Model High -TechⅣ
Programmable Controller

Operating Instructions

Version 2

Yamato Scientific Co., Ltd

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Cautions on the backup battery

- Charge the backup battery for memorizing program built-in the unit when you use the unit for the first time., and also do that when you have not used the unit for 3 weeks and more. To turn off the circuit breaker without charging may delete the programmed data
- Once turned on the circuit breaker, the battery can be charged.
- It takes about 48 hours to charge the battery completely when discharged.

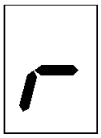
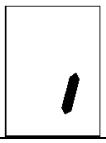
1. INTRODUCTION

Congratulations on your purchase of a Yamato Scientific's product. 'I his document discusses the operation of Model High-Tech IV Programmable Controller, especially the inputting and presetting methods of its various functions, which are not described in the operating instructions of the systems equipped with the programmable controller. The programmable controller supports the operations and performances of Yamato Scientific's machinery and equipment, This means that some of the functions discussed in this document may not work on the system you have purchased. Please refer to the operating instructions of your system for the operations and performance which are supported by the programmable controller.

This Operating Instructions 1 is the basic user's guide of Model High-Tech IV Programmable Controller. Upon your request, Yamato Scientific will furnish you with Operating Instructions 2, which discusses detailed operating procedures and programming concepts of the programmable controller

Indication of Characters

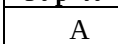
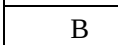
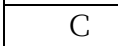
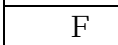
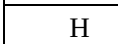
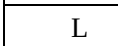
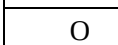
The control panel of Model High-Tech TV Programmable Controller uses 7-segment light emitting diode (LED) to show alphanumeric characters 04 its d splay. This 7-segment LED naturally has its limitation in expressing individual characters. Please take note that the alphabetical characters of 'W." "m," t," "G," "r," " i ," "A," " V " and k" are expressed by the substitutes below.

Character	Indication	Character	Indication	Character	Indication
W		G		A	
m		r		V	
t		i		k	

Explanation of Character on the display

The oven has the controller with the 4-digit LED display.

The meaning of Character on the display is as follows:

Capital	Character	Meaning of Abbreviation	Meaning of Character on the display
A		accumulation	Integrated time
B		beep	Alarm sound setting mode
C		clock	Setting of the date and the hour
D		delete program	Deleting a program
		door	The open door
		display	Sub display switching mode
E		end	Setting mode for program end
		error ##	Error code ##
F		fan	fan
		f. wt (Forced wait)	Forced wait state after the power restoration
		fn. ##	Fan condition of Segment ##
H		hold	Hold function mode
		hr. mn (hour. minute)	Setting of time (hour, minute)
L		lock	Panel locking mode
M		mn. dy (month. day)	Setting of the date (month and day)
O		off	Make a function inactive
		on	Make a function active
P		program ##	Program number
		program	Program mode
		program, segment	Ongoing program and ongoing segment
R		repeat count	Repeat frequency setting mode
		repeat	Repeat command mode
		rest time	Rest for remaining time
		ramp level	Ramp level of Segment ## (Desired set temperature)
		repeat start	Repeat start segment setting mode
		ramp time	Ramp time of Segment ## (Time required to reach the ramp level)
		real (real time)	The hour
		r. tim (real time)	the hour

S	SG.##	segment	Segment number
	St.##	soak time	Soak time of Segment ## (Holding time of the ramp level)
	StEP	step	Not in Ramp Operation
T	tEmP	temp	Temperature mode
	t mE	time	Time mode
W	WA it	wait	Wait function (Keep the operation until the desired temperature is achieved)
	Wt.##	wait ##	Wait function of Segment ##
Y	YEAr	year	the Christian era

2. INPUTTING, EDITION AND DELETING PROGRAMS

2.1 Program Composition

A program is a combination of segments and repeat commands, in which ramp time, ramp level, repeat frequency, end segment and other parameters should be preset.

[Segment]

Fig 2.1 shows the concept of a segment. Temperature and time patterns of a segment are determined by the 3 basic parameters below.

Ramp level : Desired temperature

Ramp time : Time required to achieve the preset ramp level

Soak time : Time to hold the ramp level

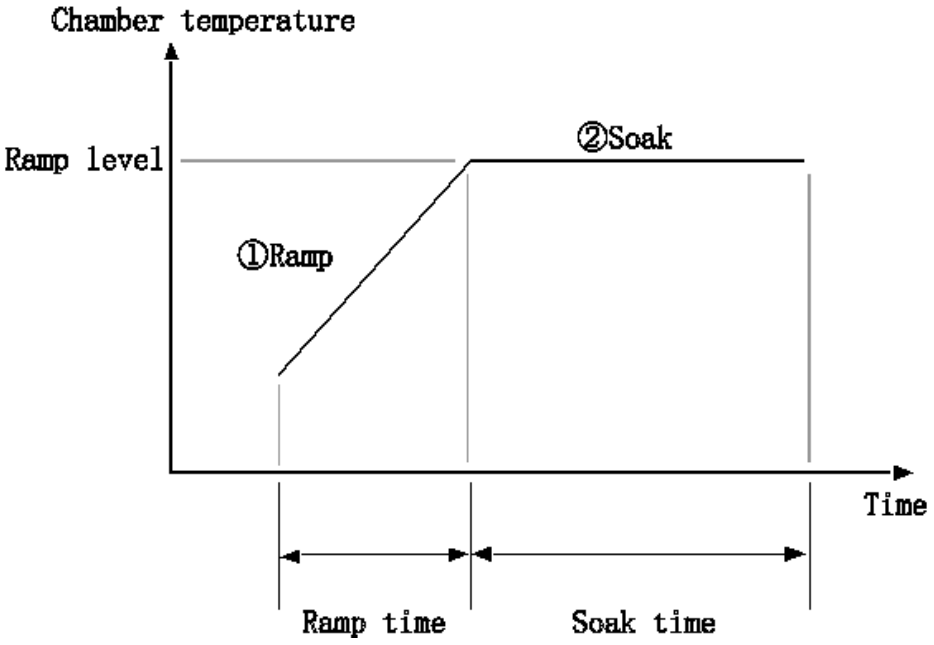
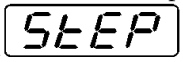


Fig. 2.1: Concept of A Segment

In Section (① of Fig. 2.1~ temperature varies at a fixed gradient rate toward the desired temperature set as the ramp level. After reaching the ramp level, temperature is kept in Section② of Fig 2.1 for the time preset as the soak time. These sections of ① and② compose a segment.

