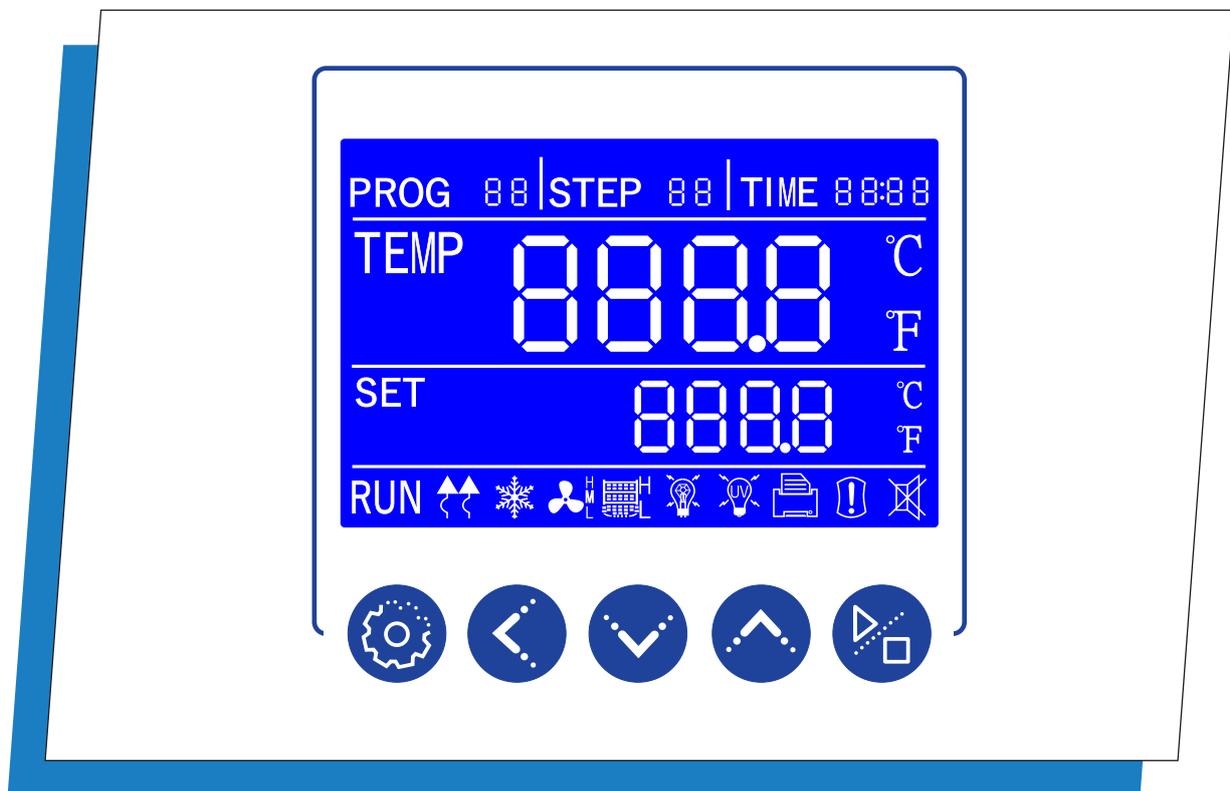


LCD CONTROLLER

L Series



Controller used on the following product

- BOF/BON Drying Ovens
- BIT/BIF Heating Incubators
- BIC Cooling Incubators
- BOV Vacuum Ovens
- BWB Water Baths

1.0 INTRODUCTION

This programming guide provides the user of the following BEING laboratory instruments the ability to change the backlit LCD controller's operational parameters to allow the instrument to work more effectively and efficiently for your operation, process, or experiment.

BIF-16, -35, -55, -120, -200, -400
Mechanical Convention Incubators

BON-30, -50, -115, -200
Natural Convention Drying Ovens

BIT-16, -35, -55, -120, -200
Natural Convention Incubators

BOV-20, -50, -90
Vacuum Ovens

BIC-60, -120, -250
Cooling incubators

BWB-05, -12, -22
General Purpose Water Baths

BOF-30, -50, -120, -200, -400
Mechanical Convention Drying Ovens

2.0 TABLE OF CONTENTS

Safety Messages	03
Controller Elements Overview	04
Changing Temperature Unit of Measurement	05 - 06
Setting Temperature and Soak Time	07
What is a Multi-step Program	08
Turn On/Off Multi-step Programs	09
Selecting Heat Rise (Profile) Type	10
Programming Multi-step Programs	11
Selecting Multi-step Program to Run	12
Setting up Program Cycling	13
Setting up RUN Delay — Fixed Value (Single-step) Programs	14
Setting up RUN Delay — Multi-step Programs	15
Changing Power-up Mode	16
Changing Low/High Alarm	17
Calibrating the Unit	18 - 20
Operational Parameters Overview	21 - 23

Safety Message

Be sure you are familiar with the safe operation of each BEING series. This unit may be connected to machinery like a vacuum pump. Improper use can cause serious or fatal injury.

Installation and repair procedures require specialized skills with laboratory equipment and electricity. Any person who installs or repairs this unit must have these technical skills to ensure this unit is safe to operate. Contact BEING Scientific, Inc. or their local authorized distributor for repairs or questions about this unit's safe installation and operation.

The precaution statements are general guidelines for these instruments' safe use and operation. It is not practical to list all unsafe conditions. Therefore, if you use a procedure not recommended in this programming guide, you must determine if it is safe for the operator and all personnel near the instrument. If there is any question about the safety of a procedure, please contact BEING Scientific before starting or stopping the instrument.

This equipment contains high voltages. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the startup procedure or troubleshoot this unit.

- Documentation must be available always to anyone who operates this equipment.
- Keep non-qualified personnel at a safe distance from this unit.
- Only qualified personnel familiar with this unit's safe installation, operation, and maintenance should attempt startup or operating procedures.
- Always stop the instrument before making or removing any connections.

Symbols used in this Programming Guide

The following signal word panels, safety symbols, and non-safety symbols are used to alert you to potential personal injury hazards or information of importance. Obey all safety messages that follow these symbols to avoid possible personal injury or death.

- **Signal word panels**

Signal word panels are a method for calling attention to a safety message or property damage message and designating a degree or level of hazard seriousness. It has three elements: a safety alert symbol, a signal word, and a contrasting rectangular background. The following signal word panels are in accordance with ANSI Z535.4-2111 (R2017) and ISO 3864 standards.



