

**UDC3500**  
**Universal Digital Controller**  
**Lockheed Addendum**

**51-52-99-36**

**March 2007**

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# 1 Introduction

## 1.1 Overview

### Function

This document should be looked at as being an addendum to the UDC3500 Product Manual 51-52-25-120. This document shows the unique Set Point Programming (SPP) functionality created specifically for Lockheed.

## 2 Configuration

### 2.1 SP Program 1 Set Up Group

#### Introduction

A *Set Point Rate* [SPRATE] lets you configure a *specific rate of change* for any local setpoint change.

A single *Set Point Program* [SP PROG] of 40 segments can be configured.

You can start and stop the Setpoint Program using the **RUN/HOLD** key.

*PV Hot Start* is a configurable feature and means that, at initialization, the setpoint is set to the current PV value and the Ramp or Rate or Program then starts from this value.

## Function Prompts

**Table 2-1 SP PROG1 Group Function Prompts**

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<p><b>SP RATE</b></p> <p><i>SP Rate operates on any LSP when both SP Ramp and SP Programming are not active.</i></p>	<p>DISABLE</p> <p>ENABLE</p>	<p><b>SETPOINT RATE</b>—Lets you configure a specific rate of change for any local setpoint change.</p> <p><b>DISABLE SETPOINT RATE</b>—Disables the setpoint rate option.</p> <p><b>ENABLE SETPOINT RATE</b>—Allows the SP rate feature.</p>
<p><b>EU/HR UP</b></p>	<p>0 to 9999 in engineering units per hour</p>	<p><b>RATE UP</b>—Rate up value. When making a setpoint change, this is the rate at which the controller will change from the original setpoint up to the new one. The ramping (current) setpoint can be viewed as SPn in the lower display.</p> <p>Entering a 0 will imply an immediate step change in Setpoint (i.e., no rate applies).</p>
<p><b>EU/HR DN</b></p>	<p>0 to 9999 in engineering units per hour</p>	<p><b>RATE DOWN</b>—Rate down value. When making a setpoint change, this is the rate at which the controller will change from the original setpoint down to the new one. The ramping (current) setpoint can be viewed as SPn in the lower display.</p> <p>Entering a 0 will imply an immediate step change in Setpoint (i.e., no rate applies).</p>
<p><b>SP PROG</b></p> <p><i>If SP Rate is enabled, it does not operate while an SP Program is running.</i></p>	<p>DISABLE</p> <p>ENABLE</p> <p>ENABLE2</p> <p>ENABL12</p>	<p><b>SETPOINT RAMP/SOAK PROGRAM #1</b>—Available only with controllers that contain this option.</p> <p><i>SP RAMP must be disabled.</i></p> <p><b>DISABLE</b>—Disables all Setpoint Programs.</p> <p><b>ENABLE</b>—Setpoint Program runs on Loop 1.</p> <p><b>ENABLE2</b>—Setpoint Program runs on Loop 2.</p> <p><b>ENABL12</b>—Setpoint Program runs on both Loop 1 and Loop 2.</p>
<p><b>STRT SEG</b></p>	<p>1 to 40</p>	<p><b>START SEGMENT NUMBER</b></p>
<p><b>END SEG</b></p>	<p>2 to 40 even numbers Always end in a soak segment (2, 4, ... 40)</p>	<p><b>END SEGMENT NUMBER</b></p> <p><b>ATTENTION</b> When linking programs 1 and 2, End Segment Number must be set to 20. Values less than 20 will prevent the SP Programs from linking.</p>
<p><b>RAMPUNIT</b></p>	<p>TIME</p> <p>EU/MIN</p> <p>EU/HR</p>	<p><b>RAMPUNIT</b>—Engineering Units for Ramp Segments</p> <p><b>TIME</b> in hours: minutes</p> <p><b>RATE</b> in Engineering units per minute</p> <p><b>RATE</b> in Engineering units per hour</p>
<p><b>RECYCLES</b></p>	<p>0 to 100 recycles</p>	<p><b>NUMBER OF PROGRAM RECYCLES</b></p>

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<b>PROG END</b>	LASTSP  F SAFE	<b>PROGRAM TERMINATION STATE</b> <b>LAST SETPOINT</b> —Hold at last setpoint in the program <b>FAIL SAFE</b> —Manual mode/Failsafe output
<b>STATE</b>	DISABLE HOLD	<b>PROGRAM STATE AT PROGRAM END</b>
<b>POWER UP</b>	ABORT RESUME RESTART	<b>POWER UP</b> —This configuration determines what the Program will do in the case of a power outage during the Program. This prompt only appears on those instruments that have the Real Time Clock option.  <b>ABORT</b> —Program terminated on power up <b>RESUME</b> —Continue at the same point in program <b>RESTART</b> —Restart program at beginning of the same cycle
<b>KEYRESET</b>	DISABLE  ToBEGIN          RERUN	<b>KEY RESET</b> —Reset/Rerun SP Program  <b>DISABLE</b>  <b>RESET TO BEGINNING OF SETPOINT PROGRAM</b> — When enabled, this selection allows you to reset via the keyboard to the beginning of the program and resets the Recycle value to 0. The program mode is placed in HOLD.  If the current Local Setpoint 1 value is at any value other than that Setpoint value used in the first Soak segment in the program, then the program will restart at the current Local Setpoint 1 value and at the beginning of the first Ramp segment in the program.  If the current Local Setpoint 1 value is at the same Setpoint value as that used for the first Soak segment in the program, then the first Ramp segment is skipped and the program will restart at the beginning of the first Soak segment in the program.  <b>RERUN CURRENT CYCLE</b> —When enabled, this selection allows you to reset the program via the keyboard to the beginning of the current cycle. The Recycle value is not affected. The program mode (RUN or HOLD) is not affected.
<b>HOTSTART</b>	DISABLE ENABLE	<b>HOT START</b> —This feature allows the SP Program to start at the current PV value rather than the current Setpoint value.

