

Hisense

Inverter-Driven Multi-Split Home Central Air Conditioning Heat Pump System Hi-Smart L Series

Technical Catalog

- Technical Data -
- Installation and Operation -
- Service and Maintenance -



Hisense

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Specifications in this catalogue are subject to change without notice, in order that Hisense may bring the latest innovations to their customers.

IMPORTANT NOTICE

- Hisense pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- Hisense cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioner is designed for standard air conditioning only.
- Do not use this heat pump air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling or heating process.
- No part of this manual may be reproduced without written permission.
- The following words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

▲ DANGER : Immediate hazards which WILL result in severe personal injury or death.

▲ WARNING : Hazards or unsafe practices which COULD result in severe personal injury or death.

▲ CAUTION : Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

NOTE : Useful information for operation and/or maintenance.

- If you have any questions, contact your distributor or dealer of Hisense.
- This manual gives a common description and information for this heat pump air conditioner which you operate as well as for other models.
- Install air conditioning according to the local standard.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature		(°C)	
		Maximum	Minimum
Cooling Operation	Indoor	23 WB	15 WB
	Outdoor	43(48) DB	-5 DB
Heating Operation	Indoor	30 DB	15 DB
	Outdoor	15.5WB	-20 WB

DB: Dry Bulb, WB: Wet Bulb

- * Once F2=1 in function setting, the max. running condition temperature is 48°C in cooling mode. The ODU is intermittent running from 48°C to 50°C . Only for Model Power 1Φ 220~240V/50Hz.

Attention

This system has been designed for only cooling or heating operation.
Do not apply this system to the rooms where individual cooling and heating operation are required at the same time.

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DESIGN

1. Features

1.1 Outdoor Unit Series

Model		AVW-38U(C/2)SC	AVW-48U(C/2)SC	AVW-54U(C/2)C	AVW-48U(E/7)SC	AVW-54U(E/7)SC
Outdoor Unit Power Supply		AC1Φ, 220~240V/50Hz 220V/60Hz			AC3Φ, 380~415V/50Hz 380V/60Hz	
Nominal Cooling Capacity	kBtu/h	38.2	47.8	52.9	47.8	52.9
Nominal Heating Capacity	kBtu/h	42.7	54.6	61.4	54.6	61.4

1.2 System Features

Inverter-Driven Home Central Air-conditioning

The inverter-driven home central air-conditioning Hi-Smart L series product is characterized by energy-saving, high efficiency, comfort, environmental protection, stability and reliability. In order to meet the requirement of increasing the control intelligence of equipment and of comfort, the intelligent control, energy-saving operation and comfortableness are more and more important. Especially the business building, building office, villa, apartment and residential area etc. need an intelligent and comfortable environment all year round. The better air conditioning solution can be provided for these buildings by inverter-driven compressor that the structure has been improved.

Hi-Smart L Series – Adopting R410A Refrigerant

Hisense is always devoted to developing the more energy-saving and environmentally protective air conditioning system, regarding the reduction of greenhouse effect and global environment protection as our responsibility. By using the environmentally protective refrigerant R410A without damage to the ozone layer as well as the energy-saving technology, the Hi-Smart L series product can be more applicable for the demands of global environmental protection.

Indoor Unit Type	Nominal Capacity (kBtu/h)													
	05	07	09	12	14	17	18	22	24	27	30	38	48	54
Ceiling Ducted Type (Low Static Pressure)		○	○	○	○	○	○	○	○	○	○	○	○	○
Ceiling Ducted Type (High Static Pressure)		○	○	○	○	○	○	○	○	○	○	○	○	○
Low-Height Ceiling Ducted Type		○	○	○	○	○	○	○	○					
Low-Height Ceiling Ducted Type (DC)	○	○	○	○	○	○	○	○	○					
Slim Ceiling Ducted Type		○	○	○	○									
1-Way Cassette Type		○	○	○	○	○		○						
2-Way Cassette Type		○	○	○	○		○		○					
4-Way Cassette Type			○	○	○	○	○	○	○	○	○	○	○	○
Compact 4-Way Cassette Type	○	○	○	○	○	○								
Wall-Mounted Type		○	○	○	○	○	○	○	○					
Ceiling and Floor Type						○	○	○	○	○	○	○	○	
Floor-Concealed Type			○		○		○		○					

○ : Available

One outdoor unit can be connected with 7 indoor units in maximum.

With the DC inverter technology, one outdoor unit can be connected with 7 indoor units in maximum. The combination rate range is from 50 % to 150%.

Model of Outdoor Units	Indoor Unit				
	Min. Nominal Cooling Capacity Combination kBth/h	Max. Nominal Cooling Capacity Combination kBth/h	Min. Combined Quantity of Indoor Units	Max. Combined Quantity of Indoor Units	Min. Individual Operation Capacity (kBth/h)
AVW-38	19.0	57.3	1	6*	5.8
AVW-48	24.0	71.7	1	7*	5.8
AVW-54	27.0	79.35	1	7*	5.8

* : Max. Connection Ratio of 150% and Max. Number of Connectable I.U. of 9 can be obtained as the following requirements are met for L Series Outdoor Units.

		Connection Ratio	
		≤130%	≤150%
Number of Connectable I.U.	Max. Number of Connectable I.U. of 7	(1)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.	(1)No more than 1 unit is allowed for Models 07/09 of wall type indoor units, or the capacity of these units in addition to 1 unit are calculated as two times declared data in case of more than 1 units connection. (2)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.
	Max. Number of Connectable I.U. of 9	(1)No more than 1 unit is allowed for Models 07/09 of wall type indoor units, or the capacity of these units in addition to 1unit are calculated as two times declared data in case of more than 1 units connection. (2)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.	(1)No more than 1 unit is allowed for Models 07/09 of wall type indoor units, or the capacity of these units in addition to 1 unit are calculated as two times declared data in case of more than 1 units connection. (2)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.

Note: The following conditions should be complied with when the AVW-48U(C/2)SC and AVW-54U(C/2)SC outdoor units are connected with 9 sets of indoor units:

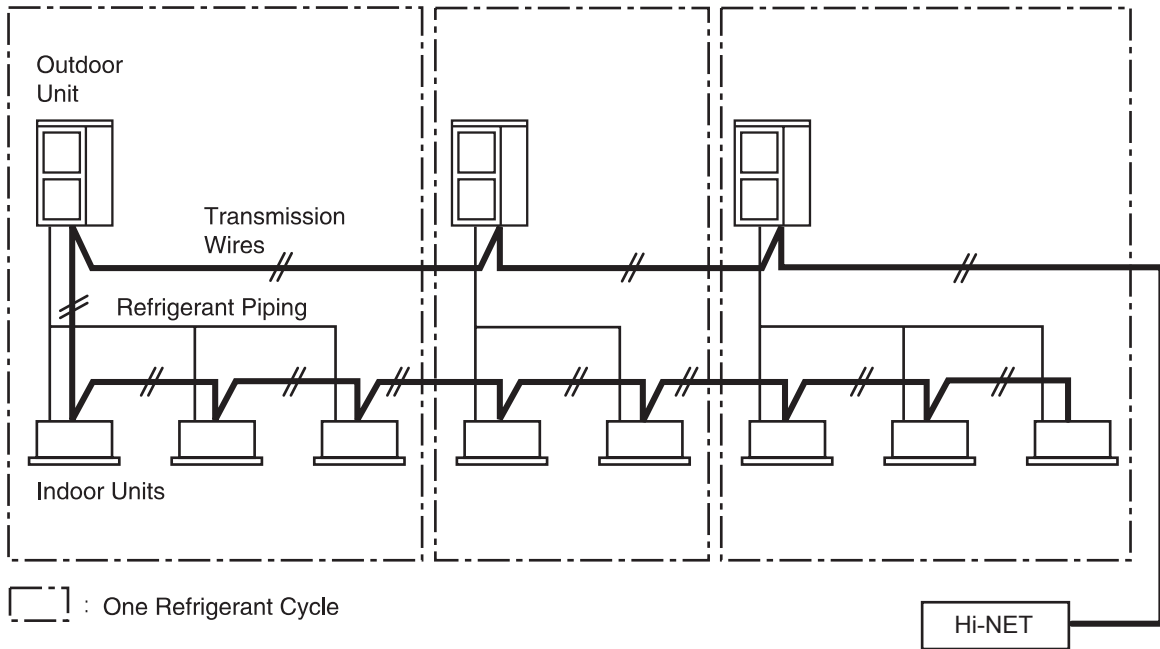
- The capacity of simultaneously operated indoor units should be less than that of outdoor unit.
- When heating, the outdoor temperature should be higher than -5°C.
- The maximum piping length (actual length) should be less than 40m; the distance from all multi-kits to indoor unit should be less than 5m.

Hi-NET System

The latest Hi-NET wiring system requires only two transmission wires connecting each indoor unit with outdoor unit for up to 64 refrigerant cycles, thus all indoor units and outdoor units are connected in series.

