

COMMANDER 1900 Series
Circular Chart Recorders

Features Guide

Multi-recipe Profile
Recorder/Controller

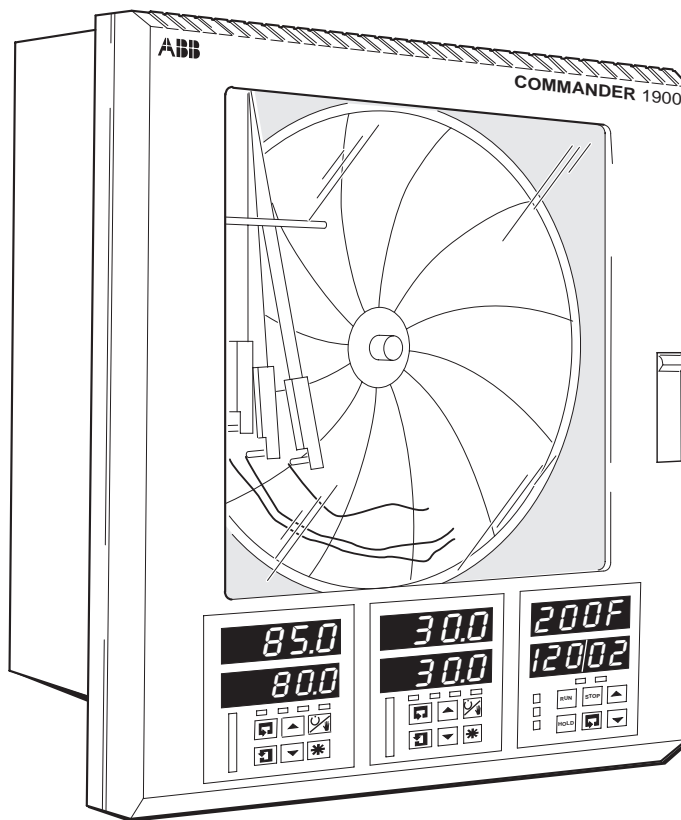


ABB INSTRUMENTATION

The Company

ABB Instrumentation is an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

The NAMAS Calibration Laboratory No. 0255(B) is just one of the ten flow calibration plants operated by the Company, and is indicative of ABB Instrumentation's dedication to quality and accuracy.

BS EN ISO 9001



St Neots, U.K. – Cert. No. Q5907
Stonehouse, U.K. – Cert. No. FM 21106

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A



Stonehouse, U.K. – Cert. No. 0255

Use of Instructions

Warning.

An instruction that draws attention to the risk of injury or death.



Note.

Clarification of an instruction or additional information.

Caution.

An instruction that draws attention to the risk of damage to the product, process or surroundings.



Information.

Further reference for more detailed information or technical details.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of Technical Communications Department, ABB Instrumentation.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

CONTENTS

Section	Page
INTRODUCTION	2
COMMANDER 1960 Versions	2
Selection	2
Applications	2
Advanced Profile Control Models	2
DISPLAYS AND CONTROLS	3
Type K Instrument	
Displays and LED Indicators	3
Type L Instrument	
Displays and LED Indicators	3
Faceplate Combinations and Product Codes	4
COMMANDER 1960 – FEATURES EXPLAINED	5
Introduction to Ramp/Soak Profile Control	5
Program Configurations	5
Guaranteed Ramp/Soak	6
Self-seeking Set Point	7
Retort Function	7
Power Recovery Function	8
Time Events	8
End of Profile State	8
Soak Adjustment – Type K Instruments	8
Cook Segment Soak	
Adjustment (Control Channel 1 only)	8
Current Segment Soak Time Adjustment	
(Control Channels 1 or 2)	9
L Type Instruments	10
Current Segment Soak Time Adjustment	10
NOTES	11

INTRODUCTION

The COMMANDER 1960 is a development of the COMMANDER 1900 with enhanced and improved Ramp/Soak profiling making the COMMANDER 1960 more powerful and flexible to your needs.

The following pages explain some of the main features of the COMMANDER 1960 to give you an idea of their function and how they can be used.

COMMANDER 1960 Versions

There are two versions of the COMMANDER 1960 ('K' Retort and 'L' Advanced). Details of these and basic operations are listed below.

Selection

The two options ('K' Retort or 'L' Advanced) are selected in the instrument code under software versions and are activated by fitting the corresponding software key.

Applications

The two versions have been designed with specific applications in mind.

'K' Software

- For use in Food processing industries for food cooking and sterilising where simple Ramp/Soaks are used and changed often to suit the different products being processed.

'L' Software

- For use in the Tire and General process industries which use more complex Ramp/Soak profiles and have need to adjust the cook times during the process.

Advanced Profile Control Models

The COMMANDER 1960 Profile Controller is available in four versions:

1961R	single pen, single loop ramp/soak control
1962R	two pen, single loop ramp/soak control
1963R	three pen, single loop ramp/soak control
1964R	two pen, dual loop ramp/soak control

Each model is available with a choice of software providing additional specialized features.

