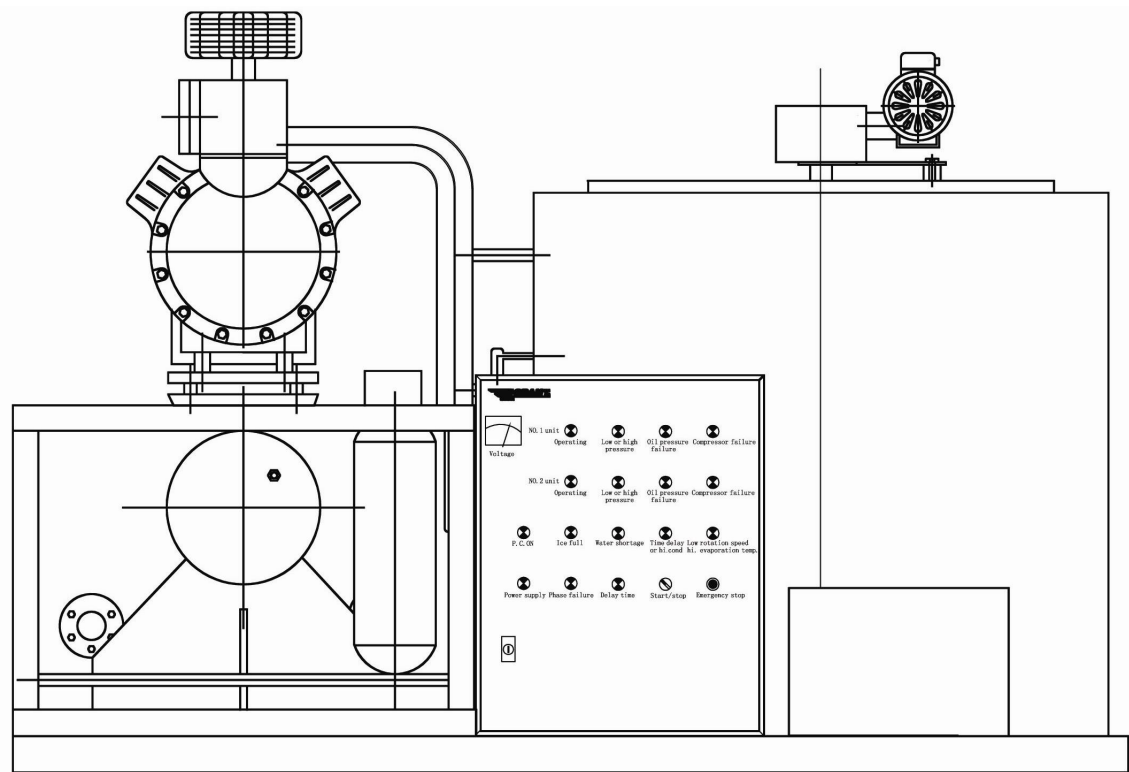


FF SERIES OF SCALE ICE MACHINES (COMPLETE UNIT)

SERVICE MANUAL

(Refrigerant: R404A)



January, 2010

Table of Contents

I. Overview	1
II. Operation Conditions & Performance Parameters	
1. Conditions for Operation of FF Series Scale Ice Machine.....	1
2. Parameters of Scale Ice Machine	1
3. Dimensions.....	2
III. Packing、Transportation、Storing and Installation	
1. In the Process of Transportation and Handling	2
2. Check on Components	2
3. Installation Conditions	2
4. Installation Procedures	3
Installation Schematic Diagram for Split Unit.....	3
Installation Schematic Diagram for Water-cooled Unit	4
5. Operating Instruction	6
IV. Operating Principles	
1. Refrigerant System.....	7
2. Water Circulation System.....	8
3. Ice level Control System	8
4. The reducer system	9
5. P.C. Board Controlling System.....	9
V. Maintenance & Trouble Shooting	
1. Equipment Maintenance.....	10
2. Trouble Shooting	11
VI. Electrical Wiring Diagram of the Slice Ice Machines	12
VII. Main Parts and Components Diagram of Slice Ice Machines	13
VIII P.C. Board and Sensor Assy.	14

I. Overview

Read this service manual carefully before installation, debugging and Operation of this scale ice machine.

This Service Manual gives an introduction of operation conditions, performance parameters, installation and debugging and operating procedures of FF series scale ice machine (complete unit) supplied with cold resource. It should be used together with special-use ice storage bin. The ice making system is of vertical, internal ice scraping type. The machine is equipped with PC board, which exercises monitoring over its whole operation process, namely:

- (1) Ice level
- (2) Water level in water tank
- (3) Normal operation of reducer's electromotor
- (4) Temperature of condenser
- (5) Shortage of refrigerant

In addition, the PC board will protect the machine when any abnormal condition arises and in the meanwhile, an alert indicator lightens up to indicate why stoppage is incurred, thus facilitates the trouble shooting and maintenance. If a light-operated device is used for ice level control, a light-dependant sensor will signal PC board to stop the machine when a beam of light sent by the light-operated device is sheltered by ice. Meanwhile, a corresponding indicator on the front panel of machine lightens up, indicating that the ice storage bin has been full of ice.

Such kind of machine features advanced micro processing system; practical operation shows it is more precise and reliable than the electromechanical control system.

II. Operation Conditions & Performance Parameters

1. Conditions for Operation of FF Scale Slice Ice Machine

	Minimum Allowable Value	Maximum Allowable Value
Ambient Temperature	5°C	40°C
Water Temperature	5°C	35°C
Water Pressure	0.15MPa	0.5MPa
Deviation from Voltage Rating	-10%	+10%

2. Parameter of Scale Ice Machine

Model	Voltage (V)	Max Current (A)	Condensing Type	Compressor (HP)	Power (kW)	Wiring size (mm ²)	Water demanded L/H
FF5AS	380V/50Hz/3N	45	Air-cooled Unit	25HP	22	10	208

It's parameter be like have alteration, anger not separately announcement.

