CONTROLLER BOARD

IM-30CA
IM-45CA
IM-65A

SERVICE MANUAL

This service manual provides information on the controller board used for Hoshizaki IM-30CA, IM-45CA, and IM-65A cubers.
Please also refer to the general service manual for the applicable model.
If any information contained herein is inconsistent with the instruction or installation manual, follow the latter manual.

M035-922 (121322)

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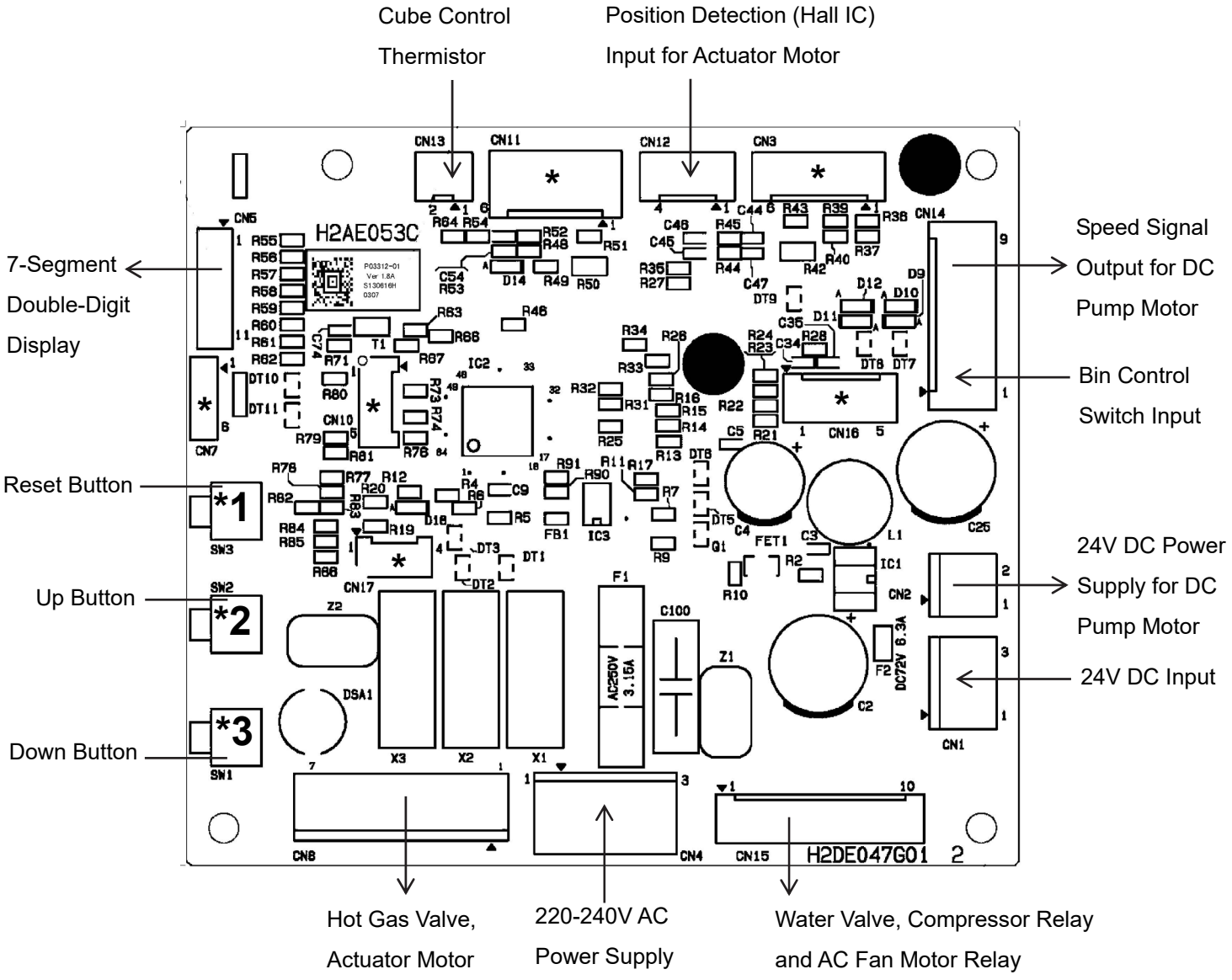
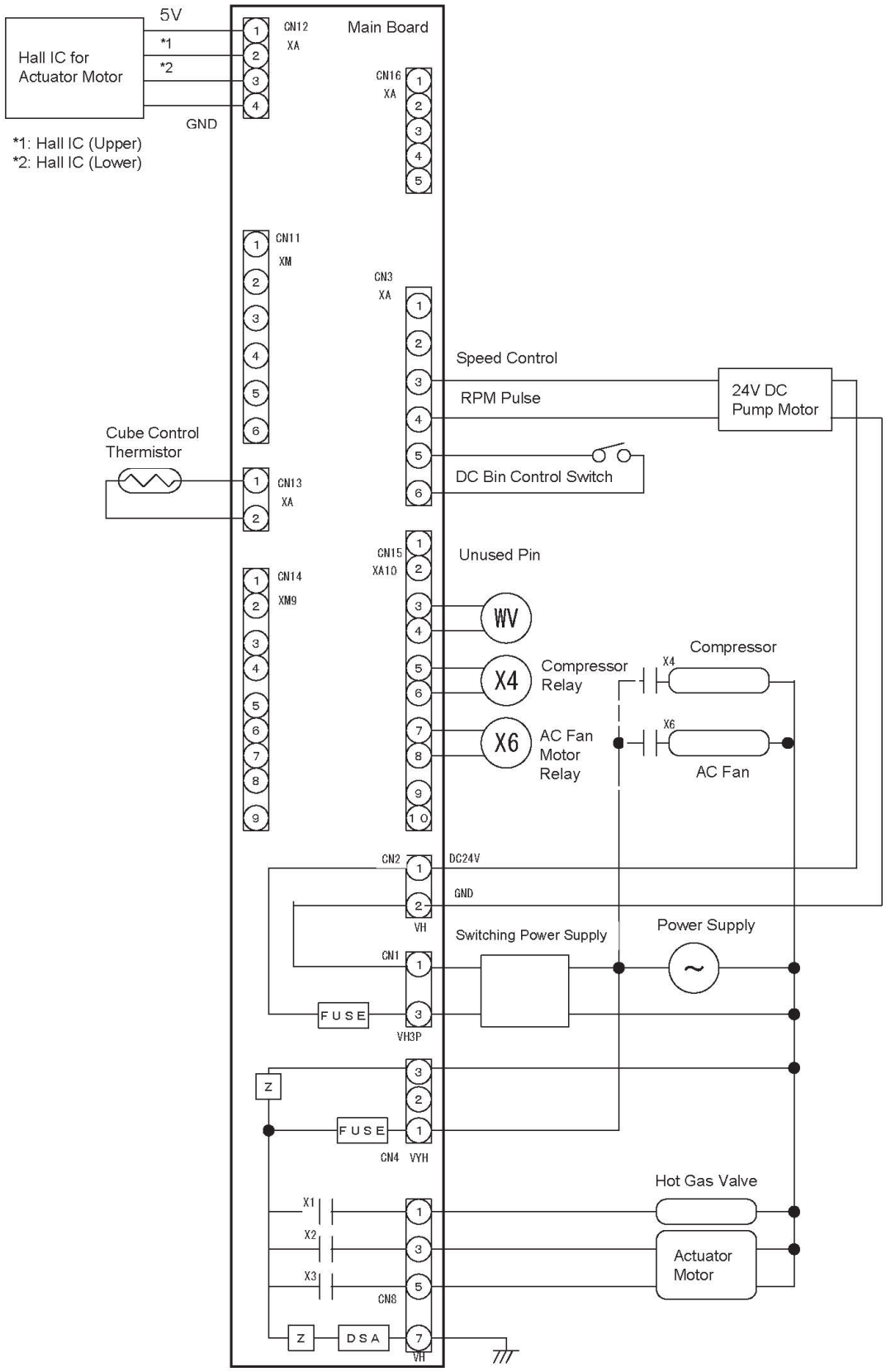
1. CONFIGURATION

[a] INPUT/OUTPUT LAYOUT

* : Not in use
*1: SW3
*2: SW2
*3: SW1

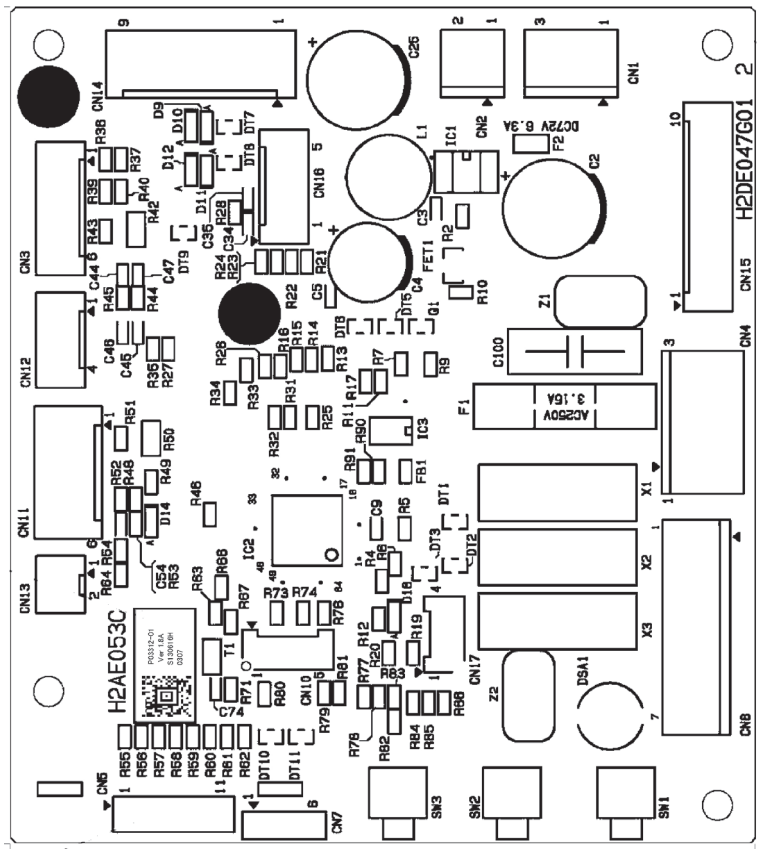


[b] INPUT/OUTPUT CIRCUIT

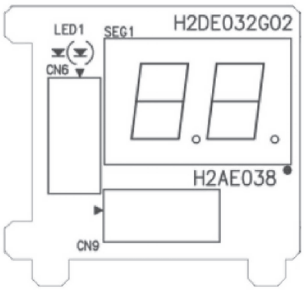


[c] BOARD CONFIGURATION

[Main Board]

