



# *Service manual*

*Room airconditioner*

*Split Wall-Mounted Type*



*Applied to:* MSC-21CRN1; MSC-21HRN1  
MSC-24CRN1; MSC-24HRN1  
MSC-28CRN1; MSC-28HRN1

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#### NOTE:

Before servicing the unit, please read this at first.  
Always contact with your service center if meet problem.

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# 1. Precaution

## 1.1 Safety Precaution

- To prevent injury to the user or other people and property damage, the following instructions must be followed.
- Incorrect operation due to ignoring instruction will cause harm or damage.
- Before service unit, be sure to read this service manual at first.

## 1.2 Warning

### ➤ Installation

- **Do not use a defective or underrated circuit breaker.**  
Use this appliance on a dedicated circuit.  
There is risk of fire or electric shock.
- **For electrical work, contact the dealer, seller, a qualified electrician, or an Authorized service center.**  
Do not disassemble or repair the product, there is risk of fire or electric shock.
- **Always ground the product.**  
There is risk of fire or electric shock.
- **Install the panel and the cover of control box securely.**  
There is risk of fire or electric shock.
- **Always install a dedicated circuit and breaker.**  
Improper wiring or installation may cause fire or electric shock.
- **Use the correctly rated breaker or fuse.**  
There is risk of fire or electric shock.
- **Do not modify or extend the power cable.**  
There is risk of fire or electric shock.
- **Do not install, remove, or reinstall the unit by yourself (customer).**  
There is risk of fire, electric shock, explosion, or injury.
- **Be caution when unpacking and installing the product.**  
Sharp edges could cause injury, be especially careful of the case edges and the fins on the condenser and evaporator.
- **For installation, always contact the dealer or an Authorized service center.**  
There is risk of fire, electric shock, explosion, or injury.
- **Do not install the product on a defective installation stand.**  
It may cause injury, accident, or damage to the product.
- **Be sure the installation area does not deteriorate with age.**  
If the base collapses, the air conditioner could fall with it, causing property damage, product failure, and personal injury.
- **Do not let the air conditioner run for a long time when the humidity is very high and a door or a windows is left open.**

Moisture may condense and wet or damage furniture.

- **Take care to ensure that power cable could not be pulled out or damaged during operation.**  
There is risk of fire or electric shock.
- **Do not place anything on the power cable.**  
There is risk of fire or electric shock.
- **Do not plug or unplug the power supply plug during operation.**  
There is risk of fire or electric shock.
- **Do not touch (operation) the product with wet hands.**  
There is risk of fire or electric shock.
- **Do not place a heater or other appliance near the power cable.**  
There is risk of fire and electric shock.
- **Do not allow water to run into electric parts.**  
It may cause fire, failure of the product, or electric shock.
- **Do not store or use flammable gas or combustible near the product.**  
There is risk of fire or failure of product.
- **Do not use the product in a tightly closed space for a long time.**  
Oxygen deficiency could occur.
- **When flammable gas leaks, turn off the gas and open a window for ventilation before turn the product on.**  
Do not use the telephone or turn switches on or off.  
There is risk of explosion or fire.
- **If strange sounds, or small or smoke comes from product. Turn the breaker off or disconnect the power supply cable.**  
There is risk of electric shock or fire.
- **Stop operation and close the window in storm or hurricane. If possible, remove the product from the window before the hurricane arrives.**  
There is risk of property damage, failure of product, or electric shock.
- **Do not open the inlet grill of the product during operation. (Do not touch the electrostatic filter, if the unit is so equipped.)**  
There is risk of physical injury, electric shock, or product

failure.

- **When the product is soaked (flooded or submerged), contact an Authorized service center.**

There is risk of fire or electric shock.

- **Be caution that water could not enter the product.**

There is risk of fire, electric shock, or product damage.

- **Ventilate the product from time to time when operating it together with a stove, etc.**

There is risk of fire or electric shock.

- **Turn the main power off when cleaning or maintaining the product.**

There is risk of electric shock.

- **When the product is not be used for a long time, disconnect the power supply plug or turn off the breaker.**

There is risk of product damage or failure, or unintended operation.

- **Take care to ensure that nobody could step on or fall onto the outdoor unit.**

This could result in personal injury and product damage.

#### ➤ CAUTION

- **Always check for gas (refrigerant) leakage after installation or repair of product.**

Low refrigerant levels may cause failure of product.

- **Install the drain hose to ensure that water is drained away properly.**

A bad connection may cause water leakage.

- **Keep level even when installing the product.**

To avoid vibration of water leakage.

- **Do not install the product where the noise or hot air from the outdoor unit could damage the neighborhoods.**

It may cause a problem for your neighbors.

- **Use two or more people to lift and transport the product.**

Avoid personal injury.

- **Do not install the product where it will be exposed to sea wind (salt spray) directly.**

It may cause corrosion on the product. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient operation.

#### ➤ Operational

- **Do not expose the skin directly to cool air for long periods of time. (Do not sit in the draft).**

This could harm to your health.

- **Do not use the product for special purposes, such as preserving foods, works of art, etc. It is a consumer air conditioner, not a precision refrigerant system.**

There is risk of damage or loss of property.

- **Do not block the inlet or outlet of air flow.**

It may cause product failure.

- **Use a soft cloth to clean. Do not use harsh detergents, solvents, etc.**

There is risk of fire, electric shock, or damage to the plastic parts of the product.

- **Do not touch the metal parts of the product when removing the air filter. They are very sharp.**

There is risk of personal injury.

- **Do not step on or put anything on the product. (outdoor units)**

There is risk of personal injury and failure of product.

- **Always insert the filter securely. Clean the filter every two weeks or more often if necessary.**

A dirty filter reduces the efficiency of the air conditioner and could cause product malfunction or damage.

- **Do not insert hands or other object through air inlet or outlet while the product is operated.**

There are sharp and moving parts that could cause personal injury.

- **Do not drink the water drained from the product.**

It is not sanitary could cause serious health issues.

- **Use a firm stool or ladder when cleaning or maintaining the product.**

Be careful and avoid personal injury.

- **Replace the all batteries in the remote control with new ones of the same type. Do not mix old and new batteries or different types of batteries.**

There is risk of fire or explosion.

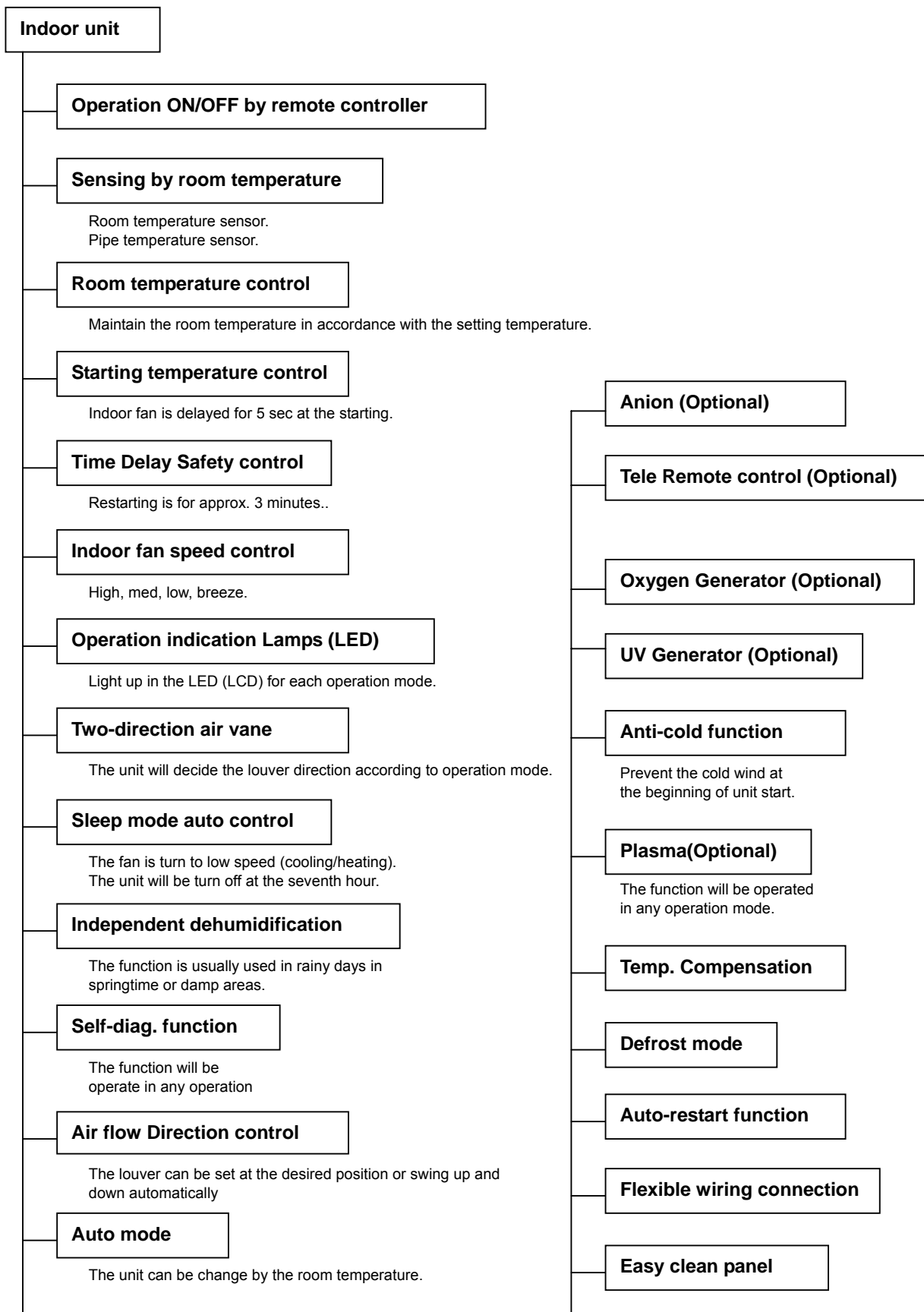
- **Do not recharge or disassemble the batteries. Do not dispose of batteries in a fire.**

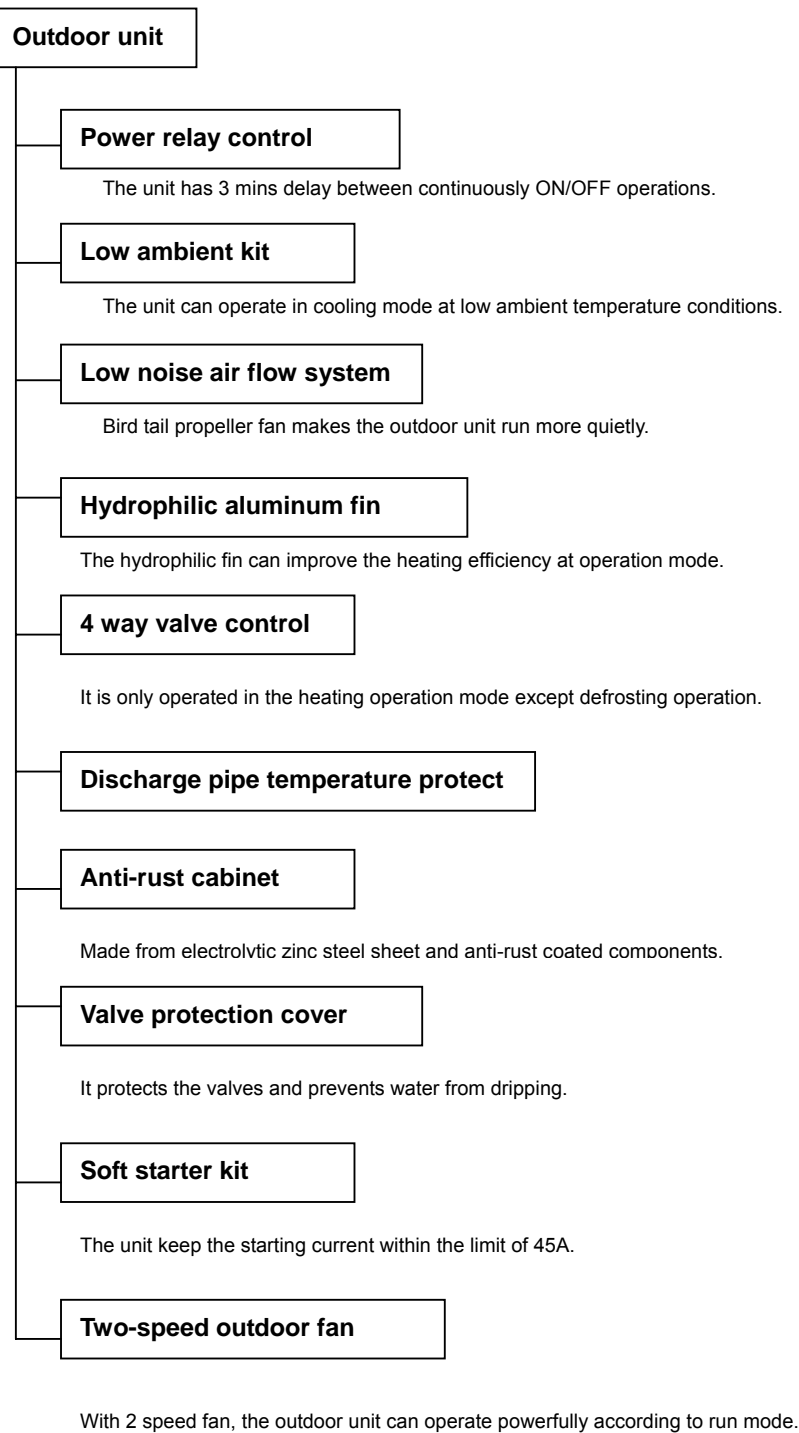
They may burn or explode.

- **If the liquid from the batteries gets onto your skin or clothes, wash it well with clean water. Do not use the remote of the batteries have leaked.**

The chemical in batteries could cause burns or other health hazards.

