

Refrigerator

Service Manual

Model: WHS-169WES1

Features

- Energy efficiency
- Micro foam technology
- Low noise operation
- Thick insulation for energy efficiency
- Latest No. 2 microbiological technology

TABLE OF CONTENTS

TABLE OF CONTENTS

1. Table of Contents.....	1
2. Product Code Illumination and Series Introduction	2
3. Specifications	3
4. Safety Precautions	4
5. Function Schedule.....	7
6. System Flow Chart	8
7. Circuit Diagram	9
8. Maintenance Service and Troubleshooting	10
9. Exploded View.....	30
10. List of Parts	31


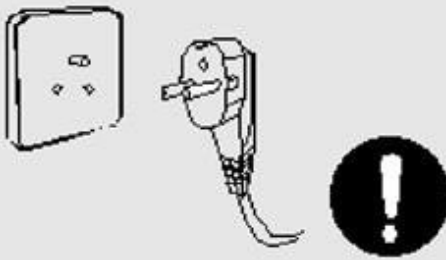

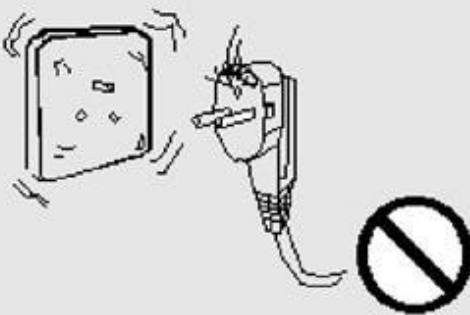


Specifications

Specifications

Model	WHS-169WES1
Capacity (gal.)	131
Color	Black
Power Supply (V/Hz)	115V/60HZ
Rated Input Power (W)	87
Power Consumption (kWh/Y)	358
Net Weight (lbs.)	43
Gross Weight (lbs.)	49
Unit Dimension (DxWxH) (in.)	21.4x25x34
Packing Dimension (DxWxH) (in.)	23x24.2x35
Container Quantity 40HQ (PCS)	227

Safety Precautions

Safety Precautions

<p>This appliance uses 220-240V-/50Hz AC for powers supply. Failure in operation and damage to the control panel, thermostat, or compressor will occur if voltage is outside the range of 187-242V, unless a regulator with a capacity of 750W or higher is installed.</p> 	<p>It is required to use appropriate outlet with secure grounding. The power cable of this appliance is fitted with a three-prong plug. The third prong should never be cut or removed.</p> 
<p>Do not damage power cord.</p> <ul style="list-style-type: none"> - Be sure to unplug unit by firmly grasping the plug. - Be sure appliance does not press against the cord or anyone tread on it. - If moving unit, be careful not to drag or damage the cord. 	<p>If the power cord or plug has been worn, stop using it. Replace it with a factory-authorized service shop.</p> 
<p>If there is a leakage of flammable gas:</p> <ul style="list-style-type: none"> - Close the gas valve. - Open doors and windows. - Do not plug in any electrical unit such as the refrigerator. 	<p>Please unplug appliance under the following situations:</p> <ul style="list-style-type: none"> - Prior to cleaning or repairing. - When replacing a damaged light bulb to avoid electrical shock. 

Safety Precautions

It is absolutely prohibited to put inside the appliance hazardous, flammable, or explosive articles, strong corrosive acid, alkali, etc.



Do not keep medicine, vaccine, or chemical reagent in the appliance. This refrigerator is for household use and cannot store items with a strict temperature requirement.



Do not store or use gasoline or other flammable articles in the vicinity of the refrigerator to avoid fire.



Do not place any electrical plugs, regulators, or microwaves on top of the refrigerator. Do not use electric appliances (except those allowed by manufacturer) inside the refrigerator.



Do not play in or around the appliance. It might cause damage and/or injury.



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

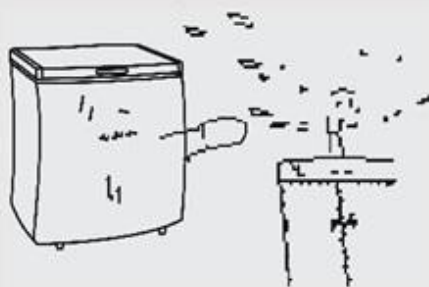


Safety Precautions

When the freezer has started running, be sure not to touch the cold surface of the freezer compartment with hand, especially when wet.



Do not spray water onto the unit or place it in a wet area to avoid damaging the electric insulation performance of the appliance.



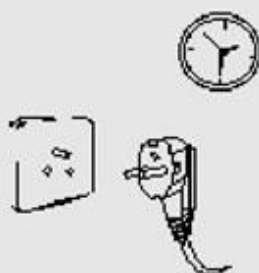
Do not dismantle or change the appliance. Repairs should only be carried out by professionals.



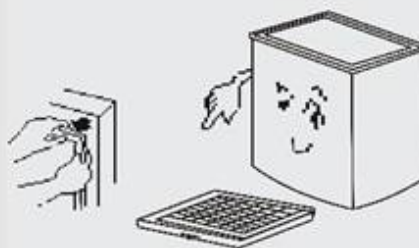
Do not place glass bottles in the freezer compartment to prevent cracks in the bottle.



If there is no power supply or the unit is being cleaned, unplug the unit. Wait at least 5 minutes before switching it on again to prevent damaging its compressor.



If the appliance is to be discarded, remove its door and its door gasket to avoid any accident should a child decide to play with it.