- The total wiring length is remarkably reduced.
- Only one connection is required for the wiring between the indoor unit and outdoor unit.
- Easy wiring connection to the central stations

Example of Hi-NET System



< Specifications >

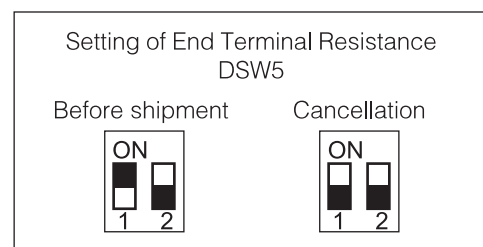
- 1) Transmission: It is shield twist pair whose sectional area is more than or equal to 0.75 mm^2 .
- 2) Polarity of Transmission: Non-polar
- 3) Maximum connecting quantity of outdoor units: 64 sets for each Hi-NET system.
- 4) Maximum connecting quantity of indoor units: 64 sets for refrigerant system and 128 indoor units for each Hi-NET system.
- 5) Maximum transmission length: Total 1000 m (including Hi-NET)
- 6) Voltage: DC 5V.

Note:

1. In case of applying Hi-NET system, the setting of DIP switch is required. The alarm will be given if the DIP switch is not set or improperly set (because of transmission error).

■ Setting of End Terminal Resistance

Before shipment, the No.1 pin in DSW5 should be turned to the "ON" position. If one Hi-NET is connected with two or more outdoor units, the No.1 pin in DSW5 should be turned to the "OFF" position from the second outdoor unit. This setting is not needed if only one outdoor unit is used.



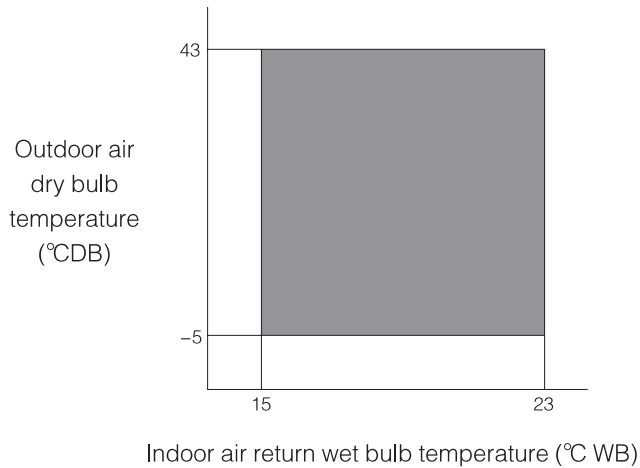
New Transmission System

A non-polar shielded twist pair is applied for the transmission wires connecting indoor units and outdoor unit so as to eliminate the damage caused by misconnection.

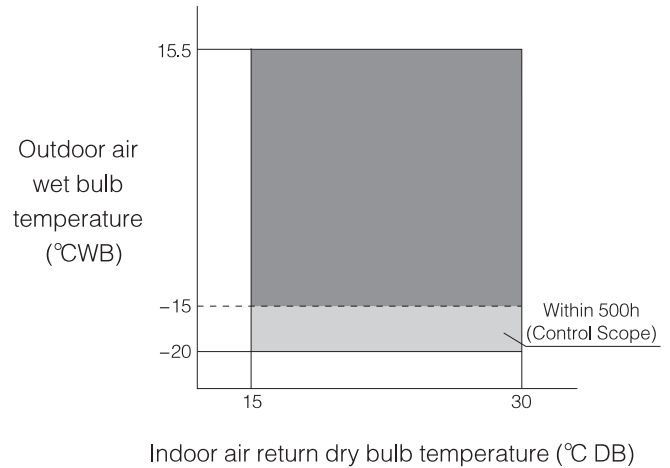
Wide Operation Range

This unit has been designed for cooling operation under ambient temperatures -5°C . This feature enables cooling to be obtained even in winter on buildings with high internal heat gains due to lighting, people and machines, particularly in areas such as shops, lecture rooms, data processing areas etc. And the heating operation under ambient temperature -20°C can be also performed.

Cooling operation



Heating operation

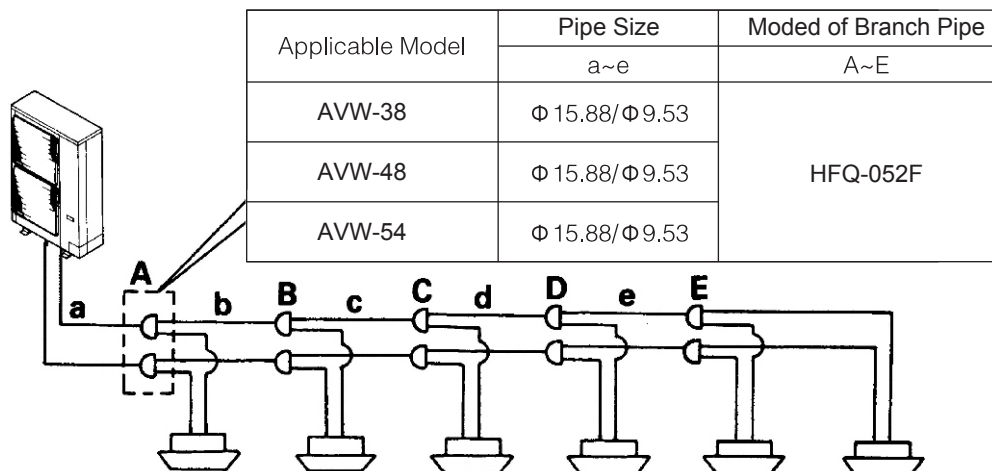


■ : Operation control range

Greatly Minimized Piping Work by “Uni-Piping System”

This new uni-piping system can be applied only if the diameters of refrigerant main pipelines are same. Owing to adopting the uniform pipe diameter, the pipeline construction is very simplified.

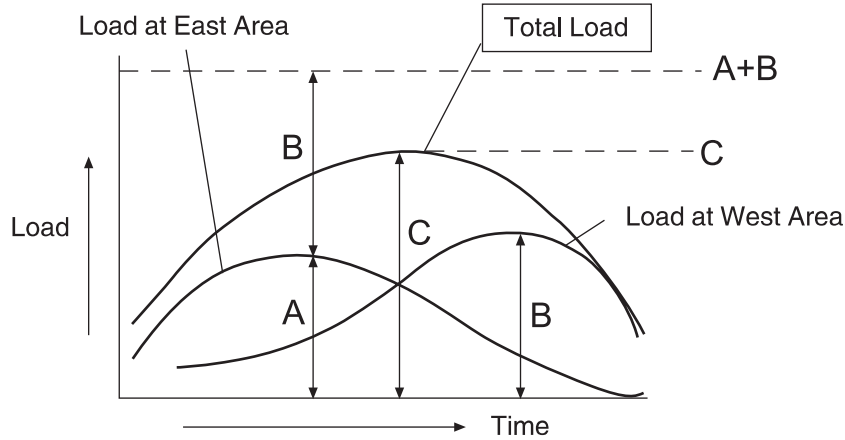
The simplified design can avoid the complex pipeline diameter selection work. The two refrigerant pipelines can only be needed for refrigerant return circuit. All pipeline connectors can also be supplied based on the field demands. These improvements make that all problems are settled in the installation processes. This type of new uni-piping system save the construction of working-hour and labor, so undoubtedly it can be regarded as an innovation. (Only used for uni-piping)



Required total capacity of outdoor unit can be reduced

In the same air conditioning system, compared with the common split type air conditioning, adopting the Hi-Smart L unit is better. The total capacity of outdoor unit of the latter is reduced by 30% than that of former. As shown in the following Figure, in a typical building, the heat load peak value at east area corresponds with 29kBTu/h at morning however at west area corresponds with 34kBTu/h at afternoon. Therefore, normally, the air conditioning of capacity of 29kBTu/h+34kBTu/h=63kBTu/h must be configured. However, actually, the load instant peak value only occurs at midday for the whole building, corresponding with the system capacity of 48kBTu/h. Therefore, the 48kBTu/h Hi-Smart L series unit can only be selected. Under the command of its control system, its capacity can meet the load demands for east area or west area of the whole building. So the capacity=(63-48)/63x100=24% of air conditioning can be saved.

Example of Building Air Conditioning:



■ Common split type – Its total capacity selection is based on the total sum of each maximum load value (=A+B);



■ Hi-Smart L Series – Its total capacity selection is based on the maximum of total constant load values.