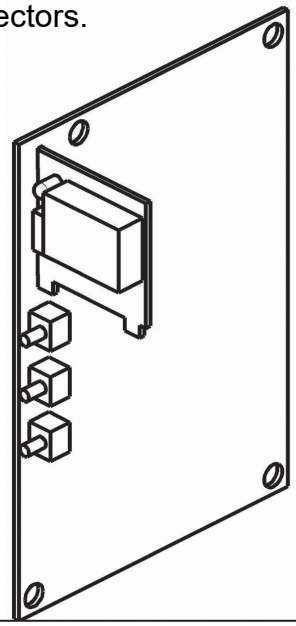


[Sub Board]

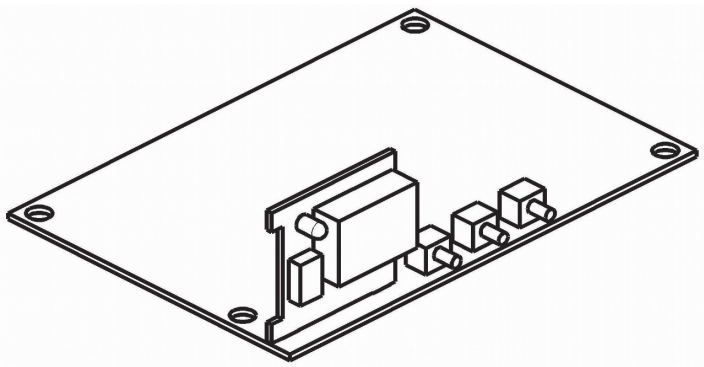


7-segment display board

The direction to install the sub board depends on models and is easily changeable by connectors.



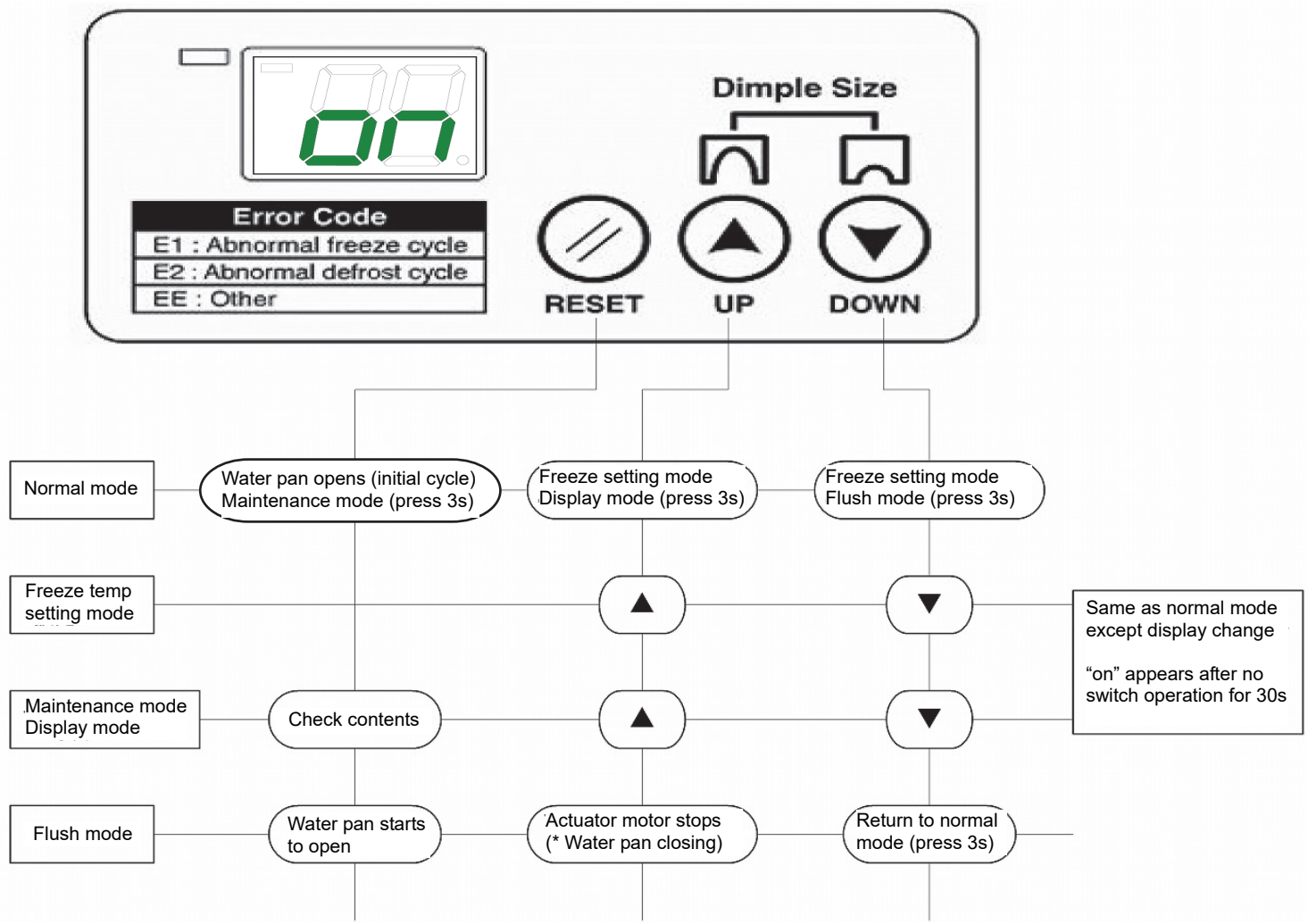
Vertical installation into control box



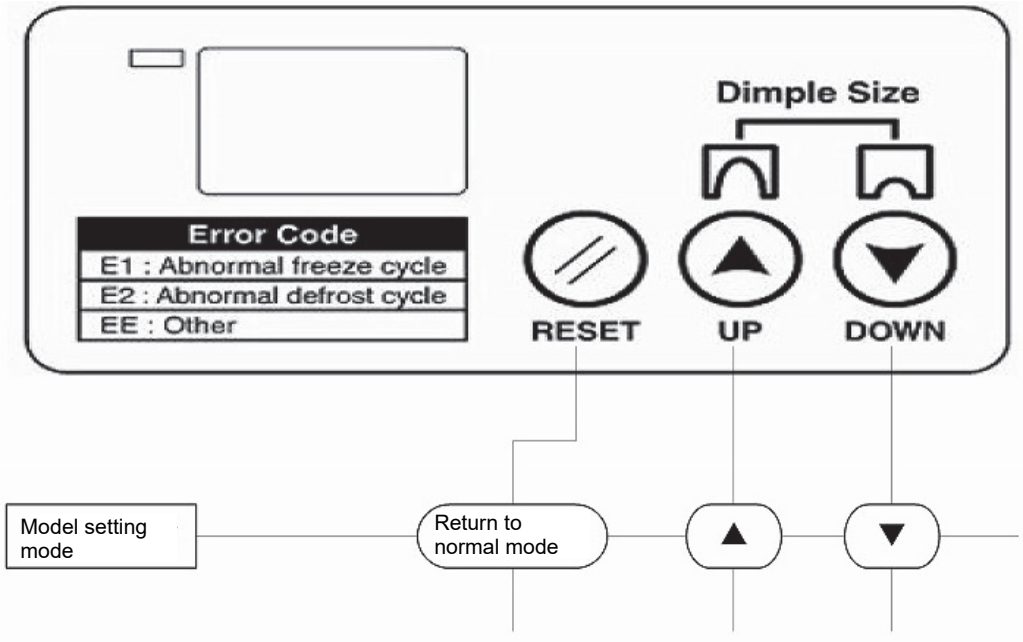
Horizontal installation into control box

[d] SWITCH OPERATION

1) The following is the switch operation flow in different modes. When pressed and released, the switch detects the operation by its pressing duration.



2) To clear the current model code information and enter the model setting mode, press the up and down switches together for 15 seconds while the model code is indicated in the display mode (see “3. [c] DISPLAY MODE”).



2. OPERATION

This service manual specifies the basic operation of the controller board “Ver. 1.2A”.

[a] SOFT START

1) When the power supply is turned on, the 7-segment LED shows “on”, the water pan starts to open after 2 minutes and 20 seconds, and the hot gas valve opens after 10 seconds. The water valve opens and the compressor starts in 3 minutes after the power supply is turned on.
   * If the reset switch is pressed during the 2-minute and 20-second standby time, the unit resets soft start and immediately starts operation.
   * The defrosting water supply time varies between the water temperatures above and below 13°C.
   * In the initial cycle, the water temperature is not detected and assumed to be below 13°C, resulting in a longer defrosting water supply time.
   * The defrosting water supply time is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).
2) The opening backup timer starts counting when the water pan starts to open. If the hall IC does not turn on within 3 minutes, the display shows “EE” and the unit

stops for 60 minutes. If the error recurs after the unit resumes operation, the display shows “EE” and the unit shuts down (recorded as “E3” in error history).

