

# SERVICE MANUAL

BLMI-500AD



## Contents

- 1 General information
  - 1.1 For your safety
  - 1.2 Warranty
  - 1.3 How to read model names and serial numbers
  - 1.4 Installation
  - 1.5 Water supply and drain pipe connection
  - 1.6 Assembly structure
  - 1.7 Specifications
  
- 2 Technical information
  - 2.1 Water and refrigeration system
  - 2.2 Operation
  - 2.3 Control board
  
- 3 Troubleshooting
  - 3.1 Parts operation check
  - 3.2 How to update main control board program
  - 3.3 Error codes
  - 3.4 Problems and resolutions
  
- 4 Circuit diagrams and technical data
  - 4.1 Circuit diagrams
  - 4.2 Performance data
  - 4.3 Evaporator sensor data

# 1 General information

## 1.1 For your safety

|  <b>WARNING</b>  |
|---|
| <ul style="list-style-type: none"><li>- The ice machine must be installed in accordance with individual State/Regional Codes and regulations.</li><li>- Read the manual thoroughly before installation. Improper installation may void or limit warranty coverage. Most Importantly, Improper installation may damage the unit and could cause serious injury.</li><li>- The ice machines must be installed and serviced by a licensed and qualified technician.</li><li>- The ice machine must be grounded and have an independent electric supply.<br/>The ice machine must be leveled and the front edge of modular head and storage bin must be flat.</li><li>- Water Supply to the ice machine must be potable and of food grade</li><li>- High pressure refrigerant is charged into the ice machine. Be careful not to damage the refrigerant circuit during installation, maintenance, and service.</li><li>- Remove remaining water on the bottom side of the ice machine and any other things may cause danger before installation, maintenance, and service.</li><li>- Turn off the power and disconnect electrical connection before installation, maintenance, and service.</li><li>- Wear full protective clothing when using chemicals for maintenance.</li><li>- Do not remove the ice by using sharp tools such as a knife. This prevents damage to the evaporator.</li></ul> |

## 1.2 Warranty

|  <b>WARNING</b>  |
|---|
| <ul style="list-style-type: none"><li>- Defective or non-approved parts obtained by unauthorized parties that cause damage to the machine will void warranty.</li></ul> |

| <b>Warranty Period</b> |         |
|------------------------|---------|
| Parts & Labor          | 3 years |
| Compressor             | 5 years |
| Evaporator             | 5 years |

### 1.3 How to read model names and serial numbers

# BLMI-500AD

B: Blue Air (on US model # only)  
 L: Lassele (Our brand in S. Korea)  
 M-Modular or U-Undercounter  
 I: Crescent shaped ice

A: Air-cooled  
 W: Water-cooled  
 D: Dispenser

Daily ice Production in LBS.

[ Label barcode ]



**MODEL NAME**

- a (4 digits) : CIS code for specific model
- b (1 digit) : Product group
- c (2 digits) : Manufacturing site (supplier code)
- d (1 digit) : Manufacturing year
- e (1 digit) : Manufacturing month
- f (5 digits) : Serial number (00001 ~ 99999)

LUIA A 94 H 2 00001  
 a b c d e f

|       |      |      |      |      |      |      |
|-------|------|------|------|------|------|------|
| Year  | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Mark  | G    | H    | J    | K    | M    | N    |
| Month | Jan. | Feb. | Mar. | Apr. | May. | Jun. |
| Mark  | 1    | 2    | 3    | 4    | 5    | 6    |
| Month | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. |
| Mark  | 7    | 8    | 9    | A    | B    | C    |

## 1.4 Installation

### 1.4.1 Suggested Installation requirements

- Indoors with good ventilation.
- No heaters or hot side equipment around the machine. Do not place in direct sunlight..
- Absolutely requires a sufficient water supply, well equipped drainage system, and close proximity to power outlet.
- Ice machine should not have any obstructions near the machine to promote and maintain proper air flow and optimum ice production.

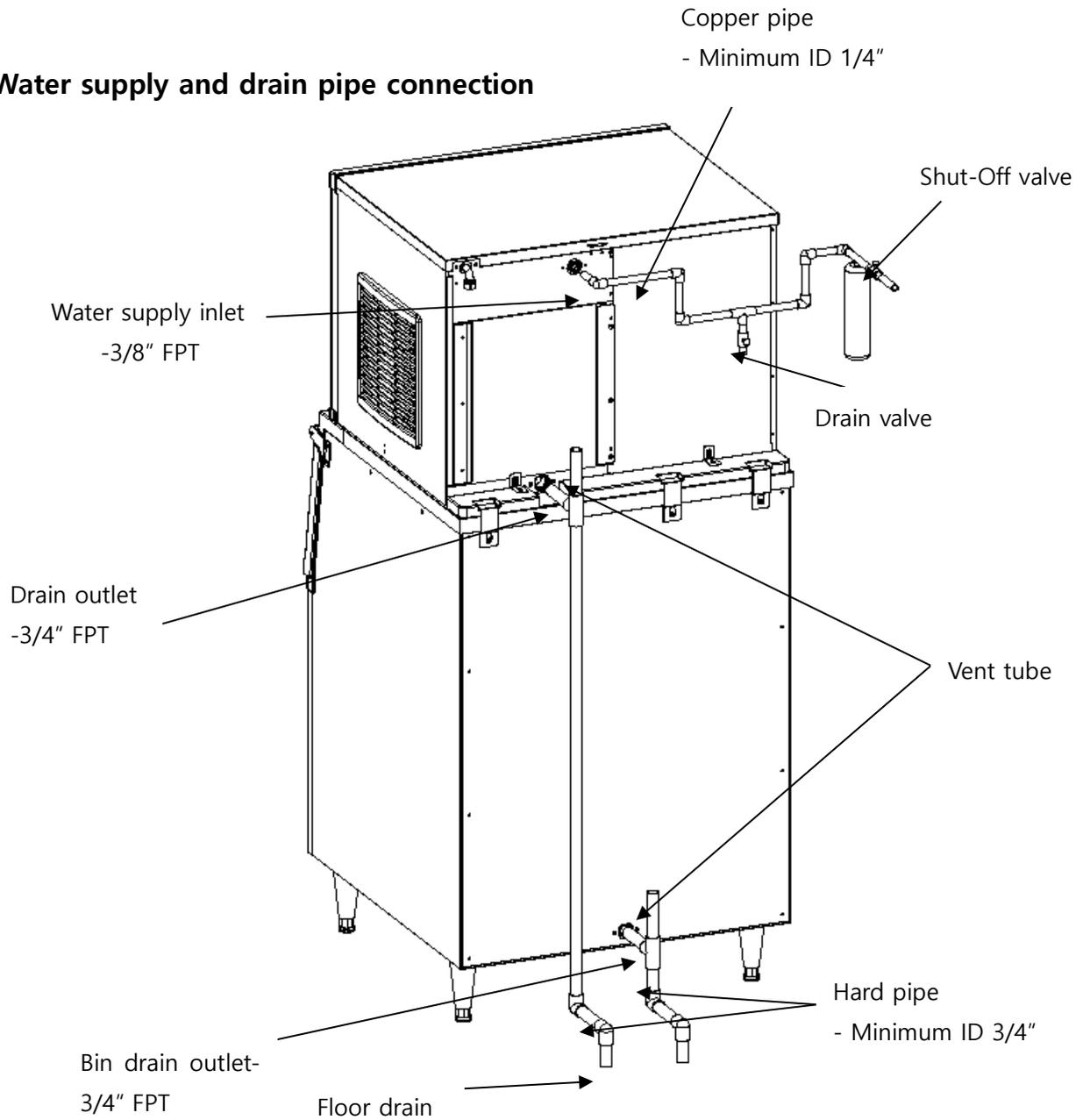
### 1.4.2 Installation check list

- Are the front edges of modular head and ice storage bin level and in alignment?
- Is the air vent pipe for the machine and drain line for ice storage bin separated?
- Is there an air gap at the end of the drain pipe of the ice storage bin?
- Have the modular head and ice storage bin, been checked and cleaned after installation?
- Is the drain pipe easily disconnected from the modular head?
- Is there 8" (200mm) minimum clearance around the ice machine?

### 1.4.3 Required environmental condition

| Contents            | Model    | Available Range       |
|---------------------|----------|-----------------------|
| Ambient Temperature | All      | 7-38°C                |
|                     |          | 45-100°F              |
| Water Temperature   | All      | 7-32°C                |
|                     |          | 45-90°F               |
| Water Pressure      | All      | 30-100psig            |
|                     |          | 2-7kg/cm <sup>2</sup> |
| Voltage             | 115V     | 104-127V              |
|                     | 208-230V | 187-264V              |
|                     | 220-240V | 198-254V              |

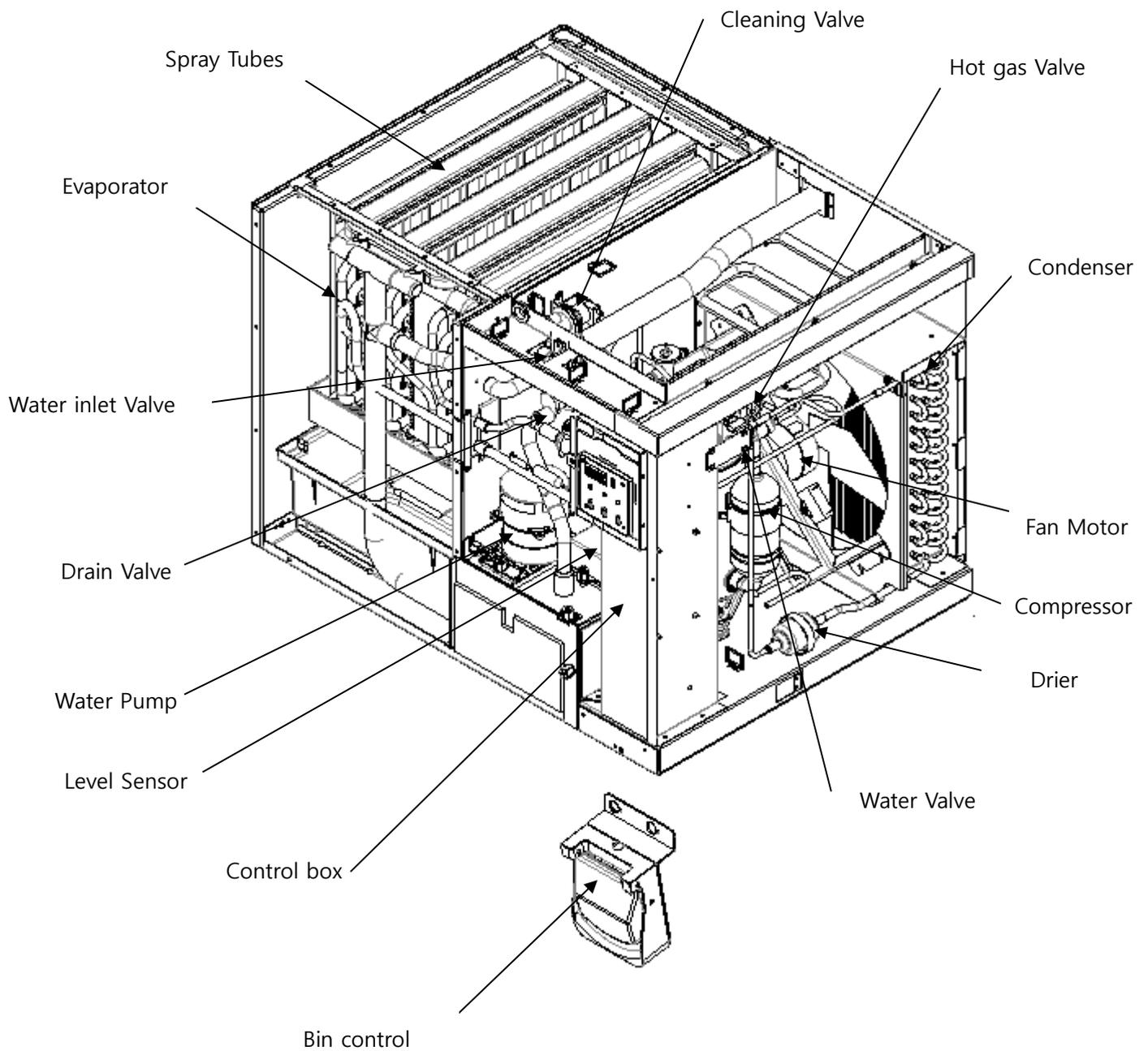
## 1.5 Water supply and drain pipe connection



There must be at minimum of 2" (50mm) vertical clearance between drainage pipe end and drainage hole.