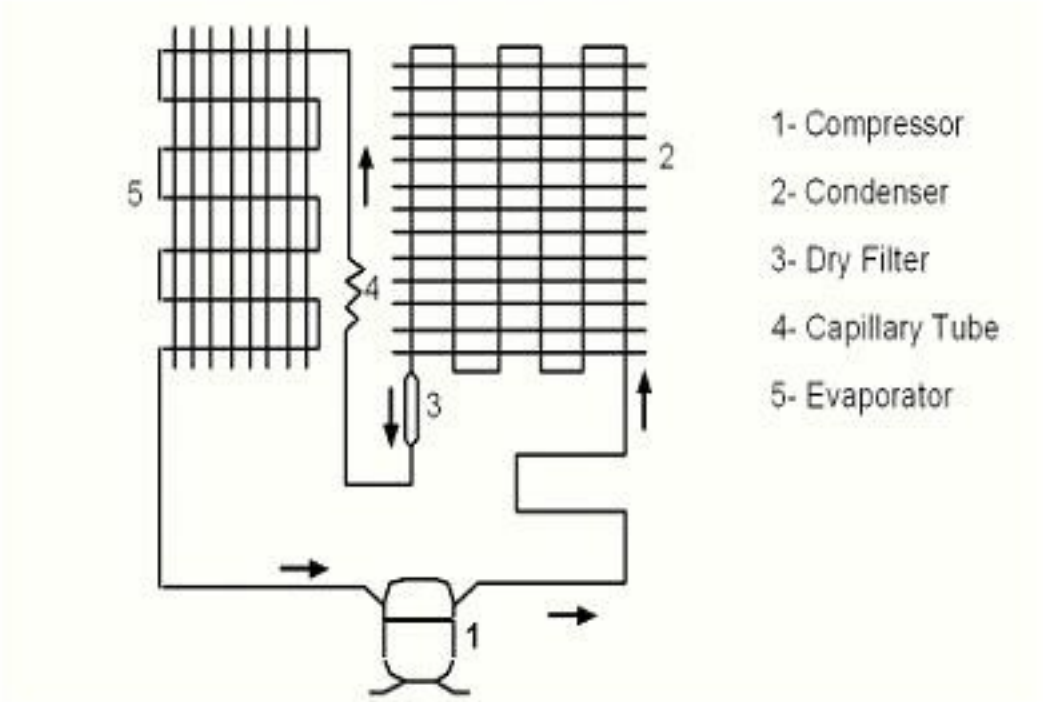
Function Schedule

- **Energy efficient**
- **Micro foam technology**
- **Low noise operation**
- **Thick insulation for energy efficiency**

System Flow Chart

System Flow Chart

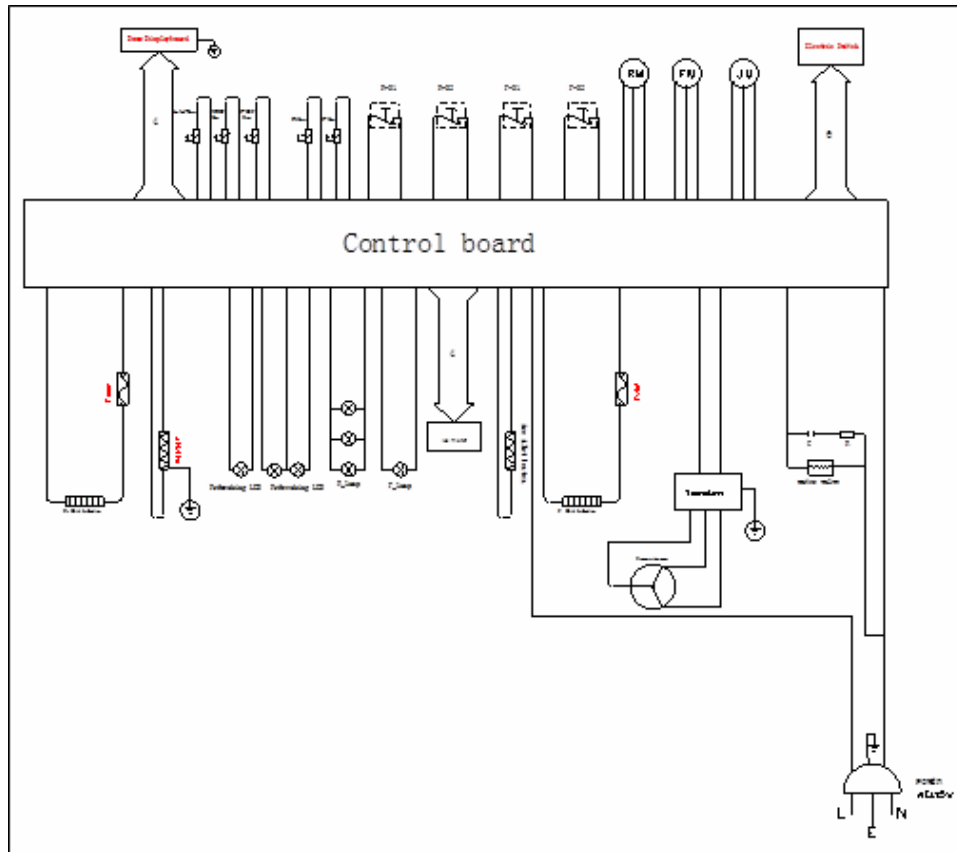
1. Schematic diagram of System Flow Chart



