

HAIER

REFRIGERATOR

SERVICE MANUAL

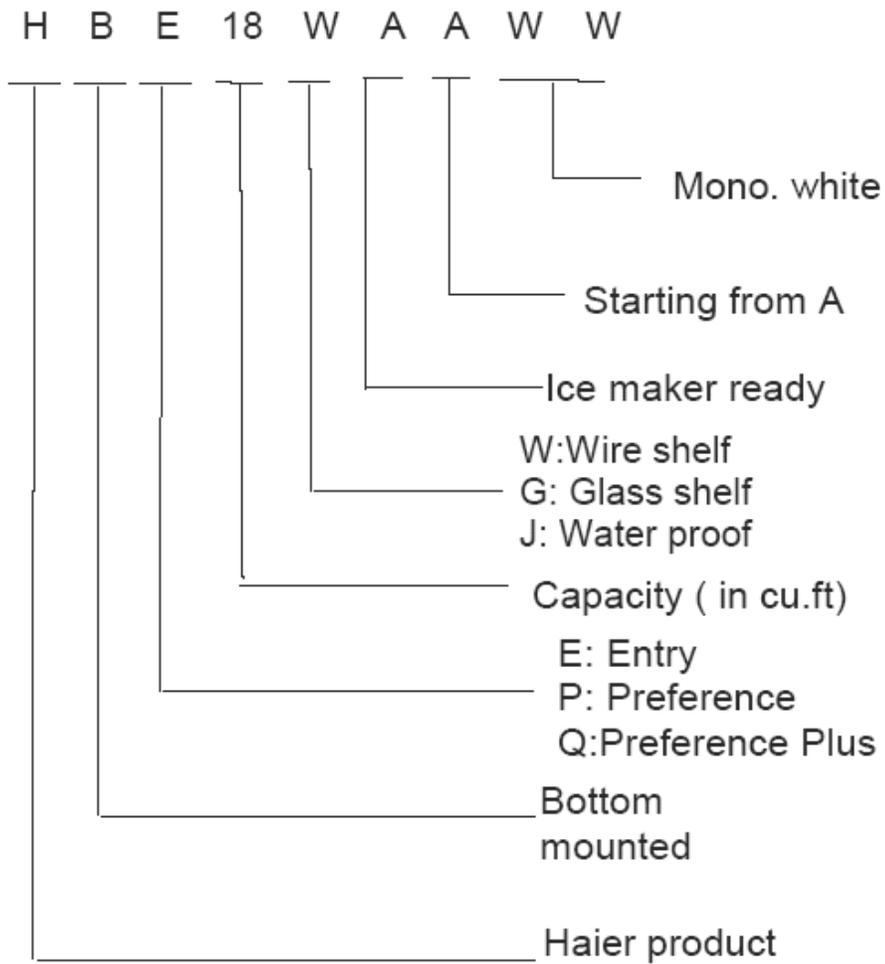
PART # RF-8888-370

HAIER AMERICA TRADING, LLC
www.haieramerica.com

TABLE OF CONTENTS

Product Code Explanation and Series	
Introduction	3
Specifications	4
Safety Precautions	5 – 10
Parts and functions	11
Function Schedule	12
System Flow Chart	13
Flow of Cold Air	14
Circuit Diagram	15 – 16
Program Diagram	17
Maintenance Service and Troubleshooting	18 – 20
Troubleshooting and Repairs	21 – 36

PRODUCT CODE EXPLANATION SERIES INTRODUCTION

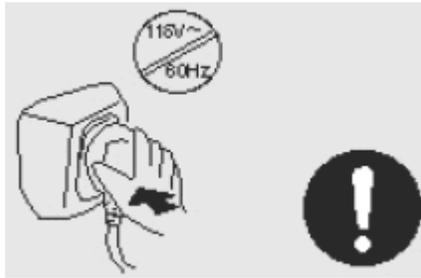


SPECIFICATIONS

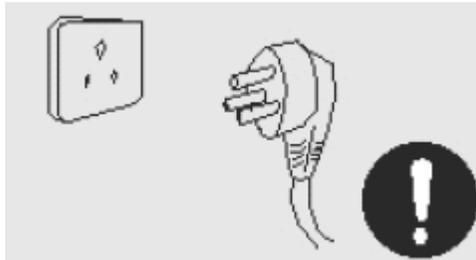
Models	HBE18WAAWW	HBP18GAAWW	HBP18GAAWW	HBP18GAABB
Net capacity (cubic ft.)	18.1	18.1	18.1	18.1
Color	White	White	White	White
Power Supply (V/Hz)	115~/60	115~/60	115~/60	115~/60
Rated Input Power (W)	100	100	100	100
Power Consumption (kW-h/24h)	1.52	1.52	1.52	1.52
Net Weight (lbs)	233	235	236	236
Gross Weight (lbs)	255	257	258	258
Unit Dimension (W*D*H) (inch)	29.6 x 33.5 x 66.1			
Packing Dimension (inch) (W*D*H)	32.3 x 33.5 x 67.3			
Container Quantity 40'HC(PCS)	42	42	42	42

SAFETY PRECAUTIONS

This appliance uses an 115V~/60Hz AC for power supply. If the voltage has excessive variations, it is likely that the appliance will not start or a malfunction might occur such as an abnormal working noise of the compressor. In this case it is required to use a voltage regulator of 750W or more.

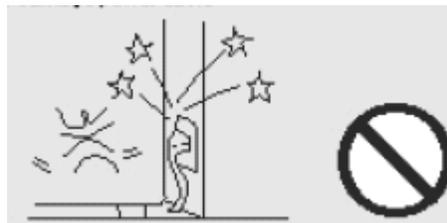


It is required that you use a separate, dedicated outlet for security grounding. The power cable of this appliance is a filled three-core (grounding) plug complying with a three-core (grounding) outlet. Under no circumstances, should the third plug pin (grounding) be cut off or removed.

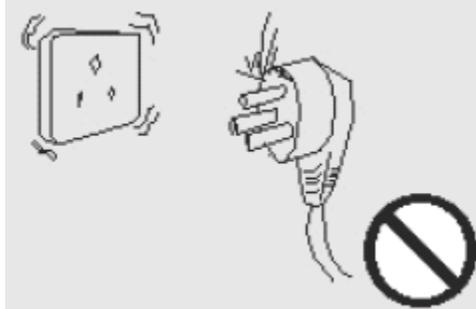


Do not damage the power cable.

Ensure not to take out the plug of the appliance by pulling on the cable. Pull it out of the outlet by firmly grasping the plug. Do not allow the body of the appliance to press against the cable. Neither should anyone or anything be placed on it. When moving the appliance from the wall, be careful not to roll or damage the power cable.



In case of a damaged or worn out power cable; it is not advisable to continue its usage. It is required to have it replaced by a qualified technician from any authorized service shop.



Whenever there is a leakage of an inflammable gas, close the valve of the leaking gas. Open all doors and windows and don't try to drag or insert any power plug for any electrical units such as a refrigerator.



You are advised to please pull out the power plug under the following circumstances:

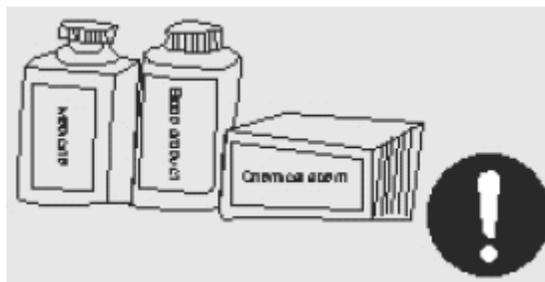
- i. Prior to cleaning or undertaking repairs.
- ii. When replacing a damaged lamp, to prevent electrical shocks.



It is not advisable to put inflammable or explosive articles, strong corrosive acids and alkali substances into the appliance.



Do not keep medicine, vaccine or chemical inside the appliance. The refrigerator is strictly meant for household purposes and should not be used to store items that require a specific temperature during storage.



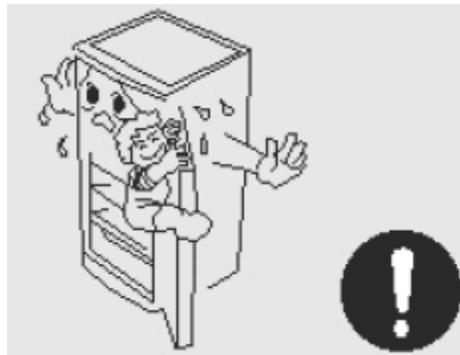
Do not store or use gasoline, or any other flammable substances in the vicinity of the refrigerator to avoid a fire outbreak.