3. Dimensions (See figure 1)

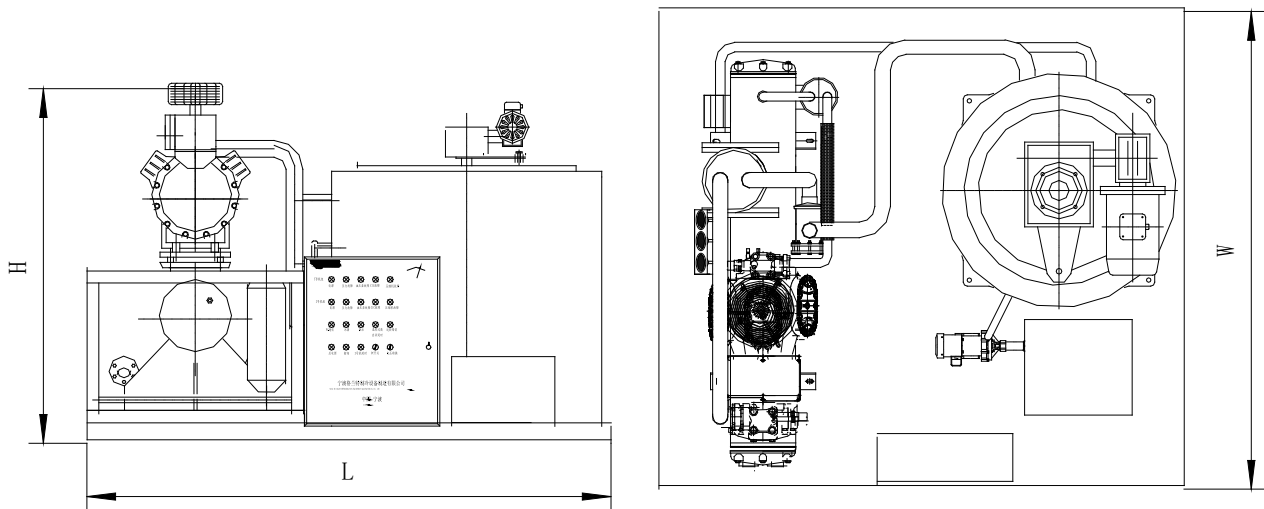


Figure 1

Model	L	W	H	备注
FF5AS	2100	1800	1300	Not contain condenser part

III. Packing、Transportation、Storing and Installation

1. Packing、Transportation and Storing: Ice machine is packed by the veneer.
Beware of collision、vibration、slanting、inversion, etc. in the process of transportation and storing. Ice machine should be kept in temperature below 40℃、dryness、well-ventilated in the storehouse, and there is no caustic gas all around.
2. Check on Components
 - A. Check whether the machine and its parts and components are complete in accordance with the packing list and whether its model is consistent with its order sheet.
 - B. Check whether the outer package is damaged and whether or not any loosening or damage is incurred to any component in the interior.
 - C. Check whether all of pipeline connections (water system, refrigerant system, etc.), electrical connections (wires, PC board, etc.) and mechanical system are in proper condition.
3. Installation Conditions (See figure 2)
 - A. Sockets and wiring must comply with local standards for electrical appliances and requirements set forth on the rating plate of the machine.
 - B. Air switch must be installed within an immediate touch and shall be chose in line with the current of various types of machines, and earth wires shall be installed in assigned position on the baseboard or in the electric case according to relevant standards.
 - C. Continual water supply shall be guaranteed for the machine (Pressure is at 0.15 to 0.5 MPa) and water supply switch shall be mounted near the slice ice machine. Inlet pipeline shall be of independent type and drainage outlet shall be also not far from the slice ice machine. Two separate water drainage pipelines shall be required for draining the slice ice machine and the ice storage bin.
 - D. The slice ice machine shall not be placed (1) in an airproof environment; (2) next to heat sources; or (3) outdoors.

E. To ensure ice quality, personnel responsible for installation shall be consulted about whether or not water filter or processor shall be installed according to user's local water-quality conditions.

4. Installation Procedures

- (1) Place the slice ice machine on corresponding ice storage bin which is used together with it and fix them with screws. See figure 2.
- (2) Check whether the machine is level or not, and level the machine with leg levellers.
- (3) Connect water supply with a hose.
- (4) Connect the drainage outlet with a spiral hose with a down slope no less than 4cm / m.
- (5) Open the water supply valve.
- (6) Insert the power plug of the machine. The plug connecting wires have three live wires (380V), one zero line and one earth wire. And the earth wire shall be connected to an assigned position on baseboard or in electric case.
- (7) For guaranteeing the slice ice machine in normal and safe operation, please have the machine properly installed and maintained under the guidance of wholesaler or supplier.
- (8) See figure 3 for installation of split unit.(See figure 3)
- (9) See figure 4 for installation of water-cooled unit.(See figure 4)

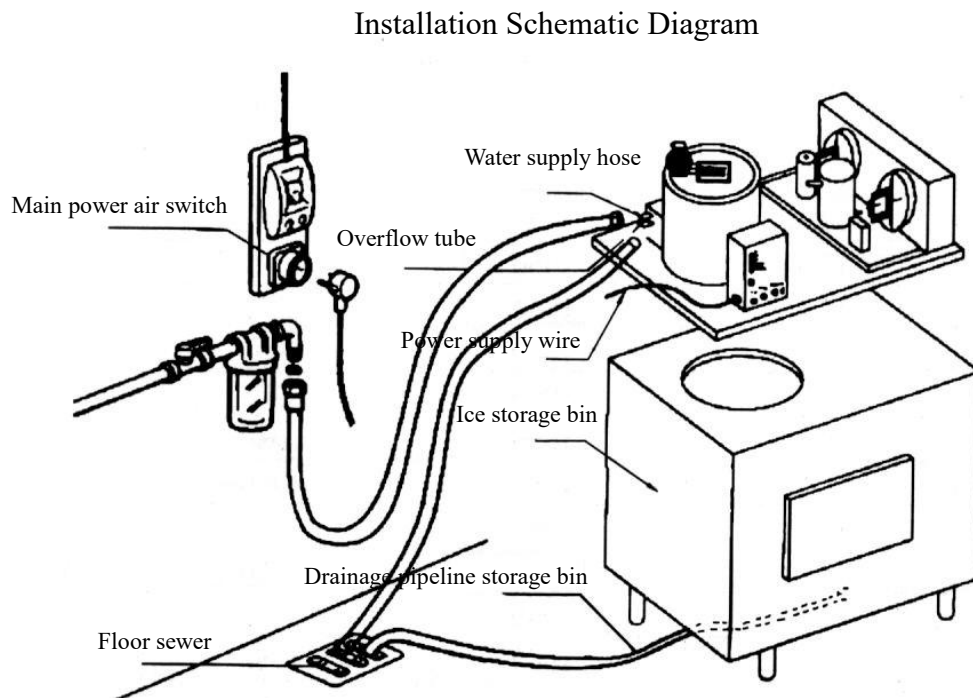


Figure 2

Installation Schematic Diagram for Split Unit

- 1) The unit and condenser have been charged with refrigerant;
- 2) In the process of installation, at first, one end of the two copper pipes shall be tightly connected with the two interfaces of condenser. (See schematic diagram). Then the other end of two copper pipes shall be loosely connected with the two interfaces of unit. Open the two valves of condenser and exhaust the air in the copper pipes. Tighten up the two interfaces of unit in the end.
- 3) Confirm that the joints are properly connected and no leakage in interfaces.
- 4) Whole pipeline is connected after valve is open;
- 5) The length of whole connecting pipeline between unit and condenser shall not be more than 8 m.

