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# HOSHIZAKI
# MODULAR FLAKER

## MODEL FM-481AGE
## FM-481AWGE
## FM-481AGE-N
## FM-481AWGE-N

## SERVICE MANUAL

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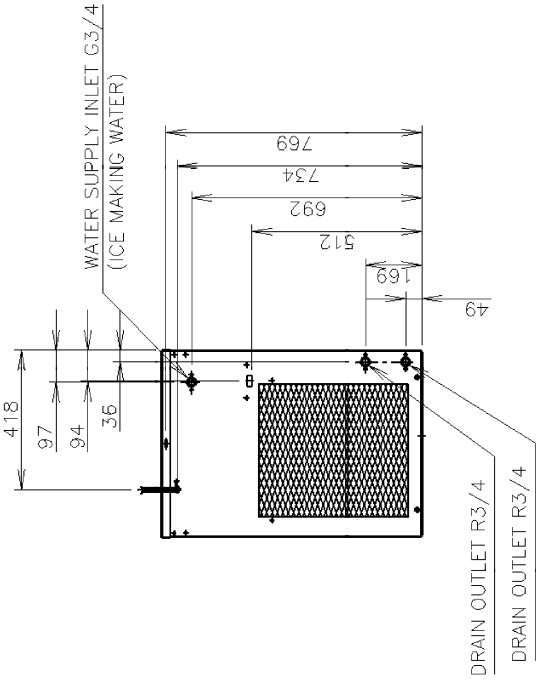
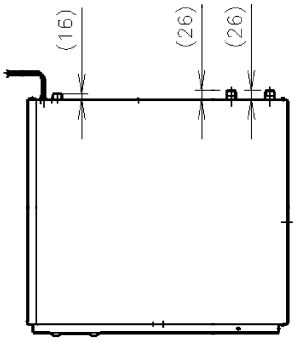
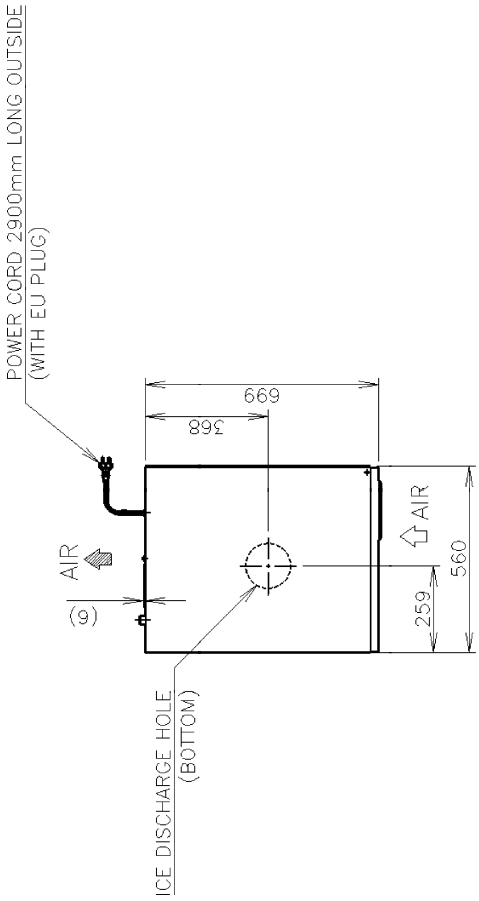
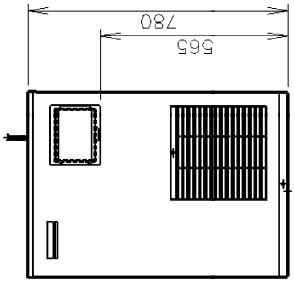


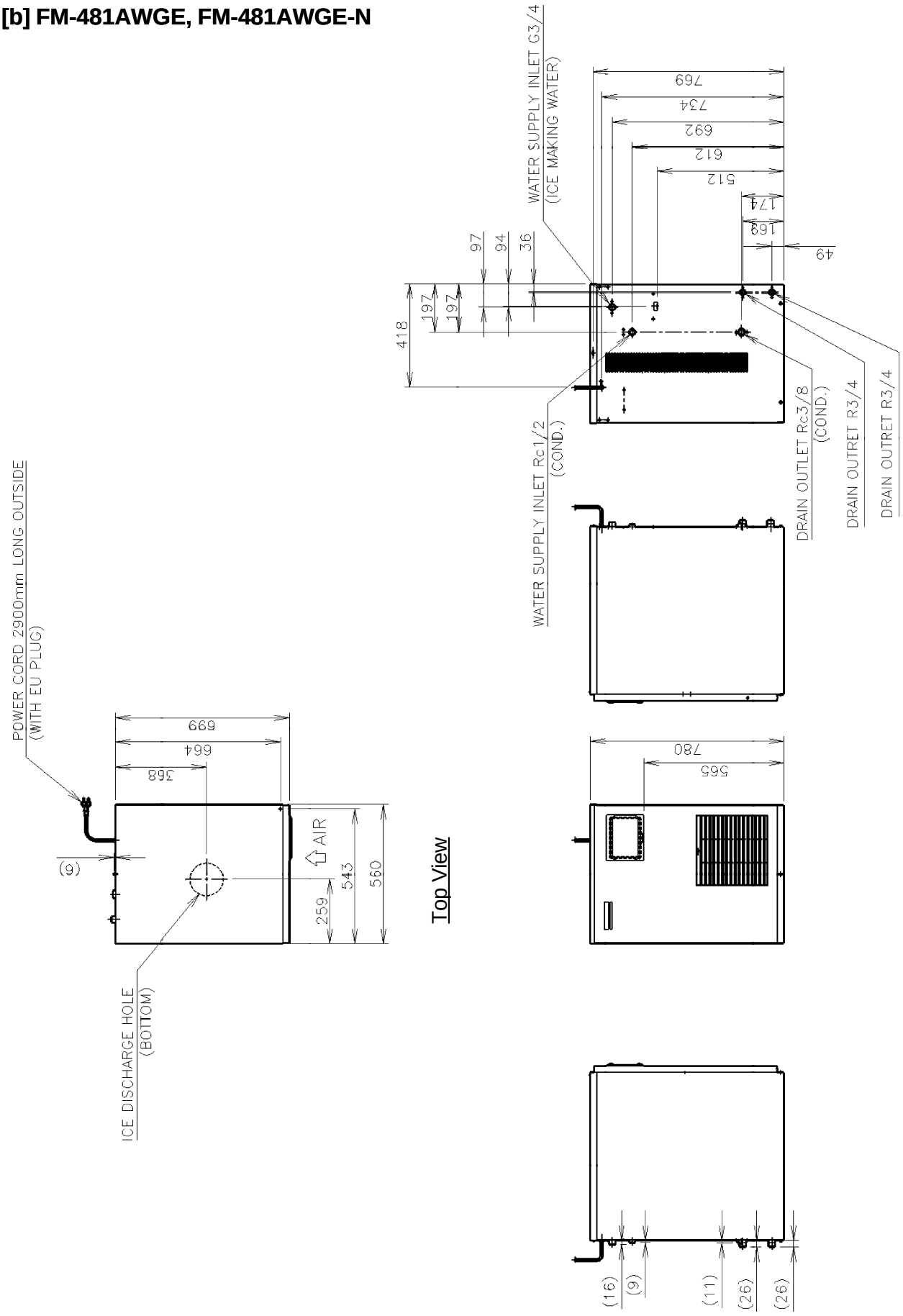



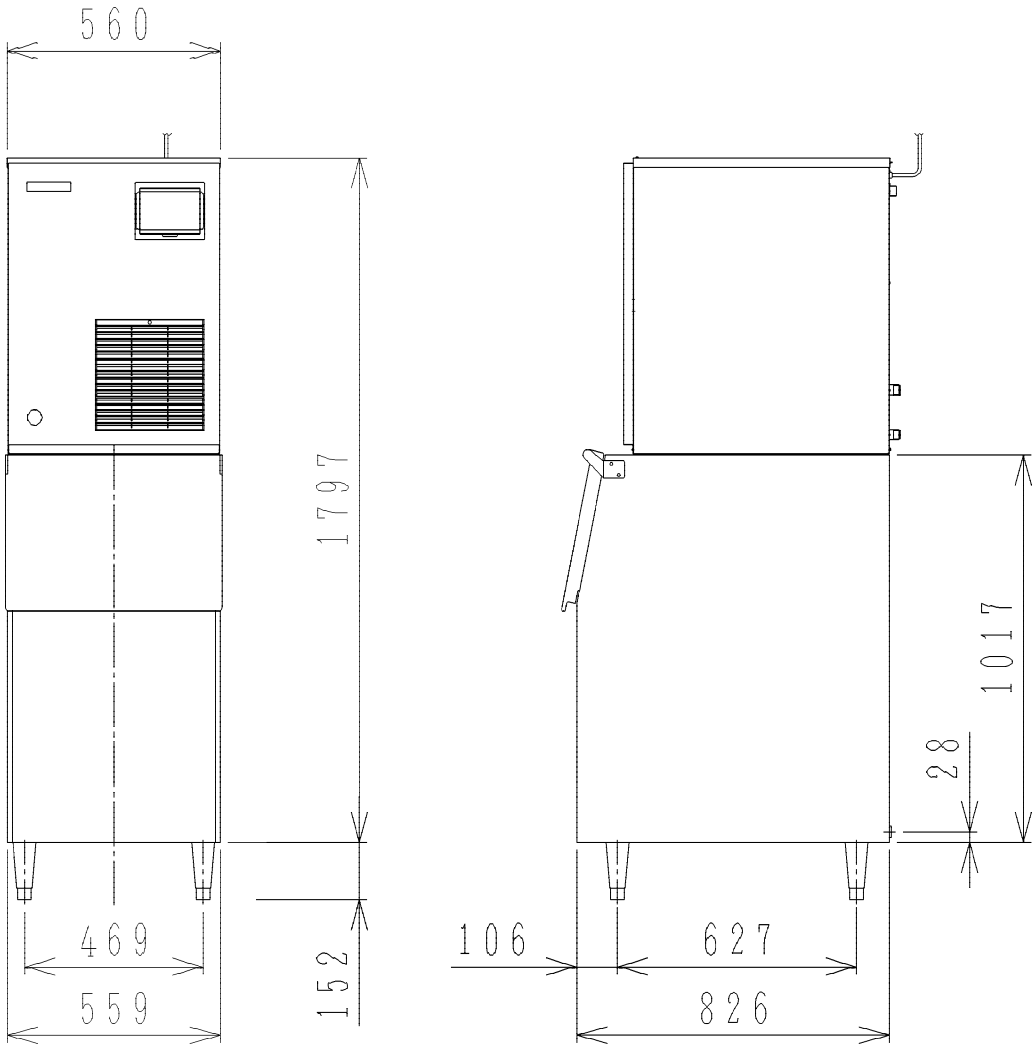

Top View



## [b] FM-481AWGE, FM-481AWGE-N



## [c] WITH STORAGE BIN (B-300_F)



# 2. SPECIFICATIONS

## [a] FM-481AGE

| | |
|---|---|
| AC SUPPLY VOLTAGE | 1 PHASE 230V 50Hz |
| AMPERAGE | 7.5A (Ambient temp. 32°C, Water temp. 21°C) |
| STARTING AMPERAGE | 30.5A |
| ELECTRIC CONSUMPTION | 1522W (Ambient temp. 32°C, Water temp. 21°C) |
| POWER FACTOR | 88% |
| POWER SUPPLY CAPACITY | Min 3.1kVA (13.3A) |
| ICE PRODUCTION PER 24h | Approx. 500 kg (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 425 kg (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 325 kg (Ambient temp. 32°C, Water temp. 21°C) |
| WATER CONSUMPTION PER 24h | Approx. 0.500 $m^3$ (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 0.425 $m^3$ (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 0.325 $m^3$ (Ambient temp. 32°C, Water temp. 21°C) |
| SHAPE OF ICE | Flake |
| MAX. STORAGE CAPACITY | Not Applicable |
| DIMENSIONS (DRAWING No.) | 560(W) x 699(D) x 780(H) (348158) |
| EXTERIOR | Stainless Steel, Galvanized Steel (Rear) |
| INSULATION | Polyurethane Foam |
| CONNECTION - ELECTRIC | Y-type Con. (with Plug) |
| - WATER SUPPLY | Inlet G 3/4" (Connected at rear side) |
| - DRAIN | Outlet R 3/4" x 2 (Connected at rear side) |
| ICE MAKING SYSTEM | Auger type |
| HARVESTING SYSTEM | Direct driven Auger (200W Gear Motor) |
| COMPRESSOR | Hermetic Compressor Model RS80C2E-CAZ-219 |
| CONDENSER | Fin and Tube type forced air cooling |
| HEAT REJECTION | 3150W (Ambient temp. 32°C, Water temp. 21°C) |
| EVAPORATOR | Copper Tube on Cylinder |
| REFRIGERANT CONTROL | Thermostatic Expansion Valve |
| REFRIGERANT CHARGE | R404A 770g |
| BIN CONTROL SYSTEM | Mechanical Bin Control (Time Delay Controlled) |
| ICE MAKING WATER CONTROL | Float Switch and Water Valve |
| ELECTRICAL PROTECTION | Class I Appliance |
| COMPRESSOR PROTECTION | Auto-reset Overload Protector, Auto-reset Pressure Switch |
| GEAR MOTOR PROTECTION | Manual-reset Circuit Breaker, Auto-reset Thermal Protector |
| LOW WATER PROTECTION | Float Switch and CM Controller |
| BIN CONTROL PROTECTION | Mechanical Switch |
| WEIGHT | Net weight 97 kg / Gross weight 118 kg |
| PACKAGE | Carton 671mm(W) x 820mm(D) x 910mm(H) |
| ACCESSORIES | Scoop, Mounting Bracket, Installation Kit |
| OPERATION CONDITIONS | |
| AMBIENT TEMP. | 5-40°C |
| WATER SUPPLY TEMP. | 5-35°C |
| WATER SUPPLY PRESSURE | 0.5-8 bar (0.05-0.8MPa) |
| VOLTAGE RANGE | Rated Voltage ± 10% |
| We reserve the right to make changes in specifications and design without prior notice. | |

## [b] FM-481AWGE

| | |
|---|---|
| AC SUPPLY VOLTAGE | 1 PHASE 230V 50Hz |
| AMPERAGE | 6.7A (Ambient temp. 32°C, Water temp. 21°C) |
| STARTING AMPERAGE | 30.5A |
| ELECTRIC CONSUMPTION | 1321W (Ambient temp. 32°C, Water temp. 21°C) |
| POWER FACTOR | 86% |
| POWER SUPPLY CAPACITY | Min 3.1kVA (13.3A) |
| ICE PRODUCTION PER 24h | Approx. 420 kg (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 380 kg (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 340 kg (Ambient temp. 32°C, Water temp. 21°C) |
| WATER CONSUMPTION PER 24h | Approx. 2.022 $m^3$ (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 2.244 $m^3$ (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 2.822 $m^3$ (Ambient temp. 32°C, Water temp. 21°C) |
| SHAPE OF ICE | Flake |
| MAX. STORAGE CAPACITY | Not Applicable |
| DIMENSIONS (DRAWING No.) | 560(W) x 699(D) x 780(H) (348159) |
| EXTERIOR | Stainless Steel, Galvanized Steel (Rear) |
| INSULATION | Polyurethane Foam |
| CONNECTION - ELECTRIC | Y-type Con. (with Plug) |
| - WATER SUPPLY | Inlet G 3/4" (Connected at rear side)<br>Cond. Inlet Rc 1/2" (Connected at rear side) |
| - DRAIN | Outlet R 3/4" x 2 (Connected at rear side)<br>Cond. Outlet Rc 3/8" (Connected at rear side) |
| ICE MAKING SYSTEM | Auger type |
| HARVESTING SYSTEM | Direct driven Auger (200W Gear Motor) |
| COMPRESSOR | Hermetic Compressor Model RS80C2E-CAZ-219 |
| CONDENSER | Water cooled, Tube in Tube Type |
| EVAPORATOR | Copper Tube on Cylinder |
| REFRIGERANT CONTROL | Thermostatic Expansion Valve |
| REFRIGERANT CHARGE | R404A 450g |
| BIN CONTROL SYSTEM | Mechanical Bin Control (Time Delay Controlled) |
| ICE MAKING WATER CONTROL | Float Switch and Water Valve |
| ELECTRICAL PROTECTION | Class I Appliance |
| COMPRESSOR PROTECTION | Auto-reset Overload Protector, Auto-reset Pressure Switch |
| GEAR MOTOR PROTECTION | Manual-reset Circuit Breaker, Auto-reset Thermal Protector |
| LOW WATER PROTECTION | Float Switch and CM Controller |
| BIN CONTROL PROTECTION | Mechanical Switch |
| WEIGHT | Net weight 97 kg / Gross weight 118 kg |
| PACKAGE | Carton 671mm(W) x 820mm(D) x 910mm(H) |
| ACCESSORIES | Scoop, Mounting Bracket, Installation Kit |
| OPERATION CONDITIONS | |
| AMBIENT TEMP. | 5-40°C |
| WATER SUPPLY TEMP. | 5-35°C |
| WATER SUPPLY PRESSURE | 0.5-8 bar (0.05-0.8MPa) |
| VOLTAGE RANGE | Rated Voltage ± 10% |
| We reserve the right to make changes in specifications and design without prior notice. | |

## [c] FM-481AGE-N

| | |
|---|---|
| AC SUPPLY VOLTAGE | 1 PHASE 230V 50Hz |
| AMPERAGE | 7.15A (Ambient temp. 32°C, Water temp. 21°C) |
| STARTING AMPERAGE | 30.5A |
| ELECTRIC CONSUMPTION | 1464W (Ambient temp. 32°C, Water temp. 21°C) |
| POWER FACTOR | 89% |
| POWER SUPPLY CAPACITY | Min 2.2kVA (9.6A) |
| ICE PRODUCTION PER 24h | Approx. 430 kg (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 360 kg (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 290 kg (Ambient temp. 32°C, Water temp. 21°C) |
| WATER CONSUMPTION PER 24h | Approx. 0.430 $m^3$ (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 0.360 $m^3$ (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 0.290 $m^3$ (Ambient temp. 32°C, Water temp. 21°C) |
| SHAPE OF ICE | Nugget |
| MAX. STORAGE CAPACITY | Not Applicable |
| DIMENSIONS (DRAWING No.) | 560(W) x 699(D) x 780(H) (350938) |
| EXTERIOR | Stainless Steel, Galvanized Steel (Rear) |
| INSULATION | Polyurethane Foam |
| CONNECTION - ELECTRIC | Y-type Con. (with Plug) |
| - WATER SUPPLY | Inlet G 3/4" (Connected at rear side) |
| - DRAIN | Outlet R 3/4" x 2 (Connected at rear side) |
| ICE MAKING SYSTEM | Auger type |
| HARVESTING SYSTEM | Direct driven Auger (200W Gear Motor) |
| COMPRESSOR | Hermetic Compressor Model RS80C2E-CAZ-219 |
| CONDENSER | Fin and Tube type forced air cooling |
| HEAT REJECTION | 2500W (Ambient temp. 32°C, Water temp. 21°C) |
| EVAPORATOR | Copper Tube on Cylinder |
| REFRIGERANT CONTROL | Thermostatic Expansion Valve |
| REFRIGERANT CHARGE | R404A 770g |
| BIN CONTROL SYSTEM | Mechanical Bin Control (Time Delay Controlled) |
| ICE MAKING WATER CONTROL | Float Switch and Water Valve |
| ELECTRICAL PROTECTION | Class I Appliance |
| COMPRESSOR PROTECTION | Auto-reset Overload Protector, Auto-reset Pressure Switch |
| GEAR MOTOR PROTECTION | Manual-reset Circuit Breaker, Auto-reset Thermal Protector |
| LOW WATER PROTECTION | Float Switch and CM Controller |
| BIN CONTROL PROTECTION | Mechanical Switch |
| WEIGHT | Net weight 97 kg / Gross weight 118 kg |
| PACKAGE | Carton 671mm(W) x 820mm(D) x 910mm(H) |
| ACCESSORIES | Scoop, Mounting Bracket, Installation Kit |
| OPERATION CONDITIONS | |
| AMBIENT TEMP. | 5-40°C |
| WATER SUPPLY TEMP. | 5-35°C |
| WATER SUPPLY PRESSURE | 0.5-8 bar (0.05-0.8MPa) |
| VOLTAGE RANGE | Rated Voltage ± 10% |
| We reserve the right to make changes in specifications and design without prior notice. | |