Flow sequence: 1→2→3→4→5→1

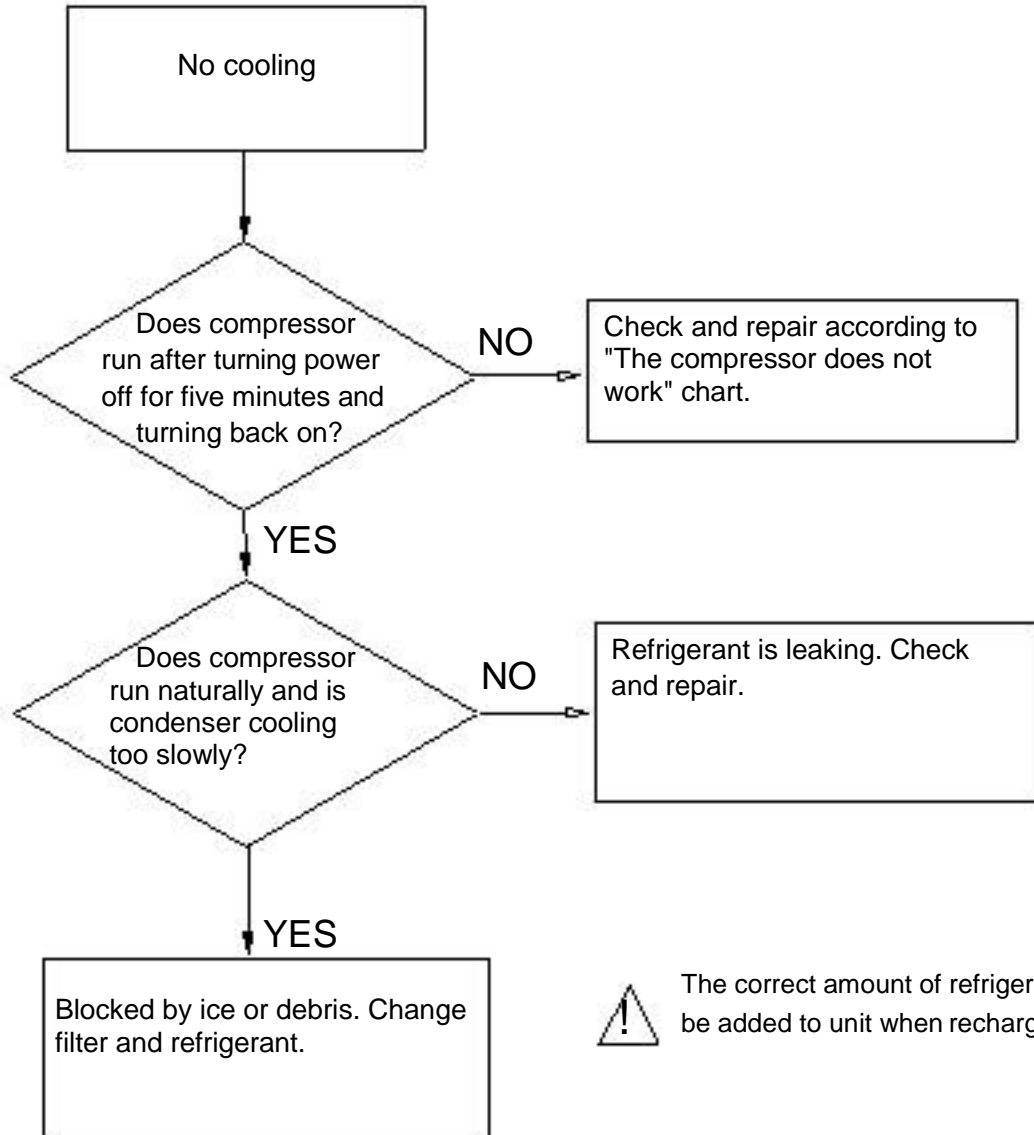
Circuit Diagram

1. Schematic Circuit Diagram

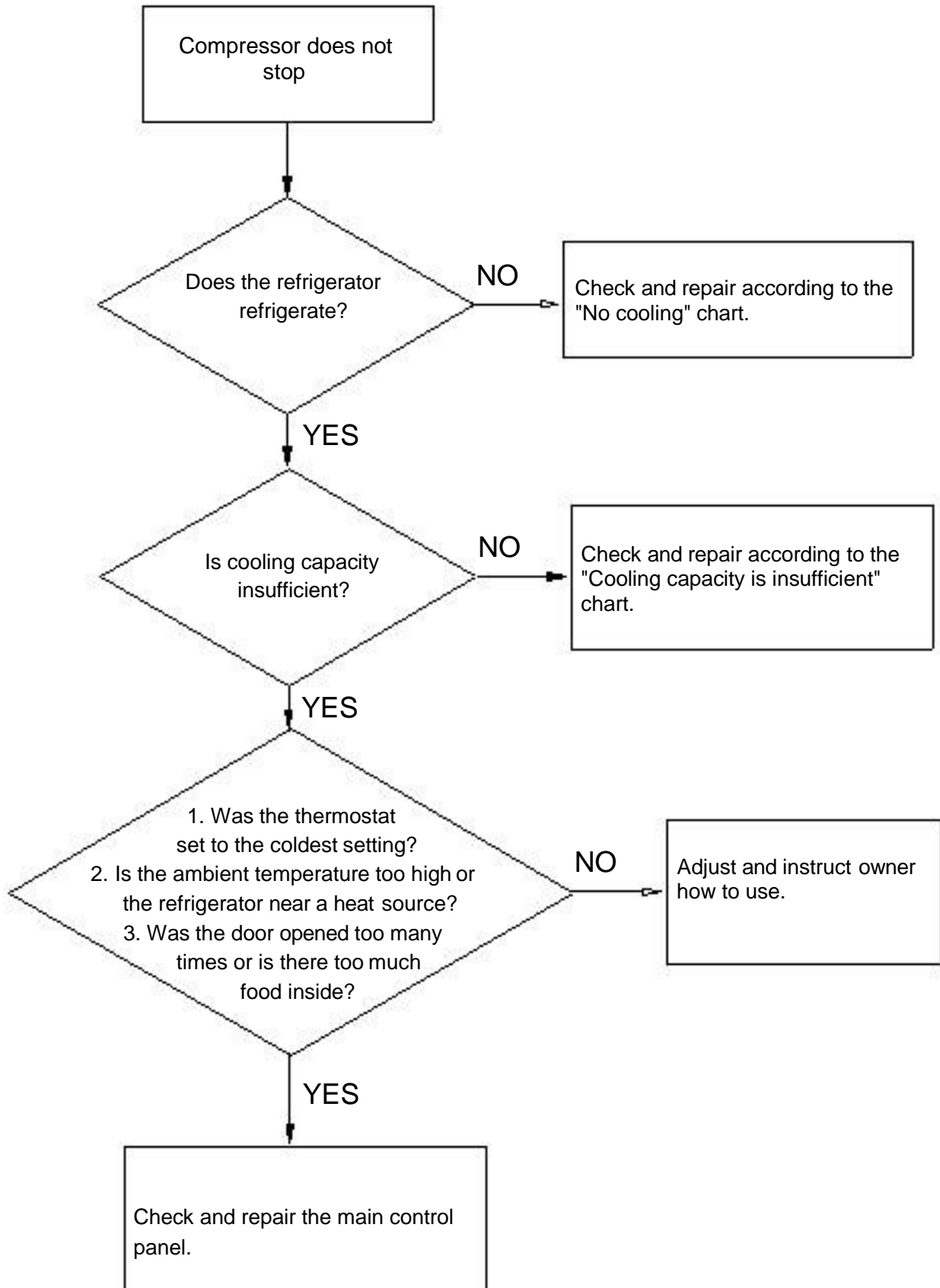


Maintenance Service and Troubleshooting

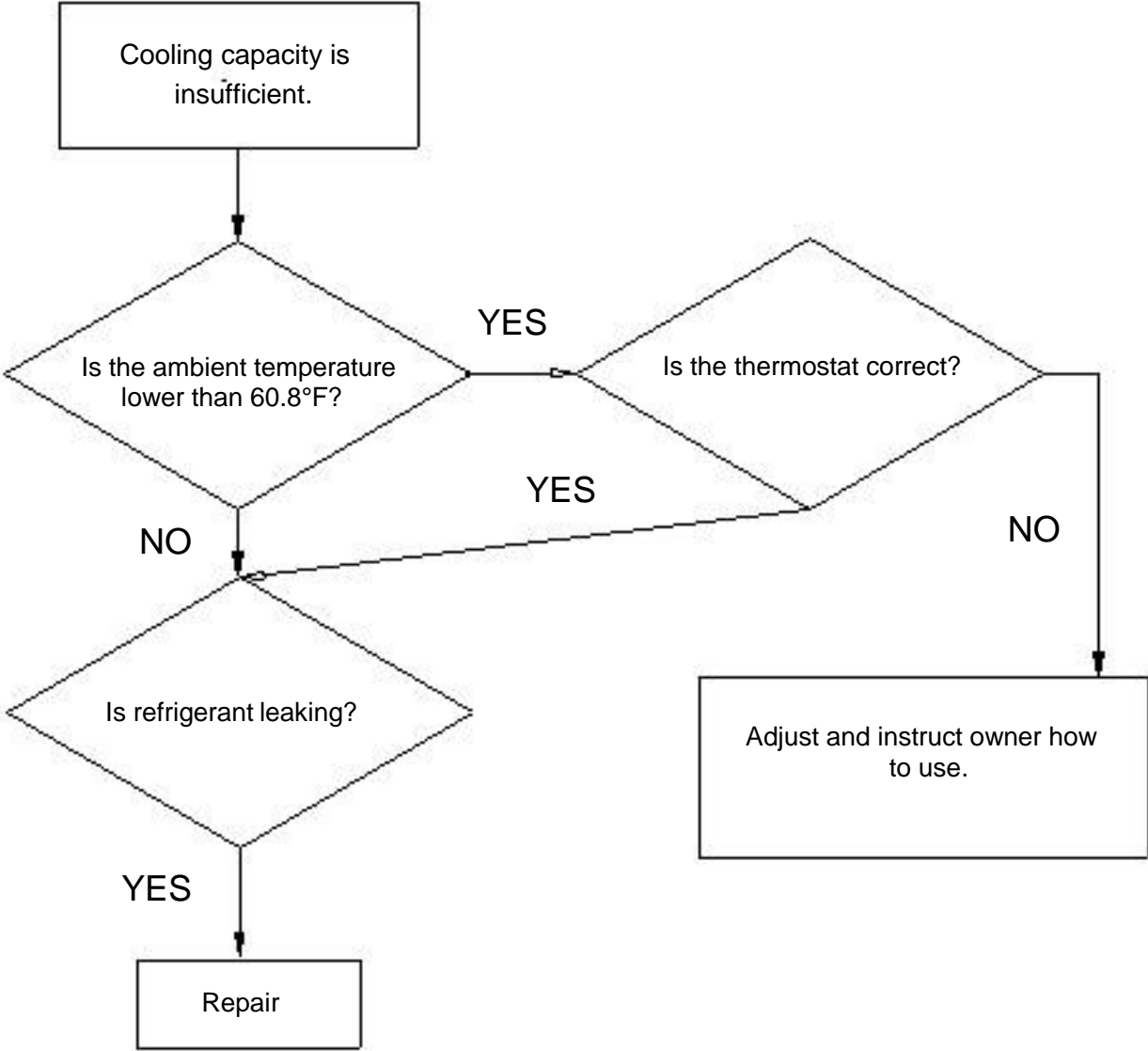
1. No cooling



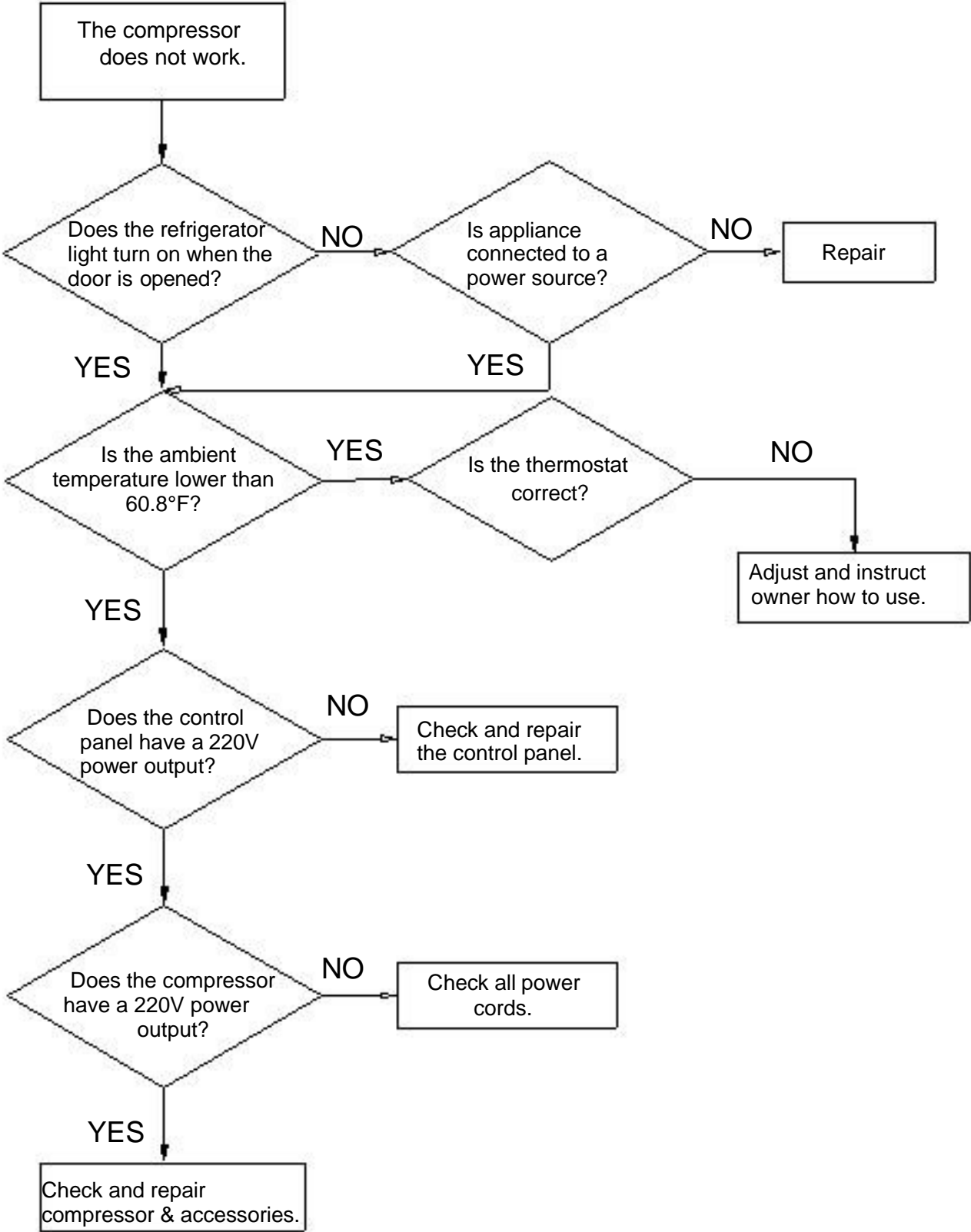
2. The compressor does not stop



3. Cooling capacity is insufficient



4. The compressor does not work



5. Normal Refrigerator Functions

A domestic refrigerator not only does it have a complicated electrical control system, but also a refrigerating system that sometimes makes it difficult to figure out if it is in good working condition. Both systems work in tandem and affect each other. If one malfunctions, this can decrease efficiency or operation or even lead to complete breakdown of the unit.