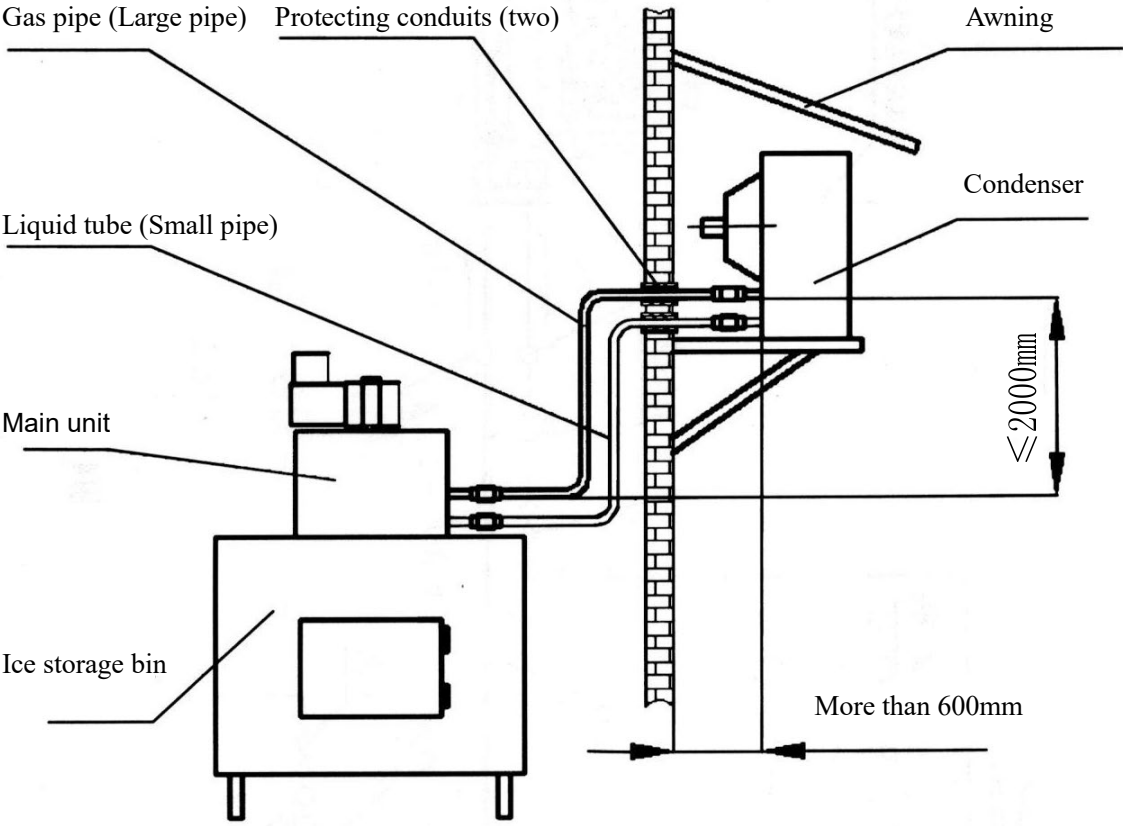
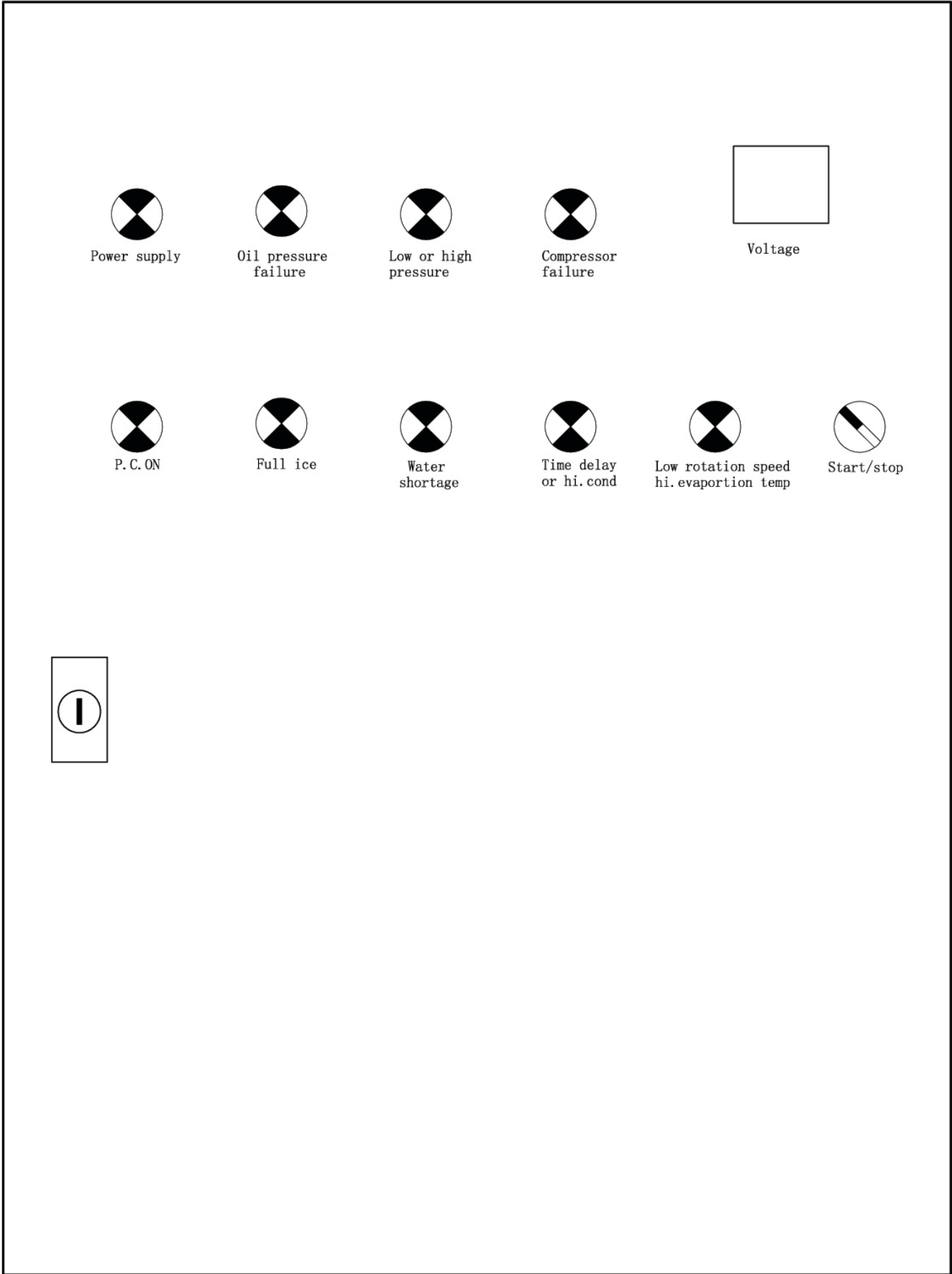


Figure 3

FF5AS Electrical Control Panel



5. Operating Instruction

(1) To start up

After the machine has been installed properly, insert the power plug and turn on (switch on) the air-break switch of the main power supply. Now the indicator light H1 (the green light) for the main electric power supply in the electricity control box of the machine lightens up. Under right phase sequence circumstance. Put the “Start/Stop” switch on the electricity control box at “Start” position (turn the switch in a clockwise way) and the machine will be on the status of 5 minutes’ delay (now the fourth red light of the second row on the electricity control box will be flickering). After the 5 minutes’ delay, the machine will start units such as the reducer and the compressor and begin to operate. The first batch of slice ice will fall into the storage bin 4 minutes after startup of the compressor. 10 minutes later, ice will spout in a normal way.

