Section 6 – Setpoint Ramp/Soak Programming ("B" Software Option)

6.1 Overview

What is programming?

The term "programming" is used here to identify the process for selecting and entering the individual ramp and soak segment data needed to generate the required setpoint versus time profile (also called a program).

For Single Setpoint Ramp, see Subsection 5.8.

A segment is a ramp or soak function which together make up a setpoint program. Setpoint Ramp/Soak Programming lets you configure six ramp and six soak segments to be stored for use as one program or several small programs. You designate the beginning and end segments to determine where the program is to start and stop.

Review program data and configuration

While the procedure for programming is straightforward, and aided by prompts, we suggest that you read *"6.2 Program Contents"* in this section as well as *"Section 3 - Configuration"* before doing the setpoint programming.

Fill out the worksheet

Draw a Ramp/Soak Profile on the worksheet provided and fill in the information for each segment. This will give you a record of how the program was developed.

What's in this section

The table below lists the topics that are covered in this section.

6.2 Program Contents

What you will configure

Basically, you will configure all the data that is relevant to each ramp and soak segment for a given setpoint versus time profile. The controller will prompt you through the sequence of segments and associated functions.

Ramp time or rate segments

A ramp segment is the time it takes to change the setpoint to the next setpoint value in the program.

- Ramps are odd number segments. Segment #1 will be the initial ramp time.
- Ramp time is determined in either:

  TIME* - Hours:Minutes Range = 0-99 hrs:59 min.

  or

  EU-M* - Degrees/Minute Range = 0 to 999
  EU-H* - Degrees/Hour

  * The selection of time or rate is made at prompt "RP UNIT"

  – Set this prompt before entering any Ramp information.

ATTENTION Entering "0" will imply an immediate step change in setpoint to the next soak.

Soak segments

A soak segment is a combination of soak setpoint (value) and a soak duration (time).

- Soaks are even number segments.
- Segment 2 will be the initial soak value and soak time.
- The soak setpoint range value must be within the setpoint high and low range limits in engineering units.
- Soak time is the duration of the soak and is determined in:

  TIME - Hours:Minutes Range = 0-99 hrs:59 min.

Start segment number

The start segment number designates the number of the first segment.

- Range = 1 to 11

End segment number

The end segment number designates the number of the last segment, it must be a soak segment (even number).

- Range = 2 to 12

Recycle number

The recycle number allows the program to recycle a specified number of times from beginning to end.

- Range = 0 to 99

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Guaranteed soak

Each soak segment can have a deviation value of from 0 to ±99 which guarantees the value for that segment.

Guaranteed soak segment values >0 guarantee that the segments process variable is within the ± deviation for the configured soak time. Whenever the ± deviation is exceeded, soak timing is frozen.

There are no guaranteed soaks whenever the deviation value is configured to 0, (that is, soak segments start timing soak duration as soon as the soak setpoint is first reached, regardless of where the process variable remains relative to the soak segment).

The value is the number in engineering units, above or below the setpoint, outside of which the timer halts. The range is 0 to ± 99.

The decimal location corresponds to input 1 decimal selection.

Program state

The program state selection determines the program state after completion.

The selections are:

- DIS = program is disabled
- HOLD = program on hold

Program termination state

The program termination state function determines the status of the controller upon completion of the program.

The selections are:

- LAST = controls to last setpoint
- LSP2 = controls using local setpoint 2 if configured.

Power outage

ATTENTION If power is lost during a program, upon power-up the controller will be in hold and the setpoint value will be the setpoint value prior to the beginning of the setpoint program. The program is placed in hold at the beginning. The mode will be as configured under "PWR UP" in the "CONTROL" group.

Ramp unit

The ramp unit selection determines the engineering units for the ramp segments.