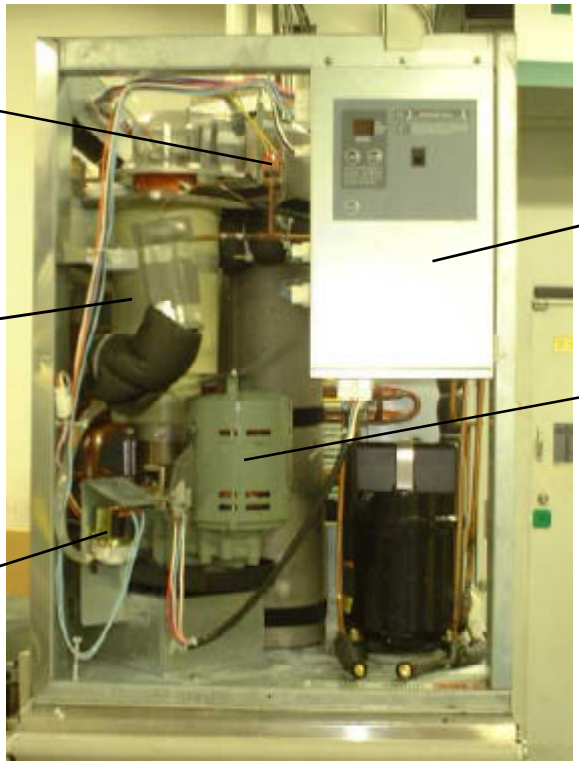
## [d] FM-481AWGE-N

| | |
|---|---|
| AC SUPPLY VOLTAGE | 1 PHASE 230V 50Hz |
| AMPERAGE | 6.74A (Ambient temp. 32°C, Water temp. 21°C) |
| STARTING AMPERAGE | 30.5A |
| ELECTRIC CONSUMPTION | 1356W (Ambient temp. 32°C, Water temp. 21°C) |
| POWER FACTOR | 87% |
| POWER SUPPLY CAPACITY | Min 2.0kVA (8.7A) |
| ICE PRODUCTION PER 24h | Approx. 380 kg (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 350 kg (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 320 kg (Ambient temp. 32°C, Water temp. 21°C) |
| WATER CONSUMPTION PER 24h | Approx. 1.988 $m^3$ (Ambient temp. 10°C, Water temp. 10°C)<br>Approx. 2.304 $m^3$ (Ambient temp. 21°C, Water temp. 15°C)<br>Approx. 2.746 $m^3$ (Ambient temp. 32°C, Water temp. 21°C) |
| SHAPE OF ICE | Nugget |
| MAX. STORAGE CAPACITY | Not Applicable |
| DIMENSIONS (DRAWING No.) | 560(W) x 699(D) x 780(H) (350939) |
| EXTERIOR | Stainless Steel, Galvanized Steel (Rear) |
| INSULATION | Polyurethane Foam |
| CONNECTION - ELECTRIC | Y-type Con. (with Plug) |
| - WATER SUPPLY | Inlet G 3/4" (Connected at rear side)<br>Cond. Inlet Rc 1/2" (Connected at rear side) |
| - DRAIN | Outlet R 3/4" x 2 (Connected at rear side)<br>Cond. Outlet Rc 3/8" (Connected at rear side) |
| ICE MAKING SYSTEM | Auger type |
| HARVESTING SYSTEM | Direct driven Auger (200W Gear Motor) |
| COMPRESSOR | Hermetic Compressor Model RS80C2E-CAZ-219 |
| CONDENSER | Water cooled, Tube in Tube Type |
| EVAPORATOR | Copper Tube on Cylinder |
| REFRIGERANT CONTROL | Thermostatic Expansion Valve |
| REFRIGERANT CHARGE | R404A 450g |
| BIN CONTROL SYSTEM | Mechanical Bin Control (Time Delay Controlled) |
| ICE MAKING WATER CONTROL | Float Switch and Water Valve |
| ELECTRICAL PROTECTION | Class I Appliance |
| COMPRESSOR PROTECTION | Auto-reset Overload Protector, Auto-reset Pressure Switch |
| GEAR MOTOR PROTECTION | Manual-reset Circuit Breaker, Auto-reset Thermal Protector |
| LOW WATER PROTECTION | Float Switch and CM Controller |
| BIN CONTROL PROTECTION | Mechanical Switch |
| WEIGHT | Net weight 97 kg / Gross weight 118 kg |
| PACKAGE | Carton 671mm(W) x 820mm(D) x 910mm(H) |
| ACCESSORIES | Scoop, Mounting Bracket, Installation Kit |
| OPERATION CONDITIONS | |
| AMBIENT TEMP. | 5-40°C |
| WATER SUPPLY TEMP. | 5-35°C |
| WATER SUPPLY PRESSURE | 0.5-8 bar (0.05-0.8MPa) |
| VOLTAGE RANGE | Rated Voltage ± 10% |
| We reserve the right to make changes in specifications and design without prior notice. | |

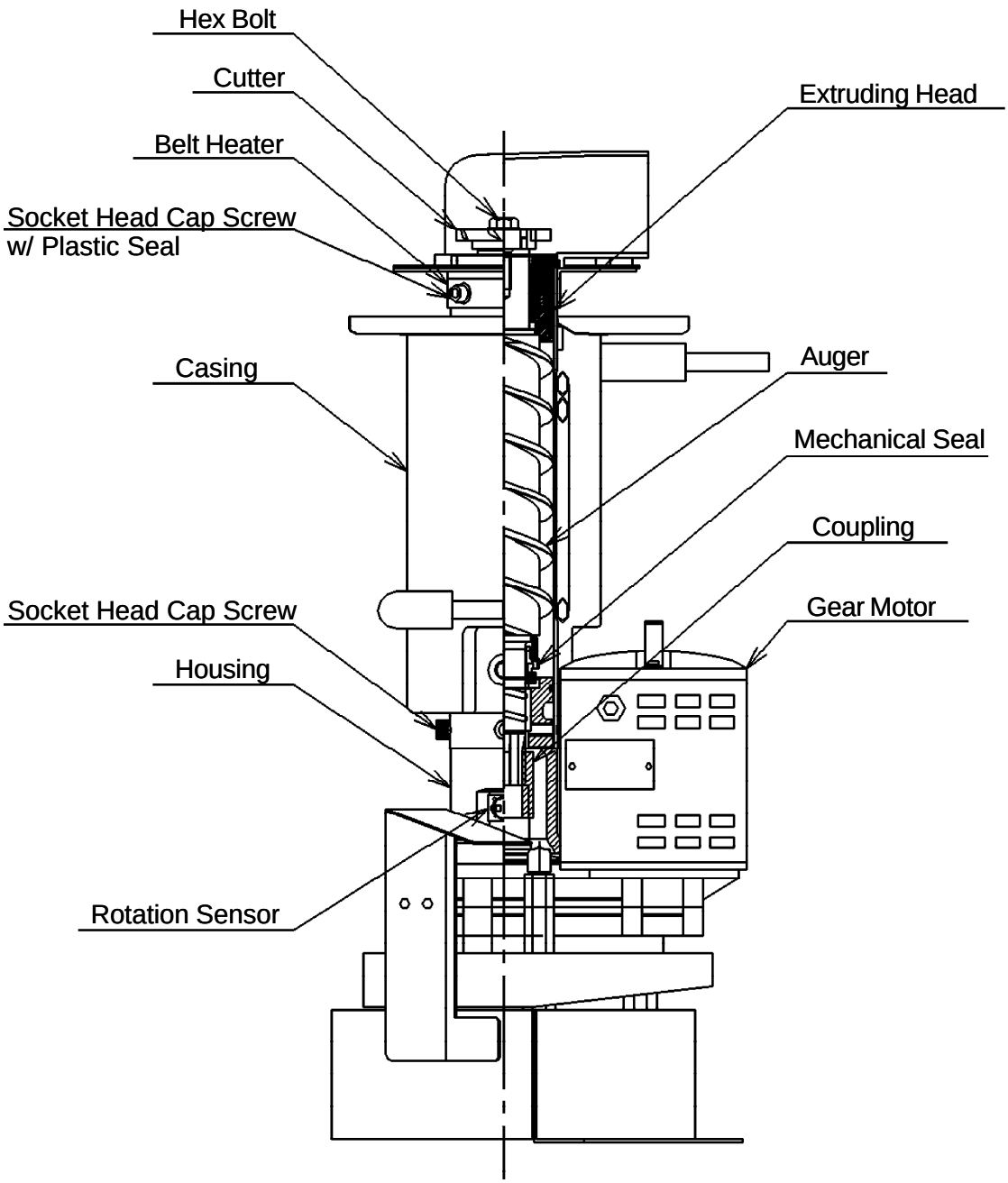
# II. GENERAL INFORMATION

## 1. CONSTRUCTION

Modular flaker model FM-481AGE/AWGE(-N) includes Water Supply, Evaporator, Compressor, Condenser and Control Assemblies. As the unit is not equipped with an Ice Storage Bin, this must be purchased separately as an optional extra.




## ICE MAKING UNIT



## 2. CONTROLLER BOARD

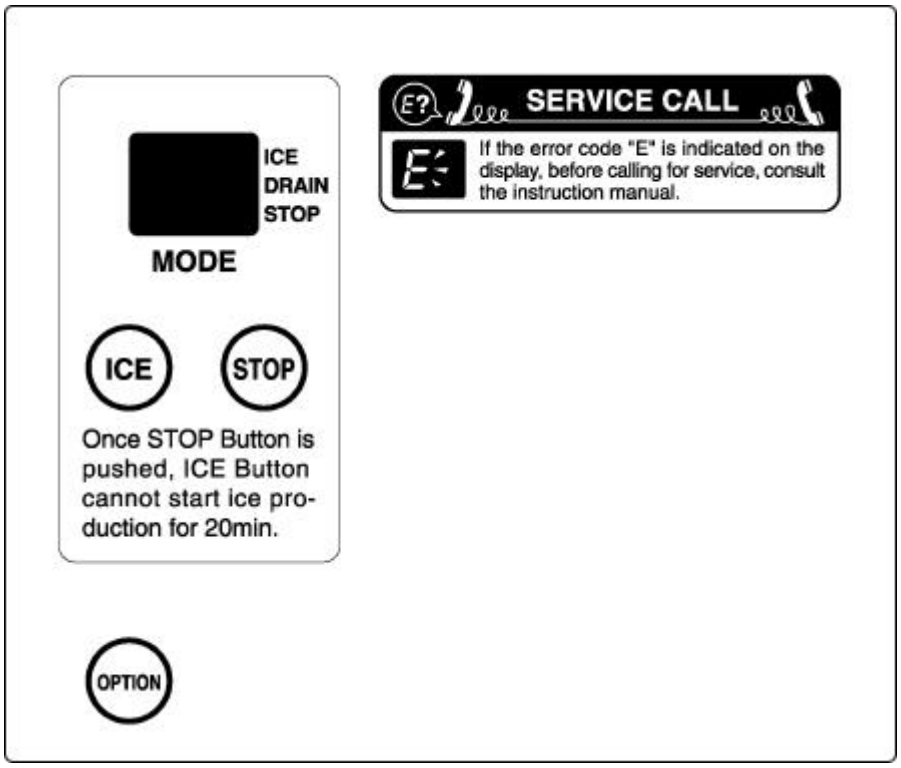
Starting from the FM-481 model change, the electric control circuit has been changed from a Timer Board to a Controller Board. The Controller Board consists of the Operation Board (Controller Board - Operation), the Main Board (Controller Board - Main) and the Sub Board (Sub Board - Current). The Main Board is common for all the auger type icemakers except for the Dip Switch settings.

The Operation Board is equipped with the Display (7 segments, 2 digits) and the three Operation Buttons “ICE”, “STOP” and “OPTION” which are for checking the operating conditions during servicing and user operation.

The Main Board is equipped with Relays for the Compressor, Gear Motor, Control Water Valve and Flush Water Valve.

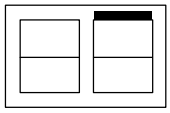
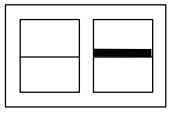
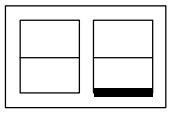
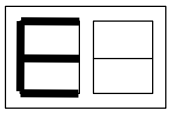
### [a] OPERATION PANEL

Positioned on the left side of the Control Box are the Operation Switch (Run/Stop) and Gear Motor Protector (3A), and on the front side are the Display and Ice, Stop and Option Buttons.



## [b] DETAILS OF FUNCTIONS

### Operation Mode Display Indications

| Item | Display Indication | Details |
|---|---|---|
| Icemaking |  ICE DRAIN STOP | Illuminates:<br>1) During icemaking cycle, or<br>2) When Storage Bin is full |
| Automatic Drain |  ICE DRAIN STOP | Illuminates:<br>1) For 15 minutes during automatic drain cycle after 6 hours in continuous icemaking cycle from the last drain cycle, or, after 1 hour with Storage Bin full, or<br>2) When Ice Button is pushed with Stop Lamp blinking |
| Manual Stop |  ICE DRAIN STOP | Illuminates when Stop Button is pushed → Blinks for 15 minutes (drain control) → Illuminates constantly (end of drain control) → Turn OFF the power supply (See instruction label) |
| Interlock Error ("E__" indication) |  ICE DRAIN STOP | Blinks in case of interlock error → Indicates "E__" → Possible cause can be located by the error code table. |
| Non-Interlock Error | | No indication for non-interlock errors. Check error records for non-interlock stoppages ("c__" indication). |

### Button Operations

| Operator | Indication, Function | Button Operation |
|---|---|---|
| User | Start icemaking | Ice Button |
| | Stop icemaking after drain | Stop Button |
| Service Personnel | Indicate total compressor operating hours | Option Button |
| | Indicate cycle time | Option Button + Ice Button |
| | Indicate error records | Option Button + Stop Button |
| | Indicate ongoing non-interlock error | Option Button + Stop Button + Stop Button after "—" indication |
| | Delete error records | Operation Switch + Stop Button + Option Button |
| | Service mode | Operation Switch + Option Button |
| Factory | Delete total compressor operating hours + Production line inspection mode | Operation Switch + Ice Button + Stop Button + Option Button |

Note: In case of interlock error ("E__" indication), the icemaker will not respond to the user's button operation.
If the icemaker has stopped because of a non-interlock error, the user's button operation can change the indication, but the icemaking or drain cycle cannot start until the error is cancelled.

## Basic Control Sequences

Start icemaking:

Water supply → Reservoir fills → Gear Motor ON → Compressor ON after 5 minutes

Stop drain:

Compressor OFF → Gear Motor OFF after 5 minutes → Water supply → Reservoir fills → Flush Water Valve ON → Flush Water Valve OFF after 10 minutes

Bin full (self-contained type):

Bin Control Switch continuously OFF for 7 seconds → Compressor OFF → Gear Motor OFF after 5 minutes → Bin Control Switch continuously ON for 7 seconds → Icemaking starts

Bin full (modular type):

Bin Control Switch continuously OFF for 7 seconds → Compressor and Gear Motor OFF → Bin Control Switch continuously ON for 7 seconds → Icemaking starts

Automatic drain:

After 6 hours from the last drain cycle or after 1 hour with Storage Bin full

Service mode:

Shortens the 5 minute delay before the initial icemaking cycle for ease of service (Water supply → Reservoir fills → Gear Motor ON → Compressor ON after 30 seconds)

Production line inspection mode:

Switches to the following controls for 30 minutes to shorten the finished product inspection and resets automatically after 30 minutes.

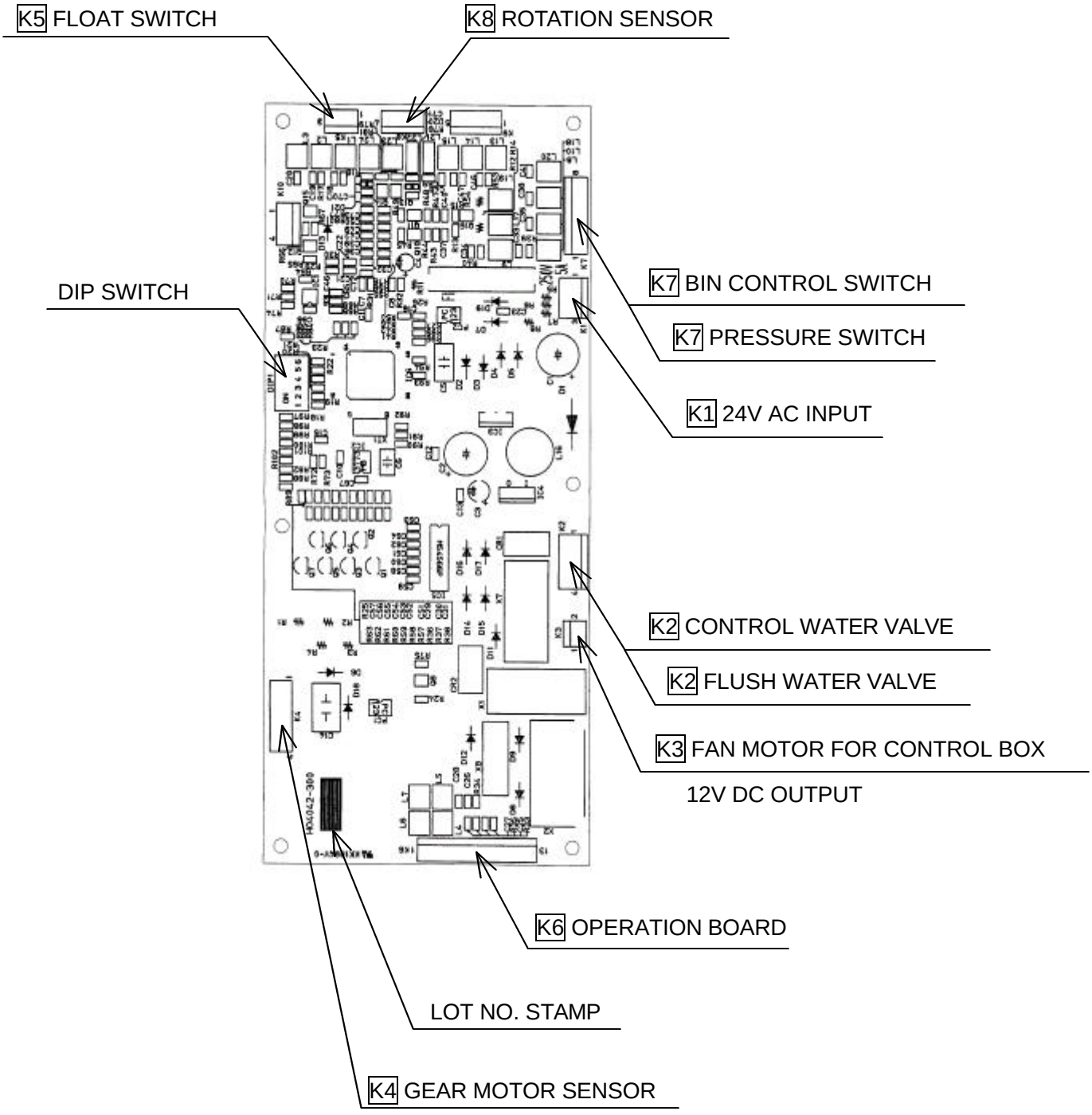
Compressor start delay at the beginning of icemaking cycle: 5 minutes → 10 seconds