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<b>SEG1RAMP</b> or <b>SEG1RATE</b>	0-99 hours.0-59 minutes Engineering units/minute or Engineering units/hour	<b>Segment #1 Ramp Time</b> or <b>Segment #1 Ramp Rate</b>  <b>ATTENTION</b> This parameter is affected by the RAMPUNIT configuration (see above). All ramps will use the same selection.
<b>SEG1PID</b>	1-4	<b>PID Set Selection</b>  <b>ATTENTION</b> The PID Set Selection prompts will only show up when PID SETS in the Control 1 or Control 2 Setup Group is set to 4 KEYBD.
<b>SEG2 SP</b>	Within the Setpoint limits	<b>Segment #2 Soak Setpoint Value</b>
<b>SEG2TIME</b>	0-99 hours.0-59 minutes	<b>Segment #2 Soak Duration</b>
<b>SOAK2DEV</b>	0.000 to 99.99	<b>Guaranteed Soak Deviation Value For Soak Segment #2</b> —The number selected will be the PV value (in engineering units) above and below the setpoint outside of which the Soak Segment timer halts. A value of 0.000 is equivalent to no Guaranteed Soak.
<b>SEG2 PID</b>	1-4	<b>PID Set Selection</b> —This selection is Loop dependent.  <b>ATTENTION</b> The PID Set Selection prompts will only show up when PID SETS in the Control 1 or Control 2 Setup Group is set to 4 KEYBD.
<b>SEG3RATE</b> <b>SEG3 PID</b> <b>SEG4 SP</b> <b>SEG4TIME</b> <b>SOAK4DEV</b> <b>SEG4 PID</b> <b>SEG5RAMP</b> or <b>SEG5RATE</b> <b>SEG5 PID</b> <b>SEG6 SP</b> <b>SEG6TIME</b> <b>SOAK6DEV</b> <b>SEG6 PID</b> <b>SEG7RAMP</b> or <b>SEG7RATE</b> <b>SEG7 PID</b> <b>SEG8 SP</b> <b>SEG8TIME</b> <b>SOAK8DEV</b> <b>SEG8 PID</b> <b>SEG9RAMP</b> or	Selections are same as above.	Same as above  <b>ATTENTION</b> When linking programs, all 20 segments in Program 1 MUST be used.



Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
SEG9RATE SEG9 PID SG10 SP SG10TIME SOAK10DV SG10 PID SG11RAMP or SG11RATE SG11 PID SG12 SP SG12TIME SOAK12DV SG12 PID SG13RAMP or SG13RATE SG13 PID SG14 SP SG14TIME SOAK14DV SG14 PID SG15RAMP or SG15RATE SG15 PID SG16 SP SG16TIME SOAK16DV SG16 PID SG17RAMP or SG17RATE SG17 PID SG18 SP SG18TIME SOAK18DV SG18 PID SG19RAMP or SG19RATE SG19 PID SG20 SP SG20TIME SOAK20DV SG20 PID		

## 2.2 SP Program 2 Set Up Group

### Introduction

Setpoint Program 2 is always linked to Program 1 in order to make a single program with a maximum length of 40 segments.

### Function Prompts

**Table 2-2 SP PROG2 Group Function Prompts**

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<b>SG21RAMP</b> or <b>SG21RATE</b>	0-99 hours.0-59 minutes Engineering units/minute or Engineering units/hour	<b>Segment 21 Ramp Time</b> or <b>Segment #21 Ramp Rate</b>  <b>ATTENTION</b> This parameter is affected by the RAMPUNIT configuration (see above). All ramps will use the same selection.
<b>SG21PID</b>	1-4	<b>PID Set Selection</b>  <b>ATTENTION</b> The PID Set Selection prompts will only show up when PID SETS in the Control 1 or Control 2 Setup Group is set to 4 KEYBD.
<b>SG22 SP</b>	Within the Setpoint limits	<b>Segment #22 Soak Setpoint Value</b>
<b>SG22TIME</b>	0-99 hours.0-59 minutes	<b>Segment #22 Soak Duration</b>
<b>SOAK22DV</b>	0.000 to 99.99	<b>Guaranteed Soak Deviation Value For Soak Segment #22</b> —The number selected will be the PV value (in engineering units) above and below the setpoint outside of which the Soak Segment timer halts. A value of 0.000 is equivalent to no Guaranteed Soak.
<b>SG22 PID</b>	1-4	<b>PID Set Selection</b> —This selection is Loop dependent.  <b>ATTENTION</b> The PID Set Selection prompts will only show up when PID SETS in the Control 1 or Control 2 Setup Group is set to 4 KEYBD.
<b>SG23RAMP</b> or <b>SG23RATE</b> <b>SG23 PID</b> <b>SG24 SP</b> <b>SG24TIME</b> <b>SOAK24DV</b> <b>SG24 PID</b> <b>SG25RAMP</b> or <b>SG25RATE</b> <b>SG25 PID</b> <b>SG26 SP</b> <b>SG26TIME</b> <b>SOAK6DV</b>	Selections are same as above.	Same as above