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

- **Safety symbols**

Safety symbols are graphic representations—of a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages—intended to convey a message without using words. The following safety symbols are used in this quick-start guide.

Mandatory



General alert. Mandatory action.



Wear protective gloves.



Read Information.

Prohibition



Do not touch fluid.

Warning



Safety Alert Symbol. General caution.



Hot Surface

Controller Element Overview



PROG Area: Displays the program working or setting group. Controller is capable of programming and storing 1 fixed value program and up to 8 multi-step programs.

STEP Area: Displays the step number within a program being set or running. Each program has 8 steps.

TIME Area: Displays the running/soak time, RUN delay time, controller level passcode, or operational parameter value.

TEMP Area: Displays the measured (actual) temperature (AKA PV or Present Value) within the unit's chamber.

SET Area: Displays the program's or program step's desired soak (dwell) cycle temperature. The °C or °F shows the controller's unit of measurement.

RUN: Illuminates when the unit's program is working. Turns off when program is stopped.

HEAT: The two wavy arrows appear when the heating element is energized.

COOLING: Snowflake illuminates when the unit's cooling is on. Turns off when cooling system is off. Blinks during the 120-second lockout period. **Series BIC only.**

FAN: Fan blades illuminate and blink when the unit's circulation fan is on. H (high), M (medium), and L (low) indicate the fan speed. Turns off when fan is off. **Series BIF, BIC, and BOF only.**

Water Level: Indicates high and low water bath levels.

Visible Alarm: Illuminates when the program has completed, has been stopped by user, or when an under ($PV < SV - AL$) or over ($PV > SV + AL$) temperature condition occurs. Additionally, when the visible alarm illuminates an audible alarm will start.

Audible Alarm Disabled: Illuminates when the user presses any key or when the unit's power is turned off.

Keys

SETTING: Starts programming the temperature and run time. Accepts the temperature and run-time values. Locks in operational values.

SHIFT: For changing the parameter value being set and viewing ambient temperature.

DECREASE: Used for setting parameter value, or modification of various values.

INCREASE: Used for setting parameter value, or press and hold for more than 2 seconds to view the remaining program time.

RUN/STOP: Press for 2 seconds to run or stop the controller.



Changing Temperature Unit of Measurement



Units are shipped with the temperature measurement set to Celsius (°C). Parameter CF = 0000.

STEP 1: Enter the Operational Settings, Level 3.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings. Time area will change and first digit will blink.

STEP 5: Set parameter and return to the home screen.



Press the SETTING key 2 times to set parameter CF and return to the home screen.



The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.

STEP 2: Enter Level 3 code. LK = 0088



Press the INCREASE key to enter the first code digit. Press the SHIFT key to move to the second code digit. Digit will blink. Press the INCREASE key to enter the second code digit.



Upon changing the temperature unit of measurement, the present value (PV) temperature will change its value.



Temperature setpoint must be changed manually.



Press the SETTING key to enter the Level 3 controller parameters.

First available parameter will appear.

STEP 6: Repeat Steps 1 and 2.

STEP 7: Scroll to parameter Ht.



Press the SETTING key 11 times to scroll through parameters until the parameter Ht appears.



The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.

STEP 3: Scroll to parameter CF.



Press the SETTING key 18 times to scroll through parameters until the parameter CF appears.



The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.

STEP 8: Change parameter Ht.



Press the INCREASE or DECREASE key to change the first digit. Press the SHIFT key to move to the second or third digit. Press the INCREASE or DECREASE key to change setting.

STEP 4: Change parameter CF.



Press the INCREASE or DECREASE key to change the first digit.

CF = 0000 Celsius (°C)
CF = 0001 Fahrenheit (°F)

Ht Parameter

Series	°C	°F
BIF/BIT	0080	0176
BIC	0080	0176
BOF/BON	0300	0572
BOV	0200	0392
BWB	0100	0212

STEP 9: Set parameter and return to the home screen.

Press the SETTING key 6 times to set parameter Ht and return to the home screen.

The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.



BIC SERIES ONLY!

All of the following parameters must be adjusted for the incubator to heat and cool properly.

STEP 10: Set parameters CL and Lt per the table below and return to the home screen.

BIC Parameter Settings

Parameter	°C	°F	Settings Level	LK
Co	0000	0000	3	0088
CL	000.5	000.9	3	0088
CF	0000	0001	3	0088
Lt	-15.0	005.0	3	0088
Ht	080.0	176.0	3	0088
tM	080.0	176.0	2	0003

Setting Temperature and Soak Time

STEP 1: Press the SETTING key.



Pressing the SETTING key for 3 seconds, starts the programming process.

The tenths temperature value blinks.

STEP 2: (cont.)



Use DECREASE or INCREASE key to set each minute and hour value.

Press the SHIFT key to move to the next parameter digits.

STEP 2: Input temperature & soak time values.

Setpoint Temperature

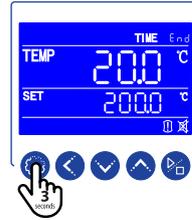
Product Series	Minimum	Maximum
BIF	Ambient + 5°C (9°F)	80°C / 176°F
BIT	Ambient + 5°C (9°F)	80°C / 176°F
BIC	-10°C / 14°F	80°C / 176°F
BOF	Ambient + 10°C (18°F)	300°C / 572°F
BON	Ambient + 10°C (18°F)	300°C / 572°F
BOV	Ambient + 10°C (18°F)	200°C / 392°F
BWB	Ambient + 5°C (9°F)	100°C / 212°F

The controller will not function correctly for BIF, BIT, BOF, BON, and BWB if the minimum setpoint temperature is not \geq ambient (room temperature) plus the designated difference shown in the table above.

For example, on a BIF or BIT incubator, if the room temperature is 22.5°C, the minimum setpoint MUST BE \geq 27.5°C.



Set time to 00:00 for the unit to run indefinitely.



Upon setting the run/soak time, press and hold the SETTING key for 3 seconds to complete the program.

TIME area will return to "End."



If changing temperature only, press and hold setting key for 3 seconds, change temperature, press setting key, and press and hold setting key for 3 seconds.



If changing time only, press and hold setting key for 3 seconds, when temperature blinks press setting key, change time, and press and hold setting key for 3 seconds.



STEP 3: Press the RUN key.