## 2. Function

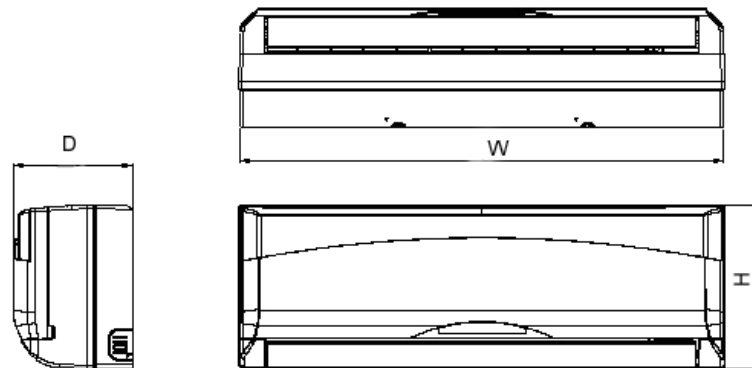






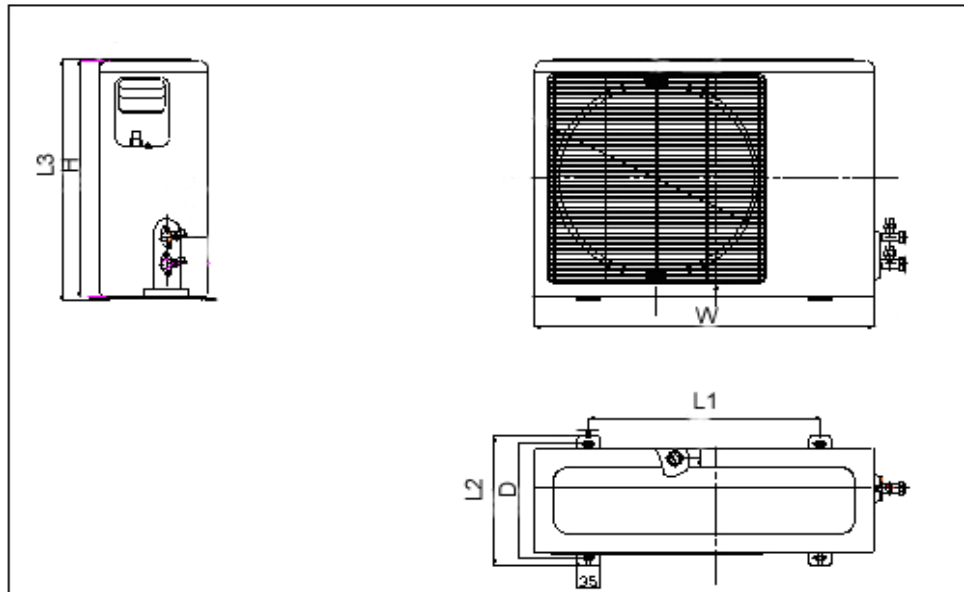
### 3. Dimension

#### 3.1 Indoor unit



Dimension Mode	W	H	D
21K	1080	330	225
24K	1080	330	225
28K	1080	330	225

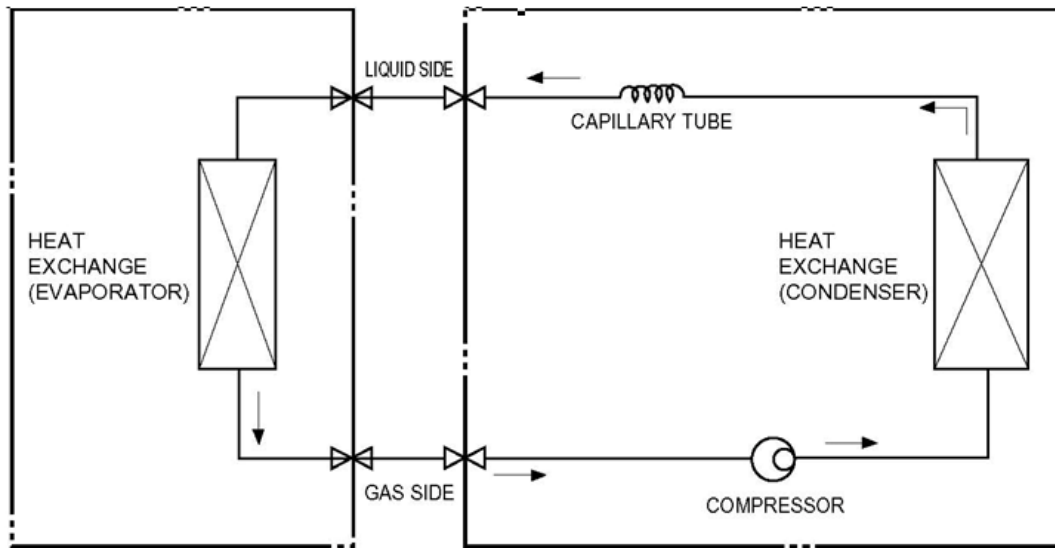
#### 3.2 Outdoor unit



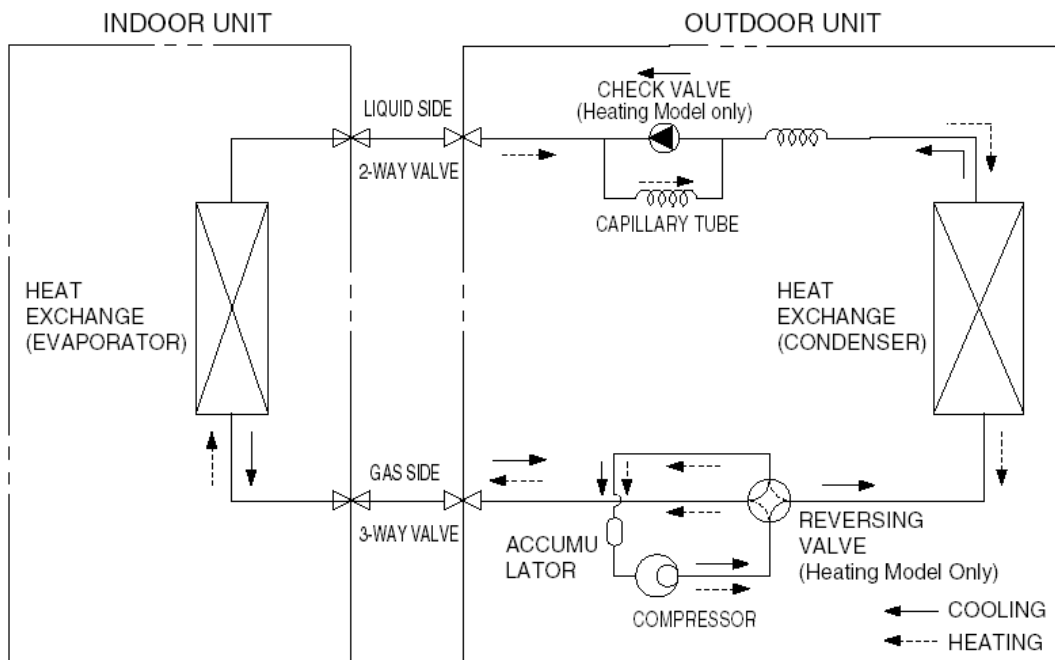
Dimension Mode	W	H	D	L1	L2	L3
7K	845	695	335	560	360	560
9K	845	695	335	560	360	560
12K	845	695	335	560	360	560

## 4. Refrigerant cycle diagram

### ➤ Cooling only



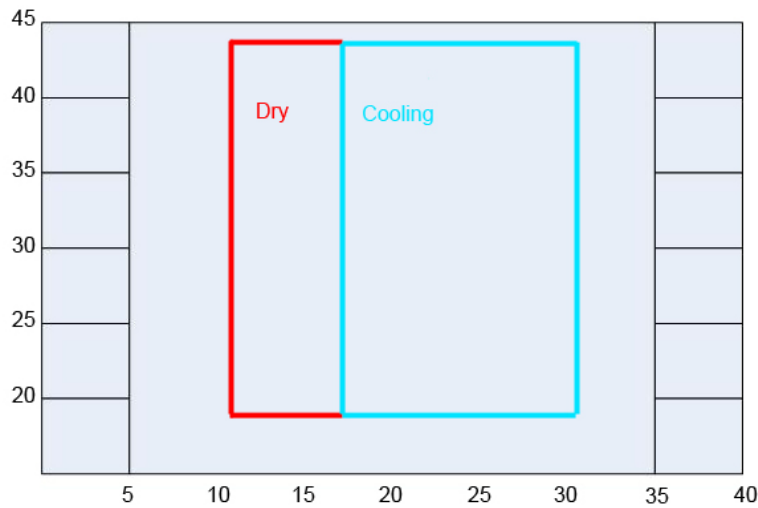
### ➤ Heat pump mode



## 5. Operation limits

### 6.1 Cooling operation

Outdoor unit air temp. °C DB

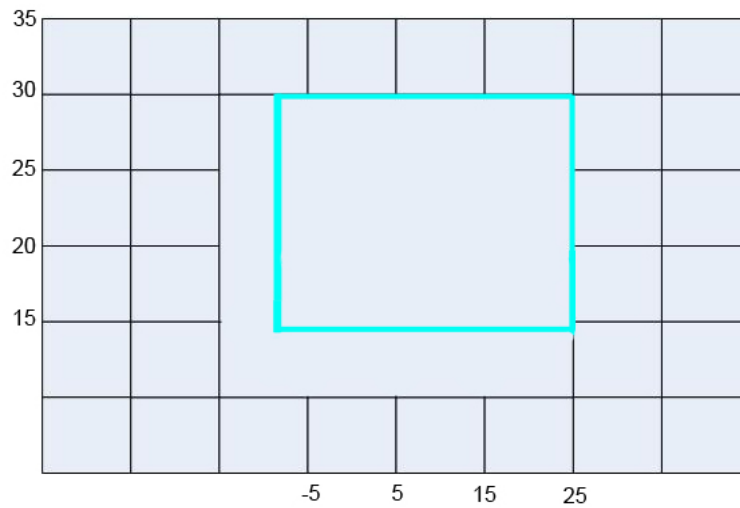


Indoor air temp. °C DB

Note: The chart is the result from the continuous operation under constant air temperature conditions. However, excludes the initial pull-down stage.