The selections are:

- TIME = Hours:Minutes
- EU-H = Degrees/Hour OR EU-M = Degrees/Minute

Digital input (remote) operation

Program can be placed in RUN or HOLD state through a remote dry contact connected to optional digital input terminals, as follows:

- RUN—contact closure places Program in RUN state, OR
- HOLD—contact closure places Program in HOLD state

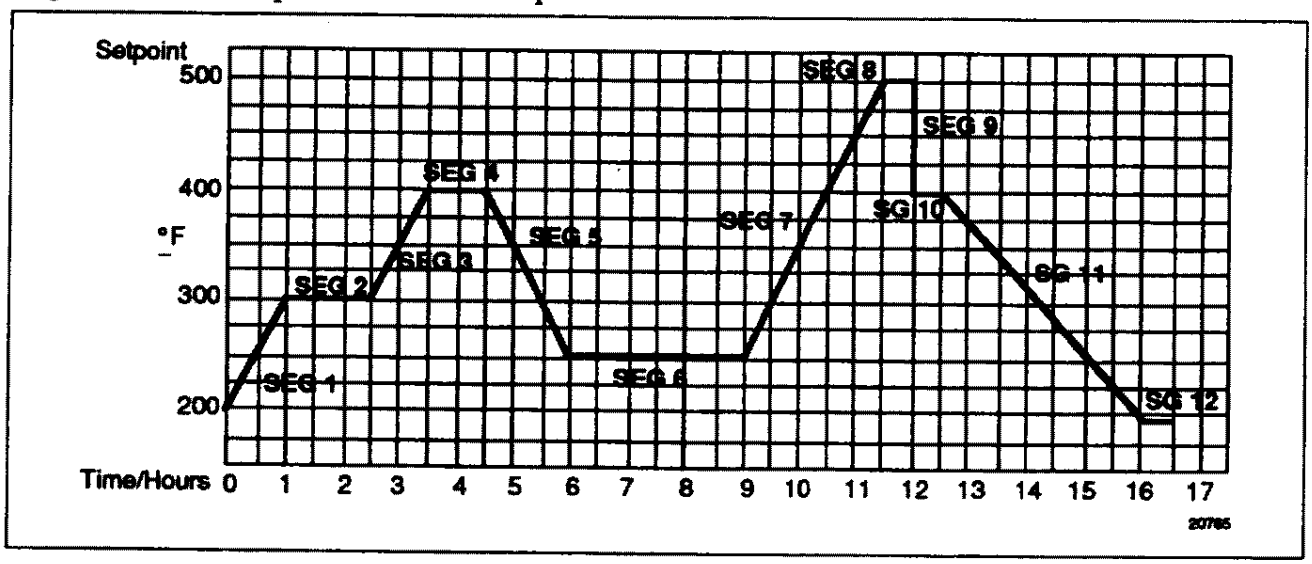
Opening contact reverts to original state.

6.3 Drawing a Ramp/Soak Profile

Ramp/soak profile example

Before you perform the actual configuration, we recommend that you draw a Ramp/Soak profile in the space provided on the "*Program Record Sheet*" (Figure 6-2) and fill in the associated information. An example of a Ramp-Soak Profile is shown in Figure 6-1.Start setpoint is at 200 degrees F.

Figure 6-1 Ramp/Soak Profile Example



Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
STRSEG	Start Seg.		1	SG7 RP	Ramp Time	7	2hrs:30min.
ENDSEG	End Seg.		12	SG8 SP	Soak SP	8	500
RECYCL	Number of Recycles		2	SG8 TI	Soak Time	8	0hr.:30 min.
SOKDEV	Deviation Value		0	SG9 RP	Ramp Time	9	0
SG1 RP	Ramp Time	1	1 hr.	SG10 SP	Soak SP	10	400
SG2 SP	Soak SP	2	300	SG10 TI	Soak Time	10	0hr.:30 min.
SG2 TI	Soak Time	2	1hr.:30 min.	SG11 RP	Ramp Time	11	3hrs:30min.
SG3 RP	Ramp Time	3	1hr.	SG12 SP	Soak SP	12	200
SG4 SP	Soak SP	4	400	SG12TI	Soak Time	12	0hr.:30 min.
SG4 TI	Soak Time	4	1 hr.	STATE	Controller State at end		HOLD
SG5 RP	Ramp Time	5	1hr.:30 min.	PG END	Controller Status		LAST SP
SG6 SP	Soak SP	6	250	RP UNIT	Engr. Unit for Ramp		TIME
SG6 TI	Soak Time	6	3hrs.:0min.				