Press the DECREASE or INCREASE key to set tenths value. Value will blink as it is being set.



Pressing the RUN key for 2 seconds starts the program. RUN, HEAT, and run/soak time illuminate.



Press and release to decrease/increase one digit at a time. Press and hold to rapidly cycle through digits.



Press the SHIFT key to move to the next parameter digits. Each move will cause parameter to blink.

Use the DECREASE or INCREASE key to set each temperature value.



Press the SETTING key to accept temperature setpoint. "End" in TIME area will change to run/soak time digits. First digit will blink.

What is a Multi-step Programs

Numerous applications—like materials testing, quality assurance, environmental simulation, and more—in many industries require precise, linear, or parabolic (controller-controlled) multi-temperature heating testing.

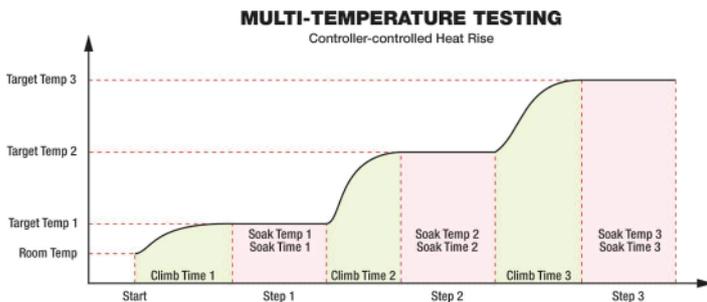
BEING's backlit LCD controller allows users to easily program 1 fixed-value and up to 8 multi-step (multi-temperature) programs with up to 8 steps (temperature and soak time) per program. Each multi-step program can be cycled from 1 to 99 times.

Users can use multi-step programs to install multiple fixed-value programs into the controller's memory for quick recall and running.

The user can select one of 9 programs to run.

Programs

- PROG 0 - Fixed Value and Time
- PROG 1 - Multi-step, Step 1 to Step 8
- PROG 2 - Multi-step, Step 1 to Step 8
- PROG 3 - Multi-step, Step 1 to Step 8
- PROG 4 - Multi-step, Step 1 to Step 8
- PROG 5 - Multi-step, Step 1 to Step 8
- PROG 6 - Multi-step, Step 1 to Step 8
- PROG 7 - Multi-step, Step 1 to Step 8
- PROG 8 - Multi-step, Step 1 to Step 8



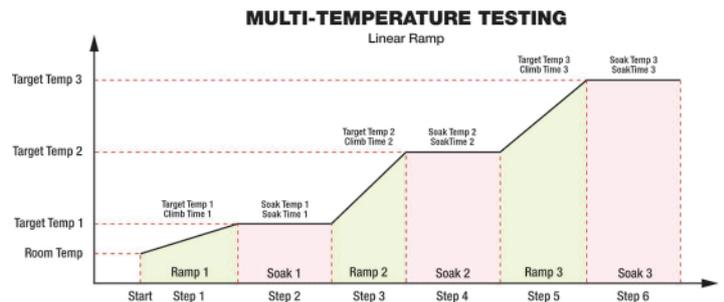
The graph shows a 3-step program heating profile: Step 1 is 25°C for 60 minutes, Step 2 is 99°C for 45 minutes, and Step 3 is 199°C for 99 minutes.

This profile occurs when parameter Li = 0000.

- Multi-step programs (PROG 1 through PROG 8) can be used for fixed-value (single-step) or multi-segment programs.
- Each step or segment in the program is for run/dwell/soak ONLY.
 - o User sets the temperature, time, and fan speed for each dwell/soak period.
- The controller controls how quickly to achieve setpoint.
 - o The larger the ΔT , the faster the controller achieves setpoint.
 - o The smaller the ΔT , the slower the controller will achieve setpoint.

Legend

- Target temp:** The temperature you want to run as planned. (Input/set temperature)
- Climb time:** The time it takes to reach your target temperature setting. *The temperature rise rate will be controlled automatically based on the controller's operational settings.*
- Ramp time:** The user establishes the time it takes to reach your target temperature setting.
- Soak time:** The time you want the chamber to run at the set temperature. *When time expires, the controller automatically launches the next step unless it is the last step in the program, in which case the unit shuts down, and the audible and visual alarms fire. The step's soak time will not start counting down until the chamber reaches $\pm 0.5^\circ\text{C}/^\circ\text{F}$ of the set temperature.*



This graph shows a 6-step program and its corresponding heating profile: Segment 1 climbs from ambient (16°C) to 50°C in 35 minutes, with a ramp of 0.97°C/minute. Segment 2 has a soak time of 120 minutes. In Segment 3, the temperature climbs from 50°C to 150°C in 360 minutes—a ramp of 0.28°C/minute. Segment 4 is a soak of 600 minutes. During Segment 5, the temperature climbs from 150°C to 200°C in 45 minutes—a ramp of 1.11°C/minute. Segment 6 is a soak of 1600 minutes. Since the time is 0 in Segment 7, the program will end when the soak timer expires in Segment 6.

This profile occurs when parameter Li = 0001.

- Linear ramps can only be accomplished using PROG 1 through PROG 8.
- Linear ramps are for:
 - o BIF, BIT, BOF, BON & BOV: **Temperature increases ONLY!**
 - o BIC: Temperature increases and decreases
 - o BWB: **NOT AVAILABLE!**
- Can be used for fixed-value (single step: climb + run/dwell/soak) or multi-temperature testing programs.
- Each step or segment is either a climb or a run/dwell/soak. **NOT TEMPERATURE DECAY (Cooling), except for BIC!**
- Segment time entered.
 - o Climb segment: The time to achieve the setpoint. **NOTE: The first step/segment will always start at ambient, NOT Zero (0). Starting at ambient must be taken into consideration when calculating your ramp slope.**
 - o Run/dwell/soak: The time to stay at that setpoint.
- Climb (ramp) slope angle is dependent on various factors, including, but not limited to, the following: instrument models (different heating elements), condition and age of the heating element, ambient temperature, and voltage fluctuation, among others.
 - o Impossible to achieve setpoint instantaneously.
 - o Ramp (climb) slopes $> 3.8^\circ\text{C}/\text{minute}$ are **not guaranteed**.
- Expect setpoint overshoot, but it should be minimal ($< 1^\circ\text{C}$). The overshoot amount depends on the ramp (climb) slope angle. The greater the ramp slope angle, the greater the overshoot.

