 & 4 are not currently used.

> *Caution: This test should be performed with all oven control panels in place and door in the closed position. Power to the heating elements will be applied during this test and represents an electrical shock hazard.*

Use the Scroll key to make the display read **OUTS**. Press the Enter key. **OUT1** is displayed and no audible click will be heard. Press the Enter key. The display reads **OUT2** and an audible click should be heard as the relay turns on. Press the Enter key. An audible click is heard as OUT2 relay turns off. **OUT3** is displayed and no audible click will be heard. Press the Enter key. The display reads **OUT4** and no audible click will be heard. Press the Enter key. Display returns to **STbY**.

SW V—Software Version — Displays the software version used in your Rampmaster.

bd T—Rampmaster Board Temperature — Displays the temperature of the actual electronics. The Rampmaster control board is designed to work properly if its temperature is kept below 160°F. This feature simply displays the actual temperature of the electronics.

LEdS—LED Test—This test simply makes all the display LED's illuminate. If a particular LED is not functioning this test will identify it.

VOLT—Voltage Test — The Volt Test directly measures the voltage supply to your oven. Voltage likes to drop a little when the oven turns on, therefore, there are two voltage readings that will be taken during this test: No Load Voltage & Full Load Voltage. Make note of the voltage readings as you perform this test.

> *Caution: This test should be performed with all oven control panels in place and door in the closed position. Power to the heating elements will be applied during this test and represents a electrical shock hazard.*

Use the Scroll key to make the display read **VOLT** and then press the Enter key. **NOLd** is displayed along with the no-load voltage. Press the Enter key, **FLLd** is displayed along with the full-load voltage. The Rampmaster then goes back to the Standby (**STbY**) position.

FACT — Factory

The Factory tools contain a group of settings that require factory assistance when setting. These settings are generally never adjusted and involve things that can really mess up your day, and your oven, if you don't know what you're doing. Therefore, these settings are not available without consultation with Evenheat technicians.

    TCOS — Thermocouple Offset — In the unlikely event that a thermocouple is reading temperature incorrectly it's possible to offset the displayed temperature to match the actual chamber temperature. It's a cool feature from the technical standpoint, yet is rarely used in the practical sense. Our technical staff will most likely dissuade you from going down this road before attempting other possible solutions.

    MAX — Maximum Programmable Temperature — We limit the maximum programmable temperature to 2200°F on heat treat ovens.

    TYPE —Thermocouple Type Selection - The Rampmaster is capable of being fitted with either a Type K or Type S thermocouple. Type K is factory supplied on all heat treat ovens.

    OUT4 — Output 4 — Has No Use in Heat Treating.

    RALL — Has No Use in Heat Treating.

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Rampmaster Error Messages

The Rampmaster monitors each use and compares performance to a set of standards. If performance does not meet standards the Rampmaster automatically stops the heat treat process and displays a corresponding Error Code describing the fault. Pressing any key at this point, displays the elapsed time and temperature at which the error occurred. Make note of these values before clearing with the RUN/STOP key. Below is a list of error codes and their conditions.

As noted on page 18 of this manual, there is a select group of Error Code standards that can be disabled if they get in your way. Heat treating sometimes knowingly violates the error parameters so we allow these particular error codes to be disabled if desired. These codes are identified below.

E– 0   Software error. General control failure.

E– 1   Ascending ramp rate is less than 12°F per hour. Rate of rise is examined every 7-1/2 minutes. Condition must persist for 22-1/2 minutes before the error is triggered. This error code is disabled when Error Codes are turned off. Probable causes are Control Relay Failure, Element Failure or Low Supply Voltage.

E– 2   While holding at programmed temperature, chamber temperature is above programmed hold temperature by 50+°F. Condition must persist for 19+ seconds before error is triggered. This error code is disabled when Error Codes are turned off. Probable cause is Control Relay Failure.

E– 3   While holding at programmed temperature, chamber temperature drops below programmed hold temperature by 50+°F. Condition must persist for 19+ seconds before error is triggered. This error code is disabled when Error Codes are turned off. Probable causes are Control Relay Failure, Element Failure or Sudden Drop in Supply Voltage.

E– 4   During a descending ramp the chamber temperature is 50+°F above the previous hold temperature. Condition must persist for 19+ seconds before error is triggered. This error code is disabled when Error Codes are turned off. Probable cause is Control Relay Failure.

E– 5   During a descending ramp the chamber temperature is 50+°F below the travelling set point. Condition must persist for 19+ seconds before error is triggered. This error code is disabled when Error Codes are turned off. Probable causes are Control Relay Failure, Element Failure or Sudden Drop in Supply Voltage.