### 6.2 Heating operation

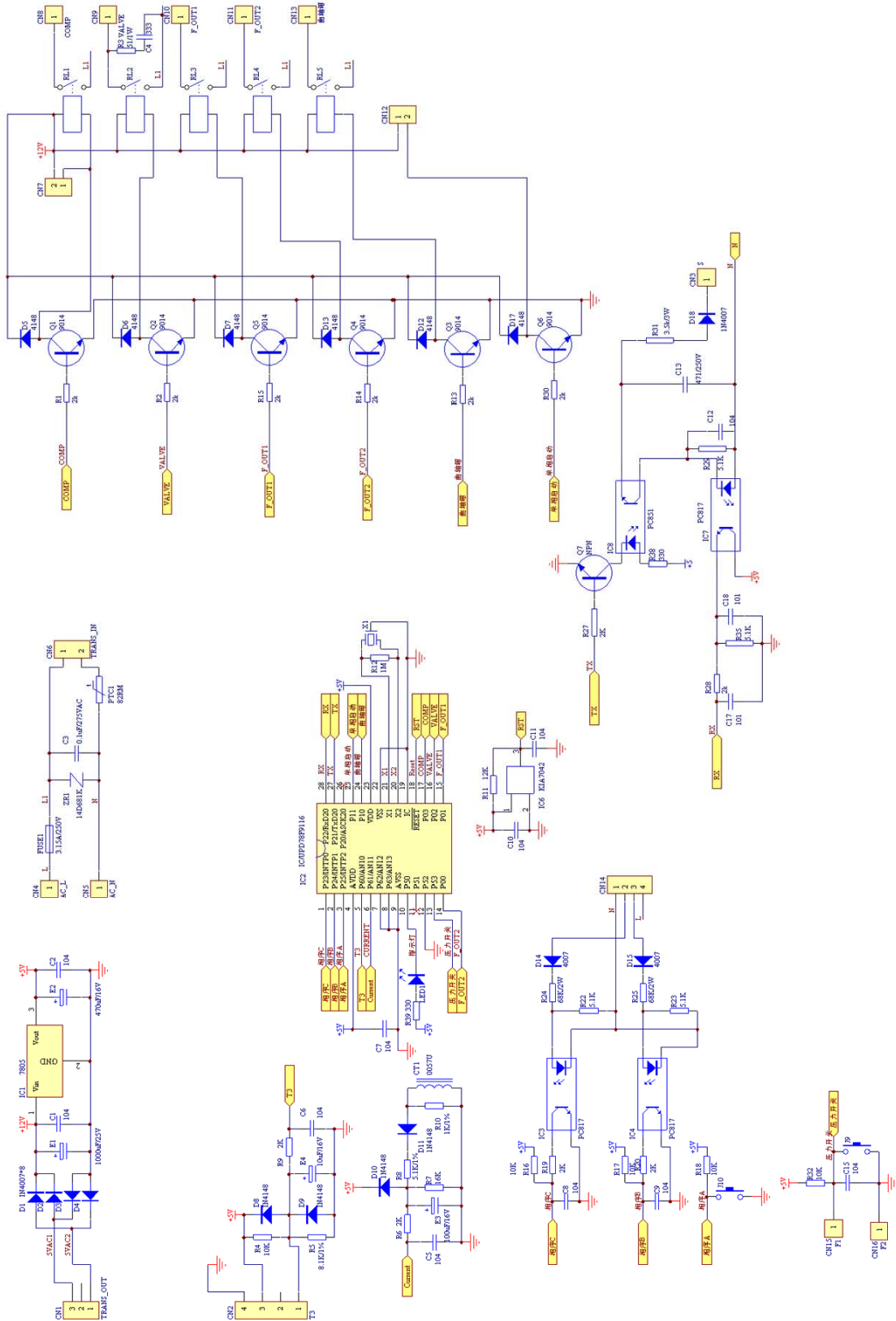
Indoor air temp. °C DB



Outdoor unit air temp. °C DB

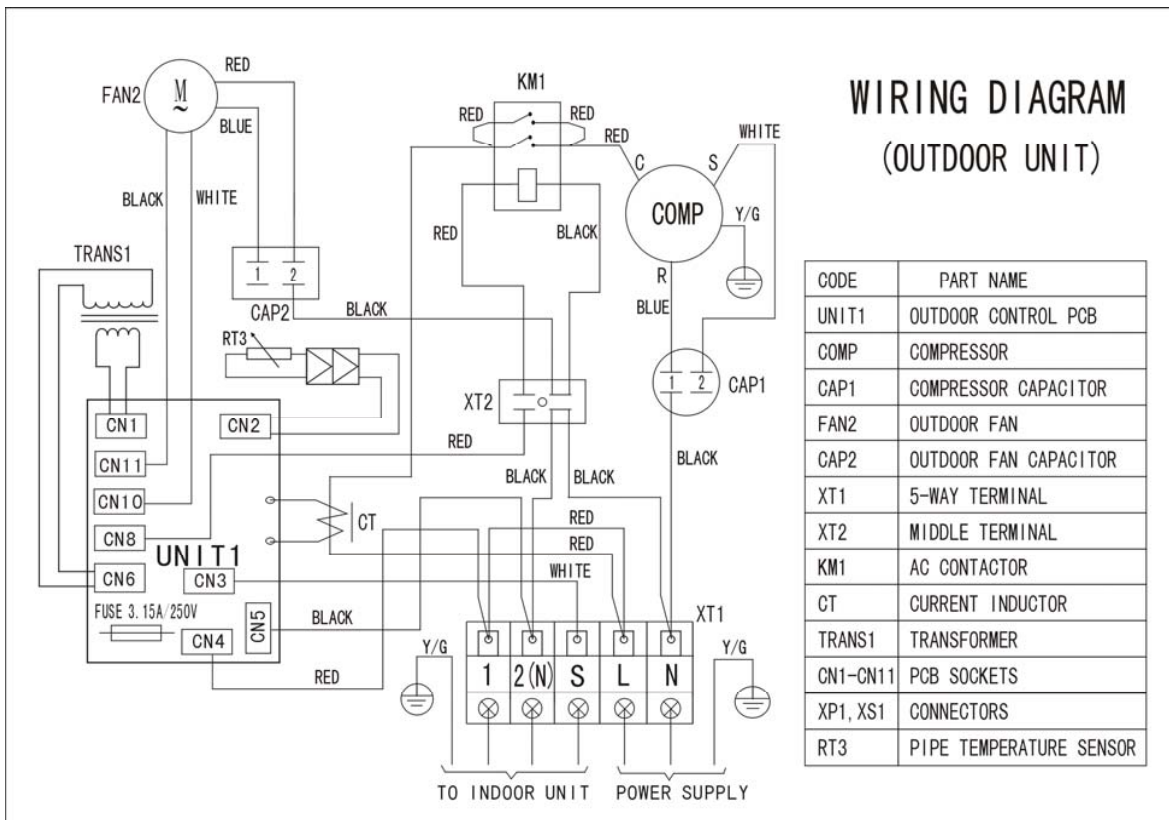
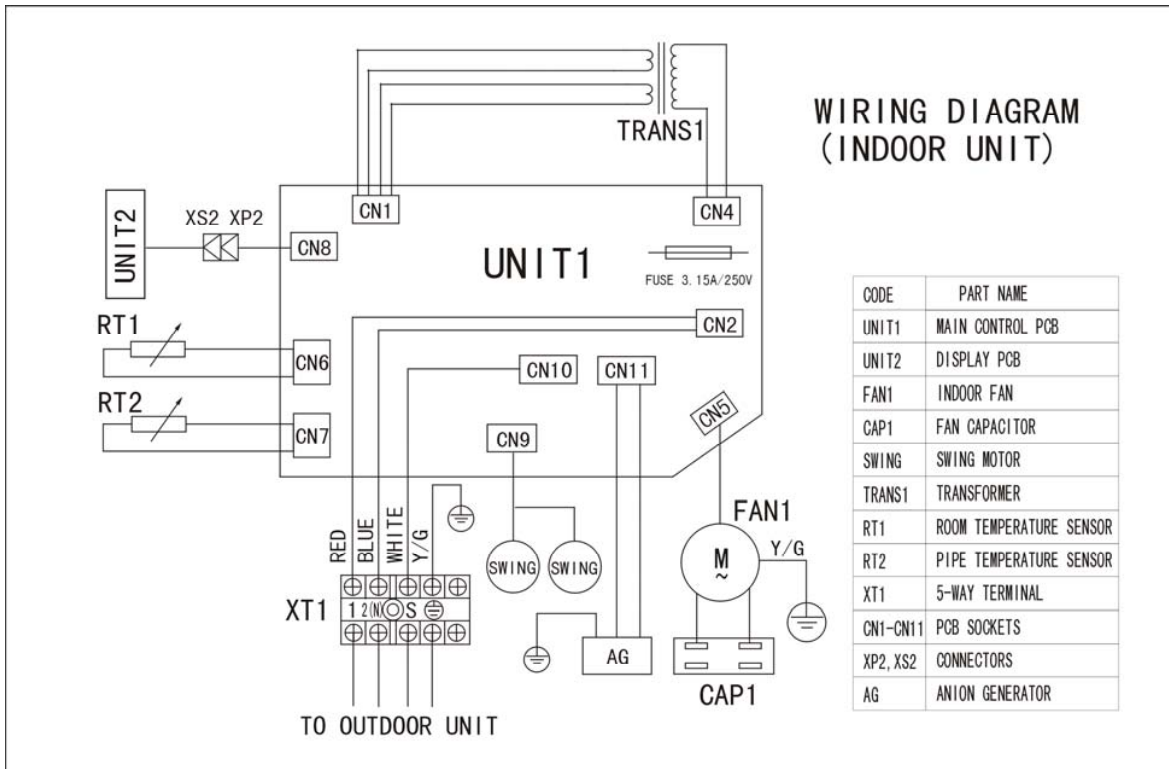
Note: The chart is the result from the continuous operation under constant air temperature conditions. However, excludes the initial pull-down stage.



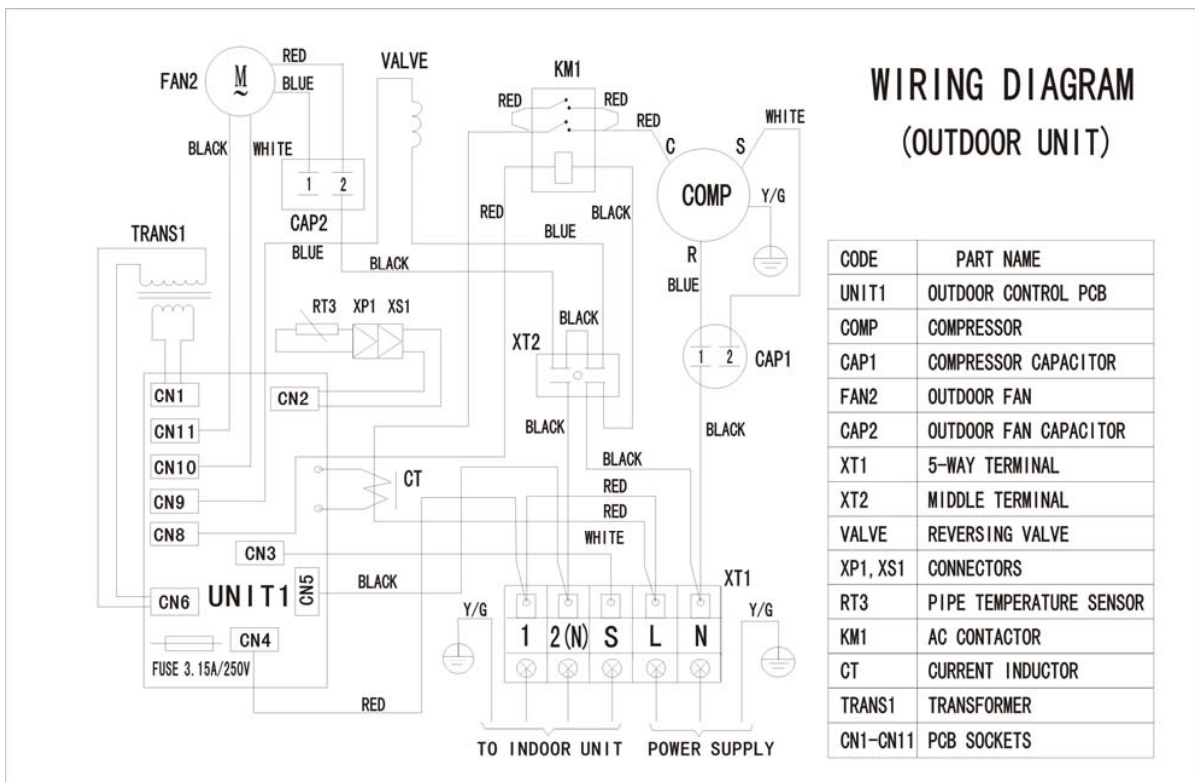
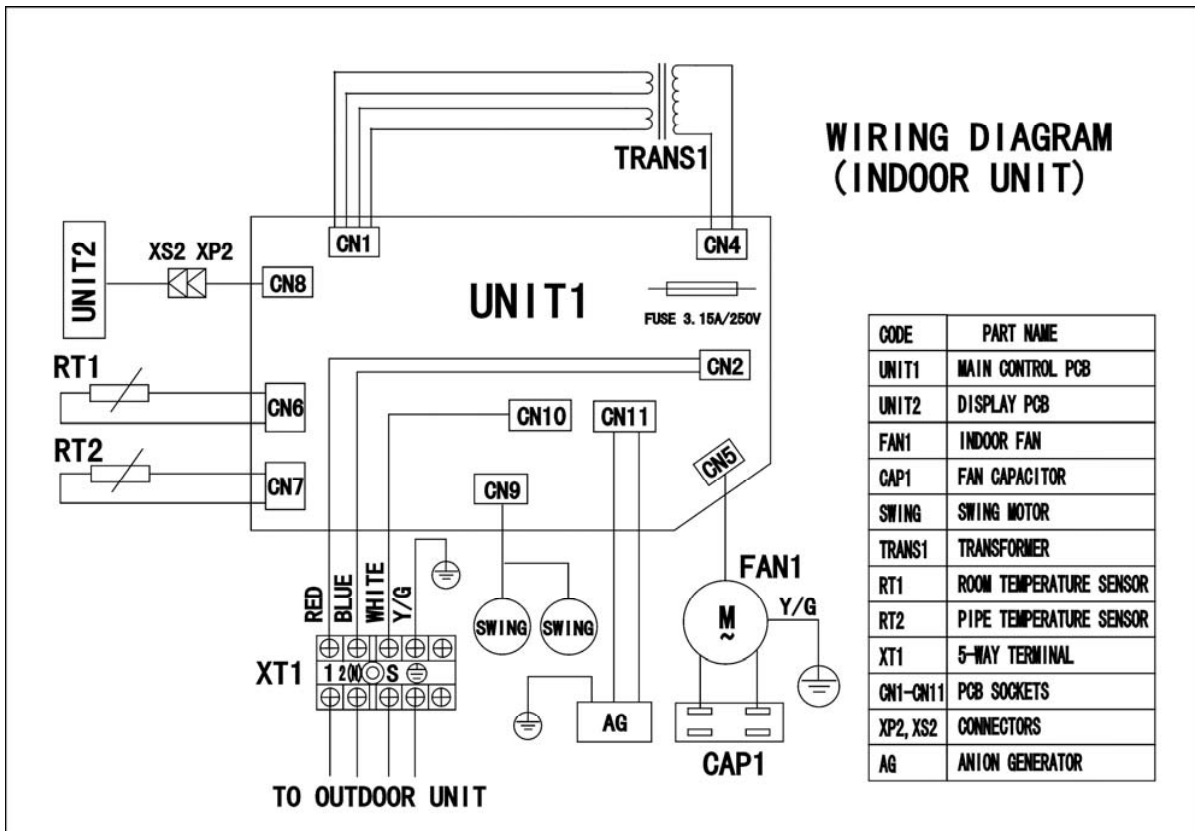


## 7.2. Wiring diagram

### 7.2.1 MSC-21CRN1, MSC-24CRN1, MSC-28CRN1



## 7.2.2 MSC-21HRN1, MSC-24HRN1, MSC-28HRN1



## 7. Installation details

### 8.1 Wrench torque sheet for installation

Outside diameter		Torque
mm	inch	Kg.m
φ 9.52	3/8	4.2
φ 12.7	1/2	5.5
φ 15.88	5/8	6.6
φ 19.05	3/4	6.6

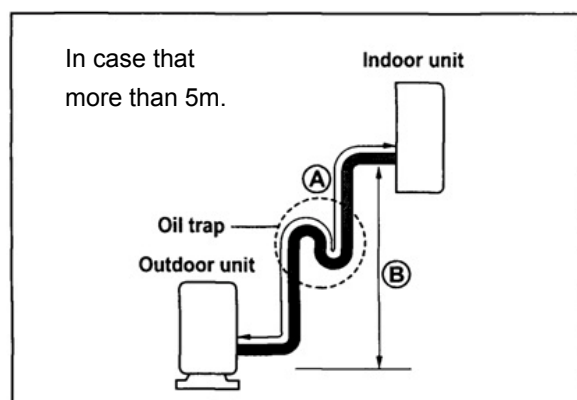
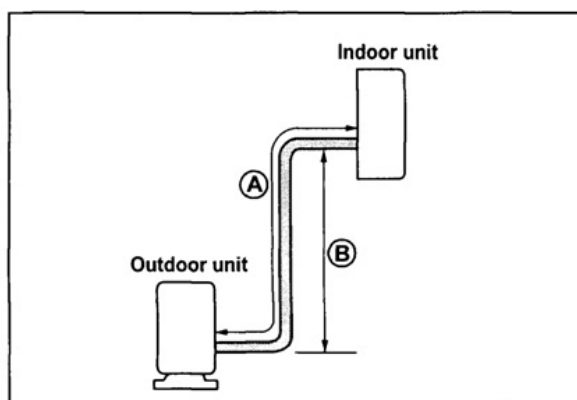
### 8.2 Connecting the cables

The power cord of connect should be selected according to the following specifications sheet.

	Grade		
Unit	21K	24K	28K
mm <sup>2</sup>	2.5	2.5	2.5

### 8.3 Pipe length and the elevation

Capacity Btu/h	Pipe size		Standard length(m)	Max. ElevationB (m)	Max. Pipe lengthA (m)	Additional refrigerant(g/m)
	GAS	LIQUID				
21k~24K	5/8" ( φ 15.88)	3/8" ( φ 9.52)	5	10	20	65
28K	5/8" ( φ 15.88)	3/8" ( φ 9.52)	5	10	20	65



Caution:

Capacity is base on standard length and maximum allowance length is base of reliability.

Oil trap should be install per 5-7 meters.



## 8.4 Air purging of the piping and indoor unit

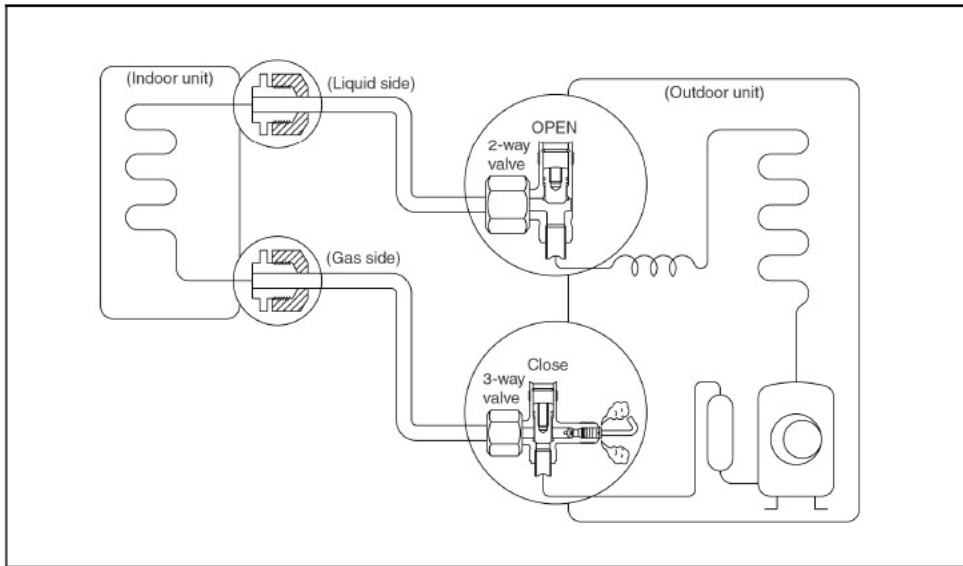
Required tools:

Hexagonal wrench; adjustable wrench; torque wrenches, wrench to hold the joints and gas leak detector.

Note:

The air in the indoor unit and in the piping must be purged. If air remains in the refrigeration piping, it will affect the compressor, reduce the cooling capacity, and could lead to a malfunction of unit.

Be sure, using a torque wrench to tighten the service port cap (after using the service port), so that it prevents the gas leakage from the refrigeration cycle.