K Type Retort Controller Models

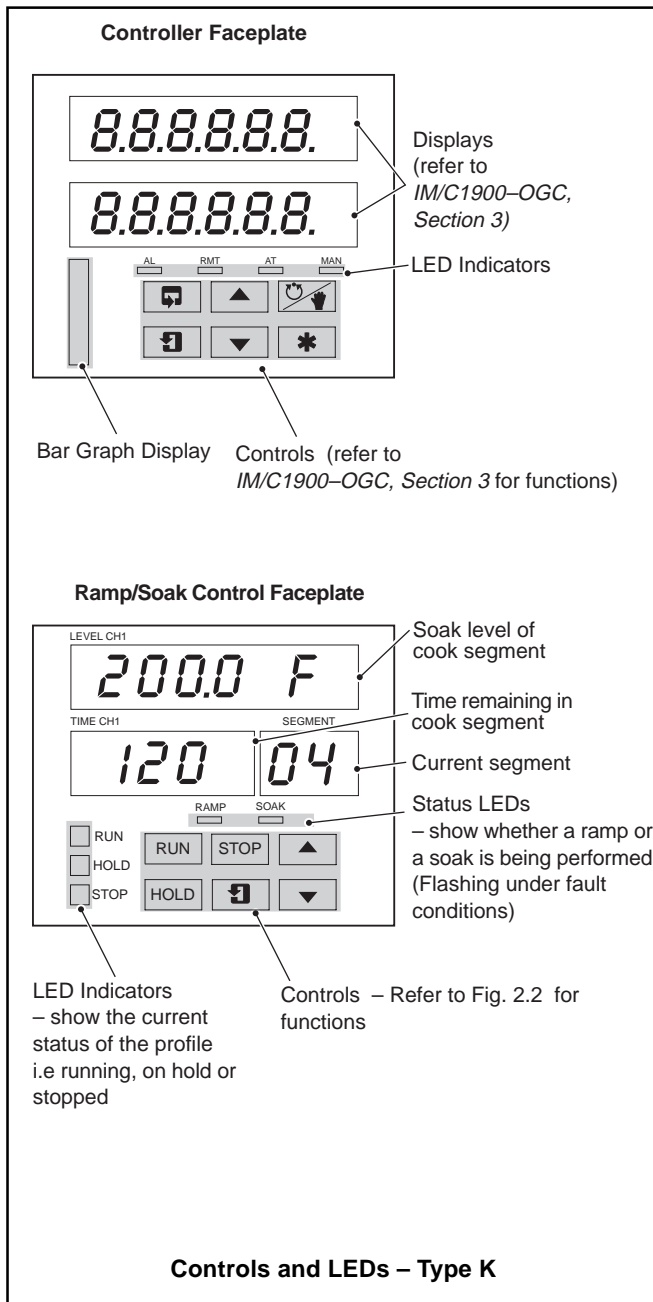
- Front panel adjustment of principal soak temperature and soak time.
- Continuous display of principal soak temperature, soak time and current segment number.
- LED indication of whether ramp or soak is being performed.
- LED indication of profile status.
- 6 time-event states common to all segments.
- Guaranteed ramp/soak by segment.

L Type Advanced Profile Control Models

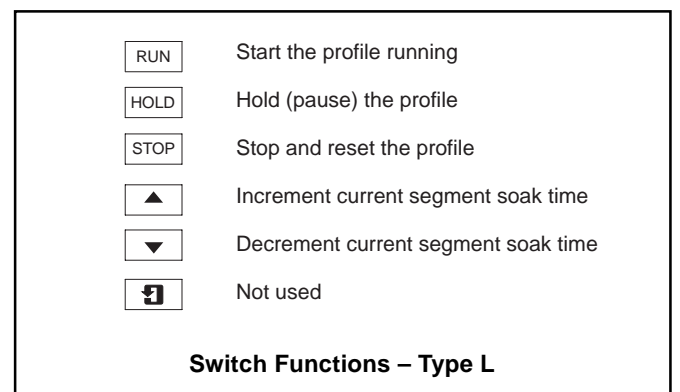
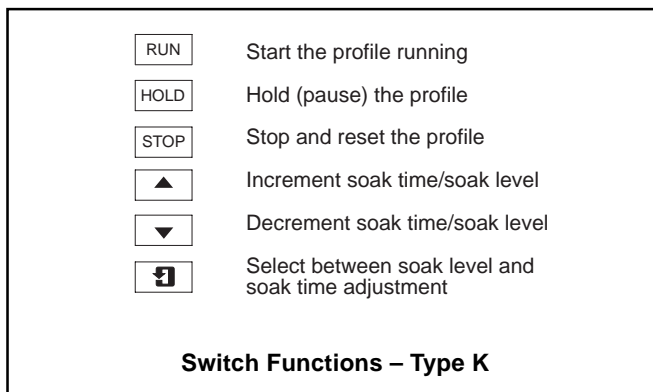
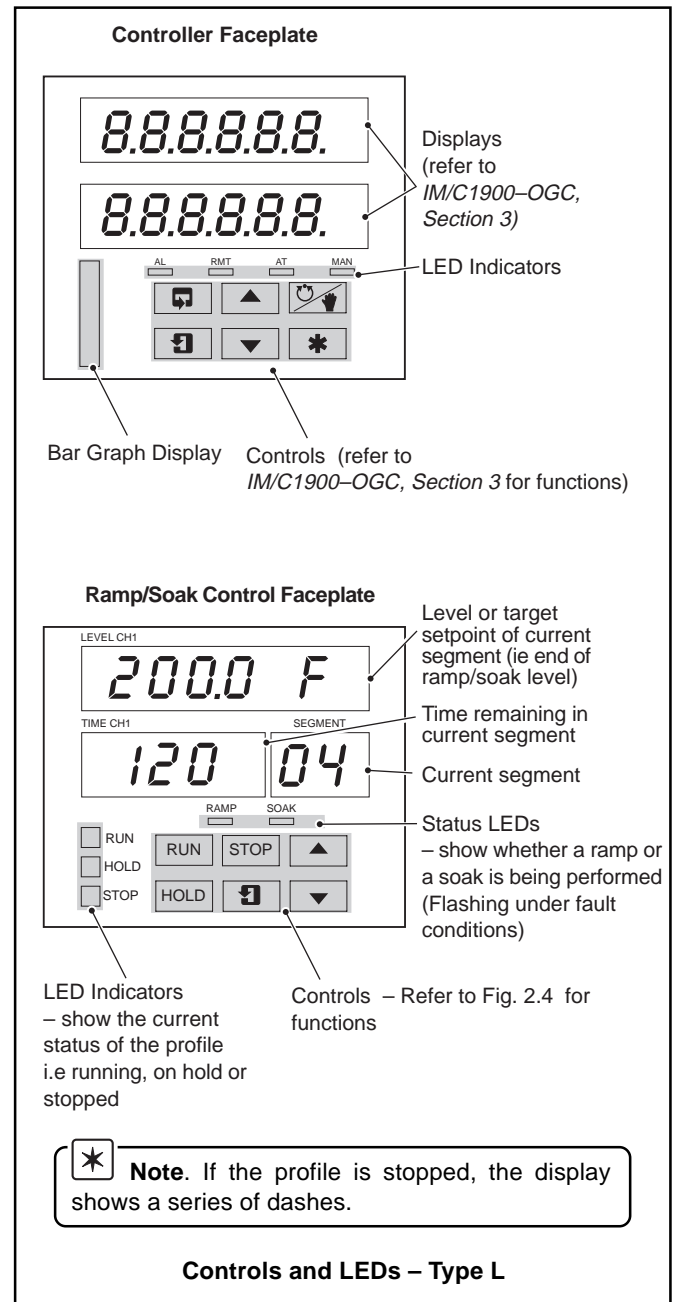
- Continuous display of level (soak segments) or target set point (ramping segments).
- Front panel adjustment of the current soak time.
- Continuous display of time remaining in current segment.
- Continuous display of current segment number.
- LED indication of whether ramp or soak is being performed.
- LED indication of profile status.
- 6 time-event states common to all segments.
- Guaranteed ramp/soak by segment.