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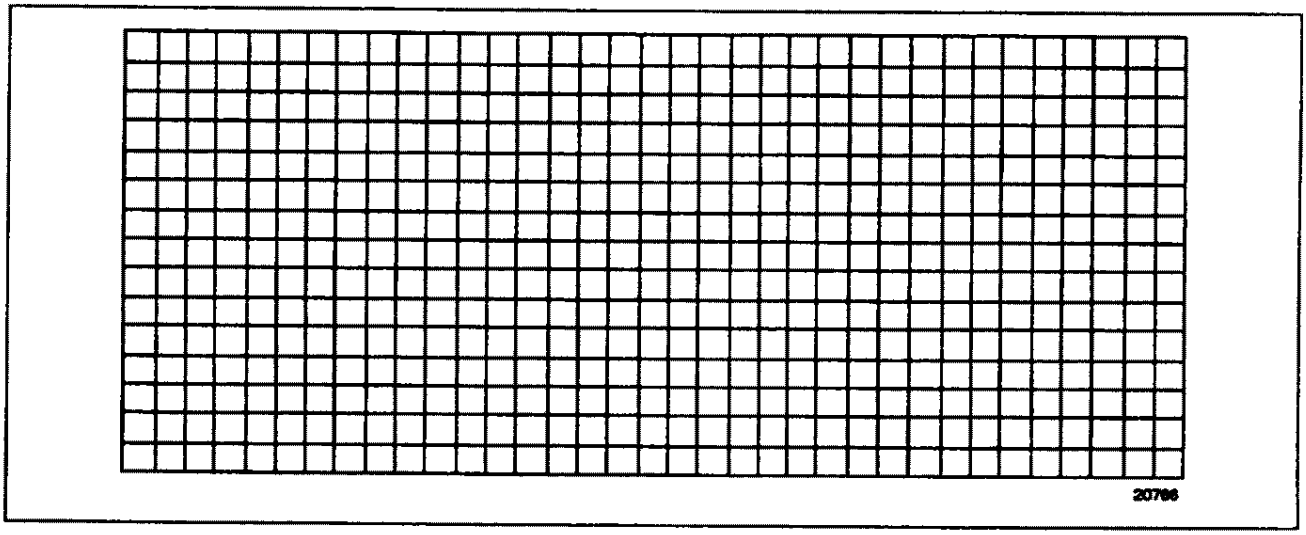
6.3 Drawing a Ramp/Soak Profile, Continued

Program record sheet

Draw your ramp/soak profile on the record sheet shown in Figure 6-2 and fill in the associated information in the blocks provided. This will give you a permanent record of your program and will assist you when entering the Setpoint data.

Figure 6-2 Program Record Sheet



Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
STRSEG	Start Seg.			SG7 RP	Ramp Time	7	
ENDSEG	End Seg.			SG8 SP	Soak SP	8	
RECYCL	Number of Recycles			SG8 TI	Soak Time	8	
SOKDEV	Deviation Value			SG9 RP	Ramp Time	9	
SG1 RP	Ramp Time	1		SG10 SP	Soak SP	10	
SG2 RP	Soak SP	2		SG10 TI	Soak Time	10	
SG2 TI	Soak Time	2		SG11RP	Ramp Time	11	
SG3 RP	Ramp Time	3		SG12SP	Soak SP	12	
SG4 SP	Soak SP	4		SG12TI	Soak Time	12	
SG4 TI	Soak Time	4		STATE	Program Controller State		
SG5 RP	Ramp Time	5		PG END	Controller Status		
SG6 SP	Soak SP	6		RP UNIT	Engr. Unit for Ramp		
SEG6 TI	Soak Time	6					

6.4 Entering the Setpoint Program Data

Procedure

The procedure listed in Table 6-1 tells you what keys to press and what prompts you will see when entering the setpoint program data. Follow the prompt hierarchy listed in Table 6-2 when selecting the functions for setpoint programming.

ATTENTION Make sure SP RAMP is disabled first (as specified in step 1) before performing the Table 6-1 procedure.