Gear Motor stop delay at the end of icemaking cycle: 5 minutes → 10 seconds

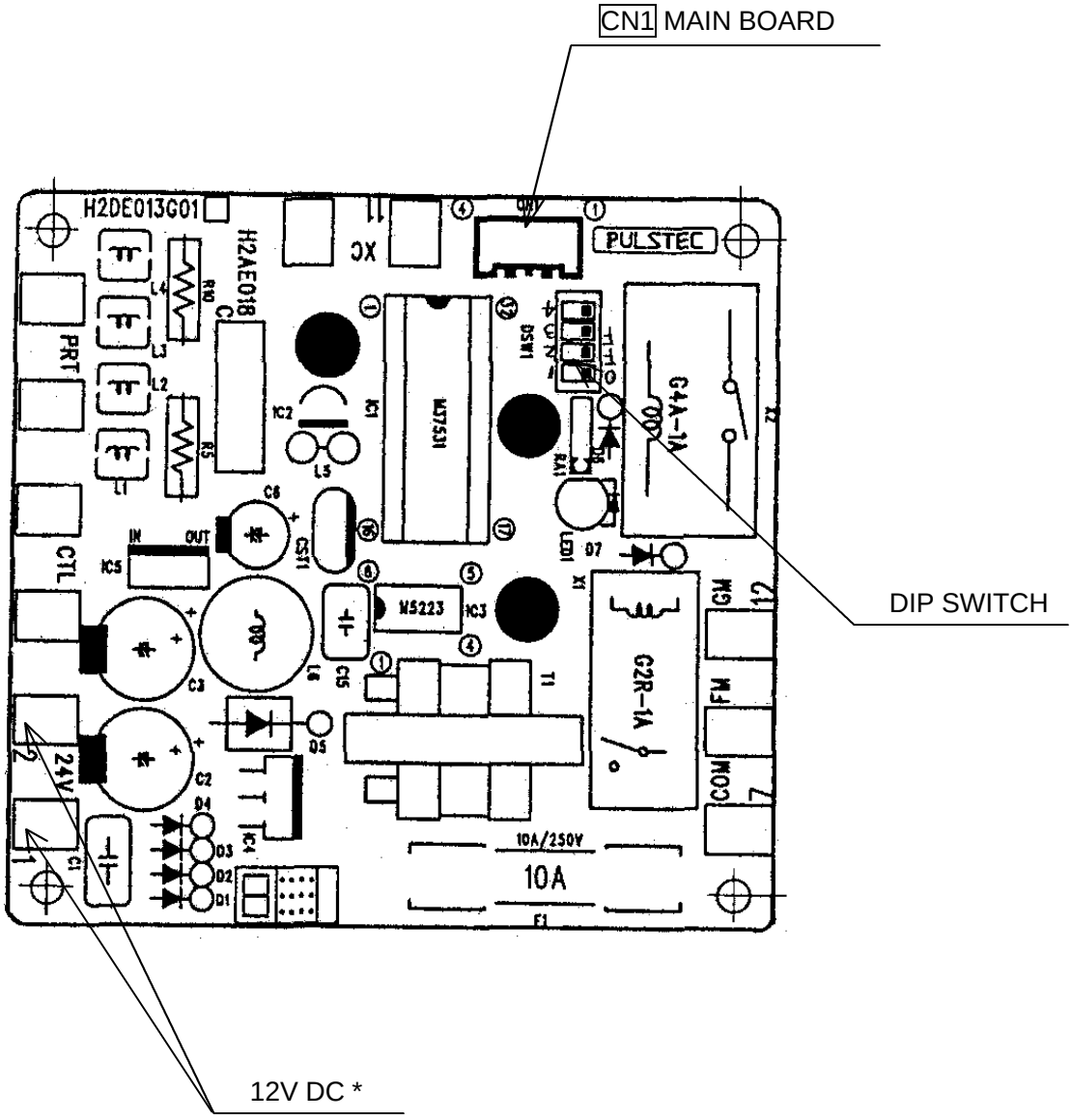
No error records, Dip Switch setting indication at startup

Intermittent operation of Control Water Valve in case of low water: 5 minutes OFF, 5 minutes ON → 10 seconds OFF, 5 minutes ON

## [c] MAIN BOARD LAYOUT



## [d] SUB BOARD LAYOUT




* Note: As the previous Timer Board marking is applied, the Sub Board is marked 24V. But the actual input is 12V.

## [e] SETTING AND CHECKING OPERATION

The Controller Board has the following functions for setting and checking:

(1) Shorten startup time
(2) Indicate total operating hours
(3) Indicate error record
(4) Delete error record
(5) Indicate cycle time
(6) Apply to any model by adjusting Dip Switch

### (1) Shorten startup time

Starting from the FM-481 model change, the startup control has been changed to "Power ON → Float Tank fills up → Gear Motor starts → Compressor starts after 5 min (formerly 1 min)".

For the initial startup after the power supply is turned on, the Compressor start delay of "5 min" can be shortened to "30 sec" by the following button operation.

(This is useful to shorten maintenance and service operation, but could be a cause of trouble if the icemaker is started up with ice still remaining inside the Evaporator Casing.)

Button Operation: (Power supply ON, Operation Switch on "STOP")
1) While pressing the Option Button, move the Operation Switch to the "RUN" position.
2) Release the Option Button when the Display shows the total compressor operating hours (_ _ thousand hours).
3) The Display illuminates "ICE", and the icemaker starts up in the shortened startup mode.

### (2) Indicate total operating hours

The total operating hours are indicated in two digits (_ _ thousand hours) by the following button operation. The total operating hours indicated may be shorter than actual time and should be used to determine the required maintenance and part replacement. The hours indicated cannot be reset.

Button Operation: (Power supply ON, Operation Switch on "RUN")
1) Only while the Option Button is pressed, the Display changes from the normal indication to the total operating hours.
2) When the Option Button is released, the Display changes from the total operating hours back to the normal indication.

(ex.)
"00" is indicated for total operating hours of 0 to 999 hours.
"01" is indicated for total operating hours of 1,000 to 1,999 hours.

“98” is indicated for total operating hours of 98,000 to 98,999 hours.
“99” is indicated for total operating hours of 99,000 hours and more.
(The indication of total operating hours is up to “99”.)
If the Display shows “- -” while the Option Button is pressed, the Controller Board must have a problem (The icemaker can continue normal icemaking operation but cannot memorize the total operating hours and error record).

### (3) Indicate error record

Use this function to get detailed information on the icemaker’s condition when maintaining or servicing the icemaker.

The error record is indicated by the following button operation and remains even if the power is turned off.

The indicated error record may include “c1” to “c4” errors as well as “E0” to “EF” errors when problems or stoppages have occurred. Those errors are recorded for low water (c1), abnormal head pressure (c2) and drain error (c4).

For example, if the indicated error record includes “c2” during inspection, check the Condenser and vicinity to locate the cause of abnormal head pressure.

Button Operation: (Power supply ON, Operation Switch on “RUN”)
1) Keep on pressing the Option Button until step 4).
2) The Display changes from the normal indication to the total operating hours.
3) (While pressing the Option Button) Press the Stop Button once.
4) The Display indicates the error record.
5) Release the Option Button. The Display changes back to the normal indication.

(ex.)
The Display indicates the record of the last eight errors from the latest to the oldest for 1 sec each.
If there is no error record, the Display indicates “- -“.
If there is a record of three errors “E0” (latest), “E1” and “E2” (oldest), the Display indicates “E0” (1 sec) → “E1” (1 sec) → “E2” (1 sec) → “- -“. The “- -“ indication means there is no more error record.

The icemaker may stop icemaking operation even when the Display is illuminating “ICE”. In this case, the Bin Control Switch may have operated, or the icemaker may be in the error “c1” or “c2”. To identify the cause during maintenance or service, check the ongoing error by the following button operation. If no error record is indicated, the cause of the above suspension is determined to be the Bin Control Switch operation.

Button Operation:
1) Keep on pressing the Option Button until step 7).
2) The Display changes from the normal indication to the total operating hours.

3) (While pressing the Option Button) Press the Stop Button once.
4) The Display indicates the error record.
5) Check that the error record indication becomes "- -".
6) (While pressing the Option Button) Press the Stop Button once again.
7) The Display indicates the error record (ongoing error).
8) Release the Option Button. The Display changes back to the normal indication.

(ex.)
If there is no ongoing error, the Display indicates "- -".
If the icemaker is in the errors "E0", "c1" and "c2", the Display repeatedly indicates "E0" (1 sec) → "c1" (1 sec) → "c2" (1 sec).

**(4) Delete error record**

The error record is not deleted by turning off the power supply but is deleted by the following button operation. To make the next service diagnosis easier, it is recommended to delete the error record during maintenance or service.

Button Operation: (Power supply ON, Operation Switch on "STOP")
1) While pressing both the Option Button and Stop Button together, move the Operation Switch to the "RUN" position.
2) When the Display illuminates "ICE", release the Stop Button first and then the Option Button.

**(5) Indicate cycle time**

The cycle time to estimate the current ice production capacity is indicated by the following button operation.

This cycle time means the time since the Float Tank fills up during Compressor operation until the next icemaking water supply starts. The last five cycles are recorded.

This record is deleted when the power supply is turned off.

Button Operation: (Power supply ON, Operation Switch on "RUN")
1) Keep on pressing the Option Button until step 4).
2) The Display changes from the normal indication to the total operating hours.
3) (While pressing the Option Button) Press the Ice Button once.
4) The Display indicates the cycle time.
5) Release the Option Button. The Display changes back to the normal indication.

As the Display can indicate only two digits, a complex system is used to indicate the cycle time record. The max five cycles are indicated from the latest to the oldest as "_ _" min "_ _" sec …… "_ _" min "_ _" sec. The Display illuminates "ICE" after all the record has been indicated.

To distinguish “min” from “sec”, the first digit for “min” is replaced by a letter of the alphabet as shown below.

| Actual Digit | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Letter | o | A | b | c | d | E |

For example, “A1” “10” stands for 11 min 10 sec.

(ex.)
If there is no cycle time record, the Display indicates “- -“.
If the cycle time record is 10 min 30 sec (latest), 9 min 45 sec and 25 min 10 sec (oldest), the Display indicates “A0” (2 sec) → “30” (2 sec) → “o9” (2 sec) → “45” (2 sec) → “b5” (2 sec) → “10” (2 sec) → “- -“.

The cycle time is related to the ice production capacity as shown in the table below. The less the ice production capacity is, the longer the cycle time will become.

The ice production capacity depends on ambient and water temperatures. See “VI. 4. PERFORMANCE DATA.”

**Cycle Time (reference)**

| Ice Production Capacity (kg/d) | CM-230 series<br>FM-250 series<br>FM-481 series | FM-1000 series | FM-2000 series |
|---|---|---|---|
| 100 | 9 min 10 sec | ———— | ———— |
| 200 | 4 min 35 sec | ———— | ———— |
| 300 | 3 min 03 sec | ———— | ———— |
| 400 | 2 min 18 sec | 2 min 57 sec | ———— |
| 500 | 1 min 50 sec | 2 min 21 sec | ———— |
| 600 | 1 min 32 sec | 1 min 58 sec | ———— |
| 700 | 1 min 19 sec | 1 min 41 sec | ———— |
| 800 | ———— | 1 min 28 sec | ———— |
| 900 | ———— | 1 min 19 sec | ———— |
| 1000 | ———— | 1 min 11 sec | ———— |
| 1100 | ———— | 1 min 04 sec | ———— |
| 1200 | ———— | 0 min 59 sec | 1 min 58 sec |
| 1600 | ———— | ———— | 1 min 28 sec |
| 2000 | ———— | ———— | 1 min 11 sec |
| 2200 | ———— | ———— | 1 min 04 sec |
| Formula (reference) | $\text{Ice Production (kg)} = \frac{55000\ (\text{constant})}{\text{Cycle Time (sec)}}$ | $\text{Ice Production (kg)} = \frac{70800\ (\text{constant})}{\text{Cycle Time (sec)}}$ | $\text{Ice Production (kg)} = \frac{141600\ (\text{constant})}{\text{Cycle Time (sec)}}$ |

**(6) Apply to any model by adjusting Dip Switch**

The Controller Board applies to any auger type model by adjusting the Dip Switch.

## Interlock Errors

(Applicable Codes for FM-481 = E0, E1, E2, E4, E7, E8, Eb, EH, EL, EF, None)

| Code | Error | Condition | Operation | Reset | Check/Repair |
|---|---|---|---|---|---|
| **E0** | Icemaking Water Leak | Following initial water supply, Float Switch trips at lower float level after Gear Motor starts but before Compressor starts. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Water leaks, Flush Water Valve not closing |
| **E1** | Icemaking Error | Icemaking cycle takes too long. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Gas leaks, Control Water Valve not closing, Air lock in Evaporator, Freeze up, Float Switch |
| **E2** | Float Switch Error | With Flush Water Valve OFF, Float Switch trips at both upper and lower float levels for 2 seconds. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Float Switch |
| **E3** | Gear Motor Error | (Only when Dip Switch 4 is ON) Gear Motor Relay is ON with Gear Motor protective circuit detector OFF. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Gear Motor protective circuit (TPO, Overload, etc.) operated. |
| **E4** | Abnormal High Side Pressure | Pressure Switch trips 5 times (OFF for 5 seconds) in 1 hour of Compressor operation. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Fan Motor, Cooling water circuit, Refrigeration circuit, Condenser clogged |
| **E5** | Gear Motor Relay fused | (Only when Dip Switch 4 is ON) Gear Motor Relay is OFF with Gear Motor protective circuit detector ON. | Whole unit (except GM) stops. | Power supply, Turn OFF - Turn ON | Replace Controller Board. |
| **E6** | Phase Reversal Error | Phase Reversal | Whole unit stops. | Power supply, Turn OFF - Turn ON | (3 phase models only) Phase reversal |
| **E7** | Failure Precaution | (FM-481 only) Gear Motor Amperage Sensor has operated more than 10 times. | E7 blinks. | N/A | Damage to Evaporator assembly (See Note 2) |
| **E8** | Abnormal Gear Motor Amperage | (FM-481 only) Gear Motor Amperage Sensor is ON. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Supply voltage, Gear Motor locked, hunting or reversing (See Note 1) |
| **Eb** | Controller Board A/D Conversion Error | Microcomputer fails in analog-to-digital conversion. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Replace Controller Board. |
| **EH** | Gear Motor Rotation Error | (Only when Dip Switch 4 is OFF) Rotation Sensor detects error. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Supply voltage, Gear Motor locked, hunting or reversing |
| **EL** | Bin Control Switch Error | Chute Protection Switch has operated due to failure of Bin Control Switch. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Bin Control Switch |
| **EF** | Abnormal Low Voltage | (Only when Dip Switch 5 is ON) Low Voltage Sensor operates 3 times in 24 hours. | Whole unit stops. | Power supply, Turn OFF - Turn ON | (Only when Dip Switch 5 is ON) Supply voltage |
| **None** | Electric Leak | Electric leak or overcurrent. | Whole unit stops. | Power supply, Turn OFF - Turn ON | Electric leaks, Fuse, Overcurrent |

Note: 1. The error "E8" is caused by an overload on the Gear Motor which increases the motor amperage to activate the Amperage Sensor. When "E8" is displayed, the fundamental

cause of the overcurrent must be removed to avoid a repeat of the error. The Gear Motor amperage will increase if it locks or hunts due to an ice blockage or insufficient torque caused by low voltage.

2. The error code "E7" blinks after "E8" is displayed ten times. If "E8" appears repeatedly, the Evaporator assembly must be under excessive load each time (see Note 1 for details). Repetitive overload on the Evaporator assembly accumulates metal fatigue inside, which may suddenly break the Auger or twist the Evaporator without any visible symptom. When "E7" blinks, replace the entire Evaporator assembly including the Evaporator, Auger, Coupling and Housing. After replacement, reset the Display as follows:
   1) Move the Operation Switch to the "STOP" position.
   2) Turn ON the Dip Switch 4 on the Sub Board.
   3) Move the Operation Switch to the "RUN" position.
   4) Turn OFF the Dip Switch 4 on the Sub Board.
   5) Turn ON the Dip Switch 4 on the Sub Board.
   6) Move the Operation Switch to the "STOP" position.
   7) Turn OFF the Dip Switch 4 on the Sub Board.
   8) While pushing the Option Button and Stop Button on the Operation Panel, move the Operation Switch to the "RUN" position.

## Non-Interlock Errors

(Applicable Codes for FM-481 = All)

| Code | Error | Condition | Operation | Reset | Check/Repair |
|---|---|---|---|---|---|
| **CM Time "— —"** | Microcomputer Read/Write Error | Microcomputer fails to read/write properly. | Memory circuit not available. | Replace Controller Board. | Error records and compressor operating hours not available on display |
| **c1** | Low Water | Water supply continues for more than 90 seconds, or Float Switch trips at lower float level and does not reset for more than 60 seconds after water supply. | Whole unit stops until Reservoir fills up. Only Control Water Valve operates intermittently every 5 minutes. | Automatically resets after Reservoir fills up. | Water supply interruption, Control Water Valve not opening, Flush Water Valve not closing, Float Switch, Water leaks |
| **c2** | Abnormal High Side Pressure | Pressure Switch stays OFF for 5 seconds. | Whole unit stops. | Automatically resets after Pressure Switch turns ON. | Fan Motor, Cooling water circuit, Refrigeration circuit, Condenser clogged |
| **c3** | Abnormal Low Voltage | (Only when Dip Switch 5 is ON)<br>Voltage stays below 64 – 84% rating for more than 1 second with Compressor ON and Control Water Valve OFF. | Whole unit stops. | Automatically resets after voltage stays above 69 – 94% rating for 120 seconds. | Supply voltage |
| **c4** | Drain Error | Float Switch trips at upper float level in 10 minutes after Flush Water Valve turns ON. | Indication only. | N/A | Flush Water Valve not opening, Control Water Valve not closing |

## Dip Switch Setting (Main Board)

| No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **ON** | Modular Type | Icemaking Timer 1 | Chute Switch Normally open contact (Current) | Rotation Sensor OFF | Low Voltage Sensor ON Automatic Drain Every 6h | Micro-computer Check |
| **OFF** | Self-contained Type | Icemaking Timer 2 | Chute Switch Normally closed contact (Revision) | Rotation Sensor ON | Low Voltage Sensor OFF Automatic Drain Every 12h (External timer setting available) | Normal Operation |

## Icemaking Timer Setting

| | | Dip Switch 2 | |
|---|---|---|---|
| | | **ON** | **OFF** |
| **Dip Switch 1** | **ON** | 1st cycle: 30 minutes<br>2nd cycle and after: 15 minutes | 1st cycle: 20 minutes<br>2nd cycle and after: 10 minutes |
| | **OFF** | 1st cycle: 59 minutes<br>2nd cycle and after: 30 minutes | 1st cycle: 59 minutes<br>2nd cycle and after: 20 minutes |

±5% accuracy

## Main Controller Board Drawing Nos. and Dip Switch Setting

| Drawing No. | Dip Switch | | | | | | Factory Inspection Marking | Applicable Models |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 459866-04<br>459866-14 | ON | ON | OFF | OFF | ON | OFF | H9 | Modular type with Rotation Sensor (FM-481 etc.) |
| 459866-06<br>459866-16 | ON | ON | OFF | ON | ON | OFF | Hb | Modular type (FM-1000ASFE3 etc.) |
| 459866-07<br>459866-17 | OFF | ON | OFF | ON | ON | OFF | Fb | Self-contained type (CM-100 etc.) |
| 459866-08<br>459866-18 | ON | ON | ON | ON | ON | OFF | N/A | Service parts (FM-1000ASFE3 with K-1, K-2, A-0 only) |
| 459866-09<br>459866-19 | ON | ON | ON | OFF | OFF | OFF | N/A | Service parts |

## Controller Board - Main (HO4042-100: 458033-04) [Early Version]

Dip Switch Setting (UK/CONT.)

| Model | Dip Switch | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| FM-1000ASFE3 (K-1, K-2, A-0) | ON | ON | ON | OFF | ON | OFF |

Note: This Controller Board - Main (HO4042-100: 458033-04) will not be supplied as a service part. For replacement, order the “Improved Version” according to the Parts List.