Turning On/Off Multi-step Programs



Units are shipped with the controller set to fixed value (single-step) programs. Parameter Mo = 0000.

STEP 1: Enter the Operational Settings, Level 4.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings.

Time area will change and first digit will blink.

STEP 4: Set parameter and return to the home screen.



Press the SETTING key 1 time to set parameter Mo and return to the home screen.

STEP 2: Enter Level 4 code. LK = 8286



Press the INCREASE key to enter the first code digit. Press the SHIFT key to move to the second code digit. Digit will blink. Press the INCREASE key to enter the second code digit.

Follow the same procedure for the third and fourth code digits.



Upon changing to multi-step programs, the controller screen will change to PROG 1.



Press the SETTING key to enter the Level 4 controller parameters.

The Mo parameter will appear.



Upon initializing the unit for the first time, user needs to set the temperature and time for each step in a program.

STEP 3: Change parameter Mo.



Press the INCREASE or DECREASE key to change the first digit.

Mo = 0000 Fixed value (Single-step) program
Mo = 0001 Multi-step programs

Selecting Heat Rise (Profile) Type



Units are shipped with the controller set to controller-controlled heat rise. Parameter Li = 0000.



NOT ALL MODELS AND UNITS HAVE LINEAR HEATING RAMP PROFILE CAPABILITY. CHECK YOUR UNIT'S OPERATIONAL SETTINGS, LEVEL 3 PARAMETERS. ALSO, CHECK RULES ON PAGE 7 OF THIS DOCUMENT.

STEP 1: Enter the Operational Settings, Level 3.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings.

Time area will change and first digit will blink.

STEP 4: Change parameter Li.



⇒Blink←

Press the INCREASE or DECREASE key to change the first digit.

Li = 0000 Controller-controlled heat rise
Li = 0001 User-controlled (linear) heat rise

STEP 2: Enter Level 3 code. LK = 0088

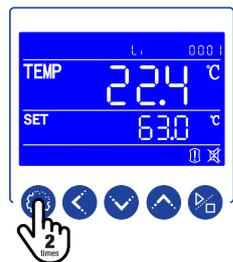


⇒Blink←

Press the INCREASE key to enter the first code digit. Press the SHIFT key to move to the second code digit. Digit will blink. Press the INCREASE key to enter the second code digit.

Follow the same procedure for the third and fourth code digits.

STEP 5: Set parameter and return to the home screen.



Press the SETTING key 2 times to set parameter Li and return to the home screen.



Press the SETTING key to enter the Level 3 controller parameters.

First available parameter will appear.



Upon changing to multi-step programs, the controller screen will change to PROG 1.

STEP 3: Scroll to parameter Li.



Press the SETTING key 28 times to scroll through parameters until the parameter Li appears.



The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.

Programming Multi-step Programs

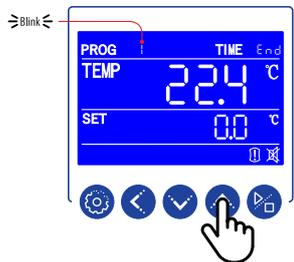


Units are shipped with the controller initially set to PROG 1 when multi-step programs are turned on. If multi-step programs are turned off and later turned on, the last program run or selected will be displayed.

STEP 1: Select program number to set up.



Press the SETTING key for 3 seconds. The "PROG 1" will initially blink. Then the number will blink.



Press the INCREASE key to select the program number to program.



Pressing the SETTING key starts the programming process.

STEP 1 will appear. "End" in TIME area will change to run/soak time digits. PROG and the tenths temperature value blinks.



Press the SETTING key to accept temperature setpoint. The first TIME digit will blink.

STEP 3: Set the STEP run/soak time.



Use INCREASE or DECREASE key to set each minute and hour value.

Press the SHIFT key to move to the next parameter digits.



Press the SETTING key to accept the run/soak time.

The next program step will appear. The tens temperature value will blink.



Units are shipped with all steps in each program set to zero temperature and zero run/soak time.

STEP 2: Set the STEP temperature.



Press the INCREASE or DECREASE key to enter the tenths temperature value.



Press the SHIFT key to move to the next parameter digits. Each move will cause parameter to blink.

Use INCREASE or DECREASE key to set each temperature value.

STEP 4: Repeat Steps 2 and 3 for each program step.



Leave step temperature and run/soak time at zero for each step not needed for the program.



Upon setting all of the steps, the controller will return to multi-step program the home screen.

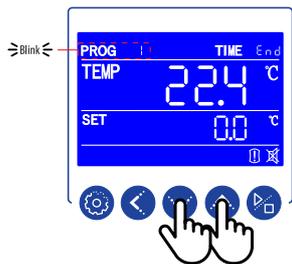
Selecting Multi-step Program to Run

STEP 1: Press the SETTING key.



Press the SETTING key one (1) time. The “PROG” area will blink.

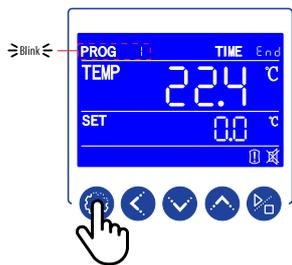
STEP 2: Select program number.



Press the INCREASE or DECREASE to select program number.



Units are shipped with the controller initially set to **PROG 1** when multi-step programs are turned on. If multi-step programs are turned off and later turned on, the last program run or selected will be displayed.



Press the SETTING key to confirm the program to be run.

STEP 3: Press the RUN key.



Pressing the RUN key for 2 seconds starts the program. STEP area, RUN, HEAT, and run/soak time illuminate.

Setting up Program Cycling

! This function is for multi-step programs only.

i Units are shipped with program cycling set to 1. Parameter Cy = 0001.

STEP 1: Ensure the multi-step program function is turned on. See "Turning On/Off Multi-step Programs" instructions on page 09.

STEP 2: Select program (1 - 8) to run multiple cycles. See "Selecting Multi-step Program to Run" instructions on page 12.

STEP 3: Enter the Operational Settings, Level 1.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings. Time area will change and first digit will blink.

STEP 2: Press the SETTING key.



Press the SETTING key to enter Level 1 parameters.

! When entering the controller's operational parameters, Level 1, LK = 0000, will always come up first.

STEP 3: Scroll to parameter Cy.



Press the SETTING key 1 time to scroll through parameters until the parameter Cy appears.