## 1.6 Assembly structure

### 1) BLMI-500AD

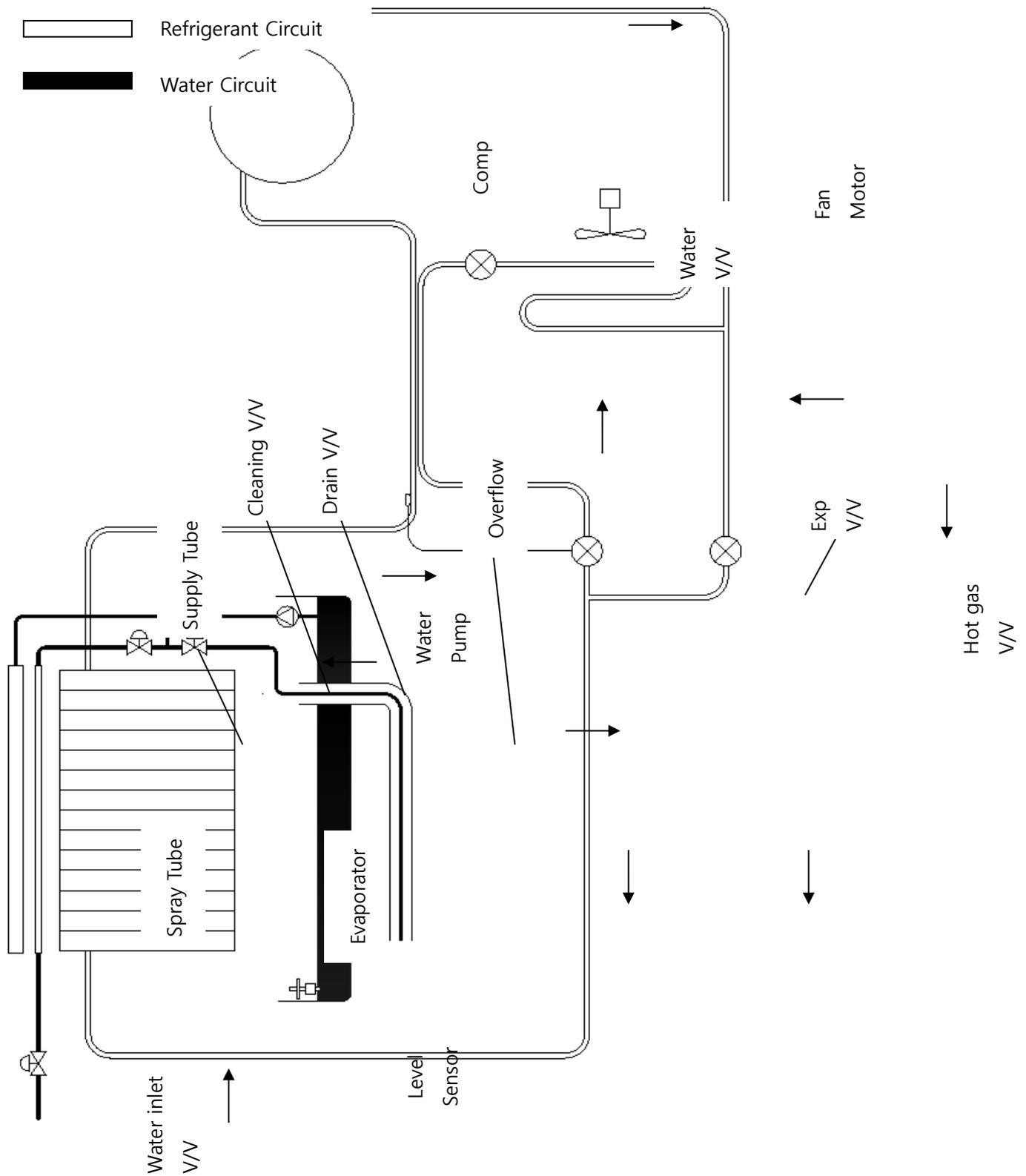


## 1.7 Specification

| Content                      | 500AD  | REMARKS                                |
|------------------------------|--|--|
| AC Supply voltage            | 115V/60Hz                                      |  |
| Amperage & power consumption | 14A /1100W                                     | AT90°F/WT70<br>°F<br>AT32°C<br>/WT21°C |
| Maximum Fuse Circuit Breaker | 15A  |  |
| Product size (W*D*H)         | 30" * 24" * 20" [inch]<br>762 * 610 * 560 [mm] |  |
| Weight                       | 126 lbs. (57 kg)                               |  |
| Per Cycle ( lb / Cubes)      | 9.18 lbs. (4.16 kg) / 432 Cubes                | -                                      |
| Refrigerant                  | R-410A   |  |