[b] DEFROST CYCLE

1) After the water pan opens, the hot gas valve opens until the defrost completion temperature is reached.
2) If the defrost completion temperature is not reached even when the defrost backup timer counts up (30 minutes after water pan starts to open), the display shows “E2” and the unit stops.
   If the hot gas valve fails to open, the unit may stop with the “E2” error.
   * The defrost completion temperature is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).

[c] WATER PAN CLOSES

1) When the cube control thermistor senses the evaporator temperature above the defrost completion temperature, the hot gas valve closes, the fan motor starts, and the water pan starts to close.
2) The closing backup timer starts counting when the water pan starts to close. If the hall IC does not turn on within 3 minutes, the display shows “EE” and the unit stops for 60 minutes. If the error recurs after the unit resumes operation, the display shows “EE” and the unit shuts down (recorded as “E4” in error history).
   * In the initial cycle or when the water temperature is below 13°C, the water valve opens to supply defrosting water for 10 seconds after the water pan starts to close.

[d] FREEZE CYCLE

1) When the water pan closes and the hall IC turns on, the water valve opens to supply icemaking water for a specific time. The icemaking water supply time varies between startup, reset, and the end of bin control cycle.

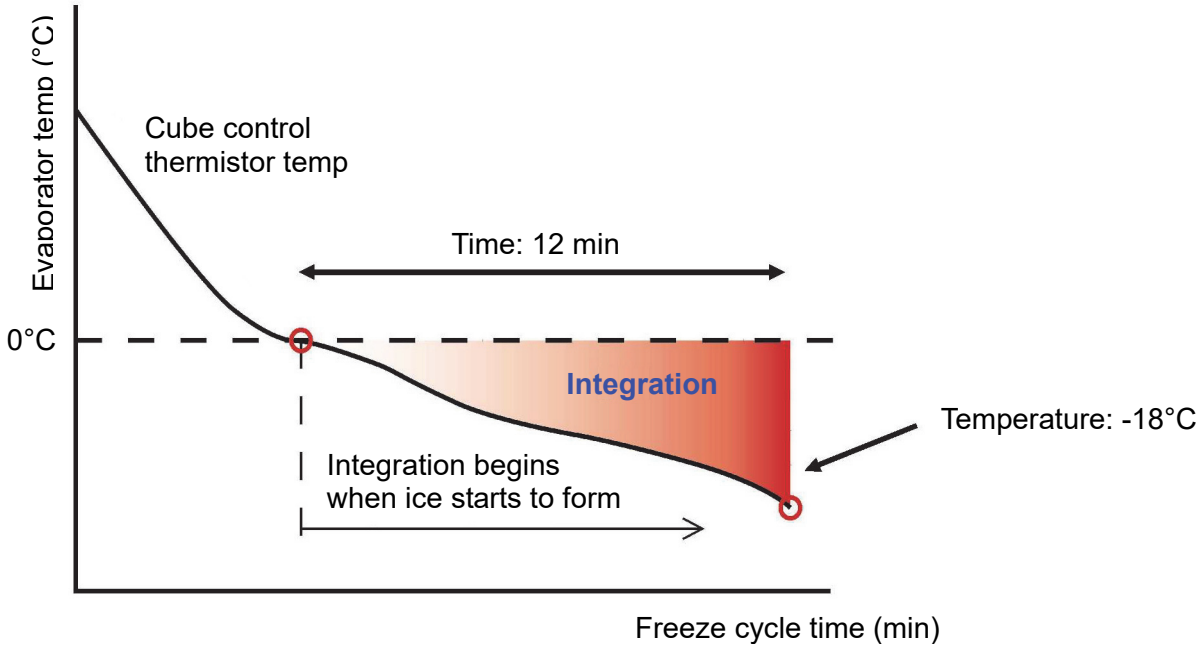
2) After icemaking water has been supplied, the pump motor starts.
3) After 30 seconds, the cube control thermistor senses the temperature that will be added with a predetermined offset value and used as the water temperature in the freeze cycle, water pan opening cycle, defrost cycle, and water pan closing cycle.

* The offset value for the cube control thermistor temperature is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).

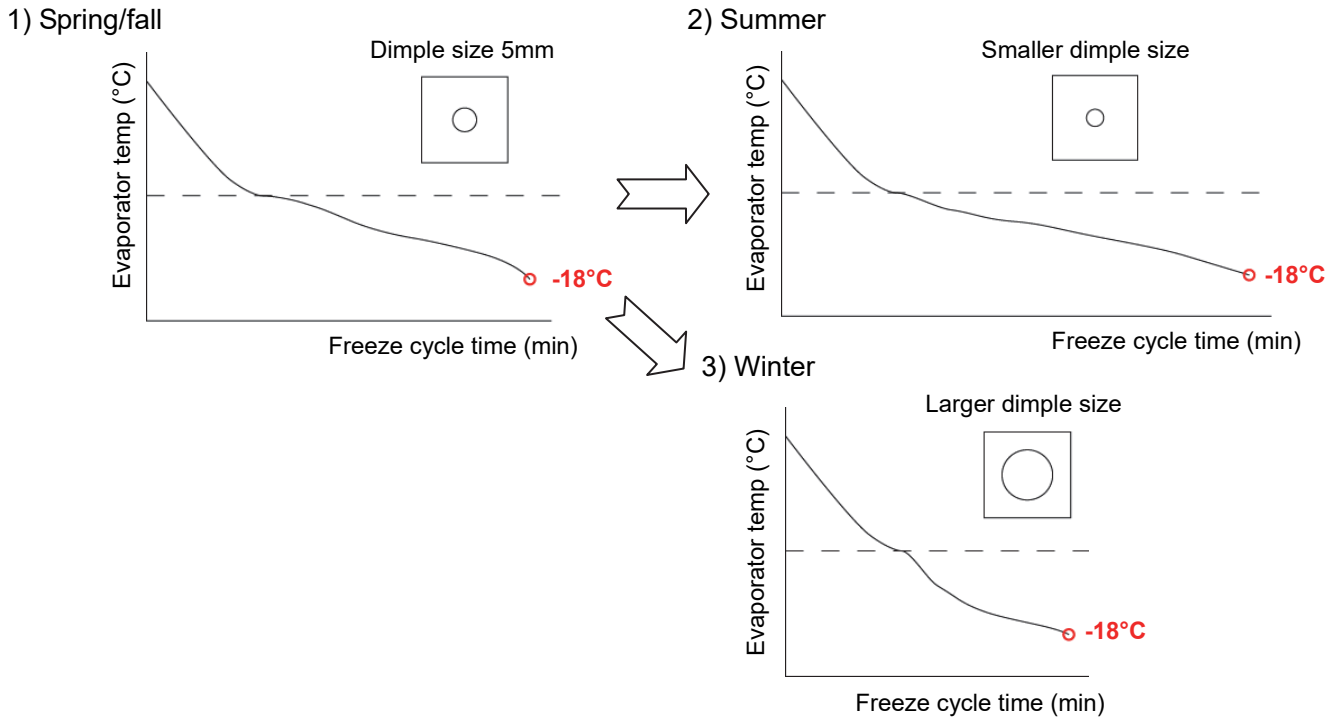
4) The freeze cycle is considered to be 100% complete when the predetermined target integrated values are reached.
   * The target integrated values (temperature and time) for the freeze completion are adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).
5) To reduce ice forming on the water pan when the freeze completion rate reaches 100% at an ambient temperature of 15 to 35°C, the hot gas valve opens and closes two times for a specific time to raise the water pan temperature. Then, the actuator motor starts to open the water pan.
   While the hot gas valve opens and closes, the freeze cycle is not considered to be complete and the pump motor and fan motor keep running.
   * The ambient temperature setting and hot gas valve opening/closing time are adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).
6) Even if the freeze backup timer counts up (45 minutes after water pan starts to close), the unit stops with the “E1” error when the evaporator temperature is above 0°C.
   If the hot gas valve fails to close, the unit may stop with the “E1” error.
   * The backup timer setting is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).

[e] FREEZE COMPLETION CONTROL

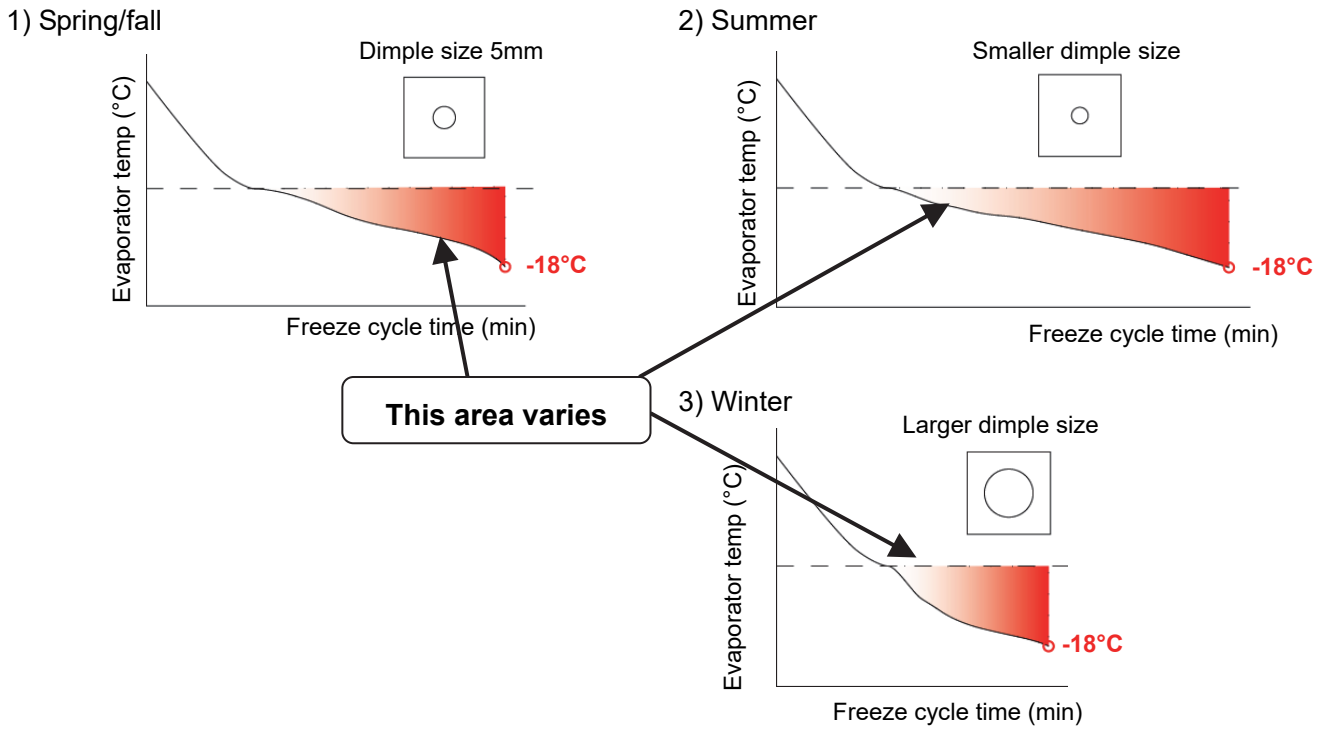
1) The target integrated values (cube control thermistor temperature and freeze cycle time) are set for freeze completion.
   * The target integrated freeze completion temperature and time are adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).
2) After the cube control thermistor senses a temperature below 0°C, the cube control thermistor temperature and freeze cycle time are integrated every second.
3) When the integrated values reach the target, the freeze cycle completes.



