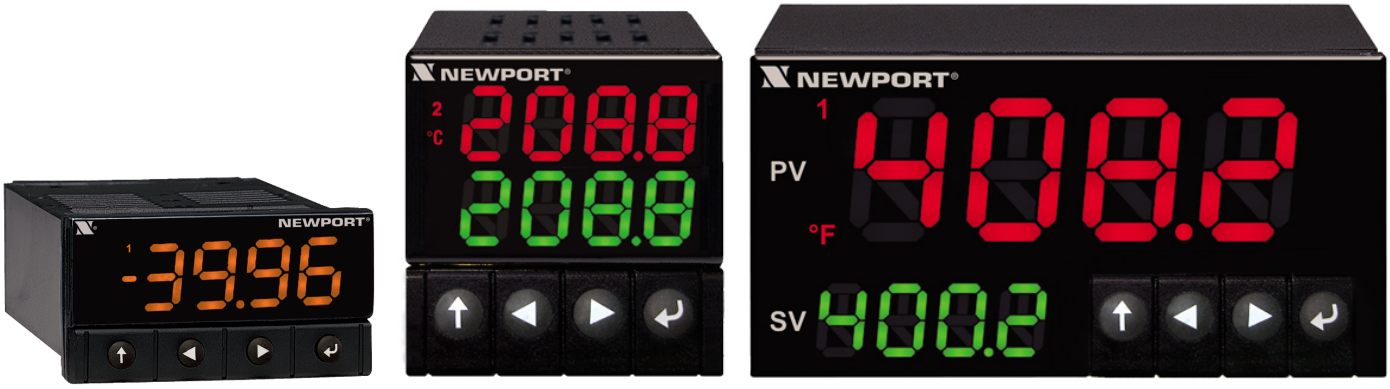
RAMP & SOAK PROCESSING

5 YEAR WARRANTY

PLATINUM™ Series



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⚠ This device is marked with the international caution symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.

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Table of Contents

1 Introduction

1.1 Purpose

The following document defines Ramp and Soak Linking used within the Platinum controller

1.2 Definition of Terms and Acronyms

I2C	2 wire serial interface
Base Device	Device connected to slave device
Smart Input	Device supporting 1 or more Input sensors
Smart Output	Device supporting 1 or more Output Elements
Sensor Element	One of the physical sensing elements on a Smart Output
AC	Alternating Current
DC	Direct Current
CS	Chip Select
ADC	Analog to Digital Converter
DAC	Digital to Analog Converter
RS485	Electrical signals used for serial communications
RS232	Electrical signals used for serial communications
CSV	Comma Separated Values
COTS	Commercially-Off-The-Shelf
ESD	Electo Static Discharge
FW	Firmware
HW	Hardware
I/O	Input/Output
LED	Light Emitting Diode
Hexadecimal	Values expressed using base 16 (2^4)

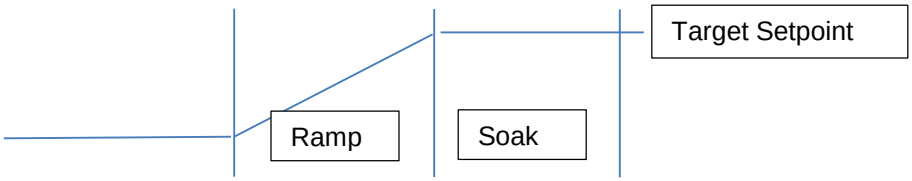
1.3 Applicable Documents

Doc. #	Name / Description	Rev. #, Date
	Omega Engineering Coding Standard	Rev 1.2.0

2 Ramp and Soak Overview

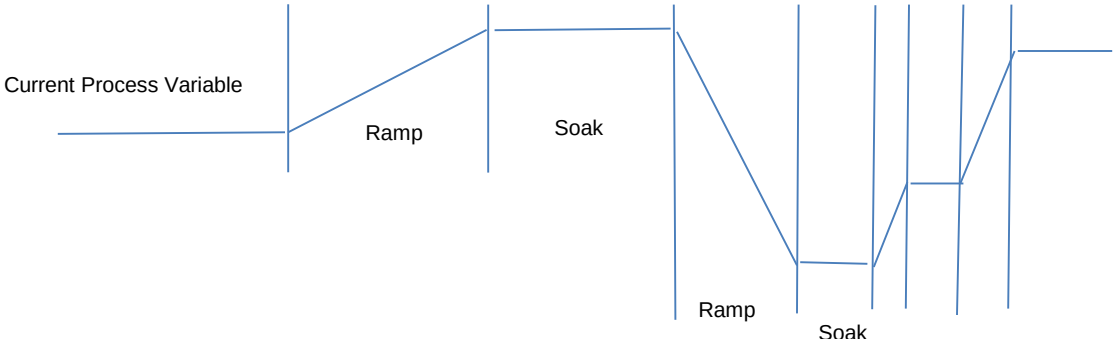
A key feature of the Platinum series Ramp and Soak mechanism is provided by the ability to 'link' ramp/soak segments together to create a chain of sequences. This allows sequences of up to 792 Ramp/Soak pairs to be defined.