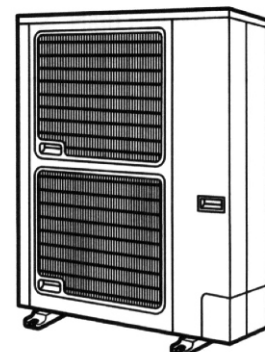
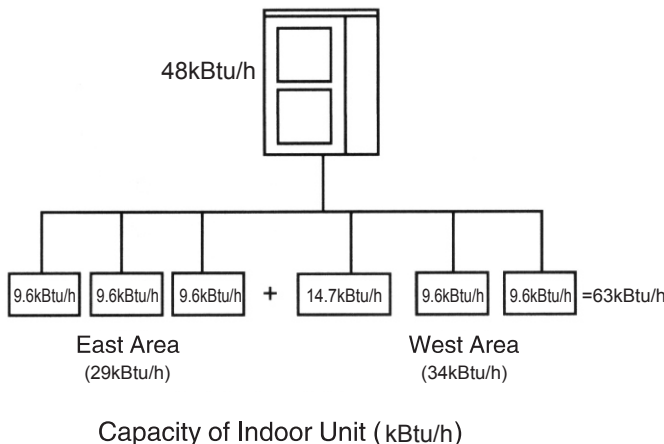
$$(A+B):C=1:0.80\sim 0.85$$

Owing to the system is composed of several indoor units, the part of indoor units can only be operated.

Hi-Smart L Series

Supply the refrigerant based on the load in each room.

$$\text{Load diversity} = 48/63=0.76;$$

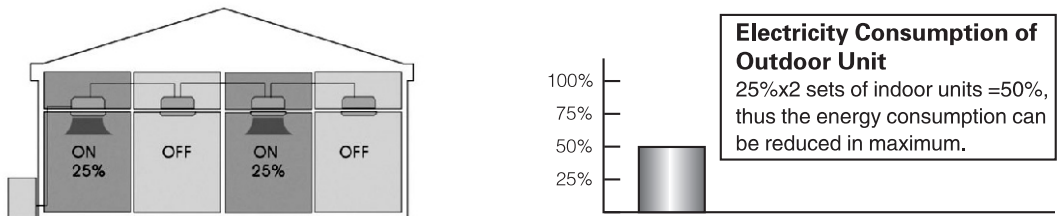


Unique Energy-saving Technology

Adopting the Hisense patent products, such as the high efficient DC inverter-driven rotary compressor, precise inverter-driven control and DC fan motor and the special technology, adopting the intelligent automatic operation system based on the actual load, the energy and operation cost can be saved and the system energy efficiency rate can be increased for outdoor unit.

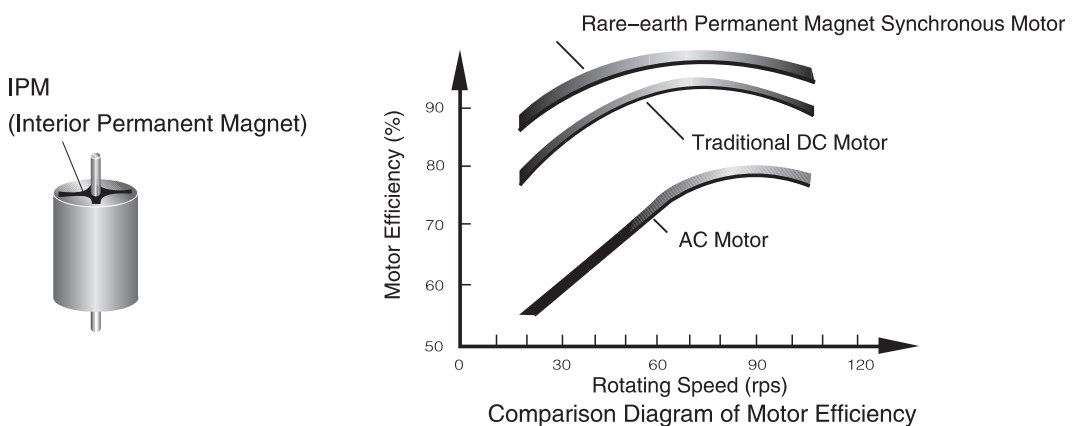
Respectively Control for Indoor Unit

The Hi-Smart L series produces can be respectively controlled based on the demand of user. The indoor unit in each room can be respectively opened or stopped. The operation state of compressor, operation frequency and output capacity of intelligent adjustable main machine can be controlled by main machine based on the operation state of indoor unit, thus avoiding the unnecessary power waste.



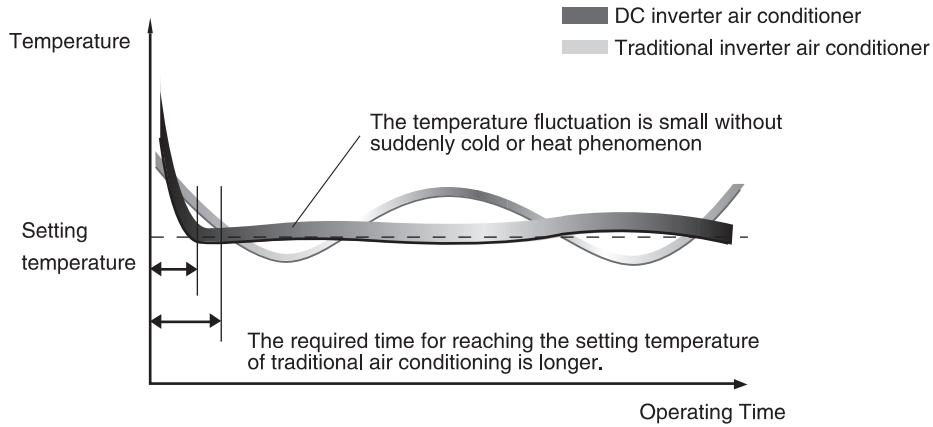
Unique Rare-earth Permanent Magnet Synchronous Motor

The rare-earth permanent magnet synchronous motor is the clustered motor that efficiency can be greatly increased in low-frequency and middle frequency; at the same time the IPM (rotor embedded type) technology is adopted, thus the torque can be increased by 20% and the motor efficiency can be further increased. Its energy can be very saved comparing with AC motor and traditional DC motor.

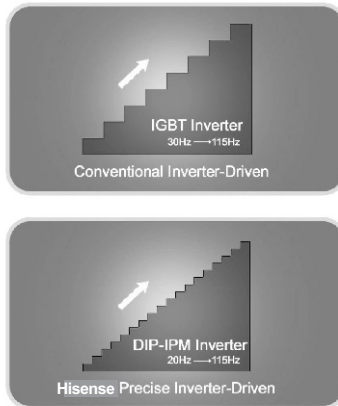


Precise Inverter Technique

The Hisense precise inverter technique adopts the PAM (pulse amplitude modulation), PWM (pulse width modulation) and PFC (power factor correction) with combined control technique. When starting, the inverter make the indoor temperature rapidly reach the setting value through accelerating the rotational frequency of compressor with the aim of PAM. After the indoor temperature reaches the setting value, the indoor temperature can be effectively and accurately kept by inverter through controlling the rotary speed of compressor with the help of PWM, without consuming more energy. The precise inverter technology can make the unit be characterized by larger power, high efficiency, stable operation, comfortable, energy-saving and 99.5% of power factor, with the advantages of energy-saving effect, economic operation and naturally comfortable indoor environment.



The working frequency can be continuously, accurately and freely adjusted based on the change of system capacity through the precise inverter technology from 20Hz to 115Hz to control the motor speed accurately. The capacity output can be automatically and accurately adjusted based on the actual air conditioning load.

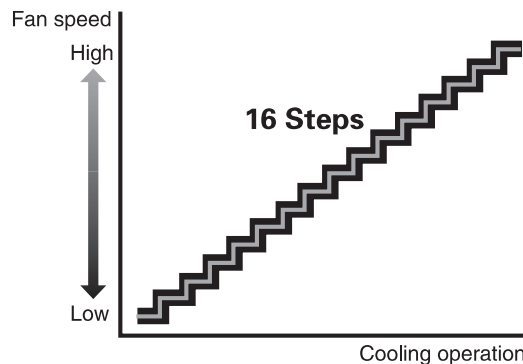


Comparison of Conventional Inverter-driven and Precise Inverter-driven

16-Step Fan Speed Control of Outdoor Unit

The fan speed of outdoor unit can be controlled by 16-step according to ambient temperature changing. Compared with the traditional fan, this wide-band adjustable mode has the following features:

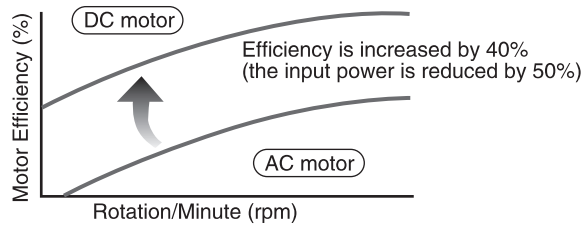
- ◆ Greatly ensuring the stability of discharge and suction pressures of compressor and increasing the service life of compressor;
- ◆ Ensuring the stability of dynamic allocation of flow (capacity) of indoor unit and reducing the indoor temperature fluctuation;
- ◆ Strengthening the rapid response of control system;
- ◆ In the mean while, ensuring the stable, permanent and reliable operation of unit.