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<p>SG26 PID</p> <p>SG27RAMP or SG27RATE SG27 PID</p> <p>SG28 SP SG28TIME SOAK28DV SG28 PID</p> <p>SG29RAMP or SG29RATE SG29 PID</p> <p>SG30 SP SG30TIME SOAK30DV SG30 PID</p> <p>SG31RAMP or SG31RATE SG31 PID</p> <p>SG32 SP SG32TIME SOAK32DV SG32 PID</p> <p>SG33RAMP or SG33RATE SG33 PID</p> <p>SG34 SP SG34TIME SOAK34DV SG34 PID</p> <p>SG35RAMP or SG35RATE SG35 PID</p> <p>SG36 SP SG36TIME SOAK36DV SG36 PID</p> <p>SG37RAMP or SG37RATE SG37 PID</p> <p>SG38 SP SG38TIME SOAK38DV SG38 PID</p> <p>SG39RAMP or SG39RATE SG39 PID</p> <p>SG40 SP SG40TIME SOAK40DV SG40 PID</p>		

## 3 Monitoring and Operating the Controller

### 3.1 Setpoint Ramp/Soak Programming

#### Introduction

**There are special features in this group that do not appear in the Standard UDC3500 Controller:**

- There is a single SP Program of up to 40 segments
- The single “SP RAMP” feature has been eliminated

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 10 ramp and 10 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 3-1 lists the program contents and an explanation of each to aid you in configuration.

#### Fill out the worksheet

Refer to the example in Figure 3-1. Draw a Ramp/Soak Profile on the worksheets provided and fill in the information for each segment. This will give you a record of how the programs were developed.

#### Program Contents

Table 3-1 lists all the program contents and a description of each.

#### **ATTENTION**

Segments 21 through 40 are in the PROGRAM 2 Set Up Group.

**Table 3-1 Program Contents**

Associated Prompts	Contents	Definition
<b>STRT SEG</b>	<b>Start segment number</b>	The start segment number designates the number of the first segment. Range = 1 to 40
<b>END SEG</b>	<b>End segment number</b>	The end segment number designates the number of the last segment; it must be a soak segment (even number). Range = 2 to 40
<b>RECYCLES</b>	<b>Recycle number</b>	The recycle number allows the program to recycle a specified number of times from beginning to end. Range = 0 to 99
<b>STATE</b>	<b>Program state</b>	The program state selection determines the program state after completion. The selections are: <ul style="list-style-type: none"> <li>• <b>DISABLE</b> = program is disabled (so program value changed to DISABLE)</li> <li>• <b>HOLD</b> = program on hold</li> </ul>
<b>PROG END</b>	<b>Program termination state</b>	The program termination state function determines the status of the controller upon completion of the program. The selections are: <ul style="list-style-type: none"> <li>• <b>LAST</b> = controls to last setpoint</li> <li>• <b>FAILSAFE</b> = manual mode and failsafe output.</li> </ul>
<b>POWER OUT</b>	<b>Program state after a power outage</b>	This configuration determines what the Program will do in the case of a power outage during the Program. This prompt only appears on those instruments that have the Real Time Clock option. The selections are: <ul style="list-style-type: none"> <li>• <b>ABORT</b> = Program terminated on power up. Instrument controls per the PROG END configuration.</li> <li>• <b>RESUME</b> = Continue at the same point in segment and cycle where power was lost.</li> <li>• <b>RESTART</b> = Restart program at the beginning of the first program segment in the same cycle where power was lost.</li> </ul>
<b>KEYRESET (ToBEGIN)</b>	<b>Reset Program to Beginning</b>	When enabled, this selection allows you to reset via the keyboard to the beginning of the program and resets the Recycle value to 0. The program mode is placed in HOLD.  If the current Local Setpoint 1 value is at any value other than that Setpoint value used in the first Soak segment in the program, then the program will restart at the current Local Setpoint 1 value and at the beginning of the first Ramp segment in the program.  If the current Local Setpoint 1 value is at the same Setpoint value as that used for the first Soak segment in the program, then the first Ramp segment is skipped and the program will restart at the beginning of the first Soak segment in the program.

