



UDC 2500 Application Note

Setpoint Rate/Ramp/Program Overview

Introduction

The Setpoint Ramp configuration group lets you enable and configure any of the following:

SPRATE – a specific rate of change for any local setpoint change. (Subsection 0)

SPRAMP – a single setpoint ramp that occurs between the current local setpoint and a final local setpoint over a time interval of 1 to 255 minutes. (Subsection 0)

SPPROG – a ramp/soak profile in a 12-segment program. (Subsection 0)

This section explains the operation of each selection and configuration reference where necessary.

ATTENTION

For any option to function, the other options must be disabled (see Subsection **Error! Reference source not found.** – Configuration).

PV Hot Start

This is a standard feature. At power-up, the setpoint is set to the current PV value and the Rate or Ramp or Program then starts from this value.

RUN/HOLD key

You can start or stop the Ramp or Program using the RUN/HOLD key.

Setpoint Ramp

Introduction

When you have configured a SETPOINT RAMP, the ramp will occur between the current local setpoint and a final local setpoint over a time interval of from 1 to 255 minutes. You can RUN or HOLD the ramp at any time.

Configuration Check

Make sure

- SPRAMP is enabled
- SP RATE and SPPROG are disabled
- A Ramp Time (TIMIN) in minutes has been configured
- A final setpoint value (FINLSP) has been configured. See Subsection **Error! Reference source not found.** – Configuration group “SPRAMP” for details.

Operation

Running a Setpoint Ramp includes starting, holding, viewing the ramp, ending the ramp and disabling it. See Table **Error! No text of specified style in document.-1.**



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Table Error! No text of specified style in document.-1 Running A Setpoint Ramp

Step	Operation	Press	Result
1	Select Automatic Mode	M-A RESET	“A” indicator is on. <i>Upper Display</i> = Hold and PV value <i>Lower Display</i> = SP and Present value
2	Set Start Setpoint	LOWER DISPLAY	Until start SP value is in lower display <i>Upper Display</i> = Hold and PV value <i>Lower Display</i> = SP and start SP value
3	Start the Ramp	RUN/HOLD	You will see <i>Upper Display</i> = Run and a changing PV value <i>Lower Display</i> = SP and a changing SP value increasing or decreasing toward a final SP value
4	Hold/Run the Ramp	RUN/HOLD	This holds the ramp at the current setpoint value. Press again to continue.
5	View the remaining ramp time	LOWER DISPLAY	Until you see <i>Upper Display</i> = RUN or HOLD and the PV value <i>Lower Display</i> = RP xx HH.MM (time remaining)
6	End the Ramp		When the final setpoint is reached, “RUN” changes to “HOLD” in the upper display and the controller operates at the new final setpoint.
7	Disable SPRAMP		See Section Error! Reference source not found. – Configuration group “SPRAMP” for details.

Power Outage

If power is lost during a ramp, 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 ramp.

The ramp is placed in hold at the beginning.

Configure the mode at Set Up Group “CONTROL”, function prompt “PWRUP”. – CONTRL GROUP FUNCTION Prompts.

Setpoint Rate

Introduction

When you have configured a SETPOINT RATE, it will apply immediately to local setpoint change.



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Configuration check

Make sure:

- SPRATE is enabled
- SPRAMP and SPPROG are disabled
- A Rate Up (EUHRUP) or Rate Down (EUHRDN) value has been configured in Engineering units per hour.

ATTENTION

A value of 0 will imply an immediate change in setpoint, that is, NO RATE applies. See Subsection **Error! Reference source not found.** – Configuration group “SPRAMP” for details.)

Operation

When a change to local setpoint is made, this controller will ramp from the original setpoint to the “target” setpoint at the rate specified.

The current setpoint value can be viewed at Sn on the lower display.

Power outages

If power is lost before the “target” setpoint is reached, upon power recovery, the controller powers up with Sn = Current PV value and it automatically “Restarts” from Sn = current PV value up to the original “target” setpoint.

Setpoint Ramp/Soak Programming

Introduction

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).

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 you read “Program Contents”. Table **Error! No text of specified style in document.-2** lists the program contents and an explanation of each to aid you in configuration. Then refer to Subsection **Error! Reference source not found.** – Configuration to do the setpoint program.

Make sure SPRATE and SPRAMP are disabled.



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Fill out the worksheet

Refer to the example in Figure Error! No text of specified style in document.-1 and draw a Ramp/Soak Profile on the worksheet provided (Figure Error! No text of specified style in document.-2) and fill in the information for each segment. This will give you a record of how the program was developed.

Operation

Refer to Table Error! No text of specified style in document.-3 Run/Monitor the program.

Program Contents

Table Error! No text of specified style in document.-2 lists all the program contents and a description of each.