As the previous freeze completion control depended on the freeze completion temperature only, the dimple size varied in 1) spring/fall, 2) summer, and 3) winter even at the same freeze completion temperature.
For example, when the freeze completion temperature is -18°C and the dimple size is 5 mm, the freeze cycle time becomes longer and dimple size smaller in summer, and the freeze cycle time becomes shorter and dimple size larger in winter.



Comparison of the evaporator temperature curves finds that the red-colored area varies in different seasons.



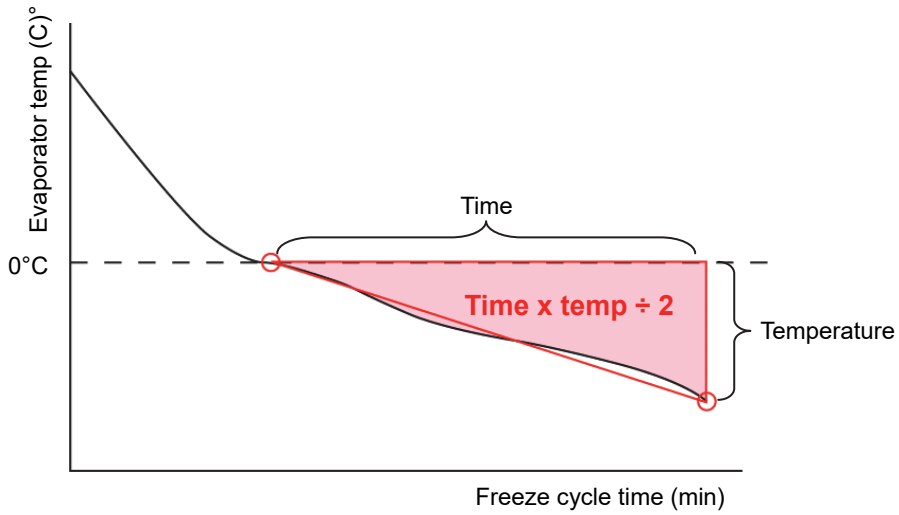
This area corresponds to the energy on ice. Making these different areas into one can equalize the dimple size.

To calculate the energy required for ice production, the actual ice production area under 0°C in the evaporator temperature curve is approximated into a triangle.
This area can be calculated by

Time x temperature ÷ 2

Therefore,

Energy required for ice production = time x temperature ÷ 2



Providing the calculated energy to icemaking water can produce ice with fixed dimple size not affected by ambient conditions.

Actually, after the evaporator temperature becomes 0°C, the icemaker adds thermistor sensed temperature every second and continues ice production until the energy value calculated above (target freeze completion value) is reached.

To have stable ice production, it is necessary to calculate icemaking energy internally with the microprocessor. This energy calculation requires not just temperature but also time as shown in the above graph.
For this reason, both temperature and time are used to determine freeze completion.

[f] WATER SUPPLY CONTROL

1) When the water pan closes and the hall IC turns on, the water valve opens to supply icemaking water for a specific time. The icemaking water supply time varies between startup, reset, and the end of bin control cycle.

* The icemaking water supply time and additional water supply time are adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).

2) After the water pan starts to open, the water valve opens in 20 seconds to supply defrosting water (water pan cleaning water) for a specific time. The defrosting water supply time varies between the water temperatures above and below 13°C. If the water temperature is below 13°C, the water valve opens for 10 seconds after the water pan starts to close.
   * The defrosting water supply time is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).
3) The water temperature is determined by a predetermined offset value plus the cube control thermistor temperature after icemaking water is supplied as mentioned in 1) and the pump motor runs for 30 seconds.
   * The water temperature offset value is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).

[g] AMBIENT TEMPERATURE CORRECTION

1) At low ambient temperatures, the dimple diameter of ice cubes is increased by a predetermined rate between the ambient temperature and target integrated freeze completion value to prevent reduction in the evaporator temperature leading to excessive ice production.
   * The rate between the ambient temperature and integrated value is adjustable in the maintenance mode (see “3. [b] MAINTENANCE MODE”).

[h] DIMPLE DIAMETER SETTING

1) When the up or down switch is pressed, the current set point temperature (maintenance mode No. 2) is displayed (see “3. [b] MAINTENANCE MODE”).
2) When the up or down switch is pressed again, the set point temperature goes up or down in 0.5°C increments.
3) When the switches are not pressed for 30 seconds, the set point temperature is determined with “on” in the display.

[i] BIN CONTROL CYCLE

1) When the bin control switch stays on for more than 10 seconds, the bin control cycle starts and the icemaker stops. After the bin control switch stays off for more than 80 seconds, the bin control cycle ends and the icemaker restarts. (The hot gas valve opens 30 seconds before the icemaker restarts.)
2) After the bin control cycle ends (or when the power supply is turned on), the water pan starts to open (if the icemaker stopped while the water pan was closing).
3) If the bin control switch turns on while the water pan is opening after the power supply is turned on (or after the reset switch is pressed), the bin control cycle does not start. When the water pan opens and the hall IC turns on, the bin control cycle starts after 10 seconds and the icemaker stops.

[j] RESET SWITCH

1) When the reset switch is pressed and released after the power supply is turned on, the soft start is reset within 3 seconds and the water pan starts to open in the initial cycle.
2) When the reset switch is pressed and released during operation (water pan opening or closing, defrost or freeze cycle), the icemaker returns to the initial cycle within 3 seconds and the water pan starts to open.
   * The above control is available because the water pan position is detected by the hall IC not by a change switch.
3) When the reset switch is pressed and released while the icemaker is off in the bin control cycle, the icemaker returns to the initial cycle within 3 seconds, the bin control cycle ends and the water pan starts to open.
4) When the reset switch is pressed and released while the icemaker is off with an error, the icemaker returns to the initial cycle within 3 seconds, the error is reset and the water pan starts to open.
   * When the icemaker returns to the initial cycle by the reset switch operation, the water temperature is assumed to be 0°C (below 13°C), the freeze back up timer is extended, the icemaking water supply time including additional water supply with the water pan closed doubles and the number of freeze cycles becomes 0.

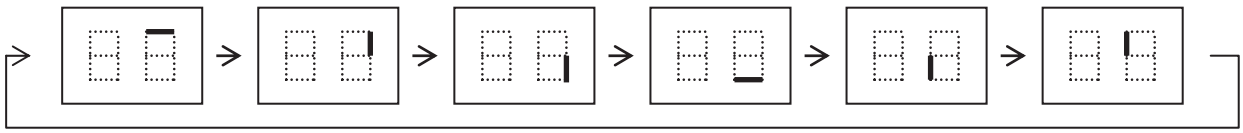
[k] 7-SEGMENT LED

1) When the power supply is turned on, the display shows “on” and the automatic icemaking process starts.
2) When the up or down switch is pressed, the display shows the current setting. When the switch is pressed again, the setting becomes adjustable. When the switches are not pressed for 30 seconds, the adjusted setting is determined with “on” in the display.
3) When an error occurs, the display flashes the applicable error code.
4) In the maintenance mode, the display shows various settings.
5) In the display mode, the display shows various values and the error history.
6) In the water circuit flush mode, the segments of the ones digit light up in rotation.
   * See “4. 7-SEGMENT DISPLAY” for further details.

3. MODE SETTING

[a] WATER CIRCUIT FLUSH MODE

1) When the down switch is pressed for 3 seconds during operation, the water circuit flush mode starts. The ones digit in the LED display lights up as follows.



2) There is no 30-second standby time after the power supply is turned on. While the compressor stays off, the actuator motor starts to open the water pan. After the water pan closes, the water valve opens to supply water. Then, the pump motor starts.
3) When the reset switch is pressed during the flush process, the water pan opens to drain the water pan and water tank. Then, the water pan closes again, the water valve opens to supply water, and the pump motor starts.
4) Repeat the above step 3) as required.
   * Manually press the reset switch to open the water pan to drain water. If the icemaker keeps running in the flush mode with the water pan closed, the freeze backup timer operates and the display shows “E1”.
   * If the cube control thermistor senses a temperature below the defrost completion temperature, the water pan keeps open, the defrost backup timer

operates and the display shows “E2”.

To reset, press the down switch for 3 seconds.