Associated Prompts	Contents	Definition
<b>KEYRESET (RERUN)</b>	<b>Rerun current cycle</b>	<b>RERUN CURRENT CYCLE</b> —When enabled, this selection allows you to reset the program via the keyboard to the beginning of the current cycle. The Recycle value is not affected. The program mode (RUN or HOLD) is not affected.
<b>HOTSTART</b>	<b>Hot Start</b>	<p>This function determines whether LSP1 or PV is used as the setpoint when the program is initially changed from HOLD to RUN. The selections are:</p> <p><b>DISABLE</b> = 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><b>ENABLE</b> = 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>
<b>RAMPUNIT SEGxRAMP or SEGxRATE</b>	<b>Ramp time or rate segments</b>	<p>A ramp segment is the time it will take to change the setpoint to the next setpoint value in the program.</p> <p>Ramps are odd number segments (1, 3, . . . 39).</p> <p>Ramp time is determined in either:</p> <p style="padding-left: 40px;">TIME - Hours.Minutes      Range = 0-99hr.59 min.</p> <p style="text-align: center;">or</p> <p style="padding-left: 40px;">RATE - EU/MIN or EU/HR    Range = 0 to 999</p> <p>This selection of time or rate is made at prompt “RAMPUNIT”. Set this prompt before entering any Ramp values.</p> <p><b>ATTENTION</b> Entering “0” implies an immediate step change in setpoint to the next soak.</p>
<b>SEGx SP SEGxTIME</b>	<b>Soak segments</b>	<p>A soak segment is a combination of soak setpoint (value) and a soak duration (time).</p> <ul style="list-style-type: none"> <li>• Soaks are even number segments (2, 4, . . . 40).</li> <li>• Segment 2 will be the initial soak value and soak time.</li> <li>• The soak setpoint range value must be within the setpoint high and low range limits in engineering units.</li> <li>• Soak time is the duration of the soak and is determined in:</li> </ul>

Associated Prompts	Contents	Definition
		TIME – Hours:Minutes Range = 0-99 hr:59 min.
<b>SEGX PID</b>	<b>PID Set</b>	<p>These prompts will appear only when the number of PID sets selected in the Control or Control 2 Setup Group is set to 4KEYBD. Each Ramp and Soak segment may select a specific PID set. A Setpoint Program enabled only for Loop 1 will use Loop 1 PID Sets. A Setpoint Program enabled only for Loop 2 will use Loop 2 PID Sets. A Setpoint Program enabled for both Loop 1 and Loop 2 will use Loop 1 PID Sets.</p> <p>Range: PID Set 1 to 4</p>
<b>SOAK2DEV</b> <i>through</i> <b>SOAK40DEV</b>	<b>Guaranteed Soak Deviation Value</b>	<p>Each individual soak segment can have a unique guaranteed deviation value of from 0.000 to <math>\pm 99.99</math> in engineering units.</p> <p><b>Guaranteed Soak</b> deviation values greater than zero ensure that the soak segment's process variable is within the <math>\pm</math> deviation value for the configured soak time. Whenever the <math>\pm</math> deviation value is exceeded, the soak timer stops until the process variable gets within the <math>\pm</math> deviation value. While the soak timer is halted, "R" and "H" will alternate in the upper display. When the PV gets within the <math>\pm</math> deviation value, the timer will resume and a steady "R" will appear in the upper display.</p> <p>There are no guaranteed soaks whenever the deviation value is configured to 0.00 (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 decimal location used here corresponds decimal configuration chosen in the Display Set up group.</p>

## Ramp/soak profile example

Before you perform the actual configuration, it is recommended that you draw a Ramp/Soak profile in the space provided for each of the “*Program Record Sheets*” and fill in the associated information in the associated Tables. An example of a Ramp-Soak Profile is shown in Figure 3-1 and Table 3-2. Start setpoint is at 200 degrees F.