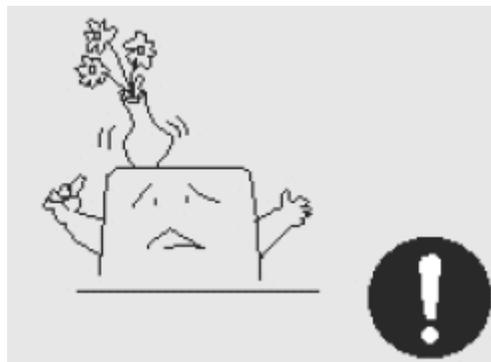
Do not place any electrical plugs, regulators or microwaves on top of the refrigerator. Do not use other appliances - except those allowed/stated by manufacturer - inside the refrigerator.



Do not play with the appliance by hanging on its door, to avoid toppling of the appliance and falling to hurt the individual.



Do not place heavy or unstable articles and water containers on top of the refrigerator.



When the refrigerator is running, take care not to touch the cold surface of the freezer compartment, especially with wet hands; otherwise your skin is likely to get stuck on the cold surface.



Do not spray water onto the refrigerator or place it in a wet area likely to be splashed with water, so as to avoid neutralizing the electric insulation performance of the appliance.



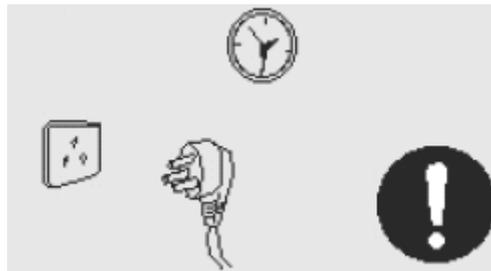
It is strictly not advisable to privately dismantle or change the appliance. Only a professional should carry out the repair of the appliance.



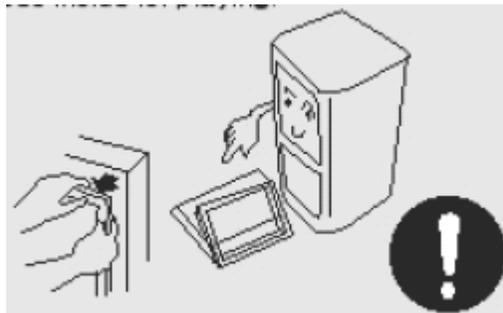
Do not put bottled drinks or beverage into the freezer compartment to prevent cracking when frost occurs.



It is required to pull out the power plug or to wait for 5mins before switching on the appliance again during cleaning or when there is no power supply to avoid damaging the compressor by continuous start and stop.

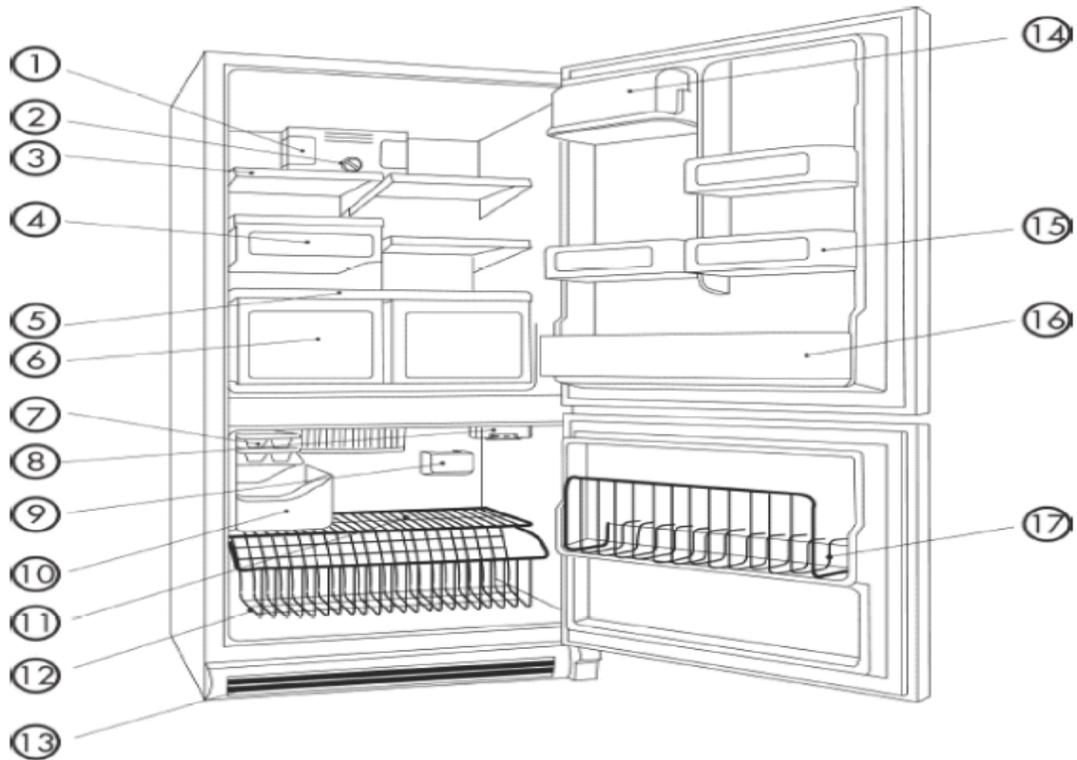


When discarding or replacing the appliance, take off the door as well as its door gasket to avoid accidents when children go playing inside it.



PARTS AND FUNCTIONS

Description of Components



1. Refrigerator Light
2. Refrigerator Control
3. Half Shelf
4. Deli Drawer
5. Crisper Cover
6. Crisper Drawers
7. Ice Tray
8. Freezer Control
9. Freezer Light

10. Ice Box
11. Freezer Shelf
12. Wire Basket
13. Base Grille
14. Dairy Bin
15. Door Bin
16. Bin Door Shelf
17. Tilt-out Wire Door Shelf

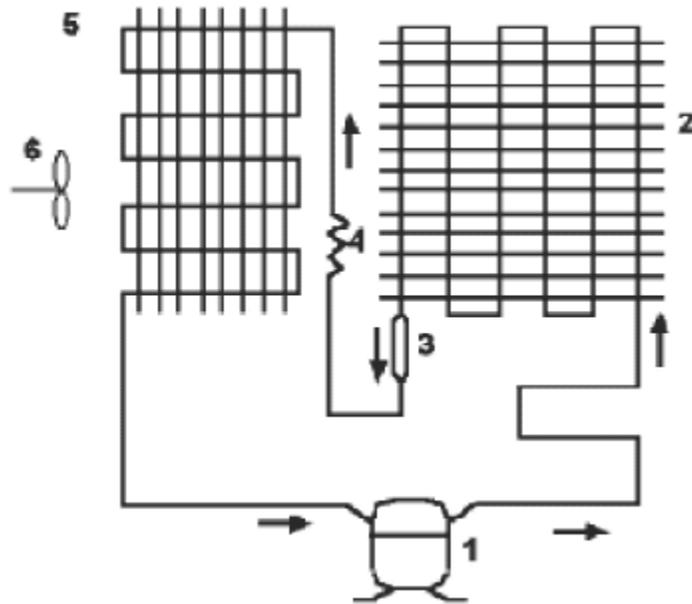
FUNCTION SCHEDULE

- Air-cooling and automatic defrosting
- Round door design and fashion handles
- Adjustable humidity crisper
- Bottom mount refrigerator, using convenience
- Crisper with adjustable moisture

Moisture in the crisper can be adjusted for satisfactory storage of vegetables and fruits.