If you want to vary the temperature in Section① on a step (for full-power increase or decrease), instead of a faced gradient rate, set  for the ramp time. Fig. 2.2 shows the pattern of a step variation of the ramp time.

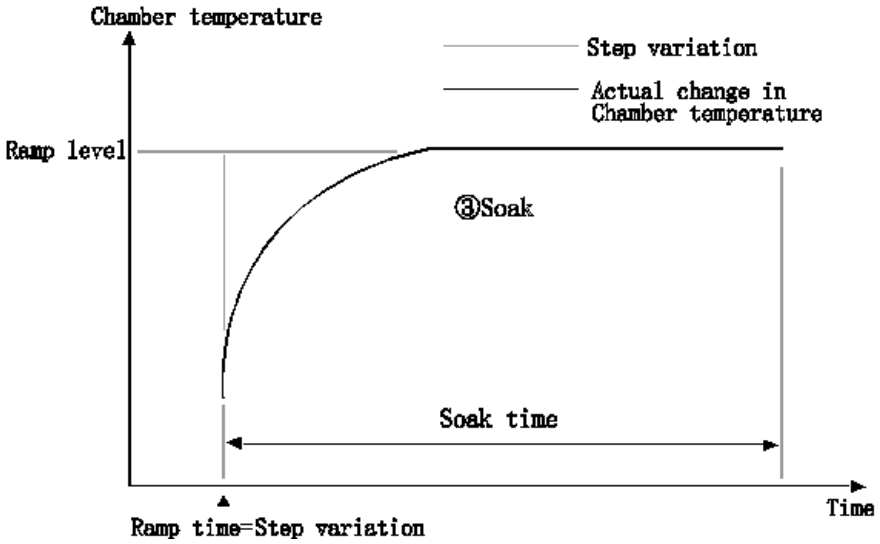


Fig. 2.2: Step Variation of Ramp Time

The soak time is set at zero (0) for a segment with only gradient-operation, while the ramp time is set at zero (0) for a segment with only fixed-value operation. Figure 2.3 shows a connected pattern of these 2 segments. In this figure, Section (4) is a segment only with the soak time set at zero (0).

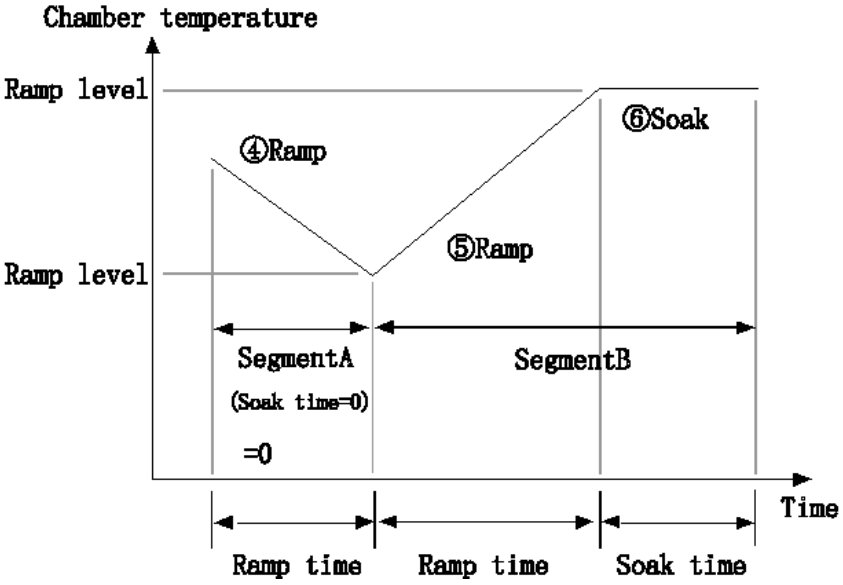


Fig. 2.3: Connection of Segmen4

■ Attribute Parameters of Segments

In addition to the three basic parameters discussed above, you may preset the following parameters.

Wait Function ON/OFF: This function temporarily suspends counting time of the program operation when influence of loads in the chamber or external disturbance such as door operation has the chamber temperature failed in achieving the preset desired temperature until the chamber temperature reaches the preset value. You may either turn ON or OFF the function.

Fan Revolution: You may preset the revolution of the internal agitation fan in the range from 1 (low speed) to 10 (high speed). See the operating instructions of your system for the fan revolution (rpm), which varies with systems.
If your system cannot control the fan revolution, the programmable controller automatically skips this function. If your system is equipped with optional automatic damper controller, you may preset the damper aperture at 5 different levels.

End Segment :When you want to complete programming, input "End" in the ramp time, which creates the end segment. You may preset the fan controller at ON/OFF or one of its 10 levels as a parameter of the end segment.

Hold: If you preset HoLd in the soak time ,the program continues the fixed-value operation thereafter HoLd appears next to a time setting of 999H (999 hours) on the display.
Note: Model High-Tech IV Programmable Controller allows you to compose a program of maximum 16 segments, which can be divided to make several different programs.

[Repeat Command]
Repeat Command allows you to repeat a series of segments as many time as yon want. This command is composed of 2 parameters; Repeat Start Segment and Repeat Frequency.