Note:

In case of the machine’s first startup or a long period of being unused, it is required to wait for 12 hours after the air-break switch of the main power supply is turned on (i.e. the compressor needs 12 hours for heating) before you turn on the Start/Stop switch, or the compressor is likely to be damaged.

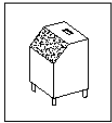
(2) To stop the machine

Turn off the “Start/Stop” switch on the electricity control box and the machine will stop working. Each time you turn on the “Start/Stop” switch and start the machine, the machine will begin to run automatically after 5 minutes’ delay.

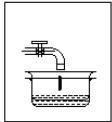
A. The 5 indicators lights on the front panel of the P.C board monitor the following statuses respectively:



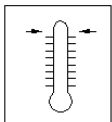
The green light is on: the machine is in a power-on status



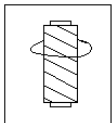
The yellow light is on: the storage bin is full of ice and the machine will resume its operation automatically 10 seconds after the ice has been taken away



The yellow light is on: insufficient water in the water reservoir. The machine will rest automatically 10 seconds after water comes



The red light is on: condenser temperature is too high or the ambient temperature is too low.
The red light is flickering: in a 5 minutes delay status after startup (normal working status)



The red light is on :rotation direction of the motor is wrong, or the speed is lower than 1300 rpm.
The red light is flickering: high evaporation temperature, i.e. the evaporating temperature fails to drop below $-1\text{ }^{\circ}\text{C}$ 10 minutes after the startup.

Note:

1. Causes for high condenser temperature: non-operative fan; blocked condenser; too high ambient temperature; too small flow rate of the condensed water; damaged condensation temperature sensor or P.C board.
 2. Causes for high evaporation temperature: short of refrigerant; too high condensation temperature; damaged condensation temperature sensor or P.C board.
- B. Explanatory notes for the “Start/Stop” switch:
- a. In normal circumstances, the switch is used to turn on or turn off the machine. **Please take care not to cut off the main power air-break switch after turning off the machine to keep the compressor under a heating status, so that the machine can be started at any time and begin to operate normally.**
 - b. When the machine is stopped as the result of the warning device initiation, causes for the trouble should be identified and the fault should be removed before the machine is re-started. In

troubleshooting, the Start/Stop switch K_2 and the air-break switch K_1 should be put at Stop position. The machine can be re-started after the troubleshooting. Start the machine in conformity with the operation instruction (1).

- C. The first green light in the first row (H1) on the front panel of the electricity control box is the indicator light of the main power supply. If this light is on while the “Start/Stop” switch is off, the heater is working and all the other units do not work.
- D. The second red light in the first row (H2) on the front panel of the electricity control box is the indicator light of missing phase of the power supply. This lamp light, please check phase sequence of the power supply.
- E. The third red light in the first row (H3) on the front panel of the electricity control: the red light will be on (for warning) if the exhaust pressure of the compressor is higher than the specified value (the pressure gage has been set up when delivery from the factory) or if the intake pressure is lower than the specified value (the pressure gage has been set up when delivering from the factory). Please identify causes of the warning and remove the trouble before you can reset the machine manually.
- F. The second row indicator light of the electricity control box for P.C. board five indicator light’s outside Lamps draw installation.

IV. Operating Principles

1. Refrigerant System (See figure 5)

Hot gas of the refrigerant is discharged from the compressor, then the hot gas goes into the condenser and is turned into liquid after refrigeration. The liquid refrigerant flows into the liquid pipeline through a drier and then to the evaporator coiler in the freezer cylinder via an expansion valve and begins to evaporate. Then the refrigerant exercises heat exchange with flowing water on the surface of the freezer cylinder, making the refrigerant into vapor. Then the gas refrigerant is drawn into the air intake pipe and then into the compressor and turned into hot gas for next turn of cycle.

Notice:

The drying filter should be replaced each time the refrigerant system is opened (e.g. for replacing compressor, condenser, etc.)

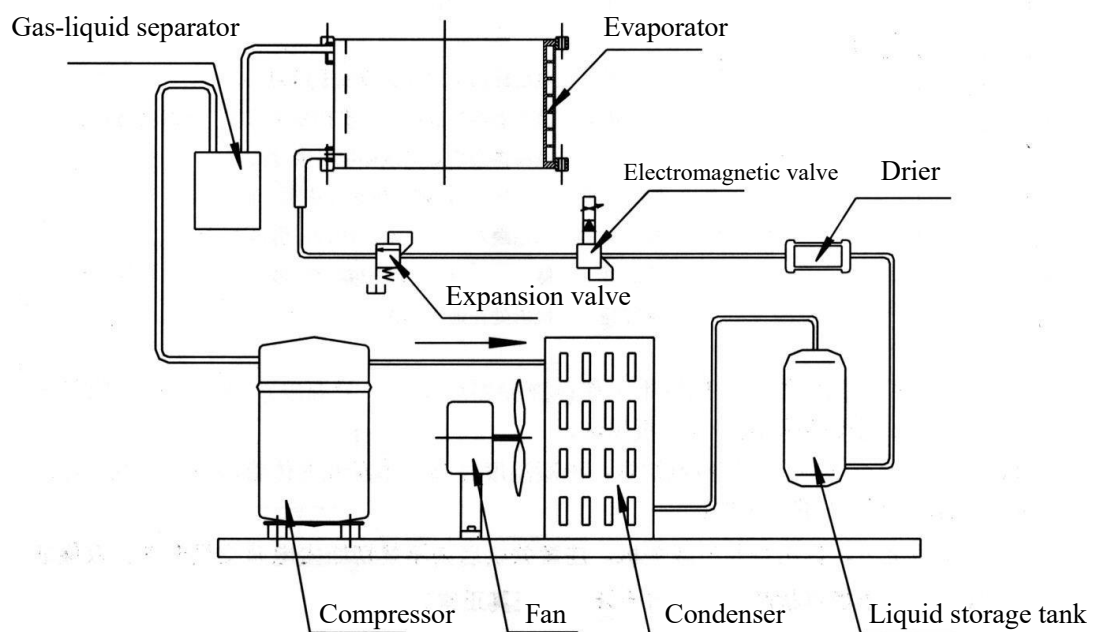


Figure 5

2. Water Circulation System (See figure 6)

Through water supplying pipes and float valve, the tap water flows into the water reservoir. Water in the water reservoir will be pressed into the water knockout vessel by a water pump and then flow to the inner surface of the evaporator. It will be cooled down gradually and some water will be turned into ice. With ice blades, the ice will be separated from the inner surface of the evaporator and drop into the ice storage bin through the ice spout. Some of the remaining water will flow back to the water reservoir.