Note:

1. The freeze backup timer and defrost backup timer are available in the water circuit flush mode. As the compressor is off in the flush mode, these timers operates to stop the icemaker in case the freeze or defrost cycle does not complete.
2. As the compressor is off in the flush mode, be sure to drop all ice cubes in the defrost cycle before starting the flush mode. If any ice cube is left on the evaporator, the defrost backup timer operates to stop the icemaker.
3. After the flush mode is reset, the icemaker resumes operation from the defrost cycle.
   * If the up switch is pressed while the water pan is closing in the flush mode, the actuator motor stops and icemaking water is supplied for a specific time. Then, the pump motor starts to spray water. This allows for checking whether the spray holes are clogged or not.

[b] MAINTENANCE MODE

When the reset switch is pressed for more than 3 seconds, the maintenance mode starts to allow various set values to be checked or adjusted.

1) Press the reset switch for more than 3 seconds while the unit is running. The display shows “n1”.
2) Press the up switch to increase the number and the down switch to decrease the number.
3) Press the reset switch to select the desired number. The current set value flashes in the display.
4) Press the up switch to increase the set value and the down switch to decrease the set value.
5) Press the reset switch to select the desired value. The display shows the number again.

To reset, leave the switches untouched for 30 seconds.

Maintenance Mode List

	No	Item	Description	Range	Step
Basic	1	Defrost completion temp	Temperature to complete defrost cycle (detected by cube control thermistor)	2 to 20°C	1
	2	Integrated constant 1 (temp)	Target integrated value inside controller board is determined by constants 1 and 2. Temperature in freeze cycle is integrated, and freeze cycle continues until target integrated value is reached. Basically, the smaller constant 1 gets, the bigger integrated value and the smaller dimple diameter become.	-5 to -40°C	0.5
	3	Integrated constant 2 (time)	Target integrated value inside controller board is determined by constants 1 and 2. Time in freeze cycle is integrated, and freeze cycle continues until target integrated value is reached. Basically, the smaller constant 2 gets, the smaller integrated value and the bigger dimple diameter become.	5 to 90 min	1
	4	Ambient temp correction operating temp for integrated value	Upper temperature limit to trip control to ensure minimum dimple size in low temp conditions like at 1°C / wt 5°C.	10 to 50°C	1
	5	Ambient temp correction rate for integrated value	Percentage of integrated value in low temp conditions against target integrated value to ensure minimum dimple size in low temp conditions like at 1°C / wt 5°C based on integrated value inside controller board determined by constants 1 and 2.	10 to 100% (00 = 100)	1
	6	Freeze backup timer	Timer setting to forcibly complete freeze cycle if cube control thermistor cannot sense freeze completion temp.	45 to 90 min	5
Water supply	10	Defrosting water supply time, water temp less than 13°C	Time to supply defrosting water to melt ice on water pan at water supply temp less than 13°C. Adjustable between 1 and 99 sec. When set to “99”, defrosting water keeps running until cube control thermistor senses defrost completion temp.	1 to 99 sec, 99 = continuous	1

	11	Defrosting water supply time, water temp 13°C or more	Time to supply defrosting water to melt ice on water pan at water supply temp of 13°C or more. Adjustable between 1 and 99 sec. When set to “99”, defrosting water keeps running until cube control thermistor senses defrost completion temp.	1 to 99 sec	1
	12	Icemaking water supply time, normal	Time to supply icemaking water.	0 to 90 sec	1
	13	Water temp measurement correction value	Setting to correct difference between water temp measured by cube control thermistor and actual water supply temp.	+0 to +20K	1
	14	N/A			
	15	Additional icemaking water supply time	Time to supply additional icemaking water required after pump motor starts following normal icemaking water supply time.	0 to 90 sec	1
Other	16	Low water detection time	Time to activate low water detection if pump motor reaches target RPM within that time after startup. Longer setting will make low water detection easier. Set to “0” to cancel.	0 to 60 sec, 0: No	1
	21	N / A			
Model type	30	N / A			
Fan motor	31	N / A			
		N / A			
		N / A			
		N / A			
		N / A			
Water regulator	36	N / A			
Pump motor	41	Normal target RPM	First 2 digits of normal target pump motor RPM. E.g. Set 38 for 3800r/min. Pump motor runs at this RPM if total no. of revolutions in freeze cycle is below No. 42 percentage.	15 to 45 (x100 RPM)	1
	42	Low RPM operating condition	Point to switch pump motor RPM by percentage of total no. of revolutions in freeze cycle against target no. of revolutions.	10 to 100 % (00 = 100)	1
	43	Low RPM	Percentage of pump motor RPM against No. 41 setting. Pump motor runs at this RPM if total no. of revolutions in freeze cycle is above No. 42 percentage.	50 to 100%	1

Slush ice	50	Pump off time	Pump off time for slush ice control to stop pump after 2 min at evaporator temp of 3 to 4°C, quickly refrigerate evaporator before icemaking water supercools, and form ice core. When set to “0”, there is no slush ice control.	0 to 90 sec, 0: no control	1
	51	Water supply time	Time to supply water while pump is off for slush ice control. If slush ice is too much and cannot be prevented solely by pump off in No. 50, water is supplied while pump is off to slightly raise tank water temp.	0 to 5 sec	1
Hard water	60	N / A			
	61	N / A			
Ice left in water pan	70	Operating temp	Upper limit of operating temp to control ice left in water pan at the end of freeze cycle. Decrease amount of defrosting water by reducing ice left in opening water pan after freeze cycle.	10 to 60°C	1
	71	Hot gas valve on time	Hot gas valve opening time to control ice left in water pan.	0 to 20 sec	1
	72	Hot gas valve off time	Hot gas valve closing time to control ice left in water pan.	10 to 60 sec	1
Ice bridge	73	Hot gas valve off time	Time to keep hot gas valve closed after 20 sec in defrost cycle. Prevent ice bridge in bin by delaying ice dropping time.	0 to 30 sec	1
Low temp in defrost cycle	74	Operating temp	Upper temperature limit at the beginning of defrost cycle.	0 to 40°C	1
High pressure	80	N / A			

Maintenance Mode Settings

* Old pump motor: auxiliary code L0 and earlier					
	No	Item	IM-45CA	IM-30CA	IM-45CA-25
Basic	1	Defrost completion temp	5	3	5
	2	Integrated constant 1 (temp)	-18	-11.5	-14.5
	3	Integrated constant 2 (time)	10	11	8
	4	Ambient temp correction operating temp for integrated value	20	20	20
	5	Ambient temp correction rate for integrated value	90	95	90
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	23	25	23
	11	Defrosting water supply time, water temp 13°C or more	11	7	11
	12	Icemaking water supply time	22	11	22
	13	Water temp measurement correction value	6	9	9
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	18	14	18
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	36	27	36
	42	Low RPM operating condition	30	90	30
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	47	43	47
	71	Hot gas valve on time	2	5	2
	72	Hot gas valve off time	28	25	28
Ice bridge	73	Hot gas valve off time	0	0	3
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

* New pump motor: auxiliary code L1 and later					
	No	Item	IM-45CA	IM-30CA	IM-45CA-25
Basic	1	Defrost completion temp	5	3	5
	2	Integrated constant 1 (temp)	-18	-11.5	-14.5
	3	Integrated constant 2 (time)	10	11	8
	4	Ambient temp correction operating temp for integrated value	20	20	20
	5	Ambient temp correction rate for integrated value	90	95	90
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	23	25	23
	11	Defrosting water supply time, water temp 13°C or more	11	7	11
	12	Icemaking water supply time	22	11	22
	13	Water temp measurement correction value	6	9	9
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	21	0	21
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	36	28	36
	42	Low RPM operating condition	30	90	30
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	47	43	47
	71	Hot gas valve on time	2	5	2
	72	Hot gas valve off time	28	25	28
Ice bridge	73	Hot gas valve off time	0	0	3
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

* Old pump motor: auxiliary code L0 and earlier					
	No	Item	IM-30CA-25	IM-45CA (60Hz)	IM-30CA (60Hz)
Basic	1	Defrost completion temp	8	5	3
	2	Integrated constant 1 (temp)	-18.5	-18	-12.5
	3	Integrated constant 2 (time)	7	10	13
	4	Ambient temp correction operating temp for integrated value	20	20	20
	5	Ambient temp correction rate for integrated value	95	90	95
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	25	23	25
	11	Defrosting water supply time, water temp 13°C or more	7	11	7
	12	Icemaking water supply time	11	22	11
	13	Water temp measurement correction value	8	8	9
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	14	18	14
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	27	36	27
	42	Low RPM operating condition	90	30	90
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	39	47	35
	71	Hot gas valve on time	5	2	5
	72	Hot gas valve off time	25	28	25
Ice bridge	73	Hot gas valve off time	15	0	0
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

* New pump motor: auxiliary code L1 and later					
	No	Item	IM-30CA-25	IM-45CA (60Hz)	IM-30CA (60Hz)
Basic	1	Defrost completion temp	8	5	3
	2	Integrated constant 1 (temp)	-18.5	-18	-12.5
	3	Integrated constant 2 (time)	7	10	13
	4	Ambient temp correction operating temp for integrated value	20	20	20
	5	Ambient temp correction rate for integrated value	95	90	95
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	25	23	25
	11	Defrosting water supply time, water temp 13°C or more	7	11	7
	12	Icemaking water supply time	11	22	11
	13	Water temp measurement correction value	8	8	9
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	0	21	0
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	28	36	28
	42	Low RPM operating condition	90	30	90
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	39	47	35
	71	Hot gas valve on time	5	2	5
	72	Hot gas valve off time	25	28	25
Ice bridge	73	Hot gas valve off time	15	0	0
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