Sketch for 16-step speed regulation of outdoor unit fan under the cooling condition

DC Fan Motor

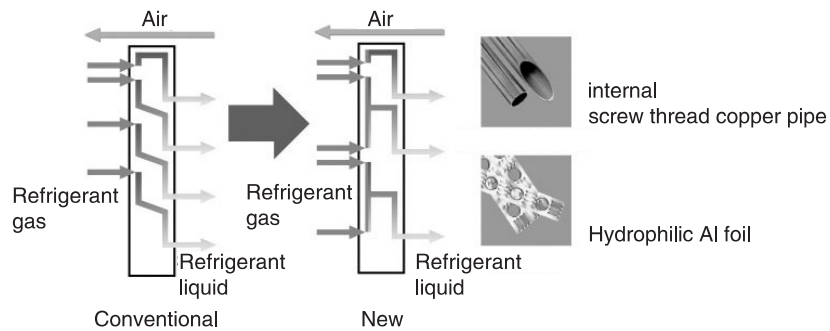
Compared with the traditional AC motor, the efficiency of AC motor is greatly increased. In addition, the gust effect can be reduced through controlling the rotary speed of fan. The machine can be stably operated even if the head wind speed is up to 10m/s.



- 1 The performance can be greatly enhanced when operating from low speed to high speed. ➔ **High performance**
- 2 With the change of outdoor air temperature, the speed of fan motor can be automatically adjusted and the motor power can be greatly saved. ➔ **High efficiency**

New Heat Exchanger

With the specially designed “2 in 1” refrigerant flow, the heat exchanging efficiency of heat exchanger can be optimized, the heat exchanging effect is better and the system efficiency is higher.



RoHS Response

Hisense actively takes measures of strictly controlling the use of harmful substance to Europe RoHS command. The RoHS is fully named as “Restriction of Hazardous Substances”, specifying the six harmful substances of Lead, Mercury, Cadmium, Hexavalent Chromium, PBDE or PBB which are forbidden to use in the electrical and electronic equipments. The purpose of this command is to protect the human health and ensure that the recovery and treatment of rejected electrical and electronic equipments meet the environmental requirement.



Substance	RoHS limit value	Typical test method
Lead	1000ppm	Wet chemical treatment or X ray fluorescence
Cadmium	100ppm	Wet chemical treatment or X ray fluorescence
Hexavalent chromium	1000ppm	Wet chemical treatment or X ray fluorescence
Mercury	1000ppm	Wet chemical treatment or X ray fluorescence
PBB/PBDE	1000ppm	GCMS, FTTR, or X ray fluorescence

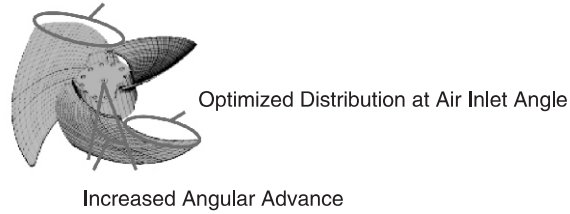
Environmental Friendly Refrigerant Protects Environment

Hi-Smart L Series adopts the R410A environmental friendly refrigerant which has acquired the world's recognition and is no harm to human body. With the highly efficient energy saving, it will not damage the globe ozone layer. By transferring temperature, humidity, fresh air and health to all spaces, you can enjoy the comfortable and fresh air conditioning environment.

Top-Class Quiet – Enjoying the Quiet Life

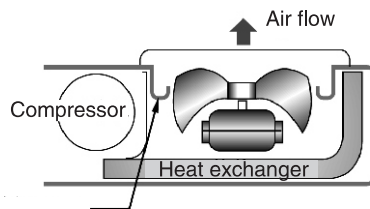
Super High-stream Fan

The fan is designed with the best flow distribution and a new type fan blade that can reduce the turbulence developed around the fan. The rotary speed can be controlled and the noise can be reduced through increasing the fan mouth diameter.



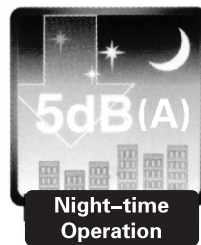
Adoption of New Bell-mouth

The new bell-mouth minimizes flow friction, resulting in smooth flow and low sound.

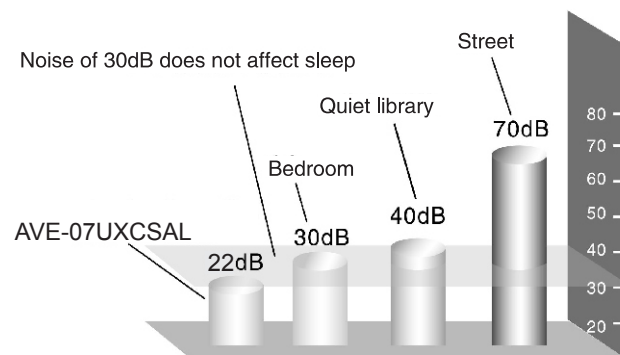


Reaching the Lowest Noise Value in Industry

With the unique night-time operation setting function, the outdoor unit can make that the noise is reduced by 5–6dB(A) compared with day normal operation when operating at night with full load. The lowest value is 48 dB(A) (AVW-38UC(2)SB).

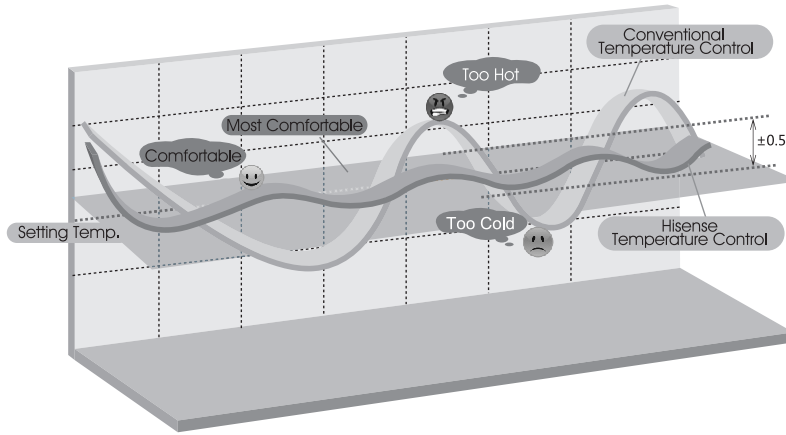


The operation noise of narrow Low-height Ceiling ducted type AVE-07UXCSAL with lowest noise in industry can be lowest to 22dB(A).



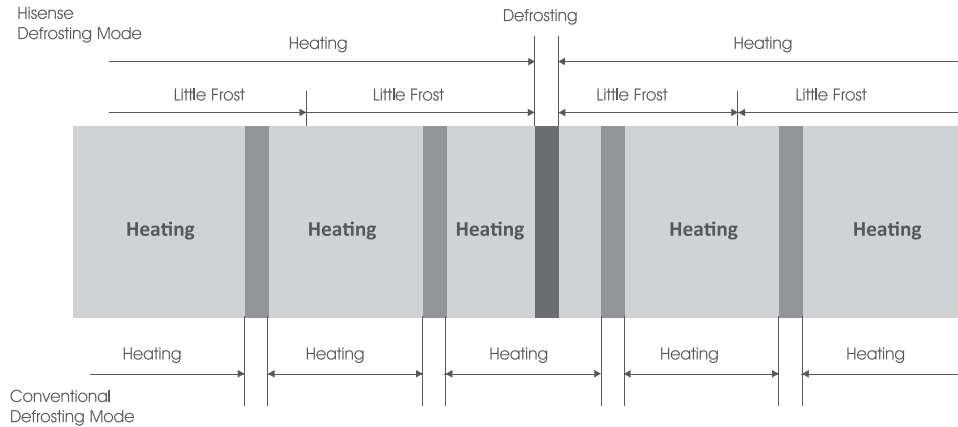
3D Temperature Control Technology

Hi-Smart L series sets temperature sensors on air outlet/air inlet of indoor units and remote controller to detect the temperature change of indoor and outdoor sensitive points accurately and regulate indoor temperature automatically, which can maintain the room temperature within 0.5 °C of setting temperature and satisfy the indoor comfort requirement.



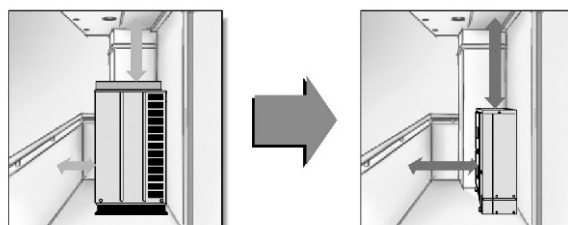
Intelligent Defrosting Technology

Hi-Smart L adopts the leading intelligent defrosting technology and precisely calculates the defrosting time, which largely increases effective heating operation time in winter and ensure heating capacity.