### Procedure

1. **Recheck the piping connections.**
2. **Open the valve stem of the 2-way valve counterclockwise approximately 90°, wait 10 seconds, and then set it to closed position.**
  - Be sure to use a hexagonal wrench to operate the valve stem
3. **Check for gas leakage.**
  - Check the flare connection for gas leakage
4. **Purge the air from the system.**
  - Set the 2-way valve to the open position and remove the cap from the 3-way valve's service port.
  - Using the hexagonal wrench to press the valve core pin, discharge for three seconds and then wait for one minute.
5. **Use torque wrench to tighten the service port cap to a torque of 1.8 kg.m. (18N.m)**

### 6. Set the 3-way valve to the opened position.

### 7. Mounted the valve stem nuts to the 2-way and 3-way valves.

### 8. Check for gas leakage.

- At this time, especially check for gas leakage from the 2-way and 3-way stem nuts, and from the service port.

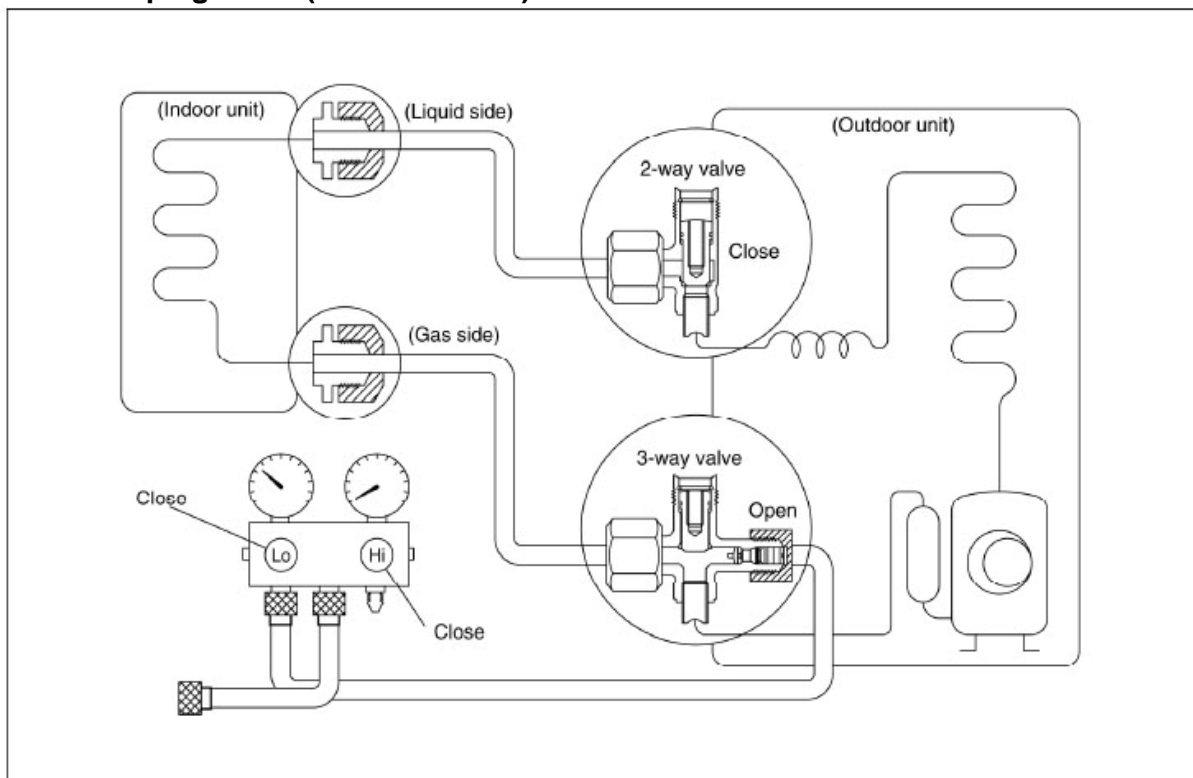
### Caution:

If gas leakage is discovered in step (3) above, take the following measures.

If the leaks stop when the piping connections are tightened further, continue working from step (4).

If the gas leaks do not stop when the connections are retightened, repair the location of the leak, discharge all of the gas through the service port, and then recharge with the specified amount of gas from a gas cylinder.

## 8.5 Pumping down (Re-installation)



### Procedure

**1. Confirm that both the 2-way and 3-way valves are set to the opened position.**

- Remove the valve stem caps and confirm that the valve stems are in the opened position.
- Be sure to use a hexagonal wrench to operate the valve stems.

**2. Operate the unit for 10 to 15 minutes.**

**3. Stop operation and wait for 3 minutes, then connect the charge set to the service port of the 3-way valve.**

- Connect the charge hose with the push pin to the gas service port.

**4. Air purging of the charge hose.**

- Open the low-pressure valve on the charge set slightly to purge air from the charge hose.

**5. Set the 2-way valve to the close position.**

**6. Operate the air conditioner at the cooling cycle and stop it when the gauge indicates 0.1MPa.**

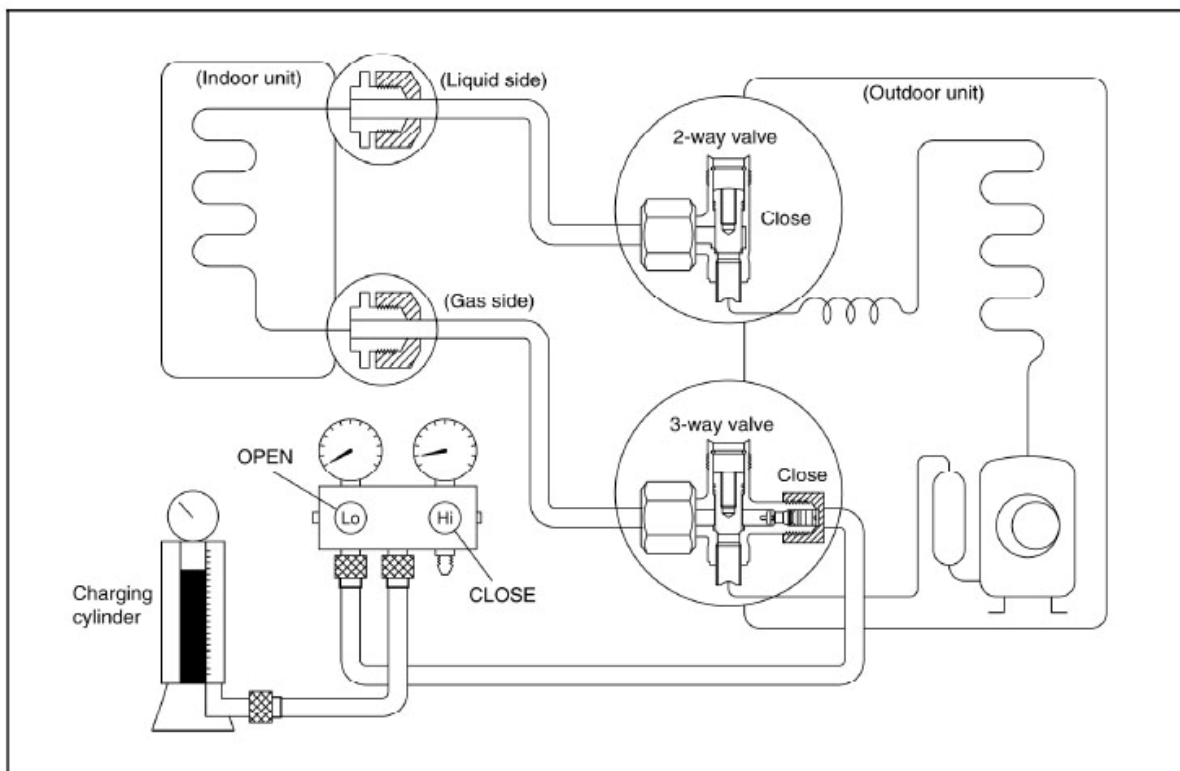
**7. Immediately set the 3-way valve to the closed position.**

- Do this quickly so that the gauge ends up indicating 0.3 to 0.5Mpa.

**8. Disconnect the charge set, and amount the 2-way and 3-way valve's stem nuts and service port caps.**

- Use a torque wrench to tighten the service port cap to a torque of 1.8 kg.m.
- Be sure to check for gas leakage.

## 8.6 Re-air purging (Re-installation)



Procedure:

**1. Confirm that both the 2-way and 3-way valves are set to the closed position.**

**2. Connect the charge set and a charging cylinder to the service port of the 3-way valve.**

- Leave the valve on the charging cylinder closed.

**3. Air purging.**

- Open the valves on the charging cylinder and the charge set. Purge the air by loosening the flare nut on the 2-way valve approximately 45° for 3 seconds then closing it for 1 minutes; repeat 3 times.
- After purging the air, use a torque wrench to tighten the flare nut to on the 2-way valve.

**4. Check the gas leakage.**

- Check the flare connections for gas leakage.

**5. Discharge the refrigerant.**

- Close the valve on the charging cylinder and discharge the refrigerant until the gauge indicate 0.3 to 0.5 Mpa.

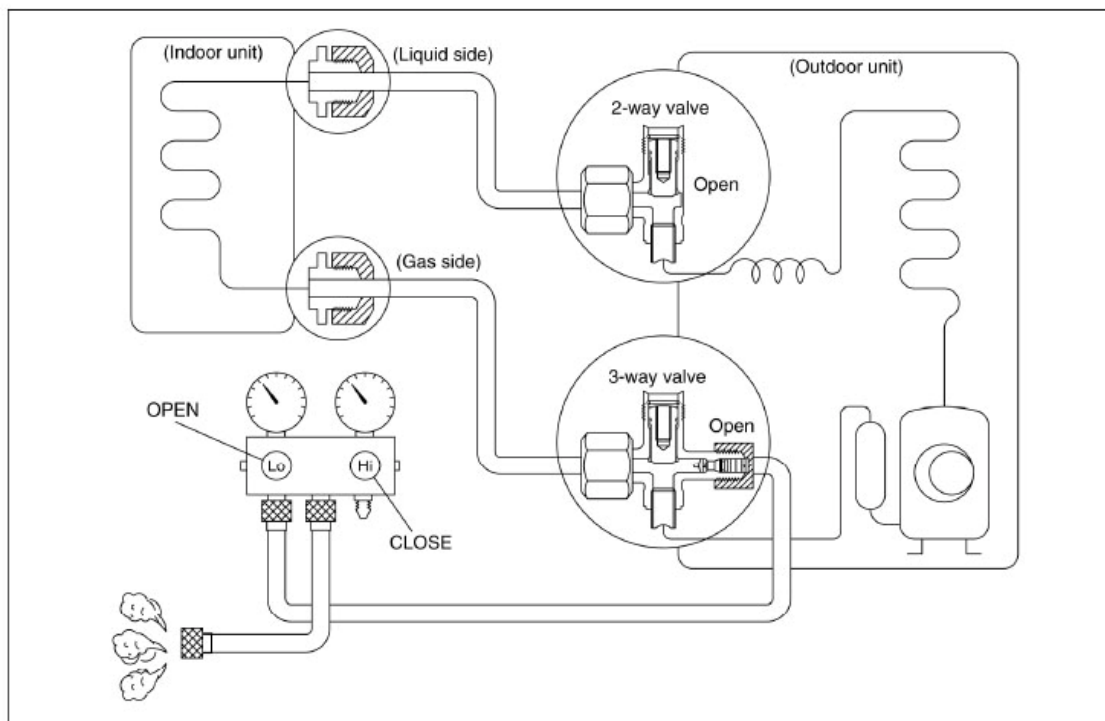
**6. Disconnect the charge set and the charging cylinder, and set the 2-way and 3-way valves to the open position.**

- Be sure to use a hexagonal wrench to operate the valve stems.

**7. Mount the valve stems nuts and the service port cap.**

- Be sure to use a torque wrench to tighten the service port cap to a torque 18N.m.
- Be sure to check the gas leakage.

## 8.7 Balance refrigerant of the 2-way, 3-way valves



Procedure:

**1. Confirm that both the 2-way and 3-way valves are set to the open position.**

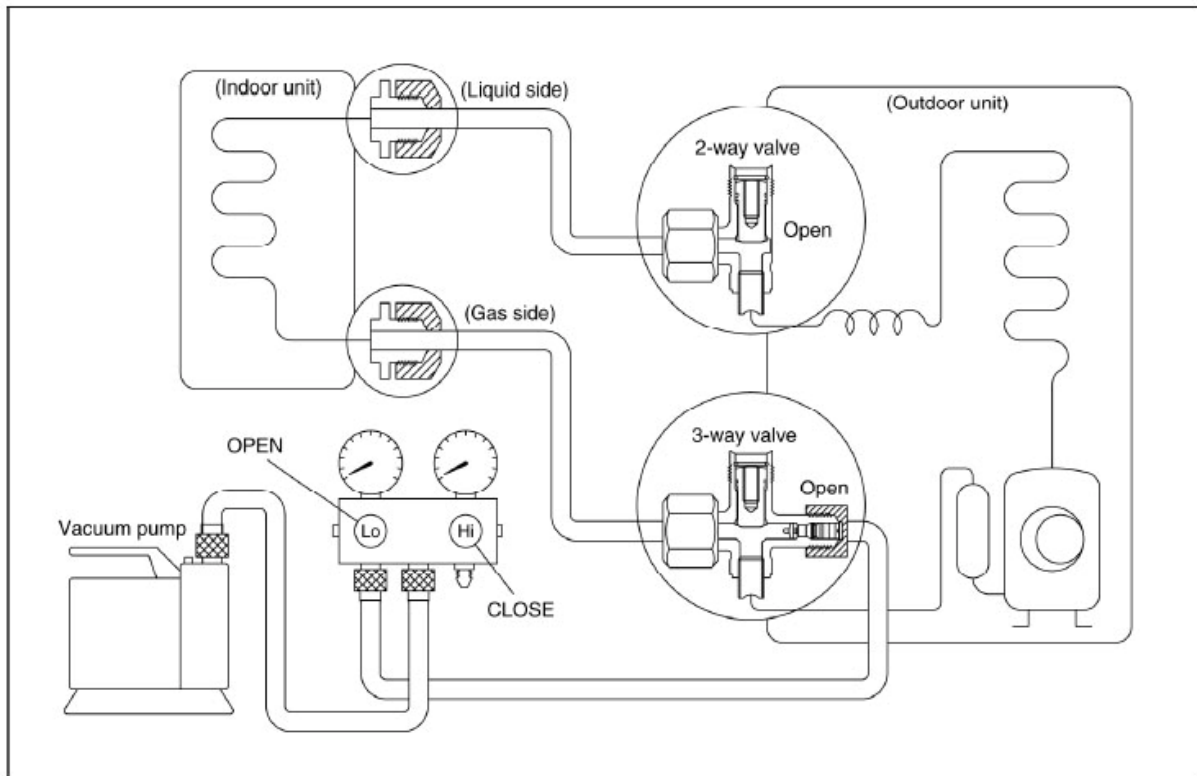
**2. Connect the charge set to the 3-way valve's service port.**

- Leave the valve on the charge set closed.
- Connect the charge hose with the push pin to the service port.

**3. Open the valves (Low side) on the charge set and discharge the refrigerant until the gauge indicates 0.05 to 0.1 Mpa.**

- If there is no air in the refrigeration cycle [the pressure when the air conditioner is not running is higher than 0.1Mpa, discharge the refrigerant until the gauge indicates 0.05 to 0.1 Mpa. If this is the case, it will not be necessary to apply a evacuation.
- Discharge the refrigeration gradually; if it is discharged too suddenly, the refrigeration oil will be discharged.