Note:

- Water supply is monitored by a sensor. If there is no water in the water reservoir or the water is soft water (not containing mineral substances), the P.C. board will make the machine stop, and then the yellow light (which indicates insufficient water) will be turned on to indicate lack of water.
- The water level in the water knockout vessel has been adjusted to the waterline marked by red paint when the machine is delivered from factory. Do not adjust it to higher or lower level at will. If the water level is really not on the waterline, you can adjust the valve in the water reservoir to make the water level be at the specified position (the water surface should be 26mm away from the bottom of the water knockout vessel).

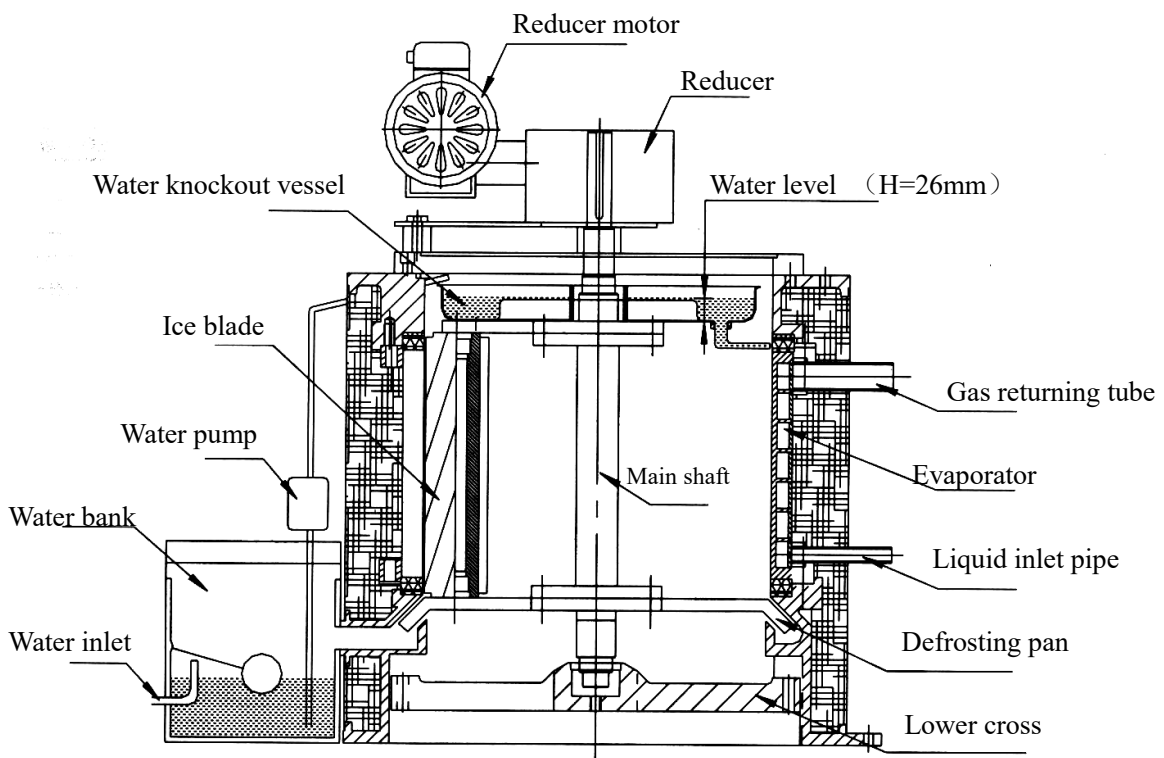


Figure 6

3. Ice Level Control System

There is a light-operated ice level controller between the machine and the ice storage bin. When the storage bin is full of ice, the ice will cut off the light beam of the ice level photoelectric sensor and then the red LED in the center of P.C. board will be turned off immediately. The yellow light indicating ice level will be turned on after the light beam has been cut off for a continuous period of time and the machine stops. The light beam will be resumed and the red light in the center of the P.C. board will be turned on immediately if the ice is taken away.

4. The Reducer System

This system includes a gear motor, a reducer and various transmission devices. The gear motor drives the reducer. The output shaft of the reducer drives the auger and water knockout vessel at a speed of 2 rpm. In case of a wrong rotation direction or low speed of the gear motor, the sensor will send a signal to the P.C. board, which will make the machine stop. Causes of the trouble should be identified and fault should be removed before the machine is re-started. Press the Reset key or put the Start/Stop switch at the "Stop" position first and then to "Start" position, the machine will begin to work again normally.

5. P.C. Board Controlling System (please refer to figure 7)

The P.C. board controls the whole operation process of the machine according to signals sent by various sensors.

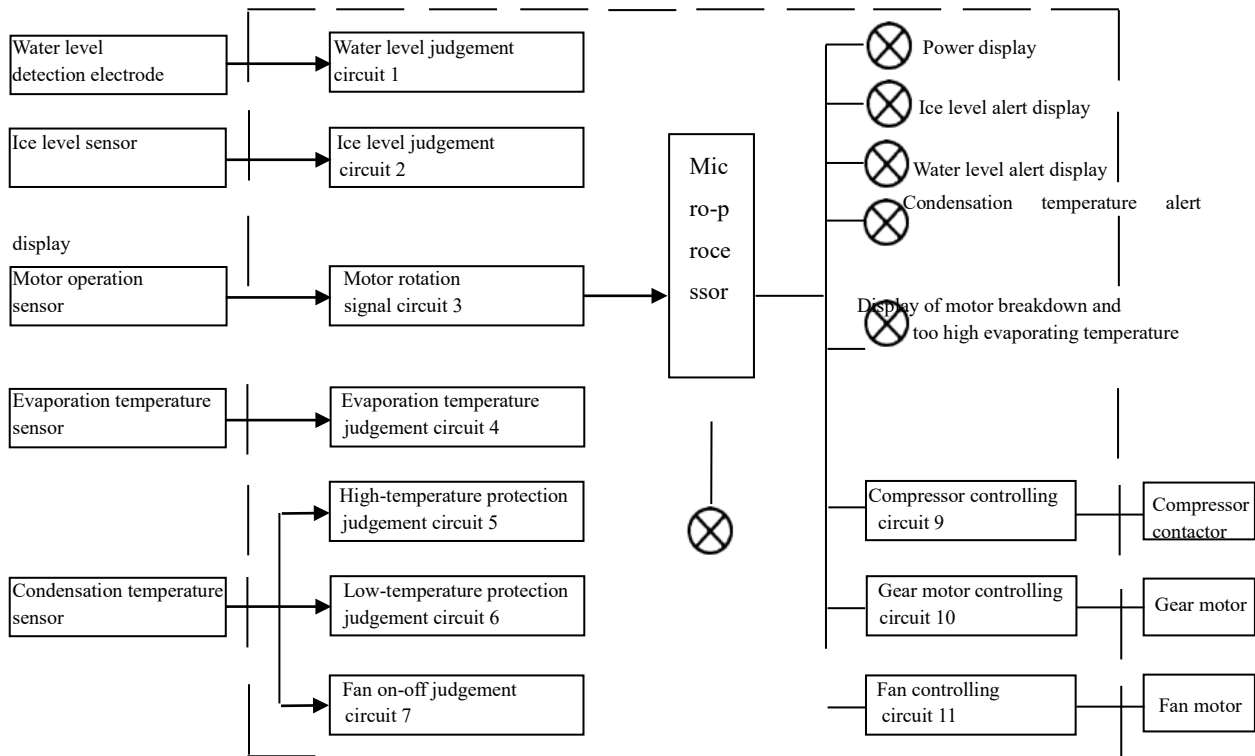


Figure 7

Notice:

There are 8 change-over switches on the P.C. board. The function of the first switch: if it is at "ON" position (the upper position), there will be no 5 minutes' of delay status after start-up; if it is at "OFF" position (the lower position), there will be a 5 minutes' of delay status after the start-up. The switch is required to be set at "OFF" position (the lower position) when the machine leaves the factory or operates normally. The function of the third switch: it is a switch for self-tests during the production process at factory. Users are required not to use this switch, the proper position of which should be the "OFF" position (the lower position). The sixth switch is a buzzer switch. If it is at "On" position (the upper position), there will be buzz for warning; if it is at "Off" position (the lower position), there will be no buzz for warning (see figure 8).

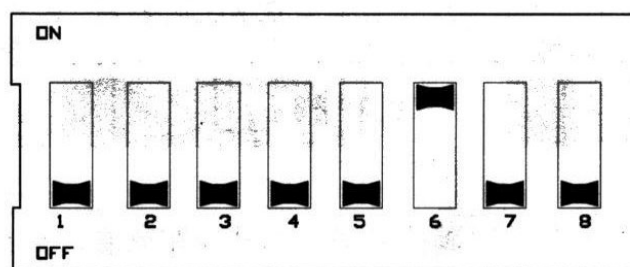


Figure 8

V. Maintenance & Trouble-shooting

1. Equipment Maintenance



Precaution: Main power supply must be cut off before conducting any operation for clearance and maintenance, especially when the ice-machine doesn't work in the state of "bin full" and "no water". In this case, don't do any maintenance and repair for the ice-machine (especially in inner part of the machine) as well, because in such case, the ice-machine may automatically start at any time to hurt people.

A. Daily Notices

For ensuring the quantity of ice slice, pay attentions for the items stated below:

- Nothing is allowed to be stored in the ice storage bin..
- Always keep the bin door close and the ice shovel clean.
- Keep off any dust from entering into the slice ice machine through its ventilator part when cleaning of the machine.

To protect the machine from any damage, please pay attention to the items stated below:

- Don't cut off the water supply when machine is operating.
- Open/close the storage bin door gently and never kick or jerk the door.
- Never stack anything on the top of ice storage bin and its surrounding area to avoid ventilation blockage and deterioration of sanitary conditions there.
- If the machine is first used and unused for a long time, start the compressor after energizing the compressor heater for 12 hours and then switch on the switch of the computer panel.

B. Regular cleaning & maintenance

Users can adapt the regular maintenance according to their local water quality and environmental conditions.

In order to ensure good performance and sanitary condition, the following regular maintenance should be conducted (at an interval of about one month).

- Clean the inside walls of the ice storage bin with detergent diluted by tepid water.
- Disinfect the bin surfaces by scrubbing them with liquid algae after flushing.
- Clean the bin and machine body by soft cloth soaked with special detergent for stainless steel.

Cleaning for the Water System

- Attach great importance to the cleaning for water system.
- For water system, Cleaning should be conducted at least twice a year.
- Cleaning out the mineral sediment and the silted scale deposit completely with detergent is recommended.

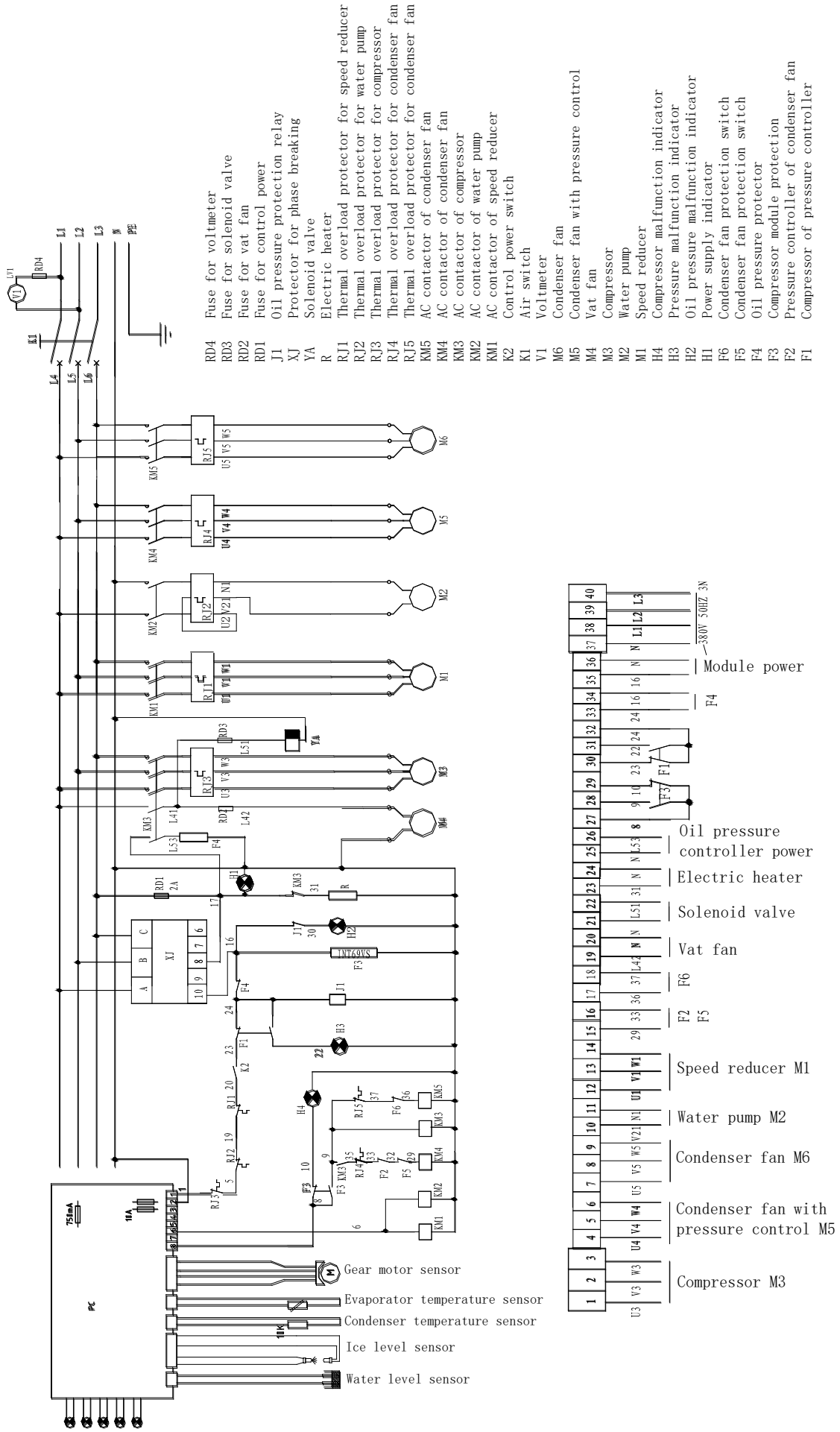
Cleaning for the Condenser

- Regularly clean the condenser in order to ensure a good cooling effect.