DISPLAYS AND CONTROLS

Type K Instrument Displays and LED Indicators



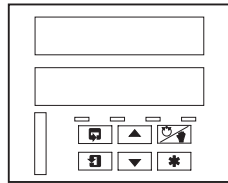
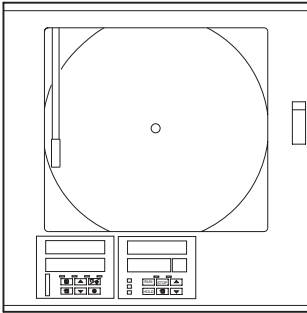
Type L Instrument Displays and LED Indicators



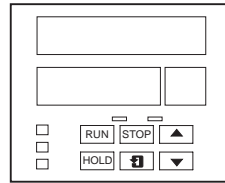
DISPLAYS AND CONTROLS

Faceplate Combinations and Product Codes

Model 1961R derived from the C1911R single pen, single loop ramp/soak control

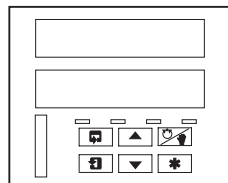
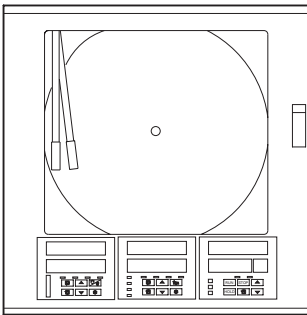


Control Faceplate
Channel 1

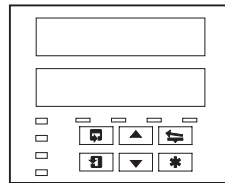


Ramp/Soak Control Faceplate
Channel 1

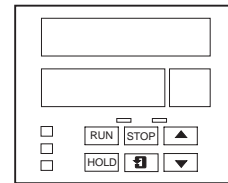
Model 1962R derived from the C1912R two pen, single loop ramp/soak control



Control Faceplate
Channel 1

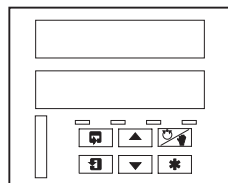
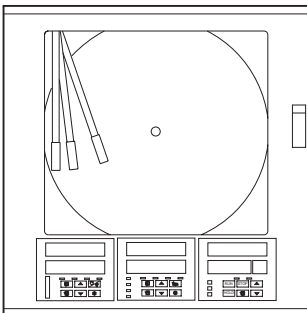


Record Faceplate
Channel 2

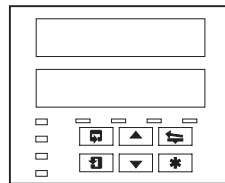


Ramp/Soak Control Faceplate
Channel 1

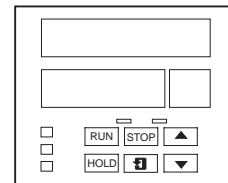
Model 1963R derived from the C1913R three pen, single loop ramp/soak control



Control Faceplate
Channel 1

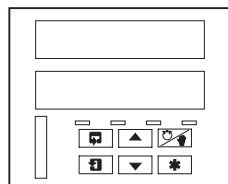
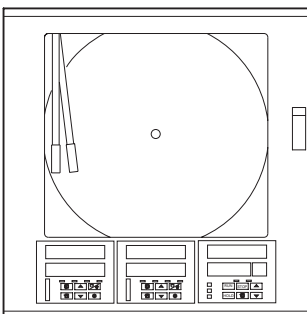


Record Faceplate
Channels 2 and 3

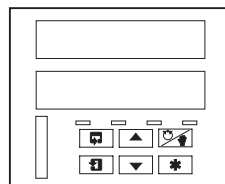


Ramp/Soak Control Faceplate
Channel 1

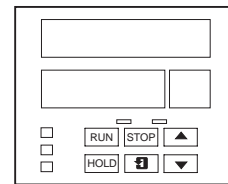
Model 1964R derived from the C1922R two pen, dual loop ramp/soak control



Control Faceplate
Channel 1



Control Faceplate
Channel 2



Ramp/Soak Control Faceplate
Channel 1



Note. On the C1964R both loops of control have enhanced guaranteed ramp soak software and advanced time event software but the additional Ramp/Soak Control faceplate applies only to channel 1.

Faceplate Combinations and Product Codes

COMMANDER 1960 – FEATURES EXPLAINED

Introduction to Ramp/Soak Profile Control



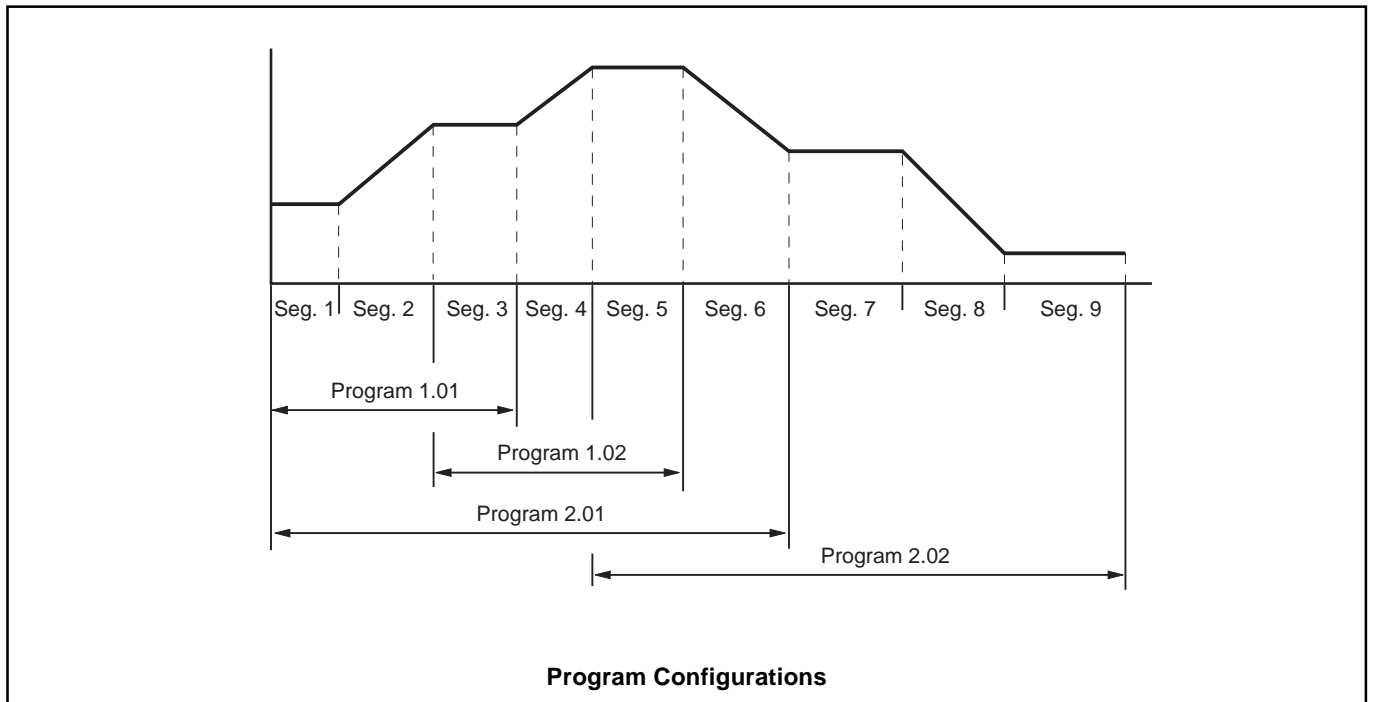
Information.