Press the INCREASE key to enter the first cycle value. Press the SHIFT key to move to the second cycle digit. Digit will blink. Press the INCREASE key to enter the second cycle value.

i Parameter Cy = 0001 to 0099.

STEP 4: Set parameter and return to the multi-step program home screen.



Press the SETTING key 2 times to set parameter Cy and return to multi-step program the home screen.

Setting up RUN Delay

The RUN delay timer is a productivity tool and a safety device that allows you to preset the start-up and running times for unattended operation.

The timer delays the start of the unit's temperature profile for a selected time from one (1) minute to 99 hours and 59 minutes (5999 minutes) in 1-minute increments. Once the delay timer expires, the program will start operation. After each occasion, the RUN/START delay timer expires, or a program is stopped, the timer returns to zero (0).

Example: It is currently 4:50 PM. The oven's current temperature is at the lab's ambient temperature. You've loaded the chamber with various products for a baking-and-annealing process at 150°C that takes 7.5 hours to complete. The ramp time to reach the setpoint is approximately 30 minutes. It must be completed by 8:00 AM the next morning.

The constraints above estimate that the program should start at 12:00 AM with a RUN/START delay timer set for 430 minutes.



A laboratory could save money on utility costs by establishing and running a program during off-peak hours. Check with your local utility provider about potential savings.

Fixed Value (Single-step) Programs

STEP 1: Enter the Operational Settings, Level 1.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings. Time area will change and first digit will blink.

STEP 2: Press the SETTING key.

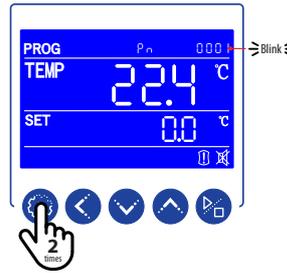


Press the SETTING key to enter Level 1 parameters.



When entering the controller's operational parameters, Level 1, LK = 0000, will always come up first.

STEP 3: Scroll to parameter dy.



Press the SETTING key 2 times to scroll through parameters until the parameter dy appears.

STEP 4: Change parameter dy.



Press the INCREASE key to enter the first time value. Press the SHIFT key to move to the second cycle digit. Digit will blink. Press the INCREASE key to enter the second time value.



Parameter dy = 00:00 to 99:59.

STEP 5: Set parameter and return to the home screen.



Press the SETTING key 1 time to set parameter dy and return to fixed value program the home screen.

Setting up RUN Delay

Multi-step Programs

STEP 1: Ensure the multi-step program function is turned on. See "Turning On/Off Multi-step Programs" instructions on page 08.

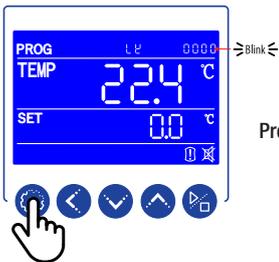
STEP 2: Select program (1 - 8) to run multiple cycles. See "Selecting Multi-step Program to Run" instructions on page 12.

STEP 3: Enter the Operational Settings, Level 1.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings. Time area will change and first digit will blink.

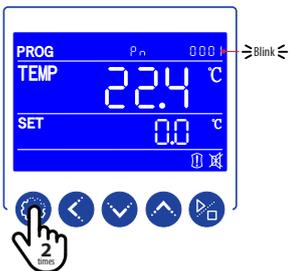
STEP 4: Press the SETTING key.



Press the SETTING key to enter Level 1 parameters.

! When entering the controller's operational parameters, Level 1, LK = 0000, will always come up first.

STEP 5: Scroll to parameter dy.



Press the SETTING key 2 times to scroll through parameters until the parameter dy appears.

STEP 6: Change parameter dy.



Press the INCREASE key to enter the first time value. Press the SHIFT key to move to the second cycle digit. Digit will blink. Press the INCREASE key to enter the second time value.

i Parameter dy=00:00 to 99:59.

STEP 7: Set parameter and return to the multi-step program home screen.



Press the SETTING key 1 time to set parameter dy and return to multi-step program home screen.

Changing Power-up Mode

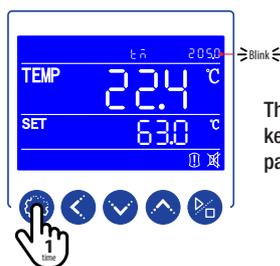
BEING's L-series controller offers 3 power-up modes for safety and productivity. The parameter Po controls these modes.

When Po = 0000: In the event of a power outage or accidental power interruption while a program is running, when power is restored to the instrument, the controller will stop the program, and the user must press the RUN/STOP key to restart the last set program.

When Po = 0001: In the event of a power outage or the power is turned off, whether a program had been running or the program was stopped due to soak time expiration or user stoppage, the controller will automatically start the last set program when power is restored to the instrument.

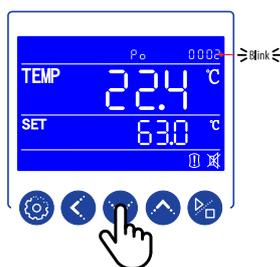
When Po = 0002: In the event of a power outage or the power is turned off when the instrument's power is restored, the controller will return to the last set program, and the user must press the RUN/STOP key to start the program whether the program had been running, the soak time expired, or the user stopped the program.

STEP 3: Scroll to parameter Po.



The tM parameter will appear. Press the SETTING key 1 time to scroll through parameters until the parameter Po appears.

STEP 4: Change parameter Po.



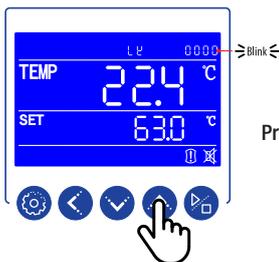
Press the DECREASE key to change the first digit.

STEP 1: Enter the Operational Settings, Level 2.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings. Time area will change and first digit will blink.

STEP 2: Enter Level 2 code. LK = 0003



Press the INCREASE key to enter the code digit.



Press the SETTING key to enter the Level 2 controller parameters.

STEP 5: Set parameter and return to the home screen.



Press the SETTING key 6 times to set parameter Po and return to the home screen.

The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.

Changing Low/High Alarm

BEING's L-series controller is equipped with a low- and high-temperature alarm that is triggered when the chamber temperature (PV) is below or above the setpoint by a prescribed value.

Low alarm: $PV < SV - AL$
 High alarm: $PV > SV + AL$

The parameter AL defines this value. While it is factory-set to a value, the user can change it to meet their application.