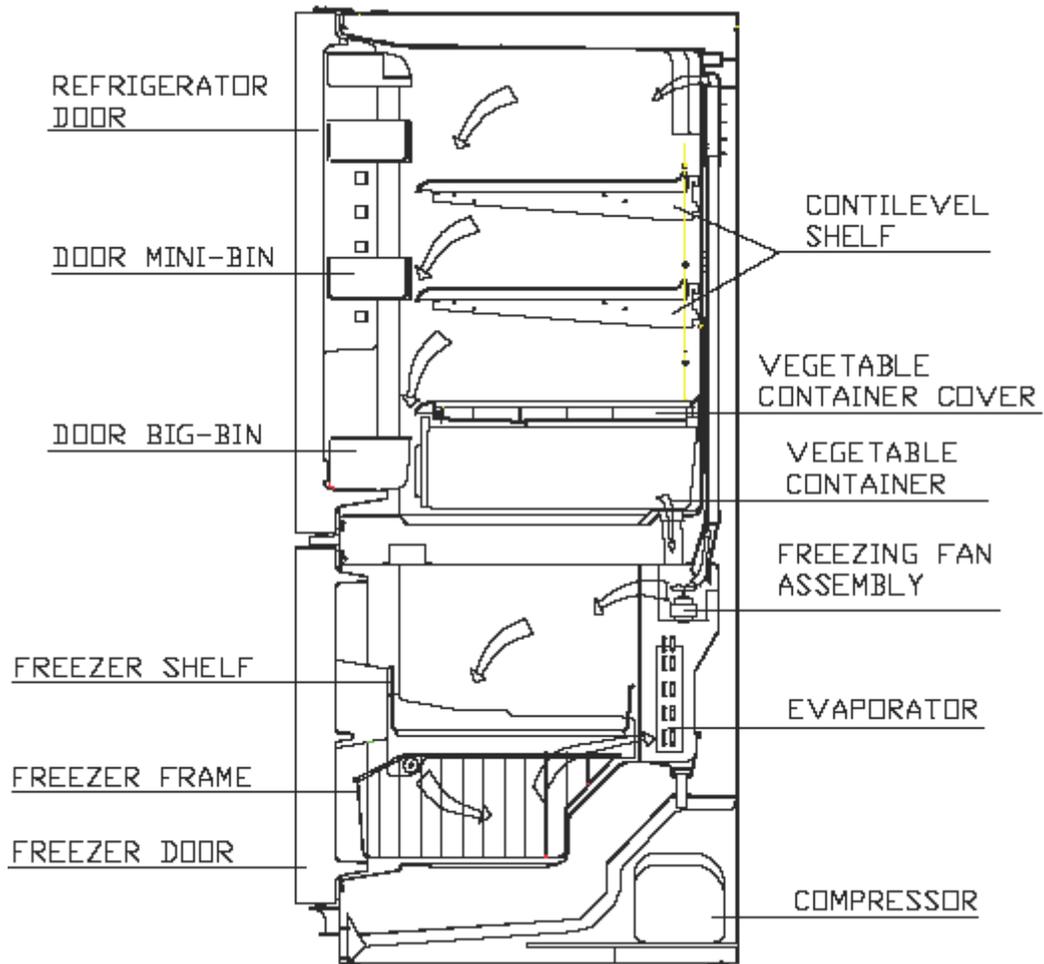
SYSTEM FLOW CHART

Schematic Diagram of System Flow Chart



1. Compressor
2. Condenser
3. Dry Filter
4. Capillary Tube
5. Evaporator
6. Air Fan

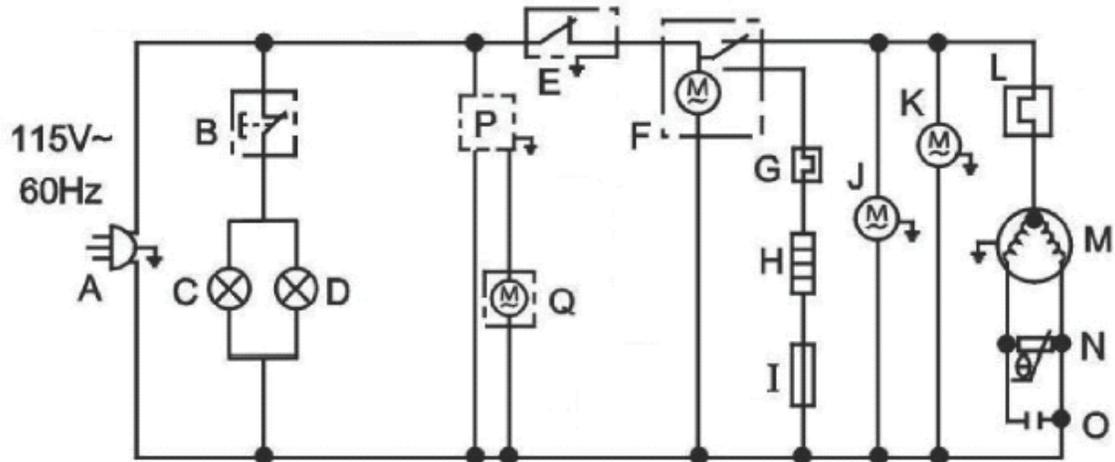
FLOW OF COLD AIR



CIRCUIT DIAGRAM

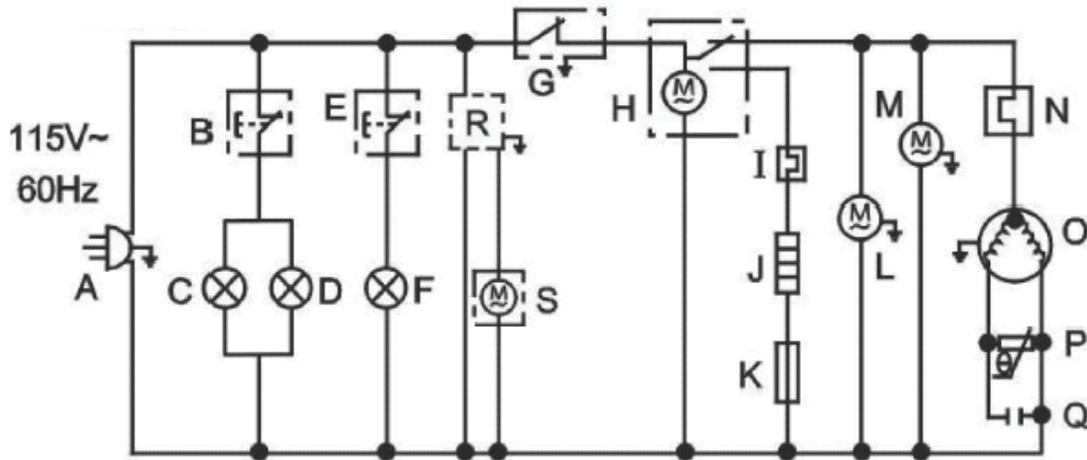
Schematic Circuit Diagram

HBE18WAAWW



- A. Plug
- B. Switch
- C. Lamp 1
- D. Lamp 2
- E. Thermostat
- F. Defrost timer
- G. Thermostat
- H. Defrost heater
- I. Fuse
- J. Fan 1
- K. Fan 2
- L. Overload Protector
- M. Compressor
- N. PTC
- O. Running Capacitor
- P. Ice Maker (not installed)
- Q. Valve (not installed)