* Old pump motor & Jiaxipera compressor: auxiliary code H0 and earlier					
	No	Item	IM-65A	IM-65A-25	IM-65A (60Hz)
Basic	1	Defrost completion temp	2	2	5
	2	Integrated constant 1 (temp)	-20	-18	-20
	3	Integrated constant 2 (time)	11	6	11
	4	Ambient temp correction operating temp for integrated value	18	18	18
	5	Ambient temp correction rate for integrated value	85	85	65
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	17	17	35
	11	Defrosting water supply time, water temp 13°C or more	13	13	13
	12	Icemaking water supply time	31	31	31
	13	Water temp measurement correction value	6	6	8
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	20	20	20
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	36	36	36
	42	Low RPM operating condition	30	30	30
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	47	47	47
	71	Hot gas valve on time	10	10	10
	72	Hot gas valve off time	20	20	20
Ice bridge	73	Hot gas valve off time	0	0	0
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

* Old pump motor & Secop compressor: auxiliary code H1 to L0					
	No	Item	IM-65A	IM-65A-25	IM-65A (60Hz)
Basic	1	Defrost completion temp	3	3	3
	2	Integrated constant 1 (temp)	-19	-18	-19
	3	Integrated constant 2 (time)	11	6	11
	4	Ambient temp correction operating temp for integrated value	18	18	18
	5	Ambient temp correction rate for integrated value	85	85	65
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	17	17	17
	11	Defrosting water supply time, water temp 13°C or more	13	13	13
	12	Icemaking water supply time	31	31	31
	13	Water temp measurement correction value	6	6	8
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	20	20	20
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	36	36	36
	42	Low RPM operating condition	30	30	30
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	47	47	47
	71	Hot gas valve on time	10	10	10
	72	Hot gas valve off time	20	20	20
Ice bridge	73	Hot gas valve off time	0	0	0
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

* New pump motor & Secop compressor: auxiliary code L1 and later					
	No	Item	IM-65A	IM-65A-25	IM-65A (60Hz)
Basic	1	Defrost completion temp	3	3	3
	2	Integrated constant 1 (temp)	-19	-18	-19
	3	Integrated constant 2 (time)	11	6	11
	4	Ambient temp correction operating temp for integrated value	18	18	18
	5	Ambient temp correction rate for integrated value	85	85	65
	6	Freeze backup timer	45	45	45
Water supply	10	Defrosting water supply time, water temp less than 13°C	17	17	17
	11	Defrosting water supply time, water temp 13°C or more	13	13	13
	12	Icemaking water supply time	31	31	31
	13	Water temp measurement correction value	6	6	8
	14	N / A	0	0	0
	15	Additional icemaking water supply time	0	0	0
Other	16	Low water detection time	25	25	25
	21	N / A	1	1	1
Model	30	Type	4	4	4
Fan motor	31	N / A	20	20	20
	32	N / A	45	45	45
	33	N / A	100	100	100
	34	N / A	70	70	70
	35	N / A	100	100	100
Water regulator	36	N / A	0	0	0
Pump Motor	41	Normal target RPM	36	36	36
	42	Low RPM operating condition	30	30	30
	43	Low RPM	70	70	70
Slush ice	50	Pump off time	0	0	0
	51	Water supply time	0	0	0
Hard water	60	N / A	10	10	10
	61	N / A	0	0	0
Ice left in water pan	70	Operating temp	47	47	47
	71	Hot gas valve on time	10	10	10
	72	Hot gas valve off time	20	20	20
Ice bridge	73	Hot gas valve off time	0	0	0
Low temp in defrost cycle	74	Operating temp	0	0	0
High pressure	80	N / A	63	63	63

[c] DISPLAY MODE (LOG CLEARING)

When the up switch is pressed for more than 3 seconds, the display mode starts to allow various items and logs to be checked, displayed or cleared.

1) Press the up switch for more than 3 seconds while the unit is running. The display shows “n1”.
2) Press the up switch to increase the number and the down switch to decrease the number.
3) Press the reset switch to select the desired number. The current value appears in the display.
4) Press the reset switch while the value is displayed. The display shows the number again.

To reset, leave the switches untouched for 30 seconds.
To clear, press the up and down switches together for 5 seconds while the value is displayed.

Display Mode List

No	Item	Description	Clear
n1	Freeze cycle time count up (min)	0 to 99 min	No
n2	Freeze cycle completion rate (%)	0 to 100% (00 = 100%)	No
n3	Current cube control thermistor temp	Rounded to the nearest whole number	No
n4	Current ambient thermistor temp	Rounded to the nearest whole number	No
n5	Water temp (presumed)	“H” for 13°C or more “L” for less than 13°C	No
n6	N / A	Display 0.	No
n7	Current pump motor RPM	1/100 of actual value. Round to the nearest whole number. E.g. 1560 r/min : 16, 820 r/min : 8	No
n8	Current condenser thermistor temp	Rounded to the nearest whole number	No
h1	Last freeze cycle time (min)	Same as current freeze cycle time. Freeze cycle is not considered complete if interrupted by bin control switch or reset switch.	Yes
h2	Number of freeze cycles	Number of cycles completed. 10 is added every 10 cycles. Freeze cycle is not considered complete or counted in if interrupted by bin control switch or reset switch.	Yes

h3	Total number of freeze cycles	< Display > e.g. 655350 cycles (start) (end) 65→off→53→off→50→off→ - -	No
h4	Error log	Display up to 5 errors from latest to oldest for 1 sec ON, 0.5 sec OFF, "- -" at the end, then back to latest error. In case of less than 5 errors, display oldest error, "- -", then back to latest one. < Display > e.g. E5 (latest), E4, E3, E2, E1 (oldest) (latest) (oldest) E5→off→E4→off→E3→off→E2→off→E1→off→ - -	Yes
h5	Software version	For Ver 1.0A, display "01."→"0A"→"01."alternately for 1 sec ON, 0.5 sec OFF.	No
h6	Default model code	Display set model codes from "00" to "FF" (hexadecimal, 256 patterns)	No (*)

* To clear the model code, press the up and down switches together for 15 seconds (for controller board replacement and setting error correction only).

[d] MODEL CODE SETTING MODE

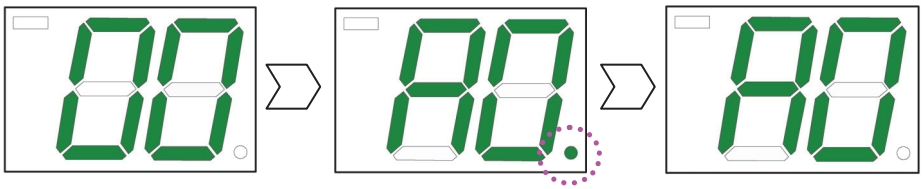
To correct model code setting:

1) When the up switch is pressed for more than 3 seconds, the display mode starts and the display shows "n1".
2) Press the up or down switch to have "h6" in the display.
3) Press the reset switch. The current memorised model code appears in the display.
4) Press the up and down switches together for 15 seconds. The display shows "00".
5) Press the up switch to increase the first digit in the 7-segment display, and the down switch to increase the second digit. The digit changes in the following order: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. Set the proper model code according to the model code list below. When a preset model code is displayed, the dot on the bottom right lights up.
6) When the chosen preset model code is displayed, press the reset switch to store the board memory (the display shows "on" and the machine will then always start up with this memorized program as default).
   * To check the current memorised model code, view in the display mode (follow steps 1) to 3) above).

After replacement of controller board:

1) The display shows “00” when the power is turned on.
2) Follow the steps 5) and 6) above for setting.

<Controller board replaced> <Chosen model code displayed> <Model code memorised>

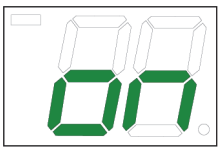


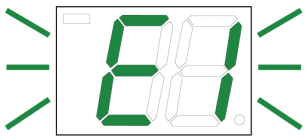
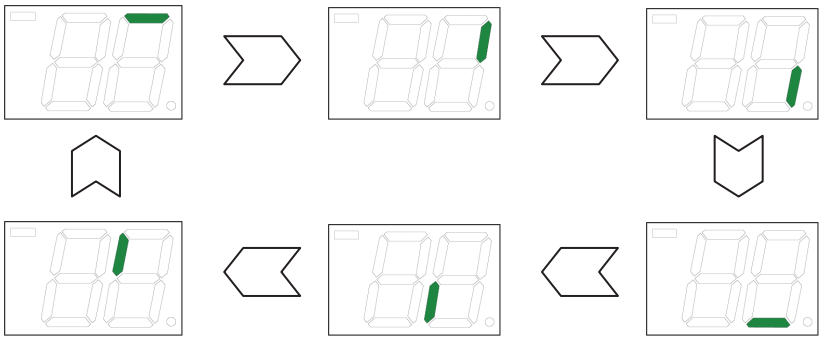
Model Code List

1st Digit	2nd Digit	Model
8	3	IM-65A
8	4	IM-45CA
8	5	IM-30CA
8	9	IM-65A-25
8	A	IM-45CA-25
8	B	IM-30CA-25
8	F	IM-65A (60Hz)
9	0	IM-45CA (60Hz)
9	1	IM-30CA (60Hz)

4. 7-SEGMENT DISPLAY

[a] NORMAL MODE

Item	Display
Power on Defrost cycle Freeze cycle Bin full	
Freeze temp setting	Display range from -5.0 to -40.0 

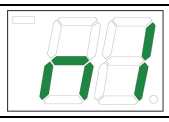
Error code	Flash  E1: Abnormal freeze cycle E2: Abnormal defrost cycle EE: Other (See “5. ERROR CODES”)
Water circuit flush	