E– 6   Negative reading detected at thermocouple (temperature sensor). Thermocouple circuit installed incorrectly (polarity reversed at some point).

E– 8   During an ascending ramp, chamber temperature is falling. Condition must persist for 22-1/2 minutes before the error is triggered. Probable causes are Control Relay Failure, Element Failure or Sudden Drop in Supply Voltage.

E– 9   Improper thermocouple installed or improper thermocouple software setting. Standard thermocouples for all Evenheat models is TYPE K.

E– A   Invalid program variable.

E–bd   Excessive Control Board Temperature.

E– d   Chamber temperature 50+°F above travelling set point. This error code is disabled when Error Codes are turned off. Probable cause is Control Relay Failure.

E - - -   Rampmaster lost power while processing information. Double check program before running the program.

ErrP   Brief Power Failure has occurred. ERRP is displayed alternately with chamber temperature or hold time. Indicates that power was lost briefly and restored. The program continues to operate. Pressing the Enter key one time during this condition removes the ERRP error code.

PF   Extended Power Failure has occurred. PF is displayed when the controller is powered up after an extended period of non-use (press Enter to clear and get to Standby). PF is also displayed if power is lost during used and the chamber temperature was below 140°F (60°C) or the chamber temperature dropped more than 250°F during the power failure. In either case, the program is stopped.

STUc   Indicates that a key on the keypad is stuck in the pressed position. General Control Failure.

FAIL   Thermocouple (temperature sensor) circuit is faulty. Thermocouple circuit is broken at some point, usually the thermocouple itself. The thermocouple circuit consists of the thermocouple, any connecting blocks and the thermocouple lead wire connecting to the Rampmaster.

For Error Codes not listed please contact Evenheat.

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Oven Trouble Shooting

Listed below are some of the more probable oven problems you'll encounter along with their most common cause and repair advice. Please feel free to contact Evenheat for assistance when dealing with these and other potential problems.

No Display

Check to see that the oven is actually plugged in. It happens! Also check the circuit protection (breakers or fuses) to see that they are not tripped or open. Breakers and fuses don't trip or open for no reason. They indicate a fault which should be investigated by licensed personnel. See below.

Oven Won't Reach Temperature

Error Codes associated with a oven not reaching temperature are E– 1, E– 3, E– 5 and E– 8. A few possibilities here:

A low voltage will certainly slow an oven down and, if the drop is low enough, it may cause failure to reach temperature. You can test this using the VOLT test described on page 19. This test is best performed at the time of trouble. Low voltage is generally associated with your power service or provider and is rarely a fault in the oven.

A failed element reduces the heat produced. Failed elements tend to be very visual and are easily seen. With the oven off (not running and unplugged) have a look at the elements for any breaks. If you see no breaks in the heating element then suspect a relay problem.

A failed relay (fails to close) reduces the heat produced. While a relay failure acts like an element failure, a relay is not visible. If the heating elements appear to be intact replace the relay.

Oven Won't Shut Off

Error Codes associated with a oven not shutting off are E– 2 or E-4 or E– d.

Most likely a failed relay (failed closed). A failed relay may cause the oven temperature to increase when it should be decreasing. Depending upon your particular oven model you may see up to 2 relays used in its design. Identifying the failed relay is fairly simple as the element connected to it will remain on. Unplug the oven and remove the oven control panel. Simply follow the element leads to the relay to identify it. Relays are maintenance items and we recommend replacing all of them when needing to replace one.

Check your program. While you won't see the error codes if you've programmed incorrectly this problem is possible.

Fail is Displayed

The thermocouple (temperature sensor) circuit is faulty. The thermocouple circuit is broken at some point, usually the thermocouple itself. The thermocouple circuit consists of the thermocouple, any connecting blocks and the thermocouple lead wire connecting to the Rampmaster.

Circuit Protection Opens ("Blown" Breaker or Fuse)

Circuit protection can open for various reasons. The BIG TWO are a short circuit and overheating. We'll look at each separately.

Short circuits occur when line voltage finds it's way to another line or ground. They are usually violent occurrences with lots of noise, flashes of light and maybe a bit of smoke! During a short circuit the amperage goes very high. This increase in amperage exceeds your breaker/fuse rating which causes them to open ("blow"). That's exactly why they're there. Short circuits generally happen immediately upon plugging the oven in or running a program. They generally do NOT happen after the oven has been on for some time.

Overheating of the breakers/fuses can cause them to open ("blow"). Overheating needs time to happen. If the oven is running fine for a while and then the breakers or the fuses open we can be fairly confident that the problem is overheating and not a short circuit. Overheating reduces the amount of amperage a breaker/fuse will allow to pass before it opens. Overheating is caused by many factors, the most common are: loose wire connections at the breakers/fuses, the size of the wire "feeding" the oven is too small, the electrical receptacle is faulty or breaker/fuse is faulty.