HBP18GAAWW/HBQ18JAAWW/HBQ18JAABB



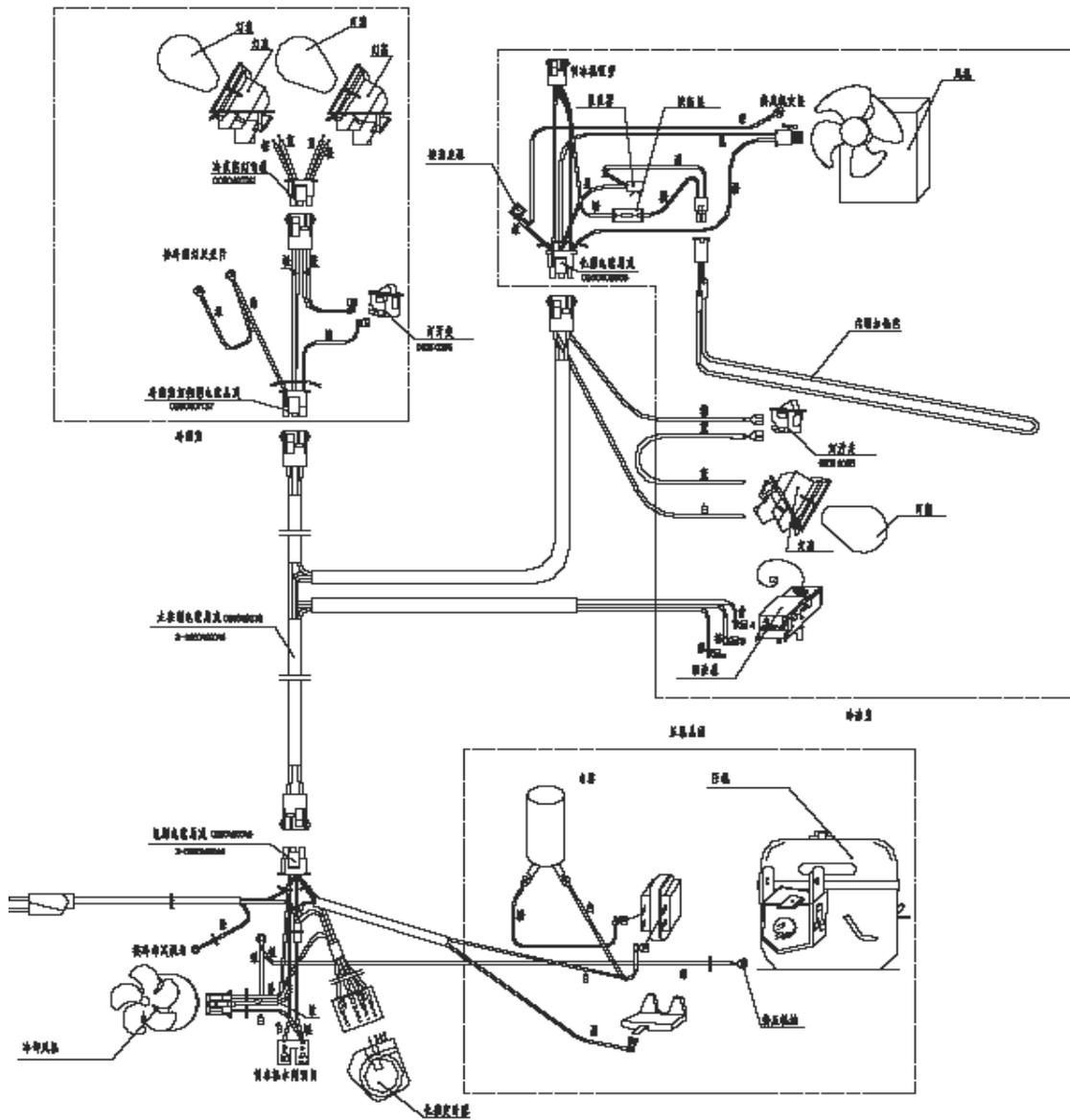
- A. Plug
- B. Switch
- C. Lamp 1
- D. Lamp 2
- E. Switch 2
- F. Lamp 3
- G. Thermostat
- H. Defrost Timer
- I. Thermostat
- J. Defrost Heater
- K. Fuse
- L. Fan 1
- M. Fan 2
- N. Overload Protector
- O. Compressor
- P. PTC
- Q. Running Capacitor
- R. Ice Maker (not installed)
- S. Valve (not installed)

Brief Description of Control Principle

The HBE18, HBP18 and HBQ18 are kinds of the forced air-cooling refrigerator with two doors. A mechanical type of all the control is generally adopted. The thermostat directly controls the start and stop of the compressor, and hence the refrigerator's temperature.

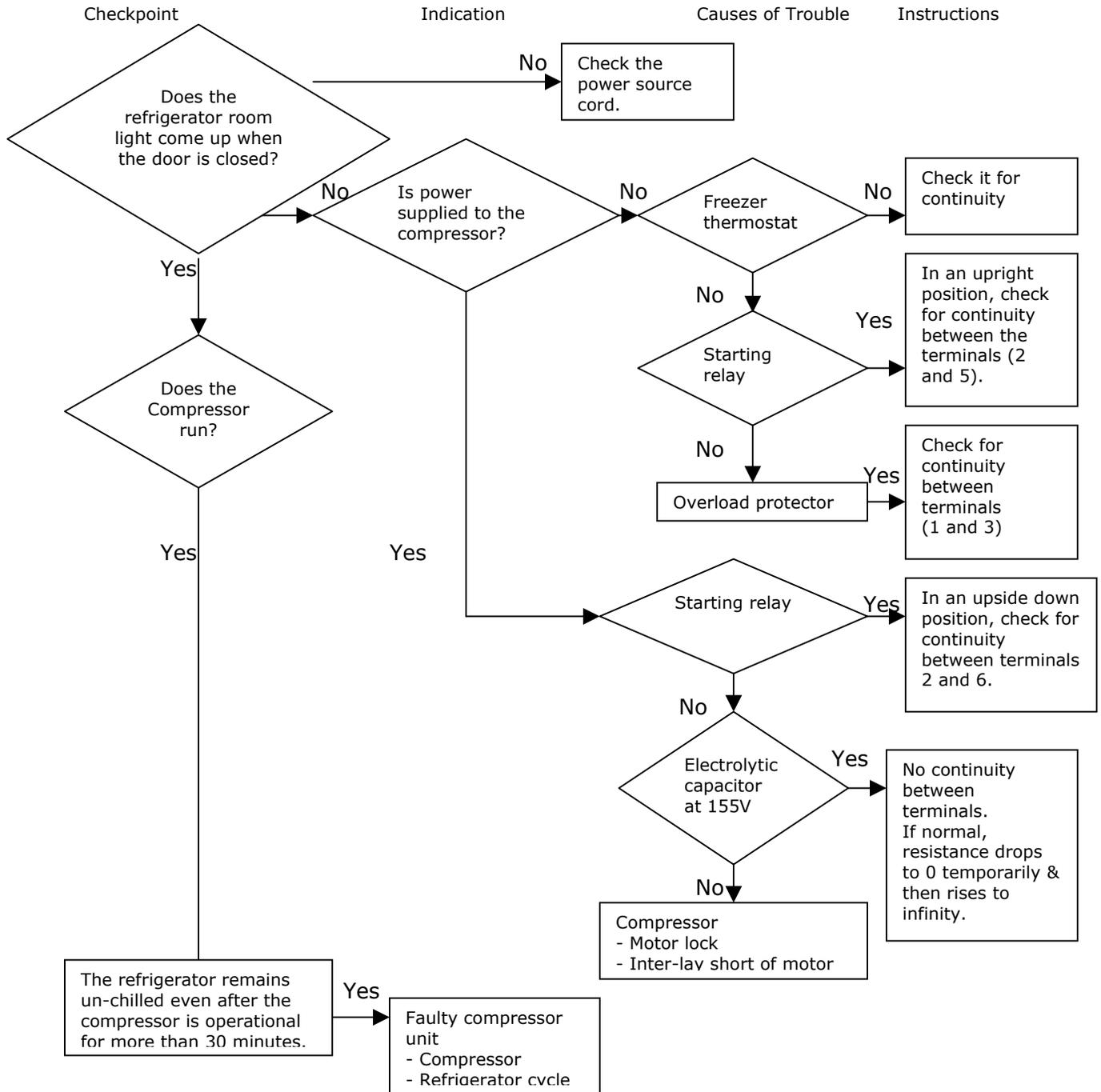
Low Temperature compensation in the above schematic diagram occurs, when the ambient is below the set temperature, the switch closes and the heating works, thus ensuring the normal start, and operation of the refrigerator at lower ambient temperatures, in such case, the freezer compartment temperature can reach a good point.