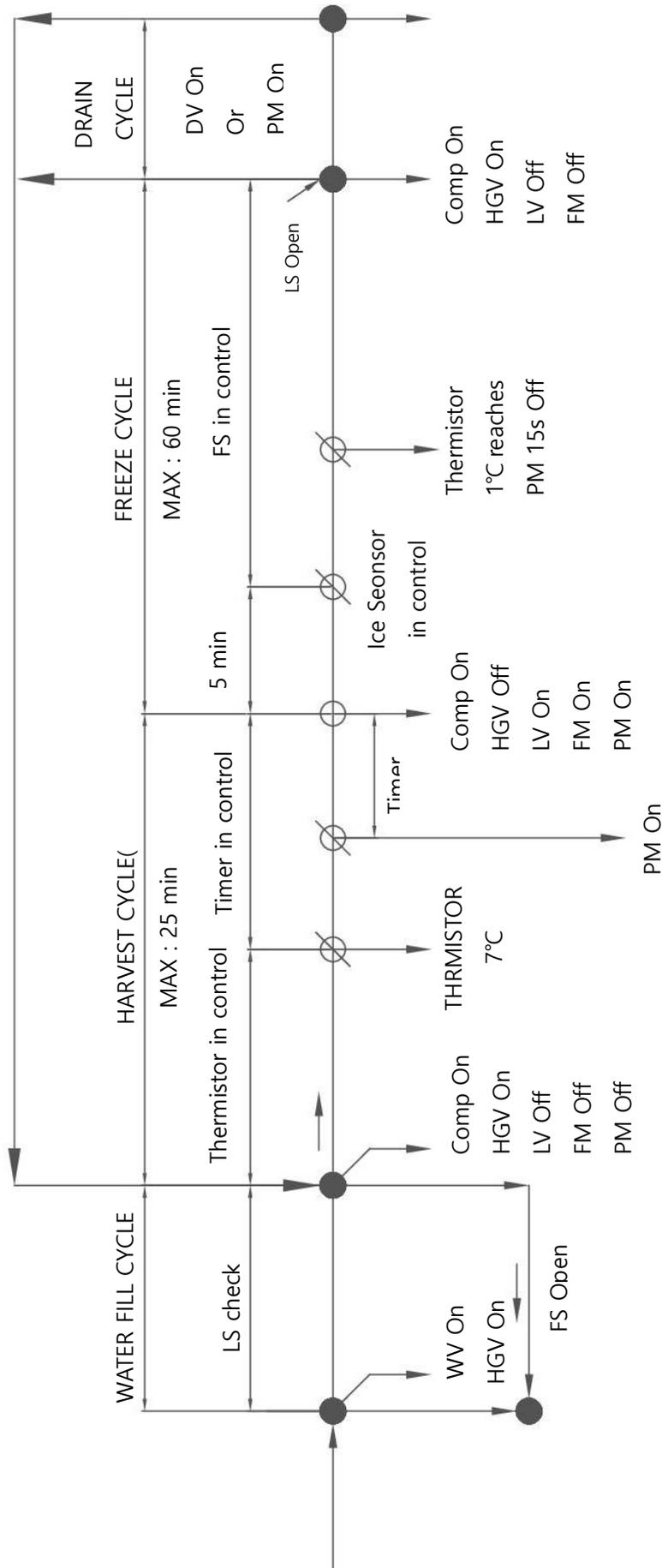
## 2 Technical information

### 2.1 Water and refrigerant system

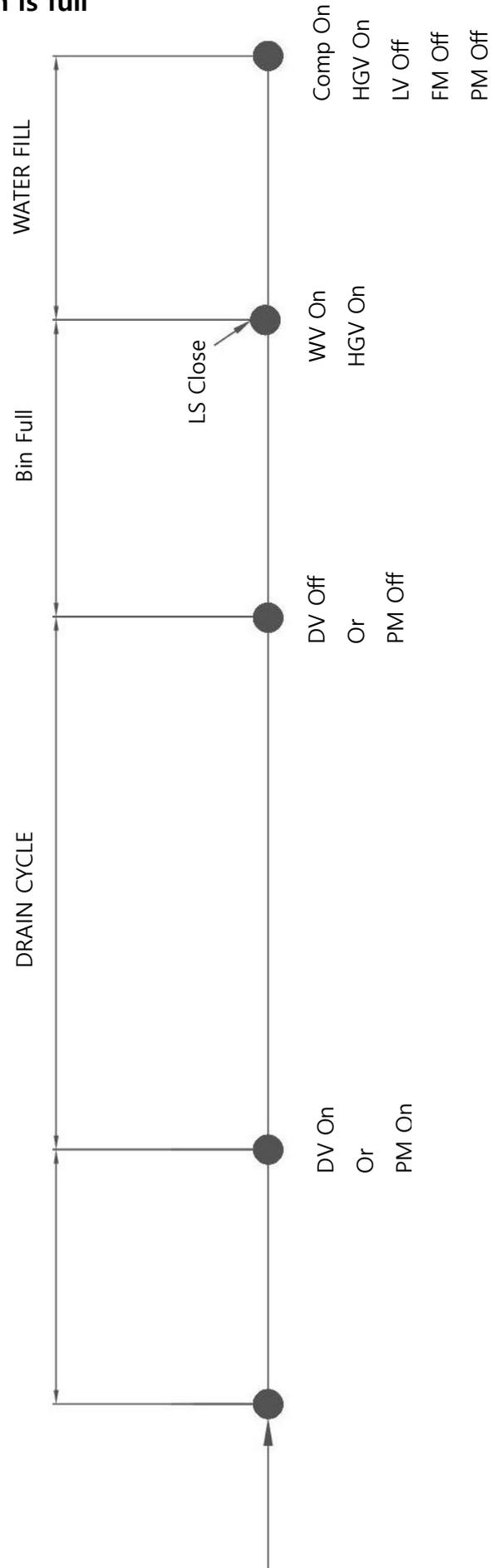


## 2.2 Operation

### 1) During freezing and harvesting cycle



2) During ice storage bin is full



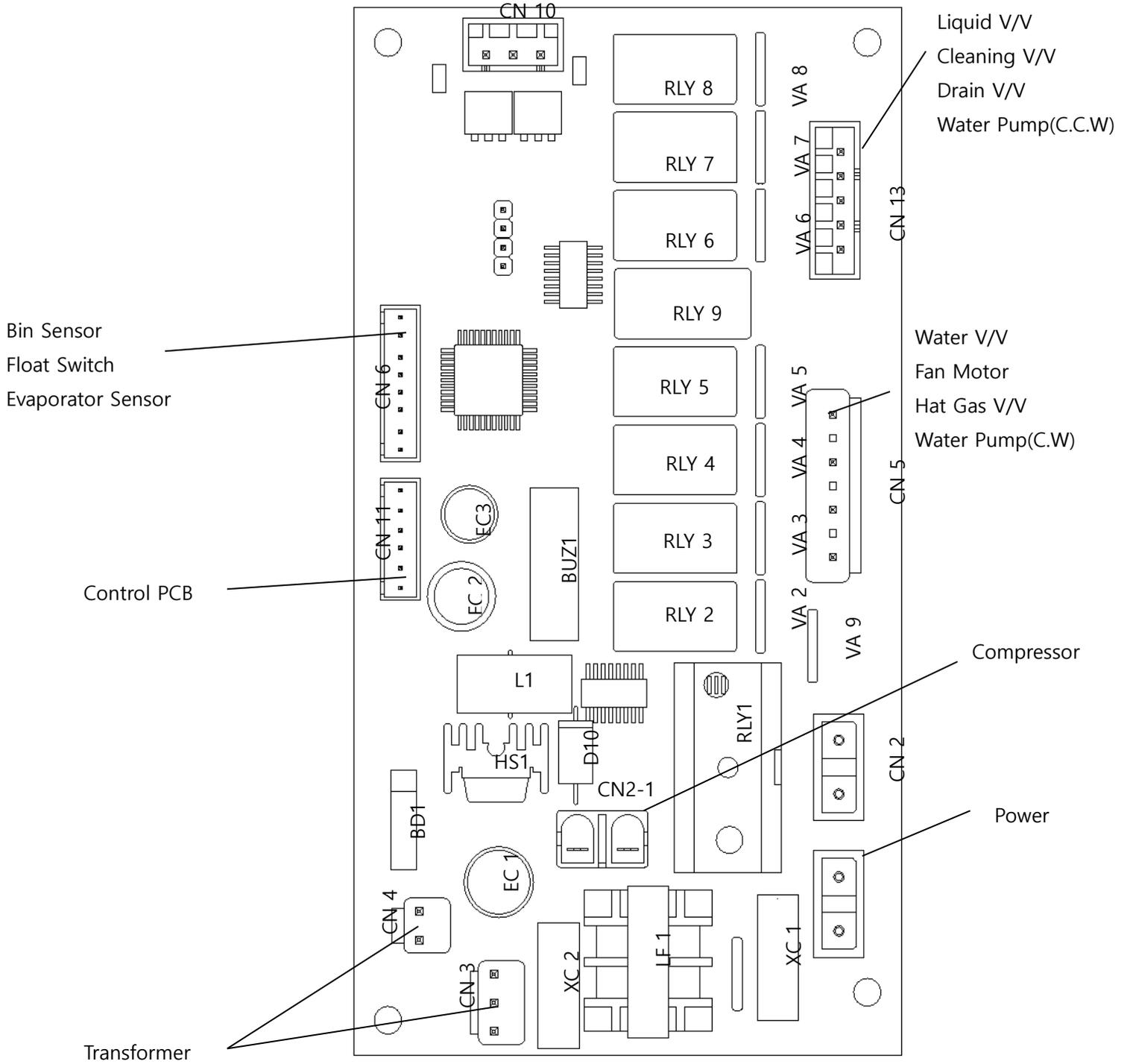
### 3) Sequence

- Stand-by
  - Once the ice machine is connected to the main power supply, it shows model name and PCB (control board) version and stand-by for operation.
  
- Water supply
  - As soon as the power is turned on, the ice machine will immediately begin the water supply cycle.
  - The ice machine will revert back to the water supply cycle if the machine is reset (turned off and turned on) during operation.
  - The water valve and hot gas valve are operational during the water supply cycle.
  - On/off LED light turns to green from red once water supply cycle is complete.
  - "XX" is displayed during water supply cycle. [XX = Elapsed time (x 10 seconds)].  
Example: the number 1 before the dot signifies water supply cycle (2 being harvest cycle and 3 being freezing cycle). .02 means the water has been supplying the machine for 20 seconds. The last 2 digits tell you the time. Simply multiply by 10 and you will have the exact number of seconds the water cycle has been active.
  
- Harvest
  - The action of dropping a batch of ice from the evaporator into the bin is called the "Harvest cycle"
  - The ice machine continues to repeat harvest and freezing cycles except for the first time the machine is turned on.
  - The compressor, hot gas valve, and water valve are in operation during the harvest cycle
  - Once evaporator temperature sensor reaches 7°C(44.6°F), harvest will be complete. This is due to the factory harvest delay time setting. (Default harvest delay time depends on model).
  - The Water pump starts operation before the harvest cycle is done.
  - On/off LED light turns from Red to Green once the harvest cycle is complete.

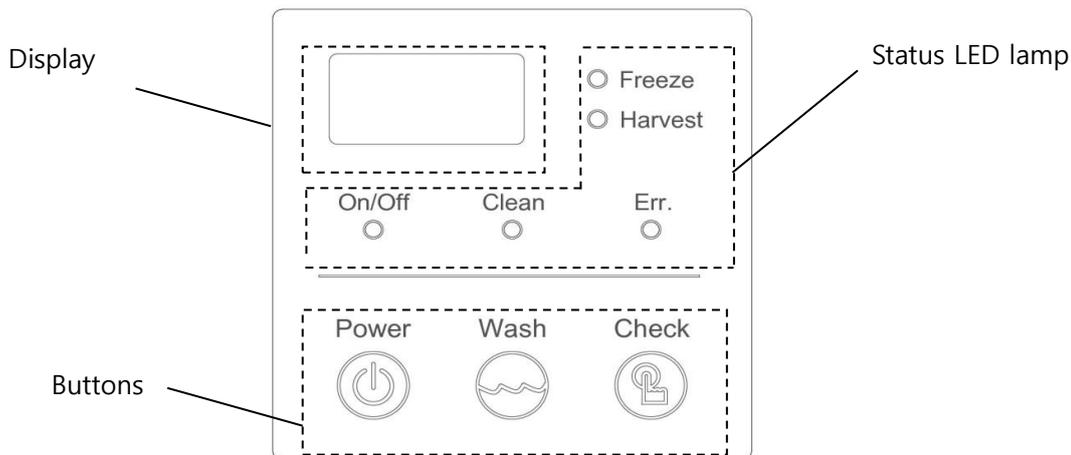
- Harvest LED light turns to Green.
- "2.xx" is displayed during harvest cycle. [.xx = Elapsed time (x 1 minute)]  
Example: The display reads: 2.03 during the harvest cycle. The first number (2) indicates that the ice machine is in the Harvest cycle. The second number (03) indicates that the machine has been in harvest for 3 minutes.
- Freezing
  - Freezing cycle is the act of water freezing onto the evaporator plate creating ice.
  - Compressor, fan motor, water pump, and water valve are in operation during freezing cycle
  - Once the freeze cycle is complete the LED light turns to Green.
  - During the freezing cycle the LED light will be Red.
  - "3.xx" is displayed during freezing cycle. [.xx = Elapsed time (x 1 minute)]  
Example: The display reads: 3.02 during the Freezing cycle. This first number (3) tells us the ice machine is in the freezing cycle. The second number (02) tells us the freezing cycle has been active for 2 minutes.
- Drainage
  - The ice machine has regular drainage intervals. When the ice bin is full the machine will drain water regularly from the machine directly following the freezing cycle.
  - The drainage interval last from 10-20 seconds.
  - Regular drainage time and interval can be adjusted once the water conditions are ascertained at the site of installation.
  - The ice machine will go into the drainage interval if the ice storage bin is full for five minutes to prevent contamination of water inside the water tank.
- Full storage
  - If the bin switch senses the bin is full of ice but the ice machine is in the middle of a new harvest cycle, ice production will cease once the current harvest cycle is complete. Ice production will also cease if the bin switch senses a full bin five minutes before a new freezing cycle begins.
  - If the bin switch senses that the bin is full five minutes After the freezing cycle begins all ice production will stop once the very next Harvest cycle is completed.
  - If the bin switch senses the bin is not full after consuming some ices, the ice machine resumes working from water supply cycle.

## 2.3 Control board

### 2.3.1



## 2.32 Display control board



### 2.3.1.1 Features

- 7-segment

| Display | Meaning   |
|---------|---|
|         | 1 = Water supply cycle<br>.xx = Elapsed time (x 10 seconds)<br>Ex) 1.02 = In water supply cycle for 20 seconds. |
|         | 2 = Harvest cycle<br>.xx = Elapsed time (x 1 minute)<br>Ex) 2.02 = In harvest cycle for 20 minutes.             |
|         | 3 = Freezing cycle<br>.xx = Elapsed time (x 1 minute)<br>Ex) 3.02 = In freezing cycle for 20 minutes.           |
|         | In drainage cycle.  |
|         | In cleaning cycle.  |
|         | Need to add cleaner or sanitizer.   |
|         | Cleaning cycle is completed.  |

- Error codes : Below error codes will be displayed so technicians can immediately identify specific malfunctions.

| Display | Meaning   |
|---------|---|
| E1      | Freezing cycle exceeds 60 minutes twice in a row.                 |
| E2      | Harvest cycle exceeds 25 minutes twice in a row.                  |
| E3      | Evaporator sensor temperature is over 60°C(140°F).                |
| E4      | Water is not drained during full storage.                         |
| E5      | Water level sensor continues to detect insufficient water levels. |
| E6      | Evaporator sensor error. (damaged or disconnected).               |
| E7      | Main Control Board<br>Main PCB program error.                     |
| E8      | Ambient temperature error.  |
| E9      | Bin switch error.   |
| HI      | Ambient temperature is over 45°C(113°F).                          |
| LO      | Ambient temperature is lower than 5°C(41°F).                      |

- E1 : If the freezing cycle exceeds 60 mins for the first time, the ice machine will activate the harvest cycle. This is called a "forced" harvest. E1 will be displayed if the same situation happens again.
- E2 : If the harvest cycle exceeds 25 mins for the first time, the ice machine will activate the freezing cycle. This is called a "forced" freezing cycle. E2 will be displayed if the same situation happens again.
- E3 : If evaporator sensor temperature is over 60°C(140°F).
- E4 : The ice machine automatically drains 5 minutes after the bin is full. E4 will be displayed if the water is not drained for 480 seconds.

- E5 :
  - 1) For the first ice making cycle: If the float switch does not sense enough water at the end of the first water supply cycle, the ice machine will go back to the water supply cycle again before advancing to the harvest cycle. E5 will be displayed If the float switch continues to sense insufficient water levels during subsequent supply cycles.
  - 2) Beginning with the second ice making cycle: If the float switch does not sense sufficient water levels at the end of the harvest cycle, the ice machine will return to the harvest cycle instead of advancing to the freezing cycle. E5 will be displayed If the float switch continues to sense insufficient water levels during the second harvest cycle.
  
- E6 : If the evaporator sensor is either damaged or disconnected.
- E7 : If main PCB is not operating properly.
- E8 : If ambient temperature sensor is damaged
- E9 : If bin switch is either not properly assembled or disconnected
  
- "HI" will be displayed if ambient temperature is over 45°C(113°F).
- "LO" will be displayed if ambient temperature is lower than 5°C(41°F).

- Status LED lamp

| LED     | Color  | Meaning                          |
|---------|--------|----------------------------------|
| On/Off  | Green  | Water has been supplied.         |
|         | Red    | Water has not been supplied yet. |
|         | Orange | Ice storage bin is full.         |
| Freeze  | Green  | In freezing cycle.               |
| Harvest | Green  | In harvest cycle.                |
| Clean   | Green  | In cleaning cycle.               |
| Err     | Red    | The ice machine has a problem    |

- Buttons

- Power : To turn the ice machine on or off: Press and hold power button for 2 seconds.