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Table Error! No text of specified style in document.-2 Program Contents

Contents	Definition
Ramp time or rate segments	<p>A ramp segment is the time or rate of change it takes to change the setpoint to the next setpoint value in the program.</p> <ul style="list-style-type: none"> • Ramps are odd number segments. Segment #1 will be the initial ramp time. • Ramp time is determined in either: <p style="margin-left: 40px;">TIME* - Hours:Minutes Range = 0-99 hr.:59 min.</p> <p style="margin-left: 80px;">or</p> <p style="margin-left: 40px;">EU-M* - Degrees/Minute Range = 0 to 999</p> <p style="margin-left: 40px;">EU-H* - Degrees/Hour</p> <p>*The selection of time or rate is made at prompt "RP UNIT" - Set this prompt before entering any Ramp information.</p> <p>ATTENTION Entering "0" will imply an immediate step change in setpoint to the next soak.</p>
Ramp unit	<p>The ramp unit selection determines the engineering units for the ramp segments.</p> <p>The selections are:</p> <ul style="list-style-type: none"> • TIME = Hours:Minutes (XX:XX) Range: 0-99 hr.:0-59 min • EU-H = Degrees/Hour OR EU-M = Degrees/Minute (Range – 0-999)
Soak segments	<p>A soak segment is a combination of soak setpoint (value) and a soak duration (time).</p> <ul style="list-style-type: none"> • 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: <p style="margin-left: 40px;">TIME - Hours:Minutes Range = 0-99 hr.:59 min.</p>
Start segment number	<p>The start segment number designates the number of the first segment. Range = 1 to 11</p>
End segment number	<p>The end segment number designates the number of the last segment, it must be a soak segment (even number). Range = 2 to 12</p>
Recycle number	<p>The recycle number allows the program to recycle a specified number of times from beginning to end. Range = 0 to 99</p>



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Contents	Definition
Guaranteed soak	<p>All soak segments can have a deviation value of from 0 to ± 99 (specified by SOK DEV) which guarantees the value for that segment.</p> <p>Guaranteed soak deviation values >0 guarantee that the soak segment's process variable is within the \pm deviation for the configured soak time. Whenever the \pm deviation is exceeded, soak timing is frozen.</p> <p>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).</p> <p>The soak deviation value is the number in engineering units, above or below the setpoint, outside of which the timer halts. The range is 0 to ± 99.</p> <p>The decimal location corresponds to input 1 decimal selection.</p>
PV Start	<p>This function determines whether LSP1 or PV is used as the setpoint when the program is initially changed from HOLD to RUN.</p> <p>The selections are:</p> <p>DISABL = When the program is initially changed from HOLD to RUN the present LSP1 value is captured as the default setpoint. If the program is terminated or the power cycled before the program has completed, the LSP1 is used as the control setpoint. The beginning segment uses this value as the initial ramp setpoint.</p> <p>ENABL = When the program is initially changed from HOLD to RUN the present PV value is captured and used as the beginning setpoint value for the ramp segment. If the program is terminated before completion, the setpoint value will revert back to the PV value captured at the initial HOLD to RUN transition. If the power is cycled before program completion, upon power-up the setpoint is set to the PV value at power-up and when the program is restarted that setpoint value is used initially.</p>
Program state	<p>The program state selection determines the program state after completion.</p> <p>The selections are:</p> <ul style="list-style-type: none">• DIS = program is disabled (so program value changed to DIS)• HOLD = program on hold
Program termination state	<p>The program termination state function determines the status of the controller upon completion of the program.</p> <p>The selections are:</p> <ul style="list-style-type: none">• LAST = controls to last setpoint• FSAF = manual mode and failsafe output.
Reset Program to Beginning	<p>When enabled, this selection allows you to reset the program to the beginning from the keyboard.</p>



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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 Error! **No text of specified style in document.-2**) and fill in the associated information. An example of a Ramp-Soak Profile is shown in Figure Error! **No text of specified style in document.-1**. Start setpoint is at 200 degrees F.