PROGRAM DIAGRAM

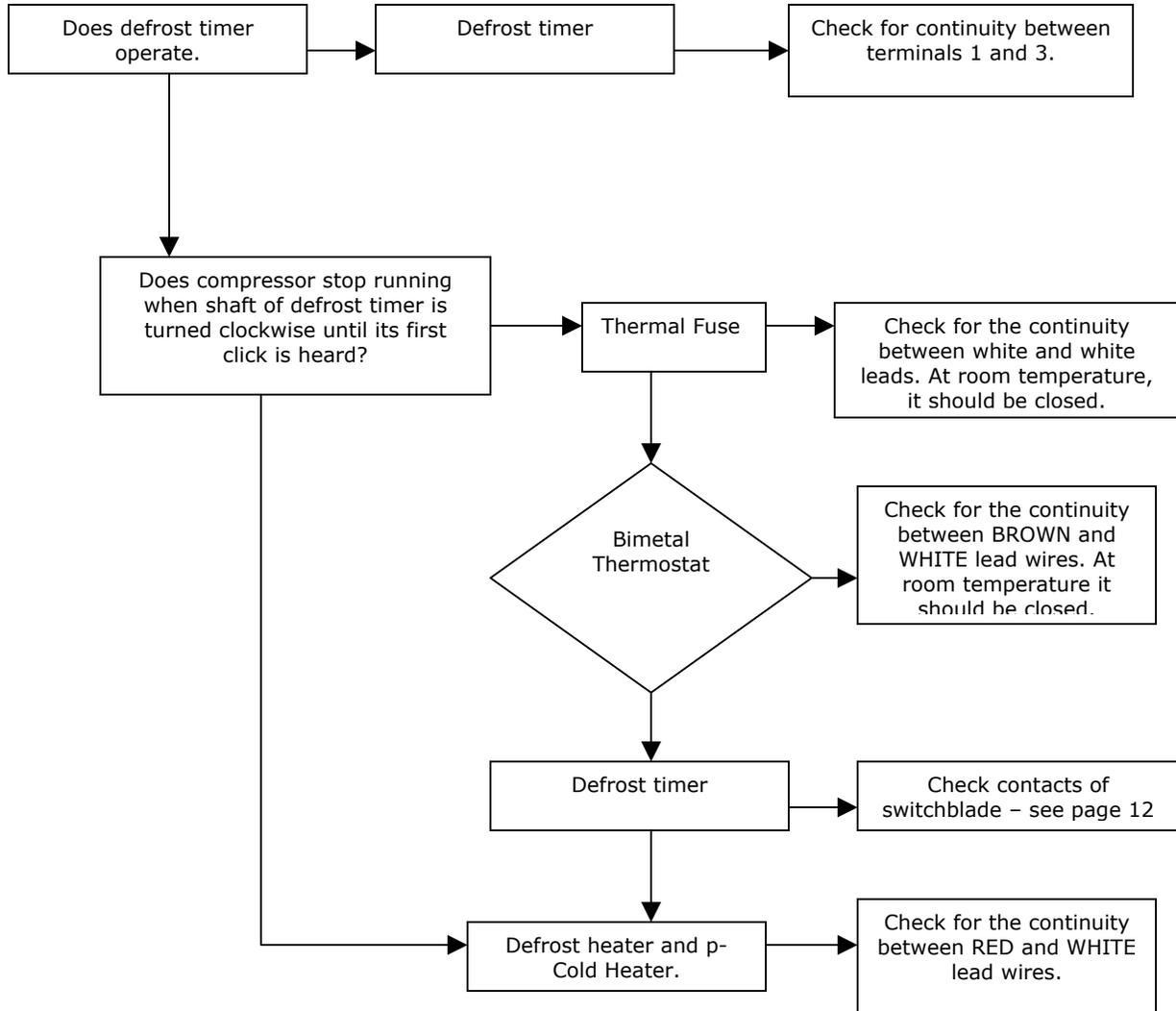


MAINTENANCE SERVICE AND TROUBLESHOOTING

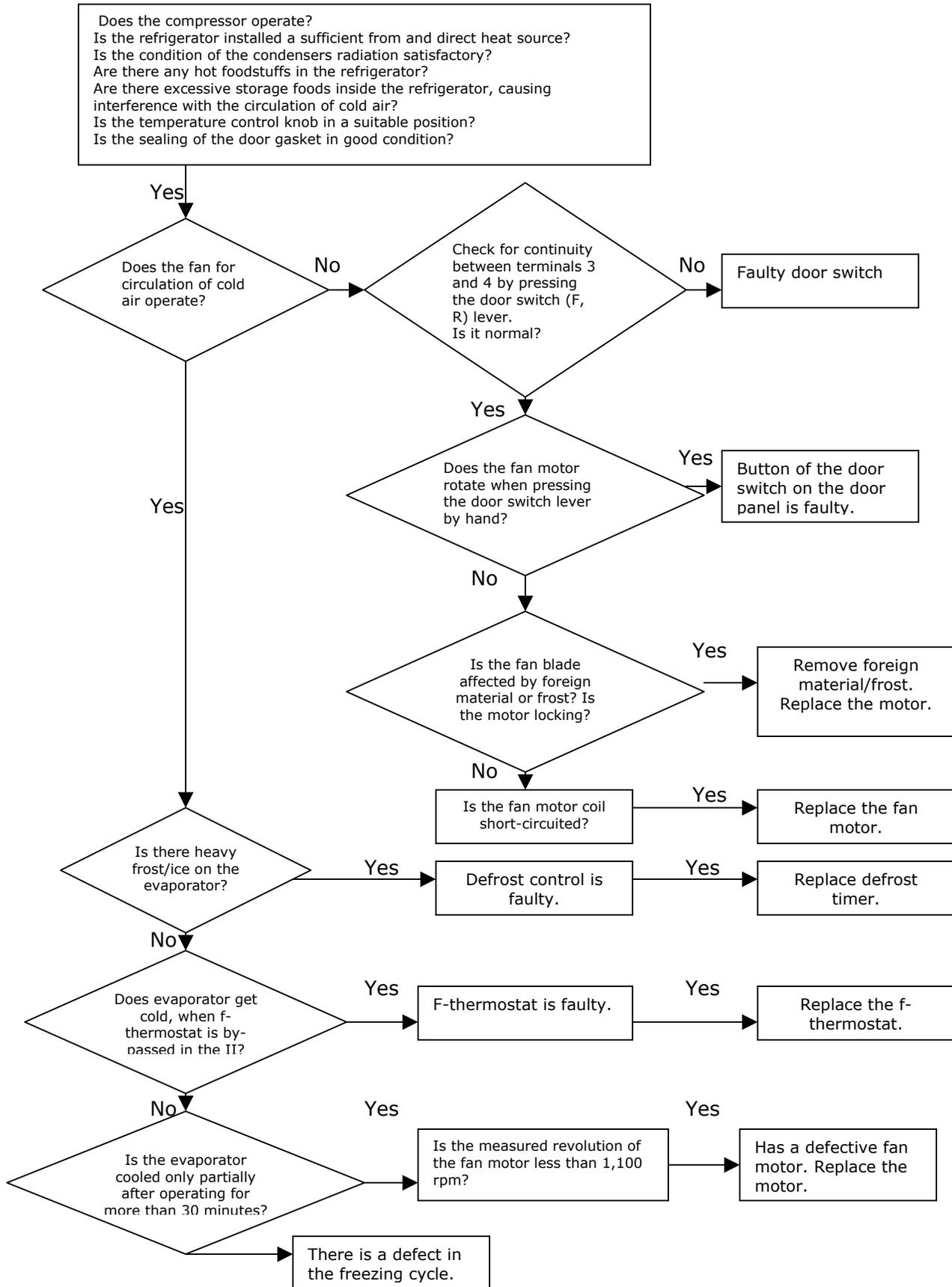
When the refrigerator does not get cold at all



No Defrosting



The freezer and refrigerator rooms are not sufficiently cold/chilled



1. **NORMAL REFRIGERATOR FUNCTIONS**

A domestic refrigerator is comprised of an electric control system and a refrigerating system. Since both systems work together, it is difficult to tell whether the refrigerating system is in good working condition. If any part of the refrigerating system or electric control does not work properly, the refrigerator's efficiency will decline, operating properties will destabilize, and in worst cases, it will not function at all.

Sending refrigerators to a service department can be difficult since they are generally large. At times, normal phenomena are incorrectly diagnosed as troubles. Before we deal with the recurrent problems of refrigerators, here is a brief outline of normal occurrences that should not be considered as problems. If any of the occurrences listed below happens, you can continue to use your refrigerator:

a) Rumbling Sounds

When the compressor of a refrigerator stops running, a rumbling sound will be heard from the evaporator. This sound is caused by the flow of refrigerant in the evaporator tube. The refrigerant flows shortly after the compressor has stopped running. This sound, therefore, does not constitute a problem.

b) Clicking Noises

Refrigerators often make clicking noises. This is also normal. It is the result of the intake or release of the armature of a current dead weight start relay when the compressor is started.

The compressor motor makes a clicking sound while it is running. This sound is faint in the daytime but becomes louder at night.

c) Hot Refrigerator Parts

The compressor consists of an electric motor and a compressing apparatus. During its normal operation, the temperature of the motor's starter core and windings will range between 212°F-230°F. The temperature of the piston and cylinder of the compressing mechanism is normally 212°F due to the heat produced when compressing the refrigerant. Most of the heat radiates through the compressor casing to the air, therefore the temperature of the casing is generally between 185°F and 194°F. It becomes extremely hot, particularly in summer when the ambient temperature is higher than usual.

All these are normal phenomena.

d) Crackling Sounds

For the direct cooling refrigerator, an irregular crackling sound is caused by expansion and contraction of the compressor. This sound will not affect the normal operation of the refrigerator.

2. **COMMON PROBLEMS OF A REFRIGERATOR AND THEIR SOLUTIONS**

Refrigerator problems are closely related to the quality of components, level of workmanship, and owner maintenance. The parameters generally used to determine the working conditions of a refrigerator include the temperature inside the refrigerator, the operating rate, electrical power consumption, noise level, and other functional indices. If any of these indices passes their permissible range, there is a fault with the refrigerator.