Repeat Start Segment: Program repeats the section between the segment designated as the repeat start segment and the segment immediately before the repeat start segment.

Note: (1) Repeat Command works for only the segments that were input and preset before the command. In other words, you cannot repeat the segmen4 which you preset after the repeat command.

(2) You cannot preset the nesting of a repeat command, which means to insert a repeat command into the existing repeat command, as shown in Fig. 2.4.1. It is also impossible, as shown in Fig. 2.4.2, to preset a repeat command across the existing repeat command.

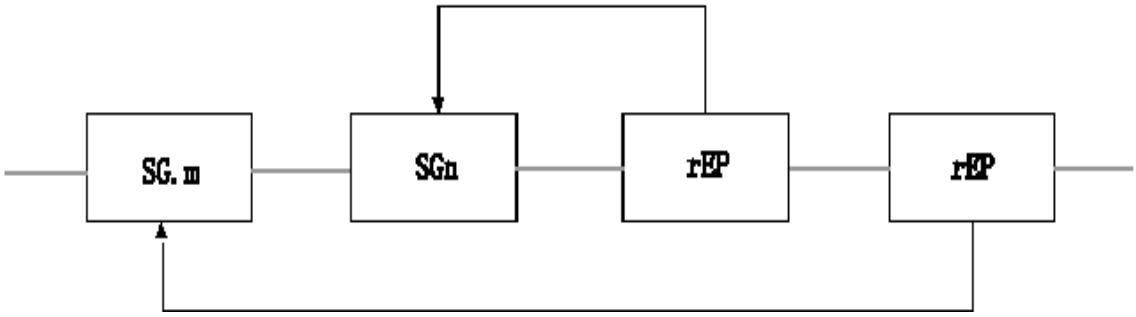


Fig.2.4.1:Nesting of a Repeat Command

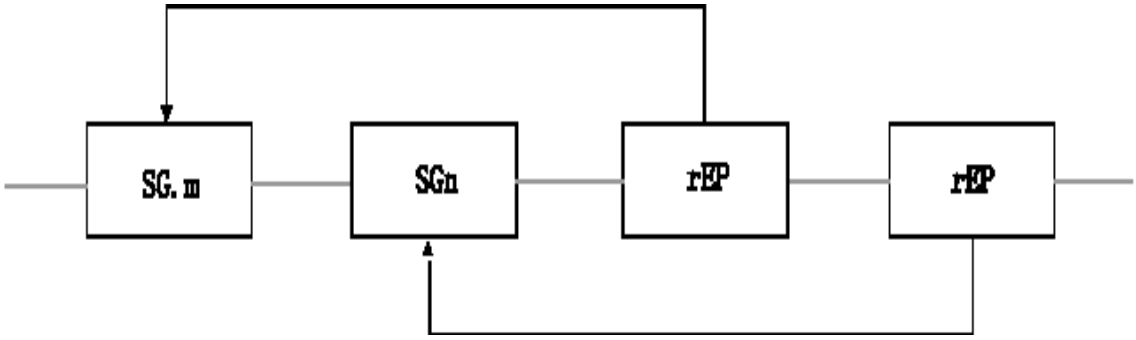


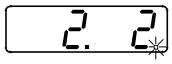
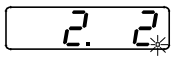
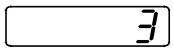
Fig.2.4.2:Cross Setting of Repeat Commands

Repeat frequency :You may preset Repeat Frequency in the range from 1 to 9999 times. If you set the repeat frequency at zero(0),which means endless repetition of the segments ,the program continues repeat operation until it is forced to stop.

Indication of the rest of the repeat count

The rest of the repeat frequency including the ongoing segment can be shown on the sub display by using the DISPLAY key while performing the repeat command of the program operation.

[Operation Procedure]

Key Operation	Main Display	Sub Display	Explanation
The repeat operation is on : Ex. While performing the repeat operation the segment 2 to 3 of the program 2			
Push the Display key several times	It shows the present measured temperature	 (Ex.: Indication of the execution segment)	Push the display key and make the sub display shown the execution segment. The sub display shows the ongoing program number at the left double-digit and the ongoing segment at the right double-digit. When performing this operation while running the repeat operation, the dot point of the LSB (the right most digit) flashes.
Push either ▲ key or ▼ key	It shows the present measured temperature	 (Ex.: Indication of the execution segment) ↑↓ Shown alternately  (Ex.: Indication of the remaining repeat frequency)	The remaining repeat frequency can be shown on the sub display by pushing the ▲ key or ▼key while the dot point located at the corner of the below to the right of the segment number is flashing (during running the repeat operation.) The remaining repeat frequency shown at this time includes the ongoing segment. When you perform the repeat operation infinitely (the setting of the repeat frequency is 0), 0 is shown on the sub display.

2.2 Inputting Programs

In this paragraph , you will learn how to input the program shown in Fig.2.5 as an example into Program No.2.