Table 6-1 Setpoint Program Data Entry Procedure

Step	Action	Press	Result
1	Disable SP RAMP	SET UP then FUNCTION then ▲	until you see: Upper Display: SET Lower Display: SPRAMP until you see Upper Display: EnAb Lower Display: SPRAMP until you see Upper Display: dIS Lower Display: SPRAMP
2	Select SP PROG Group	FUNCTION until you see	Upper Display: dIS Lower Display: SP PROG
		▲	to enable SP Program Upper Display: EnAb Lower Display: SP PROG

Table 6-1 is continued on next page

Procedure, continued

Table 6-1 Setpoint Program Data Entry Procedure, Continued

Step	Action	Press	Result
3	Select the functions	FUNCTION	This accesses the function prompts and enables Setpoint Programming. Upper Display → The current value for each prompt is shown Lower Display → The individual function prompts within the setpoint program group are shown. Successive presses of the FUNCTION key will sequentially display all the functions and their values or selections. Follow the prompt hierarchy shown in table 6-2.
4	Change the value or selection of a function prompt	▲ or ▼	This changes the value or selection in the upper display. If the display blinks, you are trying to select an unacceptable value.
5	Enter Value or selection into memory	FUNCTION	This enters the value or selection and goes to another prompt. Repeat steps 4 and 5 for each function you want to change.
6	Exit configuration	DISPLAY	This exits from the configuration mode.

Alarms on the Setpoint Program

You can configure an event to go ON or OFF at the beginning or end of any segment. Refer to *Subsection 3.15 - Alarms Set Up Group* for details.

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Prompt hierarchy

Table 6-2 lists all the function prompts for Setpoint Program data configuration in the order of their appearance.

- Follow the procedure in Table 6-1 to transfer the data from your setpoint Ramp/Soak profile into the controller.
- All parameters may be changed while the program is disabled or in HOLD.

Table 6-2 Prompt Hierarchy and Available Selections

Prompt	Definition	Value or Selection (use ▲ or ▼)
SP RAMP	Setpoint Ramp selection	*Selections*: DIS **SP RAMP must be disabled to allow Setpoint Programming.**
SP PROG	Setpoint Ramp/Soak Programming	*Selections*: ENAB DIS **SP PROG must be enabled to view the remaining prompts.**
STRSEG	Start Segment Number	*Enter Value*: 1 to 11
ENDSEG	End Segment Number	*Enter Value*: 2 to 12 Always end in a soak segment (2,4,.....12)
RECYCL	Number of Program Recycles	*Enter Value*: 0 to 99 recycles
SOKDEV	Guaranteed Soak Deviation Value	*Enter Value*: 0 to ± 99.9 The number selected will be 0 to 99± from setpoint.
SG1 RP	Segment #1 Ramp Time or Segment #1 Ramp Rate	*Enter Value*: Ramp Time = 0-99hrs:0-59min, or EU-M or EU-H = 0-999 degrees/minute or hour **Select TIME or EU-M/EU-H at prompt "RPUNIT".** **All ramps will use whatever is selected at "RPUNIT."**
SG2 SP	Segment #2 Soak Setpoint Value	*Enter Value*: Within the Setpoint limits
SG2 TI	Segment #2 Soak Duration	*Enter Value*: 0-99hrs:0-59min
SG3 RP	Segment #3 Ramp Time or Segment #3 Ramp Rate	*Enter Value*: Ramp Time = 0-99hrs:0-59min, or EU-M or EU-H = 0-999 degrees/minute (EU-M) or hour (EU-H)
SG4 SP	Segment #4 Soak Setpoint Value	*Enter Value*: Within the Setpoint limits
SG4 TI	Segment #4 Soak Duration	*Enter Value*: 0-99hrs:0-59min