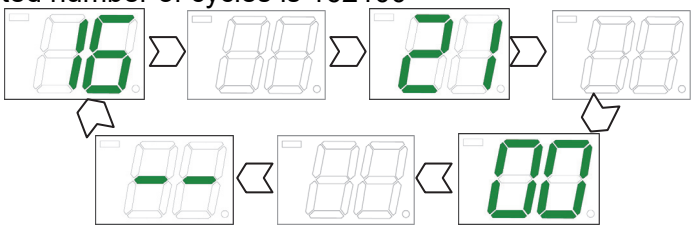
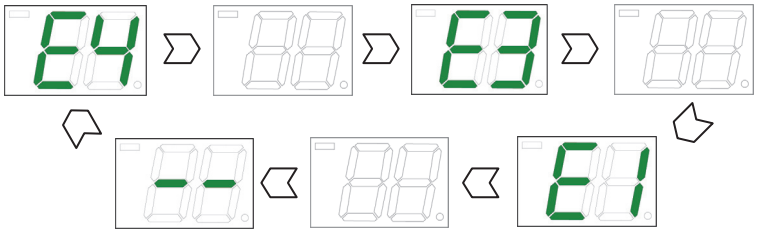
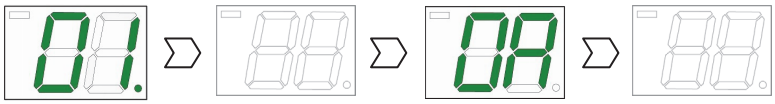
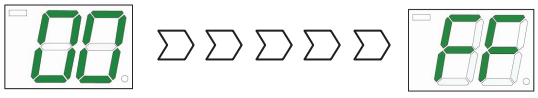
[b] MAINTENANCE MODE

No.	Item	Display (example)
1	Defrost completion temp	 16°C
2	Integrated constant 1 (temp)	-18°C  -18.5°C  Dot appears for value with “.5” as in -18.5°C
3	Integrated constant 2 (time)	 21 min
4	Ambient temp correction operating temp for integrated value	Same as No. 1
5	Ambient temp correction rate for integrated value	 90%  100% (last 2 digits only)
6	Freeze backup timer	Same as No. 3

*’ No. 7 and later are same as above.

[c] DISPLAY MODE

No.	Item	Display (example)
–	n*, h*	 
n1	Freeze cycle time count up (min)	21 min or 21%  100% (last 2 digits only) 
n2	Freeze cycle completion rate (%)	

n3	Current cube control thermistor temp	-19°C  24°C 
n4	Current ambient thermistor temp	
n5	Water temp (presumed)	Water temp 13°C or more  Water temp less than 13°C 
n6	N / A	Display 0.
n7	Current pump RPM	 Display 1/100 of actual value. Round to the nearest whole number. E.g. For 1560 r/min, 1600 r/min : 16
n8	Condenser thermistor temp	Same as n3 and n4
h1	Last freeze cycle time (min)	 21 min
h2	Number of freeze cycles	If counted number of cycles is 162100 
h3	Total number of freeze cycles	
h4	Error log	If 3 errors from latest to oldest are E4, E3, and E1 
h5	Software version	Ver 1.0A is displayed as follows alternately for 1 sec ON and 0.5 sec OFF 
h6	Default model code	Set model codes from “00” to “FF” (hexadecimal, 256 patterns) 

5. ERROR CODES

[a] ERROR CODES, CAUTION CODES

* When the controller board detects an error, the display shows one of the following error and caution codes in the display mode. Operation depends on the type of error.

* The error and caution codes other than E1 and E2 are indicated as “EE” in the 7-segment display at the time of occurrence. The error log is indicated up to five errors from the latest entry.

Error	Item	Description	Operation	Reset
E1	Freeze error	Freeze backup timer (45/60 minutes after water pan starts to close) counts up before freeze cycle completes, and evaporator temperature is 0°C or higher.	Shut down	Press reset switch
E2	Defrost error	Defrost backup timer (30 minutes after water pan starts to open) counts up before defrost cycle completes.	Shut down	Press reset switch
E3	Water pan opening error	Water pan has not fully opened within 60 seconds, and 3 minutes have passed even with opening failure control.	Halt	Press reset switch
		Unit resumes operation after 60 minutes and repeats the above error.	Shut down	
E4	Water pan closing error	Water pan has not fully closed within 60 seconds, and 3 minutes have passed even with closing failure control.	Halt	Press reset switch
		Unit resumes operation after 60 minutes and repeats the above error.	Shut down	
E5	High temperature error	Evaporator temperature stays 60°C or higher for 5 seconds or more.	Shut down	Press reset switch
E8	Pump motor lock error	Pump motor is locked for 30 seconds while control pressure is applied.	Keep running	Press reset switch
		Above error has been detected 3 times.	Shut down	
EA	Data error	Model setting data memory IC is defective.	Shut down	Replace controller board
EC	Cube control thermistor error	Cube control thermistor circuit is open or shorted for 2 seconds.	Shut down	Replace thermistor

Caution	Item	Description	Operation	Reset
C1	Low water detection	If pump motor reaches target RPM within certain period of time after startup, a defrost cycle (water pan opens and closes) runs. If the above occurs again, C1 appears.	Shut down	After 30 minutes, automatically resets and restarts
C2	High pressure	Condenser thermistor senses 58°C or higher temperature.	Compress or stops	After 10 minutes, condensing temperature 50°C or lower, pressure 1.96MPa or lower

[b] SERVICE DIAGNOSIS

Error	Check	Possible Cause	Remedy
E1	Water valve	Closing failure	Clean or replace
	Refrigeration circuit	Gas leak	Repair
		Clogged capillary	Replace heat exchanger
		Clogged expansion valve	Replace
	Compressor	Defective	Replace
		Starting failure	Check supply voltage or replace electrical components
	Compressor relay	Coil circuit open	Replace
	Condenser	Clogged	Clean
	Fan Motor	Locked	Replace
		Low RPM	Replace
		Broken fan	Replace fan
	Hot gas valve	Closing failure	Replace
	Cube control thermistor	Disconnected	Reconnect
E2	Hot gas valve	Opening failure	Replace
	Controller board	Defective	Replace
E3	Actuator motor	Defective	Replace
	Controller board	Relay contact failure	Replace
		Defective	Replace
E4	Actuator motor	Defective	Replace
	Controller board	Relay contact failure	Replace
		Defective	Replace
E5	Hot gas valve	Closing failure	Replace
	Controller board	Relay contact failure	Replace
E8	Pump motor	Locked	Replace
		Connector disconnected	Reconnect
		Open circuit	Repair
EA	Controller board	Defective	Replace
EC	Cube control thermistor	Open or short circuit	Replace
	Controller board	Connector disconnected	Reconnect

Caution	Check	Possible Cause	Remedy
C1	Water circuit	Low water	Check main valve
		Low water pressure	Set to appropriate pressure
	Water valve	Defective	Replace
		Connector disconnected	Reconnect
		Clogged filter	Clean
	Pump motor	Defective	Replace
	Pump motor suction	Loose connection	Correct
		Defective gasket	Replace
	Pump motor discharge	Loose hose connection	Correct
		Defective connecting hose	Replace
C2	Air-cooled condenser	Dirty with oily smoke, low condensing capacity	Clean
		Clogged filter	Clean
	Water circuit	Low water	Check shutoff valve
	Fan motor	Defective	Replace
	Ambient temperature	Too high	Ventilate and cool down

6. TROUBLESHOOTING

[a] INSTRUCTIONS FOR SERVICE ENGINEER

1) Check that the icemaker has been earthed properly. If not, the controller board will not work properly.
2) Do not change wiring and connections, or the controller board will not work properly.
3) Do not touch the electronic devices on the controller board or the back of the controller board.
4) Do not repair the electronic devices and parts on the controller board in the field except for the fuse (250V AC, 6.3A, 5mm DIA x 20mm).
5) To get static free, always touch the metal part of the icemaker before servicing.
6) Handle the controller board by the edges only.
7) Do not drop the controller board on the floor.

[b] CHECKING CONTROLLER BOARD

1) Before checking the controller board, check the cube control thermistor and bin control switch for proper operation. See “BEFORE CHECKING CONTROLLER BOARD” in the service manual for the applicable model.
2) If the above parts are operating properly, check each part according to “5. [b] SERVICE DIAGNOSIS”.

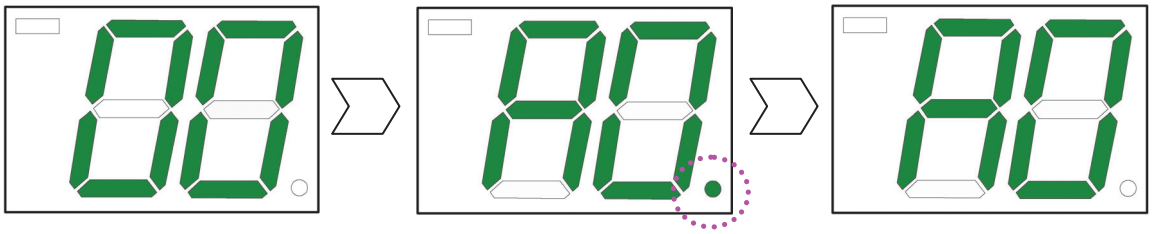
7. REMOVAL AND REPLACEMENT

The replacement controller board is in common use for the entire IM models.

To replace:

1) Unplug the icemaker or disconnect the power source.
2) Remove the front cover and control box cover.
3) Disconnect all the connectors from the controller board. Remove the controller board from the control box.
4) Install the replacement controller board in the control box. Reconnect the connectors.
5) Replace the control box cover and front cover.
6) Plug in the icemaker or connect the power source. As the replacement controller board has not been set for the proper model code, the 7-segment display illuminates “00”.
   * The code “00” does not belong to any model.
7) Press the up switch to increase the first digit in the 7-segment display, and the down switch to increase the second digit. The digit changes in the following order: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. Set the proper model code according to the model code list provided with the replacement controller board (see next page). When a preset model code is displayed, the dot on the bottom right lights up.
8) When the chosen preset model code is displayed, press the reset switch to store the board memory (the display shows “on” and the machine will then always start up with this memorized program as default).