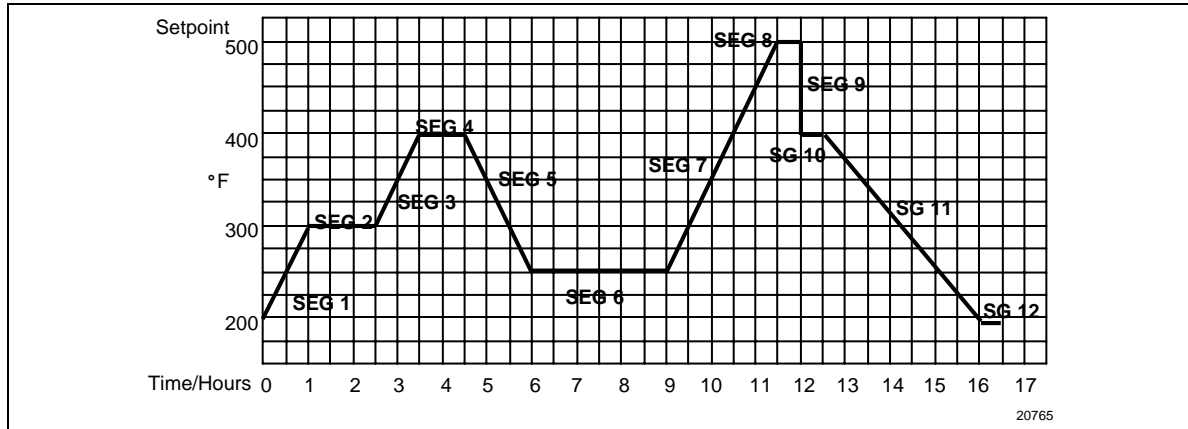


Figure 3-1 Ramp/Soak Profile Example

Table 3-2 Ramp/Soak Profile Example (Using 12 Segments)							
Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
<b>STRT SEG</b>	Start Seg.		1	<b>SEG4 SP</b>	Soak SP	4	400
<b>END SEG</b>	End Seg.		12	<b>SEG4TIME</b>	Soak Time	4	1 hr.
<b>RAMP UNIT</b>	Engr. Unit for Ramp		TIME	<b>SEG5RAMP</b>	Ramp Time	5	1 hr:30 min.
<b>RECYCLES</b>	Number of Recycles		2	<b>SEG6 SP</b>	Soak SP	6	250
<b>SOAK DEV</b>	Deviation Value		0	<b>SEG6TIME</b>	Soak Time	6	3 hr:0 min.
<b>PROG END</b>	Controller Status		LAST SP	<b>SEG7RAMP</b>	Ramp Time	7	2 hr:30 min.
<b>STATE</b>	Controller State at end		HOLD	<b>SEG8 SP</b>	Soak SP	8	500
<b>KEYRESET</b>	Reset SP Program		DISABLE	<b>SEG8TIME</b>	Soak Time	8	0 hr:30 min.
<b>POWER UP</b>	Program Status at Power up		ABORT	<b>SEG9RAMP</b>	Ramp Time	9	0
<b>HOTSTART</b>	PV Hot Start		DISABLE	<b>SG10 SP</b>	Soak SP	10	400
<b>SEG1RAMP</b>	Ramp Time	1	1 hr.	<b>SG10 TIME</b>	Soak Time	10	0 hr:30 min.
<b>SEG2 SP</b>	Soak SP	2	300	<b>SG11RAMP</b>	Ramp Time	11	3 hr:30 min.
<b>SEG2TIME</b>	Soak Time	2	1 hr:30 min.	<b>SG12 SP</b>	Soak SP	12	200
<b>SEG3RAMP</b>	Ramp Time	3	1 hr.	<b>SG12TIME</b>	Soak Time	12	0 hr:30 min.



### Figure 3-2 SP Program Segments 1 to 20 Record Sheets

Draw your ramp/soak profile for SP Program Segments 1 to 20 on the record sheet shown below and fill in the associated information in the Table provided. This will give you a permanent record of your program and will assist you when entering the Setpoint data.

**Table 3-3 SP Program Segments 1 to 20 Record Sheets**

Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
<b>STRT SEG</b>	Start Seg.			<b>SEG3RAMP</b>	Ramp Time	3	
<b>END SEG</b>	End Seg.			<b>SEG3 PID</b>	PID Set	3	
<b>RAMPUNIT</b>	Engr. Unit for Ramp			<b>SEG4 SP</b>	Soak SP	4	
<b>RECYCLES</b>	Number of Recycles			<b>SEG4TIME</b>	Soak Time	4	
<b>PROG END</b>	Controller Status			<b>SOAK4DEV</b>	Guar. Soak	4	
<b>STATE</b>	Controller State at end			<b>SEG4 PID</b>	PID Set	4	
<b>POWER UP</b>	Program Status at Power up			<b>SEG5RAMP</b>	Ramp Time	5	
<b>KEYRESET</b>	Reset SP Program			<b>SEG5 PID</b>	PID Set	5	
<b>HOT START</b>	PV Hot Start Program			<b>SEG6 SP</b>	Soak SP	6	
<b>SEG1RAMP</b>	Ramp Time	1		<b>SEG6TIME</b>	Soak Time	6	
<b>SEG1 PID</b>	PID Set	1		<b>SOAK6DEV</b>	Guar. Soak	6	
<b>SEG2 SP</b>	Soak SP	2		<b>SEG6 PID</b>	PID Set	6	
<b>SEG2TIME</b>	Soak Time	2		<b>SEG7RAMP</b>	Ramp Time	7	
<b>SOAK2DEV</b>	Guar. Soak	2		<b>SEG7 PID</b>	PID Set	7	
<b>SEG2 PID</b>	PID Set	2					

**Table 3-3 SP Program Segments 1 to 20 Record Sheets**

Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
<b>SEG8 SP</b>	Soak SP	8		<b>SG15RAMP</b>	Ramp Time	15	
<b>SEG8TIME</b>	Soak Time	8		<b>SG15 PID</b>	PID Set	15	
<b>SOAK8DEV</b>	Guar. Soak	8		<b>SEG16 SP</b>	Soak SP	16	
<b>SEG8 PID</b>	PID Set	8		<b>SG16TIME</b>	Soak Time	16	
<b>SEG9RAMP</b>	Ramp Time	9		<b>SOAK16DV</b>	Guar. Soak	16	
<b>SEG9 PID</b>	PID Set	9		<b>SG16 PID</b>	PID Set	16	
<b>SG10 SP</b>	Soak SP	10		<b>SG17RAMP</b>	Ramp Time	17	
<b>SG10 TIME</b>	Soak Time	10		<b>SG17 PID</b>	PID Set	17	
<b>SOAK10DV</b>	Guar. Soak	10		<b>SEG18 SP</b>	Soak SP	18	
<b>SG10 PID</b>	PID Set	10		<b>SG18TIME</b>	Soak Time	18	
<b>SG11RAMP</b>	Ramp Time	11		<b>SOAK18DV</b>	Guar. Soak	18	
<b>SG11 PID</b>	PID Set	11		<b>SG18 PID</b>	PID Set	18	
<b>SG12 SP</b>	Soak SP	12		<b>SG19RAMP</b>	Ramp Time	19	
<b>SG12TIME</b>	Soak Time	12		<b>SG19 PID</b>	PID Set	19	
<b>SOAK12DEV</b>	Guar. Soak	12		<b>SEG20 SP</b>	Soak SP	20	
<b>SG12 PID</b>	PID Set	12		<b>SG20TIME</b>	Soak Time	20	
<b>SG13RAMP</b>	Ramp Time	13		<b>SOAK20DV</b>	Guar. Soak	20	
<b>SG13 PID</b>	PID Set	13		<b>SG20 PID</b>	PID Set	20	
<b>SEG14 SP</b>	Soak SP	14					
<b>SG14TIME</b>	Soak Time	14					
<b>SOAK14DV</b>	Guar. Soak	14					
<b>SG14 PID</b>	PID Set	14					