- Wash : For cleaning and sanitizing the ice machine.
  - Check : Allows the user to check the status of different operations of the machine.
- Combination
    - Power + Wash : Pressing and holding these buttons will force the machine into the harvest cycle.
    - Power + Check : Pressing and holding these buttons will force the drainage cycle.
    - Wash + Check : This will open the hot gas valve and water valve to aid in the system evacuation in the lines if necessary.
- Status check :
    - Once the check button is pressed, the display will cycle through the status of each of the categories below. Simply press check again to get to the next operation in the sequence. If there is no further activity on the check button, the display will automatically return to the standard operation status display.

| Sequence | Status                         | Remarks |
|----------|--------------------------------|---------|
| 1 - E    | Evapoator sensor Temeprature   |         |
| 2 - F    | Average time of freezing cycle |         |
| 3 - H    | Average time of harvest cycle  |         |
| 4 - ≡    | Total freezing cycle counts    |         |
| 5 - ###  | Ambient temperature            |         |

## 2.3.2 Parameter setting

### 2.3.2.1 Instruction - How to change the setting

| Number | Display   | Direction   |
|--------|---|---|
| 1      |    | Press check button for 5 seconds to change parameter setting.   |
| 2      |    | P-1 will be displayed.  |
| 3      |    | Press check button again to adjust P-1 setting result.<br>The setting can be adjusted up or down by pressing power or wash buttons. |
| 4      |  | P-2 after pressing the check button again, P-2 will be displayed.   |
| 5      | -   | Refer to following table to check each parameter's meaning and further information.   |
| 6      |  | Press check button for five seconds to get out of the parameter setting mode.   |

### 2.3.2.2 Parameter code meaning

| Number | Display | Features  | Range                 | Adjustable value     |
|--------|---------|---|-----------------------|----------------------|
| 1      | P-1     | Set evaporator temperature for harvest control                | 5 ~ 30°C<br>41 ~ 86°F | default: 45 °F       |
| 2      | P-2     |   |                       |                      |
|        | HI      | Set harvest delay time when ambient temperature is high.      | 60 ~ 300<br>sec       | default: 100         |
|        | LO      | Set harvest delay time when ambient temperature is low.       | 60 ~ 300<br>sec       | default: 120         |
| 3      | P-3     | drainage cycle interval                                       | 1 ~ 10                | 1,2,5,10/ default:10 |
| 4      | P-4     | Anti-Slushing temperature                                     | -4 ~ 4°F              | default: 34°F        |
| 5      | P-5     | Set water pump delay time to prevent ice from becoming slush. | 10~60 sec             | 1<br>default: 15     |
| 6      | P-6     | Set PCB program   | 25A~90A               | default: 50d         |
| 7      | P-7     | Reset freezing cycle count                                    | 0~1                   | 0                    |
| 8      | P-8     | Set drainage time   | 10~20 sec             | 10 default: 10       |
| 9      | P-9     | Set water supply time during harvest                          | 0~300 sec             | 10 default: 70       |
| 10     | P-10    | Set bin switch error alarm                                    | Y,N                   | Y,N default: Y       |

- P-1 / Set evaporator temperature for harvest control: Once evaporator sensor reaches the set temperature, harvest cycle will be done. [Default Setting : 7°C(44.6 °F)]
- P-2 / Set harvest delay time
  - HI: Set harvest delay time after evaporator sensor reaches a set temperature[Default : 7°C(45°F)] use this adjustment when ambient temperature is high.
  - LO: Set harvest delay time after evaporator sensor reaches a set temperature[Default : 7°C(45°F)] use this adjustment when ambient temperature is low.

P-3 / Set drainage cycle interval : Set drainage cycle interval to drain remaining water at the bottom of water tank. [Default: Every 10 freezing cycles]

P-4 / Anti-Slushing temperature . [Default : 34°F ]

- P-5 / Set water pump delay time to prevent ice from turning to slush. Set the pump motor to stop when the evaporator sensor reads the set temperature. This will prevent the ice from turning to slush. [Default : 15 seconds]
- P-6 / Set PCB program: Default setting depends on model.
- P-7 / Reset freezing cycle count: Reset freezing cycle count to zero. By reading the freezing cycles we can tell when a unit will need to have new filtration and also how long the unit has been in operation. This acts like the the ice machine odometer.
- P-8 / Set drainage time: [Default: 10 seconds]
- P-9 / Set water supply time during harvest -

P-10 / Set bin switch error alarm

If "Y" is set, the machine rings alarm when the bin switch is not properly assembled.

### 3 Troubleshooting

#### 3.1 Parts operation check

##### 3.1.1 Test mode

##### 1) How to get in test mode to check parts' operation

| # | Display Control Board   | Direction   |
|---|---|---|
| 1 |    | To turn off the machine: Press and hold the power button for 5 seconds.   |
| 2 |   | Press and hold wash button for 5 seconds to activate test mode.   |
| 3 |  | Off will be displayed.  |
| 4 |  | C will be displayed. The compressor will turn on to show the compressor is working.   |
| 5 | -   | To cycle through all the working parts of the machine simply press the wash button again. Refer to the table below for further information. |
| 6 |  | To exit the test mode, press and hold wash button when "off" is displayed on the display.   |

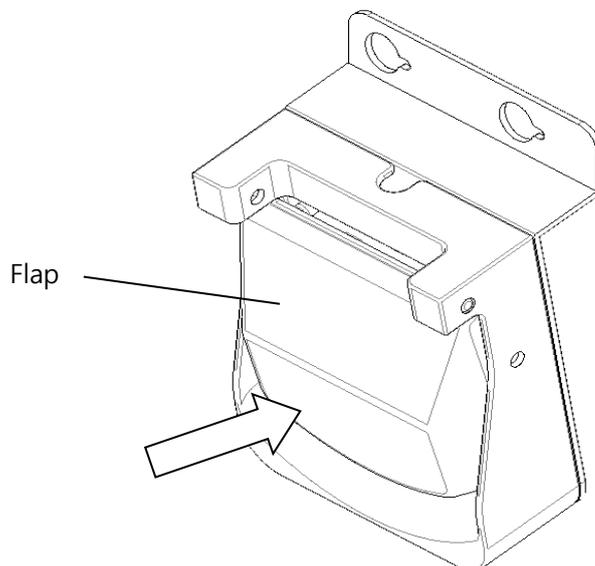
## 2) Test code meaning

| Number | Display | Function                        | Remarks           |
|--------|---------|---------------------------------|-------------------|
| 1      | OFF     |                                 |                   |
| 2      | C       | Compressor On                   |                   |
|        |         | Fan motor On                    |                   |
|        |         | Water valve On                  |                   |
| 3      | P       | Pump motor C.W On (Circulation) |                   |
| 4      | P1      | Pump motor C.C.W On (Drainage)  |                   |
| 5      | H       | Hot gas valve On                |                   |
| 6      | F       | Fan motor On                    |                   |
| 7      | E       | Water valve On                  |                   |
| 8      | AC      | Cleaning valve On               |                   |
| 9      | AS      | Water valve On                  |                   |
| 10     | d       | Drain On                        |                   |
| 11     | Dyc     | Water valve on                  | Factory use only. |
|        |         | Cleaning valve on               |                   |
|        |         | Drain valve on                  |                   |

\* The test mode only shows available parts for each machine. If the ice machine does not have a certain part, the test code for that part will not show up on the display.

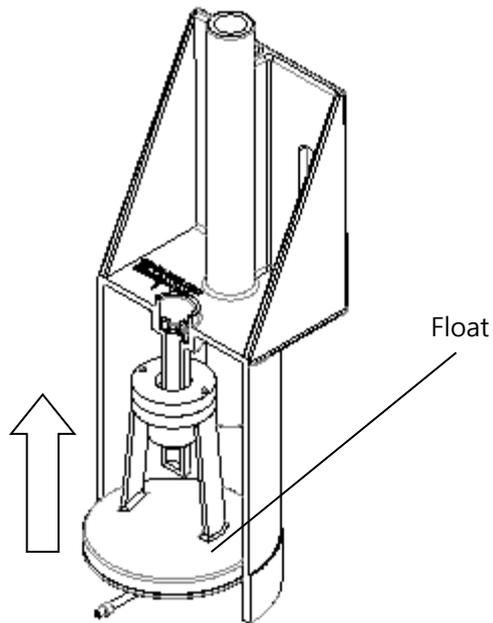
### 3.1.2 Sensor operation check

#### 1) Bin switch sensor



- Can be checked while the machine is in operation. (Water supply, Freezing, or Harvesting Cycles.)
- Press and hold down the plate flap on bin switch.
- [ FULL ] will be displayed after 10 seconds if the bin switch properly works.
- [ FULL ] will disappear within 5 seconds after releasing the plate flap.

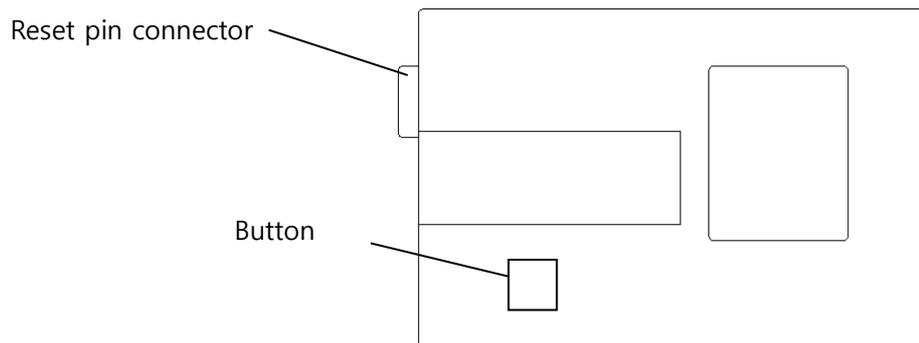
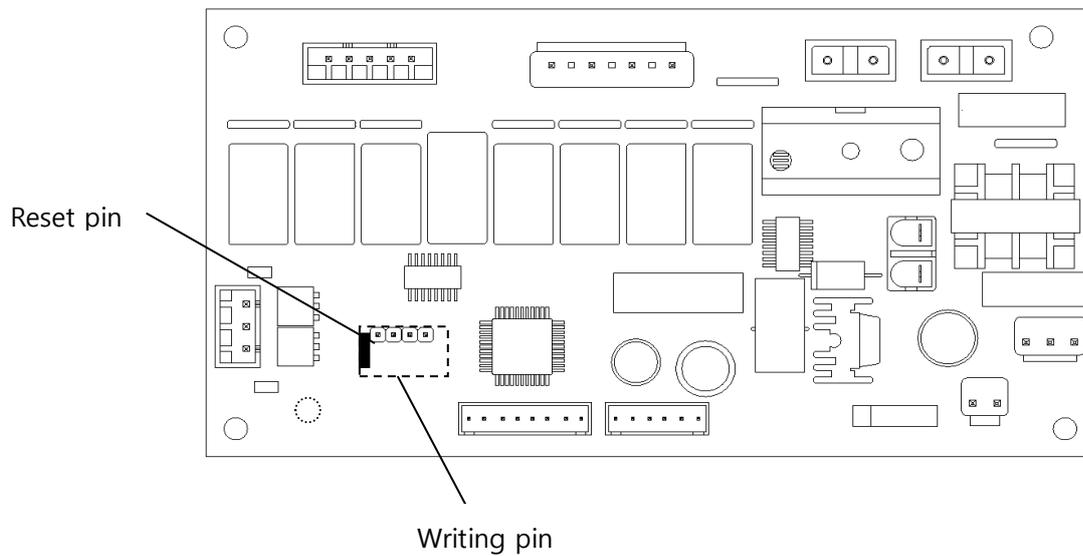
## 2) Water level sensor



- Can be checked while the machine is in operation. (Water supply, Freezing, or Harvesting Cycle.)
- Lift the float switch to its highest level, and then proceed to slowly push the float switch all the way down to the lowest position.
- The display will show a green light to indicate the float is at the lowest position. A Red light will appear if the float switch cannot sense the lowest position.