Since refrigerators are generally big, it's not always practical to send them to a service department over small issues. Sometimes these issues are normal and not a sign of real malfunction. Therefore, before dealing with actual problems, below is a brief account of some normal occurrences that might happen to the unit. There is no need to worry; they can usually be fixed easily.

Normal Functions:

- A.** When the compressor has just stopped running, a rumbling sound can be heard from inside the evaporator, which is caused by refrigerant flowing in the evaporator tubing. Since the pressure difference is still greater after the compressor has stopped running, the refrigerant will flow for some time, so this sound is normal.
- B.** When the compressor starts running, a clicking sound can often be heard, which is produced by the motion of deadweight start relay. The compressor motor will produce a slight and uniform sound while it is running. This sound is not easy to hear in the daytime, but it can be heard at night.
- C.** The compressor consists of an electric motor and a compressing device. During normal operation, the motor's stator core and windings will rise to a temperature in the range of 212°F–230°F, and the temperature of the piston and cylinder can reach as high as 212°F due to the heat produced by the compressing refrigerant. Most of the heat escapes through the compressor casing; therefore, its casing is generally at a temperature between 185°F–194°F. It is extremely hot, particularly in summer when the ambient temperature is higher.
- D.** For a direct cool refrigerator, an irregular cracking sound can often be heard when the compressor is running for a prolonged period of time or has just stopped running. This sound is caused by the tension from the expansion and contraction when there is a temperature change, and it will not affect the refrigerator's normal operation.

6. Common Problems in Refrigerators and Their Remedies

Issues occurring in refrigerators are closely related to the quality of their components, the manufacturers' workmanship, and if they are properly used and maintained. The aspects generally used to gauge the working conditions of a refrigerator include its temperature, operation rate, power consumption, noise level, and other functional indexes. If any one of these factors is beyond its permissible range, this indicates that there is a fault or issue in the refrigerator.

During the life cycle of a refrigerator, the probability of an issue occurring within a specific time is called its failure rate. Comparing the refrigerator's control circuit system and its refrigerating system, the failure rate of the former is higher, and that of the thermostat is the highest. In troubleshooting, first determine where the problem originates from: the control system or the refrigerating system. Generally there is no trouble-indicating instrument mounted on a domestic refrigerator, so an issue's location and nature should be determined according to its features. Therefore, experience in servicing is important in troubleshooting. Experienced service technicians can correctly locate issues and take reasonable measures based on their comprehensive analysis of problematic characteristics and of various kinds of refrigerators.

Three Checkup Essentials:

1. Look

- a. Check the refrigerating system tubing for cracks and welded parts for leaks. If there is a leakage, an oil stain will appear.
- b. Check the suction and exhaust pressure values (high and low pressures) of compressor to see if they are normal.
- c. Check frost conditions on the evaporator and the gas return tube. It is abnormal to see no frost or frost on only one part of the evaporator.
- d. Check the speed of temperature drop inside freezer compartment. It is abnormal if the speed is noticeably slower than the normal.
- e. Check area to see if it is suitable for placing a refrigerator there.
- f. Check door seal, casing, surface, and thermal insulation layer.
- g. Look at the main control panel to determine if various indicators are normal.

2. Listen

- a. Listen to the noises emitted when the compressor is running. Hums from a fully enclosed unit is caused by overload, indicating that the motor cannot be started normally. A clattering sound from inside the start relay signifies the start contacts cannot be released normally. A whistling sound is caused by high-pressure gas escaping through a crack in the pressure tube inside the compressor. The sound of striking clunks indicate a suspended spring inside the compressor has broken.

During compressor's normal operation, a faint and constant hum due to undulation of electrical current can be heard; this is normal. However, if it sounds like an impact sound inside the compressor, this means that a large quantity of wet saturated vapor of refrigerant or refrigerating oil has entered the compressor cylinder. If it sounds like a striking sound of metal parts inside the compressor, this means that some part has become loose. (Be sure to differentiate this sound from those formed during the compressor starting or stopping.)

- b. Open the refrigerator door while compressor is in operation, and listen to the sound of gas flow inside the evaporator. If it sounds like gentle whistling accompanied by a sound similar to water flowing, this is the sound produced by the normal circulation of refrigerant within the evaporator. If only the gas flowing sound can be heard and there is no water flowing sound, this indicates that the refrigerant has already percolated. If neither sound can be heard, this means that the filter or capillary is clogged.

3. Touch and Feel

- a. After the compressor has operated normally 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, this means the refrigerant is leaking. If the condenser is hot for only a few minutes and then cools down, this means that the filter and capillary are clogged. If the forced air-cooling condenser has hot air blowing out, the system is out of order.
- b. Feel the filter's temperature. During normal operation, the temperature on the filter's surface should be a little higher than the ambient temperature. If condensation appears, it is because the filter's temperature is lower than the ambient temperature and the screen is clogged. This obstructs the flow of refrigerant, causing a drop in temperature due to throttling.
- c. Feel the temperature of exhaust gas from the refrigeration system. The exhaust gas should be extremely hot during normal operation. For refrigerators with an enclosed compressor refrigeration system, there should be no frost or condensation on the gas suction tube. Otherwise, there is something wrong in the system. (It is normal for frost and condensation to appear for a short period of time when starting the machine.) Since a refrigerator is a combination of several components, these elements are connected to and influence each other. If a problem is discovered through any of the previously mentioned checkups, do not make a hasty conclusion based on only one issue. It is advisable to analyze and conduct troubleshooting comprehensively, with the aid of

Maintenance Service and Troubleshooting

instruments or other ways, because several issues may share a common source and several problems may occur simultaneously due to a specific reason. With this method, some suspicious issues can be eliminated and a correct judgment can be reached.

7. Analysis of Problems and Troubleshooting

A. Poor Refrigerating Effect

The so-called "poor refrigerating effect" refers to when the refrigerator operates normally, but it does not cool down to the temperature indicated by the thermostat. Possible causes for this occurrence are discussed and analyzed below:

1. Refrigerant Leaks

Analysis of Problem

Refrigerant leakage will result in an insufficient refrigerating capacity, which will lower the gas suction and exhaust pressures and increase the exhaust gas temperature. The exhaust tube will be rather hot, and a continuous gas-flowing sound from the outlet of the capillary will be louder than normal. Little to no frost will appear on the evaporator. After shutting down, the balance pressure in the system is lower than the saturation pressure corresponding to the ambient temperature.