<Controller board replaced> <Chosen model code displayed> <Model code memorised>

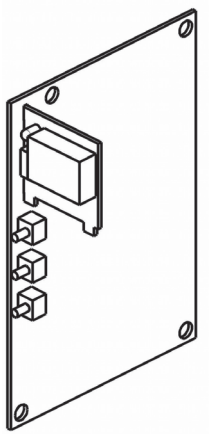


* To check the current memorised model code, view in the display mode (press and hold the up switch for 3 seconds – the display changes to “n1”, then press the up switch several times to find “h6”, then press the reset switch and the memorised code appears in the display).
* If for any reason the machine needs to be reset back to the factory settings, hold

the up and down switches for 15 seconds whilst the code is displayed (in display mode). The machine will stop working and the display will reset to “00” (cleared memory).

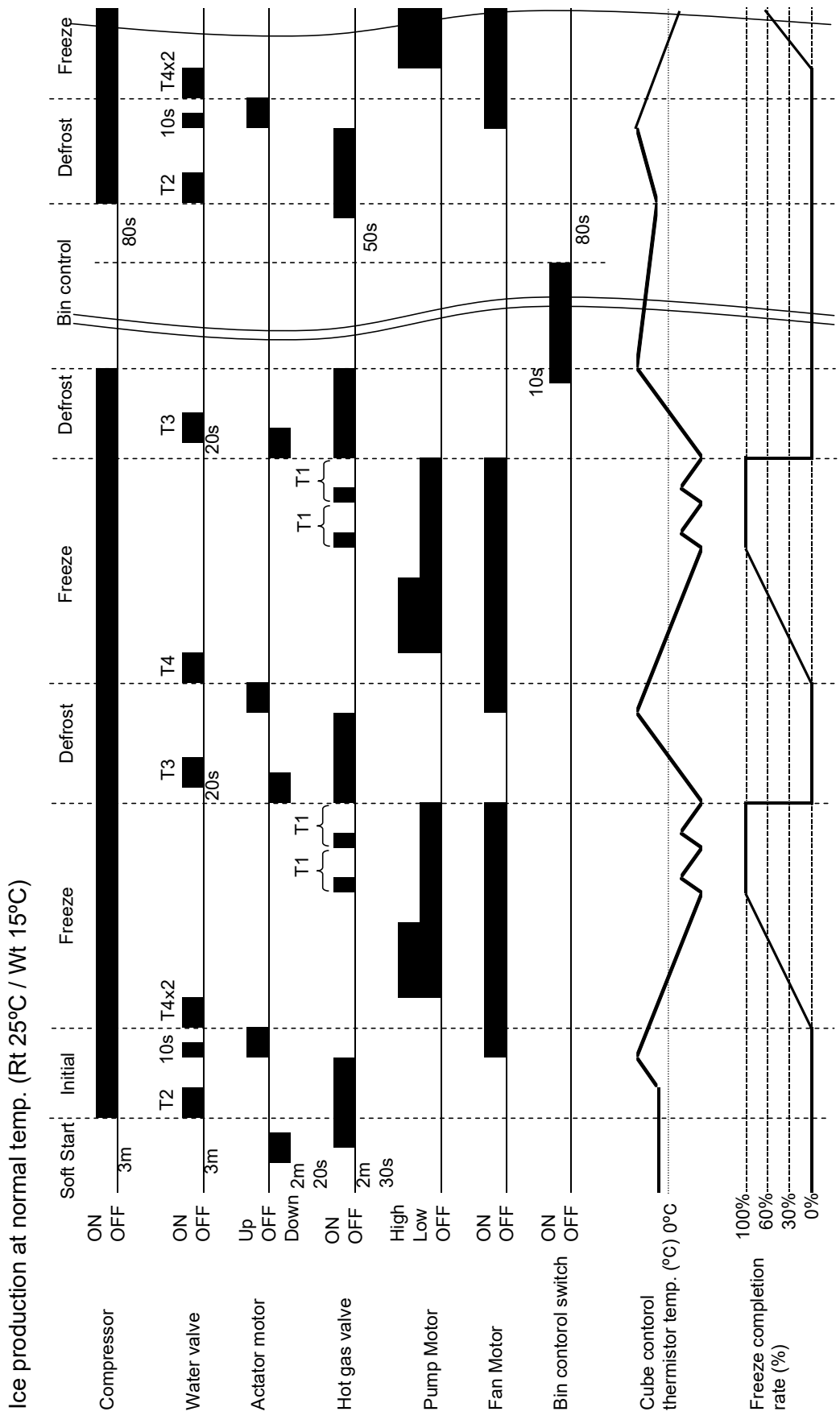
The controller board will then need to be reprogrammed (select and memorise the correct code for the machine) using steps 7) and 8) above.

Note:

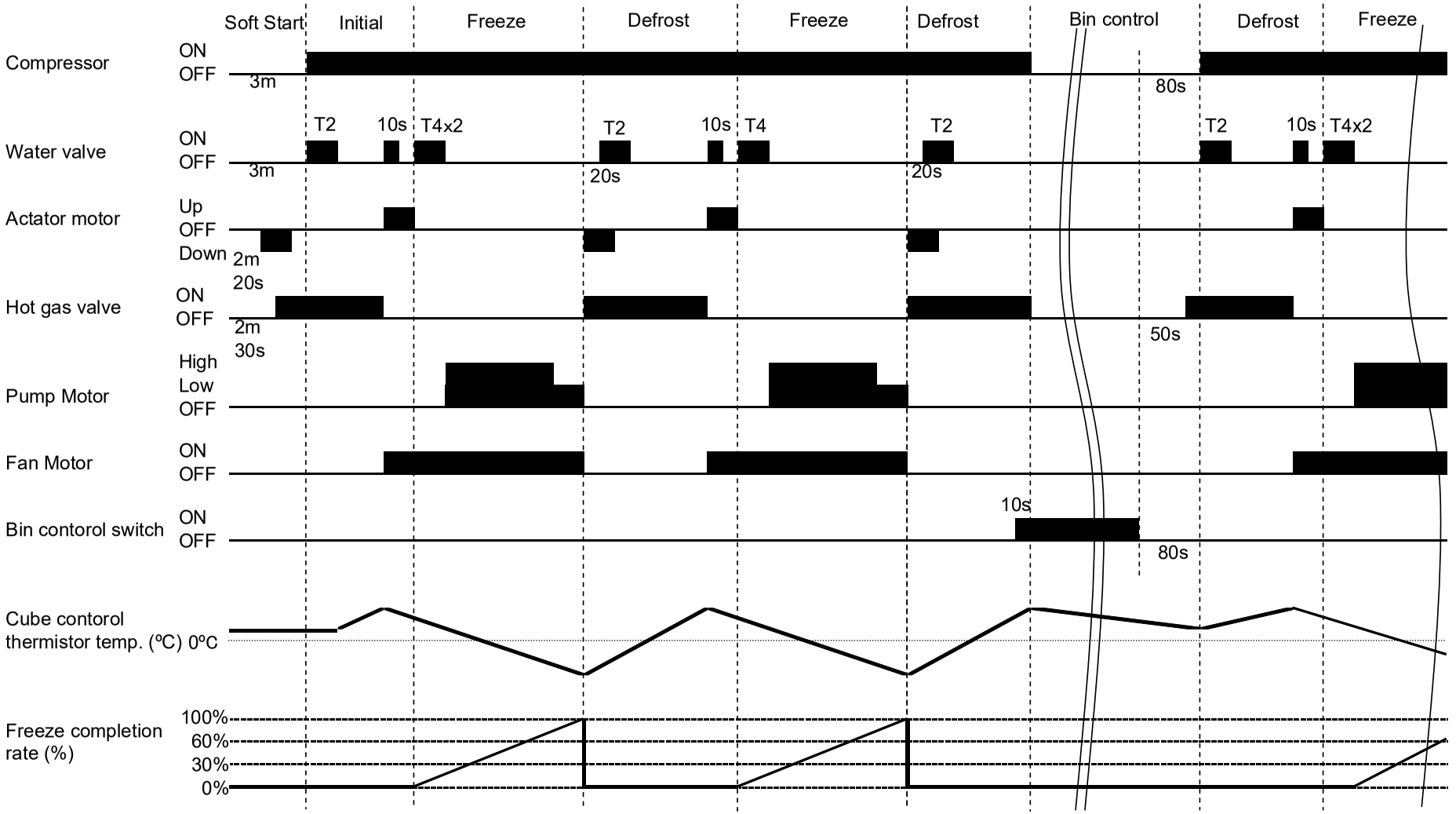


1. Be sure to get static free before servicing the controller board.
2. Do not touch the controller board with wet or dirty hands.
3. Do not impact the controller board. If it drops on the floor, do not use it.
4. Do not hold the leads when disconnecting the connectors.
   * Locking connectors must be unlocked before being disconnected.
   * Reconnect the connectors properly.
5. Install the new controller board in its correct position.
6. Bind the wiring inside the control box the way it was.
   * Do not push the wiring on the controller board.
   * Do not bind the thermistor leads and high voltage wires together.

8. TIMING CHART



Ice production at low temp. (Rt 10ºC / Wt 10ºC)



Notes on timing charts

Item			IM-65A	IM-45CA	IM-30CA
Water pan defrost control	Ambient temp in control	/	18°C - 47°C	20°C - 47°C	20°C - 43°C
	Hot gas valve on/off time	T1	10 / 20s	2 / 28s	5 / 25s
Defrosting water supply time (water temp. less than 13°C, or initial cycle)		T2	Max 17s	Max 23s	Max 25s
Defrosting water supply time (water temp. 13°C or more)		T3	13s	11s	7s
Icemaking water supply system		T4	31s	22s	11s

When the power is turned on or the unit resumes operation after a bin control cycle, the water temperature is considered less than 13°C and the water valve opens for T2 seconds to supply defrosting water. If the water temperature is normal, the water pan opens and immediately starts to close again. In this case, defrosting water flows for 10 seconds and not for the above supply time.