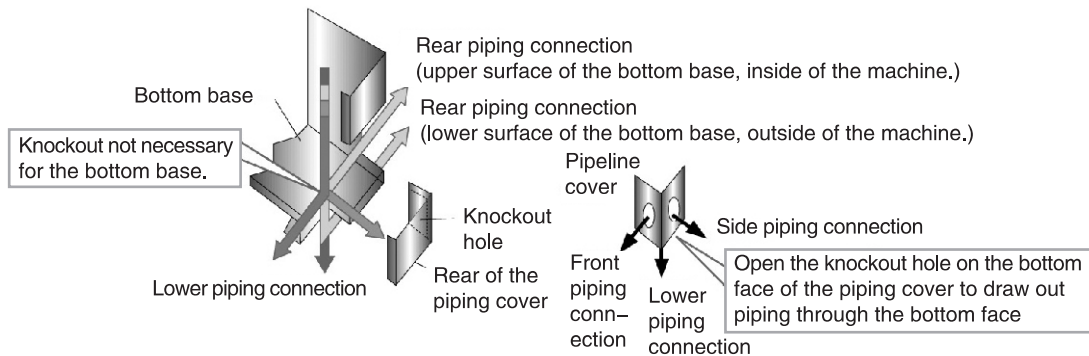
Compact Size and Saving Space

The main machine of system is characterized by compact volume, light weight, small size and easy installation. It can be installed in the concealed places, such as work veranda or storage room, which can simultaneously meet the cold and heating requirements for several rooms. Furthermore, the reasonable arrangement of outdoor unit will not damage the overall aesthetic appearance of building.



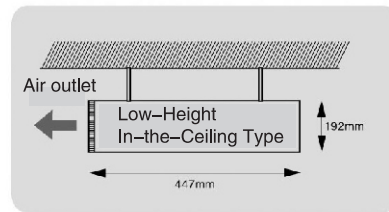
Free Connection

The connection direction of Hi-Smart L Series refrigerant pipeline is free. Any side of outdoor unit can be connected with pipeline (front, back, side and bottom) for easy installation, which can be freely applicable for any location.



Concealed Installation for Matching the Decoration

Different from the traditional wall type and cabinet type, the indoor units of home central air conditioning are mostly concealed in the ceiling. Only the air outlet can be seen. The thickness of Hitachi low-height in-the-ceiling (duct) type is only 192mm to leave more space for designer and for matching the high-grade decoration indoors.



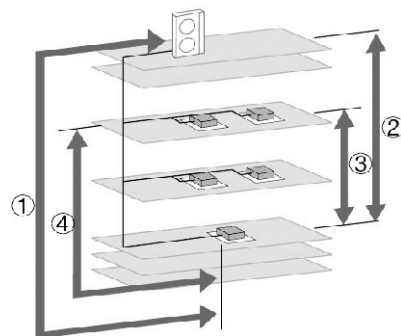
The pipe and wire are exposed outside, which is not aesthetic.

The concealed indoor unit can be perfectly matched with the decoration.

Long Pipe Design

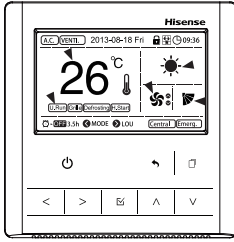
The maximum total length of pipe is 120m

- ① Maximum length of pipe is 75m;
- ② Height difference between indoor and outdoor units is 30m;
- ③ Height difference between indoor units is 15m;
- ④ Length of pipe from the first multi-kit to the farthest indoor unit is 30m.



Various Controllers

The indoor unit can use the various controlling for control, which can achieve the single control or concentrated control for mostly convenient use of user.



Remote Control Switch HYXE-J01H

Remote Control Switch:

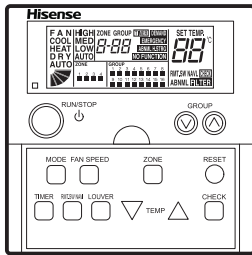
- COOL / HEAT / DRY / FAN / AUTO
- High fan, middle fan, low fan / Swing Louver
- Temperature setting / I.U. Timer setting
- Filter indicator
- Total heat exchanger operation control
- Check function
- Alarm code display function
- Increasing the wind speed function



Wireless Remote Control Switch HYE-Q01

Wireless Remote Control Switch:

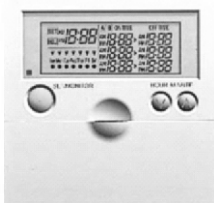
- COOL / HEAT / DRY / FAN / AUTO
- High fan, middle fan and low fan
- Swing Louver
- Temperature setting
- I.U. Timer setting
- Filter indicator



HYJE-D02H: Controlling the indoor unit of 64 sets in maximum

Central Station:

- COOL / HEAT / DRY / FAN / AUTO
- High fan, middle fan and low fan
- Swing Louver
- Temperature setting
- I.U. Timer setting
- Filter indicator
- Alarm code display function
- Remote control switch not available function
- Indoor unit selection function
- Operation state monitor
- Maximum number of control indoor unit: 128



7-Day Timer HYDE-E01H

7-Day Timer:

- Running setting
- Holiday setting
- 2 patterns set for the weekly schedule
- 3 times ON/OFF settings for each weekly day

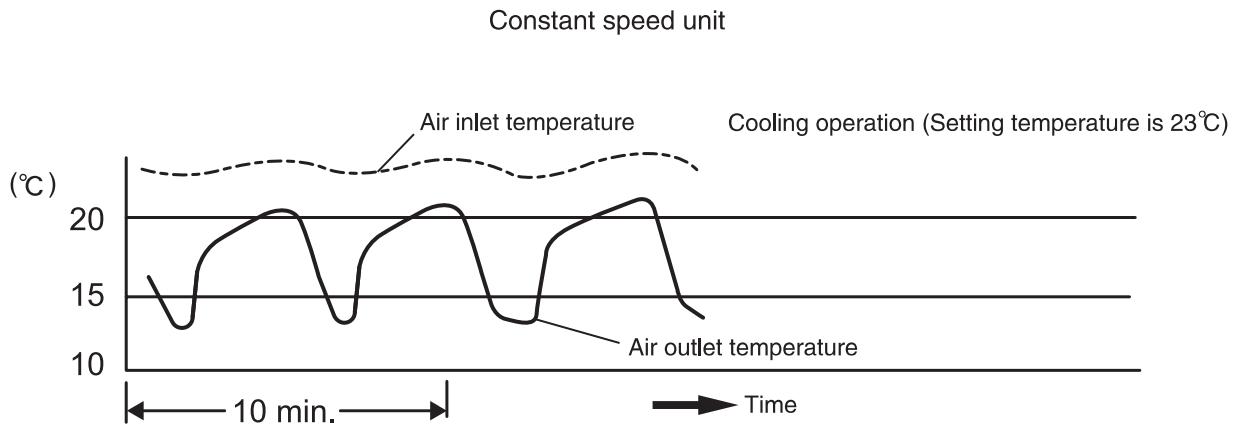
1.3 System Control

New Transmission System

The indoor and outdoor units are connected by a shield twist pair of non-polarity.

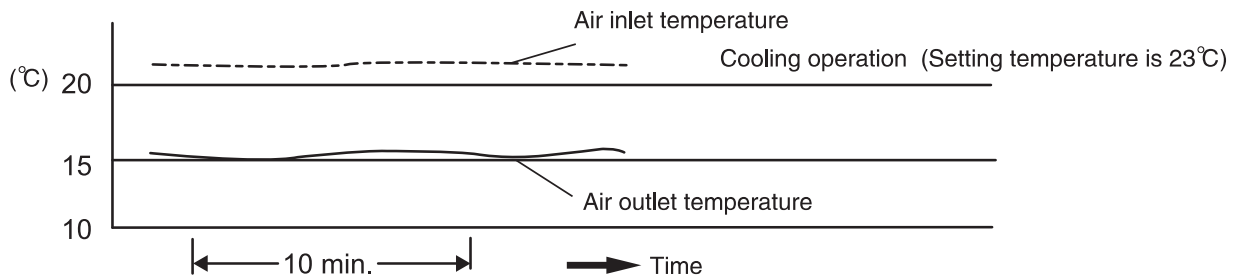
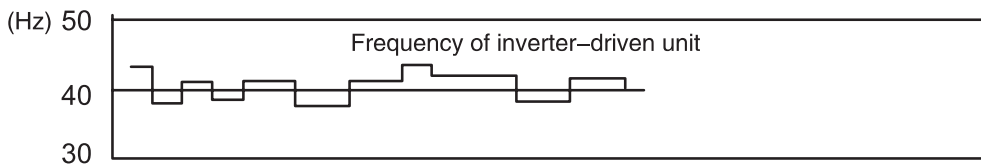
Wider inverting range to ensure the accurate control

The operation frequency of compressor of Hi-Smart L series outdoor unit can be automatically adjusted within the wider range from 20 Hz to 115 Hz, to avoid the frequent open/close controlling of machine unit and achieve the smooth and stable operation. The control range for this new type wider capacity meets the requirement not only of larger space, but also of smaller space, such as guest rooms and management rooms. Owing to the compressor can be operated at a high speed when defrosting, the defrosting is very quick.