## Controller Board - Main (HO4052-100: 459866-##) [Improved Version]

Dip Switch Setting (UK/CONT.) (A-1 and after)

| Model | Dip Switch | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CM-230AFE<br>FM-250AFE | ON | ON | OFF | ON | ON | OFF |
| FM-481AGE<br>FM-481AWGE<br>FM-481ALGE | ON | ON | OFF | OFF | ON | OFF |
| FM-1000ASFE3<br>FM-1000ALE<br>FM-1000ALF<br>FM-2000ALE<br>FM-2000ALF | ON | ON | OFF | ON | ON | OFF |
| FM-1000ASFE3<br>(K-1, K-2, A-0) | ON | ON | ON | ON | ON | OFF |
| CM-110FE<br>FM-120FE | OFF | ON | OFF | ON | OFF | OFF |

Dip Switch Setting (GENERAL/OCEANIA) (A-1 and after)

| Model | Dip Switch | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CM-230AF<br>FM-250AF | ON | ON | OFF | ON | ON | OFF |
| FM-481AG<br>FM-481AWG | ON | ON | OFF | OFF | ON | OFF |
| CM-100F<br>FM-120F | OFF | ON | OFF | ON | OFF | OFF |

# III. INSTALLATION INSTRUCTIONS

## 1. LOCATION

**WARNING**

1. This icemaker is not intended for outdoor use. Normal operating ambient temperature should be within 5°C to 40°C. Normal operating water temperature should be within 5°C to 35°C. Operation of the icemaker, for extended periods, outside of these normal temperature ranges may affect production capacity.

2. The icemaker should not be located next to ovens, grills or other high heat producing equipment.

3. The location should provide a firm and level foundation for the equipment.

4. Allow 15 cm clearance at rear and sides for proper air circulation and ease of maintenance and/or service should they be required. Allow 60 cm clearance on top to allow for removal of the Auger.

5. This appliance is not suitable for installation in an area where a water jet could be used and where dripping is not allowed.

6. Do not place anything on top of the icemaker or in front of the Louver.

## 2. ELECTRICAL CONNECTIONS

**WARNING**

**THIS APPLIANCE MUST BE EARTHED**

This icemaker requires an earth that meets the national and local electrical code requirements. To prevent possible severe electrical shock to individuals or extensive damage to equipment, install a proper earth wire to the icemaker.

* This icemaker should not be installed:
  a) Where the power supply is not within the range of 220 - 240V.
  b) Where the icemaker cannot be plugged directly into its own power supply without using an extension cord or sharing a receptacle.

* Usually an electrical permit and services of a licensed electrician are required.

* If the supply cord and the plug should need to be replaced, it should only be done by a qualified service engineer.

* The maximum permissible system impedance (Zmax) at the interface point of the power supply to be connected with this icemaker must be 0.2908+j0.18175 ohm. Determine in consultation with the supply authority, if necessary, that the icemaker is connected only to a supply of 0.2908+j0.18175 ohm or less.

## 3. WATER SUPPLY AND DRAIN CONNECTIONS

**WARNING**

Only potable water should be used for the icemaker.

(For the U.K. only, the connections must be in accordance with current requirements of the Model Water Byelaws 1986 SI No. 1147)

* Water supply pressure should be minimum 0.5 bar and maximum 8 bar. If the pressure exceeds 8 bar, use a proper pressure reducing valve. Do NOT throttle back the supply tap.

* A plumbing permit and services of a licensed plumber may be required in some areas.

* The icemaker drain is gravity flow, so ensure drain pipe has an adequate pitch or fall.

* Water should drain into an open trap.

* On water-cooled model, a back flow preventer may be required in the cooling water circuit.

1) [Water-Cooled Model Only]
   By means of a suitable spanner or wrench, tighten the 1/2-3/4 nipple (accessory) into the Rc1/2 fitting and the 3/4-3/8 nipple (accessory) into the Rc3/8 fitting on the rear of the icemaker as indicated. P.T.F.E. tape and/or a suitable sealing compound should be used to obtain a leak free joint.

   Note: Jointing compounds should be approved and suitable for potable water use.

2) Attach angled end of white flexible inlet hose (accessory) to the G3/4 fitting on the rear of the icemaker as indicated, ensuring rubber sealing washer is correctly positioned. Hand tighten sufficiently to provide leak free joint.

[Air-Cooled Model]

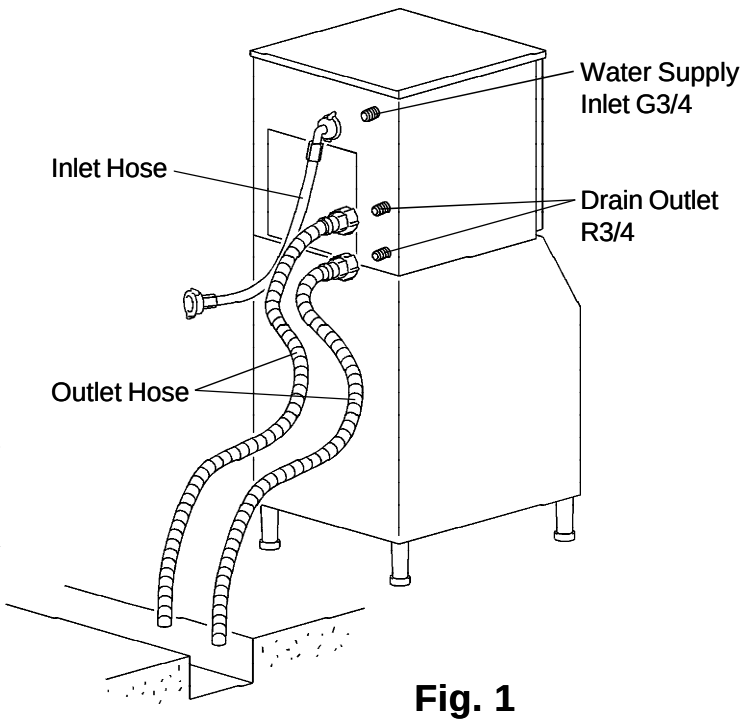



**Fig. 1**

Note: On water-cooled model, make the same connection to free end of 1/2-3/4 nipple on the water-cooled condenser inlet.

3) Attach the other end of inlet hose(s) to the water tap, noting washer(s) is/are correctly positioned before hand tightening as above.

Note: If filtration or treatment is used, ensure icemaker section only is on treated water supply, not the condenser.

4) Attach grey flexible outlet hoses (accessory) to the R3/4 fittings as indicated, confirming fitment of rubber washers before finally hand tightening the joints. These pipes can be cut to length as necessary to suit position of main drain.

Note: On water-cooled model, make the same connection to free end of 3/4-3/8 nipple on the condenser outlet.

[Water-Cooled Model]

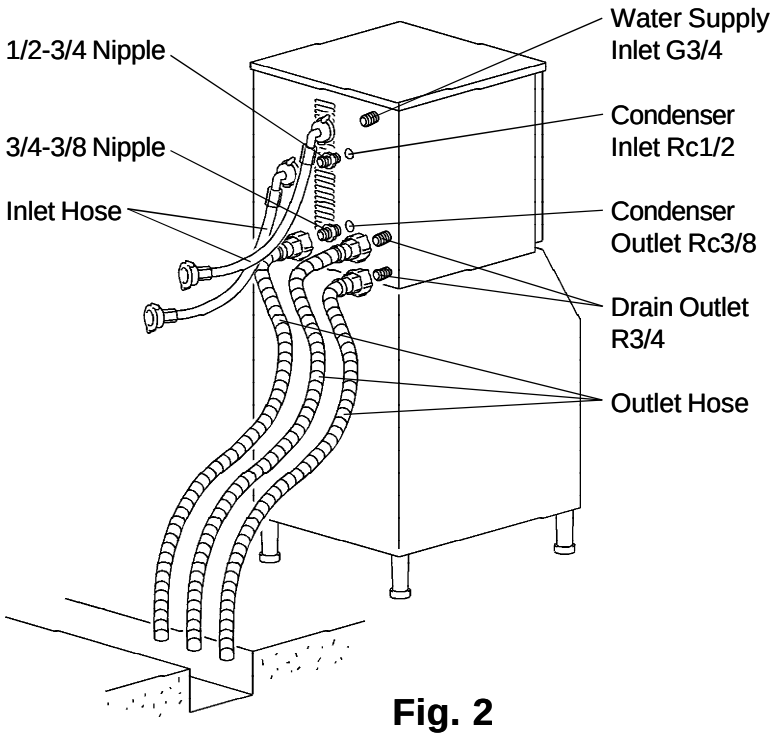



**Fig. 2**

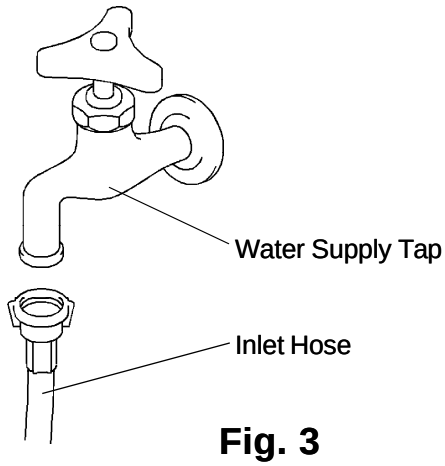



**Fig. 3**

## 4. START-UP PROCEDURE

1) Check that the power supply cord is disconnected.

2) With the Front Panel removed, check that the Operation Switch on the Control Box is in the “RUN” position.

3) Open the water supply tap.

4) Connect the power supply and energise.

5) The Display will illuminate in the “ICE” mode.

6) The following should occur in sequence:
   a) Water Reservoir will fill.
   b) Gear Motor will start.
   c) Compressor will start.

7) Replace the Front Panel in its correct position.

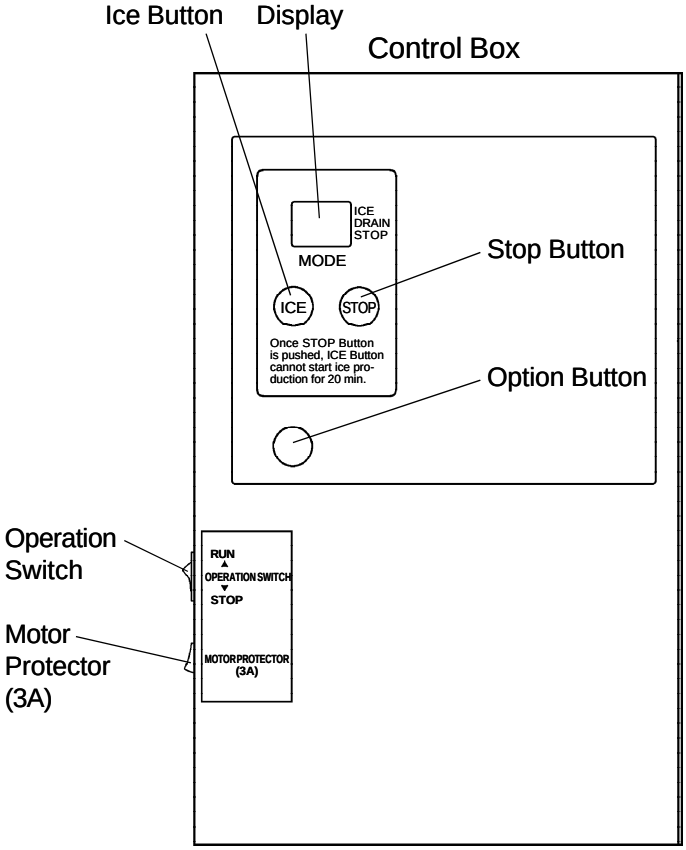



**Fig. 4**

## IMPORTANT

1. Check the conditions and quality of the ice production.

2. Do not use ice produced in the trial run. It might be contaminated with foreign matter in the water circuit. Discard or flush down the drain.

3. Clean the Storage Bin before use (see “III. 1. CLEANING” in Instruction Manual).

# IV. MAINTENANCE AND CLEANING INSTRUCTIONS

**IMPORTANT**

1. This icemaker must be maintained individually, referring to the instruction manual and labels provided with the icemaker.

2. To have the optimum performance of this icemaker, the following consumable parts need periodical inspection, maintenance and replacement:

   Extruding Head (Top Bearing)
   Housing (Lower Bearing)
   Mechanical Seal

   These parts should be inspected at least once a year or every 10,000 hours of operation. Their service life ultimately depends on water quality and environment, therefore more frequent inspection and maintenance may be required.

## 1. EXTRUDING HEAD, HOUSING BEARING, AUGER BEARING

These parts should be replaced if a diametrical gap of more than 0.5 mm is found when at least three spots are checked by changing the direction of the Auger on each Bearing.
It depends on the water quality and conditions, but normally the Bearings should be checked for wear after a total of 8,000 - 10,000 hour operation from installation date.

Note: The clearance between the Auger blades and the Evaporator interior is 0.4 - 0.5 mm. If the Bearings and rotating parts are worn out to create a larger clearance, the Evaporator interior may be damaged. (The diameters differ by 0.8 - 1.0 mm.)
If the Auger surfaces against which the Bearings contact are no longer smooth or show any burrs or abrasions during the above inspection, replace the auger.

## 2. MECHANICAL SEAL

The Mechanical Seal prevents water leaks from between the Auger and the Housing Bearing and gradually wears out to reduce its watertightness. Check the amount of water leakage from the Drain Pipe located at the side of the Gear Case to determine the necessity of replacement.

| Total operation time | Water leakage |
|---|---|
| 3,000 hours | 0.1 mL/h |
| 10,000 hours | 0.5 mL/h |

Note: The water leakage will exceed the above amount with scale/dirt build up or damage on the mating surface. Replace the Mechanical Seal when the water leakage exceeds 0.5 mL/h.

## 3. GEAR MOTOR

After the following hours of operation, check the Gear Motor for excessive noise caused by increased torque or deterioration of mechanical parts.

| | |
|---|---|
| Bearing, Gear and other mechanical parts: | 10,000 hours |
| Oil seal: | 5 years |

Note: When the output shaft oil seal is exposed to a large amount of water at one time, water may enter the Gear Case. Always drain the water circuit before removing the Auger for service.

## 4. CONDENSER

Check the Condenser once a year, and clean if required by using a brush or vacuum cleaner. More frequent cleaning may be required depending on the location of the icemaker.

## 5. AIR FILTER (AIR-COOLED MODEL ONLY)

A plastic mesh Air Filter removes dirt or dust from the air, and keeps the Condenser from getting clogged. As the Filter gets clogged, the icemaker's performance will be reduced. Remove and clean the Air Filter at least twice per month:

1) Remove the screw, push down the Lock and take off the Louver.
   Note: Do not put your hand inside the machine compartment.

2) Remove the Air Filter by pushing it down.

3) Clean the Air Filter by using a vacuum cleaner. When severely clogged, use warm water and a neutral cleaner to wash the Air Filter.

4) Rinse and dry the Air Filter thoroughly, and place it in position.

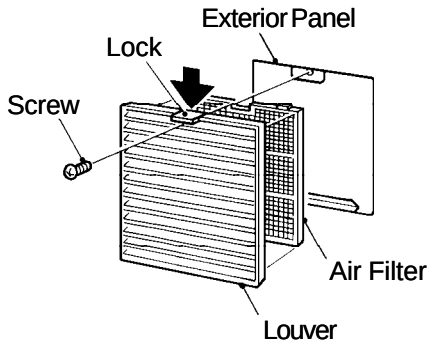



**Fig. 5**

## 6. WATER VALVE

1) Disconnect the power source.

2) Close the water supply tap.

3) Disconnect the Inlet Hose from the Water Valve.

4) Remove the Mesh Filter from the Water Valve.

5) Clean the Mesh using a brush.

6) Replace the Mesh and Inlet Hose in their correct positions.

7) Open the water supply tap.

8) Connect the power source.

9) Check for leaks.

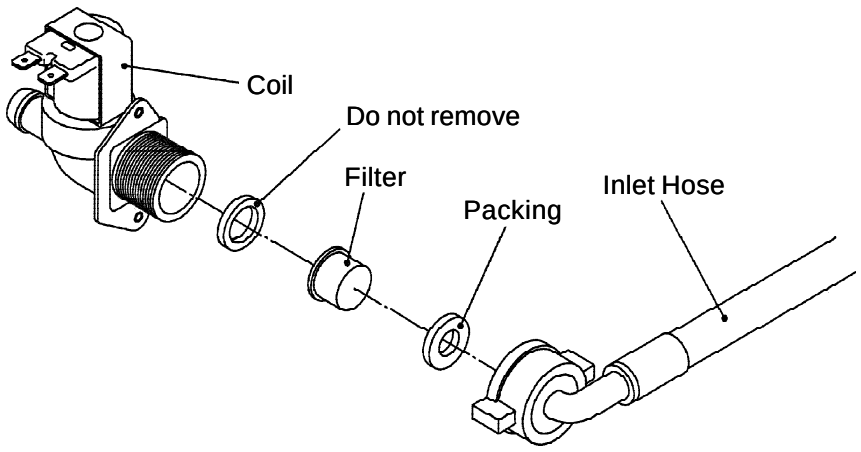



**Fig. 6**

## 7. CLEANING OF WATER SYSTEM

**WARNING**

1. HOSHIZAKI recommends cleaning this unit at least twice a year. More frequent cleaning, however, may be required in some existing water conditions.

2. Do not touch the Operation Switch with damp hands.

3. Always wear rubber gloves, eye protectors, apron, etc. for safe handling of the cleaner and sanitiser.

4. Use the cleaners and sanitisers recommended by Hoshizaki. Contact your local Hoshizaki office for further details. (The instructions below give an example of those recommended cleaners and sanitisers.)

5. Never mix cleaning and sanitising solutions in an attempt to shorten cleaning time.

6. Wipe off any splashed or spilt cleaner/sanitiser immediately.

7. Do not use any ammonia type cleaners on any part of the icemaker.

<STEP 1>

Dilute the solutions with water as follows:

Cleaning solution: "Nickel-Safe Ice Machine Cleaner" by The Rectorseal Corporation or similar. Prepare approximately 3 L of solution as directed on the container.

Sanitising solution: 30 mL of 5.25% sodium hypochlorite with 7.6 L of water or the Hoshizaki recommended sanitiser as directed on the container.

**IMPORTANT**

For safety and maximum effectiveness, use the solutions immediately after dilution.

<STEP 2>

Use the cleaning solution to remove lime deposits in the water system.

1) Open the Plastic Access Flap on the Front Panel.

2) Press the Stop Button to activate the flush cycle (approx. 10 minutes).

3) Remove all ice from the Storage Bin to avoid contamination by the cleaner.

4) Unplug the icemaker. Remove the Top and Front Panels.

5) Remove the Cover of the Reservoir. Remove any loose debris or scale.

6) Carefully fill the Reservoir with the solution to the overflow point. If necessary, use a small brush to clean the inside of the Reservoir.

7) Refit the Reservoir Cover.

8) Check that the Operation Switch is in the “RUN” position.

9) Loose fit the Front and Top Panels.

10) Allow the icemaker to stand for about 10 minutes, then plug in the icemaker to make ice with the solution.

11) With the water supply tap open, allow the machine to continue icemaking for a further 20 minutes. Open the Access Flap and press the Stop Button.

12) Allow time for the Gear Motor to stop and the water system to drain.

13) Unplug the icemaker.

14) Refit the Top and Front Panels. Plug in the icemaker.

15) Allow the icemaker to make ice for approximately 10 minutes.

16) Pour warm water into the Storage Bin to melt any ice down the drain.

Note: 1. If the machine has heavy deposits of scale, repeat the complete cleaning procedure.