### 3.2 Main PCB program update

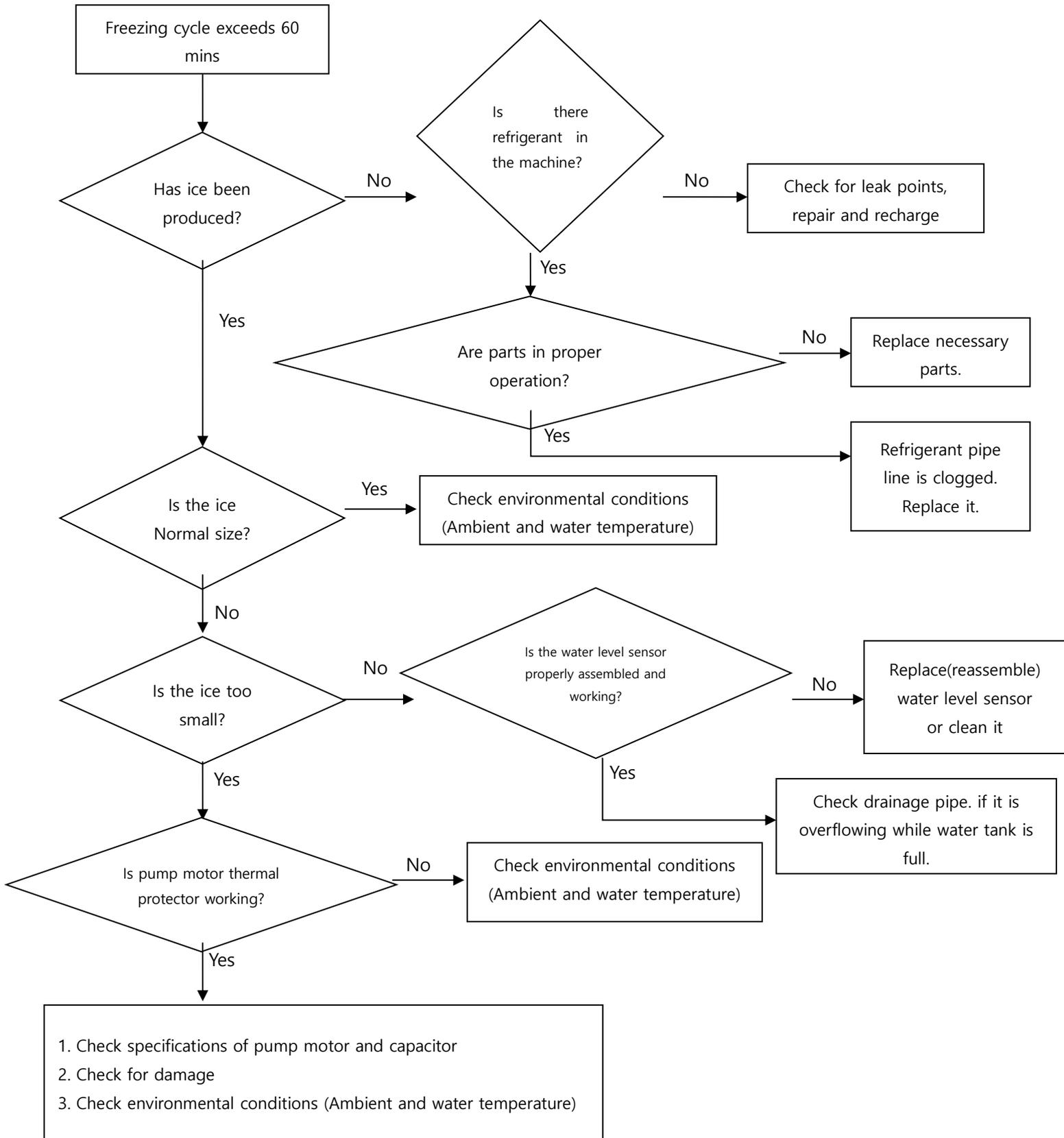
- The PCB program may be easily updated by using EPGM.



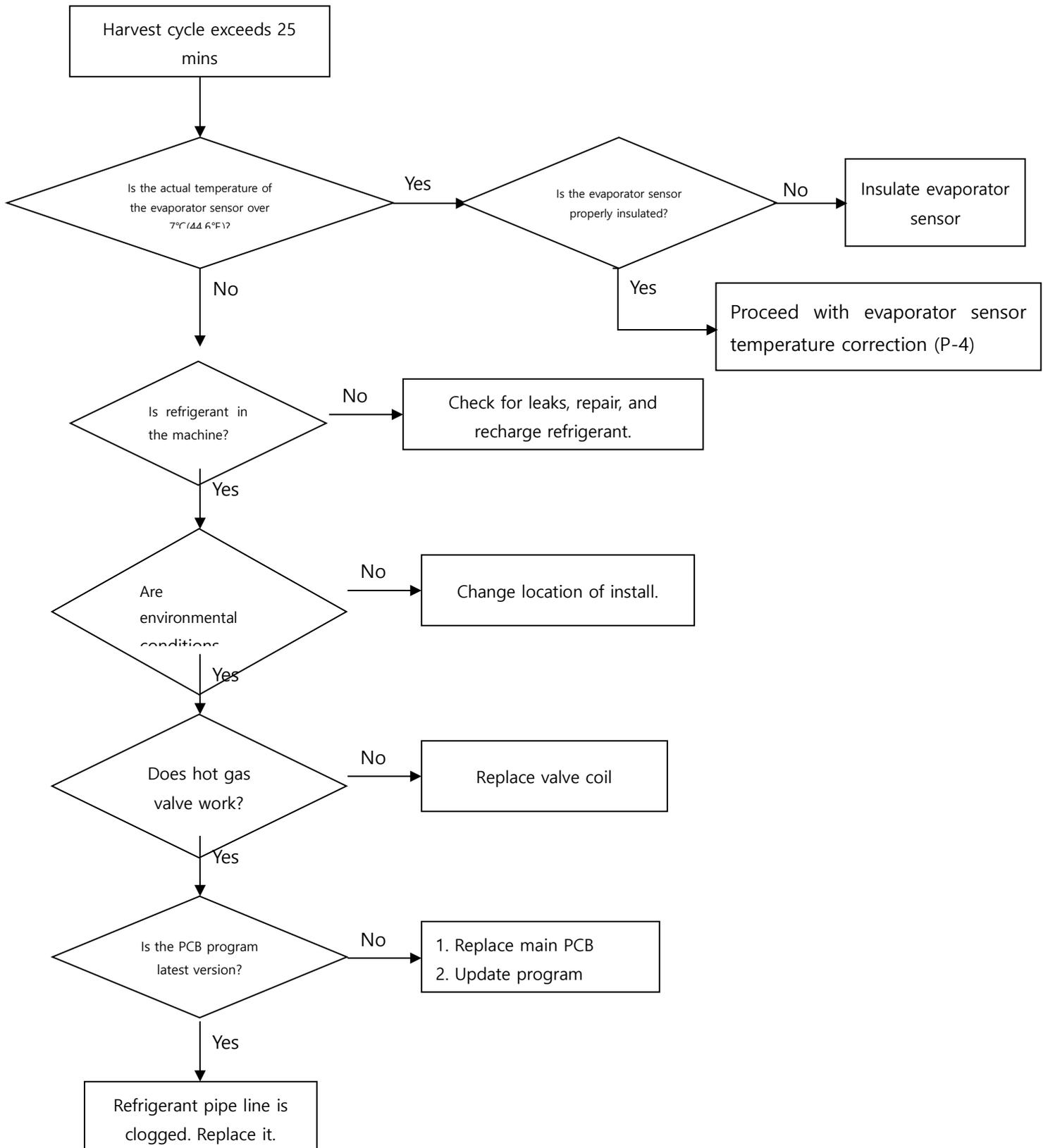
- To reset the PCB, Turn off the ice machine. Disconnect the machine from the main power source
- Connect EPGM to main power.
- Connect the reset pin connector from the EPGM to the reset pin on main PCB.
- Press button on EPGM.
- 'Beep' alarm will sound when update is done.

### 3.3 Error codes

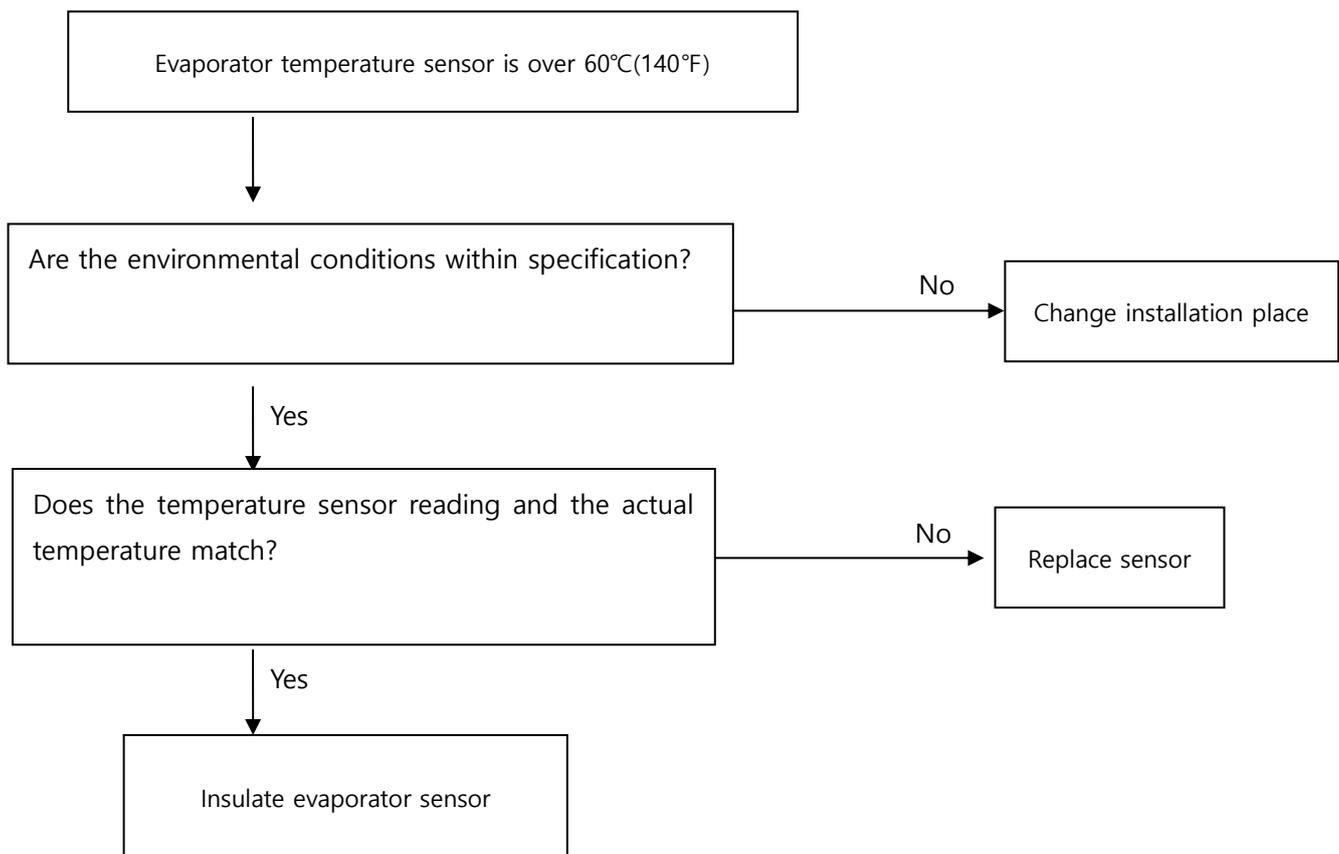
#### 3.3.1 E1 / Freezing cycle exceeds 60 minutes.