## 8.8 Evacuation



Procedure:

**1. Connect the vacuum pump to the charge set's centre hose.**

**2. Evacuation for approximately one hour.**

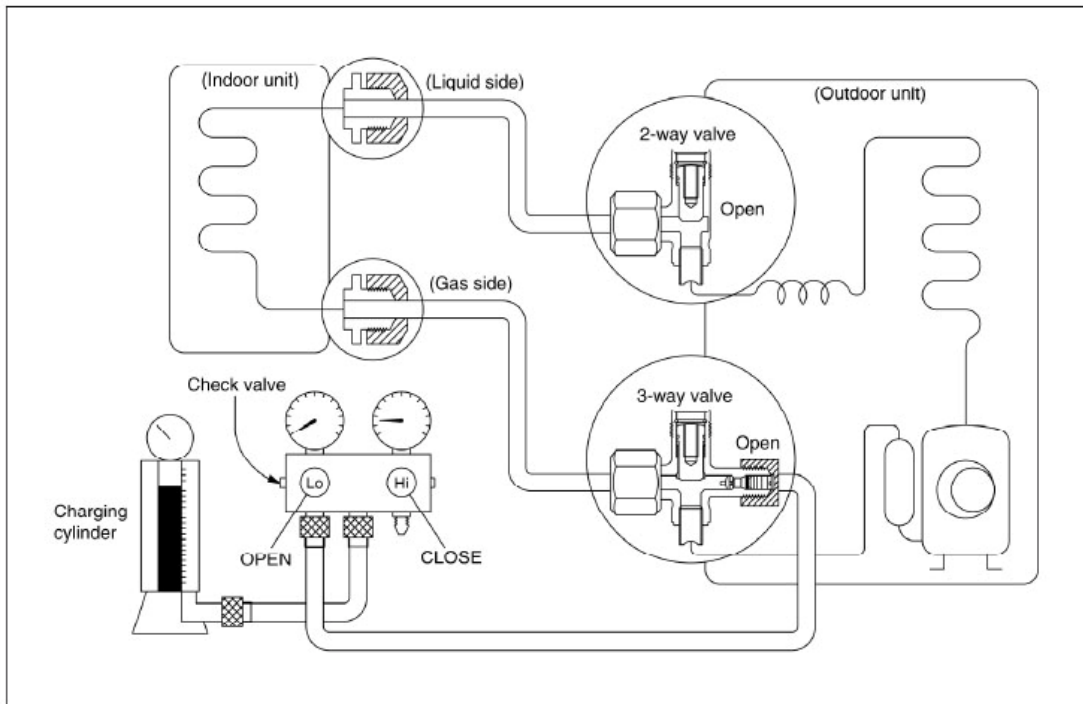
- Confirm that the gauge needle has moved toward -0.1 Mpa (-76 cmHg) [vacuum of 4 mmHg or less].

**3. Close the valve (Low side) on the charge set, turn off the vacuum pump, and confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).**

**4. Disconnect the charge hose from the vacuum pump.**

- Vacuum pump oil, if the vacuum pump oil becomes dirty or depleted, replenish as needed.

## 8.9 Gas charging



Procedure:

### 1. Connect the charge hose to the charging cylinder.

- Connect the charge hose which you disconnected from the vacuum pump to the valve at the bottom of the cylinder.

### 2. Purge the air from the charge hose.

- Open the valve at the bottom of the cylinder and press the check valve on the charge set to purge the air (be careful of the liquid refrigerant).

### 3. Open the valves (Low side) on the charge set and charge the system with liquid refrigerant.

- If the system cannot be charge with the specified amount of refrigerant, it can be charged with a little at a time (approximately 150g each time) while operating the air conditioner in the cooling cycle; however, one time is not sufficient, wait approximately 1 minute and then repeat the procedure.(pumping down-pin).

### 4. Immediately disconnect the charge hose from the 3-way valve's service port.

- Stopping partway will allow the refrigerant to be discharged.
- If the system has been charged with liquid refrigerant while operating the air conditioner, turn off the air conditioner before disconnecting the hose.

### 5. Mounted the valve stem caps and the service port

- Use torque wrench to tighten the service port cap to a torque of 18N.m.
- Be sure to check for gas leakage.

## 8. Pressure table

Note:

The pressure data is from 3 way valve, the pressure data are pressure above atmosphere.

D: Dry bulb temp.

W: Wet bulb temp.

### 9.1 MSC-21CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25°C	30°C	35°C	40°C	45°C	50°C
21°C D15°C W	Pressure(kg/cm <sup>2</sup> )	8.6	8.7	9.0	9.1	9.5	10.0
24°C D17°C W	Pressure(kg/cm <sup>2</sup> )	8.8	9.0	9.4	9.6	10.1	10.6
27°C D19°C W	Pressure(kg/cm <sup>2</sup> )	9.0	9.3	9.6	10.1	10.5	11.0
32°C D23°C W	Pressure(kg/cm <sup>2</sup> )	9.4	9.8	10.0	10.6	11.0	11.4

### 9.2 MSC-21HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25°C	30°C	35°C	40°C	45°C	50°C
21°C D15°C W	Pressure( kg/cm <sup>2</sup> )	8.6	8.7	9.0	9.1	9.5	10.0
24°C D17°C W	Pressure( kg/cm <sup>2</sup> )	8.8	9.0	9.4	9.6	10.1	10.6
27°C D19°C W	Pressure( kg/cm <sup>2</sup> )	9.0	9.3	9.6	10.1	10.5	11.0
32°C D23°C W	Pressure( kg/cm <sup>2</sup> )	9.4	9.8	10.0	10.6	11.0	11.4

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	Pressure	12°C D	7°C D	0°C D	-4°C D	-7°C D	-15°C D
		11°C W	6°C W	-1°C W	-6°C W	-9°C W	-x°C W
15°C	Pressure( kg/cm <sup>2</sup> )	28.2	27.1	21.5	20.7	20.3	/
18°C	Pressure( kg/cm <sup>2</sup> )	30.8	28.4	24.7	22.9	22.2	/
20°C	Pressure( kg/cm <sup>2</sup> )	31.4	30.1	25.4	24.8	23.3	/
22°C	Pressure( kg/cm <sup>2</sup> )	33.5	31.3	26.4	25.4	23.9	/

### 9.3 MSC-24CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25°C	30°C	35°C	40°C	45°C	50°C
21°C D15°C W	Pressure( kg/cm <sup>2</sup> )	8.7	8.8	9.0	9.1	9.5	10.1
24°C D17°C W	Pressure( kg/cm <sup>2</sup> )	8.8	9.0	9.4	9.6	10.1	10.6
27°C D19°C W	Pressure( kg/cm <sup>2</sup> )	9.1	9.4	9.7	10.1	10.5	11.0
32°C D23°C W	Pressure( kg/cm <sup>2</sup> )	9.5	9.9	10.1	10.6	11.0	11.5

### 9.4 MSC-24HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25°C	30°C	35°C	40°C	45°C	50°C
21°C D15°C W	Pressure( kg/cm <sup>2</sup> )	8.7	8.8	9.0	9.1	9.5	10.1
24°C D17°C W	Pressure( kg/cm <sup>2</sup> )	8.8	9.0	9.4	9.6	10.1	10.6
27°C D19°C W	Pressure( kg/cm <sup>2</sup> )	9.1	9.4	9.7	10.1	10.5	11.0
32°C D23°C W	Pressure( kg/cm <sup>2</sup> )	9.5	9.9	10.1	10.6	11.0	11.5

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	Pressure	12°C D	7°C D	0°C D	-4°C D	-7°C D	-15°C D
		11°C W	6°C W	-1°C W	-6°C W	-9°C W	-x°C W
15°C	Pressure( kg/cm <sup>2</sup> )	28.4	27.2	21.6	20.8	20.4	/
18°C	Pressure( kg/cm <sup>2</sup> )	30.8	28.6	24.9	23.1	22.4	/
20°C	Pressure( kg/cm <sup>2</sup> )	31.6	30.4	25.6	24.9	23.5	/
22°C	Pressure( kg/cm <sup>2</sup> )	33.7	31.5	26.8	25.6	24.0	/

### 9.5 MSC-28CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25°C	30°C	35°C	40°C	45°C	50°C
21°C D15°C W	Pressure( kg/cm <sup>2</sup> )	8.9	9.0	9.2	9.3	9.7	10.3
24°C D17°C W	Pressure( kg/cm <sup>2</sup> )	9.0	9.2	9.6	9.8	10.3	10.8
27°C D19°C W	Pressure( kg/cm <sup>2</sup> )	9.3	9.6	9.8	10.3	10.7	11.2
32°C D23°C W	Pressure( kg/cm <sup>2</sup> )	9.7	10.1	10.3	10.8	11.1	11.6

### 9.6 MSC-28HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25°C	30°C	35°C	40°C	45°C	50°C
21°C D15°C W	Pressure( kg/cm <sup>2</sup> )	8.9	9.0	9.2	9.3	9.7	10.3
24°C D17°C W	Pressure( kg/cm <sup>2</sup> )	9.0	9.2	9.6	9.8	10.3	10.8
27°C D19°C W	Pressure( kg/cm <sup>2</sup> )	9.3	9.6	9.8	10.3	10.7	11.2
32°C D23°C W	Pressure( kg/cm <sup>2</sup> )	9.7	10.1	10.3	10.8	11.1	11.6

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	Pressure	12°C D	7°C D	0°C D	-4°C D	-7°C D	-15°C D
		11°C W	6°C W	-1°C W	-6°C W	-9°C W	-x°C W
15°C	Pressure( kg/cm <sup>2</sup> )	28.6	27.4	21.8	20.9	20.6	/
18°C	Pressure( kg/cm <sup>2</sup> )	30.9	28.8	25.0	23.3	22.6	/
20°C	Pressure( kg/cm <sup>2</sup> )	31.8	30.6	25.8	25.0	23.7	/
22°C	Pressure( kg/cm <sup>2</sup> )	33.9	31.7	27.0	25.8	24.2	/



## 9. Capacity table

### 10.1 MSC-21CRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25°C	30°C	35°C	40°C	45°C	50°C
21°C D 15°C W	Total capacity kW	5.73	5.58	5.43	4.94	4.81	4.59
	Sensitive capacity kW	4.49	4.30	4.22	4.00	3.87	3.65
	Input kW.	1.72	1.94	2.10	2.30	2.40	2.56
24°C D 17°C W	Total capacity kW	6.41	6.13	5.80	5.51	5.38	5.13
	Sensitive capacity kW	5.11	4.84	4.77	4.48	4.29	4.08
	Input kW.	1.72	1.94	2.10	2.30	2.40	2.56
27°C D 19°C W	Total capacity kW	6.76	6.48	6.13	5.90	5.63	5.47
	Sensitive capacity kW	5.32	5.10	4.96	4.63	4.49	4.23
	Input kW.	1.77	1.97	2.17	2.35	2.46	2.67
32°C D 23°C W	Total capacity kW	7.38	7.18	6.73	6.30	6.13	5.80
	Sensitive capacity kW	5.46	5.14	5.06	4.75	4.53	4.38
	Input kW.	1.82	2.04	2.28	2.44	2.53	2.73

### 10.2 MSC-21HRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25°C	30°C	35°C	40°C	45°C	50°C
21°C D 15°C W	Total capacity kW	5.73	5.58	5.43	4.94	4.81	4.59
	Sensitive capacity kW	4.49	4.30	4.22	4.00	3.87	3.65
	Input kW.	1.72	1.94	2.10	2.30	2.40	2.56
24°C D 17°C W	Total capacity kW	6.41	6.13	5.80	5.51	5.38	5.13
	Sensitive capacity kW	5.11	4.84	4.77	4.48	4.29	4.08
	Input kW.	1.72	1.94	2.10	2.30	2.40	2.56
27°C D 19°C W	Total capacity kW	6.76	6.48	6.13	5.90	5.63	5.47
	Sensitive capacity kW	5.32	5.10	4.96	4.63	4.49	4.23
	Input kW.	1.77	1.97	2.17	2.35	2.46	2.67
32°C D 23°C W	Total capacity kW	7.38	7.18	6.73	6.30	6.13	5.80
	Sensitive capacity kW	5.46	5.14	5.06	4.75	4.53	4.38
	Input kW.	1.82	2.04	2.28	2.44	2.53	2.73

WINTER		OUTDOOR CONDITIONS					
Indoor Conditions		12°C D 11°C W	7°C D 6°C W	4°C D 3°C W	0°C D -1°C W	-4°C D -6°C W	-7°C D -8°C W
15°C	Capacity kW	7.94	7.61	7.38	6.85	5.95	5.90
	Input kW.	2.16	2.10	2.01	1.96	1.70	1.54
18°C	Capacity kW	7.82	7.58	7.06	6.71	5.82	5.26
	Input kW.	2.25	2.19	2.17	2.05	1.81	1.74
20°C	Capacity kW	7.61	7.38	6.92	6.57	5.69	5.13
	Input kW.	2.32	2.28	2.14	2.05	1.85	1.79
22°C	Capacity kW	7.33	7.12	6.71	6.37	5.44	5.13
	Input kW.	2.39	2.30	2.19	2.10	1.90	1.59

**10.3 MSC-24CRN1**

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25°C	30°C	35°C	40°C	45°C	50°C
21°C D 15°C W	Total capacity kW	6.55	6.37	6.21	5.64	5.49	5.24
	Sensitive capacity kW	5.13	4.91	4.83	4.57	4.42	4.17
	Input kW.	1.97	2.21	2.40	2.63	2.74	2.93
24°C D 17°C W	Total capacity kW	7.33	7.01	6.63	6.30	6.15	5.86
	Sensitive capacity kW	5.84	5.53	5.45	5.11	4.91	4.67
	Input kW.	1.97	2.21	2.40	2.63	2.74	2.93
27°C D 19°C W	Total capacity kW	7.73	7.40	7.03	6.74	6.43	6.25
	Sensitive capacity kW	6.08	5.83	5.66	5.29	5.13	4.84
	Input kW.	2.02	2.25	2.46	2.69	2.81	3.06
32°C D 23°C W	Total capacity kW	8.43	8.20	7.69	7.20	7.00	6.63
	Sensitive capacity kW	6.24	5.88	5.78	5.43	5.18	5.01
	Input kW.	2.08	2.33	2.61	2.79	2.89	3.12

**10.4 MSC-24HRN1**

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25°C	30°C	35°C	40°C	45°C	50°C
21°C D 15°C W	Total capacity kW	6.55	6.37	6.21	5.64	5.49	5.24
	Sensitive capacity kW	5.13	4.91	4.83	4.57	4.42	4.17
	Input kW.	1.97	2.21	2.40	2.63	2.74	2.93
24°C D 17°C W	Total capacity kW	7.33	7.01	6.63	6.30	6.15	5.86
	Sensitive capacity kW	5.84	5.53	5.45	5.11	4.91	4.67
	Input kW.	1.97	2.21	2.40	2.63	2.74	2.93
27°C D 19°C W	Total capacity kW	7.73	7.40	7.03	6.74	6.43	6.25
	Sensitive capacity kW	6.08	5.83	5.66	5.29	5.13	4.84
	Input kW.	2.02	2.25	2.46	2.69	2.81	3.06
32°C D 23°C W	Total capacity kW	8.43	8.20	7.69	7.20	7.00	6.63
	Sensitive capacity kW	6.24	5.88	5.78	5.43	5.18	5.01
	Input kW.	2.08	2.33	2.61	2.79	2.89	3.12