- **10 programs per control channel.**
- **Digital State program selection** – allows digital inputs to select program to be run.
- **99 programmable segments** – can be shared between programs and controllers – see Fig. 4.2.
- **Programmable time units** – can be programmed in hours or minutes.
- **Program repeat** – 0 to 99 times or continuously.
- **Program holdback hysteresis** – separate settings for ramping segments and soak segments.
 - can be applied above, below or above and below the set point.
- **6 types of ramp/soak generated events** – segment active event, program active event, end of program event, holdback event, hold active event and time events.
- **6 ramp/soak commands** – can be selected from the front panel or via digital signals to run/hold programs, reset programs, skip forward to next segment, skip backwards to beginning of segment, increase soak time or decrease soak time (refer to relevant figs for ramp/soak adjust example).
- **6 time event states** – common to each segment
- **Self-seeking set point function** – avoids unnecessary delays when a program is started – see Fig. 4.4.
- **Retort function** – ensures safe operation under fault conditions.
- **Power recovery function** – determines ramp/soak profile restart position.
- **End of Profile State** – latched 'ON' until reset

The Ramp/Soak option is a set point profile generator which controls the Local set point and can be used with any type of control process for more complex control. A Profile Program is made up of Ramps (the set point is increased or decreased at a linear rate until it reaches the desired value) and Soaks (the set point is maintained at a fixed value for a set time duration).

Program Configurations

There are 99 segments that can be shared between programs and control channels. For normal applications it is recommended that segments 1 to 50 are assigned to channel 1 and segments 51 to 99 are assigned to channel 2. The figure below shows 9 segments, shared between four separate programs on channel 1 and channel 2.



Program Configurations

...COMMANDER 1960 – FEATURES EXPLAINED

Guaranteed Ramp/Soak

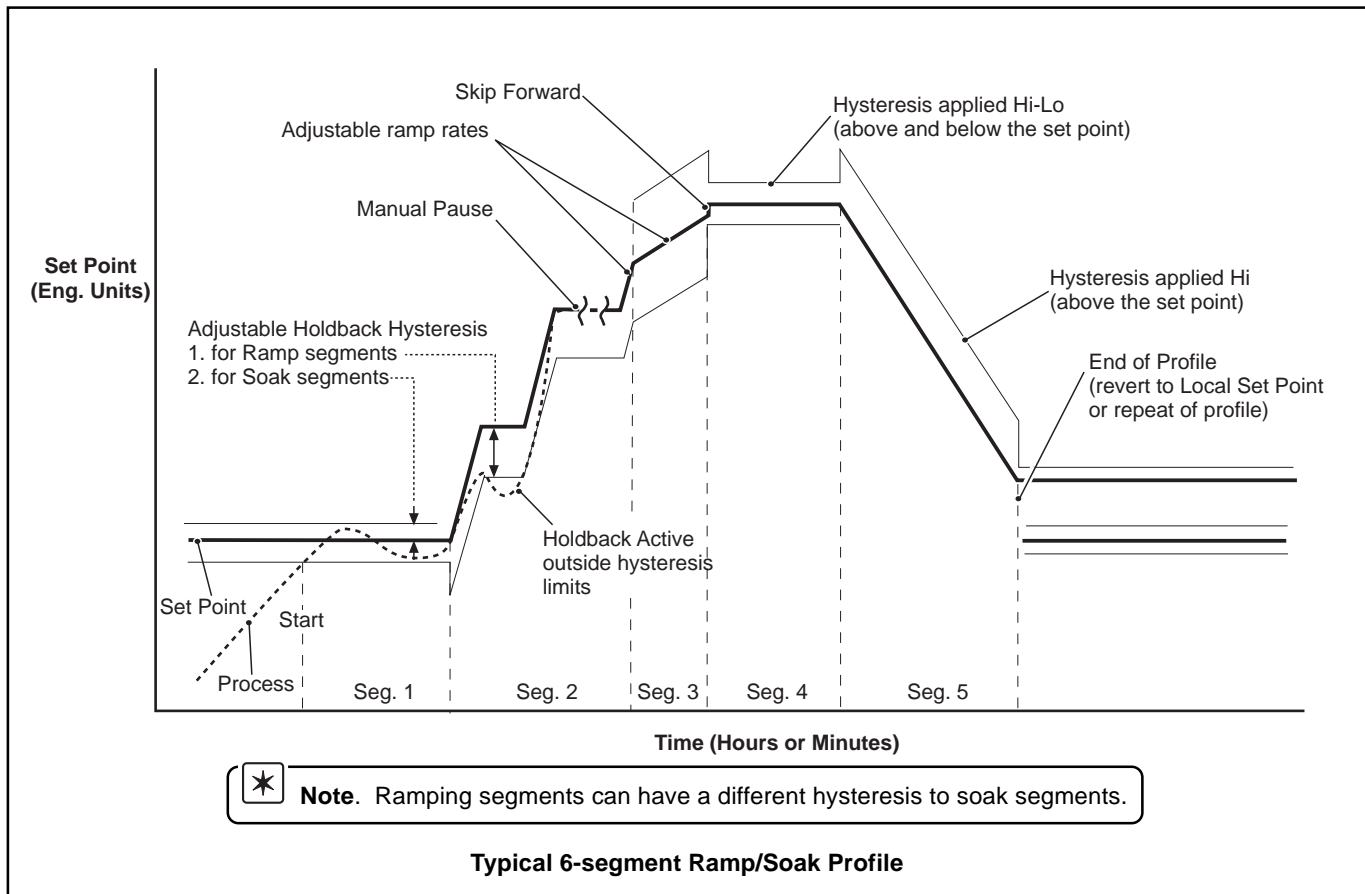
If the process variable deviates from the set point by more than the hysteresis value, the program status is set to 'H-HOLD' and Guaranteed ramp/soak is applied automatically. Each program has two associated hysteresis values;

- HYSL-r* which is applied to ramping segments, and
- HYSL-S* which is applied to soak segments.