### 3.3.2 E2 / Harvest cycle exceeds 25 minutes.

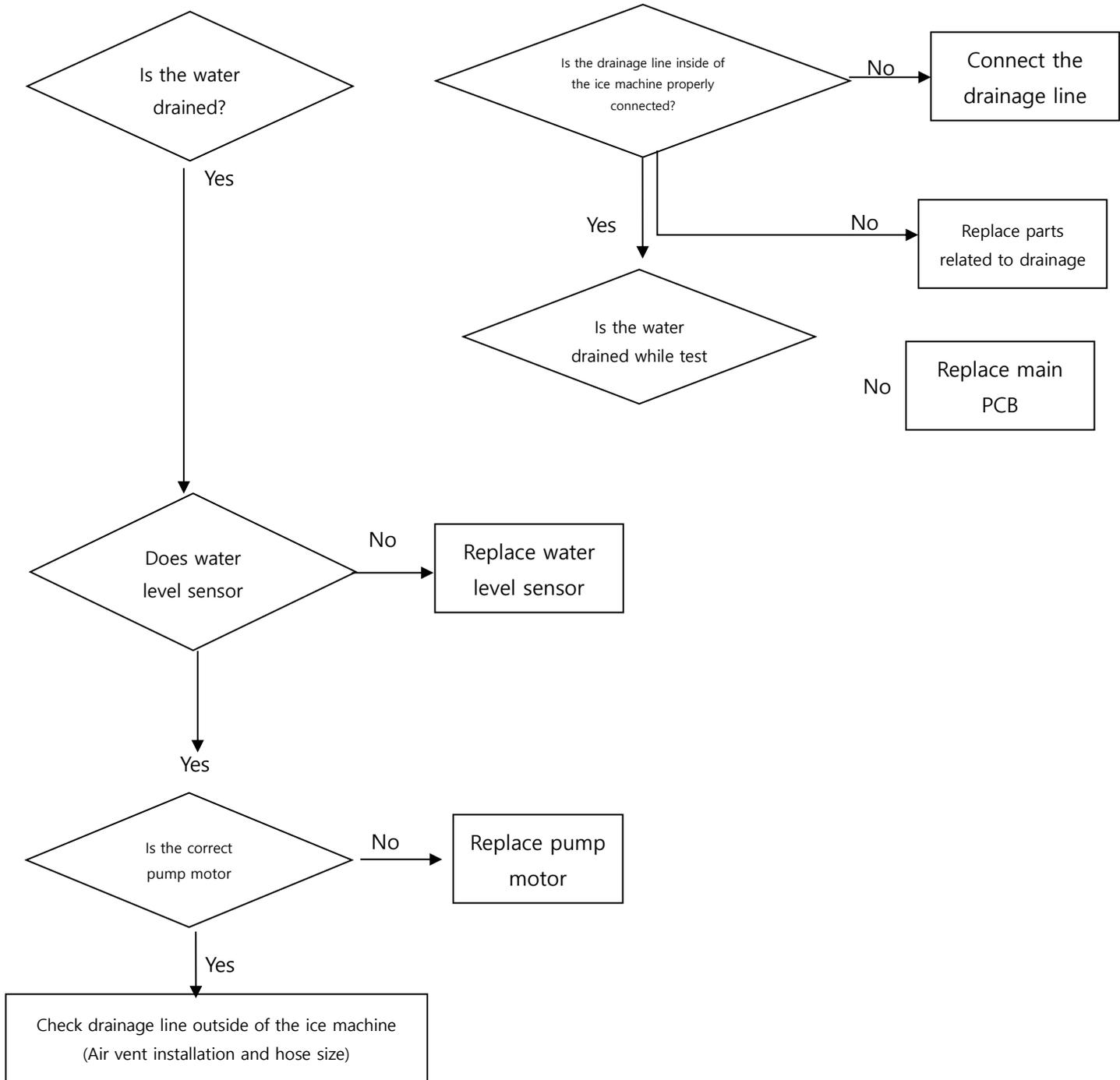


### 3.3.3 E3 / Evaporator sensor temperature is over 60°C(140°F)

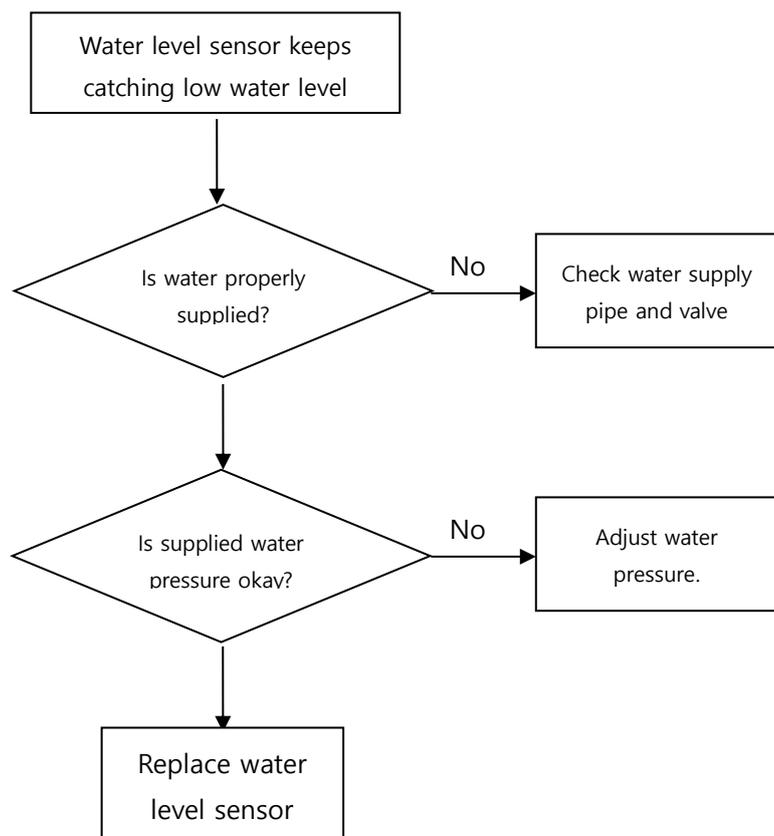


### 3.3.4 E4 / Water is not drained during full storage. - Feature removed in 2022.

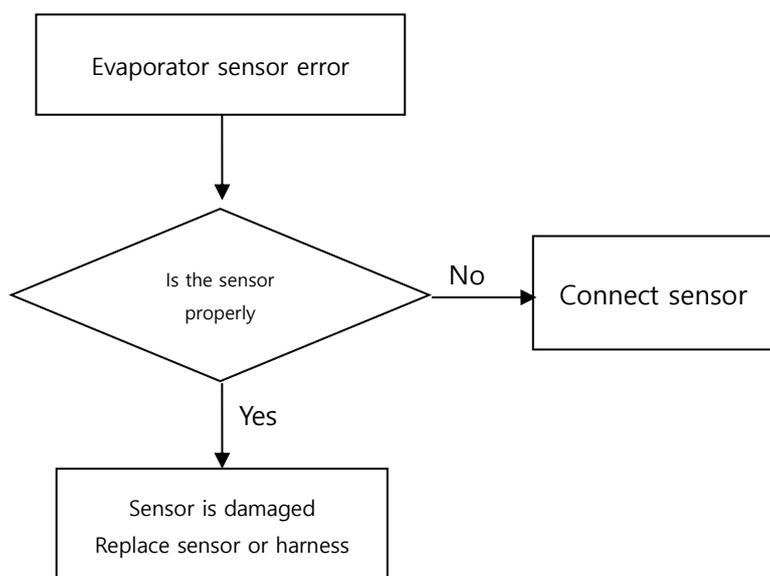
Water is not sufficiently drained within set drainage time  
(default: 480 seconds) when the ice storage bin is full.



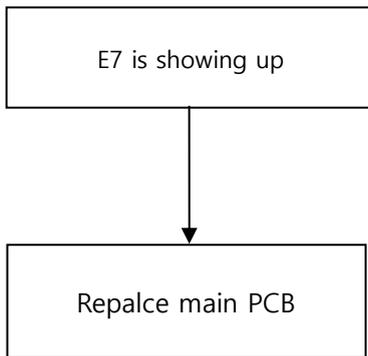
### 3.3.5 E5 / Water level sensor keeps catching low water level



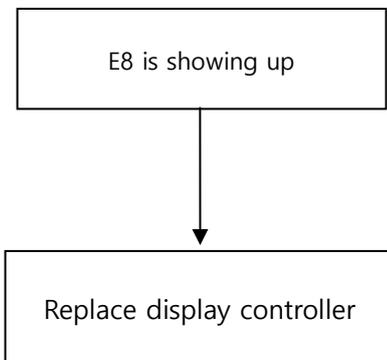
### 3.3.6 E6 / Evaporator sensor error



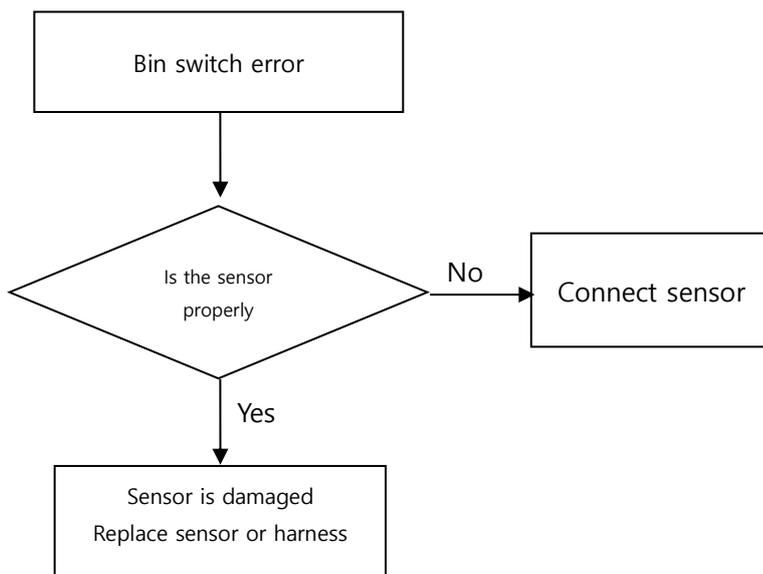
### 3.3.7 E7 / Main PCB program error



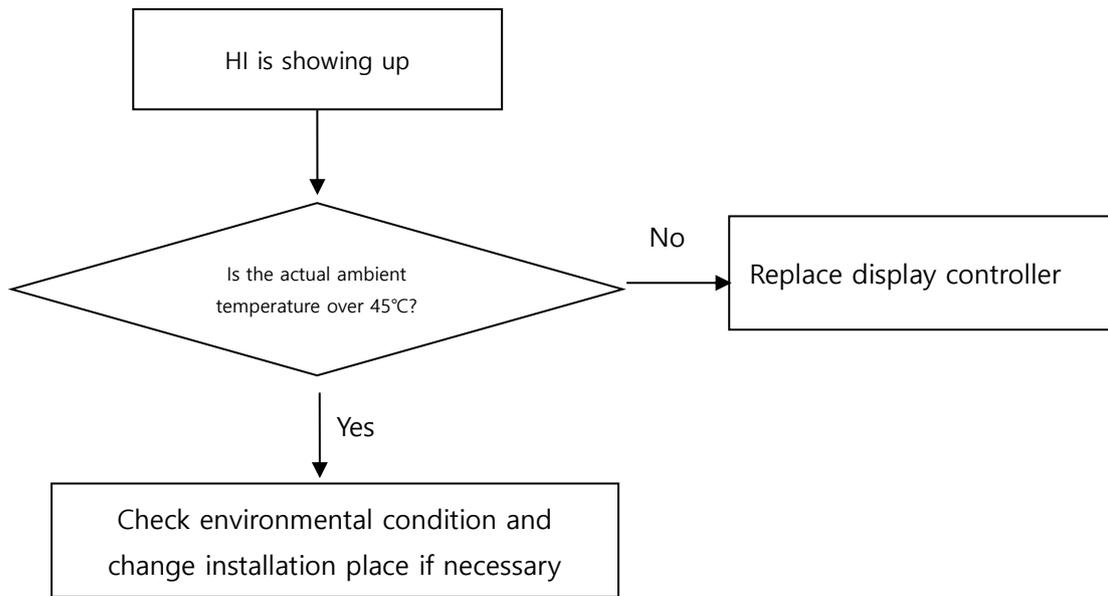
### 3.3.8 E8 / Ambient temperature error