STEP 1: Enter the Operational Settings, Level 2.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings. Time area will change and first digit will blink.

STEP 2: Enter Level 2 code. LK = 0003



Press the INCREASE key to enter the code digit.



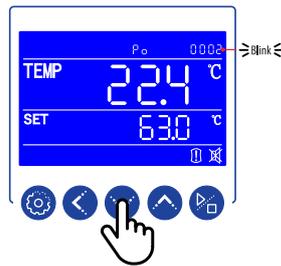
Press the SETTING key to enter the Level 2 controller parameters.

STEP 3: Scroll to parameter AL.



The tM parameter will appear. Press the SETTING key 2 times to scroll through parameters until the parameter AL appears.

STEP 4: Change parameter AL.



Press the INCREASE key to enter the first time value. Press the SHIFT key to move to the second cycle digit. Digit will blink. Press the INCREASE key to enter the second time value.

STEP 5: Set parameter and return to the home screen.



Press the SETTING key 5 times to set parameter AL and return to the home screen.

! The number of times the SETTING needs to be pushed may vary based on your unit's manufacturing date.

Calibrating the Unit

Unit calibration is recommended to be performed at time of the unit's commissioning, when the unit of measurement is switched, as defined by your standard operating procedures, or as required by regulatory agencies.

BEING's LCD controller uses a two temperature process to calibrate the unit.

Tools Needed:

A remote-monitoring thermocouple thermometer with a NIST-traceable calibration certificate.



Compare the thermometer's and probe's temperature ratings against the series operating range to ensure compatibility.



Series BOV: A ribbon lead thermocouple is required so as not to damage the door seal. Additionally, the lead and probe materials must be rated for temperatures up to 200°C (392°F).



**USE CONTROLLER CONTROLLED RAMP.
ENSURE PARAMETER Li = 0 FOR ALL
MODELS THIS MANUAL COVERS.**

Series BIF, BIT, BOF, and BON

STEP 1: Set program, and press the RUN key for 2 seconds.

STEP 2: Allow PV temperature to stabilize then **wait 30 minutes** before recording temperature with external thermometer.

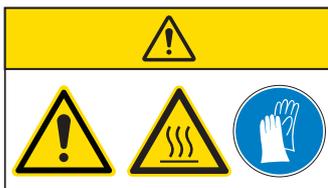
STEP 3: Insert thermometer probe into test hole.



Upon reaching the set temperature, insert thermometer probe into the test hole.



Thermometer probe's outer diameter must be less than 5mm.



If a probe or datalogger is placed inside the chamber, the probe MUST BE placed in the geometric center of the chamber as shown in Figure 1 under Series BIC.

STEP 4: Run the test again at a second set temperature (SV2) at least 10°C (18°F) greater than the first.



Make sure thermometer is stable. Then record the set temperature (SV1 & SV2), present measured value (PV1 & PV2), and thermometer reading (TV1 & TV2).

STEP 5: Compare thermometer readings to set and present temperatures. If $SV1 \neq PV1 \neq TV1$ or $SV2 \neq PV2 \neq TV2$, move to STEP 6.

Series BIC

STEP 1: Insert the probe in the chamber through the test hole / accessory port if wired. Ensure the probe's bulb is located in the geometric center of the chamber as shown below.



The test hole / accessory port is Ø25mm and located on the right side of the incubator.

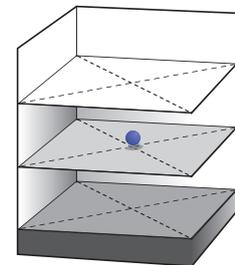


Figure 1.

STEP 2: Set program, and press the RUN key for 2 seconds.

STEP 3: Allow PV temperature to stabilize then **wait 30 minutes** before recording temperature with external thermometer.

STEP 4: Run the test again at a second set temperature (SV2) at least 10°C (18°F) greater than the first.



Make sure thermometer is stable. Then record the set temperature (SV1 & SV2), present measured value (PV1 & PV2), and thermometer reading (TV1 & TV2).

STEP 5: Compare thermometer readings to set and present temperatures. If $SV1 \neq PV1 \neq TV1$ or $SV2 \neq PV2 \neq TV2$, move to STEP 6.

Series BOV

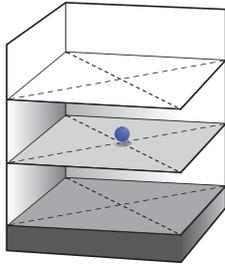
Before programming the controller for the calibration tests the oven needs to be prepared properly to get the best results.

STEP 1: Attach the thermocouple to a shelf.



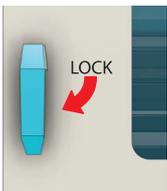
Use high-temperature tape, preferably aluminum tape, to attach the thermocouple to the **geometric center** of one shelf.

STEP 2: Place the shelf in the vertical center of the chamber.



The thermocouple should be placed in the geometric center of the oven, as shown in the above illustration.

STEP 3: Close and lock the door.



After preparing the thermocouple and placing it in the geometry center of the oven, close the door and turn the door handle clockwise 90°.

STEP 4: Draw a vacuum.

Ensure the chamber vent (Balance Hole) is closed. If your vacuum pump is not connected to the oven's auxiliary power outlet, turn it on and turn the PUMP switch on. Allow the vacuum gauge to reach -1 bar, then turn the PUMP switch off.

STEP 5: Set program and press the RUN key for 2 seconds.

STEP 6: Allow PV temperature to stabilize then **wait 2-3 hours** before recording temperature with external thermometer.

STEP 7: Run the test again at a second set temperature (SV2) at least 10°C (18°F) greater than the first.



Make sure thermometer is stable. Then record the set temperature (SV1 & SV2), present measured value (PV1 & PV2), and thermometer reading (TV1 & TV2).

STEP 8: Compare thermometer readings to set and present temperatures. If $SV1 \neq PV1 \neq TV1$ or $SV2 \neq PV2 \neq TV2$, move to STEP 6/9, in The Math.

Series BWB

STEP 1: Fill the chamber. Close the chamber cover. Set the program and press the RUN key for 2 seconds.

STEP 2: Allow the PV temperature to stabilize then **wait 30 minutes** before recording the chamber temperature with external thermometer.

STEP 3: Upon reaching the set temperature, open chamber cover. Insert the thermometer probe into the **center of bath**.