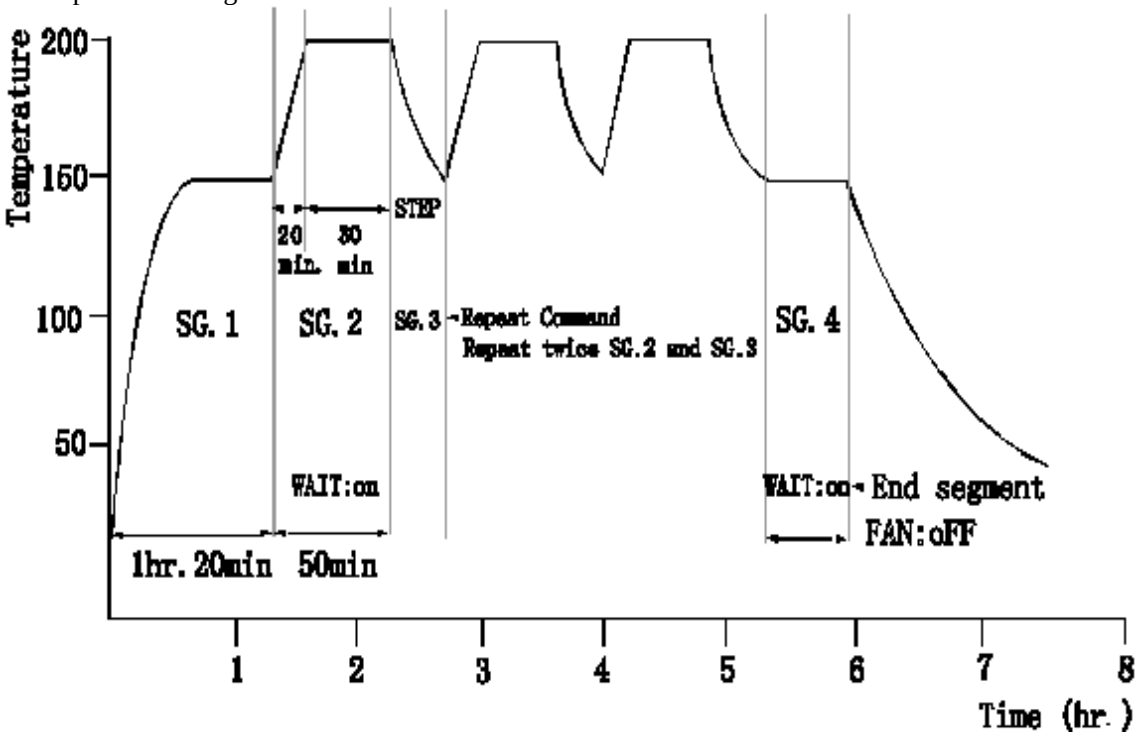


Fig.2.5:Sample Program

Note: In the tables below, hollow alphanumeric characters mean that they are flashing on the corresponding display.

[Setting Program Number]

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲ key or ▼ key	PrOG	e.g., 157	Left 2 digits: Number of the existing programs Right 2 digits Remaining memory size (%)
Push ENTER key,	e.g., Pr. 1	e.g., 4357	Activates Program input & Edit mode. Main: Indicates Program No. 1. Left 2 digits: Memory size of Program No. 1 Right 2 digits: Remaining memory size
Push ▲ key.	Pr. 2	057	Same as above. The slob display shows that the memory size of Program No. 2 is zero (O) or that Program No. 2 has not been programmed.

[Setting Segment 1]

Key Operation	Main Display	Sub Display	Explanation
Push ENTER key.	Approx. 1 second later		Activates Program input mode for Pr. 2. Requesting to input Ramp Time 1 rt. 1 of Segment 1. Push ▲ or ▼ key when you want to switch Prom STEP to real time. In this example, you are working on a step operation so that you do not need to change the indication.
	STEP	rt. 1	
Push ENTER key.	STEP	rt. 1	The main display stops flashing and keeps lighting the indication, notifying that Ramp Time 1 was set.
	Approx. I second later		Requesting to input the temperature of Ramp Level 1 rL. 1
	e.g 0	rL. 1	

Push ▲ or ▼ key and ENTER key.	150 ↓ (Lighting)	rL. 1	Push ▲or ▼ key to show a desired temperature of 150_C and push ENTER key to accept it as Ramp Level 1. The main display changes from flashing to lighting,
	Approx. l second later		Requesting to input Soak Time 1 of Segment 1.
	e.g., 0	St. 1	
Push ▲ or ▼ key and ENTER key.	1.20. (Lighting)	St. 1	Push ▲or▼ s key to show a desired soak time of 1 hour 20 minutes and push ENTER key to accept it as Soak Time 1. The main display changes from flashing to lighting.
	Approx. 1 second later		Push ▲or ▼ key to turn on or off Wait Function 1. In this example, you are working on a step operation so that you do not need to change the indication.
	oFF	Wt. 1	
Push ENTER key,	oFF	Wt. 1	The main, display changes from flashing to lighting, notifying that Wit Function 1 was set.
	Approx. 1 second later		Requesting to input Fan Revolution. Push ▲ or ▼ key to set a level of Fan Revolution in the range from Level 10 (fast) to Level 1 (slow). Default is Level 10. In this example, you accept a fan revolution of Level 10.
	10	FAn	
push ENTER key.	10	FAn	The main display changes from flashing to lighting, notifying that the fan revolution of Level 10 was set.
You have finished setting Segment 1.			

[SettingSegment2]

Key Operation	Main Display	Sub Display	Explanation
Push ENTER key,	Approx. 1 second later SG. 2 ↓ StEP	254 ↓ rt. 2	Activates Input mode for Segment 2. Left 2 digits. Program number you are working on. Right 2 digits: Remaining memory size Requesting to input Ramp Time 2 rt. 2 of Segment 2.
Input and preset the following parameters for this example in the same manner as Segment 1.			
rt. 2 :20 minutes rL. 2 : 200℃ St. 2 : 30 minutes Ht. 2 : ON FAn : 10			

[Setting Segment 3]

Input and preset the following parameters in She same manner as above.
rt. 3 : StEP
rL. 3 : 150℃
St. 3 : 0 minute (This is a segment of only the gradient operation.)
Ht. 3 : OFF
FAn : 10
You have finished setting Segment 2 and 3.

[Setting a Repeat Command]

hey Operation	Main Display	Sub Display	Explanation
Push ▲ or ▼ key. Push ENTER key.	Approx. 1 second later SG. 4 → rEP → 0	240 → 240 → r.Str	The main display shows that the programmable controller is ready for inputting Segment 4. Push▲ or ▼ key to change the controller to the input mode of Repeat Command. The main display flashes rEP (Repeat). Requesting to input the number of Repeat Start Segment r.Str.
Push ▲ or ▼ key and ENTER key.	2 → Lighting → 1	r.Str → r.cnt	Push ▲ or ▼ key to show the desired repeat start segment number of 2 and push ENTER key to accept it. The main display changes from flashing to lighting. r.cnt (Repeat Count): Requesting to input the repeat frequency. Default is set at 1.
Push▲ or ▼ key and ENTER key.	2 → Lighting	r.cnt	Push ▲or ▼ key to show a repeat frequency of 2 and push ENTER key to accept it. The main display changes from flashing to lighting.