The hysteresis value can be set within the limits '0' to '9999' where a setting of '0' implies that no deviation from the set point value can be tolerated ('0' is the company standard setting).

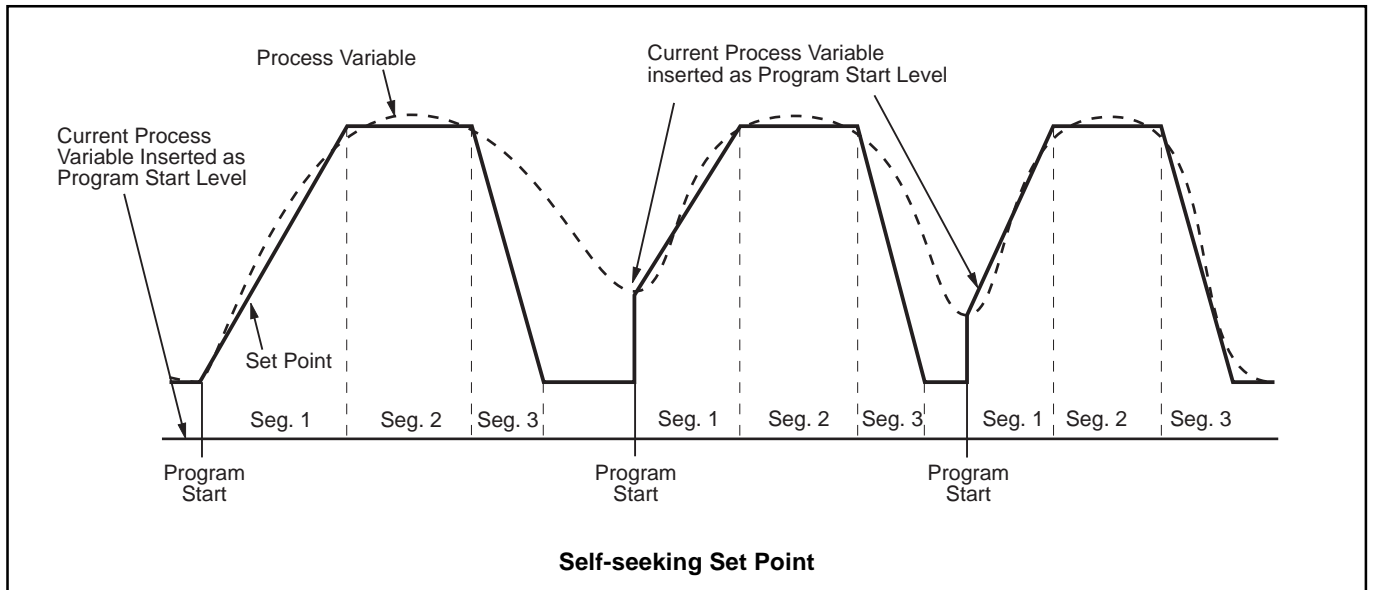
Hysteresis can be applied in one of four ways, with individual settings for each segment;

- OFF* – hysteresis not applied, ramp/soak not guaranteed.
- HI* – hysteresis applied above set point ('H-HOLD' set if $PV > [SP + \text{Hysteresis}]$).
- LO* – hysteresis applied below set point ('H-HOLD' set if $PV < [SP - \text{Hysteresis}]$).
- HI-LO* – hysteresis applied above and below set point ('H-HOLD' set if $PV > [SP + \text{Hysteresis}]$ or $PV < [SP - \text{Hysteresis}]$).



Self-seeking Set Point

The Self-seeking Set Point function reduces the delay between the end of a program and the beginning of the next program. The process variable value is used as the program start point and the set point steps up to the process variable value. This has the effect of changing the overall segment time and maintains a constant ramp rate.



Retort Function

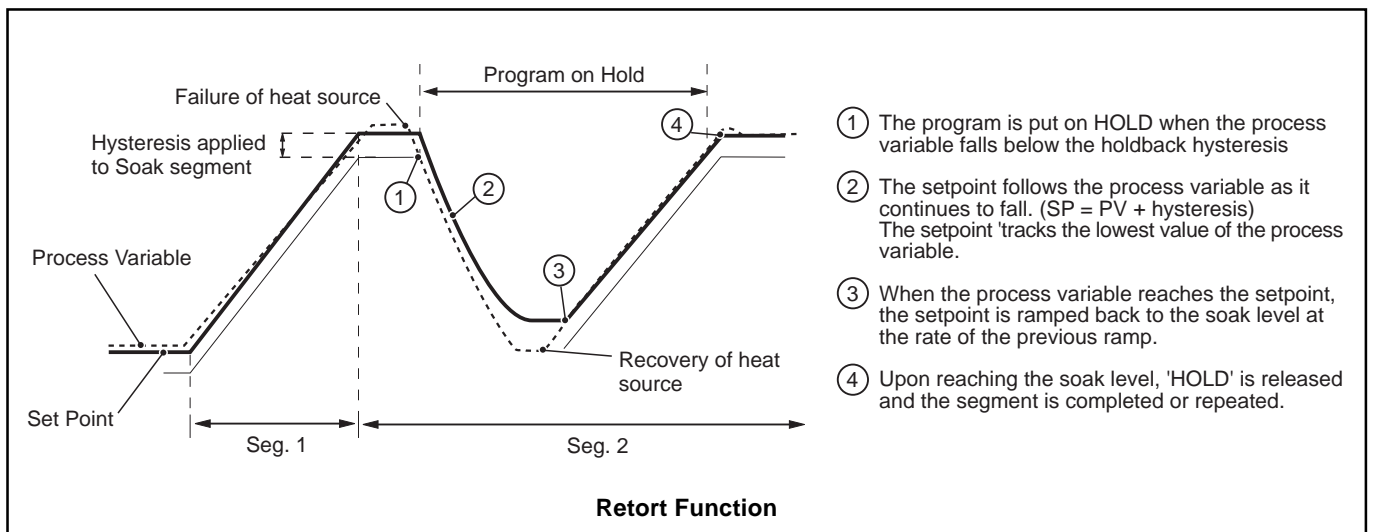
The Retort function ensures safe operation of retort vessels under fault conditions. If the heat source fails during a soak segment, the process variable will inevitably fall. When the process variable falls below the holdback hysteresis value the program is put on HOLD (as for normal operation). The setpoint then follows the process variable as it continues to fall (Retort Hold).