WINTER		OUTDOOR CONDITIONS					
Indoor Conditions		12°C D 11°C W	7°C D 6°C W	4°C D 3°C W	0°C D -1°C W	-4°C D -6°C W	-7°C D -8°C W
15°C	Capacity kW	8.57	8.22	7.97	7.40	6.43	6.37
	Input kW.	2.34	2.27	2.17	2.12	1.83	1.66
18°C	Capacity kW	8.44	8.19	7.62	7.25	6.28	5.68
	Input kW.	2.43	2.36	2.34	2.22	1.95	1.88
20°C	Capacity kW	8.21	7.90	7.47	7.10	6.15	5.54
	Input kW.	2.51	2.43	2.31	2.22	2.00	1.93
22°C	Capacity kW	7.92	7.69	7.25	6.88	5.87	5.54
	Input kW.	2.58	2.48	2.36	2.27	2.05	1.71

**10.5 MSC-28CRN1**

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25°C	30°C	35°C	40°C	45°C	50°C
21°C D 15°C W	Total capacity kW	7.64	7.44	7.25	6.58	6.41	6.12
	Sensitive capacity kW	5.99	5.73	5.63	5.34	5.16	4.87
	Input kW.	2.29	2.58	2.80	3.07	3.19	3.42
24°C D 17°C W	Total capacity kW	8.55	8.17	7.74	7.34	7.18	6.84
	Sensitive capacity kW	6.81	6.45	6.36	5.97	5.72	5.45
	Input kW.	2.29	2.58	2.80	3.07	3.19	3.42
27°C D 19°C W	Total capacity kW	9.01	8.63	8.20	7.87	7.50	7.29
	Sensitive capacity kW	7.09	6.80	6.61	6.17	5.99	5.64
	Input kW.	2.36	2.62	2.90	3.13	3.28	3.56
32°C D 23°C W	Total capacity kW	9.84	9.57	8.97	8.40	8.17	7.73
	Sensitive capacity kW	7.28	6.86	6.75	6.34	6.04	5.84
	Input kW.	2.43	2.72	3.04	3.25	3.37	3.64

**10.6 MSC-28HRN1**

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25°C	30°C	35°C	40°C	45°C	50°C
21°C D 15°C W	Total capacity kW	7.64	7.44	7.25	6.58	6.41	6.12
	Sensitive capacity kW	5.99	5.73	5.63	5.34	5.16	4.87
	Input kW.	2.29	2.58	2.80	3.07	3.19	3.42
24°C D 17°C W	Total capacity kW	8.55	8.17	7.74	7.34	7.18	6.84
	Sensitive capacity kW	6.81	6.45	6.36	5.97	5.72	5.45
	Input kW.	2.29	2.58	2.80	3.07	3.19	3.42
27°C D 19°C W	Total capacity kW	9.01	8.63	8.20	7.87	7.50	7.29
	Sensitive capacity kW	7.09	6.80	6.61	6.17	5.99	5.64
	Input kW.	2.36	2.62	2.90	3.13	3.28	3.56
32°C D 23°C W	Total capacity kW	9.84	9.57	8.97	8.40	8.17	7.73
	Sensitive capacity kW	7.28	6.86	6.75	6.34	6.04	5.84
	Input kW.	2.43	2.72	3.04	3.25	3.37	3.64

WINTER		OUTDOOR CONDITIONS					
Indoor Conditions		12°C D 11°C W	7°C D 6°C W	4°C D 3°C W	0°C D -1°C W	-4°C D -6°C W	-7°C D -8°C W
15°C	Capacity kW	9.84	9.44	9.15	8.50	7.38	7.32
	Input kW.	2.68	2.60	2.49	2.43	2.11	1.91
18°C	Capacity kW	9.69	9.40	8.75	8.33	7.21	6.53
	Input kW.	2.79	2.71	2.69	2.54	2.24	2.16
20°C	Capacity kW	9.43	9.07	8.58	8.15	7.06	6.36
	Input kW.	2.88	2.79	2.66	2.54	2.30	2.21
22°C	Capacity kW	9.09	8.83	8.33	7.90	6.74	6.37
	Input kW.	2.96	2.85	2.71	2.60	2.35	1.97

## 10. Electronic function

### 11.1 Proper symbols and their meaning

T1: Indoor ambient temperature

T2: Indoor evaporator temperature

T3: Outdoor condenser temperature

TS: Setting temperature through the remote controller

I<sub>3sec</sub>: Self-protection amp of compressor, continue three seconds until turns off the compressor.

I<sub>5MIN</sub>: Self-protection amp of compressor, continue five minutes until turns off the compressor.

I<sub>FAN</sub>: Self-protection amp of outdoor fan/indoor fans when they change from higher wind to lower wind.

I<sub>RESTORE</sub>: Amp self-protection return value

TH<sub>DEFROST</sub>: High wind, defrosting temperature difference

TM<sub>DEFROST</sub>: Middle wind, defrosting temperature difference

TL<sub>DEFROST</sub>: Low wind, defrosting temperature difference

TE1: Anti-cold wind, from Fan Off to Breeze temperature

TE2: Anti-cold wind, from Breeze to Setting Fan Speed temperature

TE3: Anti-cold wind, from Setting Fan Speed to Breeze temperature

TE4: Anti-cold wind, from Breeze to Fan Off temperature

TE5: Evaporator low temperature protection entering temperature

TE6: Evaporator low temperature protection restoring temperature

TE7: Evaporator high temperature protection, compressor off temperature

TE8: Evaporator high temperature protection, fan off temperature

TE9: Evaporator high temperature protection, restoring temperature

TE10: Condenser high temperature protection, compressor off temperature

TE11: Condenser high temperature protection, compressor restoring on temperature

### 11.2 Function

Remote receiving

Testing and forced running

Position set for indoor unit wind vane

LED displaying and alarm

On or off Timer

Protection for the compressor

Current protection

High temperature protection of indoor heat exchanger at heating mode

Auto defrosting and heating recovery at heating mode

Anti cold air at heating mode

Anti frozen at cooling mode

### 11.3 Protection

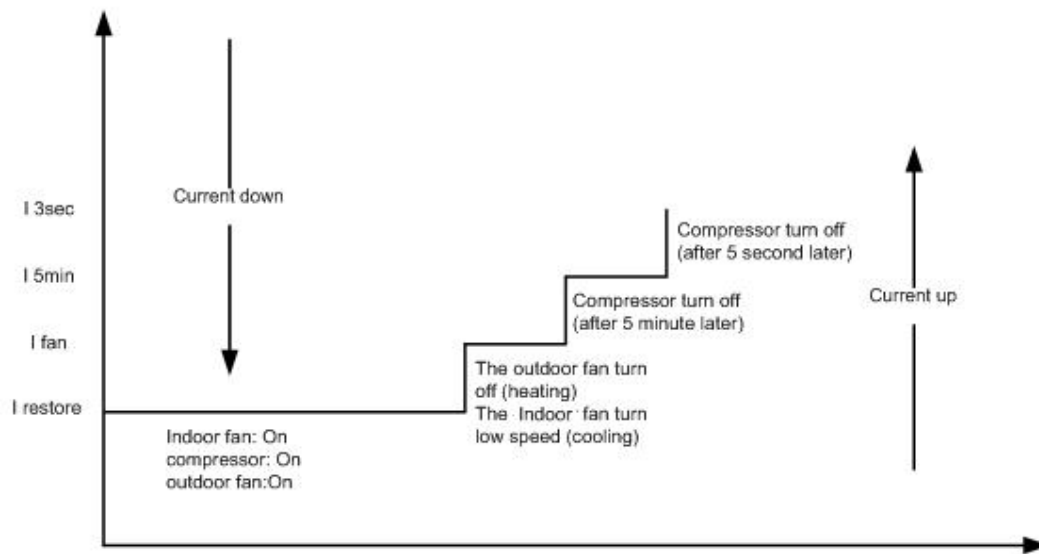
11.3.1 3 minutes delay at restart for compressor.

11.3.2 Sensor protection at open circuit and breaking disconnection

11.3.3 The malfunction of correspondence in CMOS chip with EEPROM indication.

When the CMOS chip and EEPROM can't communicate during the time of using EEPROM to select parameter, the LED shows information of the malfunction (when use jump to select parameter, it doesn't have this function). After the showing, the unit can't go right to work except turning off.

### 11.3.4 The current protection of the compressor



If compressor turns off for continuously 4 times due to current protection in 10 minutes from Compressor On, the unit stops and LED displays failure information and can't returns to normal operation automatically.

### 11.3.5 The protection of outdoor unit

The protection of outdoor unit mostly contains: the protection of exhausting temperature, the protection of exhausting press etc. when any of the protection occur, the outdoor unit exports a signal to indoor unit.

The action of indoor unit: when the indoor unit infers a high-tension signal from outdoor exceeding 3 seconds, the whole unit turns off, come to checking condition, the indoor unit shows the information of malfunction. (4-way valve turns off 2 minutes after the compressor.

When the indoor unit infers a low-tension signal from outdoor exceeding 3 seconds, the protection remove, and the unit go right to work.

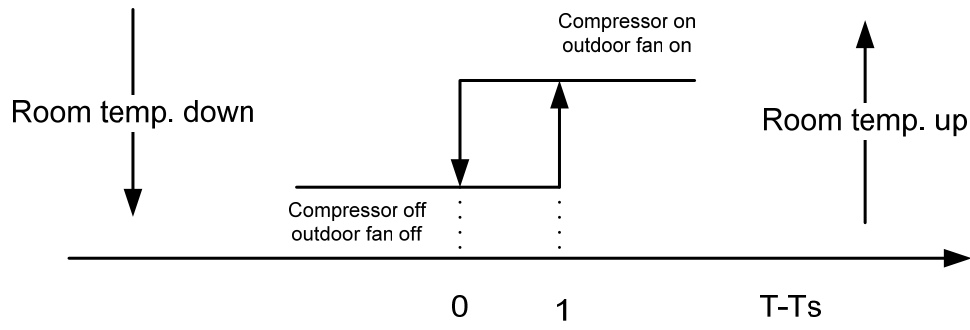
## 11.4 Fan-only mode

Fan speed is high/mid/low/ Auto

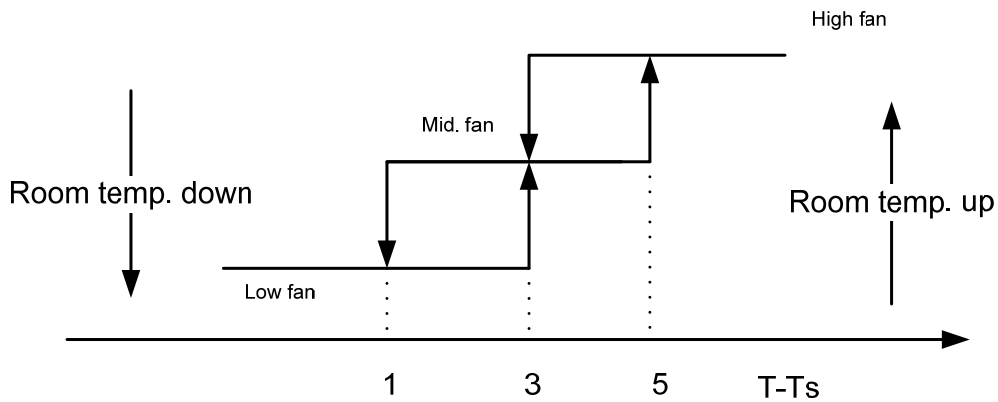
## 11.5 Cooling mode

The 4-way valve is closed at cooling mode.

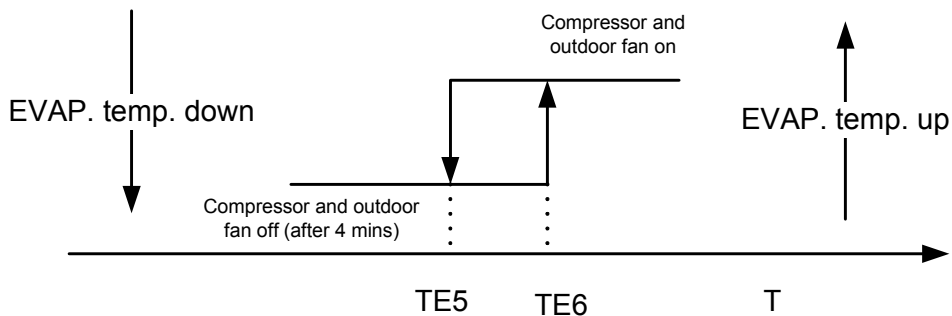
The action of the compressor and the outdoor fan: ( $T$ =indoor temperature)



Auto fan at cooling mode:



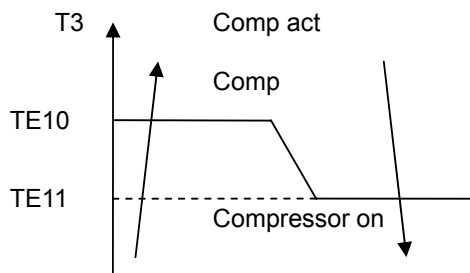
Anti-freezing control to indoor evaporator at cooling mode ( T: evaporator temp. )



Condenser high temperature protection (cooling only type don't have the protection):

This protection only runs in cooling mode, cooling in auto mode and turbo mode

The condition of this protection:



Under the protection the outdoor fan keeps run.

## 11.6 Dehumidifying mode

The 4-way valve is off in dehumidifying mode

At dehumidifying mode, the unit runs in cooling, the speed of the indoor fan is low, and the speed can't change.

At dehumidifying mode, the protection is the same as that of cooling mode.

At dehumidifying mode, the action of step motor is the same as that of cooling mode.

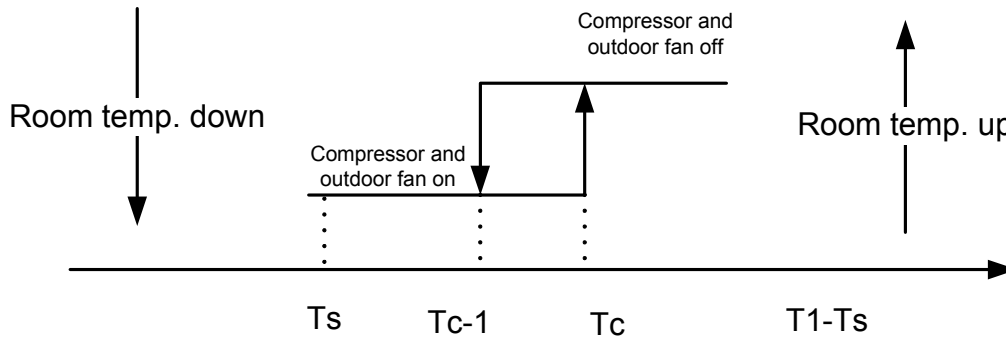
## 11.7 Heating mode

11.7.1 Generally, the 4-way valve is open in heating mode, but it is closed in defrosting mode. 4-way

valve must delay 2 minutes compared with compressor if the compressor changed into non-heating mode or turned off. 4-way valve doesn't delay in dehumidifying mode

11.7.2 Generally, the outdoor fan is turned off with the on-off action of compressor in heating mode, except for the defrosting mode or the end of defrost

11.7.3 Action of compressor and outdoor fan motor at heating mode: compressor must run for 4 minutes after starting and then judge temperature. Meanwhile other protections are still valid.