2. Do not increase the proportion of cleaning solution to shorten cleaning times, as this may lock the Auger when completing item 10).

<STEP 3>

Note: Sanitising should always be completed after cleaning or alternately as an individual procedure if conditions exist to make it necessary.

Use 2.8 lit. of the sanitising solution to sanitise the icemaker.

17) Follow items 1) to 16) to complete sanitisation of the water system.

# 8. PERIODICAL CLEANING

## [1] Machine and Bin Exterior

Wipe the exterior at least once per week with a clean, soft cloth. Use a damp cloth containing a neutral cleaner to wipe off grease or dirt.

## [2] Storage Bin Interior Cleaning/Sanitisation (as required)

1) Open the Storage Bin Door, and remove all ice.

2) Wash the Bin Liner, Ice Deflector and Door inner surface with a neutral non-abrasive cleaner. Rinse thoroughly with a clean cloth and fresh water.

3) Mix 5 litres of water with 18 mL of 5.25% sodium hypochlorite solution in a suitable container or the recommended Hoshizaki sanitiser as directed.

4) Soak a clean sponge or cloth with the solution and wipe all the surfaces of the Bin Liner, Ice Deflector and Door inner surface.

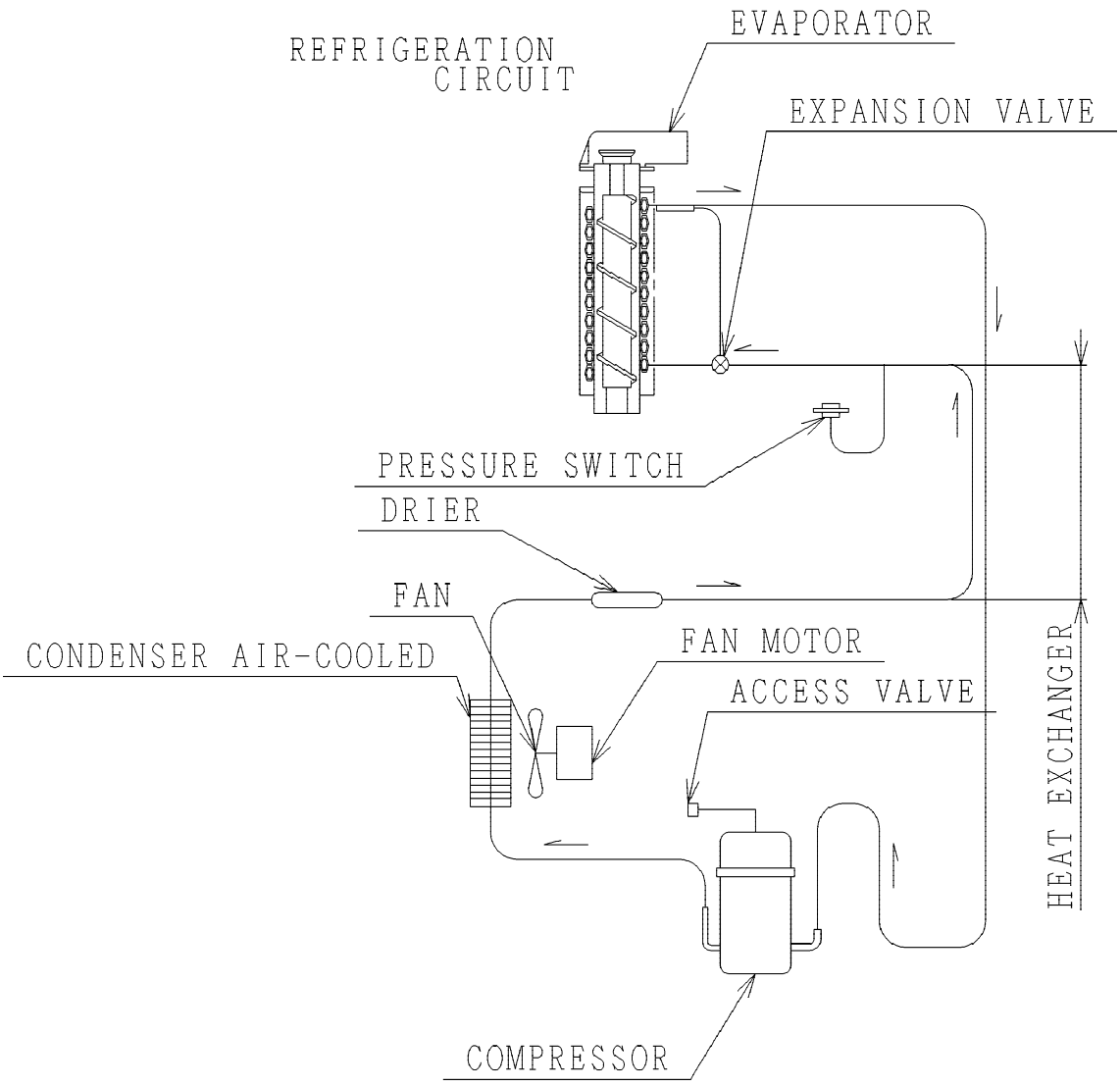
5) Rinse thoroughly with fresh water and a clean cloth to wipe off the solution. Close the Bin Door.

Note: Some solutions may cause damage to the Bin liner surfaces or corrosion on the metal parts. Always rinse the sanitiser unless directed otherwise by Hoshizaki guidelines.

# V. TECHNICAL INFORMATION

## 1. WATER AND REFRIGERANT CIRCUIT

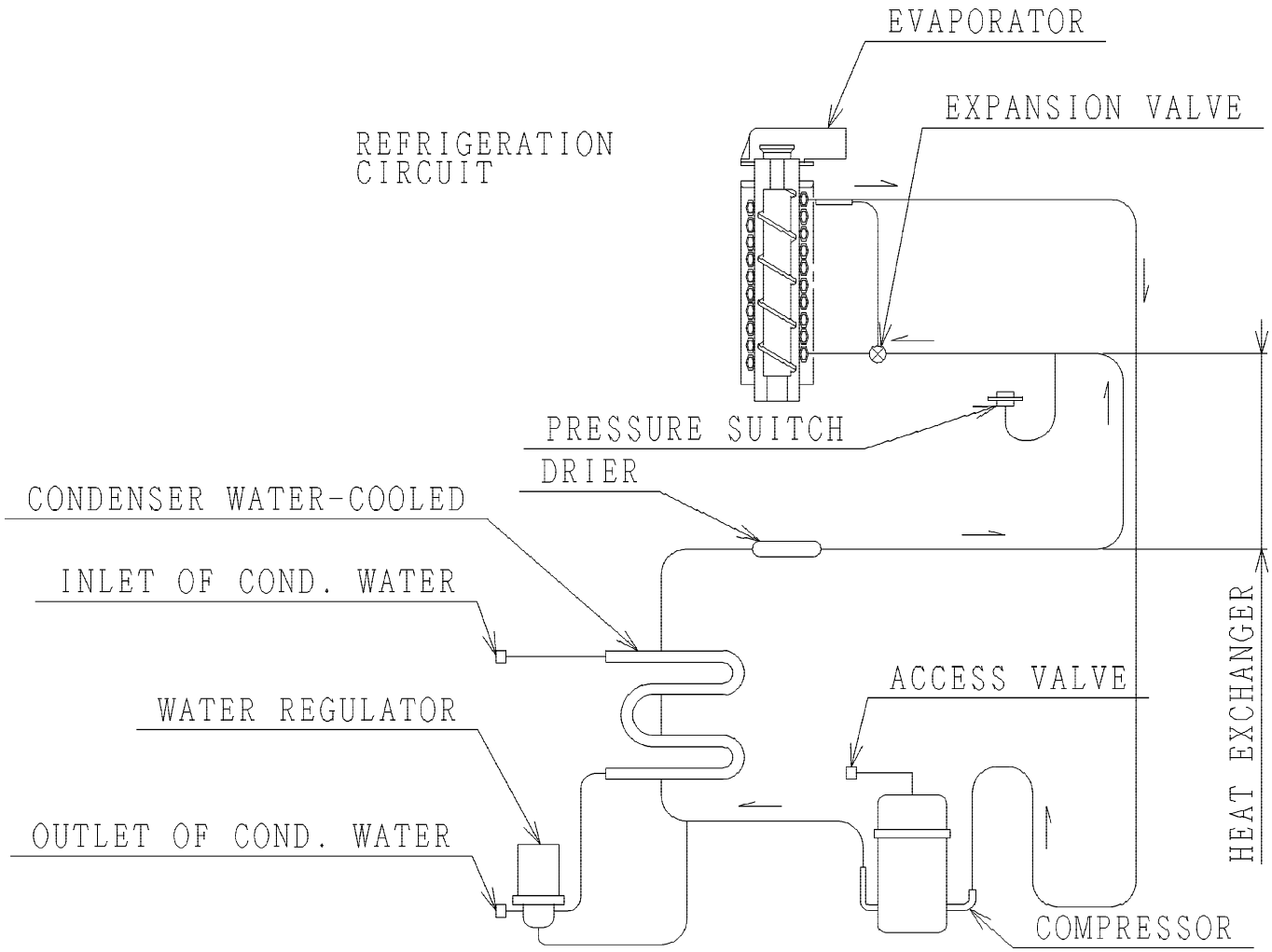
### [a] FM-481AGE, FM-481AGE-N




Pressure Switch

| | |
|---|---|
| Cut-out | 28.5 + 1.5/0 bar |
| Cut-in | 23 ± 1.5 bar |

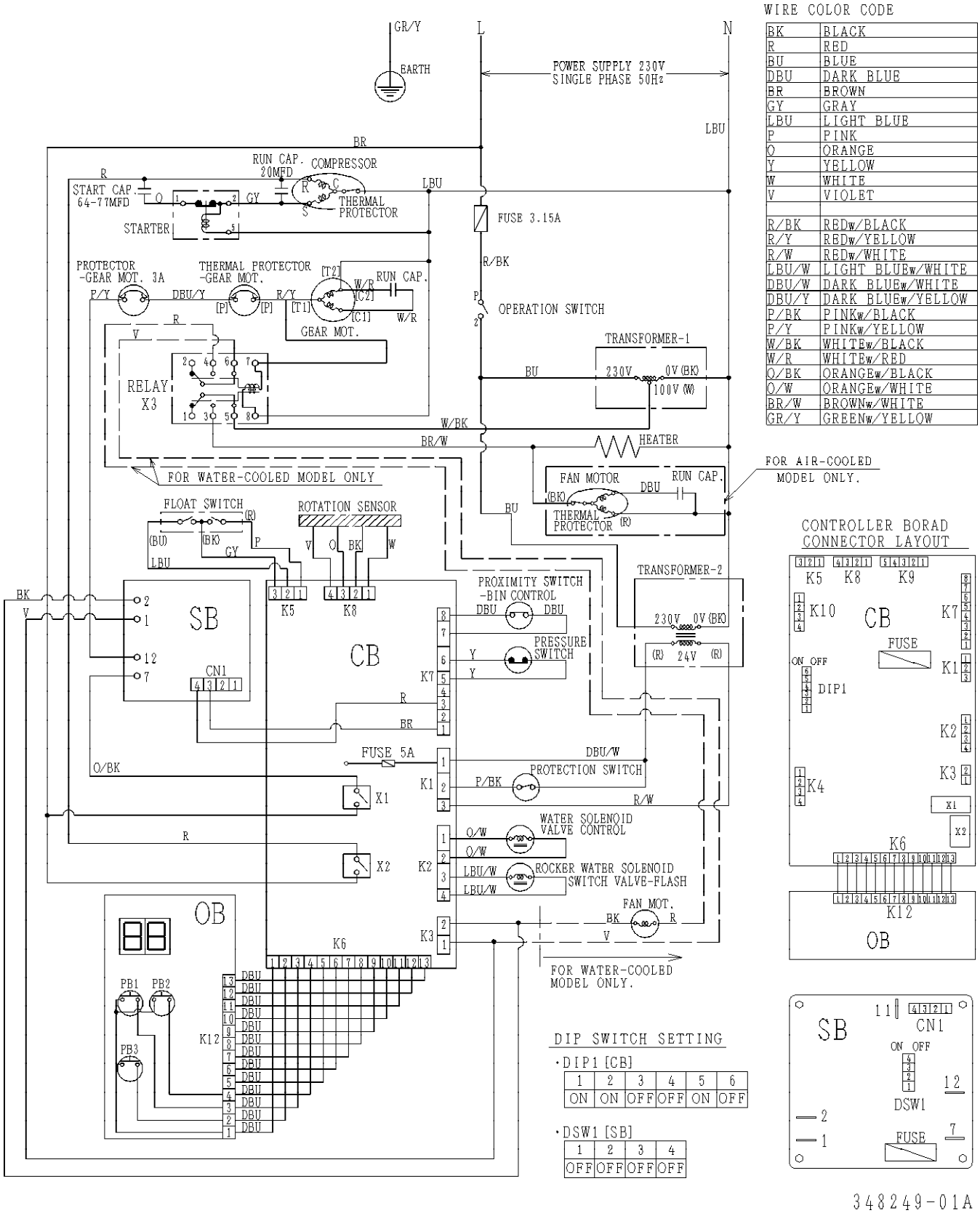
**[b] FM-481AWGE, FM-481AWGE-N**




Pressure Switch

| | |
|---|---|
| Cut-out | 22 + 1.5/0 bar |
| Cut-in | 18 ± 1.5 bar |

# 2. WIRING DIAGRAM




WIRE COLOR CODE

| | |
|---|---|
| BK | BLACK |
| R | RED |
| BU | BLUE |
| DBU | DARK BLUE |
| BR | BROWN |
| GY | GRAY |
| LBU | LIGHT BLUE |
| P | PINK |
| O | ORANGE |
| Y | YELLOW |
| W | WHITE |
| V | VIOLET |
| | |
| R/BK | REDw/BLACK |
| R/Y | REDw/YELLOW |
| R/W | REDw/WHITE |
| LBU/W | LIGHT BLUEw/WHITE |
| DBU/W | DARK BLUEw/WHITE |
| DBU/Y | DARK BLUEw/YELLOW |
| P/BK | PINKw/BLACK |
| P/Y | PINKw/YELLOW |
| W/BK | WHITEw/BLACK |
| W/R | WHITEw/RED |
| O/BK | ORANGEw/BLACK |
| O/W | ORANGEw/WHITE |
| BR/W | BROWNw/WHITE |
| GR/Y | GREENw/YELLOW |

CONTROLLER BORAD
CONNECTOR LAYOUT




DIP SWITCH SETTING

・DIP1 [CB]

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| ON | ON | OFF | OFF | ON | OFF |

・DSW1 [SB]

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| OFF | OFF | OFF | OFF |




348249-01A

# 3. TIMING CHART AND SEQUENCE OF OPERATION

## [a] STARTUP, ICEMAKING OPERATION

1) The icemaker starts icemaking operation when the Operation Switch is moved to the "RUN" position (Controller Board energized).

2) The Display illuminates "ICE", and the Control Water Valve opens to supply water until the Float Switch trips at the upper water level (Reservoir full of water). The Control Water Valve closes, the Gear Motor starts, and the Compressor starts in 5 minutes.

3) Once the icemaker starts the continuous icemaking operation, the water supply cycle is repeated whenever the Float Switch trips at the lower water level, until the Gear Motor stops.

## [b] STOP BUTTON

1) When the Stop Button is pressed with "ICE" illuminated on the Display, the water supply cycle continues until the Gear Motor stops, and the Display stops illuminating "ICE" and starts blinking "STOP".

2) When the Stop Button is pressed, the Compressor stops immediately and the Gear Motor stops in 5 minutes.

3) After the Gear Motor stops, the Control Water Valve stays open until the Float Switch trips at the upper water level. Then the Control Water Valve closes and the Flush Water Valve opens for 10 minutes.

4) When the Flush Water Valve closes, the Display stops blinking and illuminates "STOP".

5) If the Bin Control Switch is ON (Storage Bin not full) and "DRAIN" or "STOP" is illuminated on the Display when the Flush Water Valve closes, pressing the Ice Button will start the process of "[a] STARTUP, ICEMAKING OPERATION".

## [c] AUTOMATIC FLUSH CYCLE

1) The icemaker starts the following automatic flush cycle every 6 hours. (If the icemaker is flushed by the Stop Button or Bin Control Switch operation, the automatic flush cycle will start 6 hours after the startup.)

2) The Display illumination changes from “ICE” to “DRAIN”.

3) The Compressor stops and the Gear Motor stops in 5 minutes.

4) After the Gear Motor stops, the Control Water Valve stays open until the Float Switch trips at the upper water level. Then the Control Water Valve closes and the Flush Water Valve opens for 10 minutes.

5) When the Flush Water Valve closes after 10 minutes, the Display illumination changes from “DRAIN” to “ICE”, and the icemaker automatically starts the process of “[a] STARTUP, ICEMAKING OPERATION”.

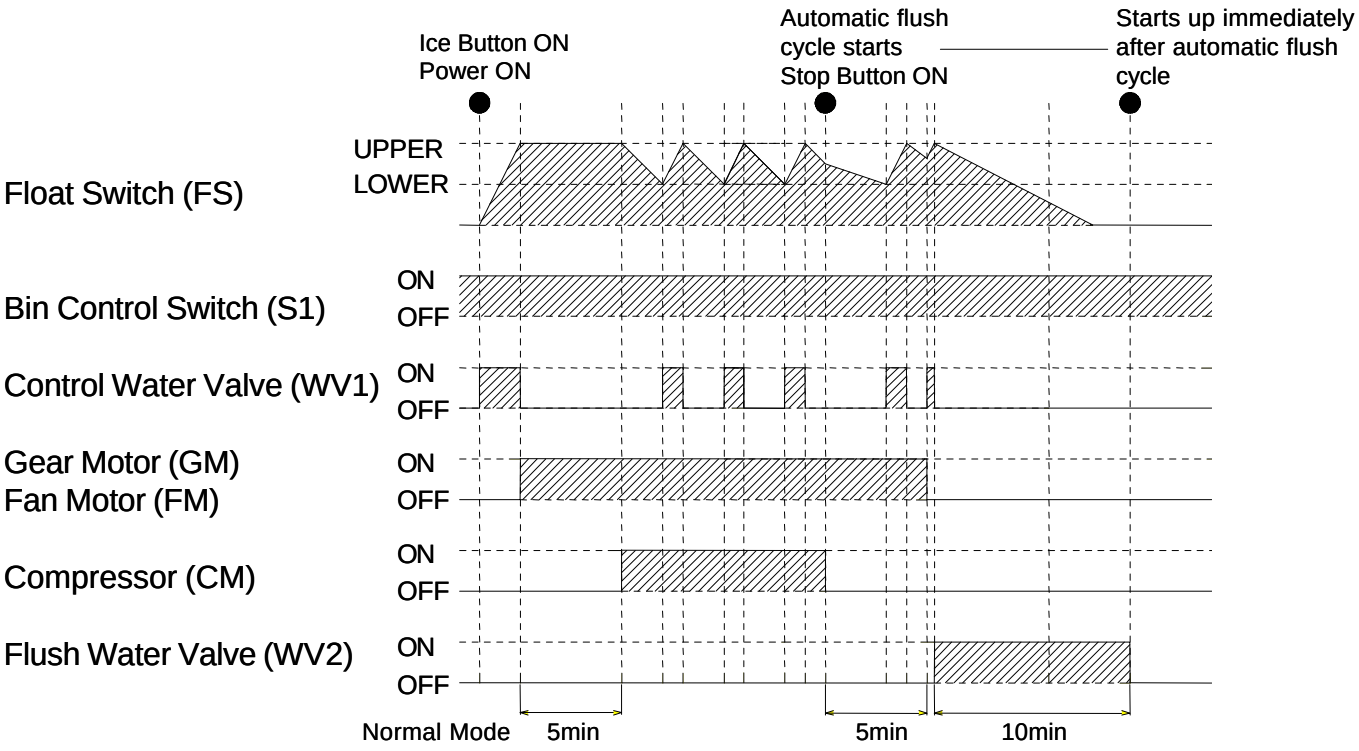



**Fig. 7**

**[d] BIN CONTROL SWITCH (Storage Bin full for less than 60 minutes)**

1) The Bin Control Switch trips or resets after the same condition lasts for more than 7 seconds.