You have finished setting Repeat Command..

[Setting Segment 4]

Key Operation	Main Display	Sub Display	Explanation
Push ENTER key.	Approx. 1 second later SG. 4 → StEP	237 → rt. 4	Activates Input mode for Segment 4 when you accept the repeat command. Requesting to input Ramp Time 4 rt. 4 of Segment 4.

Input and preset the following parameters in the same manner as previous segments.

rt. 4	: 0 minute (This is a segment of only the fixed value operation)
rL. 4	: 150℃
St. 4	: 50 minutes
Ht. 4	: ON
FAn	: 10

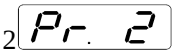
You have finished setting Segment 4.

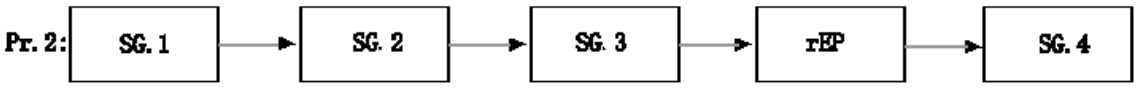
[Inputting and Setting End Segment]

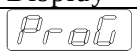
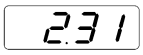
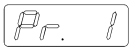
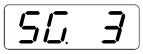
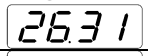
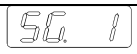
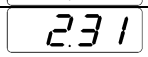
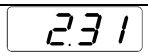
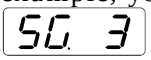
Key Operation	Main Display	Sub Display	Explanation
Push ENTER key. Push ▲or▼ key	SG. 5 ↓ StEP ↓ End	2.34 ↓ rt. 5 rt. 5	Activates Input mode for Segment 5. Requesting to input Ramp Time5 (rt. 5) of Segment 5. Push ▲ or ▼ key to change to Program Input mode for End Segment.
Push ENTER key	10	FAn	Requesting to turn on or off the fan or input its revolution level.
Push ▲or▼ key.	oFF	FAn	Push A or t key to change the setting. In this example, turn off the fan.
Push ENTER key.	Approx. 1 second later ProG	2.31	Push ENTER key to accept the setting of the fan, This completes all the settings for Program No. 2. The displays return to their initial indications of Program Input a Edit mode.

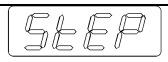
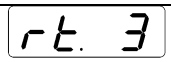
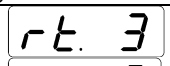
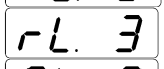
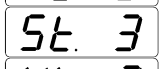
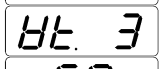
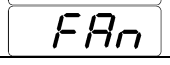
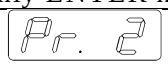
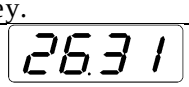
2.3 Editing Programs

Model High-Tech IV Programmable Controller supports Edit function of only
・Segment parameters; and
・Repeat parameters
or editing programs. Take note that the programmable controller does not support Delete of repeat command and Insert of new segments or a new repeat command.

In this paragraph, you will edit Segment 3 of Program No. 2  in Fig. 2.6, which is composed of the following segments and a repeat command.

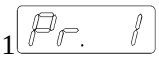


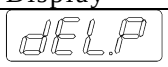
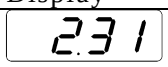
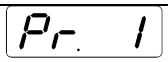
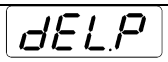
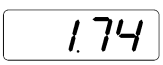
Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either▲ key or ▼key		e.g., 	Left 2 digits: Number of the existing programs Right 2 digits: Remaining memory size (%)
Push ENTER key. Push▲or▼key	e.g.,  ↓ 	e.g.,  ↓ e.g., 	Activates Program Input & Edit mode. Push ▲ or ▼ key to show the program number you want to edit on the main display. Left 2 digits: Memory size of Program No. 2 Right 2 digits: Remaining memory size
Push ENTER key.			The main display Rashes the first segment number of the program. Left 2 digits: Program number you are working on. Right 2 digits: Remaining memory size (%)
Push ▲ or ▼ key.			Every time you push A or Y key, the main display scrolls the segments of the program in the preset sequence. In this example, you are going to edit Segment 3  , which should be shown on the main display.

Push ENTER key.			Indicates that the ramp time of Segment S is set at the step operation. **Change it to the gradient operation with a ramp time of 45 minutes.**
Input and preset the following parameters in the same manner as discussed in "inputting Programs."			
	 : 45 minutes  : 150℃  : o minutes (This is a segment of only the gradient operation.)  : ON  : 10		
You have changed the parameters with asterisks. For the other parameters you do not change, push only ENTER key.			
			**Whenever you have finished editing a parameter, the displays return to show the initial indications of Program Edit mode.** ↓ If you leave them for about 10 seconds, the programmable controller understands that you have finished editing the program and returns to the displays shown immediately before you pushed MODE key.

2.4 Deleting Programs

You can delete the programs not in use any longer from the programmable controller. Take note that on Program Delete mode, you cannot check the contents of the program you are going to delete.

In this paragraph, you v ill learn how to delete Program No. 1 

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲ key or ▼ key			Push MODE key several times to flash (Delete Program) on the man display. Left 2 digits: Number of the existing programs Right 2 digits: Remaining memory size (%)
Push ENTER key.			Activates Program Delete mode. The main display shows the smallest number of the existing programs. Every time you push ▲ or ▼ key, the main display scrolls the program number in sequence. In this example/ you are going to delete Program No. 1, so that don't touch s and t keys.
Push ENTER key.	 (Lighting) Approx, 1 second later 	 	**Pushing ENTER key deletes Program No. 1, and the main display returns to the initial indication of Program Delete mode.** Deleting Program No. 1 (with a memory size of 43%) reduces the number of the existing programs to 1, and the remaining memory size to 74%.