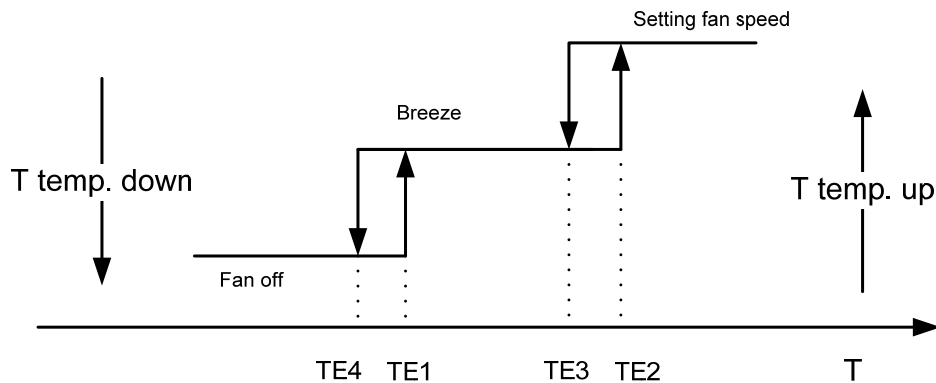
$T_c$  is the temperature of heating mode. The temperature will increase  $4^\circ\text{C}$ ,  $3^\circ\text{C}$ ,  $2^\circ\text{C}$ ,  $1^\circ\text{C}$ , the unit choose one with the jump JT1, JT2.

JT1 \ JT2	OFF	ON
OFF	$1^\circ\text{C}$	$3^\circ\text{C}$
ON	$2^\circ\text{C}$	$4^\circ\text{C}$

#### 11.7.4 Indoor Fan actions at heating mode

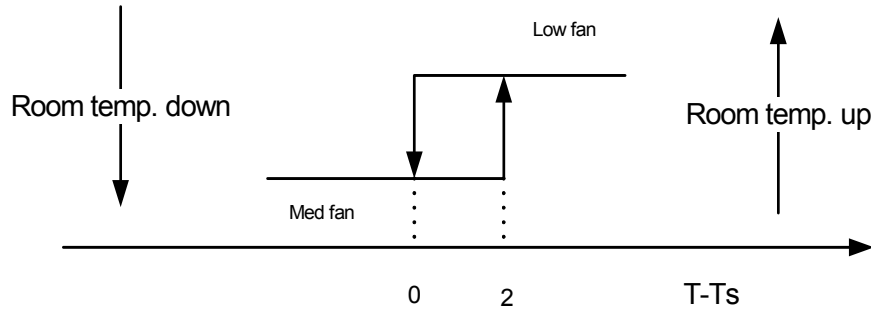
Indoor Fan can be set at HIGH/MID/LOW/AUTO by using a remote controller, but Anti-cold wind function prevails.

Anti-cold wind control function at heating mode ( $T$ =indoor exchanger temp.)

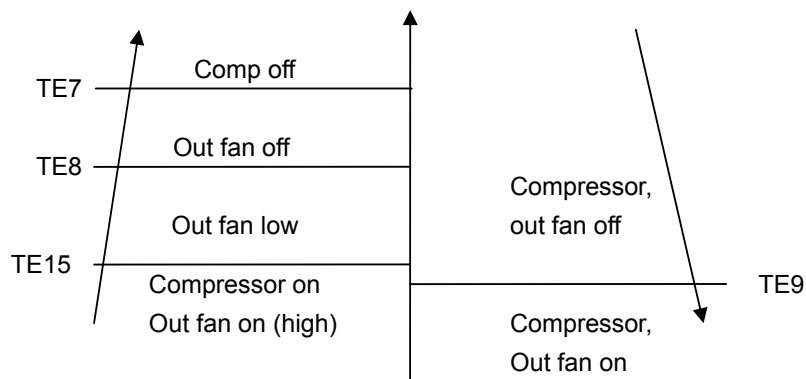




### 11.7.5 Auto wind at heating mode (T=indoor temp.)



### 11.7.6 Indoor evaporator high-temperature protection at heating mode



### 11.7.7 The louver opens to Standard Angle ANGLHEAT when power is on for the first time

## 11.8 Defrosting mode(available for heating mode)

11.8.1 Defrosting condition: Defrosting starts when either of the following ①&②:

- ① The compressor keeps running under the condition of  $T_3 < 0^\circ\text{C}$  (TC1) for 40 minutes or more, beside  $T_3 < -3^\circ\text{C}$  (TC3) exceed 3 minutes.
- ② Calculate from the end of latest defrost, evaporator high temp. Protection only closes outdoor fan with the compressor still running. Add up to 90 minutes.

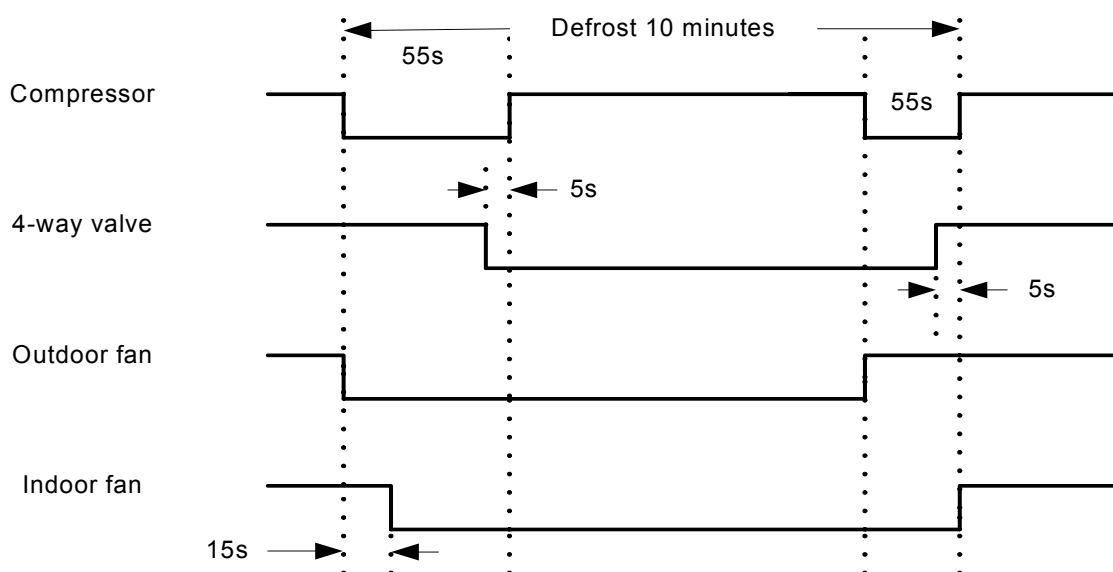
11.8.2 Attention: defrosting end or  $T_3 \geq 20^\circ\text{C}$  (TC2) the clock restart.

### 11.8.3 Ending condition of defrosting

If one of following conditions is satisfied, end the defrost and turn into heating mode:

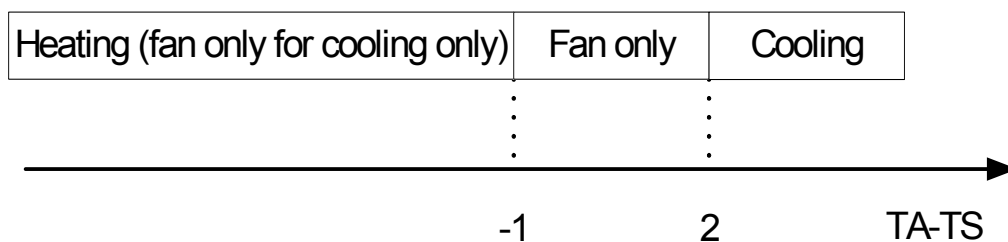
- A. The defrost time has reached to 10 minutes.
- B.  $T_3 \geq TC2$  ( $20^\circ\text{C}$ )

11.8.4 Defrosting Actions (In defrosting action the protection of T2's open circuit and short circuit can't run.)



## 11.9 Auto mode

**11.9.1** The air conditioner automatically selects one of the following operation modes: cooling, heating or fan only according to the temperature difference between room temperature (TA) and set temperature (TS).



**11.9.2** The indoor fan blows automatically in corresponding selected mode

**11.9.3** The motion of indoor fan's blade should accord with the selected operation mode

**11.9.4** One mode should be carried out for at least 15 minutes once selected. If the compressor cannot start for 15 minutes, reselect the operation mode according to the room temp. and set temp., or reselect when the set temp. varies

## 11.10 Force cooling function

**11.10.1** Select forced cooling function with the forced cooling button or the switch

**11.10.2** The compressor is unconditionally turned on, after 30 minutes cooling operation the unit turn to force auto mode.

**11.10.3** All protections of remote control cooling are available at forced cooling operation

**11.10.4** Forced Auto function

Select forced auto function with the forced auto button or the switch.

In forced auto status the A/C operates at auto mode with a set temp. of 24°C.

## 11.11 Sleep mode

**11.11.1** The sleep function is available at cooling, heating or auto mode

**11.11.2** Cooling:

The set temperature rise 1°C per hour. Two hours later, the set temperature will maintain as a constant and 30

the fan speed is kept at low speed.

The total time is 7 hours, after 7 hours the unit stops

#### 11.11.3 Heating:

The set temperature decrease 1°C per hour. Two hours later, the set temperature will maintain as a constant and the air circulation is kept at low speed (Anti-cold function takes precedence over all).

The total time is 7 hours, after 7 hours the unit stops

#### 11.11.4 Auto:

After an hour running under economic mode, the set temp will rise 1°C, if it is under cooling mode; the set temp will decrease 1°C, if it is under heating mode; the set temp will be changeless, if it is under fan-only mode; the condition will be the same after the air conditioner running under economic mode after 2 hours, and during the next time the set temp do not change. The total time is 7 hours, after 7 hours the unit stops.

### 11.12 Auto restart function

In case of a sudden power failure, this function automatically sets the unit to previous settings before the power failure when power returns

### 11.13 Turbo mode

In cooling mode, when pressing the turbo button on the remote controller, the unit will enter turbo mode with ultra-high speed and reach the set temperature more quickly. After running 20 minutes in turbo mode, the indoor fan will automatically recover the preset speed.

### 11.14 PLASMA ( optional):

Starts with indoor fan.

Note: Plasma and Anion can be use together

### 11.15 Anion( optional)

Starts with indoor fan.

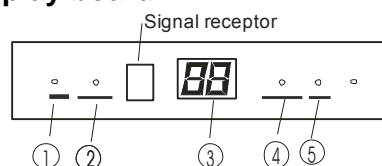
Note: Plasma and Anion can be use together

## 11. Model and Parameters

Model	MSH-21CRN1	MSH-21HRN1	MSH-24CRN1	MSH-24HRN1	MSH-28CRN1	MSH-28HRN1
I3SEC	14A	14A	14A	14A	18A	18A
I5MIN	20A	20A	20A	20A	24A	24A
IFAN	22A	22A	22A	22A	26A	26A
IRESTORE						
IDEFROST						
TE1		25°C		25°C		25°C
TE2		32°C		32°C		32°C
TE3		30°C		30°C		30°C
TE4		20°C		20°C		20°C
TE5	2°C	2°C	2°C	2°C	2°C	2°C
TE6	12°C	12°C	12°C	12°C	12°C	12°C
TE7		63°C		63°C		63°C
TE8		57°C		57°C		57°C
TE9		50°C		50°C		50°C
ANGLCOOL	67	67	67	67	67	67
ANGLHEAT		93		93		93
ANGLOFF	130	130	130	130	130	130
TH <sub>DEFROST</sub>						
TM <sub>DEFROST</sub>						
TL <sub>DEFROST</sub>						

## 12. Troubleshooting

### 13.1 Display board



- ① **AUTO indicator**  
This indicator illuminates when the air conditioner is in AUTO operation.
- ② **DE FROST indicator (For Cooling & Heating models only)**  
This indicator illuminates when the air conditioner starts defrosting automatically or when the warm air control feature is activated in heating operation.
- ③ **TEMPERATURE indicator**  
Displays the temperature settings when the air conditioner is operational.
- ④ **OPERATION indicator**  
This indicator flashes after power is on and illuminates when the unit is in operation.
- ⑤ **TIMER indicator**  
This indicator illuminates when TIMER is set ON/OFF.