Solution

If there is a refrigerant leak, do not rush to recharge it with refrigerant. Since there are many joints and sealed surfaces in a refrigerator, there are numerous potential leak points. Therefore, locate the point(s) of leakage and note from where it leaks. After repairing, recharge refrigerant. In troubleshooting, pay attention to those parts that are prone to leak, checking main connection points for oil seepage and tubing for cracks. If there is no severe leak, charge the system with nitrogen to detect leak points. Once the leak is found, repair it, empty the system, charge with refrigerant, and turn on the refrigerator for a test run.

2. Too much refrigerant charged into the system

Analysis of Problem

- a. If the amount of refrigerant charged into the system exceeds its capacity, the surplus refrigerant will take space in the evaporator, which will reduce its heat-dissipation area and the refrigerating efficiency. Malfunctions caused by this abnormal occurrence are:
 - i. the gas suction and exhaust pressures are higher than normal,
 - ii. the condenser is hot,
 - iii. the compressor's electric current rises,
 - iv. loose frost forms on the evaporator,
 - v. the refrigerator temperature drops slowly, and
 - vi. frost appears on the gas return tube.
- b. If excessive refrigerant has been charged, the liquid refrigerant that cannot evaporate in the evaporator will return to the compressor, causing "liquid striking." The refrigerant evaporates and bubbles as soon as it flows into the refrigerating oil at the bottom of compressor. In severe cases, foam will cover the inside of the compressor and be pulled in by the piston, causing damage to the components of the compressor.

Solution

According to operating procedures, it is necessary to turn the appliance off. After a few minutes, open the refrigerant charging tube, let refrigerant escape, replace dry filter, recharge refrigerant after evacuating, and seal charging port.

3. Air left in the refrigerating system

Analysis of Problem

Residual air in the refrigerating system will reduce its refrigerating efficiency. The main effects are a higher temperature in the segment from the compressor outlet to the condenser inlet and an increase in the gas suction and exhaust pressures, although the gas exhaust pressure will not exceed its rated value. Since there is air in the system, both the gas exhaust pressure and temperature will rise, and the gas-flowing sound is intermittent and louder.

Solution

Turn off the refrigerator for several minutes, then open the tubing, evacuate it, and recharge the system with refrigerant.

4. Low efficiency of compressor

Analysis of Problem

Low efficiency of a refrigerating compressor refers to the reduction of gas discharge capacity and the corresponding reduction of refrigerating capacity due to the fact that the refrigerant in the system is unchanged. This normally occurs when the compressor has been in use for a long period of time: its moving parts have worn out, clearance fits have increased, and the sealing property of its gas valve has deteriorated, causing a decrease in its gas discharge capacity.

Solution

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

5. Thick frost layer on evaporator

Analysis of Problem

If a direct cool refrigerator will be used for a prolonged period of time, be sure to defrost its evaporator regularly; otherwise, the frost layer on the evaporator tubing will become thick. Heat conduction will be severely affected if the whole tubing is covered in ice, and the temperature in the refrigerator will not be able to drop to the ideal range.

Solution

To defrost, first turn refrigerator off. Next, open refrigerator door to let in air or use a fan to speed up airflow and defrosting process. To avoid damaging the evaporator tubing, never strike frost layer with any iron tools or wooden sticks.

6. Refrigerating oil in evaporator tubing

Analysis of Problem

During refrigerating cycles, refrigerating oil residue may remain in the evaporator tubing. However, if there is a considerable amount of refrigerating oil in the evaporator, the heat conduction effect will be severely affected, which will cause poor refrigeration effect.

Solution

It is sometimes difficult to determine if this issue is caused by refrigerating oil residue in the evaporator tubing because it tends to be confused with other problems. Generally, the cause can be determined by examining the frost on the evaporator. If there is little to no frost covering the evaporator, this means the deterioration of refrigerating effect is due to the accumulation of refrigerating oil residue in the evaporator tubing, unless another problem have been discovered. To remove refrigerating oil residue in the evaporator, disassemble the evaporator, purge it thoroughly, and dry it. If it is difficult to disassemble, charge refrigerant from the evaporator inlet several times to wash it. Then, purge and dry it with nitrogen.

7. Obstructed flow in refrigerating system

Analysis of Problem

If the refrigerating system is not cleaned thoroughly, some of the filter screen meshes can become clogged with dirt that accumulated after a long period of use. This causes a decrease in flow rate and a poor refrigerating effect. Malfunctions caused by this abnormal occurrence are:

- a. decrease of gas discharge pressure,
- b. lower temperature of discharged gas and of the clogged area, and,
- c. in severe cases, condensation or frosting may appear.

Solution

Purge tubing and replace the dry filter with a new one or clean it thoroughly. Recharge the system with refrigerant and seal the charging port.

B. No Refrigerating

When the compressor runs normally, but little to no frost appears on the evaporator and the refrigerator temperature does not lower, this is termed "no refrigerating." There are many causes for this problem, and it can be complicated to determine. In servicing, special attention should be given to discover the cause of the problem. Some common causes for this malfunction are analyzed below:

1. Entire refrigerant has leaked out

Analysis of Problem

If leak points in the refrigerating system have not been found and repaired in a timely manner, this can result in the refrigerant completely leaking out. There are two kinds of leakage:

- a. Slow leakage: When a refrigerator has not been used in a long time, the refrigerant might gradually leak out. If in the course of operating the refrigerator it gradually becomes not as cold as normal and, eventually, does not refrigerate, there is a slow leakage.
- b. Fast leakage: All of the refrigerant escapes swiftly from a rupture in system tubing.

Symptoms of total leakage of refrigerant are as follows:

- a. the compressor can be easily started (if there is no damage to the compressor parts),
- b. the operating current decreases,
- c. the gas suction pressure increases,
- d. the discharge pressure decreases,
- e. the gas discharge tube is cold,
- f. no sound of gas flow in the evaporator can be heard, and
- g. no gas escapes out of the process tube after cutting it open.

Solution

Check the whole appliance, particularly locations which are prone to leak. After leak point(s) have been found, repair or replace with new parts, according to specific circumstances, and then empty the system to recharge refrigerant.

2. Refrigerating system is clogged with ice

Analysis of Problem

The expansion valve can become clogged with ice if the moisture is not removed properly from refrigerant system, air purging is done improperly, or the water content in the refrigerant is substandard. The symptoms for this condition are:

- a. irregular refrigeration, sometimes working normally at the beginning, but, afterward, frost forms at the clogged area;
- b. evaporation temperature drops below 32°F;
- c. water accumulates at and clogs the narrow part of the capillary;
- d. frost melts at the evaporator;
- e. no sound of gas flowing can be heard; and
- f. The gas suction pressure becomes a vacuum.