Temporary Suspension of Program Operation

Temporary suspension of program operation means to stop the program timer and temporarily keep the programmable controller at the status of ready-for-operation. During the suspension, the programmable controller shuts off power supply to heaters and does not regulate chamber temperature.

[Suspending Program Operation Temporarily]

Key Operation	Main Display	Sub Display	Explanation
Push Operation Menu key	PAUS	Pr. 2	If you push Operation Menu key during the program operations the main display shows PAUS (Pause) while the sub display shows the ongoing program number. When you want to cancel Temporary Suspension of Program Operation, leave the programmable controller for 20 seconds or push ESC key.
Push ENTER key.	PAUS (Lighting)	Pr. 2	**Suspends program operation temporarily.** The main display shows chamber temperature, while the sub display alternately shows , and the program number (left 2 digits) PAUS and the ongoing segment number (right 2 digits). Ready indicator lamp Rashes on the operation monitor.
	Approx. 1 second later		
	e.g., 173	PAUS ↑↓ Alternate indicator. 2. 3	

[Restarting Program Operation]

Push Operation Menu key and operation starts again automatically. If chamber temperature deviated from the preset temperature during the suspension of operation, the sub display flashes its indication. When chamber temperature reaches the desired temperature, the operation timer starts again and the sub display shows the correct temperature.

Important

Program input, Edit and Delete modes can be activated only during the program operation, and they do not work in the fixed-value operation and the automatic star/stop operation. These modes can work when you have pushed Operation Menu key at the status of ready-for -operation, including temporary suspension of program operation. When the programmable controller is on the mode which cannot execute Program input, Edit and Delete, pushing MODE key skips the indication of these modes.

3. INPUTTNG AND SETTING FUNCTIONS

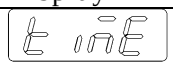
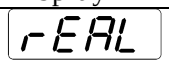
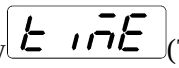
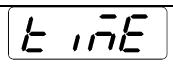
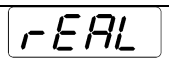
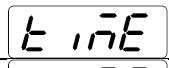
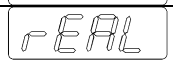
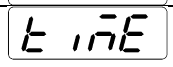
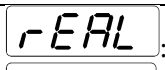
You can add a variety of functions by using MODE key. This section discusses the inputting and setting functions, which are common to all Yamato Scientific's machinery and equipment. For setting the functions particular to your system, see the operating instructions of the system. If your system does not support certain functions, pushing MODE key simply skips those functions, which are not shown on the displays.

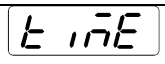
3.1 Switching between Time and Period

Starting time of the automatic state operation and the program operation, and ending time of automatic stop operation can be designated by either time or period-of operation, If you set them by time, the sub display shows it at the upper left corner.

In this paragraph, you will learn how to change the setting from time to period of operation.

[Procedure]

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲key or ▼ key			Push MODE key several times to show  (Time) on the main display, The sub display shows the present time.
Push ENTER key.	 (Lighting) Approx. l second later	 	Activates Time/Period Switching mode.
Push ▲or▼ key.	 ↑ Alternate ↓ indication		 :Time (XX o'clock XX minutes) :Interval (E hours XX minutes or XXX hours) Push ▲ or ▼ key to show on the main display.

<table>
<tr><td rowspan="3">Push ENTER key.</td><td>
(Lighting)</td><td>  </td><td rowspan="3">Accepts the change of the setting from time to period of operation.</td></tr>
<tr><td colspan="2">Approx. 1 second later</td></tr>
<tr><td colspan="2">The displays return to their initial indications shown immediately before you pushed MODE key.</td></tr>
<tr><td colspan="4">Note: Time is default setting. When you are setting the operation parameters, you cannot switch this setting.</td></tr>
</table>

3.2 Setting and Releasing Panel Key Lock

Panel Key Lock deactivates the eight keys on the control panel, except for indication Switching key. With this special function, you can prevent accidental or unauthorized key operation ashen the programmable controller is in service.

[Setting Panel Key Lock]

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲ key or▼ key	LocK	oFF	Push MODE key several times to show LocK (Lock) on the main display. The display shows the present setting
Push ENTER key.	LocK (Lighting)	oFF	**Activates Panel Key Lock Set/Release mode.**
	Approx. 1 second later		
	oFF	LocK	
Push ▲ or ▼ key.	↑ Alternate indication ↓ oFF	LocK	:Releases Panel Key Lock. on: Sets Panel Key Lock When you want to lock the panel keys, push ▲ or ▼ key to show on on the main display
Push ENTER key.	on (Lighting)	LocK	**Accept the setting of Panel Key Lock.** The displays return to their initial indications shown immediately before you pushed MODE key.
	Approx. 1 second later		
	The displays return to their initial indications shown immediately before you pushed MODE key.		

Note: Panel Key Lock ON is default setting When you are setting the operation parameters, you cannot switch this setting.

[Releasing Panel Key Lock]

Push MODE key to activate Panel Key Lock Set/Release mode, and switch OFF (oFF) the lock

Note. When the panel key lock is turned on, MODE key skips all the modes except for Panel Key Lock Set/Releasing mode.

3.3 Turning ON and OFF Buzzer Sound

If something abnormal happens on your system, all the indicator lamps including alarm indicator lamps start flashing, the main display shows the present chamber temperature and the sub display shows the error code of the abnormal condition. You can choose to activate or deactivate buzzer sound when your system is in trouble.

In this paragraph, you will learn how to turn on the buzzer sound.