A Ramp/Soak segment is defined as a specified increase or decrease (Ramp) of the process variable over a set period of time, followed by holding (Soak) the process variable at a fixed level for a fixed period of time.



The Platinum products provide a multi-segment/multi-profile Ramp and Soak mechanism with the additional ability to link multiple profiles together to implement extended sequences.

Although the term 'RAMP' is used to indicate the process variable change, there is no restrictions on the direction of change. The Target Setpoint may be above or below the Current process variable for each cycle within a sequence.



The Ramp and Soak times are provided in 1 second increments and may span from 1 second to 99 hours, 59 minutes, 59 seconds. Internally, the time values are tracked within 0.1 second intervals.

The Ramp and Soak function attempts to provide a controlled increase to the process variable such that the target setpoint is reached within the specified time. Options are provided to track the specified RAMP time, the specified SOAK time or the overall CYCLE time.

3 Platinum Ramp / Soak Components

3.1 Ramp / Soak segment

The Ramp / Soak segment is defined by 3 primary and 2 secondary parameters.

Parameter	Parameter Name	Description
MRT.#	Multi Ramp Time	Amount of time allocated to ramp the process level to the MSP.# (see below)
MRE.#	Multi Ramp Enable Flag	Flag to control whether the RE.ON bit will be set during this cycle
MSP.#	Multi Ramp Setpoint	Target level of process variable at the end of the Ramp cycle
MST.#	Multi Soak Time	Time to hold the process variable at the MSP level
MSE.#	Multi Soak Enable Flag	Flag to control whether the SE.ON bit will be set during this cycle

Note: the '#' is replaced with the current segment number (1..8)

The time data supports up to HH.MM or MM.SS, allowing times to be defined up to 99 hours, 59 minutes and 59 seconds. The format is determined by the TIM.F parameter.

The Platinum family groups up to 8 such ramp/soak segments into a Ramp Soak 'profile' and allows up to 99 profiles to be defined.

3.2 Ramp Soak Profile

The Platinum family supports up to 99 Ramp / Soak profiles, each profile consisting of up to 8 ramp / soak segments.

Parameter	Parameter Name	Options	Description
M.TRK	Tracking Mode	RAMP	Ramp time tracking
		SOAK	Soak time tracking
		CYCL	Cycle time tracking
E.ACT	End Action	STOP	STOP the end of the profile, returning to RUN_WAIT
		HOLD	Continuing to maintain the process variable, but turn off the SE.ON bit
		LINK	Link to another profile (see below)
N.SEG	Number of Segments	1..8	The number of valid segments within the profile

A Ramp / Soak profile defines the number of active segments within the profile, the action to be taken at the end of the profile and a parameter to determine if the RAMP time, SOAK time or total CYCLE time is to be tracked.

In an ideal situation the controller will ramp the process variable to the desired setpoint in exactly the specified ramp time and then hold the process variable at the setpoint for exactly the specified soak time.

3.2.1 Ramp Time Tracking

The Ramp Time Tracking option will monitor the specified Ramp time and if the process variable has not achieve the specified setpoint within the ramp time a fault will be recorded and the controller will return to the RUN_WAIT state.

3.2.2 Soak Time Tracking

The Soak Time Tracking option will monitor the specified Ramp time and if the process variable has not achieve the specified setpoint within the ramp time the unit will remain in the Ramp mode. When the setpoint is reached it will switch to the soak mode and ensure that the process variable is maintained for the specified soak time.

3.2.3 Cycle Time Tracking

The Cycle Time Tracking option will monitor the specified Ramp time and if the process variable has not achieve the specified setpoint within the ramp time the unit will switch to the Soak mode. When the total elapsed time = Ramp Time + Soak time the unit will end the segment.

3.3 Ramp / Soak Operation

The Ramp and Soak operation is controlled by the R.CTL parameter that determines if the Ramp / Soak function is enabled and how it is initiated and the S.PRG parameter that determines the starting profile.

The R.CTRL allows for the Ramp / Soak function to be initiated from the front panel (YES option) or from either the front panel or the digital input (RMT option).

The S.PRG parameter determines the first profile that is loaded. It is also used as a ‘restarting’ point when the LINK end action is used.