$$\text{Setpoint} = \text{Process Variable} + \text{Hysteresis value}$$

Upon recovery of the heat source, the process is controlled at the new setpoint value. When the process variable reaches the setpoint it is then ramped back to the initial soak value at the rate of the previous ramp (Retort Ramp). When the soak level is reached the program is released from its hold state and the segment is either completed or repeated from the beginning, depending on the retort mode selected.

The retort mode is selected in the **Ramp/Soak Profile Page, CONTROL CONFIGURATION LEVEL**.

Note. For the retort function to operate, either *LO* or *H I-LO* hysteresis must be applied to the soak segments.



...COMMANDER 1960 – FEATURES EXPLAINED

Power Recovery Function

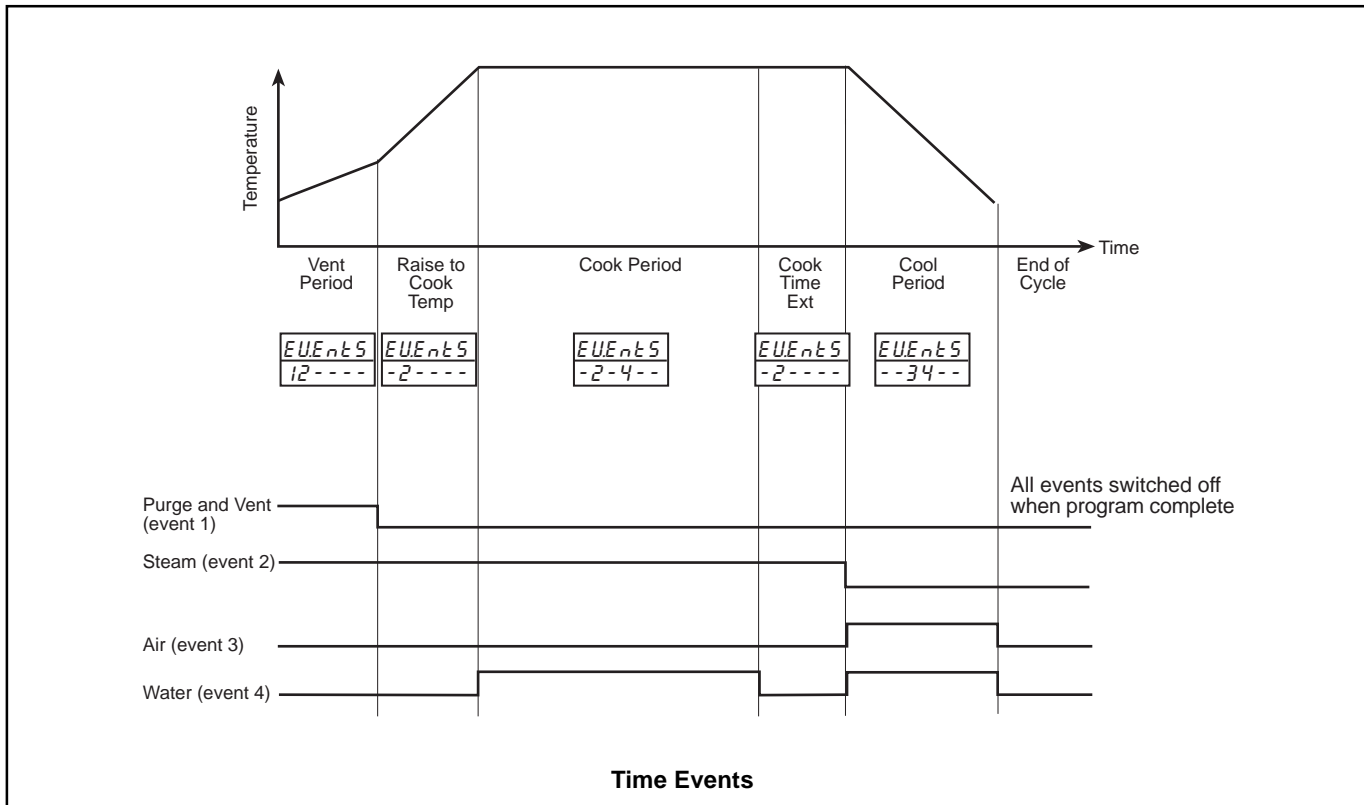
The Power Recovery function allows pre-selection of the restart position within a ramp/soak profile when power is restored after a failure. If power is restored before the **Power Down Time** expires, the ramp/soak profile continues from the point at which power failed. If power is restored after the **Power Down Time** has expired, the profile resumes from one of the following user-selected points: start of the current program; start of the current segment or from the profile position at the time of failure. In all three cases the controller restarts in **HOLD** mode.

Time Events

Channel 1 and 2 can be assigned up to six Time-event states. Each state generates a source ('tEU- 1.1' to 'tEU- 6.1' and 'tEU- 1.2' to 'tEU- 6.2') which can be assigned to relays, digital outputs, logic equations etc. in the same way as any other digital signal.

Time event states are provided in addition to program and segment events states and do not affect their operation.

Each segment has an associated 'EUEntS' setting which is used to control the Time-event states.



End of Profile State

The end of profile state is a digital source which can be assigned in the same manner as any other digital signal. The state is set automatically when the program is complete and remains set until a reset signal is received. The state can be configured to reset via a digital source – or alternatively, if set to 'NONE', the state resets automatically after two seconds.

Soak Adjustment – Type K Instruments

Cook Segment Soak Adjustment (Control Channel 1 only)

The cook segment is defined as the soak segment with the highest soak level or the last segment in a series if more than one segment has this level (ie. the highest segment number).

The level and/or duration of the cook segment can be adjusted continuously, either by use of the keys on the Ramp/Soak control faceplate, or via digital signals – see **Ramp/Soak Profile Control Page**. The adjustment can be activated at any time during the program.