[Procedure]

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲key or ▼ key	bEEP	e.g., oFF	Push MODE key several times to show bEEP (Beep) on the main display. The sub display shows the present setting.
Push ENTER key.	bEEP (Lighting)	oFF	**Activates Buzzer Sound ON/OFF mode**
	Approx. 1 second later		
	oFF	bEEP	
Push ▲ or ▼ key.	oFF ↑ Alternate ↓ indication on	bEEP	oFF: Deactivates buzzer Soured on:Activates buzzer sound. When you want to turn on the buzzer sound, push ▲or ▼ key to show on on the main display
Push ENTER key.	on (Lighting)	bEEP	**Accepts the setting of Buzzer Sound.**
	Approx. 1 second later		
	The displays return to their initial indications shown immediately before you pushed MODE key.		

Note: Buzzer Sound on is default setting.

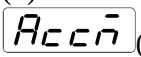
3.4 Indication of Integrating Operation Time

This function accumulates the operation time when Power key is turned on. Maximum accumulation of time is 49,999 hours, which cannot be reset. Accumulated operation time provides useful information when you determine the timing of maintenance.

In this paragraph, you will learn how to show the accumulated operation time.

[Procedure]

(1) Push the MODE key and then push either ▲ key or ▼ key

(2) Push the MODE key and then push either ▲key or ▼ key to show  (Accumulation) on the main display. The sub display shows the accumulated operation time at present (in the unit of hours),

Note: You do not need to push ENTER key, because this function only shows the accumulated operation time. In this function, ENTER key and ▲and ▼ keys do not work.

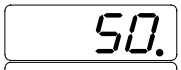
(3) When you want to cancel the function, push ESC key or leave the programmable controller for 20 seconds, The displays return to their indications shown immediately before you pushed MODE key.

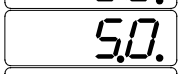
[Expression of Accumulated Operation Time]

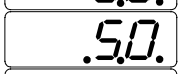
When the accumulated operation time exceeds 9999 hours 59 minutes, the sub display goes back to 0 (zero) and starts emulating time again. Decimal point also moves to the left by one digit at every operation time of 10,000 hours.

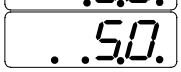
Figure① shows an accumulated operation time of 10,050 hours.

In the same manner, ② means 20,050 hours, ③ 30,050 hours and ④40,050 hours

① 

② 

③ 

④ 

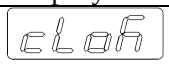
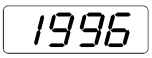
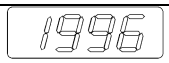
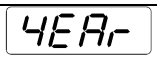
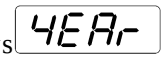
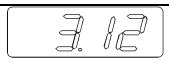
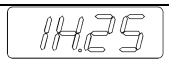
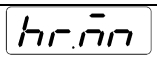
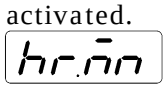
3.5 Setting Date and Time

The timer clock built in Model High-Tech IV Programmable Controller has been calibrated at the standard time in our factory. However, you still need to adjust it periodically to make sure of its correct time indication in your operating environment.

In this paragraph, you will learn how to calibrate the built-in timer clock.

Note: The built-in timer clock causes an daily error of 12 seconds at a working temperature of 25℃.

[Procedure]

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲key or ▼ key		e.g., 	Push MODE key several times to show (Clock) on the main display. The sub display show j the accumulated operation time in the order of year, date and time at an interval of 2 seconds.
push ENTER key.			Activates Date & Time Set mode. The sub display shows  (Year) and the main display flashes the present data. push ▲ or ▼ key to set the correct year.
Push ENTER key.			In about 1 second, Date Set mode is activated. The sub display shows (Month and Day) and the main display flashes the present data. Push ▲or ▼ key to set the correct date.
Push ENTER key.			In about 1 second, Time Set mode is activated. The sub display shows  (Hours and Minutes) and the main display flashes the present data, Push ▲or ▼ key to set the correct time.
Push ENTER key.	Approx.1 second later The displays return to their initial indications shown immediately before you pushed MODE key.		Accepts the setting of Date & Time.

Note: if you want to cancel the calibration of Date & Time, push ESC key or leave the programmable controller for 20 seconds. Date & Time Setting Function works only when the programmable controller is ready for operation with Operation Menu selected or after operation.

3.6 Hold Function

Hold function is the one of functions that the HitecⅣcontroller supports by using the MODE key.
It can work only if the setting time of the operation start time of the Auto-Start operation and the Program operation and the operation stop time are not set in hours but in a period of time.

General Description of the Hold Function

Once the Hold Function is on, immediately the HitecⅣcontroller stops the built-in timer and keeps the condition. The definite examples are shown below.

1. When the Hold Function activated while the unit is in standby condition of starting operation, the waiting time to start is extended by a period of time when the Hold Function was on
2. When the Hold Function activated while performing the fixed gradient rate operation toward the desired temperature, the controller stops the gradient operation and changes to the fixed temperature operation to keep the internal target temperature of the controller at the point of time. (The internal target temperature is not always same as the ramp level in the program segment) Once the Hold Function is off, the controller resumes performing the gradient operation that had been performed just before the Hold Function was on.
3. When the Hold Function activated while performing the gradient operation with full power, the controller changes to the fixed temperature operation to keep the chamber at the ramp level in the program segment after reaching the ramp level (the desired temperature)
4. When the Hold Function activated while keeping the chamber at the ramp level, the setting soak time in the Auto-Stop operation and the Program operation are extended by a period of time when the Hold Function was on
5. When you change a certain ongoing operation to the other operation by pushing the MENU key with the Hold Function is on, the Hold Function is automatically released at the point of time when the operation is changed.