STEP 4: Run the test again at a second set temperature (SV2) at least 10°C (18°F) greater than the first.



Make sure thermometer is stable. Then record the set temperature (SV1 & SV2), present measured value (PV1 & PV2), and thermometer reading (TV1 & TV2).

STEP 5: Compare the thermometer readings to set and present temperatures. If $SV1 \neq PV1 \neq TV1$ or $SV2 \neq PV2 \neq TV2$, move to STEP 6.

The Math

STEP 6/9: Perform the following calculations to determine Pb and PK.

For example:

SV1= 37°C TV1 = 36°C

SV2= 50°C TV2 = 48°C

Full Scale Adjustment (Slope)

$$PK = \{[(TV2-TV1) \div (SV2-SV1)] - 1\} \times 4000$$

$$PK = \{[(48-36) \div (50-37)] - 1\} \times 4000$$

$$PK = -308$$

Zero Adjustment (Intercept)

$$Pb = TV2 - \{[PK \div (4000 \div SV2)] + SV2\}$$

$$Pb = 48 - \{[-308 \div (4000 \div 50)] + 50\}$$

$$Pb = 1.9$$

TV1 & TV2 should be rounded to the nearest tenth since the controller's resolution is 0.1.



ONLY CALCULATE PK AND PB IF TV1 AND TV2 ARE $\geq \pm 1\text{C}$.

The PK parameter is a negative or positive whole number. The Pb parameter has one (1) decimal place. Both parameters should be rounded up to the nearest whole number (PK) or tenth (Pb).

Programming Correction

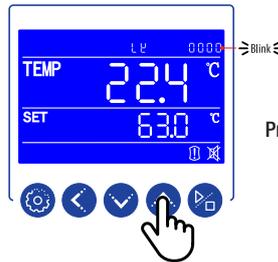
STEP 7/10: Enter the Operational Settings, Level 2.



Press the SETTING and SHIFT keys for 3 seconds to enter the controller's operational parameter settings.

Time area will change and first digit will blink.

STEP 8/11: Enter Level 2 code. LK = 0003



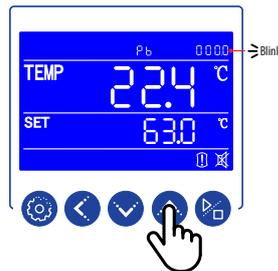
Press the INCREASE key to enter the code digit.



Press the SETTING key to enter the Level 2 controller parameters.

The tM parameter will appear. Press the SETTING key 3 times to scroll through parameters until the parameter Pb appears.

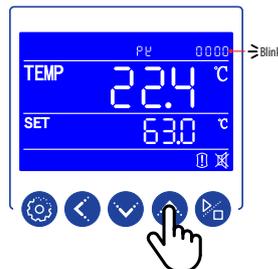
STEP 9/12: Change parameter Pb



Press the INCREASE or DECREASE key to change the first digit. Press the SHIFT key to move to the second digit. Digit will blink. Press the INCREASE key to enter the second digit. Continue until parameter is set.

Press the SETTING key 1 time to move to the PK parameter.

STEP 10/13: Change parameter PK



Press the INCREASE key to change the first digit. Press the SHIFT key to move to the second digit. Digit will blink. Press the INCREASE key to enter the second digit. Continue until parameter is set.

Press the DECREASE key immediately if you want a negative parameter value.

Press the SETTING key 2 times to set parameter PK and return to the home screen.

Operational Parameter Settings Overview

Changing parameter value process

STEP 1



Press and hold SETTING and shift keys for 3 seconds to view the controller's operational parameters.

STEP 2



Press increase key to change first digit value. Value will blink as it is being set.

Press the shift key to move to the next parameter digits. Each move will cause digit to blink.

STEP 3



Press SETTING key once entering required code for the parameter level you want to change.

STEP 4



First available function parameter within level will appear. Press increase key to change first digit value. Value will blink as it is being set.

Press the shift key to move to the next parameter digits. Each move will cause digit to blink.

STEP 5



Press SETTING key once entering parameter value.

Next parameter will appear or controller will return to the home screen.

Level 1 | LK [LK] = 0000

PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
Pn Pn	Working Group	0 – 8	For multi-step program control only, set up a working group for instrument operation. When Pn is set to 0, group 0 is fixed value (single-step) control.	
Cy Cy	No. of Cycles	0 – 99	Controls number of times a multi-step program runs. When Cy is 0, the instrument has been running between the work groups. When Cy IS NOT 0, the instrument will automatically stop after cycling Cy times in the work group. The value will automatically return to 1 after shutdown.	0001
dy dy	Run Delay	00:00 – 99:59 (hh:mm)	00:00 - No delay. Other values - Start of a program will be delayed dy time after pressing the RUN key.	00:00

Level 2 | LK [LK] = 0003

PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
tM tM	Maximum Allowable Temperature Setting	Set within the measuring range	Stop heating and alarm when the maximum temperature is exceeded. The user cannot program the setpoint temperature above this temperature.	See Table Below
Po Po	Power-up Mode	0 – 2	0000: Controller is in a stopped state after power-on. User must start the operation by pressing the RUN/STOP button for 3 seconds. 0001: Controller automatically starts the step operation after power-on. Po 0002: Controller starts running from the last power-off.	0002
AL AL	Alarm Setting	0 – Full Range	Alarm illuminates with audible output (and HOLD function) when the temperature exceeds the Setpoint+AL value.	003.0
Pb Pb	Zero Adjustment (Intercept)	-100.0 – 100.0	When the zero error of the meter is large and the full-scale error is small, adjust this value. Generally, PT100 rarely adjusts this value.	000.0
PK PK	Full Scale Adjustment (Slope)	-1000 – 1000	When the zero error of the meter is small and the full-scale error is large, adjust the value. PK = 4000 x (mercury thermometer value-display value)/display value, generally PT100 first adjust this value.	0000
PA PA	Ambient Temperature Correction	-80 – 80	When there is an error between the actual ambient temperature and the controller display ambient temperature, adjust the value.	000.0
2b 2b	Zero Correction Second Method	-100.0 – 100.0	When the zero error of the second channel is large and the full scale error is small, adjust this value. Generally, PT100 rarely adjusts this value.	0000
2K 2K	Full Scale Adjustment Second Method	-1000 – 1000	When the zero error of the second channel is small and the full scale error is large, adjust this value. PK = 4000 x (mercury thermometer value-displayed value)/displayed value, generally PT100 adjusts this value first.	000.0