Note that these occurrences will appear intermittently; sometimes the refrigerator works well and other times it does not. In order to determine if the system is clogged with ice, heat suspicious points with hot water to melt any ice. If the sound of gas flowing is heard and the gas suction pressure rises, then the system was clogged with ice.

Solution

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

3. Refrigeration system is clogged with dirt

Analysis of Problem

Coarse-grained dirt and refrigerant oil tend to settle in and clog the capillary inlet. If considerable dirt accumulates there, the whole filter screen may be blocked, preventing the refrigerant from passing through. This problem exhibits some of the same symptoms as when the refrigeration system is clogged with ice, namely higher gas suction pressure, lower temperature of discharged gas, and no sound of gas flowing in the evaporator. The difference between the two problems is that if the clogging is caused by dirt, tapping the suspicious clogged point(s)—normally in the capillary or in the connection joint of the filter—may cause the refrigerant to flow through partially, resulting in some change, whereas if it is heated with a hot towel, no change will occur. After dismissing the possibility that the clogging is due to ice, it is safe to assume the clogging is caused by dirt.

Solution

Dismantle the system, remove the dry filter, purge the tubing with nitrogen, install a new filter, evacuate it, and charge it with refrigerant.

4. Clogged filter

Analysis of Problem

A completely clogged filter rarely happens. When this problem does occur, it is usually caused by a buildup of paste-like matter, dust, or dirt on the filter after the refrigerator has been in use for a long period of time. Sometimes, tapping the filter may remove some of the blockage. When the filter is clogged, its temperature will be cooler than normal.

Solution

The same as prescribed in the “Refrigerating system clogged with dirt” section.

5. Broken gas suction and discharge valve blocks

Analysis of Problem

The compressor works by opening and closing the gas suction and discharge valves in order to draw in and discharge the refrigerant. If the valve block is broken, the refrigerant cannot be discharged, preventing refrigeration.

Solution

It can be difficult to differentiate this problem from others because they often share similar symptoms. When repairing, listen attentively for any abnormal sound(s) coming from the compressor—sometimes the broken pieces of valve block may strike against the cylinder. Next, feel the compressor casing to determine if it is too hot. Then, with pressure gauges, measure the pressures at the high and low pressure ports of the compressor. If the gas suction valve block is broken, the suction pressure will be extremely high and its gauge pointer will swing violently. If the gas discharge valve block is broken, the discharge pressure will be extremely high and its gauge pointer will also swing drastically. In both cases, stop the compressor at once, and, if possible, open the cylinder cover to check the valve block, and then repair or replace.

C. Compressor Suddenly Stops

Often when the compressor suddenly stops during operation, the gas suction pressure and/or discharge pressure have exceeded their respective prescribed ranges. When this occurs, the pressure-operated protective relay automatically shuts off the compressor. Below are some of the common reasons for high gas discharge pressure and low suction pressure.

1. Stoppage due to excessively high gas discharge pressure

1a. Excess refrigerant

Analysis of Problem

Loose frost and poor refrigerating effect may occur if excessive refrigerant is charged into the system. Excessive refrigerant will occupy additional space in the evaporator, which will reduce its heat dissipating area, and “liquid striking”

may occur as well. Meanwhile, condensation may occur on the gas return tube, and the gas discharge pressure will rise. When it reaches the maximum value, the protective relay will activate and shut off the compressor.

Solution

Open the tubing, evacuate, and charge the system with the proper quantity of refrigerant.

1b. Air left in the system

Analysis of Problem

Residual air in the system will circulate with the refrigerant in the system. The major symptoms caused by this problem are poor refrigerating effect, higher gas discharge pressure, and higher discharged gas temperature (the gas discharge tubing is considerably hot). The gas discharge pressure will exceed its normal value when the compressor has run for an extended period of time, thus making the protective relay activate and shut off the compressor.

Solution

Exam how the air was left in the refrigerating system. Generally, there are three possibilities:

- i. the air was sucked into the system during a careless repair,
- ii. it was not completely purged when evacuating the system, or
- iii. there are leak points at the low-pressure end of the refrigerating system. Leak points appear mainly in low-temperature parts because the evaporation temperature is lower in low-temperature devices; it is easier for air to enter the system in such areas.

Once it has been determined that air is in the system, open the tubing, evacuate it, and charge it with refrigerant.

2. Broken due to electrical issues

2a. Thermostat is out of order

Analysis of Problem

If the thermostat is not in good working order or its temperature sensor has been installed improperly, frequent stopping is likely to occur.

Solution

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

Maintenance Service and Troubleshooting

2b. Overload of electric motor

Analysis of Problem

The motor might stop running if:

- i. too many items are placed inside the refrigerator, which will cause the thermal load to exceed its refrigerating capacity, or
- ii. The power supply voltage drops considerably, causing the current flowing through the motor to increase drastically, activating the thermal protector and blowing a fuse. If the motor is still running, its windings will be burned out.

Solution

Reduce the thermal load, paying close attention to the variation in the power supply voltage.

2c. Abnormal thermal protection

Analysis of Problem

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

Solution

Replace the thermal protector with a new one.

3. Blockage due to other causes

Normal Stoppage

A thermostat generally controls when the compressor starts and stops. When the temperature in the refrigerator reaches its desired value, the thermostat will shut down the compressor automatically. Never confusion this normal operation as a malfunction. Be sure to differentiate this normal occurrence from real issues while servicing.

D. Compressor Will Not Start

If the compressor does not start, find the root of the problem by conducting a step-by-step checkup. There are many possible causes, including electrical and mechanical.

1. Check if power supply is connected to the compressor circuit

Analysis of Problem

If the compressor will not start, usually the problem will manifest itself in the power supply circuit, such as power failure, poor switch contact, or blown fuse. Make a comprehensive analysis of the situation, find the cause, and take measures to fix the problem.

Solution

- a. Check the power circuit input—connected to the light switch—to see if there is voltage in the power supply. This can be determined with a voltmeter or a test pencil. If a blown fuse is found, determine and remove its cause, and replace it with a new one with the same specifications.

- b. Check the compressor accessories, including its thermal protector and relay. If 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 humming will sound when the compressor is turned on. If this happens, shut it down immediately or the motor windings will burn out if this condition persists.
- c. Check the relay contacts and plugs to see if they are in perfect order and working. Poor contact may cause the motor to stop running or to hum.

2. Check if circuit voltage is normal

Analysis of Problem

If the circuit voltage is lower than its rated value, it will be difficult to start the motor, and a humming will be heard.

Solution

Measure the voltage with a voltmeter. If it is too low, instruct the owner to buy a stabilizer to increase the voltage for normal operation.