Inverter-driven unit

Variable frequency

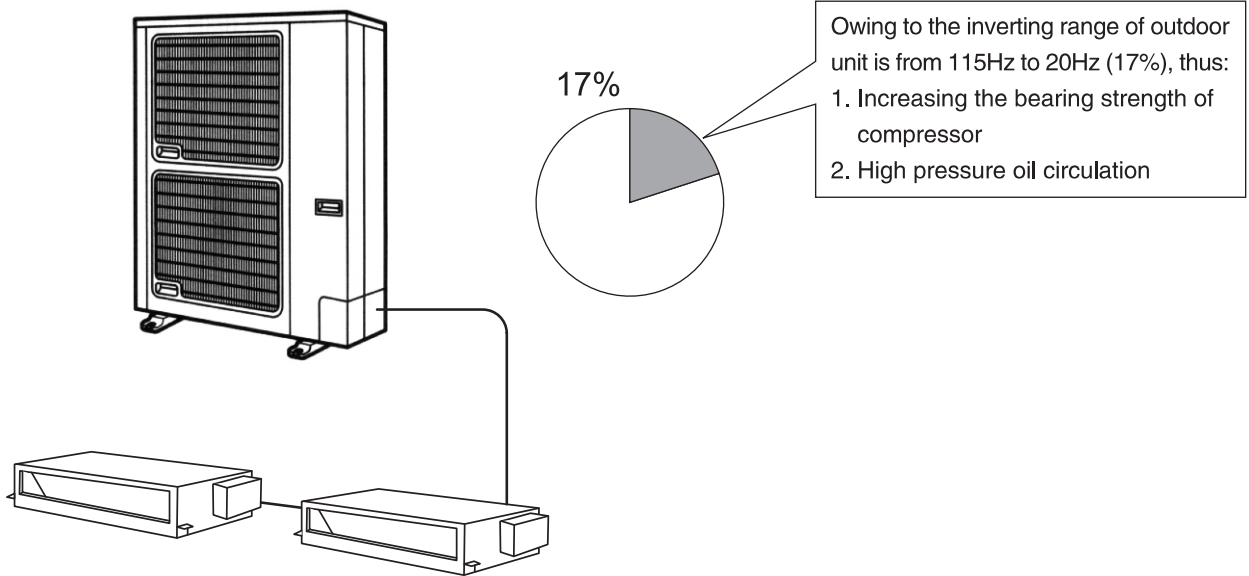


Note: The above is for the temperature decreasing situation of air outlet.

Electronic Capacity Control

The capacity of outdoor unit can be continuously changed from 20Hz to 115Hz through inverter. The wider operation range can be ensured through increasing the bearing strength of compressor and function of interior oil separating. Therefore, this air conditioning system can be well adjusted based on the load changing within one day.

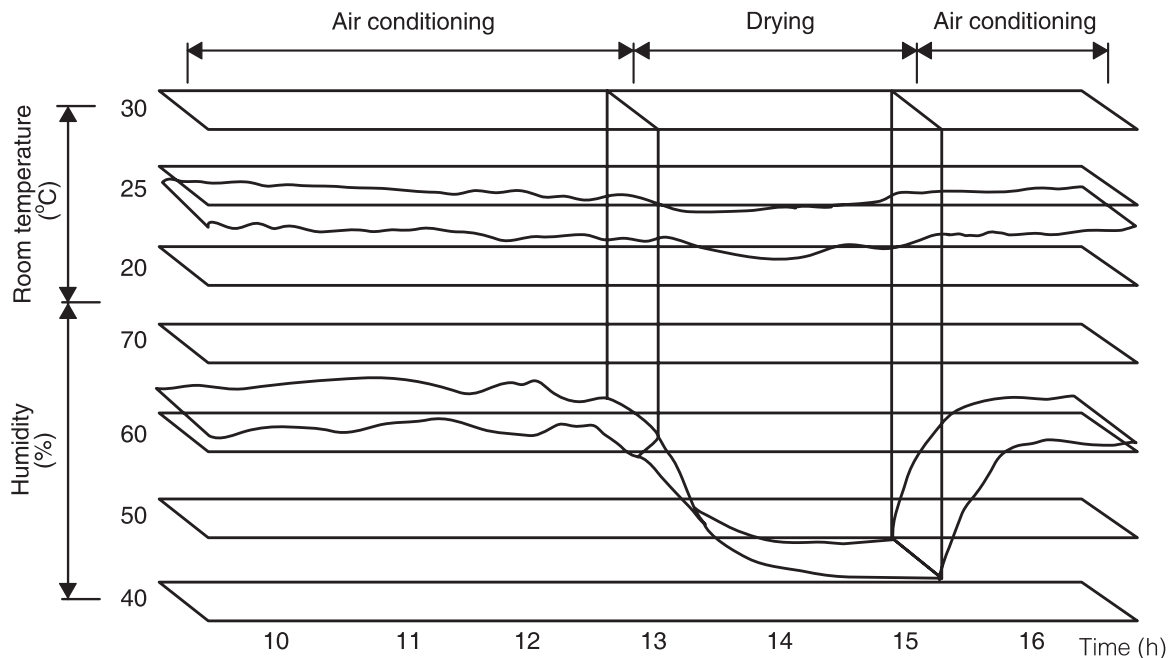
In addition, with the inverter-driven compressor, the capacity of indoor unit can be controlled through detecting the air return temperature and setting room temperature. Therefore, the comfortable situation of air conditioner can be achieved even in the very small room not using the “ON/OFF” switch of control equipment.



1.4 Drying Operation

This system can play a function of dehumidification effect combining with the inverter-driven and air flow control of indoor unit, at the same time, the room temperature fluctuation is hardly effected.

Room temperature and humidity variation during dry operation.



1.5 Test Run and Self-Diagnosis Control

Test run and self-diagnosis function of multi-functional remote control switch and control board of outdoor unit

The high-quality control can be achieved through the new remote control switch, with the new self-diagnosis function, the operation situation of indoor unit and outdoor unit can be rapidly checked. In addition, the alarm data for abnormal situation of machine unit can be easily stored in the computer.

The self-diagnosis function can be achieved through the control board of outdoor unit, the operation data of several units such as the opening of electronic expansion valve can be shown on the seven-segment digital display of the control board.

With these functions, the period is shortened and the working capacity is reduced for the test run and maintenance work of machine unit.

- Diagnose with the remote control switch

The PCB control board can be checked using the LCD remote control switch (optional). Therefore, the check for PCD will be quick and accurate.

- Data memory of the remote control switch

If the abnormal situation occurs, the LCD remote control switch can display the alarm code for quick fault diagnosis.

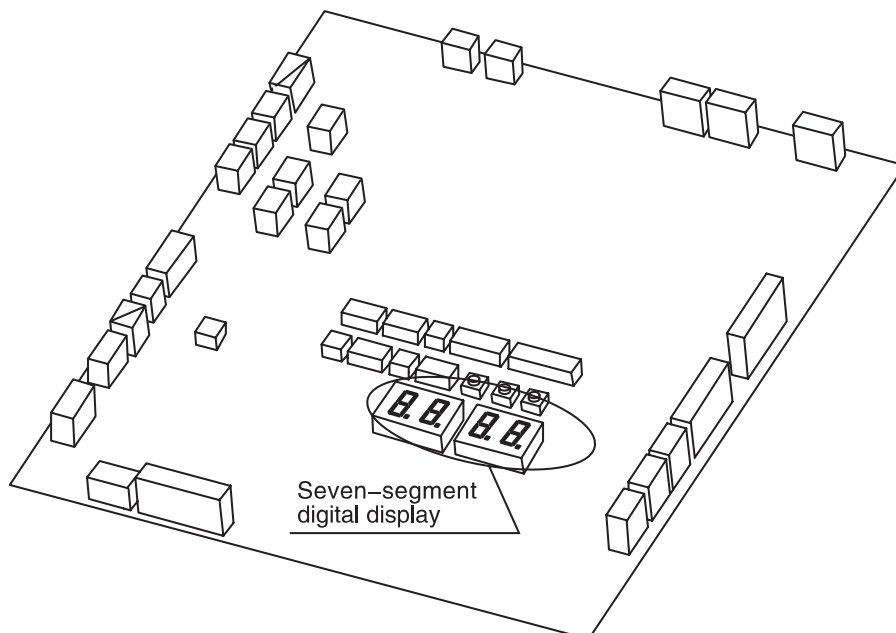
Self-diagnosis function

- Diagnosis is done by using the seven-segment digital display of outdoor unit

The PCB of outdoor unit is equipped with the seven-segment digital display, showing various operation modes, such as:

- Outdoor temperature
- Gas discharge temperature
- Evaporating temperature during heating
- Condensating temperature
- Gas discharge pressure
- Gas suction pressure
- Operation time of compressor

In addition, it can also provide the quick and accurate test run data or normal operation data.