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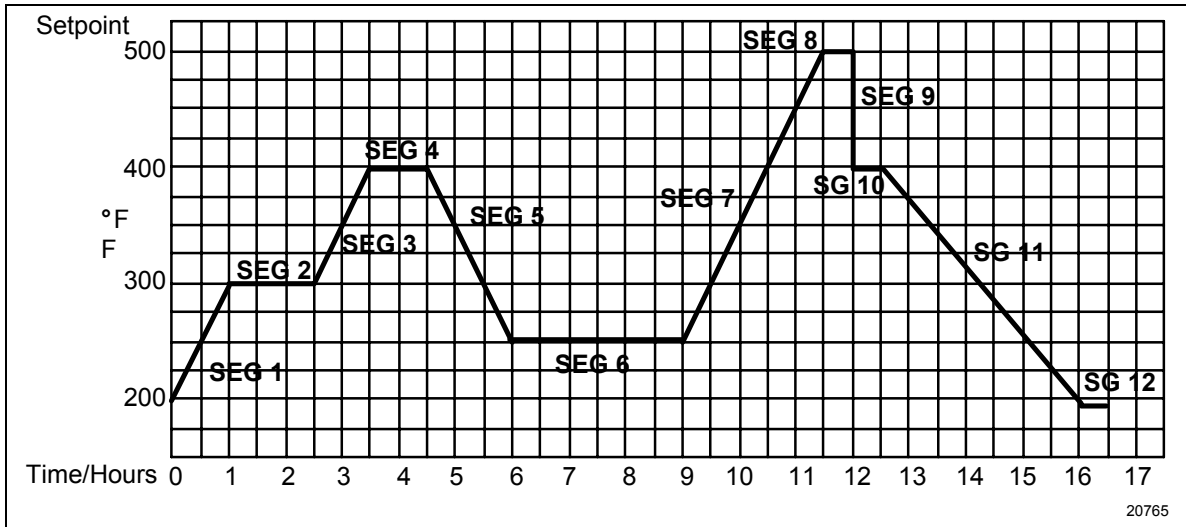


Figure Error! No text of specified style in document.-1 Ramp/Soak Profile Example

Ramp/Soak Profile Example

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

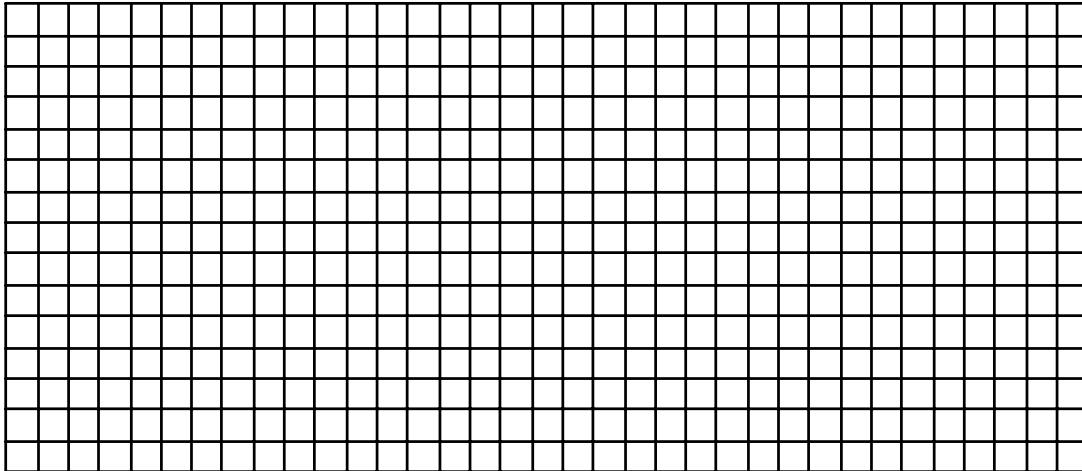


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SG4 SP	Soak SP	4	400
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Program record sheet

Draw your ramp/soak profile on the record sheet shown in Figure Error! No text of specified style in document.-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.



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Figure Error! No text of specified style in document.-2 Program Record Sheet

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



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SG3 RP	Ramp Time	3		SG12TI	Soak Time	12	
SG4 SP	Soak SP	4					

Run/Monitor the program

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 Error! No text of specified style in document.-3 lists all the functions required to run and monitor the program.

Table Error! No text of specified style in document.-3 Run/Monitor Functions

Function	Press	Result
Set the Local Setpoint	LOWER DISPLAY	<i>Upper Display</i> = PV value <i>Lower Display</i> = SP
	▲ or ▼	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.



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Function	Press	Result
External Hold		<p>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.</p> <p>The “HOLD” in the upper display will be displayed periodically in lower case.</p> <p>ATTENTION The keyboard takes priority over the external switch for the RUN/HOLD function.</p> <p>Contact reopening runs program.</p>
Viewing the present ramp or soak segment number and time	<div style="border: 1px solid black; padding: 2px; display: inline-block;">LOWER DISPLAY</div> until you see	<p><i>Upper Display</i> = PV value <i>Lower Display</i> = XXHH.MM</p> <p>Time remaining in the SEGMENT in hours and minutes. XX = 1 to 12</p> <p style="text-align: right;"><i>continued</i></p>
Viewing the number of cycles left in the program	<div style="border: 1px solid black; padding: 2px; display: inline-block;">LOWER DISPLAY</div> until you see	<p><i>Upper Display</i> = PV value <i>Lower Display</i> = REC_XX</p> <p>Number of cycles remaining in the setpoint program. X = 0 to 99</p>
End Program		<p>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).</p> <ul style="list-style-type: none"> The controller either operates at the last setpoint in the program or goes into manual mode/failsafe output.
Disable Program		<p>See Section Error! Reference source not found. – Configuration Group “SPPROG” for details.</p>

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.



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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 the contact will cause the Controller to revert to its original state.