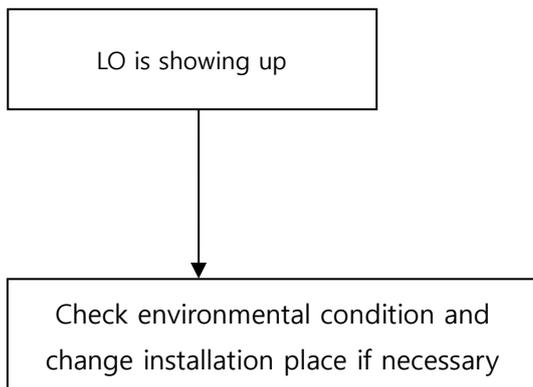
### 3.3.9 E9 / Bin switch error



### 3.3.10 HI / Ambient temperature is over 45°C(113°F)

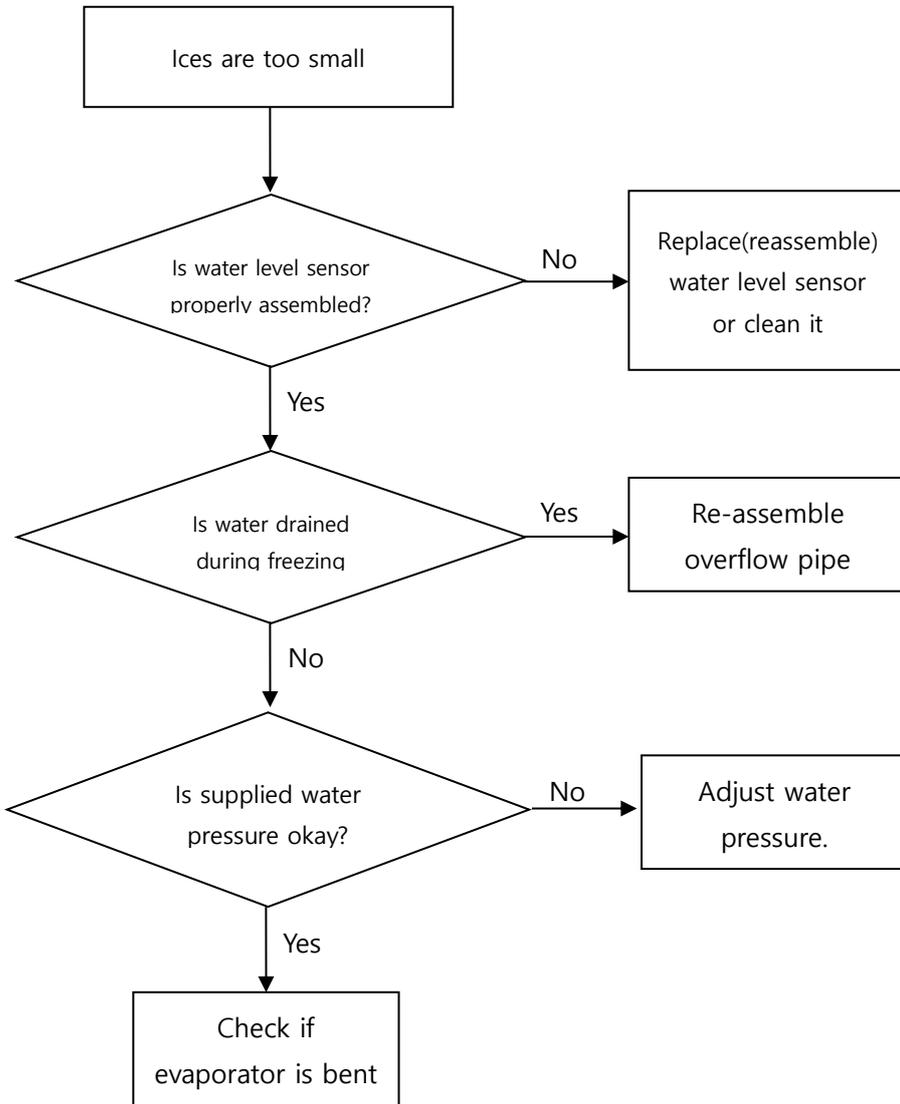


### 3.3.11 LO / Ambient temperature is lower than 5°C(41°F)

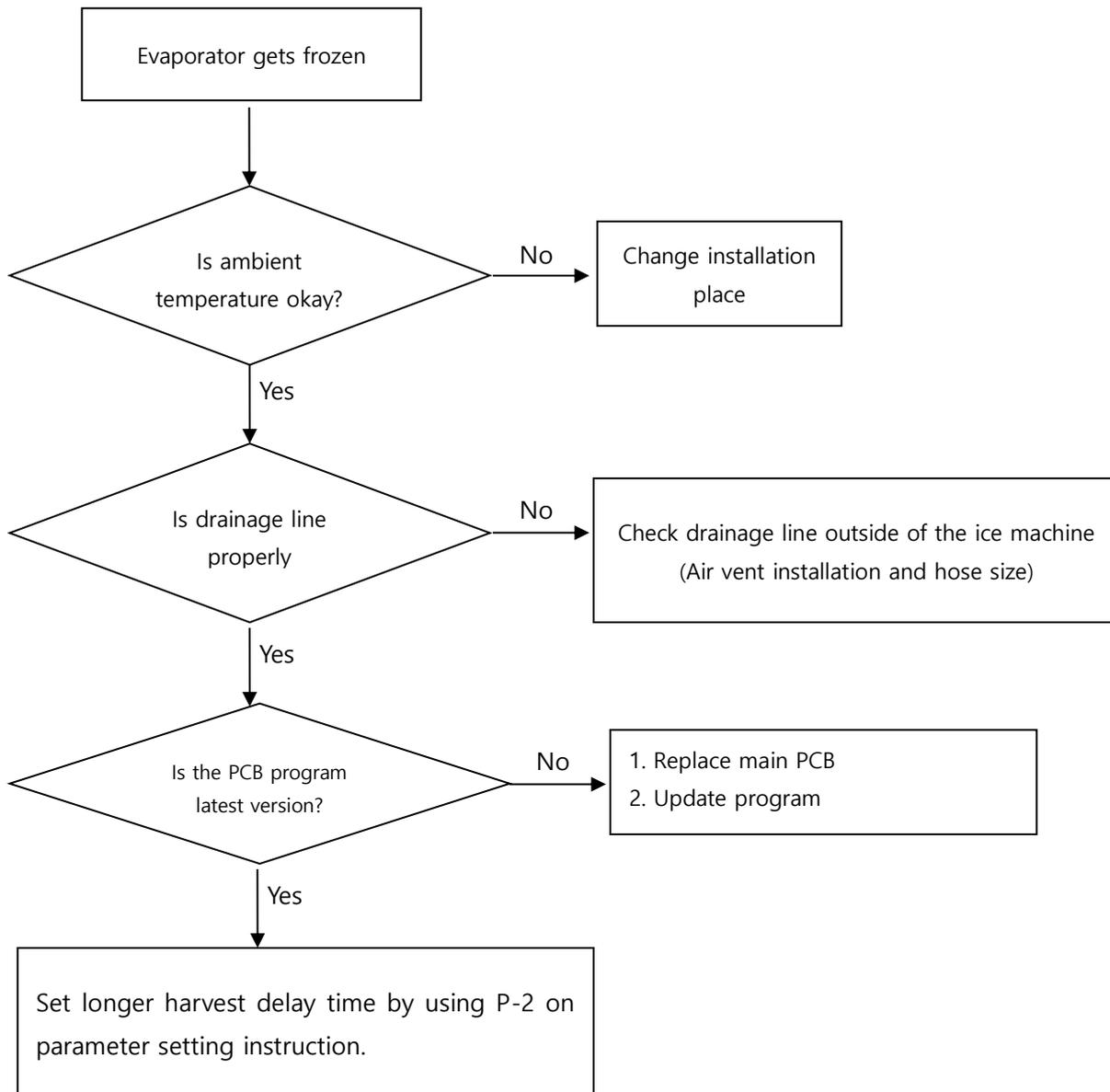


### 3.4 Problems and resolution

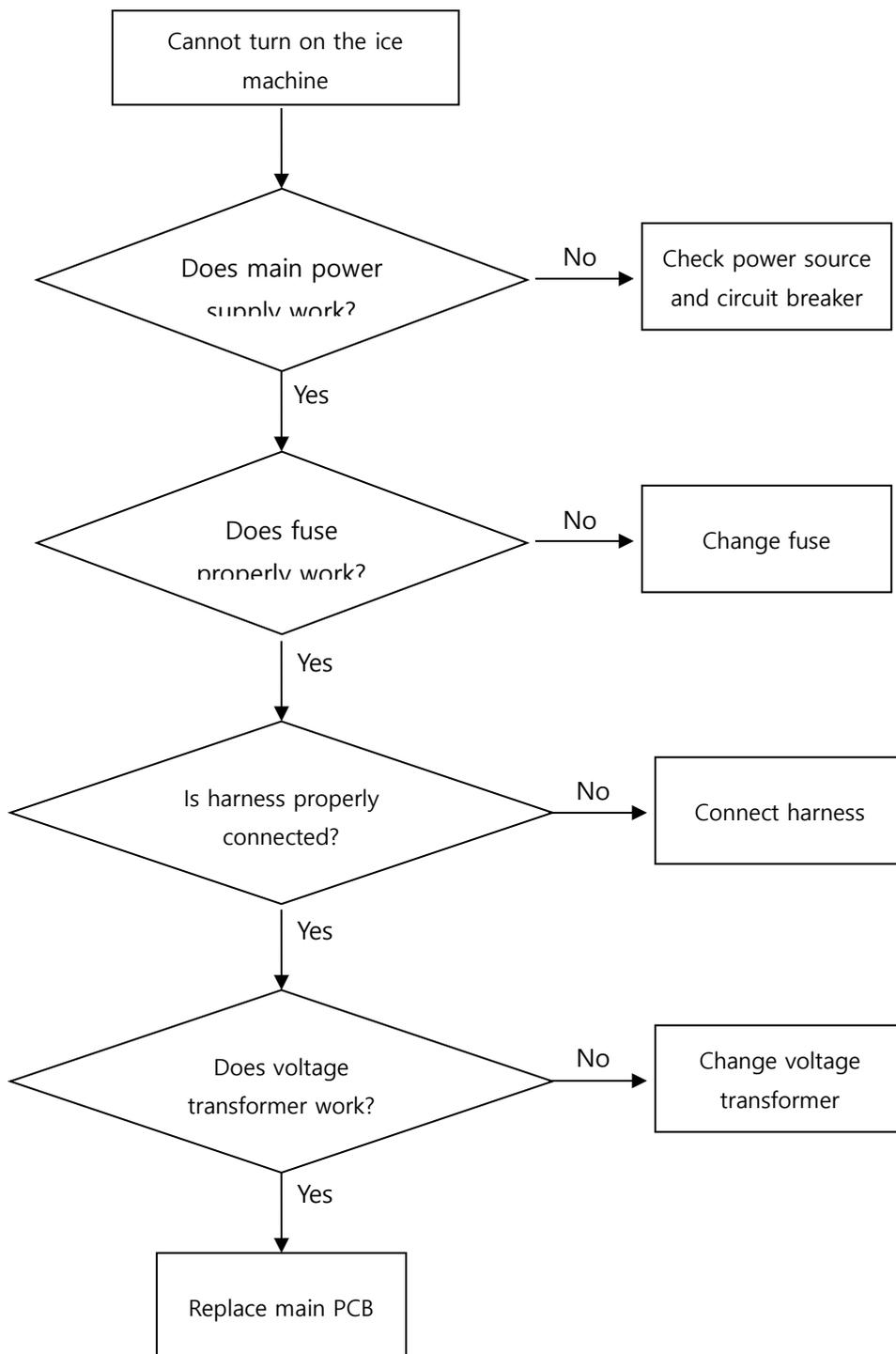
#### 3.4.1 Ices are too small



### 3.4.2 Evapoartor gets frozen



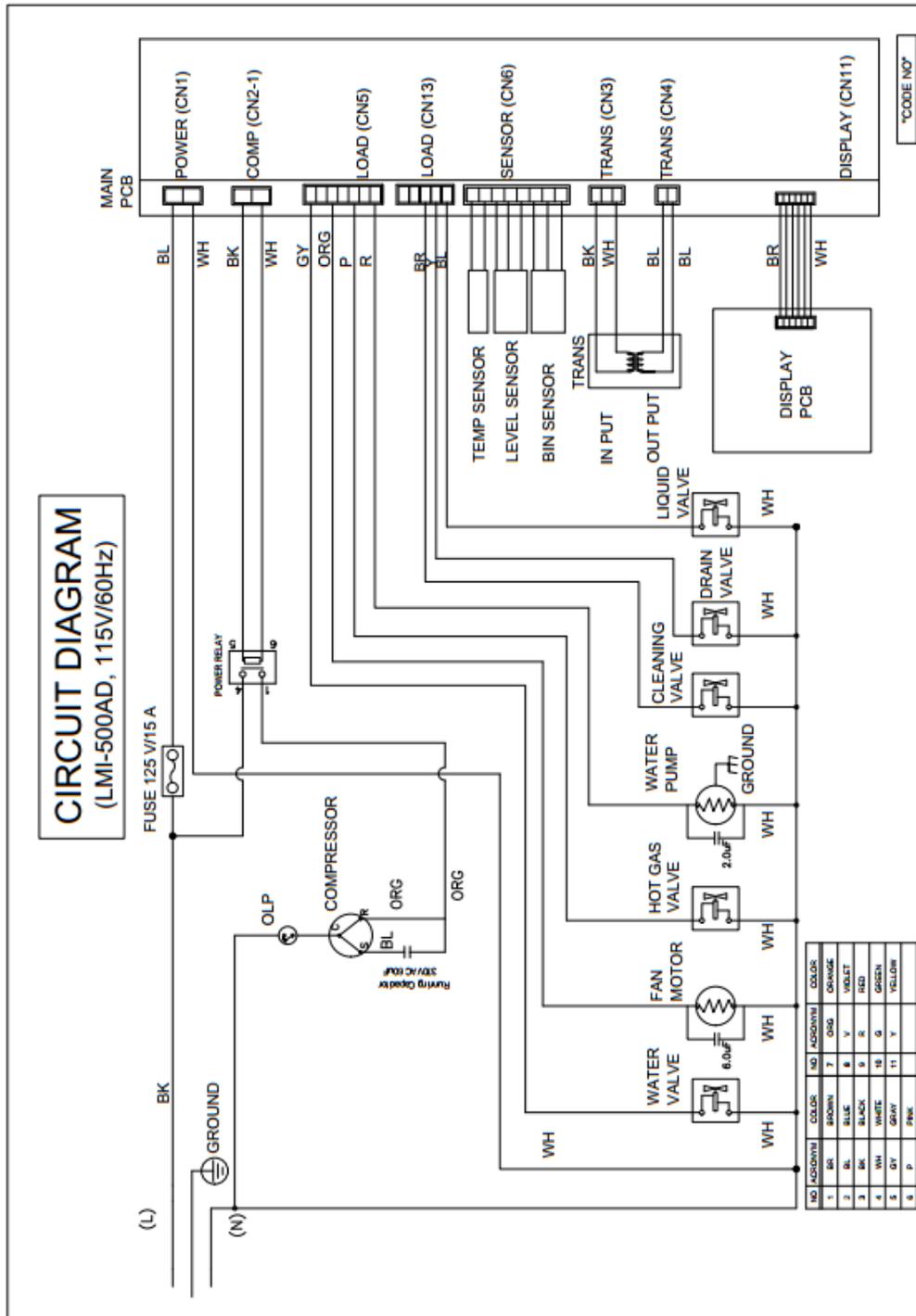
### 3.4.3 Cannot turn on the ice machine