2) When the Bin Control Switch trips, the Compressor and Gear Motor stop at the same time. The Display keeps on illuminating “ICE”.

3) If the Bin Control Switch resets in less than 60 minutes, the icemaker starts the process of “[a] STARTUP, ICEMAKING OPERATION”.

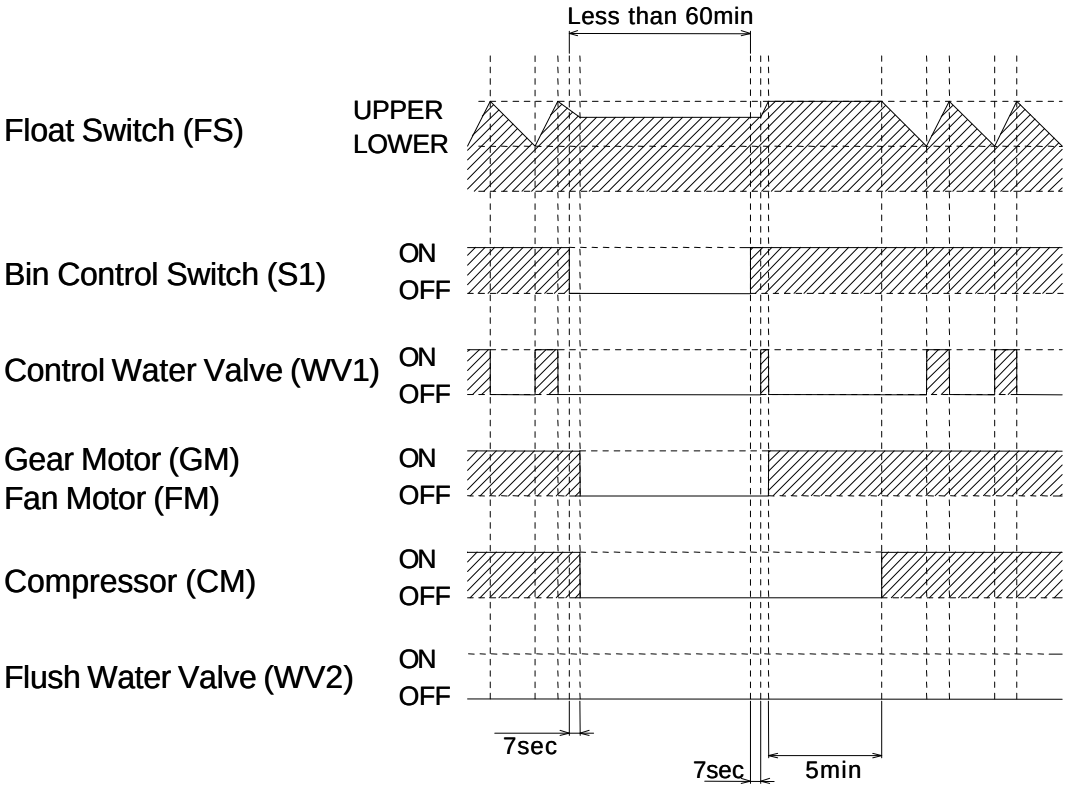



**Fig. 8**

**[e] BIN CONTROL SWITCH (Storage Bin full for more than 60 minutes)**

1) The Bin Control Switch trips or resets after the same condition lasts for more than 7 seconds.

2) When the Bin Control Switch trips, the Compressor and Gear Motor stop at the same time. The Display keeps on illuminating “ICE”.

3) If the Storage Bin remains full for 60 minutes, the Display illumination changes to “DRAIN”. The Control Water Valve stays open until the Float Switch trips at the upper water level. Then the Control Water Valve closes and the Flush Water Valve opens for 10 minutes.

4) When the Flush Water Valve closes after 10 minutes, the Display illumination changes from “DRAIN” to “ICE”.

5) When the Bin Control Switch resets, the icemaker starts the process of “[a] STARTUP, ICEMAKING OPERATION”.

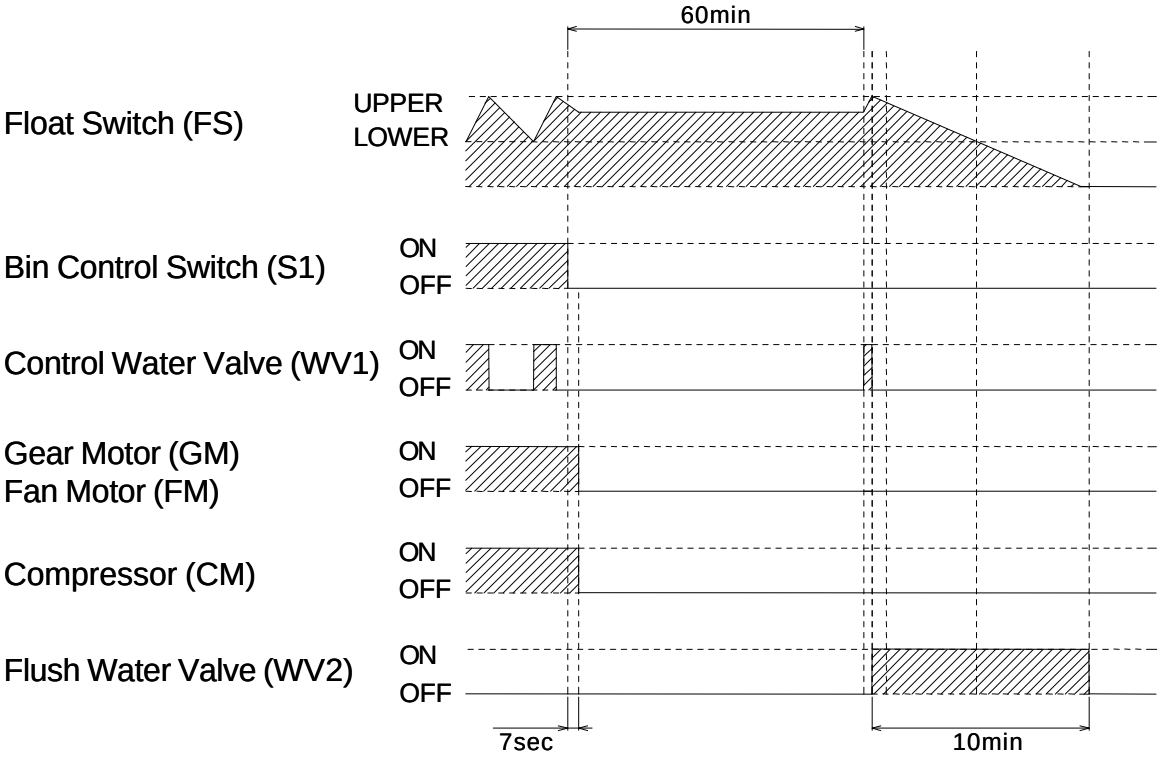



**Fig. 9**

**[f] BIN CONTROL SWITCH (Checking Actuator)**

When the Bin Control Switch seems to have malfunctioned, check the dimensions of the Actuator as well as the operation of the Proximity Switch. Also, if the Chute Switch or the Gear Motor Circuit Protector has operated for some unidentified reason, be sure to check the Actuator for proper dimensions.

1) Remove the Bin Control Switch from the Chute.

2) Move the Actuator to the maximum operation angle as shown below (top). Check that the Actuator is about 13 mm away from the Barrier. If not, replace the whole Bin Control Switch assembly.

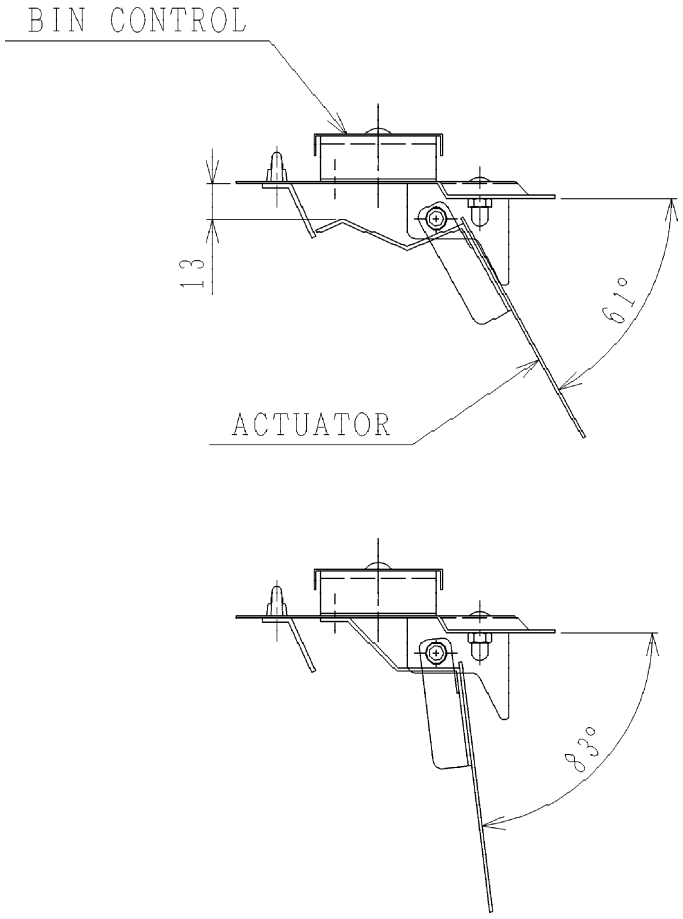



**Fig. 10**

## [g] CHUTE SWITCH

The Chute Switch consists of a microswitch and a band securing the Spout and Chute. When the Bin Control Switch breaks down, the band opens and presses the button on the microswitch (contacts open) to stop the icemaker (error code: EL).

To restart the icemaker, remove ice from the Spout and Chute, and move the Operation Switch to the “STOP” position, then to the “RUN” position.

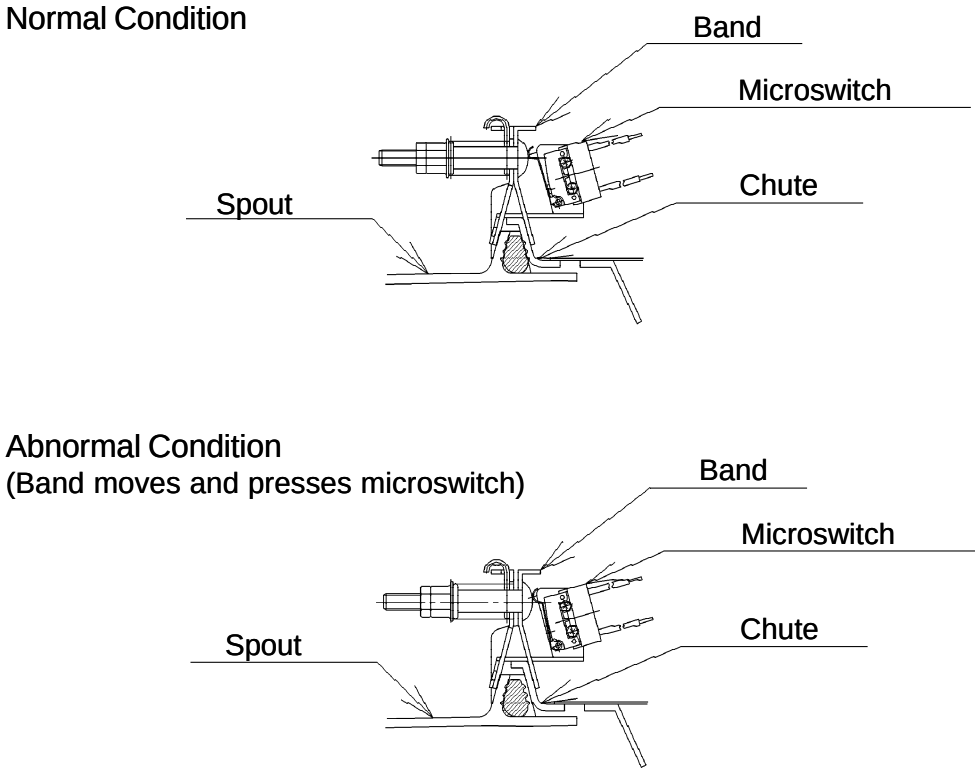
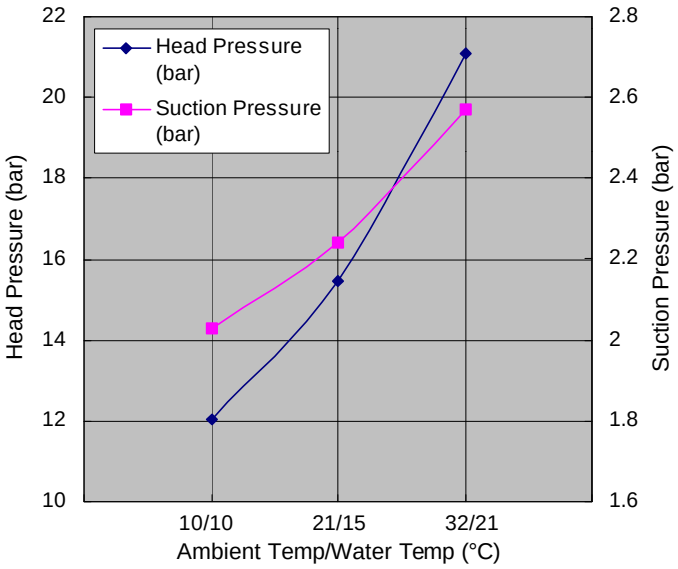
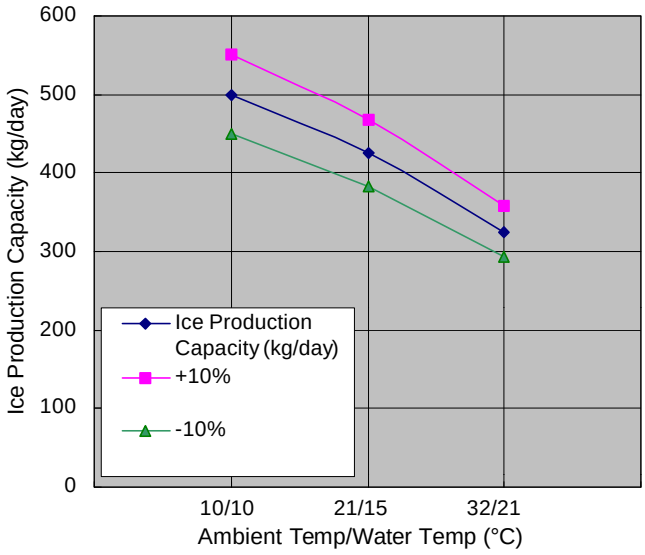


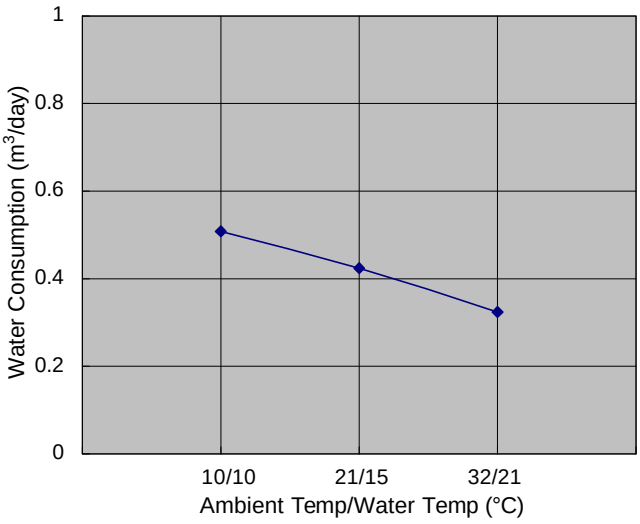

**Fig. 11**

# 4. PERFORMANCE DATA

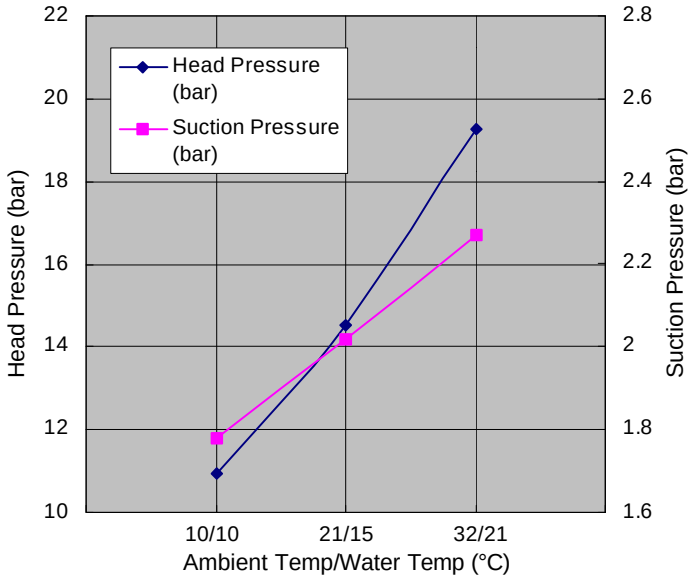
## [a] FM-481AGE

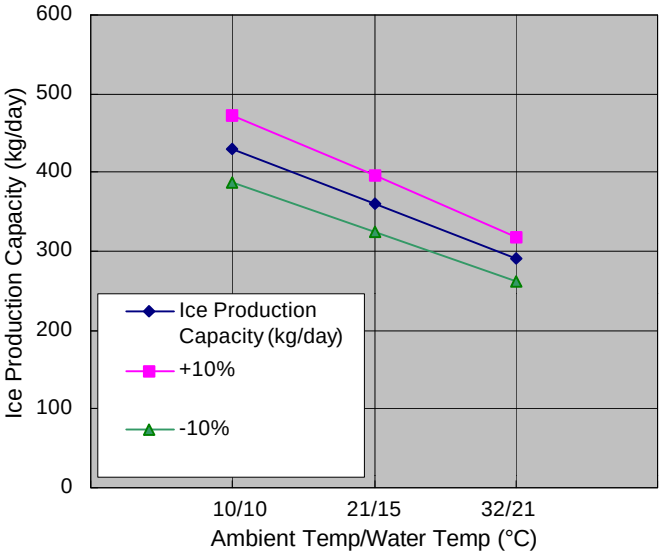


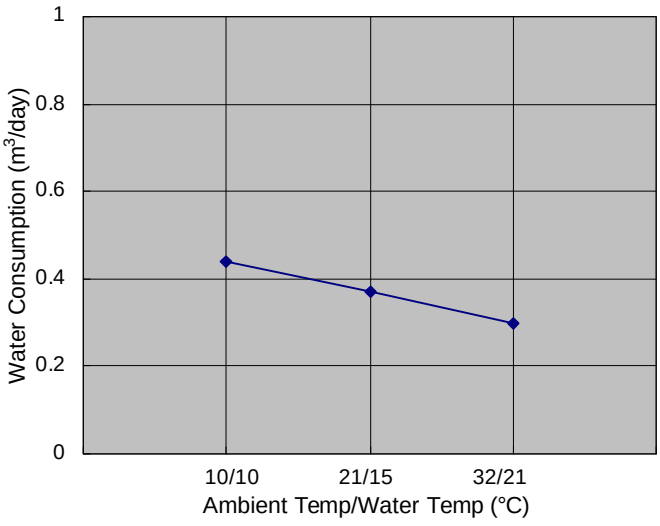



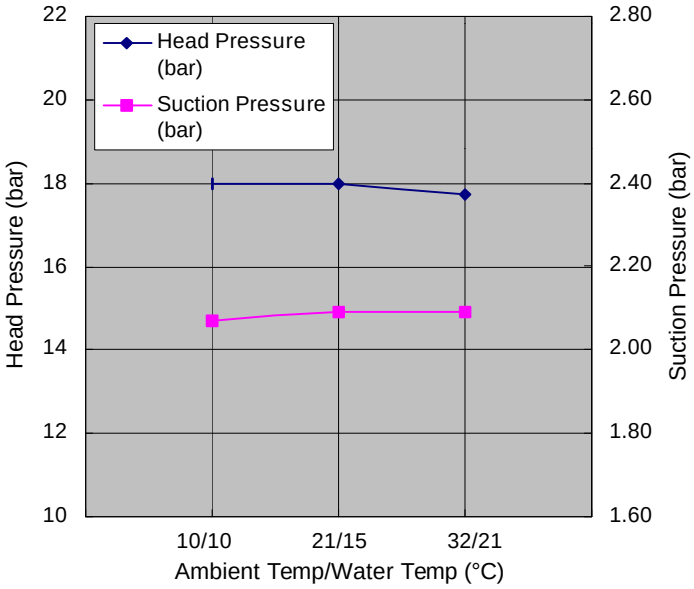
## [b] FM-481AGE-N

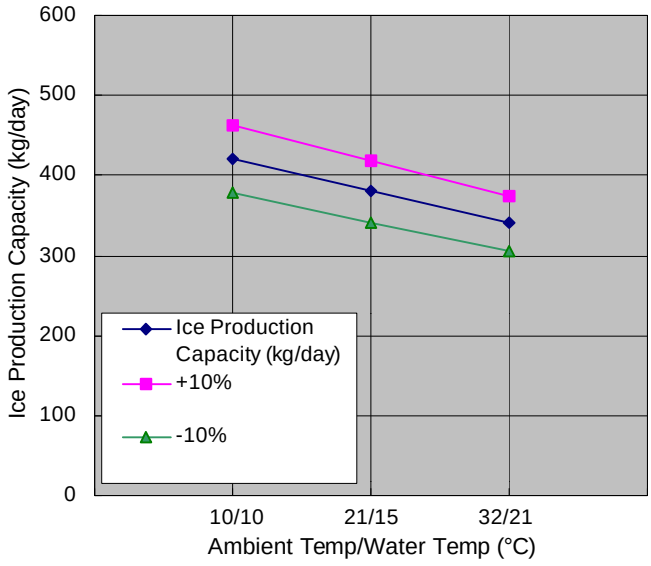

Head Pressure (bar)
Suction Pressure (bar)
Head Pressure (bar)
Suction Pressure (bar)
22
20
18
16
14
12
10
2.8
2.6
2.4
2.2
2
1.8
1.6
10/10
21/15
32/21
Ambient Temp/Water Temp (°C)