Parameter	Parameter Name	Options	Description
R.CTL	Control	NO	Ramp and Soak is disabled
		YES	Ramp and Soak is started using the front panel
		RMT	Ramp and Soak is started using either the front panel or the digital input
S.PRG	Starting Profile	1..99	First profile loaded on start of Ramp and Soak

3.4 Ramp / Soak Profile Linking

The End Action determines the action taken at the end of the current profile, determined by the N.SEG parameter for the current profile.

If the LINK option is chosen the controller will load a new profile and continue the Ramp / Soak cycle. The profile loaded is determined by the value specified in the LINK parameter.

LINK parameter		
0	Reload the S.PRG profile	Allows continuous process cycling
1..99	Load the specified profile	Allows linking to random profiles
100	Reload the current profile	Allows single profile process cycling
101..199	Add the LINK parameter to the current Profile, wrapping around if sum exceeds 99	Allows 'jumping relative' to the current profile in complex sequences. If the Current Profile + Link value exactly equals 100 (or 200) the S.PRG profile is reloaded. If the sum exceeds 100 the 100 is subtracted and the result is used as the target profile.

3.4.1 Ramp / Soak Link Values > 100

When the LINK value exceeds 100 modulus arithmetic is used to determine the target profile. The Link value is added to the current profile number and then 100 is subtracted from the result to provide the target profile.

If the Link value is 99, the target profile will be the one immediately preceding the current profile:

Target = (Current + 99) – 100 → Current - 1.

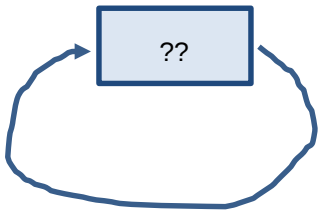
If the Link value is 101 the target profile will be the one immediately following the current profile:

Target = (Current + 101) – 100 → Current + 1

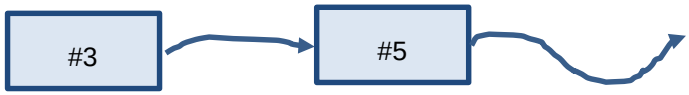
A special case exists if the summation results in exactly 100 (or exactly 200). In this case, the calculated result is 0, and the S.PRG profile will be loaded

3.5 Link Examples:

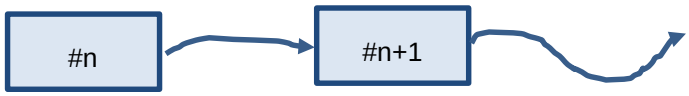
LINK = 0, Current profile ?? - the S.PRG profile is reloaded. This allows multiple profiles to be linked and the final profile specifying the entire 'chain' should be restarted.



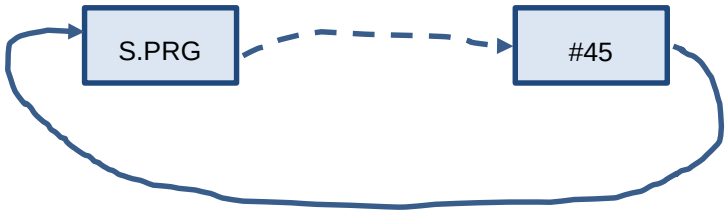
LINK = 5, Current profile = 3 - Profile # 5 will be loaded at the end of the current profile. Multiple profiles may be chained together using absolute profile numbers



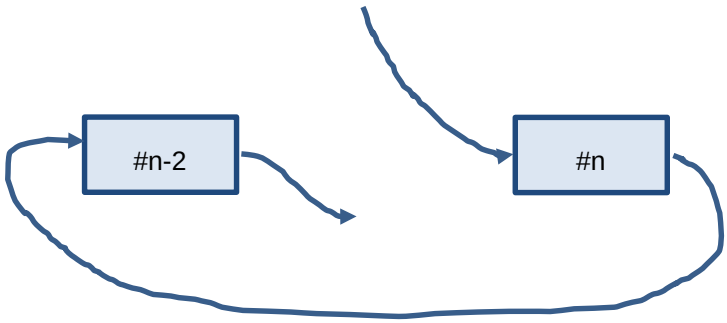
LINK = 101, Current Profile 'n' - The next sequential profile will be loaded. This allows multiple profiles to be chained together without regard to the absolute profile numbers.



LINK = 55, Current profile = 45 – the sum of 55 + 45 = 100. The S.PRG profile will be reloaded, re-starting the entire chain



LINK = 98, Current Profile 'n' - the n-2 profile will be loaded, allowing profiles to jump 'forward' or backwards.-



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