3. Check if contacts of thermal relay are closed

Analysis of Problem

The contacts of the thermal relay are sometimes open due to a leakage of temperature-sensing agent from the temperature sensor.

Solution

Remove the relay cover to check its contacts. If they are open, this means the original setting was not properly positioned or the temperature-sensing agent has leaked. Adjust the contacts of the temperature sensor towards the low temperature direction. Once completed, check if contacts have been closed. If they are still open, dismantle the temperature-sensing disc and immerse it into warm water to see if the contacts activate. If they do not, the temperature-sensing agent has leaked out, and the thermostat must be replaced.

4. Motor problems and other electrical failings

- 4a. Motor windings have been burned or short-circuited between cycles

Analysis of Problem

When motor windings have been burned or short-circuited, the fuse will blow repeatedly, especially when the light switch is closed.

Solution

Check the terminals and outer casing to see if they are short-circuited, and measure the resistance of each phase with a voltmeter. If short-circuited or the resistance of a phase is low, this means the windings are short-circuited and/or the insulation layers have deteriorated or been burned.

A multimeter can also be used. If the insulation resistance is lower than two mega ohms (Ω), this means that the insulation layer is damaged. If the motor has been burned, repair it or replace it with a new one.

4b. Faulty control relay

Analysis of Problem

Overheating, burnouts, and/or wearing of control relay contacts will generally occur. All these will cause poor contact in electricity.

Solution

Dismantle the control relay to repair or replace it with a new one.

4c. Defective electric contactor in thermostat

Analysis of Problem

Damaged contactor and the temperature-sensing agent has leaked.

Solution

Replace the old/broken contactor with a new one.

4d. Check the terminals for loose connection and electrical circuits for other abnormal occurrences.

5. Mechanical problems in compressor

Analysis of Problem

- a. Shaft seizure: This is mainly caused by poor lubrication, such as insufficient lubricant, clogged lubricant oil line, or irregular application of lubricant. Dirt and other impurities in the lubricant will increase its gumminess and cause the shaft to seize up. Copper plating may also cause shaft seizure.
- b. Piston seizure: This is caused when the fit clearance between the piston and cylinder is too small or has expanded due to heat.

These problems have most likely happened if the refrigerator is turned on, but the compressor will not start, while it emits a slight humming, and, seconds later, the thermal protective relay activates and opens the contacts. This process will occur repeatedly, and the compressor will remain inactive.

Solution

Replace compressor.

E. Compressor Will Not Stop

The compressor will run continuously for several hours or without end. There are many reasons why this might happen.

1. Common Causes

- a. Too much food is placed or is too densely packed in the refrigerator, resulting in poor ventilation or inadequate conditions for temperature sensing.
- b. The ambient temperature is too high, creating poor ventilation and heat dissipation.
- c. The control system is out of order.
- d. Control system functions normally, but there is an issue in the refrigeration system.

Maintenance Service and Troubleshooting

2. Temperature is set incorrectly

Analysis of Problem

The temperature control knob is set to the "coldest" setting. This setting is for fast freezing and can cause continuous running because the temperature for the compressor to power off is too low, so it won't stop running until it reaches the "coldest" temperature.

Solution

Check the temperature control knob to see if it is set to "coldest."

3. Thermostat is malfunctioning

Analysis of Problem

When the thermostat does not work properly, it will make the compressor run continuously, causing the temperature to drop. The issue usually lies in the fact that the contacts of the thermostat cannot be released.

Solution

Dismantle the thermostat and make a thorough examination. If it is out of order, replace it with a new one.

4. Evaporation temperature is too high

Analysis of Problem

Refrigerant leakage and clogging in a refrigeration system will affect the refrigerating capacity. Due to a lower refrigerating capacity, the refrigerator temperature cannot reach its rated value and the thermostat will malfunction, so the compressor will continue to run. When the evaporation temperature in the system is too high, the temperature-sensing agent in the temperature sensor will also be hot, so the thermostat will be unable to cut off the power supply to the compressor and stop it.

Solution

If the amount of refrigerant is insufficient, recharge the system with refrigerant. If clogging occurs, disassemble the clogged part. If the evaporation temperature is too high, resolve this problem with an appropriate amount of refrigerant.

5. Damaged thermal insulation layer and/or door seal

Analysis of Problem

When the thermal insulation layer inside the casing deteriorates or the door seal does not touch the doorframe, the temperature in the refrigerator will rise and make the compressor continuously run.

Solution

Check the thermal insulation layer for damage. If damaged, repair it. If the door has deformed or the door seal does not close tightly against the casing, repair or replace seal/gasket.

F. Leakage Current

1. Slight leakage current

Electrical insulator has deteriorated due to dampness, thus resulting in a slight leakage current.

2. Serious leakage current

Refrigerator has become electrically charged due to an electrical problem or faulty wiring in power cord or outlet. This is extremely dangerous.

3. Leakage current test

- a. Slight leakage current: A tingly sensation will be felt if the metal parts of the refrigerator are touched. When tested with a test pencil, the neon light will turn on. In that case, determine if the grounding was properly done. If it was, turn off the refrigerator, and check the insulation of the electrical circuits with a voltmeter.
- b. Serious leakage current: Never touch the refrigerator casing, its door handle, or other metal parts. Test the refrigerator with a test pencil; the test pencil should light up brightly. Next, measure the resistance between the power cord and the casing with a voltmeter; the reading should be zero ohms (Ω). At worst, there is a blown fuse. Check the three-prong outlet to see if the live and neutral wires were inverted, which will turn the power plug's ground prong into a live wire. Another possibility is that the live wire and neutral line of the outdoor power supply circuit have been inversely connected, making the neutral wire become live.

G. Strong Vibrations and Loud Noises

1. Refrigerator placed improperly

- a. Uneven ground will cause the refrigerator to be unsteady, causing large vibrations and loud noises during operation.
- b. If the leveling screws have not been adjusted properly, vibrations and noises will occur even if the refrigerator has been placed on a levelled ground.

2. Abnormal noise from compressor

Suspended springs inside the compressor casing are out of balance and strike against the casing. Worn compressor parts may also cause noise.

3. Echo in tubing and loose parts

Improperly laid or tightly packed tubes or loose parts may cause vibrations and noise.

Maintenance Service and Troubleshooting

4. Inspection guidelines

To find the source(s) of noise, press the vibrating spot while the refrigerator is in operation and listen if the vibration becomes weak or disappears. If the refrigerator has not been levelled, put a leveler on the refrigerators top and adjust the leveling screws. If noise is coming from the compressor, hit different spots on the side of the casing with a regular or rubber hammer with a wooden block in-between to determine if the suspended springs are out of balance or have been caught in something.