...Soak Adjustment – Type K Instruments

...Cook Segment Soak Adjustment (Control Channel 1 only)

The Ramp/Soak control faceplate displays the time remaining in the cook segment. Initially, this is the segment duration, and it decrements to zero as the segment is being run. After the cook segment is completed, the display remains at zero until the end of the program, when it reverts back to the show segment duration. If several segments with the same soak level are cascaded, the time displayed is the total time for all these segments. Adjustments made to the soak level change the level of all these segments. Adjustments made to the soak time change the duration of the last segment only.

Note. Any changes made to the cook time/temperature are saved in the program memory.

The diagram illustrates the 'Cook Segment Soak Adjustment' process. It starts with a control faceplate showing a Soak Level of 200.0 F and a Soak Time of 60. Below the faceplate are four graphs showing the temperature profile over time:

- Graph 1:** Initial 60 minutes Soak Time. (Lower display shows time remaining in cook segment)
- Graph 2:** Soak Time can be changed to suit current recipe (e.g., to 65 minutes).
- Graph 3:** Soak Temperature displayed (e.g., 200.0 F).
- Graph 4:** Soak Temperature can be changed to suit current recipe (e.g., to 250.0 F).

Annotations include: 'Press to select Level adjustment' pointing to the Soak Level display, and 'Flashing decimal point indicates that adjustment is available' pointing to the decimal point in the Soak Level display.

Cook Segment Soak Adjustment – Controller 1 Ramp/Soak Control Faceplate

Current Segment Soak Time Adjustment (Control Channels 1 or 2)

The Soak Adjust function allows the Soak time of a segment to be extended or reduced by a value preset in the 'SK-Adj' frame – see **Ramp/Soak Profile Control Page**. The soak time can be adjusted repeatedly (in preset increments) while the segment is running, either from the controller faceplate or by a digital signal (assigned in the 'Inc.Src' or 'dEc.Src' frames).

Note. Any changes made to the soak time via the controller faceplate are not saved in the program memory. At the end of the program, all soak times are reset to their original values.

The diagram illustrates the 'Current Segment Soak Adjustment' process. It starts with a control faceplate showing 'SEG 8' and a Soak Time of 30.0. Below the faceplate are four graphs showing the temperature profile over time:

- Graph 1:** Initial 60 minutes Soak Time. Lower display shows time remaining.
- Graph 2:** Soak Time extended by 5 minutes to 65 minutes. 35 minutes remaining.
- Graph 3:** Soak Time extended a further 5 minutes to 70 minutes. 40 minutes remaining.
- Graph 4:** Soak Time reduced by 15 minutes to 55 minutes, 5 minutes less than the initial Soak Time.

Annotations include: 'Flashing' pointing to the Soak Time display, and 'x3' indicating a multiplier for the adjustment.

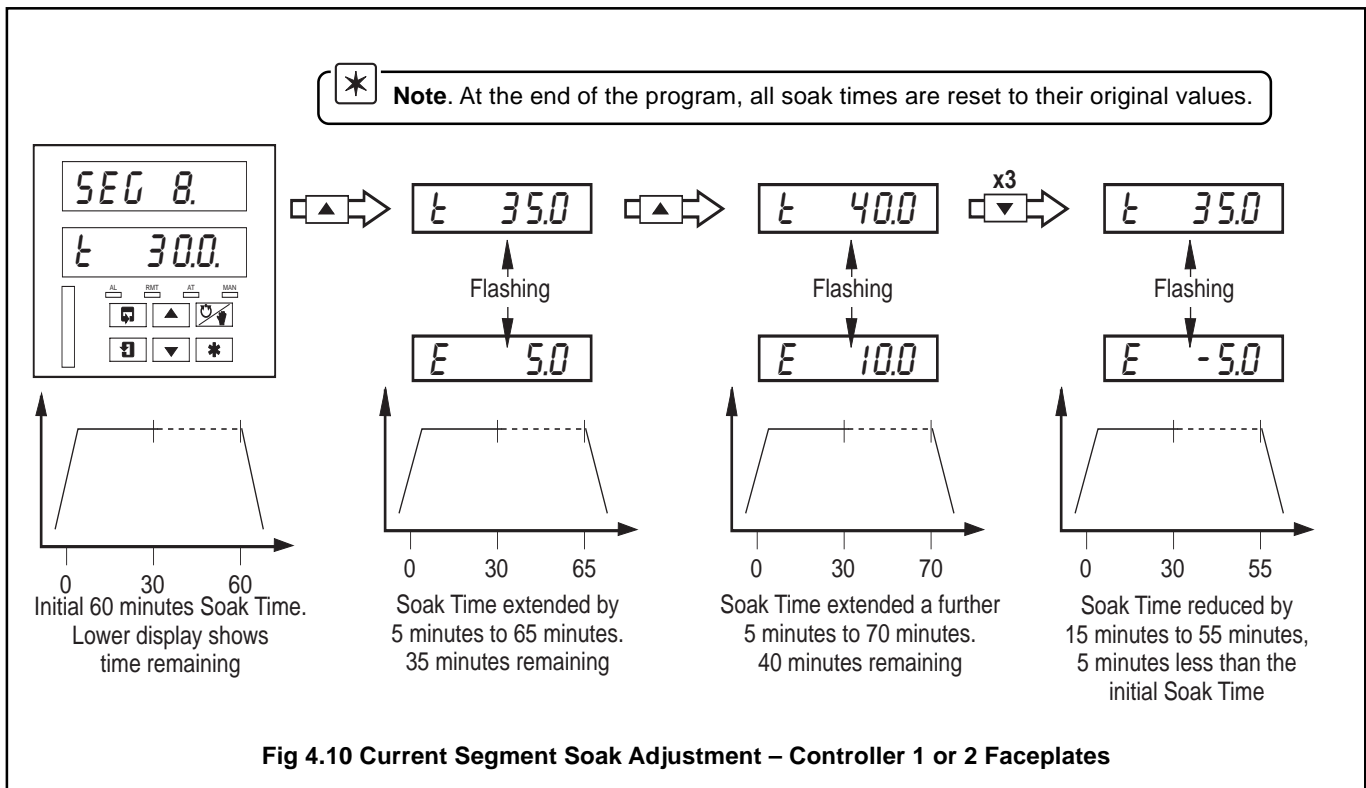
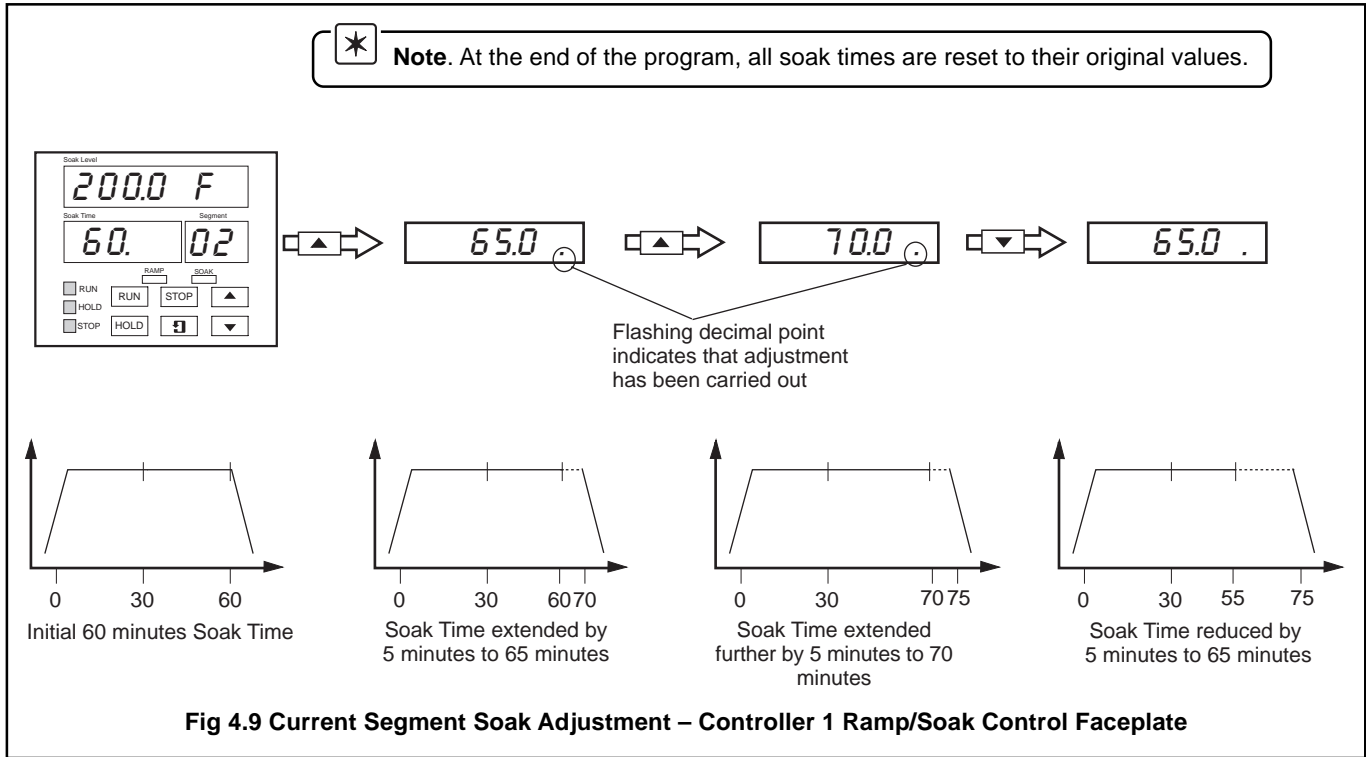
Current Segment Soak Adjustment – Controller 1 or 2 Faceplates