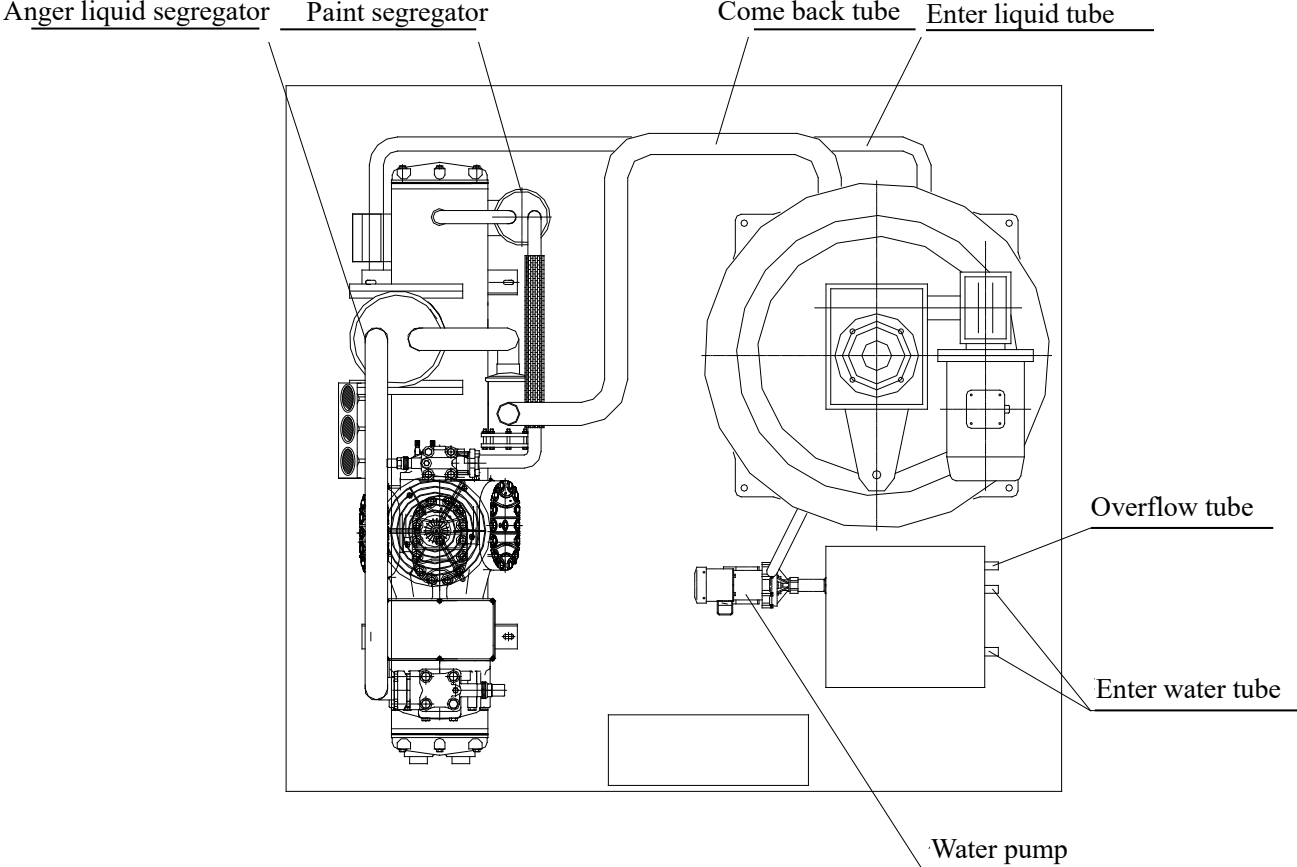
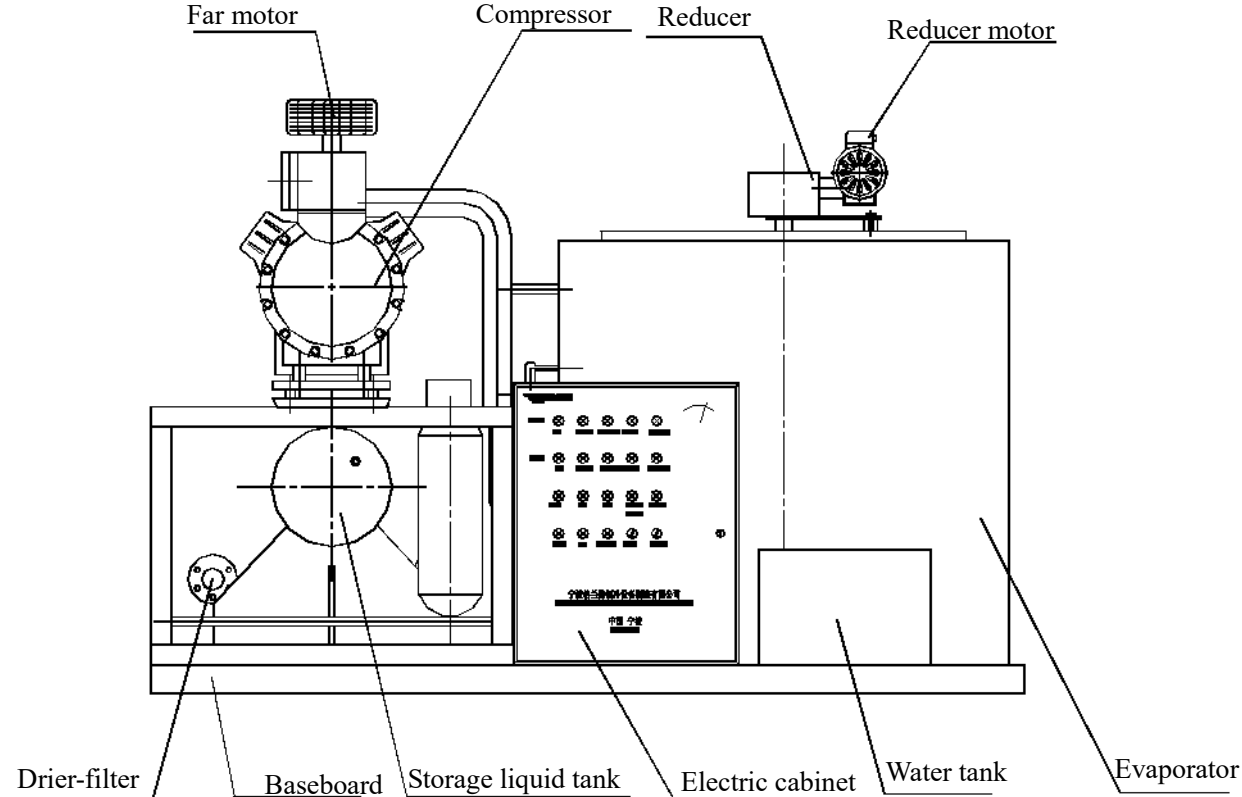
2. Trouble Shooting