2. General Data

General Data of Outdoor Unit

Model		AVW-38U(C/2)SC	AVW-48U(C/2)SC	AVW-54U(C/2)SC	AVW-48U(E/7)SC	AVW-54U(E/7)SC
Refrigerant		R410A				
Power Supply		AC1Φ, 220~240V/50Hz, 220V/60Hz			AC3Φ, 380~415V/50Hz, 380V/60Hz	
Nominal Cooling Capacity*1)	kW	11.6	14.5	16.0	14.5	16.0
	Btu/h	39,700	49,500	54,600	49,500	54,600
Nominal Cooling Capacity*2)	kW	11.2	14.0	15.5	14.0	15.5
	Btu/h	38,000	47,800	52,900	47,800	52,900
Nominal Heating Capacity	kW	12.5	16.0	18.0	16.0	18.0
	Btu/h	42,700	54,600	61,400	54,600	61,400
Outer Dimensions	(H)	mm	1,380	1,380	1,380	1,380
	(W)	mm	950	950	950	950
	(D)	mm	370	370	370	370
Net Weight	kg	93	95	97	103	103
Type of Compressor		Hermetic DC inverter-driven scroll compressor				
Output Power of Compressor	kW	2.2	2.5	2.8	2.5	2.8
Heat Exchanger		Multi-Pass Cross-Finned Tube				
Condenser Fan Quantity		2	2	2	2	2
Air Flow Rate	m ³ /min.	90	90	100	90	100
Motor Output	W	51 × 2	51 × 2	51 × 2	51 × 2	51 × 2
Sound Pressure Level dB (A)	Cooling/Heating	48/50	48/50	50/52	48/50	50/52
	Night-Shift mode	42	42	45	42	45
Refrigerant Flow Control		Micro-Computer Control Expansion Valve				
Refrigerant Piping		Flare-Nut Connection (With Flare Nuts)				
Liquid Line	mm	Φ9.53				
Gas Line	mm	Φ15.88				
Pipe Connection		Multi-Kit Connection				
Model of Multi-Kit		HFQ-102F				

Notes: 1. The nominal cooling capacity and heating capacity are based on following conditions:

<u>Cooling Operation Conditions</u>	27°C DB (80°F DB)	Heating operation condition:
Indoor Air Inlet Temperature:	*1) 19.5°C WB (67°F WB)	Indoor air inlet temperature: 20°C DB (68°F DB)
	*2) 19.0°C WB (66.2°F WB)	Outdoor air inlet temperature: 7°C DB (45°F DB)
Outdoor Air Inlet Temperature:	35°C DB (95°F DB)	6°C WB (43°F WB)

Pipeline length: 7.5m Pipe Lift: 0m

2. The sound pressure level is based on following conditions:

1.5 meters from floor level, and 1 meter from the unit service cover surface.

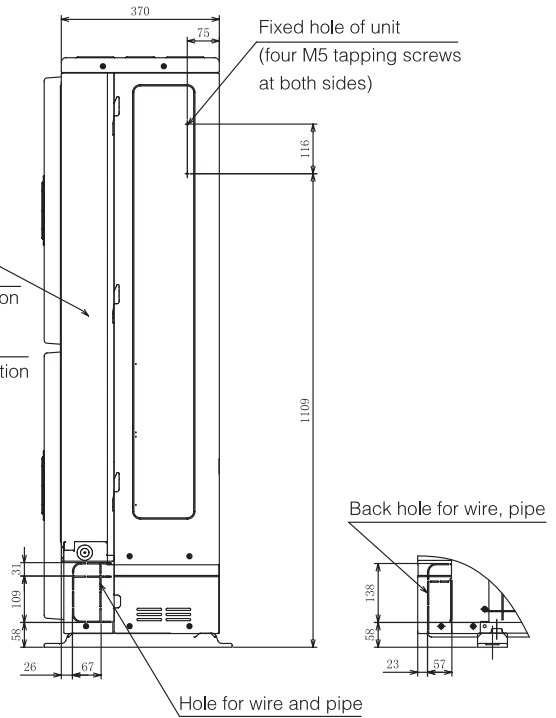
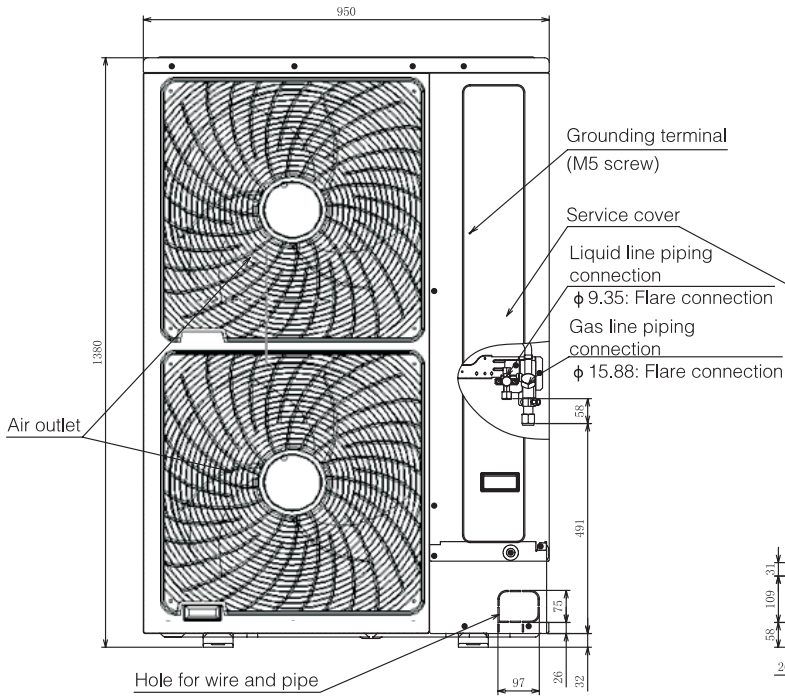
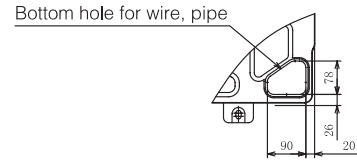
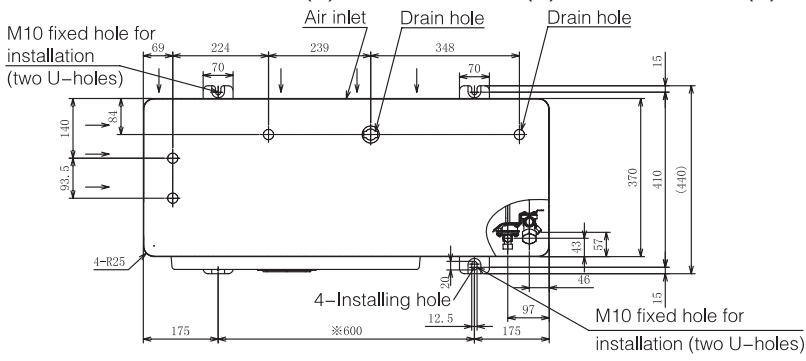
The above data was measured in an anechoic chamber so that reflected sound should be taken into consideration in the field.

3. Dimensional Data

3.1 Dimensional Data of Outdoor Unit

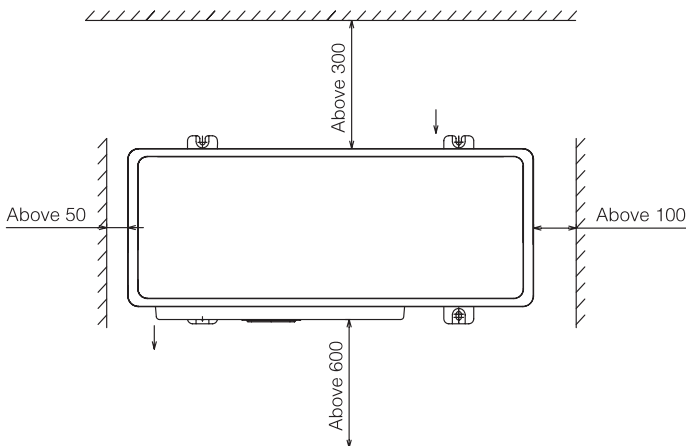
Model: AVW-38UC(2)SC, AVW-48UC(2)SC, AVW-54UC(2)SC, AVW-48UE(7)SC, AVW-54UE(7)SC

Unit: mm

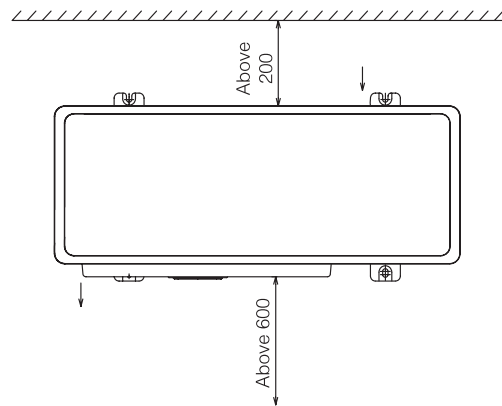


Service space

There are barriers on both sides; and there is no barrier on the upper part.