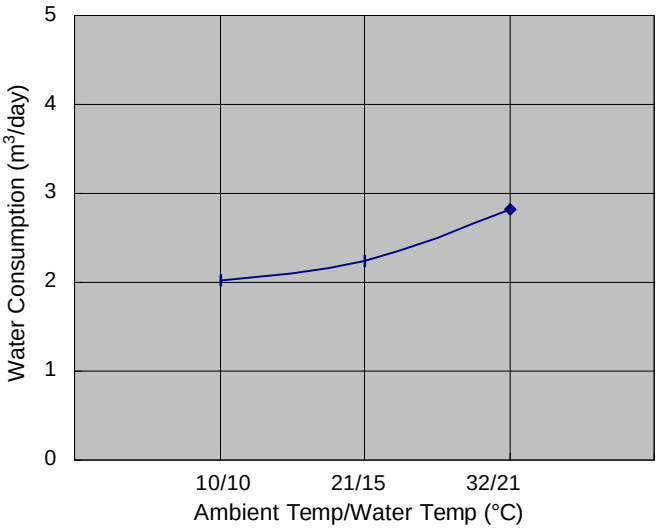

Ice Production Capacity (kg/day)
Ice Production Capacity (kg/day)
+10%
-10%
600
500
400
300
200
100
0
10/10
21/15
32/21
Ambient Temp/Water Temp (°C)


Water Consumption (m3/day)
1
0.8
0.6
0.4
0.2
0
10/10
21/15
32/21
Ambient Temp/Water Temp (°C)

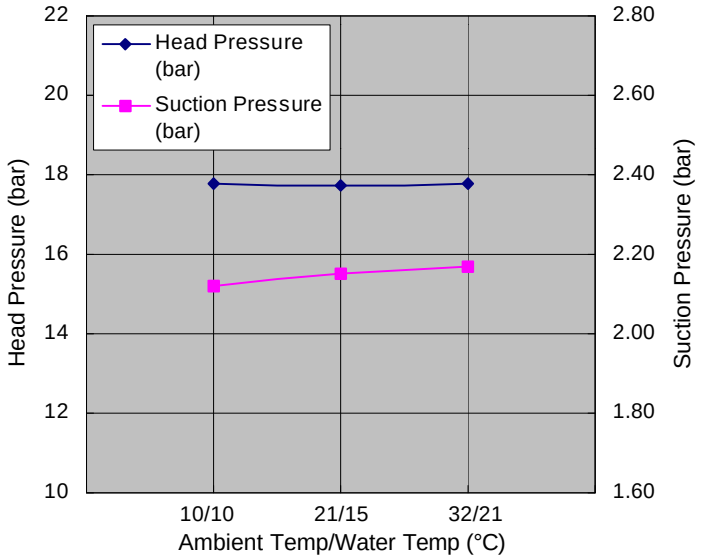
## [c] FM-481AWGE

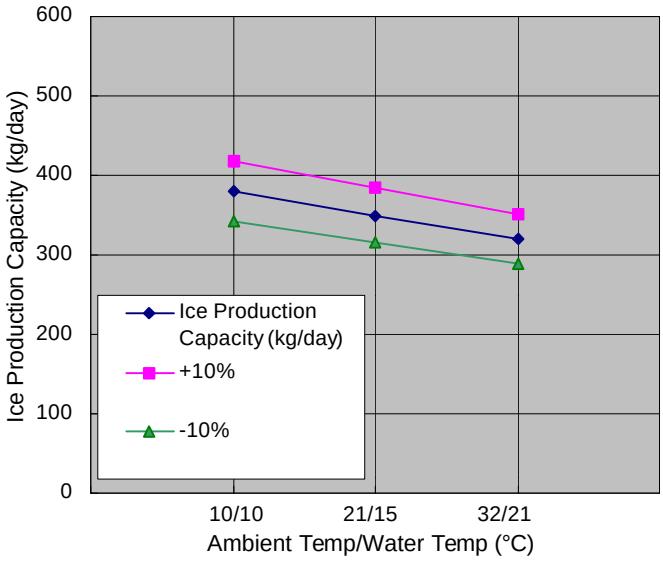

Head Pressure (bar)
Suction Pressure (bar)
Head Pressure (bar)
Suction Pressure (bar)
22
20
18
16
14
12
10
2.80
2.60
2.40
2.20
2.00
1.80
1.60
10/10
21/15
32/21
Ambient Temp/Water Temp (°C)

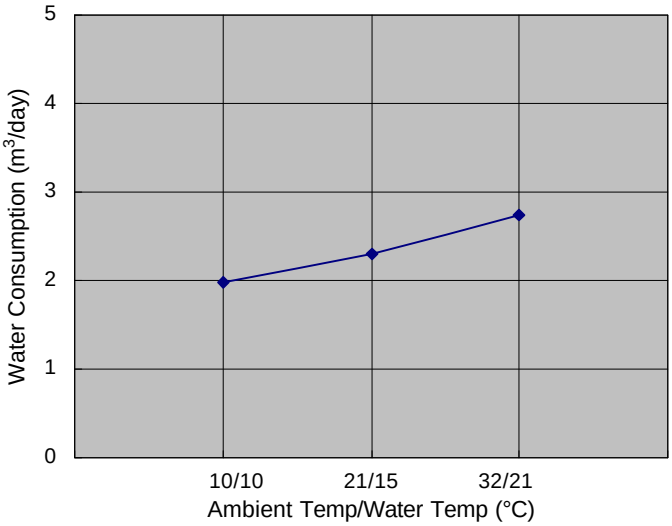

Ice Production Capacity (kg/day)
+10%
-10%
Ice Production Capacity (kg/day)
600
500
400
300
200
100
0
10/10
21/15
32/21
Ambient Temp/Water Temp (°C)


Water Consumption (m3/day)
5
4
3
2
1
0
10/10
21/15
32/21
Ambient Temp/Water Temp (°C)

## [d] FM-481AWGE-N



# VI. ADJUSTMENT OF COMPONENTS

## 1. WATER REGULATING VALVE - WATER-COOLED MODEL ONLY

The Water Regulating Valve (also called "Water Regulator") is factory-adjusted. No adjustment is required under normal use. Adjust the Water Regulator, if necessary, using the following procedures:

1) Attach a pressure gauge to the high-side line of the system. Or prepare a thermometer to check the condenser drain temperature.

2) After 5 minutes of ice production, the pressure gauge should read 18 bar or the thermometer read 38 - 40°C. If the readings are lower, use a flat blade screwdriver to adjust the screw in a clockwise direction. If the readings are higher, adjust in a counterclockwise direction. Adjust the screw by a half turn only each time and recheck the readings before making further adjustments.

3) Check that the pressure or the condenser drain temperature remains steady at the recommended settings before removing the gauge or thermometer.

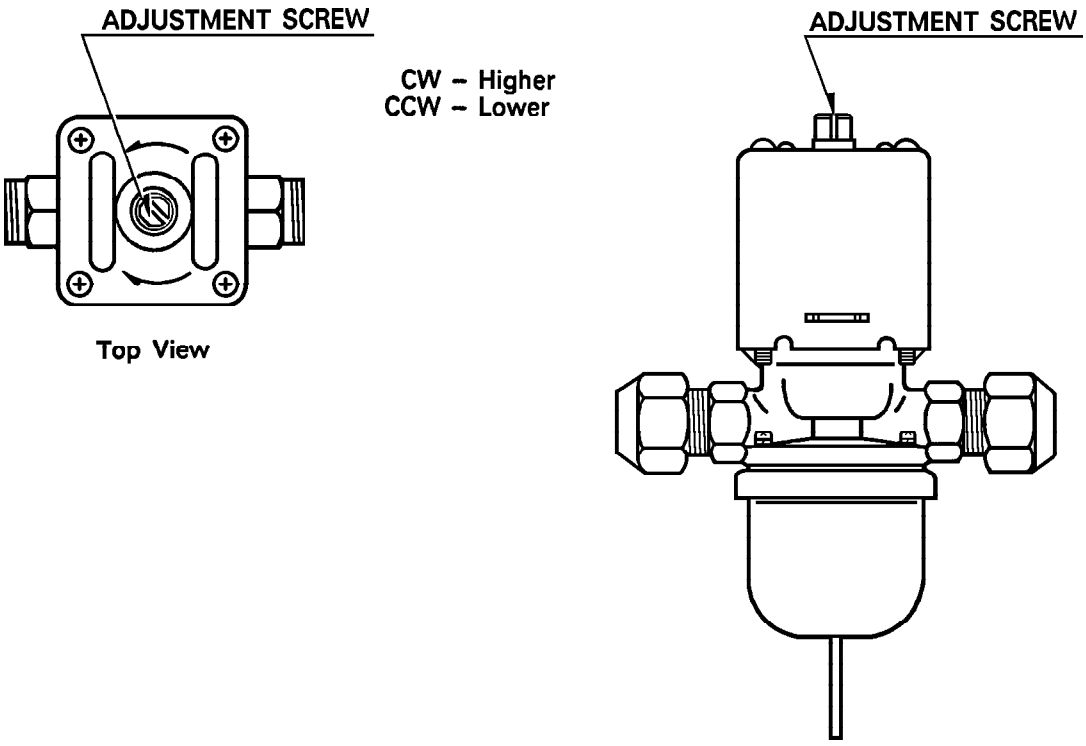



**Fig. 12**

## VII. SERVICE DIAGNOSIS

Display error record by operating the Operation Board (See “II. 2. [d] (3) Indicate error record”). Check for a possible cause and service the unit.

## 1. NO ICE PRODUCTION

| PROBLEM | POSSIBLE CAUSE | | REMEDY |
|---|---|---|---|
| [1] The icemaker will not start. | a) Power Supply | 1. STOP position. | 1. Move to RUN position. |
| | | 2. Loose connections. | 2. Tighten. |
| | | 3. Bad contacts. | 3. Check for continuity and replace. |
| | | 4. Blown fuse. | 4. Replace. |
| | | 5. Voltage too low. | 5. Get recommended voltage. |
| | b) Fuse (Controller Board) | 1. Blown out. No indication on Operation Board. K3 connector not supplied with 12V DC. | 1. Find out the cause of short circuit (ex. Control Water Valve, Flush Water Valve, Control Box Fan Motor), resolve it, and replace Controller Board. |
| | c) Transformer Receptacle (on rear of interior) | 1. Disconnected. | 1. Connect. |
| | d) Operation Switch | 1. STOP position. | 1. Move to RUN position. |
| | | 2. Bad contacts. | 2. Check for continuity and replace. |
| | e) Transformer | 1. Coil winding opened. | 1. Replace. |
| | f) Water Valve | 1. Coil winding opened. | 1. Replace. |
| | g) Water Supply Tap | 1. Closed. | 1. Open. |
| | | 2. Water failure. | 2. Wait till water is supplied. |
| | h) Plug and Receptacle (Control Box) | 1. Disconnected. | 1. Connect. |
| | | 2. Terminal out of Plug or Receptacle. | 2. Insert Terminal back in position. |
| | i) Chute Switch | 1. Tripped. | 1. See “V. 3. [g] CHUTE SWITCH”. |
| [2] Water does not stop, and the icemaker will not start. | a) Water Control Relay (Controller Board) | 1. Contacts fused. | 1. Replace Controller Board. |
| | | 2. Coil winding opened. | 2. Replace Controller Board. |
| | b) Float Switch | 1. Bad contacts. | 1. Check for continuity and replace. |
| | | 2. Float does not move freely. | 2. Clean or replace. |
| | c) Flush Water Valve | 1. Valve seat clogged and water leaking. | 1. Clean or replace. |
| | d) Hoses | 1. Disconnected. | 1. Connect. |
| | e) Mechanical Seal | 1. Water leaks. | 1. Replace. |
| | f) Reservoir | 1. Cracked. | 1. Replace. |
| [3] Water has been supplied, but the icemaker will not start. | a) Bin Control | 1. Bad contacts. | 1. Check for continuity and replace. |

| PROBLEM | POSSIBLE CAUSE | | REMEDY |
|---|---|---|---|
| [3] (Continued) | | 2. Activator does not move freely. | 2. Clean Axle and its corresponding holes or replace Bin Control. See "V. 3. [f] BIN CONTROL SWITCH". |
| | b) Gear Motor Protector (Circuit Breaker) | 1. Tripped. | 1. Find out the cause, resolve it, and press Reset Button on Motor Protector. |
| | c) Gear Motor Relay (Controller Board) | 1. Coil winding opened. | 1. Replace Controller Board. |
| | | 2. Bad contacts. | 2. Check for continuity and replace Controller Board. |
| | d) Controller Board | 1. Broken. | 1. Replace. |
| | e) Gear Motor Protect Relay | 1. Coil winding opened. | 1. Replace. |
| | | 2. Bad contacts. | 2. Check for continuity and replace. |
| | f) Pressure Switch | 1. Dirty Condenser fins. | 1. Clean. |
| | | 2. Ambient temperature too warm. | 2. Check for recommended temperature. |
| | | 3. Fan not rotating. | 3. See 3 - [1] - a). |
| | | 4. Refrigerant overcharged. | 4. Recharge. |
| | | 5. Refrigerant line or components plugged. | 5. Clean and replace Drier. |
| | | 6. Bad contacts. | 6. Check for continuity and replace. |
| | | 7. Loose connections. | 7. Tighten. |
| [4] Gear Motor starts, but Compressor will not start or operates intermittently. | a) X2 Relay on Controller Board | 1. Bad contacts. | 1. Check for continuity and replace Controller Board. |
| | | 2. Coil winding opened. | 2. Replace Controller Board. |
| | b) Thermal Relay | 1. Tripped. | 1. Reset. |
| | c) Compressor | 1. Loose connections. | 1. Tighten. |
| | | 2. Motor winding opened or earthed. | 2. Replace. |
| | | 3. Motor Protector tripped. | 3. Find out the cause of overheat or overcurrent. |
| | d) Power Supply | 1. Circuit Ampacity too low. | 1. Install a larger-sized conductor. |
| [5] Gear Motor and Compressor start, but no ice is produced. | a) Refrigerant Line | 1. Gas leaks. | 1. Check for leaks with a leak detector. Reweld leak, replace Drier and charge with refrigerant. The amount of refrigerant is marked on Nameplate or Label. |
| | | 2. Refrigerant line clogged. | 2. Replace the clogged component. |

## 2. LOW ICE PRODUCTION

| PROBLEM | POSSIBLE CAUSE | | REMEDY |
|---|---|---|---|
| [1] Low ice production. | a) Refrigerant Line | 1. Gas leaks. | 1. See 1 - [5] - a). |
| | | 2. Refrigerant line clogged. | 2. Replace the clogged component. |
| | | 3. Overcharged. | 3. Recharge. |
| | b) High-side Pressure Too High | 1. Dirty Air Filter or Condenser. | 1. Clean. |
| | | 2. Ambient or condenser water temperature too warm. | 2. Check for recommended temperature. |
| | | 3. Condenser water pressure too low or off. | 3. Check and get recommended pressure. |
| | | 4. Fan rotating too slow. | 4. See 3 - [1] - a). |
| | | 5. Water Regulating Valve clogged. | 5. Clean. |
| | c) Expansion Valve (not adjustable) | 1. Low-side pressure exceeding the limit. | 1. Replace. |
| | d) Evaporator | 1. Evaporator pipe crushed. | 1. Replace. |

## 3. OTHERS

| PROBLEM | POSSIBLE CAUSE | | REMEDY |
|---|---|---|---|
| [1] Abnormal noise | a) Fan Motor (Condenser Unit) | 1. Bearing worn out. | 1. Replace. |
| | | 2. Fan blade deformed. | 2. Replace fan blade. |
| | | 3. Fan blade does not move freely. | 3. Replace. |
| | b) Compressor | 1. Bearings worn out, or cylinder valve broken. | 1. Replace. |
| | | 2. Mounting pad out of position. | 2. Reinstall. |
| | c) Refrigerant Lines | 1. Rub or touch lines or other surfaces. | 1. Replace. |
| | d) Gear Motor (Ice Making) | 1. Bearing or Gear wear/damage. | 1. Replace. |
| | e) Evaporator | 1. Low-side pressure too low. | 1. See if Expansion Valve Bulb is mounted properly, and replace the valve if necessary. |
| | | 2. Scale on inside wall of Freezing Cylinder. | 2. Remove Auger. Use a solution of lime removing cleaner to clean periodically.<br>If water is found to surpass the following levels, install a conditioner.<br>Hardness 50 ppm<br>Silica 30 ppm |
| | f) Heater | 1. Broken. | 1. Replace. |

| PROBLEM | POSSIBLE CAUSE | | REMEDY |
|---|---|---|---|
| [1] (Continued) | g) CPR (Condenser Unit) | 1. Internal leaks. | 1. Replace. |
| [2] Overflow from Reservoir (Water does not stop.) | a) Water Supply | 1. Water pressure too high. | 1. Install a Pressure Reducing Valve. |
| | b) Water Valve | 1. Diaphragm does not close. | 1. Clean or replace. |
| | c) Float Switch | 1. Bad contacts. | 1. Check for continuity and replace. |
| [3] Gear Motor Protector operates frequently. | a) Power Supply Voltage | 1. Too high or too low. | 1. Connect the unit to a power supply of proper voltage. |
| | b) Evaporator Assy | 1. Bearings or Auger worn out. | 1. Replace Bearing or Auger. |

# VIII. REMOVAL AND REPLACEMENT OF COMPONENTS

## 1. SERVICE FOR REFRIGERANT LINES

### [a] SERVICE INFORMATION

#### 1) Allowable Compressor Opening Time and Prevention of Lubricant Mixture [R404A]

The compressor must not be opened more than 30 minutes in replacement or service. Do not mix lubricants of different compressors even if both are charged with the same refrigerant, except when they use the same lubricant.