## 4 Circuit diagrams and technical data

### 4.1 Circuit diagrams

#### 4.1.1 BLMI-500AD (115V/60Hz)



## 4.2 Performance data

### 4.2.1 BLMI-500AD (115V/60Hz)

| content   | Ambient Temp (°F/°C) | Water temp(°F/°C) |      |           |      |           |      |
|---|----------------------|-------------------|------|-----------|------|-----------|------|
|   |                      | 50°F/10°C         |      | 70°F/21°C |      | 90°F/32°C |      |
| Approximate electric consumption [W] (Stable after 5 min)             | 70/21                | 879               | 825  | 956       | 835  | 1010      | 840  |
|   | 80/27                | 958               | 890  | 1053      | 895  | 1107      | 898  |
|   | 90/32                | 1054              | 944  | 1075      | 952  | 1097      | 959  |
|   | 100/38               | 1125              | 1035 | 1148      | 1045 | 1203      | 1050 |
| Current consumption [A] (Stable after 5 min)                          | 70/21                | 8.1               | 7.7  | 8.8       | 7.8  | 9.2       | 7.8  |
|   | 80/27                | 8.8               | 8.2  | 9.6       | 8.3  | 10.1      | 8.3  |
|   | 90/32                | 9.6               | 8.7  | 9.8       | 8.7  | 10.0      | 8.8  |
|   | 100/38               | 10.2              | 9.4  | 10.4      | 9.5  | 10.9      | 9.6  |
| Approximate water consumption per 24hr [gal/day, m <sup>3</sup> /day] | 70/21                | 81                | 0.31 | 76        | 0.29 | 69        | 0.26 |
|   | 80/27                | 75                | 0.28 | 69        | 0.26 | 64        | 0.24 |
|   | 90/32                | 69                | 0.26 | 62        | 0.24 | 69        | 0.26 |
|   | 100/38               | 64                | 0.24 | 60        | 0.23 | 58        | 0.22 |
| Approximate electric consumption per 24hr [kWh/day]                   | 70/21                | 19.3              |      | 20.0      |      | 20.7      |      |
|   | 80/27                | 20.6              |      | 21.7      |      | 22.3      |      |
|   | 90/32                | 22.2              |      | 28.6      |      | 23.3      |      |
|   | 100/38               | 24.6              |      | 25.1      |      | 25.5      |      |
| Approximate ice production per 24hr [lb/day , kg/day]                 | 70/21                | 530               | 241  | 494       | 224  | 437       | 198  |
|   | 80/27                | 477               | 216  | 434       | 197  | 431       | 196  |
|   | 90/32                | 448               | 203  | 417       | 189  | 405       | 184  |
|   | 100/38               | 414               | 188  | 382       | 173  | 361       | 164  |
| Freezing cycle time [min]   | 70/21                | 21                |      | 23        |      | 25        |      |
|   | 80/27                | 23                |      | 25        |      | 28        |      |
|   | 90/32                | 25                |      | 29        |      | 26        |      |
|   | 100/38               | 28                |      | 30        |      | 32        |      |
| Harvest cycle time[min]   | 70/21                | 3.8               |      | 3.4       |      | 3.3       |      |
|   | 80/27                | 3.7               |      | 3.3       |      | 3.3       |      |
|   | 90/32                | 3.5               |      | 3.1       |      | 2.4       |      |
|   | 100/38               | 2.5               |      | 2.3       |      | 2.3       |      |

| content  |            | Ambient Temp (°F/°C) | Water temp(°F/°C) |      |           |      |           |      |
|--|------------|----------------------|-------------------|------|-----------|------|-----------|------|
|  |            |                      | 50°F/10°C         |      | 70°F/21°C |      | 90°F/32°C |      |
| High pressure in freezing (psig / kgf/cm <sup>2</sup> g) | after 5min | 70/21                | 312.9             | 22.0 | 344.9     | 24.3 | 369.1     | 26.0 |
|  |            | 80/27                | 362.0             | 25.5 | 394.0     | 27.7 | 414.6     | 29.2 |
|  |            | 90/32                | 406.1             | 28.6 | 416.4     | 29.3 | 426.7     | 30.0 |
|  |            | 100/38               | 449.5             | 31.6 | 458.0     | 32.2 | 475.1     | 33.4 |
|  | Stable     | 70/21                | 303.7             | 21.4 | 307.2     | 21.6 | 310.1     | 21.8 |
|  |            | 80/27                | 350.6             | 24.7 | 350.6     | 24.7 | 353.4     | 24.9 |
|  |            | 90/32                | 387.6             | 27.3 | 388.7     | 27.3 | 389.7     | 27.4 |
|  |            | 100/38               | 429.5             | 30.2 | 429.5     | 30.2 | 434.5     | 30.6 |
| Low pressure in freezing (psig / kgf/cm <sup>2</sup> g)  | after 5min | 70/21                | 70.4              | 5.0  | 91.0      | 6.4  | 105.3     | 7.4  |
|  |            | 80/27                | 76.8              | 5.4  | 98.1      | 6.9  | 112.4     | 7.9  |
|  |            | 90/32                | 84.6              | 6.0  | 89.3      | 6.3  | 93.9      | 6.6  |
|  |            | 100/38               | 85.3              | 6.0  | 93.9      | 6.6  | 101.0     | 7.1  |
|  | Stable     | 70/21                | 51.9              | 3.7  | 54.0      | 3.8  | 53.3      | 3.8  |
|  |            | 80/27                | 55.5              | 3.9  | 55.5      | 3.9  | 55.5      | 3.9  |
|  |            | 90/32                | 57.6              | 4.1  | 58.0      | 4.1  | 58.3      | 4.1  |
|  |            | 100/38               | 61.2              | 4.3  | 61.2      | 4.3  | 61.2      | 4.3  |
| High pressure in harvest (psig / kgf/cm <sup>2</sup> g)  | Stable     | 70/21                | 171.4             | 12.1 | 268.8     | 18.9 | 295.8     | 20.8 |
|  |            | 80/27                | 184.2             | 13.0 | 280.2     | 19.7 | 326.4     | 23.0 |
|  |            | 90/32                | 192.0             | 13.5 | 264.6     | 18.6 | 337.1     | 23.7 |
|  |            | 100/38               | 203.4             | 14.3 | 338.5     | 23.8 | 367.0     | 25.8 |
| Low pressure in harvest (psig / kgf/cm <sup>2</sup> g)   | Stable     | 70/21                | 128.7             | 9.1  | 209.1     | 14.7 | 235.4     | 16.6 |
|  |            | 80/27                | 133.7             | 9.4  | 214.8     | 15.1 | 257.4     | 18.1 |
|  |            | 90/32                | 138.0             | 9.7  | 240.4     | 16.9 | 266.0     | 18.7 |
|  |            | 100/38               | 142.9             | 10.1 | 266.0     | 18.7 | 291.6     | 20.5 |

### 4.3 Evaporator sensor data

| Temp'<br>(°C) | Resistance<br>(kΩ) | Temp'<br>(°C) | Resistance<br>(kΩ) | Temp'<br>(°C) | Resistance<br>(kΩ) | Temp'<br>(°C) | Resistance<br>(kΩ) |
|---------------|--------------------|---------------|--------------------|---------------|--------------------|---------------|--------------------|
| -40           | 87.8               | 0             | 13.29              | 40            | 2.97               | 80            | 0.886              |
| -39           | 83.3               | 1             | 12.75              | 41            | 2.87               | 81            | 0.862              |
| -38           | 79.0               | 2             | 12.23              | 42            | 2.78               | 82            | 0.839              |
| -37           | 75.0               | 3             | 11.73              | 43            | 2.69               | 83            | 0.817              |
| -36           | 71.2               | 4             | 11.26              | 44            | 2.60               | 84            | 0.795              |
| -35           | 67.6               | 5             | 10.81              | 45            | 2.52               | 85            | 0.774              |
| -34           | 64.2               | 6             | 10.38              | 46            | 2.44               | 86            | 0.754              |
| -33           | 61.0               | 7             | 9.97               | 47            | 2.36               | 87            | 0.734              |
| -32           | 58.0               | 8             | 9.58               | 48            | 2.28               | 88            | 0.715              |
| -31           | 55.1               | 9             | 9.21               | 49            | 2.21               | 89            | 0.697              |
| -30           | 52.5               | 10            | 8.85               | 50            | 2.14               | 90            | 0.679              |
| -29           | 49.9               | 11            | 8.51               | 51            | 2.08               | 91            | 0.661              |
| -28           | 47.5               | 12            | 8.18               | 52            | 2.01               | 92            | 0.645              |
| -27           | 45.2               | 13            | 7.87               | 53            | 1.95               | 93            | 0.628              |
| -26           | 43.1               | 14            | 7.57               | 54            | 1.89               | 94            | 0.612              |
| -25           | 41.0               | 15            | 7.28               | 55            | 1.83               | 95            | 0.597              |
| -24           | 39.1               | 16            | 7.01               | 56            | 1.78               | 96            | 0.582              |
| -23           | 37.2               | 17            | 6.75               | 57            | 1.72               | 97            | 0.568              |
| -22           | 35.5               | 18            | 6.50               | 58            | 1.67               | 98            | 0.554              |
| -21           | 33.9               | 19            | 6.26               | 59            | 1.62               | 99            | 0.540              |
| -20           | 32.3               | 20            | 6.03               | 60            | 1.57               | 100           | 0.527              |
| -19           | 30.8               | 21            | 5.80               | 61            | 1.53               | 101           | 0.514              |
| -18           | 29.4               | 22            | 5.59               | 62            | 1.48               | 102           | 0.501              |
| -17           | 28.1               | 23            | 5.39               | 63            | 1.44               | 103           | 0.489              |
| -16           | 26.8               | 24            | 5.20               | 64            | 1.40               | 104           | 0.477              |
| -15           | 25.6               | 25            | 5.01               | 65            | 1.35               | 105           | 0.466              |
| -14           | 24.5               | 26            | 4.83               | 66            | 1.32               | 106           | 0.455              |
| -13           | 23.4               | 27            | 4.66               | 67            | 1.28               | 107           | 0.444              |
| -12           | 22.4               | 28            | 4.50               | 68            | 1.24               | 108           | 0.434              |
| -11           | 21.4               | 29            | 4.34               | 69            | 1.21               | 109           | 0.423              |
| -10           | 20.4               | 30            | 4.19               | 70            | 1.17               | 110           | 0.414              |
| -9            | 19.6               | 31            | 4.04               | 71            | 1.14               | 111           | 0.404              |
| -8            | 18.7               | 32            | 3.90               | 72            | 1.11               | 112           | 0.395              |
| -7            | 17.9               | 33            | 3.77               | 73            | 1.08               | 113           | 0.385              |
| -6            | 17.2               | 34            | 3.64               | 74            | 1.05               | 114           | 0.377              |
| -5            | 16.4               | 35            | 3.52               | 75            | 1.02               | 115           | 0.368              |
| -4            | 15.7               | 36            | 3.40               | 76            | 0.99               | 116           | 0.360              |
| -3            | 15.1               | 37            | 3.29               | 77            | 0.96               | 117           | 0.351              |
| -2            | 14.5               | 38            | 3.18               | 78            | 0.94               | 118           | 0.343              |
| -1            | 13.9               | 39            | 3.07               | 79            | 0.91               | 119           | 0.336              |
| 0             | 13.3               | 40            | 2.97               | 80            | 0.89               | 120           | 0.328              |