When Changing Unit of Measurement

Series	BIF/BIT	BIC	BOF/BON	BOV	BWB
tM Initial Value (°C)	080.0	080.0	300.0	200.0	100.0
tM Value (°F)	176.0	176.0	572.0	392.0	212.0

Level 3 | LK [2] = 0088

PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
CL [CL]	Cooling Control Set Up	-5.0 – 60.0	When the compressor is started and stopped for cooling, when the temperature exceeds the CL value and the compressor cooling control delay is met, the cooling light is on, the cooling contact is turned on, and the compressor is started.	000.5
Ct [Ct]	Cooling Control Delay	0 – 300 seconds	The delay time required to start the compressor twice, Ct = 0 cancels the compressor function.	0001
LA [LR]	Lower Limit Absolute Value Alarm	Full Range	Alarm illuminates with audible output when the measured temperature is lower than this value.	010.0
2T* [2T]	Second Temperature Probe	0 – 2	0: Second temperature probe not used 1: Second temperature probe tests ambient temperature 2: Second temperature probe is monitoring samples' temperature (in chamber)	0000
P [P]	Proportional Band	2.0 – 300.0	Proportional effect adjustment, the greater the P, the smaller the proportional effect, the lower the system gain.	015.0
I [I]	Integral Time	2 – 3600 seconds	Integral action time constant, the greater the I, the weaker the integral action.	0300
d [d]	Derivative Time	0 – 3600 seconds	Derivative action time constant, the greater the d, the stronger the derivative action.	0300
HP [HP]	Overshoot Suppression	0 – 100%	Controller has stronger ability to suppress temperature overshoot when the value of Ar is smaller.	0100
SL [SL]	Segmentation Point	0.0 – 300.0	Sectional setting temperature of section PID.	050.0
Lr [Lr]	Overshoot Suppression 1	0 – 100	Lr overshoot suppression effect when set temperature is less than or equal to SL.	0020
t [t]	Heating Cycle	1 – 100 seconds	Relay output <20s, SSR and thyristor switch <3s.	0003
Lt [Lt]	Temperature Lower Limit Setting	-80.0 – 320.0	Set the lower limit of measurement temperature.	000.0
Ht [Ht]	Temperature Upper Limit Setting	-80.0 – 392.0	Set the upper limit of measurement temperature.	°C: 200.0 °F: 392.0
md [md]	Circulation Fan Selection	0 – 1	0000: Automatic circulation fan 0001: Manual circulation fan	0000
FA [FR]	Fan motor combination option	0-2	0: Low Speed or no Fan 1: Mid and low speed combination 2: High and low speed combination 3: High and mid speed combination,when md =1, this parameter is invalid.	0000
Fn [Fn]	Fan Speed Conversion Value	0 – 300.0	<ul style="list-style-type: none"> When the measured temperature is greater than the set temperature +Fn or when the measured temperature is less than the set temperature -Fn, the high-speed fan starts. When the measured temperature is higher than the set temperature -Fn and the measured temperature is lower than the set temperature +Fn, the low-speed fan start. This parameter is only valid when the circulating fan parameter md is selected as 0. Fn = 0, no fan output; Fn = 300.0, first gear fan output. 	300
dr [dr]	Gating Options	0 – 2	0000: No gating 0001: Close the door 0002: Open the door	0001
wA [wA]	Water level input option	0-2	0: No input 1: Connected valid 2: Disconnected valid	0000
CF [CF]	Unit of Temperature Measurement	0 – 1	0000: Celsius 0001: Fahrenheit	0000
Co [Co]	Cooling Options	0 – 2	0000: RUN/Stop type 0001: Balanced type, related to ambient temperature 0002: Balanced type, related to CL	0001

*BEING Scientific instruments sold in North America aren't equipped with a second temperature probe.

When Changing Unit of Measurement

BIC Series Only!

Parameters	CL	Co	LT
Setting Value (°C)	000.5	0000	-15.0
Setting Value (°F)	000.9	0000	005.0

When Changing Unit of Measurement

Series	BIF/BIT	BIC	BOF/BON	BOV	BWB
Ht Initial Value (°C)	080.0	080.0	300.0	200.0	100.0
Ht Value (°F)	176.0	176.0	572.0	392.0	212.0

Level 3 | LK [ㄹ] = 0088 (Cont.)

PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
HC HC	Compressor start and stop settings	0-1	0: Compressor won't stop 1: When the measured temperature is lower than the set temperature 5 degrees, stop the compressor, and start the compressor after the temperature reaches the set value	0001
Yu Yu	Cooling solenoid valve switching value	-80 to 320	When working, when the set or measured temperature is less than this value, the output is low; when the set or measured temperature is greater than or equal to this value, the output is high.	0045
Mu Mu	Cooling solenoid valve switching value	-80 to 320	When working, when the measured temperature is less than this value, the output is low; when the measured temperature is greater than or equal to this value, the output is high.	0045
F1 F1	OUT1 Output option	0-14	0: LA low temperature output 1: AL or tM alarm 2: cooling output 3: high-speed fan 4: medium-speed fan 5: low-speed fan 6: lighting 7: low output (for set temperature) 8: UV output 9: high Output (for set temperature) 10: LA high output 11: Yu low output (for measurement temperature) 12: Yu high output (for measured temperature) 13: Mu measurement low output 14: Mu measurement high output 15: Manual output (no Output indicator) 16: Manual output, no output indicator, output is forced to close due to lack of water or door opening.	0000
F6 F6	OUT6 Output option	0-14		0000
F7 F7	OUT7 Output option	0-14		0000
F8 F8	OUT8 Output option	0-14		0000
uC uC	UV Light selection	0-1	0: No UV light 1: UV light is ready	0000
Li Li	Program heating and cooling	0-1	0000: Free heating and cooling 0001: Linear heating and cooling	0000
OT OT	Allowable opening time	0-600 secs	When the door opening time exceeds Ot seconds, the buzzer will give an alarm, and the cooling fan will be stopped. If it is 0, there is no door open time exceeding alarm.	180

Level 4 | LK [ㄹ] = 8286

PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
Mo Mo	Program Type Selection	0 – 1	Mo = 0000: Fixed Value (Single-step Program) Mo = 0001: Multi-step Program	0000



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