During the entire service life of a refrigerator, the probability of problems occurring within a specific time is called its failure rate. A comparison between the control circuit system of a refrigerator and its refrigerating system indicates that the failure rate of the former is higher. When troubleshooting, the first thing you must do is to determine whether the source of the problem is the control system or the refrigerating system.

There is usually no troubleshooting instrument for the domestic refrigerator. The location and nature of problems must therefore be determined according to their respective features. Experience in servicing is very important for troubleshooting. Well-experienced service technicians can correctly identify and solve problems based on their comprehensive analysis of the characteristics of the particular problems as well as the operating conditions for various kinds of refrigerators.

- **Three Essential Things To Note During A Checkup**

- **Look**

- a) Check the tubing of the refrigerating system for cracks and various welding points for leakages. If there is a leakage, a distinct oil stain will be seen.
- b) Check the suction and the exhaust pressure valves (high pressure and low pressure) of compressor to see whether they are normal.
- c) Check the conditions of the frost attached to its evaporator and gas return tube. It is abnormal if frost has formed on part of the evaporator or there is no frost attached to it.
- d) Pay attention to the rate at which the temperature decreases in both the refrigerator and freezer compartments.
- e) Check the environment to see whether it is suitable for the refrigerator.
- f) Check refrigerator door seal, case, table surface, and heat insulation layer.
- g) Look at the main control board to ascertain if various indication states are normal.

➤ **Listen**

- a) Listen to the noises made while the compressor is running. During the normal operation of compressor, a slight and uniform humming sound due to undulation of electric currents will be heard. The sounds listed below indicate a malfunction.
- *Humming sounds* from a fully enclosed aggregate unit indicate that the motor was not started properly.
 - *Clattering sounds* from the start relay indicate that the start contacts cannot be released normally.
 - *Whistling sounds* indicate the release of high-pressure gas from a crack in the pressure tube inside the compressor.
 - *Clucking sounds* indicate that the suspended spring inside the compressor has broken
 - *Knocking sounds* from inside the compressor indicates that a large quantity of moist refrigerant vapor or refrigerating oil has leaked into the compressor cylinder.
 - *Striking sounds* from metal parts inside the compressor indicate that moving parts are loose.
- b) Listen to the gas flowing in the evaporator by opening the refrigerator door while the compressor is in operation. Normally, refrigerant circulating in the evaporator produces a gentle whistling accompanied by a sound similar to water flowing. If only the whistling can be heard and there is no sound similar to water flowing, then the refrigerant has already percolated. If neither sound can be heard, the filter or capillary is clogged.

➤ **Touch and Feel**

- a) Feel the compressor while it is running. Its temperature should be less than 194°F. Its temperature may exceed 194°F if it has been running for an extended period.
- b) After the compressor has operated for 5~10 minutes, feel the condenser. The temperature of its upper part should be higher than that of its lower part (or its right part is hotter than its left part, depending on the type of condenser coil). This indicates that the refrigerant is circulating properly. If the condenser is not hot, then the refrigerant is leaking. If the condenser is hot for only a few minutes and then cools down, the filter and capillary are clogged. If hot air is blown out of the forced air-cooling condenser, the system is out of order.
- c) Feel the filter's temperature. Normally, the temperature on the filter's surface should be a little higher than the ambient temperature. If the filter is lower than the ambient temperature, then the meshes of its screen are clogged. This obstructs the flow of refrigerant causing a drop in temperature due to throttling.

- d) Feel the temperature of exhaust gas from the refrigerating system. The exhaust gas should be extremely hot. If the refrigerator has an enclosed compressor refrigerating system, there should be no frost or condensation on the gas suction tube. However, frost and condensation may appear for a very short time period immediately after starting the machine.

Do not use only one of the indicators from the checklist above to decipher the state of your refrigerating system. It is advisable to find out two or more abnormal phenomenon, or conduct comprehensive troubleshooting because several kinds of troubles may share a common abnormality.

3. ANALYSIS OF TROUBLES AND TROUBLESHOOTING

- **Poor Refrigerating Effect**

The "poor refrigerating effect" refers to when the refrigerator operates normally, but does not cool to the temperature indicated by the thermostat. Possible causes are discussed and analyzed below:

1) **Refrigerant leaks**

Analysis of Trouble

The refrigerant leaks will result in an insufficient refrigerating capacity. This will lead to lower gas suction and exhaust pressure as well as hotter exhaust gas. The exhaust tube will become extremely hot, and the sound of gas flowing from outlet of the capillary will become louder than usual. After shut down, the balance pressure in the system is lower than the saturation pressure corresponding to the same ambient temperature.

Remedy

Locate the refrigerant leak points immediately, and note welding points and parts where the leaks occur. While troubleshooting, pay attention to those parts that are liable to leak, check main connection points for oil seepage and tubing for cracks. After repairing the leak points, refill the refrigerant. If you have problems detecting the leak points, charge the system with nitrogen to help identify leaks. Drain the system of the nitrogen before refill with refrigerant.

2) **Too much refrigerant in the system**

Analysis of Trouble

- a) If amount of refrigerant in the system exceeds its nominal capacity, the excess refrigerant will displace the evaporator. This will reduce the heat-dissipation area and decrease the refrigerating efficiency. Malfunctions caused by excess refrigerant are: gas suction and exhaust pressures increase, condenser becomes hotter, the electric current of the compressor rises, frost forms on the evaporator and gas return tube, and the refrigerator's temperature drops slowly.

- b) If excessive refrigerant has been charged, the liquid refrigerant that cannot evaporate in the evaporator will return to the compressor. This will cause "liquid striking." The liquid refrigerant evaporates and effervesces as soon as it flows into the refrigerating oil at the bottom of compressor. If the condition is severe, foams will cover the inside the compressor housing and be sucked by the piston, causing damage to the components of compressor.

Remedy

According to the operating procedures, it is mandatory to turn the machine off. After several minutes, open the refrigerant charging tube and let the refrigerant escape from it, replace the dry filter, refill the refrigerant after evacuating, and then seal the charging port.

3) There is air left in the refrigerating system

Analysis of Trouble

Residual air in the refrigerating system will reduce its refrigerating efficiency. Major effects are an increase in temperature of the segment from the compressor outlet to the condenser inlet and an increase in gas suction and exhaust pressures. However, the gas exhaust pressure will not exceed its rated value. Due to the air in the system, both the gas exhaust pressure and temperature will rise. In addition, the sound of gas flowing will become intermittent and louder.

Remedy

Turn off the refrigerator, and wait for several minutes. Next, open and evacuate the tubing. Then refill the system with refrigerant.

4) Low efficiency of compressor

Analysis of Trouble

Low efficiency of a refrigerating compressor refers to the actual reduction of gas discharge capacity and the corresponding reduction of refrigerating capacity under the condition that the refrigerant in the system is unchanged. This typically occurs when the compressor has been in use for a long time.

Remedy

Measure the high and low pressures with pressure gauges to see whether they are normal. If an abnormal sound comes from the compressor or the temperature of its casing is too high, cut the discharge port open and operate the compressor. Inspect to see if there is pressure at the discharge port with your finger. In a normal compressor, it is difficult to block the discharge port with your finger.

5) Too thick a frost layer formed on evaporator

Analysis of trouble

If a direct cooling refrigerator is to be used for a prolonged period, make sure that you defrost its evaporator regularly. If you fail to do so, the frost layer on the evaporator tubing will become thicker and thicker. Heat conduction will be severely affected when the whole tubing is wrapped with a transparent ice layer, and finally the temperature in the refrigerator won't fall to the prescribed range.

Remedy

Turn the refrigerator off and prepare for defrosting. Open the refrigerator's door to allow air inside or use a fan to speed up air moving into the refrigerator to quicken the defrosting process. Never strike the frost layer with any iron tool or wooden stick in order not to damage the evaporator tubing.

6) Refrigerating oil in evaporator tubing**Analysis of Trouble**

During the refrigerating cycles, small amounts of refrigerating oil may remain in the evaporator tubing. However, if there is considerable refrigerating oil left in the evaporator after an extended period of operation, the heat conduction effect will be severely affected. The result will be a poor refrigerating effect.