### Figure 3-3 SP Program Segments 21 to 40 Record Sheets

Draw your ramp/soak profile for SP Program Segments 21 to 40 on the record sheet shown below and fill in the associated information in the Table provided. This will give you a permanent record of your program and will assist you when entering the Setpoint data.

**Table 3-4 SP Program Segments 21 to 40 Record Sheets**

Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
<b>SG21RAMP</b>	Ramp Time	21		<b>SG27RAMP</b>	Ramp Time	27	
<b>SG21 PID</b>	PID Set	21		<b>SG27 PID</b>	PID Set	27	
<b>SEG22 SP</b>	Soak SP	22		<b>SEG28 SP</b>	Soak SP	28	
<b>SG22TIME</b>	Soak Time	22		<b>SG28TIME</b>	Soak Time	28	
<b>SOAK22DV</b>	Guar. Soak	22		<b>SOAK28DV</b>	Guar. Soak	28	
<b>SEG22 PID</b>	PID Set	22		<b>SG28 PID</b>	PID Set	28	
<b>SG23RAMP</b>	Ramp Time	23		<b>SG29RAMP</b>	Ramp Time	29	
<b>SG23 PID</b>	PID Set	23		<b>SG29 PID</b>	PID Set	29	
<b>SEG24 SP</b>	Soak SP	24		<b>SEG30 SP</b>	Soak SP	30	
<b>SG24TIME</b>	Soak Time	24		<b>SG30 TIME</b>	Soak Time	30	
<b>SOAK24DV</b>	Guar. Soak	24		<b>SOAK30DV</b>	Guar. Soak	30	
<b>SEG24 PID</b>	PID Set	24		<b>SG30 PID</b>	PID Set	30	
<b>SG25RAMP</b>	Ramp Time	25		<b>SG31RAMP</b>	Ramp Time	31	
<b>SG25 PID</b>	PID Set	25		<b>SG31 PID</b>	PID Set	31	
<b>SEG26 SP</b>	Soak SP	26		<b>SG32 SP</b>	Soak SP	32	
<b>SG26TIME</b>	Soak Time	26		<b>SG32TIME</b>	Soak Time	32	
<b>SOAK26DV</b>	Guar. Soak	26		<b>SOAK32DEV</b>	Guar. Soak	32	
<b>SG26 PID</b>	PID Set	26		<b>SG32 PID</b>	PID Set	32	

**Table 3-4 SP Program Segments 21 to 40 Record Sheets**

Prompt	Function	Segment	Value	Prompt	Function	Segment	Value
<b>SG33RAMP</b>	Ramp Time	33		<b>SG37RAMP</b>	Ramp Time	37	
<b>SG33 PID</b>	PID Set	33		<b>SG37 PID</b>	PID Set	37	
<b>SEG34 SP</b>	Soak SP	34		<b>SEG38 SP</b>	Soak SP	38	
<b>SG34TIME</b>	Soak Time	34		<b>SG38TIME</b>	Soak Time	38	
<b>SOAK34DV</b>	Guar. Soak	34		<b>SOAK38DV</b>	Guar. Soak	38	
<b>SG34 PID</b>	PID Set	34		<b>SG38 PID</b>	PID Set	38	
<b>SG35RAMP</b>	Ramp Time	35		<b>SG39RAMP</b>	Ramp Time	39	
<b>SG35 PID</b>	PID Set	35		<b>SG39 PID</b>	PID Set	39	
<b>SEG36 SP</b>	Soak SP	36		<b>SEG40 SP</b>	Soak SP	40	
<b>SG36TIME</b>	Soak Time	36		<b>SG40TIME</b>	Soak Time	40	
<b>SOAK36DV</b>	Guar. Soak	36		<b>SOAK40DEV</b>	Guar. Soak	40	
<b>SG36 PID</b>	PID Set	36		<b>SG40 PID</b>	PID Set	40	

## 4 Modbus Read, Write and Override Parameters plus Exception Codes for Lockheed Special

### 4.1 Overview

#### Introduction

This section contains information concerning Reading, Writing, and Overriding parameters in this instrument that are unique to the Lockheed Special. For all other parameters and for general information, see the UDC3500 Product Manual.