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Heat Treat Data

The following heat treat data has been provided to Evenheat by various sources. We suggest you view this data as a starting and reference point on which to build your heat treating experience. What works for these guys may or may not necessarily work for you.

General Heat Treating Data for Various Metals
Special Thanks to Texas Knifemakers Supply for this Information

Steel Type	Rockwell Hardness	Hardening Temperature	Hardening Time	Temper Temperature	Temper Time
D2 Tool Steel	58 RC	1880°F	15 min.	500°F	2 hrs. 2 times
D2 Springs & Rockers	43 to 45 RC	1880°F	15 min.	1200°F	2 hrs. 1 time
154CM S.S.	58 RC 61 RC	1900°F	15 min.	400°F for 58 RC 275°F for 61 RC	2 hrs. 2 times
154CM S.S. Springs & Rockers	43 to 45 RC	1900°F	15 min.	1200°F	2 hrs. 1 time
440C S.S.	58 RC	1880°F	15 min.	225°F	2 hrs. 1 time
440C S.S. Springs & Rockers	43 to 45 RC	1880°F	15 min.	1100°F	1 hr. 1 time
CPM 440V S.S. (S60V)	58 RC	1950°F	30 min.	300°F	2 hrs. 2 times
CPM 440V S.S. Springs & Rockers	43 to 45 RC	1950°F	30 min.	1100°F	2 hrs. 1 time
ATS-34 S.S.	58 RC 61 RC	1900°F	15 min.	400°F for 58 RC 275°F for 61 RC	2 hrs. 1 time
ATS-34 S.S. Springs & Rockers	43 to 45 RC	1900°F	15 min.	1200°F	2 hrs. 2 times
Vascoware & Cru-ware		1950°F	30 min.	1000°F	2 hrs. 3 times
Boye Dendritic S.S.		1880°F	30 min.	400°F	1 hr. 2 times
440A S.S.		1880°F	15 min.	212°F	2 hrs. 1 time
CMP420V		2150°F	10 min.	400°F	2 hrs. 2 times
A-2		1800°F		500°F	2 hrs. 2 times
01 Tool Steel		1500°F	10 min. or until non-magnetic, oil quench (oil needs to be warm - 100 to 150°F) Temper at 350°F for 2 hrs.		
Annealing		1650°F	30 min.	1650°F for 30 min. Shut off with oven door closed. Leave in overnight.	

NOTE: These figures are based on 3/16" thick material and should be altered to the thickness of the material being treated. (I.E. 1/8" thick material should be 8 to 10 minutes and 1/4" material should be near 20 minutes). The rule of thumb is 1 hour per inch of thickness.

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Heat Treating Stainless Blade Steels at Ranger Original Handcrafted Knives
Special Thanks to Rob Ridley of Ranger Original for this Information

We have had a number of people ask us for our "secrets" about heat treating knife blades. While we appreciate the compliment, there really are no secrets – and what works for us may not be your favored solutions. Here are our recipes. You may copy them, publish them or use them as you please. We have drawn from various sources, including Crucible data sheets, other steel suppliers and postings on Blade Forums as well as a good dose of personal experience.

All of our stainless blades get double wrapped in high temperature, 309SS foil envelopes – with double folded seams pressed down firmly. Always put them in the envelope the same way – so you can put them in spine down and pull them out by the handle, instead of the tip. We use brown paper (no idea why brown – just what we use) in pieces about 2 x 2 inches. 2 pieces for an average hunter and four for a big bowie. The trick is to use enough paper to eat up the Oxygen in the envelope – without blowing up the envelope like a balloon.

154CM, CPM154, ATS34

All three of these, heat treat the same. After a full speed ramp up to temperature, they soak 45 minutes to an hour in the Evenheat Oven at 1950F degrees. Then they get placed – still in the foil – spine down – then flat - on a 1" aluminum plate. The second aluminum plate is placed on top and pressure is applied. We used to use weights for the pressure, but now we use clamps. You are looking for good firm contact. If you are thinking hydraulics you are thinking WAY too much pressure. After 2 minutes (or less) they will be hand cool, and ready to remove from the foil for cryogenics. They don't have to go straight into cryo, but aim for something less than an hour from plate quenching. We use liquid nitrogen for cryo but dry ice in acetone will also do. The household freezer is no use at all. They probably only need a couple hours in cryo, but we leave them overnight.
The next morning, they will be in the range of RHC63+. After warming to room temperature, they get tempered. We temper twice at 500F degrees for two hours each time – to get about RHC61. You can experiment for other hardness's but 61 is a very good target for these steels.