Remedy

If there is no frost on the evaporator, then there is a high probability that the deterioration of refrigerating effect is due to the accumulation of refrigerating oil in the evaporator tubing. Remove accumulated refrigerating oil, dismantle the evaporator, purge it thoroughly, and then dry it. If it is difficult to dismantle, fill the evaporator tubing with refrigerant from the evaporator's inlet several times to remove the refrigerating oil. Then, purge and dry it with nitrogen.

7) Flow obstructed in refrigerating system**Analysis of Trouble**

If the refrigerating system is not purged thoroughly, the filter screen meshes become clogged by dirt. This results in a decrease in flow rate and a poor refrigerating effect. The effects of clogged filters included: decrease of gas discharge pressure, the drop in the temperature of discharged gas, and, for severe cases, condensation and frosting may appear.

Remedy

Purge the tubing. After replacing, the dry filter or cleaning it thoroughly, refill the system with refrigerant and seal the charging port.

- **No Refrigerating**

"No refrigerating" refers to a situation where the compressor runs normally, but the refrigerator's temperature does not decrease. While servicing, careful attention will be required to find and correct the cause. The most common causes for this malfunction are analyzed below.

1) The entire refrigerant has leaked

Analysis of Trouble

Leak points in the refrigerating system have not been found and repaired timely, allowing refrigerant to leak completely. There are two kinds of leaks: slow leaks and fast leaks. Symptoms of total leakage of refrigerant are:

- The compressor can be started easily (if there is no damage to the compressor parts)
- The operating current becomes low
- The gas suction pressure increases
- The discharge pressure decreases
- The temperature of the gas discharge tube drops
- There is no sound of gas eruption from the liquid in the evaporator, and
- No gas gushes out of the process tube when cut after shutdown

Remedy

Check the whole machine, particularly those locations which are liable to leak. After leak points have been found, repair them or replace them with new parts according to specific circumstances. Then evacuate the system and finally change the refrigerant.

2) Refrigerating system is clogged with ice

Analysis of Trouble

This is typically a result of a poor dryness treatment, improper air purging, or substandard water content. The symptoms of this condition are:

- Irregular refrigeration, extreme frosting at the clogged area,
- Evaporation temperature drops below 0°C or 32°F,
- Water accumulates and gradually clogs the narrow part of the capillary,
- Frost to melt at the evaporator, there is no sound of gas flowing,
- The gas suction pressure becomes a vacuum.

Note that these phenomena will appear intermittently. In order to know whether the system is clogged with ice, heat the parts that are suspected with hot water. If the sound of gas flowing is heard and the gas suction pressure rises, the trouble is that the system is clogged with ice.

Remedy

If there is too much moisture in the refrigerating system, release the refrigerant, purge the tubing with nitrogen, and then refill the system with the filtered refrigerant. Another method is to connect a filter with moisture absorbers, such as silica gel or anhydrous calcium chloride, to the refrigerating system. Next, replace the filter, evacuate it again, and fill the system with refrigerant.

3) Refrigerating system is clogged with dirt**Analysis of Trouble**

Coarse-grained dirt and refrigerant oil in the system tend to settle and clog the capillary inlet. Flow of refrigerant stops when the filter screen is completely clogged by dirt. This condition has the same symptoms as when the refrigerating system is clogged by ice. However, when you heat the clogged area with a hot towel, there is no reaction. After rejecting the possibility of ice clogging, it can be concluded that the clogging is due to dirt.

Remedy

Dismantle the system. Remove the dry filter and purge the tubing with nitrogen. Next, install a new filter. Then evacuate it and fill with refrigerant.

4) Clogged filter**Analysis of Trouble**

The complete clogging of the filter rarely occurs. Oftentimes, there is an accumulation of paste-like matter formed from dust on the filter. Tapping the filter may remove part of the paste-like matter. When the filter is clogged, it will be cooler than normal.

Remedy

The same as described for the capillary clogged with dirt.

- **Troubles of Compressor**

1) Broken gas suction and discharge valve blocks**Analysis of Trouble**

The compressor works by opening and closing the gas suction valve and discharge valve to suck and discharge the refrigerant. If the valve block is broken, the refrigerant cannot be discharged. This prevents refrigeration.

Remedy

It is quite difficult to differentiate this trouble from others because they have similar symptoms. When repairing, listen attentively for abnormal sounds coming from the compressor. Oftentimes, broken pieces of valve block strike against the cylinder. Check to see if the compressor casing is too hot. Secondly, measure the pressures at the high and low-pressure ports of the compressor with pressure gauges. If the gas suction valve block is broken, the suction pressure gauge pointer will swing violently and the suction pressure will be very high. Whereas when the gas discharge valve block is broken, the discharge pressure gauge pointer will swing drastically and the discharge pressure will be very high. In both cases, stop the compressor at once. If possible, open the cylinder cover, check the valve block, and repair it.

- **Compressor suddenly stops**

Very often, when the compressor suddenly stops, the gas suction pressure and/or discharge pressure have exceeded their respective prescribed ranges. When this happens, the pressure-operated protective relay automatically shuts off the power to the compressor. Below we discuss the reasons for high gas discharge pressure and low suction pressure.

- **Stoppage due to excessively high gas discharge pressure**

1) High Gas-discharge pressure due to excess refrigerant

Analysis of Trouble

Loose frosting and poor refrigerating effect may occur if excessive refrigerant has been charged into the system. Excess refrigerant will occupy additional space in the evaporator.

This will reduce its heat dissipating area, and the phenomenon of "liquid striking" may occur.

Condensation may occur on the gas return tube, and the gas discharge pressure will rise.

When it reaches the threshold value, the protective relay will actuate and shut off the power supply to the compressor.

Remedy

Open the tubing. Re-evacuate and charge the system with a proper quantity of refrigerant.

2) Air in the system

Analysis of Trouble

The residual air in the system will circulate with the refrigerant in the system. The major symptoms are higher gas discharge pressure, higher discharged gas temperature, and poor refrigerating effect. The gas discharge pressure will exceed its maximum value when the compressor has run for an extended period, and activates the protective relay.

Remedy

Check if the air in the refrigerating system. Generally, there are three possibilities. First, is that the air has been sucked into the system during repairs due to carelessness. Secondly, it has not been completely purged whilst evacuating the system. The third possibility is that there are leak points at the low-pressure end of the refrigerating system. Leak points appear in low temperature parts or assemblies. This is because the evaporation temperature is lower for such low temperature devices, especially at the low-pressure end; it is easier for the air to go into the system. Once it has been ascertained that air does exist in the system, you have to open the tubing, re-evacuate it and then charge it with refrigerant.

➤ **Stoppage due to electrical troubles**

❖ **Thermostat is out of control due to electric troubles**

Analysis of Trouble

In case the thermostat does not work in its good order or its temperature sensor has not been installed properly, frequent stoppage is also likely to occur.

Remedy

Try to adjust the temperature sensor's position until the compressor can be started and stopped normally. If this cannot be achieved, and the stoppage still occurs repeatedly, it is most likely that the mechanical parts or contacts are out of order, disassemble the thermostat, make a thorough checkup and repair it.

❖ **Overload of electric motor**

Analysis of Trouble

Probably, too many things have been put into the refrigerator, and hence the thermal load exceeds its refrigerating capacity; or in case the power supply voltage drops considerably, the current flowing through the motor will increase drastically making the thermal protector actuate and the fuse; blown, and hence the motor stops running. If the motor is still running continuously in such a case, its windings will be burned out.

Remedy

Reduce the thermal load, pay attention to the variation in voltage of the power supply.

❖ **Abnormal thermal protection**

Analysis of Trouble

The compressor current is within its normal range, but the thermal protector actuates repeatedly.

Remedy

Replace the thermal protector with a new one.

➤ **Sudden stoppage due to other causes.**

Normal Stoppage

Thermostat generally controls the start and stop of the compressor. When the temperature in the refrigerator reaches its desired value, the thermostat will shut down the compressor automatically. Never take this normal operation as a problem; care should be taken to differentiate it from other real problems in servicing.

❖ **Compressor won 't start.**

In case the compressor cannot be started, you must find out the origins of this trouble through systematic checkup, because probably there are many causes, including the electrical and mechanical parts.

a) Inspect the power supply to see whether it is connected to the compressor circuit.

Analysis of Trouble

In case the compressor cannot be started, this will generally exhibit in the power supply circuit, for instance, power failure, poor contact of switch, and blown fuse. Make a comprehensive analysis of these phenomena, find out its real cause and take corrective measures to resolve the problem.