#### 4.1.1 SP PROG1

Table 4-1 lists all the register addresses and ranges or selections for the function parameters in Set-up Group SP PROG1.

**Table 4-1 Set-up Group – SP PROG1**

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
SP Rate	174	01AE	430	INT	R/W	0 = Disabled 1 = Enable 1 2 = Enable 2 3 = Enable 12
Rate Up (EU/HR)	108	006C	108	FP	R/W	0 to 9999
Rate Down (EU/HR)	109	006D	109	FP	R/W	0 to 9999
Rate Up (EU/HR) Loop2	108	016C	364	FP	R/W	0 to 9999
Rate Down (EU/HR) Loop2	109	016D	365	FP	R/W	0 to 9999
SP PROG1	178	01B2	434	INT	R/W	0 = Disabled 1 = Enable 1 2 = Enable 2 3 = Enable 12
Start Segment #	88	0058	88	FP	R/W	1 to 40

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
End Segment # (must be a Soak Segment)	176	00B0	176	INT	R/W	0 = Soak 2 1 = Soak 4 2 = Soak 6 3 = Soak 8 4 = Soak 10 5 = Soak 12 6 = Soak 14 7 = Soak 16 8 = Soak 18 9 = Soak 20 10 = Soak 22 11 = Soak 24 12 = Soak 26 13 = Soak 28 14 = Soak 30 15 = Soak 32 16 = Soak 34 17 = Soak 36 18 = Soak 38 19 = Soak 40
Engineering Units or Ramp Segments	182	00B6	182	INT	R/W	0 = HRS:MIN 1 = EU/Minute 2 = EU/Hour
Program Recycles	89	0059	89	FP	R/W	0 to 100
Controller Status at Program End	180	00B4	180	INT	R/W	0 = Last Setpoint and Mode 1 = Manual, Failsafe Output
Program End State	181	00B5	181	INT	R/W	0 = Disable SP Program 1 = Hold at Program End
Power UP	211	40D3	16595	INT	R/W	0 = Abort 1 = Resume 2 = Restart
Reset SP Program (ToBEGIN)	179	00B3	179	INT	R/W	0 = Disable 1 = Via Keypad 2 = Rerun
PV Hotstart	226	00E2	226	INT	R/W	0 = Disabled 1 = Enabled
Segment #1 Ramp Time	57	0039	057	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #1 PID SET	191	40BF	16575	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #2 Soak Setpoint Value	58	003A	058	FP	R/W	Within Setpoint Limits
Segment #2 Soak Time	59	003B	059	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #2	87	4057	16471	FP	R/W	0 to 99.9 (0 = no soak)
Segment #2 PID SET	192	40C0	16576	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #3 Ramp Time	60	003C	060	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #3 PID SET	193	40C1	16577	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #4 Soak Setpoint Value	61	003D	061	FP	R/W	Within Setpoint Limits
Segment #4 Soak Time	62	003E	062	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #4	89	4058	16472	FP	R/W	0 to 99.9 (0 = no soak)
Segment #4 PID SET	194	40C2	16578	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #5 Ramp Time	63	003F	063	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #5 PID SET	195	40C3	16579	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #6 Soak Setpoint Value	64	0040	064	FP	R/W	Within Setpoint Limits

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #6 Soak Time	65	0041	065	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #6	89	4059	16473	FP	R/W	0 to 99.9 (0 = no soak)
Segment #6 PID SET	196	40C4	16580	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #7 Ramp Time	66	0042	066	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #7 PID SET	197	40C5	16581	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #8 Soak Setpoint Value	67	0043	067	FP	R/W	Within Setpoint Limits
Segment #8 Soak Time	68	0044	068	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #8	90	405A	16474	FP	R/W	0 to 99.9 (0 = no soak)
Segment #8 PID SET	198	40C6	16582	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #9 Ramp Time		0045	069	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #9 PID SET	199	40C7	16583	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #10 Soak Setpoint Value	70	0046	070	FP	R/W	Within Setpoint Limits
Segment #10 Soak Time	71	0047	071	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #10	91	405B	16475	FP	R/W	0 to 99.9 (0 = no soak)



Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #10 PID SET	200	40C8	16584	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #11 Ramp Time	72	0048	072	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #11 PID SET	201	40C9	16585	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #12 Soak Setpoint Value	73	0049	073	FP	R/W	Within Setpoint Limits
Segment #12 Soak Time	74	004A	074	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #12	92	405C	16476	FP	R/W	0 to 99.9 (0 = no soak)
Segment #12 PID SET	202	40CA	16586	FP	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #13 Ramp Time	72	4048	16456	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #13 PID SET	203	40CB	16587	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #14 Soak Setpoint Value	73	4049	16457	FP	R/W	Within Setpoint Limits
Segment #14 Soak Time	74	404A	16458	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #14	93	405D	16477	FP	R/W	0 to 99.9 (0 = no soak)
Segment #14 PID SET	204	40CC	16588	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #15 Ramp Time	75	404B	16459	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #15 PID SET	205	40CD	16589	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #16 Soak Setpoint Value	76	404C	16460	FP	R/W	Within Setpoint Limits
Segment #16 Soak Time	77	404D	16461	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #16	94	405E	16478	FP	R/W	0 to 99.9 (0 = no soak)
Segment #16 PID SET	206	40CE	16590	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #17 Ramp Time	78	404E	16462	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #17 PID SET	207	40CF	16591	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #18 Soak Setpoint Value	79	404F	16463	FP	R/W	Within Setpoint Limits
Segment #18 Soak Time	80	4050	16464	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #18	95	505F	16479	FP	R/W	0 to 99.9 (0 = no soak)
Segment #18 PID SET	208	40D0	16592	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #19 Ramp Time	81	4051	16465	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #19 PID SET	209	40D1	16593	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #20 Soak Setpoint Value	82	4052	16466	FP	R/W	Within Setpoint Limits
Segment #20 Soak Time	83	4053	16467	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #20	96	4060	16480	FP	R/W	0 to 99.9 (0 = no soak)
Segment #20 PID SET	210	40D2	16594	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4