Table 6-2 is continued on next page

Prompt hierarchy, continued

Table 6-2 Prompt Hierarchy and Available Selections, Continued

Prompt	Definition	Value or Selection (use ▲ or ▼)
SG5 RP	Segment #5 Ramp Time or Segment #5 Ramp Rate	*Enter Value*: Ramp Time = 0-99hrs:0-59min, or EU-M or EU-H = 0-999 degrees/ minute (EU-M) or hour (EU-H)
SG6 SP	Segment #6 Soak Setpoint Value	*Enter Value*: Within the Setpoint limits
SG6 TI	Segment #6 Soak Duration	*Enter Value*: 0-99hrs:0-59min
SG7 RP	Segment #7 Ramp Time or Segment #7 Ramp Rate	*Enter Value*: Ramp Time = 0-99hrs:0-59min, or EU-M or EU-H = 0-999 degrees/ minute (EU-M) or hour (EU-H)
SG8 SP	Segment #8 Soak Setpoint Value	*Enter Value*: Within the Setpoint limits
SG8 TI	Segment #8 Soak Duration	*Enter Value*: 0-99hrs:0-59min
SG9 RP	Segment #9 Ramp Time or Segment #9 Ramp Rate	*Enter Value*: Ramp Time = 0-99hrs:0-59min, or EU-M or EU-H = 0-999 degrees/ minute (EU-M) or hour (EU-H)
SG10SP	Segment #10 Soak Setpoint Value	*Enter Value*: Within the Setpoint limits
SG10TI	Segment #10 Soak Duration	*Enter Value*: 0-99hrs:0-59min
SG11RP	Segment #11 Ramp Time or Segment #11 Ramp Rate	*Enter Value*: Ramp Time = 0-99hrs:0-59min, or EU-M or EU-H = 0-999 degrees/ minute (EU-M) or hour (EU-H)
SG12SP	Segment #12 Soak Setpoint Value	*Enter Value*: Within the Setpoint limits
SG12TI	Segment #12 Soak Duration	*Enter Value*: 0-99hrs:0-59min
STATE	Program state at program end	*Selections*: DISABLE HOLD (hold mode)
PG END	Program Termination State	*Selections*: LAST SP- Hold at last setpoint in the program LSP2 - Local setpoint 2
RPUNIT	Engineering units for ramp segments	*Selections*: TIME EU-M EU-H

6.5 Run/Monitor the Program

Introduction

Prior to running the program, make sure all the "SP PROG" function prompts under the Set Up group "SP RAMP" have been configured with the required data.

- "HOLD" appears periodically in the upper display indicating that the program is in the HOLD state.

ATTENTION SP Programmer parameter *cannot* be changed during RUN state (must be in HOLD state).

Run/Monitor functions

Table 6-3 lists all the functions required to run and monitor the program.

Table 6-3 Run/Monitor Functions

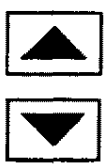
Function	Press	Result
Set the Local Setpoint	DISPLAY	You will see Upper Display  Local Setpoint Value Lower Display SP
		To set the Local Setpoint value to where you want the program to start out.
Run State	RUN HOLD	Initiates the setpoint program. "RUN" appears in the upper display indicating that the program is running.
Hold State	RUN HOLD	Holds the setpoint program. "HOLD" appears in the upper display indicating that the program is in the HOLD state. The setpoint holds at the current setpoint.
External Hold		If Remote Switching (Digital Input Option) is present on your controller, contact closure places the controller in the HOLD state, if the setpoint program is running. The "HOLD" in the upper display will be displayed periodically in lower case. **ATTENTION** The keyboard takes priority over the external switch for the RUN/HOLD function. Contact reopening runs program.

Table 6-3 is continued on next page

Run/Monitor functions, continued

Table 6-3 Run/Monitor Functions, Continued

Function	Press	Result
Viewing the present ramp or soak segment number and time	DISPLAY until you see	Upper Display ← PV value Lower Display ← **XXHHMM** Time remaining in the SEGMENT in hours and minutes XX = 1 to 12
Viewing the number of cycles left in the program	DISPLAY until you see	Upper Display ← PV value Lower Display ← **REC.X** Number of cycles remaining in the setpoint program X = 0 to 99
End Program		When the final segment is completed, the "RUN" in the upper display either changes to "HOLD" (if configured for HOLD state), or disappears (if configured for disable of setpoint programming). • The controller either operates at the last setpoint in the program or controls using local setpoint 2.
Disable Program	SETUP until you see	Upper Display: SETUP Lower Display: SP RAMP
	FUNCTION until you see	Upper Display: ENAB Lower Display: SP PROG
	▲ or ▼ until you see	Upper Display: DIS Lower Display: SP PROG
	DISPLAY	Exit configuration and Program is disabled.