#### 2) Treatment for Refrigerant Leak [R404A]

If a refrigerant leak occurs in the low side of an ice maker, air may be drawn in. Even if the low side pressure is higher than the atmospheric pressure in normal operation, a continuous refrigerant leak will eventually lower the low side pressure below the atmospheric pressure and will cause air suction. Air contains a large amount of moisture, and ester oil easily absorbs a lot of moisture. If an ice maker charged with R404A has possibly drawn in air, the drier must be replaced. Be sure to use a drier designed for R404A.

#### 3) Handling of Handy Flux [R404A]

Repair of the refrigerant circuit needs brazing. It is no problem to use the same handy flux that has been used for the current refrigerants. However, its entrance into the refrigerant circuit should be avoided as much as possible.

#### 4) Oil for Processing of Copper Tubing [R404A]

When processing the copper tubing for service, wipe off oil, if any used, by using alcohol or the like. Do not use too much oil or let it into the tubing, as wax contained in the oil will clog the capillary tubing.

#### 5) Service Parts for R404A

Some parts used for refrigerants other than R404A are similar to those for R404A. But never use any parts unless they are specified for R404A because their endurance against the refrigerant have not been evaluated. Also, for R404A, do not use any parts that have been used for other refrigerants. Otherwise, wax and chlorine remaining on the parts may adversely affect R404A.

#### 6) Replacement Copper Tubing [R404A]

The copper tubes currently in use are suitable for R404A. But do not use them if oily inside. The residual oil in copper tubes should be as little as possible. (Low residual oil type copper tubes are used in the shipped units.)

### 7) Evacuation, Vacuum Pump and Refrigerant Charge [R404A]

Never allow the oil in the vacuum pump to flow backward. The vacuum level and vacuum pump may be the same as those for the current refrigerants. However, the rubber hose and gauge manifold to be used for evacuation and refrigerant charge should be exclusively for R404A.

### 8) Refrigerant Leak Check

Refrigerant leaks can be detected by charging the unit with a little refrigerant, raising the pressure with nitrogen and using an electronic detector. Do not use air or oxygen instead of nitrogen for this purpose, or rise in pressure as well as in temperature may cause R404A to suddenly react with oxygen and explode. Be sure to use nitrogen to prevent explosion.

## [b] REFRIGERANT RECOVERY

The refrigerant must be recovered if required by an applicable law. A Low-side Access Valve is provided in the unit. Recover the refrigerant from the Access Valve, and store it in a proper container. Do not discharge the refrigerant into the atmosphere.
When replacing the Drier, take the opportunity to also fit a High-side Access Valve for ease of charging liquid refrigerant.

## [c] EVACUATION AND RECHARGE

1) Attach Charging Hoses, Service Manifold and Vacuum Pump to the Low-side and High-side (to be fitted by servicer) Access Valves. If possible, use Quick Release Connectors onto the Access Valves (especially on the high side).

2) Turn on the Vacuum Pump.

3) Allow the Vacuum Pump to pull down to a 760 mmHg vacuum. Evacuating period depends on the pump capacity.

4) Close the Low-side and High-side Valves on the Service Manifold.

5) Disconnect the Vacuum Pump, and attach a Refrigerant Charging Cylinder to accurately weigh in the liquid charge. Remember to purge any air from the Charging Hose. See the Nameplate for the required refrigerant charge.

6) Open the High-side Valve on the Gauge Manifold, and accurately measure in the liquid charge. Close the valve on the Charging Cylinder before closing the High-side Manifold Valve. Any remaining liquid in the line can be charged into the low side.

   Note: Always charge in the liquid stage, as many refrigerants are blends and vapour charging will affect the blend consistency (eg. R404A).

7) Turn on the icemaker. Release the High-side Access Connector, and allow pressure in the charging line to slowly enter the low side of the system. Cap off the High-side Access Valve. When pressure reduces on the low side, disconnect the low side charging line and cap off the Access Valve.

8) Always cap the Access Valves to prevent a refrigerant leak.

9) Always thoroughly leak test all joints and valve caps.

10) Avoid charging large quantities of liquid into the low side in case of damage to the Compressor.

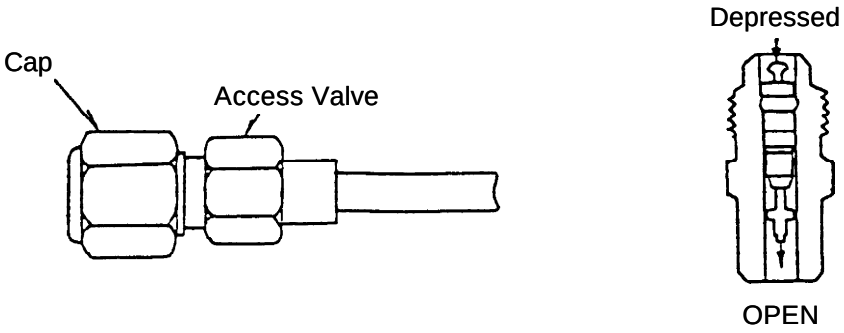



**Fig. 13**

## 2. BRAZING

**DANGER**

1. Refrigerant R404A itself is not flammable, explosive and poisonous. However, when exposed to an open flame, R404A creates Phosgene gas, hazardous in large amounts.

2. Always recover the refrigerant and store it in a proper container, if required by an applicable law. Do not discharge the refrigerant into the atmosphere.

3. Do not use silver alloy or copper alloy containing Arsenic.

4. In its liquid state, the refrigerant can cause frostbite because of the low temperature.

## 3. COMPRESSOR

**IMPORTANT**

Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repair or replacement has been made.

1) Disconnect the power source.

2) Remove the panels.

3) Remove the Terminal Cover on the Compressor, and disconnect the Compressor wiring.

4) Recover the refrigerant and store it in a proper container, if required by an applicable law (See “1. [b] REFRIGERANT RECOVERY”).

5) Remove the Discharge, Suction and Access Pipes from the Compressor using brazing equipment.

**WARNING**

When repairing a refrigerant system, be careful not to let the burner flame contact any electrical wires or insulation.

6) Remove the Bolts and Rubber Grommets.

7) Slide and remove the Compressor. Unpack the new Compressor package. Install the new Compressor.

8) Attach the Rubber Grommets of the previous Compressor.

9) Clean the Suction and Discharge Pipes with an abrasive cloth/paper.

10) Place the Compressor in position, and secure it using the Bolts and Washers.

11) Remove plugs from the Discharge, Suction and Access Pipes.

12) Braze the Access, Suction and Discharge Pipes (Do not change this order) with nitrogen gas flowing at the pressure of 0.2 - 0.3 bar.

13) Install the new Drier (See "4. DRIER").

14) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

15) Evacuate the system, and charge it with refrigerant. See the Nameplate for the required refrigerant charge (See “1. [c] EVACUATION AND RECHARGE”).

16) Connect the Terminals to the Compressor, and replace the Terminal Cover in its correct position.

17) Refit the panels in their correct position.

18) Connect the power source.

## 4. DRIER

**IMPORTANT**

Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repair or replacement has been made.

1) Disconnect the power source.

2) Remove the Front Panel.

3) Recover the refrigerant and store it in a proper container, if required by an applicable law (See “1. [b] REFRIGERANT RECOVERY”).

4) Remove the Drier using brazing equipment.

5) Install the new Drier with the arrow on the Drier in the direction of the refrigerant flow. Use nitrogen gas at the pressure of 0.2 - 0.3 bar when brazing the tubings.

6) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

7) Evacuate the system, and charge it with refrigerant. See the Nameplate for the required refrigerant charge (See “1. [c] EVACUATION AND RECHARGE”).

8) Refit the Front Panel in its correct position.

9) Connect the power source.

## 5. EXPANSION VALVE

**IMPORTANT**

Sometimes moisture in the refrigerant circuit exceeds the Drier capacity and freezes up at the Expansion Valve. Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repair or replacement has been made.

1) Disconnect the power source.

2) Remove the Front Panel.

3) Recover the refrigerant and store it in a proper container, if required by an applicable law (See “1. [b] REFRIGERANT RECOVERY”).

4) Remove the Expansion Valve Bulb at the Evaporator outlet.

5) Remove the Expansion Valve Cover, and disconnect the Expansion Valve using brazing equipment.

6) Braze the new Expansion Valve with nitrogen gas flowing at the pressure of 0.2 - 0.3 bar.

**WARNING**

Always protect the valve body by using a damp cloth to prevent the valve from overheating. Do not braze with the valve body exceeding 120°C.

7) Install the new Drier (See "4. DRIER").

8) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

9) Evacuate the system, and charge it with refrigerant. See the Nameplate for the required refrigerant charge (See "1. [c] EVACUATION AND RECHARGE").

10) Attach the Bulb to the suction line. Be sure to secure the Bulb using a wire or clamp and replace the insulation.

11) Place the new set of Expansion Valve Covers in position.

12) Refit the Front Panel in its correct position.

13) Connect the power source.

## 6. WATER REGULATING VALVE - WATER-COOLED MODEL ONLY

**IMPORTANT**

Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repair or replacement has been made.

1) Unplug the icemaker.

2) Close the water supply tap.

3) Remove the panels.

4) Recover the refrigerant and store it in a proper container, if required by an applicable law.

5) Disconnect the Capillary Tube using brazing equipment.

6) Disconnect the Flare-connections of the valve.

7) Remove the screws and the valve from the Bracket.

8) Install the new valve, and braze the Capillary Tube.

9) Install the new Drier.

10) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

11) Connect the Flare-connections.

12) Evacuate the system, and charge it with refrigerant. See the Nameplate for the required refrigerant charge.

13) Open the water supply tap.

14) Plug in the icemaker.

15) Check for water leaks.

16) See “VI. 1. WATER REGULATING VALVE”. If necessary, adjust the valve.

17) Replace the panels in position.

## 7. EVAPORATOR ASSEMBLY - See Fig. 14

1) Push the Stop Button to drain the water in the Evaporator.

2) Disconnect the power source.

3) Remove the panels.

4) Remove the Band connecting the Spout with the Chute Assembly.

5) Remove the three Thumbscrews, and take off the Spout from the Evaporator.

### CUTTER

6) Remove the Bolt and lift off the Cutter.

7) Remove the Rubber O-ring and the Nylon Ring at the top of the Evaporator.

### BELT HEATER

8) Detach the spring, and remove the Belt Heater.

### EXTRUDING HEAD

9) Remove the three Socket Head Cap Screws, and lift off the Extruding Head.

10) Check the Bearing inside the Extruding Head. If it is worn out or scratched, replace the Bearing.

Note: Replacing the Bearing needs a fitting tool. If it is not available, replace the whole Extruding Head.

### AUGER

11) Lift out the Auger. Check the top and bottom areas in contact with the Bearings. If the surface is scratched or pitted, replace the Auger. Check the blade edge of the Auger. If it is scratched or worn where it has contacted the Evaporator, replace it.

### EVAPORATOR

Note: Skip the following steps 12) through 14) when the Evaporator does not need replacement.

12) Recover the refrigerant and store it in a proper container, if required by an applicable law (See "1. [b] REFRIGERANT RECOVERY").

**IMPORTANT**

Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repair or replacement has been made.

13) Remove the Bulb of the Expansion Valve.

14) Disconnect the brazing connections of the Expansion Valve and the Copper Tube - Low Side from the Evaporator, using brazing equipment.

**WARNING**

Always protect the valve body by using a damp cloth to prevent the valve from overheating. Do not braze with the valve body exceeding 120°C.

15) Remove the two Truss Head Machine Screws and the Strap securing the Evaporator.

16) Disconnect the three Hoses from the Evaporator.

17) Remove the four Socket Head Cap Screws securing the Evaporator with the Bearing - Lower.

18) Lift off the Evaporator.

**BEARING - LOWER AND MECHANICAL SEAL**

19) The Mechanical Seal consists of two parts. One part rotates with the Auger, the other is static and is fitted into a top recess in the Housing. If the contact surfaces of these two parts become worn or scratched, the Mechanical Seal may leak water and should be replaced.

20) Remove the O-ring on the top outer edge of the Housing.

21) Remove the four Bolts and lift the Housing clear of the Gear Motor. Check the Bearing inside the Housing. If it is worn or scratched, replace it using a fitting tool. Carefully ease out the lower part of the Mechanical Seal before replacing the Bearing.

Note: If a fitting tool is not available, replace the whole Lower Housing complete with Bearing.

**GEAR MOTOR**

22) Cut the Connectors.

23) Remove the three Socket Head Cap Screws securing the Gear Motor.

24) Assemble the removed parts in the reverse order of which they were removed.

**WARNING**

Be careful not to scratch the surface of the O-ring, or it may cause water leaks. Handle the Mechanical Seal with care not to scratch nor to contaminate its contact surface.

25) When replacing the Evaporator;

(a) Braze the new Evaporator with nitrogen gas flowing at the pressure of 0.2 - 0.3 bar.

(b) Replace the Drier.

(c) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

(d) Evacuate the system, and charge it with refrigerant. See the Nameplate for the required refrigerant charge (See "1. [c] EVACUATION AND RECHARGE").

26) Refit the panels in their correct position.

27) Connect the power source.

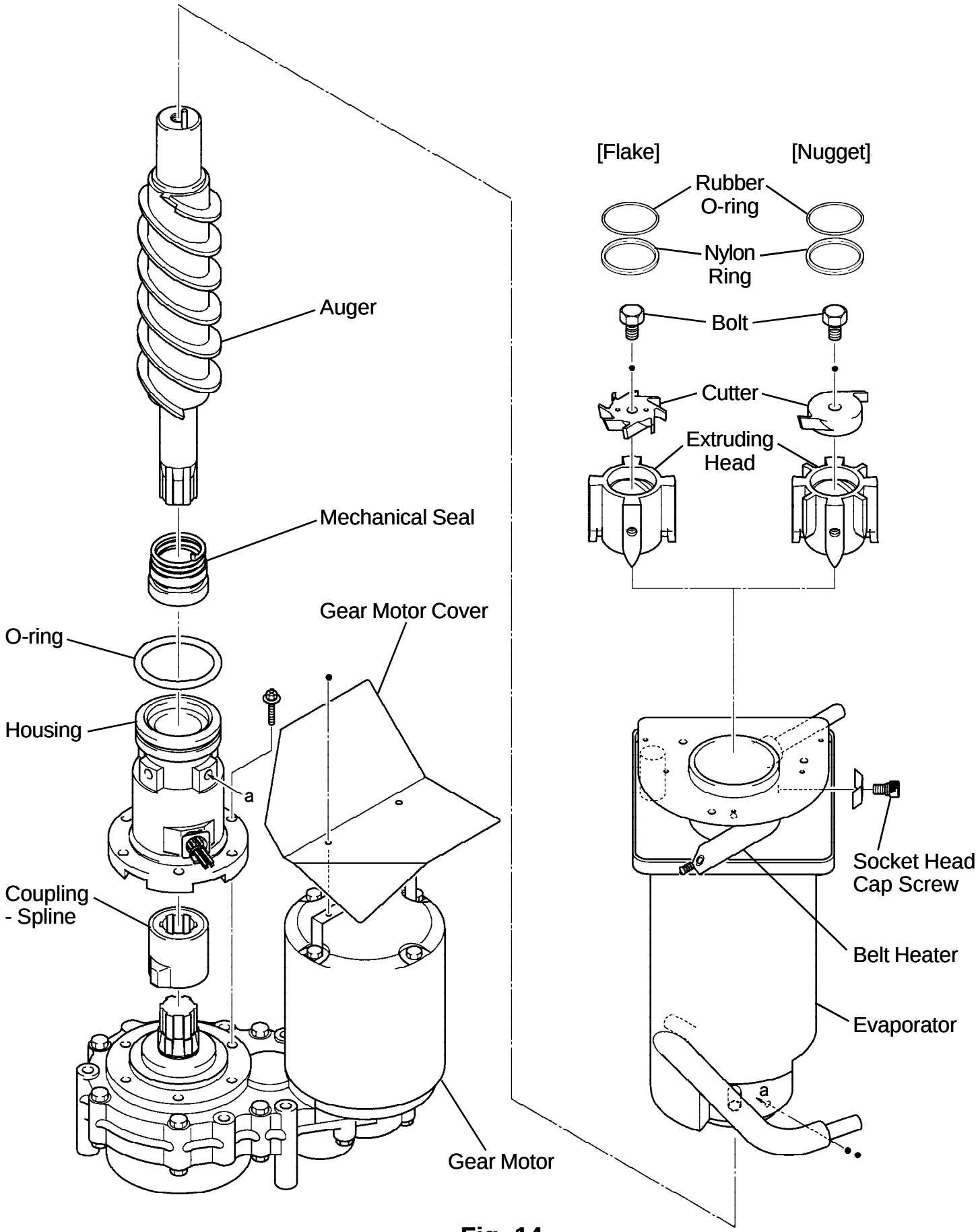

[Flake]
[Nugget]
Rubber O-ring
Nylon Ring
Bolt
Cutter
Extruding Head
Auger
Mechanical Seal
Gear Motor Cover
O-ring
Housing
a
Coupling - Spline
Socket Head Cap Screw
Belt Heater
Evaporator
a
Gear Motor

**Fig. 14**

## 8. CONTROL WATER VALVE

1) Disconnect the power source.

2) Close the water supply tap.

3) Remove the panels.

4) Disconnect the Terminals from the Control Water Valve.

5) Remove the Cover - Reservoir Inlet from the Control Water Valve.

6) Loosen the Fitting Nut on the Control Water Valve Inlets, and remove the Control Water Valve. Do not lose the Packings inside the Fitting Nut.

7) Install the new Control Water Valve.

8) Assemble the removed parts in the reverse order of which they were removed.

9) Open the water supply tap.

10) Connect the power source.

11) Check for water leaks.

12) Refit the panels in their correct position.

## 9. FLUSH WATER VALVE

1) Close the water supply tap.

2) Remove the panels.

3) Push the Stop Button, and after 5 minutes disconnect the power source.

4) Remove the Clamp and disconnect the Hose from the Flush Water Valve.

Note: Water may still remain inside the Evaporator. Be sure to drain the water into the Drain Pan.

5) Disconnect the Terminals from the Flush Water Valve.

6) Remove the Flush Water Valve from the Bracket.

7) Remove the Drain Pipe from the Flush Water Valve.

8) Connect the Drain Pipe to the new Flush Water Valve, and place the valve in position.

9) Connect the Hose to the Flush Water Valve, and secure it with the Clamp.

10) Pour water into the Reservoir, and check for water leaks on the Flush Water Valve.

11) Open the water supply tap.

12) Connect the power source.

13) Check for water leaks.

14) Push the Stop Button, and make sure water is flushing.

15) Push the Ice Button.

16) Refit the panels in their correct position.

## 10. CONTROLLER BOARD

**IMPORTANT**

A single type Controller Board is supplied as a Service Board. Some modifications and adjustment will be required to fit the icemaker models. Do not repair any parts and electronic devices on the Controller Board in the field. Replace the whole board with a new Service Board.

### [a] MODIFICATION

1) Check that the Service Board package includes:

| | |
|---|---|
| Controller Board | 1 pc. |
| Instruction Sheet | 1 pc. |

2) Modify the Service Board referring to the Instruction Sheet attached (See "II. 2. CONTROLLER BOARD" for the Dip Switch setting).

### [b] REPLACEMENT

1) Disconnect the power source.

2) Remove the Front Panel.

3) Remove screws and the Control Box Cover.

4) Disconnect the Connectors and Board Support from the Controller Board.

5) Remove the Controller Board from the Control Box.

6) Install the new Controller Board and reassemble the Control Box in the reverse order of the removal procedure.

7) Replace the Front Panel in its correct position.

8) Connect the power source.

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