## 4.1.2 SP PROG2

Table 4-2 lists all the register addresses and ranges or selections for the function parameters in Set-up Group SP PROG2.

**Table 4-2 Set-up Group – SP PROG2**

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #21 Ramp Time	1	6001	24577	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #21 PID SET	141	608D	24717	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #22 Soak Setpoint Value	2	6002	24578	FP	R/W	Within Setpoint Limits
Segment #22 Soak Time	3	6003	24579	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #22	31	601F	24607	FP	R/W	0 to 99.9 (0 = no soak)
Segment #22 PID SET	142	608E	24718	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #23 Ramp Time	4	6004	24580	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #23 PID SET	143	608F	24719	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #24 Soak Setpoint Value	5	6005	24581	FP	R/W	Within Setpoint Limits
Segment #24 Soak Time	6	6006	24582	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #24	32	6020	24608	FP	R/W	0 to 99.9 (0 = no soak)
Segment #24 PID SET	144	6090	24720	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #25 Ramp Time	7	6007	24583	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #25 PID SET	145	6091	24721	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #26 Soak Setpoint Value	8	6008	24584	FP	R/W	Within Setpoint Limits
Segment #26 Soak Time	9	6009	24585	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #26	33	6021	24609	FP	R/W	0 to 99.9 (0 = no soak)
Segment #26 PID SET	146	6092	24722	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #27 Ramp Time	10	600A	24586	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #27 PID SET	147	6093	24723	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #28 Soak Setpoint Value	11	600B	24587	FP	R/W	Within Setpoint Limits
Segment #28 Soak Time	12	600C	24588	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #28	34	6022	24610	FP	R/W	0 to 99.9 (0 = no soak)
Segment #28 PID SET	148	6094	24724	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #29 Ramp Time	13	600D	24589	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #29 PID SET	149	6095	24725	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #30 Soak Setpoint Value	14	600E	24590	FP	R/W	Within Setpoint Limits
Segment #30 Soak Time	15	600F	24591	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #30	35	6023	24611	FP	R/W	0 to 99.9 (0 = no soak)
Segment #30 PID SET	150	6096	24726	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #31 Ramp Time	16	6010	24592	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #31 PID SET	151	6097	24727	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #32 Soak Setpoint Value	17	6011	24593	FP	R/W	Within Setpoint Limits
Segment #32 Soak Time	18	6012	24594	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #32	36	6024	24612	FP	R/W	0 to 99.9 (0 = no soak)
Segment #32 PID SET	152	6098	24728	FP	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #33 Ramp Time	19	6013	24595	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #33 PID SET	153	6099	24729	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Segment #34 Soak Setpoint Value	20	6014	24596	FP	R/W	Within Setpoint Limits
Segment #34 Soak Time	21	6015	24597	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #34	37	6025	24613	FP	R/W	0 to 99.9 (0 = no soak)
Segment #34 PID SET	154	609A	24730	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #35 Ramp Time	22	6016	24598	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #35 PID SET	155	609B	24731	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #36 Soak Setpoint Value	23	6017	24599	FP	R/W	Within Setpoint Limits
Segment #36 Soak Time	24	6018	24600	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #36	38	6026	24614	FP	R/W	0 to 99.9 (0 = no soak)
Segment #36 PID SET	156	609C	24732	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #37 Ramp Time	25	6019	24601	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #37 PID SET	157	609D	24733	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #38 Soak Setpoint Value	26	601A	24602	FP	R/W	Within Setpoint Limits
Segment #38 Soak Time	27	601B	24603	FP	R/W	99.59 (0-99 Hrs:0-59 Min)

Parameter		Register Address		Data Type	Access	Data Range or Enumerated Selection
Description	ID	Hex	Decimal			
Guaranteed Soak #38	39	6027	24615	FP	R/W	0 to 99.9 (0 = no soak)
Segment #38 PID SET	158	609E	24734	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #39 Ramp Time	28	601C	24604	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #39 PID SET	159	609F	24735	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4
Segment #40 Soak Setpoint Value	29	601D	24605	FP	R/W	Within Setpoint Limits
Segment #40 Soak Time	30	601E	24606	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Guaranteed Soak #40	40	6028	24616	FP	R/W	0 to 99.9 (0 = no soak)
Segment #40 PID SET	160	60A0	24736	INT	R/W	0 = SET1 1 = SET2 2 = SET3 3 = SET4