...COMMANDER 1960 – FEATURES EXPLAINED

...Soak Adjustment – L Type Instruments

Current Segment Soak Time Adjustment

The Soak Adjust function allows the Soak time of a segment to be extended or reduced by a value preset in the 'SK-Adj' frame – see **Ramp/Soak Profile Control Page**. The soak time can be adjusted repeatedly (in preset increments) while the segment is running, either from the Ramp/Soak control faceplate, the Controller faceplate or by a digital signal (assigned in the 'Inc.Src' or 'dEc.Src' frames).



NOTES

PRODUCTS & CUSTOMER SUPPORT

A Comprehensive Instrumentation Range

Analytical Instrumentation

- **Transmitters**
On-line pH, conductivity, and dissolved oxygen transmitters and associated sensing systems.
- **Sensors**
pH, redox, selective ion, conductivity and dissolved oxygen.
- **Laboratory Instrumentation**
pH and dissolved oxygen meters and associated sensors.
- **Water Analyzers**
For water quality monitoring in environmental, power generation and general industrial applications including: pH, conductivity, ammonia, nitrate, phosphate, silica, sodium, chloride, fluoride, dissolved oxygen and hydrazine.
- **Gas Analyzers**
Zirconia, paramagnetic, infrared, thermal conductivity.

Controllers & Recorders

- **Controllers**
Digital display, electronic, pneumatic. Discrete single-loop and multi-loop controllers which can be linked to a common display station, process computer or personal computer.
- **Recorders**
Circular and strip-chart types (single and multi-point) for temperature, pressure, flow and many other process measurements.

Electronic Transmitters

- **Smart & Analog Transmitters**
For draft, differential, gauge and absolute pressure measurement. Also, liquid level and temperature
- **I to P Converters and Field Indicators**

Flow Metering

- **Magnetic Flowmeters**
Electromagnetic, insertion type probes and watermeters.
- **Turbine Flowmeters**
- **Wedge Flow Elements**
- **Mass Flow Meters**
Transmitters, sensors, controllers and batch/display units.

Level Control

- **Submersible, Capacitance & Conductivity.**

Pneumatic Instrumentation

- **Transmitters**
- **Indicating Controllers**
- **Recording Controllers**

Customer Support

ABB Instrumentation provides a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

United States of America

ABB Instrumentation Inc.
Tel: +1 716 2926050
Fax: +1 716 2736207

United Kingdom

ABB Kent-Taylor Limited
Tel: +44 (0)1480 475321
Fax: +44 (0)1480 470787

Italy

ABB Kent-Taylor SpA
Tel: +39 (0) 344 58111
Fax: +39 (0) 344 56278

Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition.

In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of operating and maintenance records relating to the alleged faulty unit.



The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.
© ABB 1997 Printed in UK (7.97)

ABB Kent-Taylor Ltd.

St. Neots
Cambs.
England, PE19 3EU
Tel: +44 (0) 1480 475321
Fax: +44 (0) 1480 217948

ABB Instrumentation Inc.

PO Box 20550, Rochester
New York 14602-0550
USA
Tel: +1 716 292 6050
Fax: +1 716 273 6207

ABB Kent-Taylor SpA

22016 Lenno
Como
Italy
Tel: +39 (0) 344 58111
Fax: +39 (0) 344 56278