Operating procedure

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either▲key or ▼ key	HoLd	oFF	Blink HoLd (Hold) on the main display. The sub display shows the present setting.
Push the ENTER key	HoLd	oFF	**Activates Hold Function Setting mode.** oFF :Hold function is off (inactive) on :Hold function is on (activate)
	Approx. 1 second later		
	oFF	HoLd	The main display blinks the present state of Hold mode and sub display shows HoLd
Push either ▲ key or ▼ key	oFF on	HoLd	oFF : Releases Hold state on : Sets Hold state Choose on if you want to bring the unit to the Hold state.
Push the ENTER key	on	HoLd	**Accepts the setting of Hold state**
	Approx. 1 second later		
	It shows the present measured temperature.	HoLd	The main display shows the present measured temperature and the sub display blinks HoLd in the Hold state. The present set temperature can be shown on the sub display only for 10 seconds by pushing the DISPLAY key.

Hold Function was set to oFF when the unit is shipped from the factory.

3.7 Communication lock out function

This function makes the communication between the PC and HitecⅣcontroller enable / disable.

If this function is activated during communicating with a host computer, the controller closes the communication

Operating Procedure

Key Operation	Main Display	Sub Display	Explanation
Push the MODE key and then push either ▲ key or ▼ key	coM.L	oFF	Blink coM.L (Communication Lock-out) on the main display. The sub display shows the present setting.
Push the ENTER key	coM.L	oFF	**Activates Communication Lock-out Function setting and releasing mode** oFF :Communication with PC is enable. on : Communication with PC is disable.
	Approx. 1 second later		
	oFF	coM.L	
Push either ▲ key or ▼ key	oFF	coM.L	oFF : Releases Communication Lock-out state on : Sets Communication Lock-out state Choose on if you want to bring the unit to the Communication Lock-out state.
	on		
Push the ENTER key	on	coM.L	**Accepts the setting of Communication Lock-out.**
	Approx. 1 second later		Both displays return to the indicating state just before you pushed the MODE key when Communication Lock-out is on.

Communication Lock-out Function was set to oFF when the unit is shipped from the factory.

Releasing the Communication Lock-out

By pushing the MODE key while the Communication Lock-out function is on, Hitec ⅣController goes to the setting and releasing the Communication Lock-out mode, and then you can release the Communication Lock-out condition to choose 'off' by pushing the ▲key or the ▼ key.

∗Precaution in handling∗

※ The remote operation cannot be performed while the Communication Lock-out function is on.

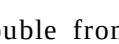
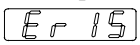
※ The unit without the PC communication feature may show the indication of this function at its display by operating the MODE key. Setting does not bring any effective result.

4. SAFETY MEASURES AND PRECAUTIONS

This section discusses the safety measures provided for Model High-Tech IV Programmable Controller, and the operational precautions of the controller and your system regulated by the controller. See the operating instructions of your system, which also describe safety measures and precautions.

4.1 POST Function

POST stands for Power On Self Test, which is a special function to check the controller's microprocessor, memory, peripheral LSI's and peripheral circuits whenever you turn on Power key. With this POST function, you can make sure that the controller is free of serious troubles before starting operation.

If the function defects something abnormal, the sub display shows one of error codes corresponded to the trouble from among error codes of  , and  .

These error codes mainly indicates a trouble of electronic circuits If this is the case, turn off the breaker and contact the dealer of your system, Yamato Scientific CD., Ltd. or Yamato Engineering Co., Ltd. in your vicinity.

4.2 Precautions

1) To prevent overheating, Model High-Tech IV Programmable Controller is equipped with automatic attempering function In addition, some of our systems also have their own attemperators in the circuit separated from the programmable controller. However, when you are working on exothermic samples or supplying electricity to samples to generate heat, those temperature regulating systems do not work effectively.

When temperature goes up abnormally high, shut down power supply or take any other appropriate measures Yamato Scientific is prepared to modify your system to manage such troubles.

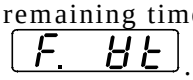
2) In case of power failure, the programmable controller of the standard specifications automatically resets itself and restarts operation when electric power becomes available again. If you install the optional Restart Selector Function In the controller, you can select either Automatic Reset or Manual Reset to restart operation after power failure for a certain period of time.

5. Behavior after Power Restoration

When having a blackout during operation, the controller resumes the following operations after the power restoration.

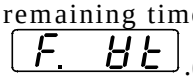
5.1 When having a blackout during the program operation

The controller automatically resume the program operation where it left at the power shutdown. In case that the temperature inside the chamber is outside the specified temperature range based on the setpoint temperature, the controller goes to the FORECED WAIT STATE until the

temperature inside the chamber comes back to the specified temperature range. When selecting the indication of the remaining time by pushing the Display key in this condition, the sub display shows  .

The timer built-in the controller does not count a period of having a blackout as running time.

5.2 When having a blackout during the Auto-Stop operation

The controller automatically resume the Auto-Stop operation where it left at the power shutdown. In case that the temperature inside the chamber is outside the specified temperature range based on the setpoint temperature after the power restoration, the controller goes to the FORECED WAIT STATE until the temperature inside the chamber comes back to the specified temperature range. When selecting the indication of the remaining time by pushing the Display key in this condition, the sub display shows  .(Forced Wait)

In case that the operation stop time is set in a period of time, the timer built in the controller does not count a period of a blackout as running time. On the contrary, in case that the operation stop time is set in hours, the timer built in the controller counts a period of a blackout as running time.

When the operation stop time reaches during a blackout, the controller stops running just after the power restoration.

5.3 When having a blackout while the operation is in standby condition

In case that the operation start time is set in a period of time, the timer built in the controller does not count a period of a blackout as standby time. On the contrary, in case that the operation start time is set in hours, the timer built in the controller counts a period of a blackout as standby time.

When the operation start time reaches during a blackout, the controller starts running just after the power restoration.

5.4 When having a blackout during the Fixed temperature operation and a soak period of the Auto-Start operation

The controller resumes running toward to the preset temperature after the power restoration.