### 13.2 Troubleshooting

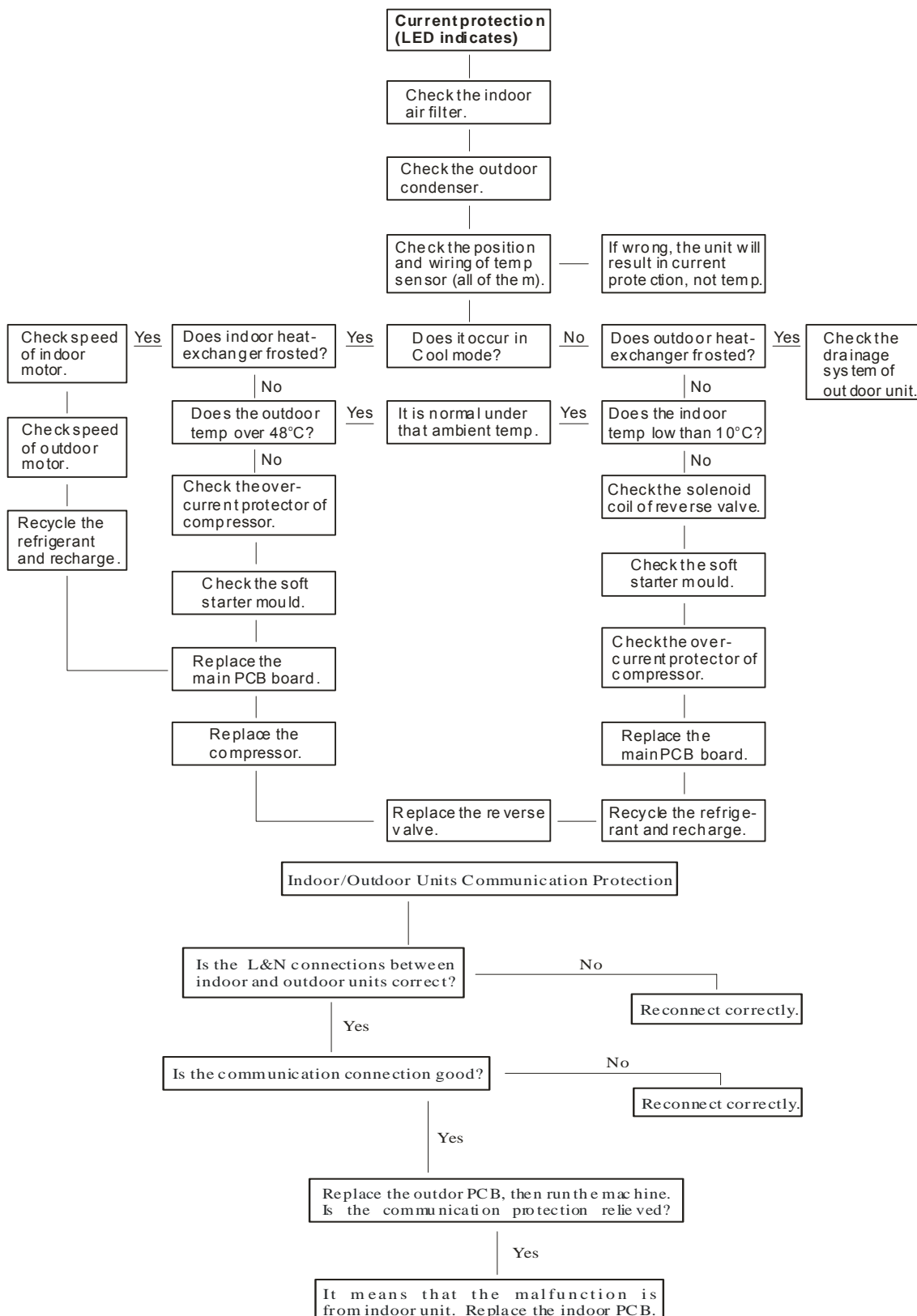
For models adopting electrical function

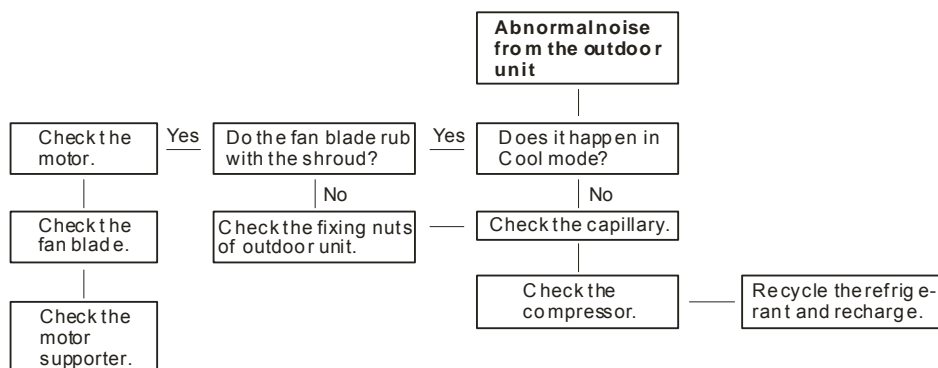
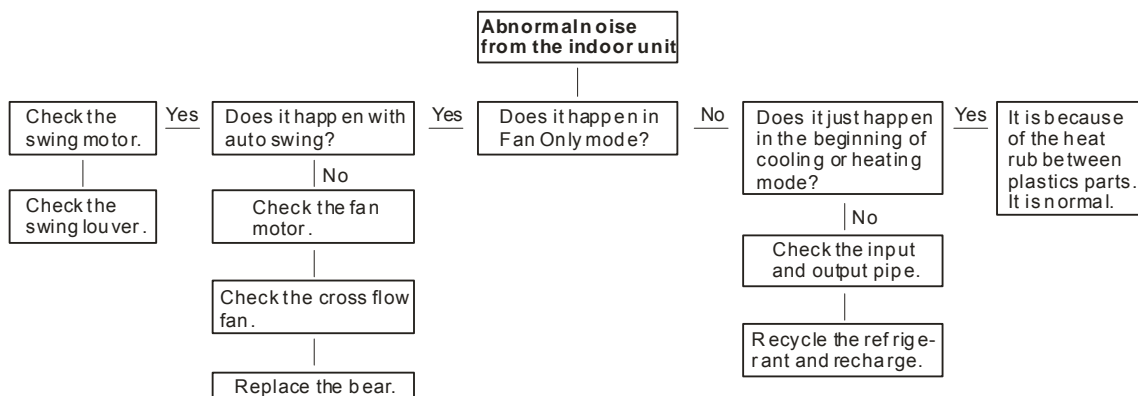
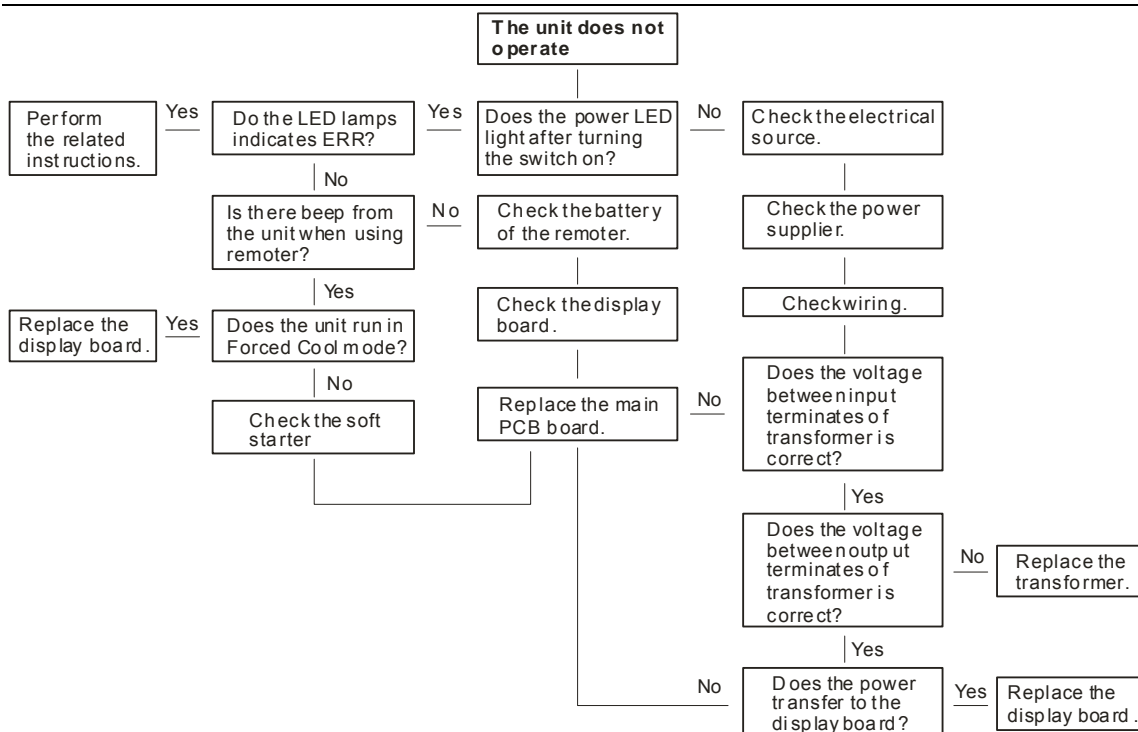
Failure phenomenon	Operation lamp	Timer lamp	Defrosting lamp	Auto lamp
Over current protection of the compressor occurs 4 times	☆	☆	☆	☆
Indoor room temp. sensor is open circuit or short circuit	X	☆	X	X
Temp. sensor on indoor evaporator is open circuit or short circuit	☆	X	X	X
Temp. sensor on outdoor condenser is open circuit or short circuit (without for cooling only models)	X	X	☆	X
Outdoor unit protects(outdoor temp sensor, phase order etc)	X	X	☆	☆
EEROM error	X	☆	X	☆
Indoor unit communication err	X	X	X	☆

✕ Extinguish      ☆ Flash at 5Hz

NOTE: For cool only model, the defrosting lamp is replaced with fan lamp, but malfunction display remains.

### 13.3 Detailed malfunction analyse





### 13.4 Malfunction Stat.

PROBLEM	CAUSE	REMEDY
Not operating	Power failure	Check the power cord.
	Wiring failure	Check the wiring. Replace the terminates or wires if failure.
	Transformer failure	Check the input and the output on transformer. Replace if failure.
	Indoor PCB failure	Replace after checked failure.
Indoor abnormal noise.	Cross flow fan failure	Replace the fan if cracked, out of balance, or partially missing.
	Loose screws	Tighten them.
	Worn bearings	Replace after checked failure.
	Motor failure	Replace the motor if knocking sounds continue when running or loose, or the motor hums or noise appears to be internal while running.
Outdoor abnormal noise.	Fan blade failure	Replace the fan blade if cracked, out of balance, or partially missing.
	Loose screws	Tighten them.
	Motor failure	Replace the motor if knocking sounds continue when running or loose, or the motor hums or noise appears to be internal while running.
	Compressor failure	Replace the compressor if sounds coming from inner of the compressor.
	Copper tubing	Remove the cabinet and carefully rearrange tubing not to contact cabinet, compressor.
Remote control failure.	Display board or indoor PCB failure	Replace the display board. If it is still false, replace the PCB.
	Battery failure	Check the voltage of battery. Replace batteries if the voltage is lower than 2.3V.
	Remote control failure	Normally, the remote control is not easy to damage. If the above two methods are not effectual, replace the remote control.
Compressor protection	Lack of refrigerant	Check leakage. Recycle the refrigerant. Correct and recharge if there is any leakage in the refrigerant system.
	Soft starter module failure	Check the module and the capacitor connected to the module. Replace if failure.
	Overcurrent protector failure	Check the resistance of compressor overcurrent protector. Replace if failure.
	Outdoor PCB failure	Replace after checked failure.



PROBLEM	CAUSE	REMEDY
Open or short circuit of outdoor temperature sensor	Temperature sensor failure	Replace after checked failure.
	Connector failure or loose	Repair or replace the sensor.
	Outdoor PCB failure	Replace after checked failure.
	Temperature sensor failure	Replace after checked failure.
	Connector failure or loose	Repair or replace the sensor.
	Indoor PCB failure	Replace after checked failure.
Over load or too low voltage protection	Soft starter module failure	Check the module and the capacitor connected to the module. Replace if failure.
	Power failure	Wait if checked the power voltage is really too low.
Fan speed beyond control	Wiring failure	Correct if indoor fan motor wiring is loose.
	Indoor fan motor failure	Check the input of fan motor. Replace if failure.
	Indoor PCB failure	Replace after checked failure.
Zero-crossing error	Indoor PCB failure	Replace after checked failure.
Insufficient cooling or heating.	Air filter	Clean or replace if restricted.
	Unit undersized	Determine if the unit is properly sized for the area to be cooled or heated.
	Condenser and Evaporator	Clean or replace if restricted.
	Room structure	Take proper measures to make the door and windows sealed well if gap is found.
	Air flow	Clean or remove if any barrier is found to block the inlet/outlet wind flow of the unit.
	Sunlight	Add a awning if the outdoor unit is exposed to the sunlight.
	Outdoor fan motor	Check the fan capacitor on outdoor power control board and replace the board if not within +/-10% of manufacturer's rating. Replace the motor if the speed is not within +/-10% of manufacturer's rating but not because of the capacitor.
	indoor fan motor	For electrical function 2.3 models. Check the fan capacitor in indoor electric box (for some models, the capacitor is on main PCB.) and replace the capacitor (or main PCB) if not within +/-10% of manufacturer's rating. Replace the motor if the speed is not within +/-10% of manufacturer's rating but not because of the capacitor.
	Less refrigerant	Check the tubes for reasons of leakage. Recycle the refrigerant, correct the leakage points and recharge.
	Capillary tube	Regulate the flow if capillary tube is blocked. Make the evaporating temperature appropriate if the evaporator is frosted.
	Compressor	The inlet and outlet valve of the compressor is damaged, making the low pressure connected with the high pressure. The refrigerating system is difficult to produce high pressure and low pressure. Replace the compressor after checking for the reason.
	Heat sources	Reduce if over loaded.
	reverse valve	The two paths for refrigerant are connected, making the low pressure connected with the high pressure. The refrigerating system is difficult to produce high pressure and low pressure. Replace the reverse valve after checking for the reason.

PROBLEM	CAUSE	REMEDY
No display on indoor unit.	LED failure	Replace the display if checked failure.
	Remote control shut the display	Push the button to turn the display on.
No cooling or heating.	No power	Check the voltage. Call an electrician if not within the limit.
	Wiring	Check the terminals. Repair and correct if loose.
	Temperature setting	Check and adjust the temperature setting.
	Mode setting	Check and adjust the mode setting.
	Soft starter module failure	Check the module and the capacitor connected to the module. Replace if failure.
	Reverse valve solenoid coil	Check the reverse valve solenoid coil. Replace the coil if short, open or damaged.
	Reverse valve	If the reverse valve is blocked, the heating mode will not perform. Replace the reverse valve after checking the reason.
Water drops from indoor unit	Water drainage failure	Check the drainage pipe and repair if failure.
	The indoor unit is incorrect installed	Correct the installation if not correct.
	Drainage pipe blocked	Correct it.
	The humidity in room is too high	It's normal if the humidity in the room is over 85%.
	Wiring failure	Check wiring. Correct if wrong wiring or loosen.
	Wire EMC	Check wiring. Correct if the communication wire is not shielded wire or twisted with other wires.
Zero-crossing error	Outdoor PCB failure	Replace if the LED is not on.
	Outdoor transformer failure	Replace if failure.
Insufficient cooling or heating.	Indoor PCB failure	Replace the PCB if the photon coupling on indoor PCB is failure.
	Indoor PCB failure	Replace after checked failure.

## 14 Characteristic of temperature sensor

Temp. °C	Resistance KΩ	Temp. °C	Resistance KΩ	Temp. °C	Resistance KΩ
-10	62.2756	17	14.6181	44	4.3874
-9	58.7079	18	13.918	45	4.2126
-8	56.3694	19	13.2631	46	4.0459
-7	52.2438	20	12.6431	47	3.8867
-6	49.3161	21	12.0561	48	3.7348
-5	46.5725	22	11.5	49	3.5896
-4	44	23	10.9731	50	3.451
-3	41.5878	24	10.4736	51	3.3185
-2	39.8239	25	10	52	3.1918
-1	37.1988	26	9.5507	53	3.0707
0	35.2024	27	9.1245	54	2.959
1	33.3269	28	8.7198	55	2.8442
2	31.5635	29	8.3357	56	2.7382
3	29.9058	30	7.9708	57	2.6368
4	28.3459	31	7.6241	58	2.5397
5	26.8778	32	7.2946	59	2.4468
6	25.4954	33	6.9814	60	2.3577
7	24.1932	34	6.6835	61	2.2725
8	22.5662	35	6.4002	62	2.1907
9	21.8094	36	6.1306	63	2.1124
10	20.7184	37	5.8736	64	2.0373
11	19.6891	38	5.6296	65	1.9653
12	18.7177	39	5.3969	66	1.8963
13	17.8005	40	5.1752	67	1.830
14	16.9341	41	4.9639	68	1.7665
15	16.1156	42	4.7625	69	1.7055
16	15.3418	43	4.5705	70	1.6469