Phenomena	Possible Causes	Remedy Suggestion
<p>Machine doesn't work.</p> <p>(1) The indicator of power supply on the P.C. board does not lighten up.</p> <p>(2) Light indicating for bin full lights on.</p> <p>(3) Light indicating water shortage lights on.</p> <p>(4) Light indicating for condenser temperature lights on.</p> <p>(5) Indicator for ice auger flashes.</p> <p>(6) Indicator for ice auger lights on.</p>	<p>Main switch is on OFF position.</p> <p>The fuse (750mA) of P.C. board is broken.</p> <p>P.C. board doesn't work.</p> <p>Connecting wire is at loose contact.</p> <p>Controller of ice level doesn't work.</p> <p>Insufficient water or over-soft water</p> <p>Condenser is blocked by dirty.</p> <p>Fan doesn't work.</p> <p>Condenser temperature sensor is damaged.</p> <p>Ambient temperature is too low.(Below 4°C)</p> <p>Insufficient refrigerant.</p> <p>Ambient temperature is too high.</p> <p>Evaporation temperature sensor is damaged.</p> <p>Gear motor rotates reversely.</p> <p>Speed of gear motor is too slow.</p>	<p>Turn switch to ON position.</p> <p>Replace fuse and check the cause of fuse breakdown.</p> <p>Replace P.C. board.</p> <p>Check connecting wire.</p> <p>Clean or replace controller of ice level.</p> <p>Refer to the suggestion for insufficient water.</p> <p>Clean the condenser.</p> <p>Clear or replace the fan.</p> <p>Replace the sensor.</p> <p>Place the machine in the location at required room temperature.</p> <p>Fill with refrigerant.</p> <p>Remove the cause.</p> <p>Replace the sensor.</p> <p>Check the connecting wire of motor and capacitor.</p> <p>Check the bearings of motor and freezer cylinder.</p>
Compressor doesn't work continuously.	<p>Low voltage.</p> <p>Some incondensable gas is in the system.</p> <p>Connecting wire of compressor starter is at loose contact.</p>	<p>Check whether the circuitry is overload or not.</p> <p>Remove the gas.</p> <p>Check and connect the wire properly.</p>
The amount of produced ice declines.	<p>Expansion valve is partly blocked or improperly adjusted.</p> <p>Moisture content in the system is too high.</p> <p>Water level in water knockout vessel is low.</p> <p>Cryogen is not enough.</p>	<p>Adjust or re-vacuumize .</p> <p>Vacuumize the system again.</p> <p>Adjust the water level to specified level.</p> <p>Check leakage and fill with refrigerant.</p>
Although in operation, the machine doesn't produce ice.	<p>No water is in the freezer cylinder.</p> <p>Gear motor gets stuck.</p>	<p>Water supply pipe of the freezer cylinder blocked.</p> <p>Check and repair or replace it.</p>
Water leakage	<p>Water level in the water reservoir is too high.</p> <p>Water level in the water knockout vessel is too high or too low.</p>	<p>Adjust again.</p> <p>Adjust again.</p>
The sound of reducer is loud.	<p>Motor bearing(s) is(are) abraded.</p> <p>Gear case is lack of lubricant.</p> <p>Bearings and gears in the gear case are worn out.</p>	<p>Check and replace bearing.</p> <p>Check gear case to ensure that it is rightly charged with lubricant.</p> <p>Check and replace the abraded assy.</p>
Lack of water	Water supply pipe is blocked.	Backout and cleanout
<p>Red Alarm light lightens up.</p> <p>High exhaust pressure</p> <p>Low suction pressure</p>	<p>Fan doesn't work.</p> <p>Electromagnetic valve is not open.</p> <p>Expansion valve is improperly adjusted.</p> <p>Insufficient refrigerant.</p>	<p>Check or replace the fan.</p> <p>Check or replace the valve.</p> <p>Adjust the valve properly.</p> <p>Fill with the refrigerant.</p>

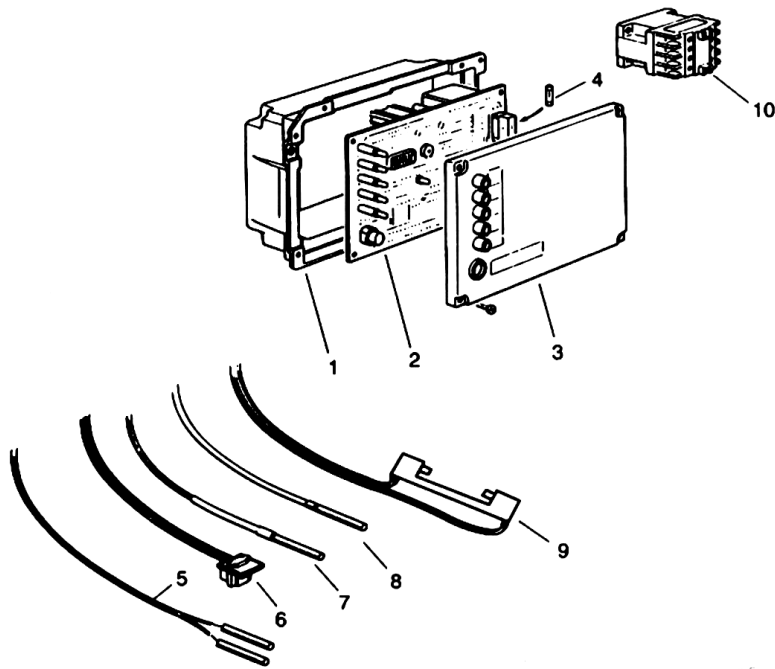
VI. Electrical Wiring Diagram of the Scale Ice Machines



VII. Main Parts and Components Diagram of Scale Ice Machines



VIII P.C. Board and Sensor Assy.



P.C. Board and Sensor Assy.

Item No	Parts No	DESIGNATION
1	205001.00	Control Bow
2	205003.00	P.C. Board Assy.
3	205002.00	Control Box Cover
4	205004.00 205005.00	Fuse (750 mA) Fuse (10A)
5	205007.00	Water Level Sensor
6	205008.00	Rotate Speed Sensor
7	205009.00	Condensation Temperature Sensor
8	205010.00	Evaporation Temperature Sensor
9	205011.00	Ice Level Control Assy.
10	205006.00	Contactora

NINGBO GRANT REFRIGERATION EQUIPMENT MANUFACTURING CO., LTD

Address (cont.): Ningbo, Zhejiang, China

Postal Code: 315153

Telephone number: 0574-88266818 and 0574-88266892

FAX: 0574-88266918

E-mail address: grant-nb@vip.sina.com

Website address: <http://www.grant-ice.com>