Remedy

- i) Check the input power circuit to see whether there is voltage in the power supply, **note:** the circuit that is connected to the knife switch. This can be determined with a voltmeter or a test pencil. If a blown fuse is found, ascertain and remove its cause, then replace it with a new one of the same specifications.
- ii) Check the compressor accessories, including its thermal protector and relay. In case the thermal protector is damaged, the compressor cannot be powered on. If the relay is out of order, the motor will not run and a hum sound can be heard from it after the compressor is turned on. In that case, shut it down immediately, otherwise, the motor windings will be burned out in case this condition lasts longer.
- iii) Check the relay contacts and plugs to see if they are perfect and work reliably. Poor contact may cause the motor not running or humming.

b) Check the circuit voltage to see whether it is normal

Analysis of trouble

If the circuit voltage is obviously lower than its rated value, it will be difficult to start the motor, and a hum sound can be heard from it.

Remedy

Measure the voltage with a voltmeter; if it is really too low, give directions to the user for buying a stabilizer to step up the voltage, thus normal operation can be achieved.

c) Check the thermal relay to see whether its contacts are closed.

Analysis of Trouble

The contacts of thermal relay sometimes may be open due to the leakage of temperature sensing agent from the temperature sensor.

Remedy

Remove the relay cover to check up its contacts. If they are open, this means that the original setting is not properly set or temperature-sensing agent has leaked out of the temperature sensor. Try to turn the adjusting stem of this valve in the direction of the lower temperature graduation, and then check the contacts to see whether they are closed. If they are still not closed, dismantle the temperature-sensing disc and then immerse it into warm water to see whether the contacts actuate. If not, it can be preliminarily determined that temperature-sensing agent has leaked out, and it must be replaced with a new thermostat.

d) Problems of motor and other electrical faults

i) Motor windings are damaged or there is a short circuited between turns

Analysis of Trouble

When motor windings are damaged or there is the occurrence of a short circuit between turns, the fuse will be blown repeatedly, and the blowout particularly occurs at that instance where you close the knife switch.

Remedy

Check the terminals and the outer casing to see whether they are short-circuited, and measure the resistance of each phase with an avometer. If short circuit occurs or the resistance of a particular phase is low, this means that there is no short circuit in the windings and/or between turns, and that insulation layers are damaged or deteriorated. Another instrument that can also be used in this inspection is a mega meter. If the insulation resistance is lower than 2 M Ω , this means that the insulation layer has a breakdown already. If the motor is damaged, repair or replaced it with a new one.

II) Control relay is faulty

Analysis of Trouble

Overheating, burns or wearing of control relay contacts will generally occur if this is true. All these will cause poor contact in electricity.

Remedy

Dismantle it for repairs, or replace it with a new one.

iii) Poor electric contractor in thermostat

Analysis of Trouble

Damaged contractor and leakage of temperature sensing agent will generally occur if this is true.

Remedy

Replace the appliance with a new one.

iv) Check the terminals for loose connection and electric circuits for other abnormal phenomena.

e) Mechanical faults of compressor

i) Seizure of shaft

This is normally caused by poor lubrication, insufficient quantity of lubricant, clogging in the lubricant oil's line, or intermittent lubricant oil supply. Dirt and other impurities in the lubricant will increase its viscosity and cause the shaft to be seized. Copper plating may also result in the seizure of the shaft.

ii) Seizing of piston

This happens because the fit clearance between the piston and cylinder is too small or expansion due to heat.

iii) How do you know that the shaft and piston have been seized

When the refrigerator is switched on, the compressor will not start running. A slight hum sound will be heard and several seconds later, the thermal protective relay will actuate and open the contacts. This process will occur repeatedly, but the compressor will not start.

❖ **Compressor will not stop**

Sometimes, the compressor will run continuously (for several hours or run without end).

If the food placed in the refrigerator is not too much, there may be the following two situations:

- i) Control system is probably out of order.
- ii) The control system works normally but there are problems in the refrigerating system or other parts.

a) Temperature is improperly set

- i) The temperature control knob is set to the "coldest" position. This position is to be used for fast freezing or continuous running, its temperature for power off is too low, therefore, the compressor will not stop and the temperature in the refrigerator becomes lower and lower.
- ii) Inspection method: check the temperature control knob to see whether it is set in the position "coldest".

b) Thermostat is malfunctioning and makes the compressor running continuously

Analysis of Trouble

When the thermostat does not work normally, it will make the compressor run continuously, and hence very low temperature will be achieved in the refrigerator. The fault is generally because the contacts of the thermostat cannot be released.

Remedy

Dismantle the thermostat and make a through checkup. If it is totally out of order, replace it with a new one.

c) Evaporation temperature is too high in refrigerating system, resulting in lower refrigerating capacity and hence continuous running of compressor

Analysis of Trouble

Leakage of refrigerant and clogging in a refrigerating system will directly affect its refrigerating capacity. Due to the reduction in its refrigerating capacity, the refrigerator temperature cannot reach its rated value. The thermostat will not work, thus the compressor runs continuously. When the evaporation temperature in the system is too high, the temperature sensing agent in the temperature sensor is also hotter therefore, the thermostat is unable to cut off the power supply to the compressor and stop it.

Remedy

If it has been found that the refrigerant in the system is insufficient in quantity, recharge it with refrigerant. In case clogging occurs, disassemble the part where it is blocked. If the evaporation temperature is too high, rectify this problem with an appropriate quantity of refrigerant.

d) No stoppage of compressor due to damaged heat-insulation layer inside case body and / or door seal

Analysis of Trouble

When the heat-insulation layer inside the case body deteriorates or the door seal does not closely touch the doorframe, the temperature in the refrigerator will rise and makes the compressor run continuously.

Remedy

Check the heat-insulation layer for damaged parts. Repair it if damaged to improve its heat-insulation property. If the door has deformed or the door seal is not tightly sealed against the case body, repair them.

e) Too much food is placed in the refrigerator, or is placed too densely, resulting in poor ventilation or poor conditions for temperature sensing hence no stoppage of the compressor.

f) Too high ambient temperature, poorer ventilation and heat dissipation make the compressor run without stopping.

❖ **Electric leakage of refrigerator**

a) Slight electric leakage

Electric insulation has deteriorated due to it being affected with damp, thus resulting in slight electric leakages.

b) Serious electric leakage

Refrigerator case has become live due to faults occurring in some electric devices or the erroneous wiring in installing power cord plug or outlet by the user. This is very dangerous.

c) Electric leakage test

ii) Slight electric leakage

A tingle sensation will be experienced as soon as you touch the metal parts of the refrigerator with the hand. When you test them with a test pencil, its neon lamp will come on. In that case, the first thing you need to do is to determine whether the grounding is perfect. If the grounding has no problem, turn off the refrigerator immediately, then check the insulation of electric circuits with a voltmeter.

iii) Serious electric leakage

Do not touch the case body of the refrigerator, its door handle or other metal parts with your hand. When you test the refrigerator with a test pencil, it will light up intensively. Measure the resistance between the power cord plug and the case body with a voltmeter, the reading will be zero (0Ω); in the worse case, the fuse will blow. Check the 3-prong outlet to see whether the live wire and the null line are inversely connected. One possibility is that the live wire and null line of the outdoor power supply circuit have been inversely connected; this makes the null line; a live wire.

❖ **Stronger vibration and louder noise**

1. Refrigerator placed improperly

a. Uneven ground

Uneven ground will cause the refrigerator to be placed unsteadily, causing stronger vibration and noise during its operation.

b. Leveling screws not properly adjusted

If the leveling screws on refrigerator legs have not been adjusted properly, vibration and noise will still occur even if the refrigerator has been placed on a level ground.

2. Abnormal noise from compressor

The three suspended springs inside the compressor case are out of balance, and strike against the case; moreover, the wear of compressor parts may cause noise sometimes.

3. Resonance of tubing and loosening of parts

Improper and compact lying of tubes or the loosening of parts may cause vibrations.

4. Large noise of the fan

a) The fan's motor is loose

b) Noise produced during normal operation of the fan

c) The impellers are not tightly fixed or eccentrically assembled.

Remedy:

For reason "a", fasten the fan's motor. For reason "b" or "c", replace the fan's motor or impellers.

5. Inspection method

To find the sources of noise, press the vibration spot with your hand while the refrigerator is in operation and listen attentively whether the vibration becomes weaker or vanishes. If the refrigerator has not been levelly placed, put a level meter on its top table and adjust the leveling screws on its legs. In case noise occurs from the compressor, strike different locations on the side surface of its case using a rubber hammer or hand hammer with a wood block in between to determine whether the suspended springs are out of balance or being seized.