CPMS30V

Same wrap – same temperature (1950F) - same soak time – same plate quench – same cryo as 154CM above. This steel gets double tempered at 400F degree for about RHC60

440C

Same wrap – Harden at 1900F degrees and only about 15 minutes at temperature – then plate quench and cryo as above. Hardness out of cryo will be about 61. Temper (twice for 2 hours) at 275F for RHC60 – 325F for RHC59 – and 375F for an excellent RHC57-58.

Questions and Answers provided by Rob Ridley of Ranger Original

Q1: Does Cryo really make a difference.

A1: Yes! It increases initial hardness between 1.5 to 2 points and even though you may temper back to softer levels, the steel has been more completely transformed to a tough and desirable state.

Q2: Why do you leave blades in the foil to plate quench them.

A2: The really hot blades never see oxygen this way. That means no scale and very little oxide. Air quenching the old way meant going back to the grinder to clean up the mess. Blades done our way can be cleaned up with just a buffer.

Q3: Why do you remove the blades from the envelope before cryo?

A3: Experience! We like hanging the blades from a coat hanger in the cryo tank. Handle pin holes make that easier. We also found that when a tight foil bag full of liquid nitrogen, hits the warm summer air, bad things can happen. The low tempering temperatures won't cause you any scale or oxide problems anyway.

Q4: Can I use my freezer for cryo?

A4: No. It isn't nearly cold enough to do any good at all. Dry Ice or Liquid Nitrogen work equally well. Dry ice is easier to handle but only lasts a day or so. Liquid nitrogen in a good dewar will last a month or more depending on use.

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Questions and Answers provided by Rob Ridley of Ranger Original - continued

Q5: I heard ATS34 etc can be tempered at a high or low range. Is this true?

A5: Sort of – but the high range gives you reduced toughness and corrosion resistance. It should be avoided.

Q6: Are there other ways to heat treat these steels?

A6: Heck yes! Air quenching, Oil quenching, Salt baths, Vacuum furnaces…. But you'll have to ask someone else about them. I haven't seen anything that gives more satisfactory results that the way we use now.

Q7: Aluminum is expensive! Can I plate quench between thick steel plates.

A7: Yes – less desirable because it absorbs heat slower – but workable.

Q8: How do I know if it hardened and tempered properly.

A8: The correct answer is to use a Rockwell C scale tester and then to do performance testing on your blades. Some claim they can tell hardness pretty close by the way a file skates over the steel. I can't. We test every blade through here and write the hardness on the blade before shipping it out. Having said that, we are rarely out by more than 1 Rockwell point from where we aimed.

Q9: 321SS foil is much cheaper. Can I use it instead of the 309SS?

A9: Depending on who you talk to, the 321 is rated to something between 1800 - 2000 degrees. The risk is that the 321 will either fail, allowing air in, or stick to the blade inside. In practice, we have used it successfully with our own blades without problem. We have seen 321SS stuck to a blade heat treated elsewhere. Because we treat other maker's blades, we choose to use only 309SS foil. Experiment at your own risk.

Q10: Does it matter where in the oven I place the blade?

A10: Yes. Temperature inside an oven can vary and generally is only measured at one point – where the thermocouple is located. For consistent results, you should keep your blades in a more or less consistent place in the chamber. Hint; Avoid getting closer to heating coils than necessary.

Q11: How do I know if my oven is accurate for temperature?

A11: Some will tell you that you can test temperature with ceramic firing cones. We disagree. Cones do not measure temperature. They measure heat work – a combination of time and temperature. Orton makes a product called TempChek which is better but still requires a rather complex cycle for a good result. An electronic probe and thermocouple is the best way to check, though can be expensive. Of course, unless you can calibrate the probe, you still don't really know do you? Note: Rob really nailed the question of using a pyrometric cone for temperature measurement. It's apples and oranges. Save the pyrometric cones for the potters.

Q12: How far can a blade be finished before heat treat?

A12: Many of our customers finish to 800 grit before heat treat. We ask makers to leave us 20 thou at the edge and point – essentially a finished blade that has not been sharpened. Although we have not had any stress fractures, it is also a good idea to avoid sharp corners where possible and to deburr pinholes and other irregularities.

Safety
Heat treating has obvious hazards. Please wear safety glasses or face shield and decent gloves. The day will come when you drop a hot blade. Make sure the floor around your oven is free from combustibles and please resist the urge to catch the falling blade.

Email rob@rangeroriginal.com with questions.

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