There are no barriers on both sides and upper part



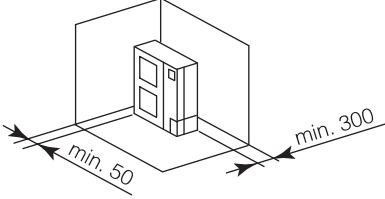
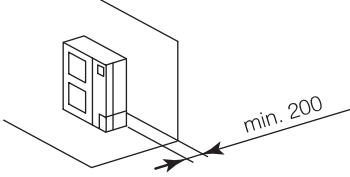
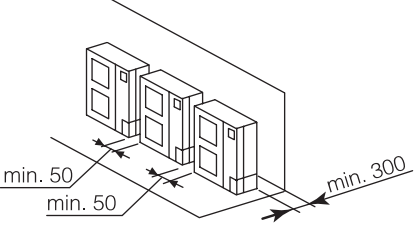
Note:

1. Stop valve is installed in the hood.
2. The interval dimension between fixed bolts for installation is 600x410.

4. Selection Data

4.1 Operation Space

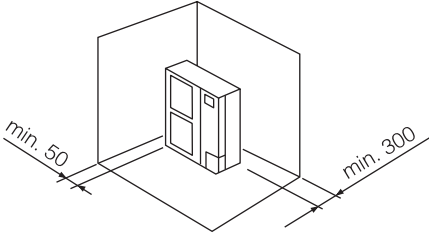
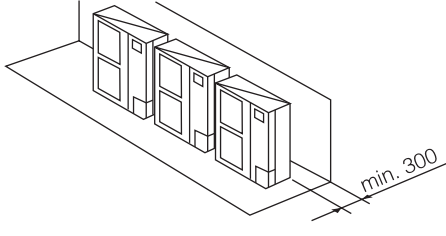
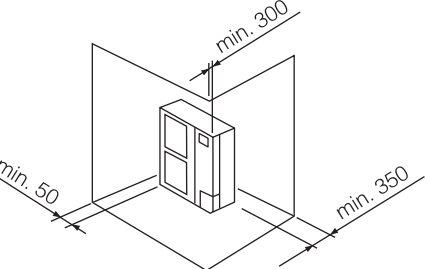
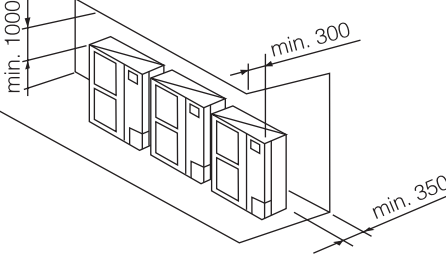
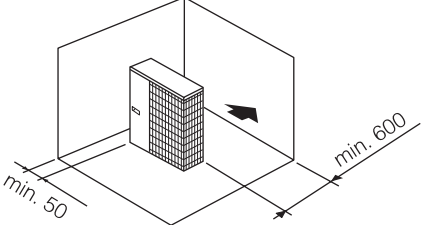
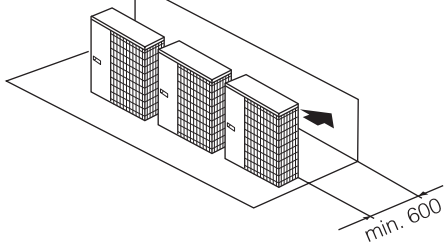
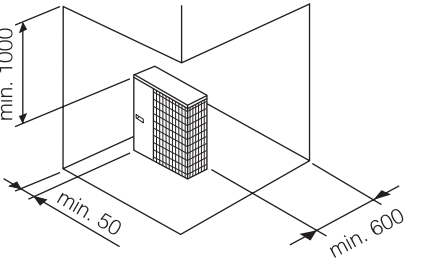
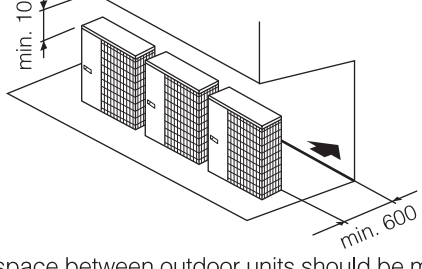
(mm)

Single installation	Single installation	Multiple installation
<p data-bbox="240 292 539 351">Right side and the upper part are open</p> 	<p data-bbox="668 292 967 351">Left side, right side and the upper part are open</p> 	<p data-bbox="1147 227 1353 253">Multiple installation</p> 

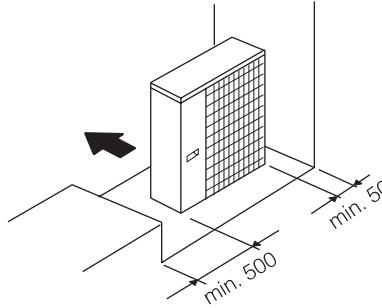
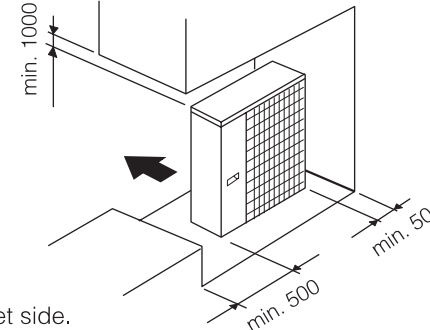
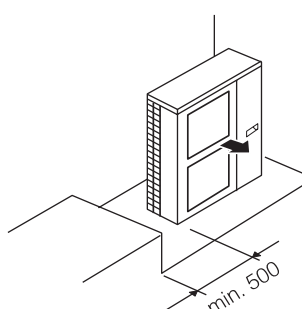
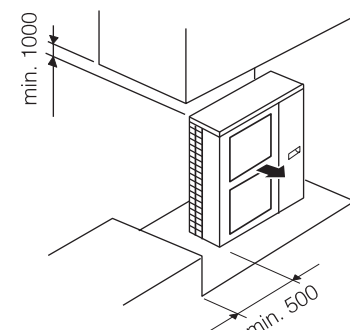
Outdoor unit

There should be sufficient maintenance and service space for the installation of outdoor unit

(mm)

		Situation when there are barriers at air inlet and outlet sides	
		One set is installed	Several sets are installed
Under the situation that there is no barrier at the air inlet side	There is no barrier at the upper part	 <p>The space from the maintenance panel should be more than 50mm. If the left and right sides of outdoor unit are open, the space of more than 300mm should be needed at back side.</p>	 <p>The space between outdoor units should be more than 50mm. There should be no barrier at left and right sides of outdoor unit.</p>
	There is barrier at the upper part	 <p>More than 50mm from each side.</p>	 <p>The space between outdoor units should be more than 50mm. There should be no barrier at left and right sides of outdoor unit.</p>
Under the situation that there is no barrier at the air outlet side	There is no barrier at the upper part	 <p>More than 50mm from each side.</p>	 <p>The space between outdoor units should be more than 50mm. There should be no barrier at left and right sides of outdoor unit.</p>
	There is barrier at the upper part	 <p>More than 50mm from each side.</p>	 <p>The space between outdoor units should be more than 50mm. There should be no barrier at left and right sides of outdoor unit.</p>

Installation space (1)

In case of barriers at left and right sides	
If there is no barrier at the upper part	If one outdoor unit is installed
	
If there is barrier at the upper part	 <p>Put air fluid director at air outlet side.</p>
If there is no barrier at the upper part	
If there is barrier at the upper part	

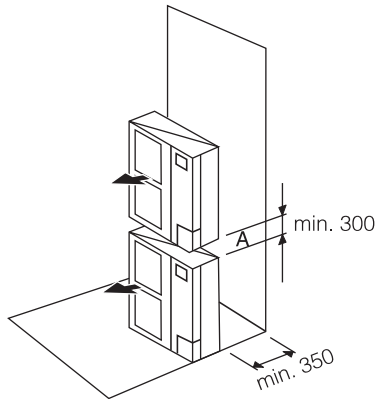
Installation space (2)

Several units are installed															
<p>A Type</p>	<p>If there is no barrier at the upper part</p>	<p>In case of only one unit installed</p> <p>There should be no barriers at left and right sides of outdoor unit. Check and confirm that the air fluid director is used.</p>	<p>Several units are installed</p> <p>The distance of 50mm between the outdoor units should be ensured; there should be no barriers at left and right sides of outdoor; the distance from unit to wall is 500mm (the rear of unit can be directly exposed under sunshine)</p>												
		<p>If there is barrier at the upper part</p> <p>There should be no barriers at left and right sides of outdoor unit. Check and confirm that the air fluid director is used.</p> <p>A dimension table</p> <table border="1"> <thead> <tr> <th>L</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>$0 < L \leq 1/2H$</td> <td>min. 600</td> </tr> <tr> <td>$1/2H < L \leq H$</td> <td>min. 1200</td> </tr> </tbody> </table>	L	A	$0 < L \leq 1/2H$	min. 600	$1/2H < L \leq H$	min. 1200	<p>If there is barrier at the upper part</p> <p>The distance of 50mm between the outdoor units should be ensured. There should be no barriers at left and right sides of outdoor unit. Check and confirm that the air fluid director is used.</p> <p>If $L > H$, the unit should be padded to make $L < H$.</p>						
L	A														
$0 < L \leq 1/2H$	min. 600														
$1/2H < L \leq H$	min. 1200														
<p>B Type</p>	<p>If there is no barrier at the upper part</p>	<p>In case of only one unit installed</p> <p>There should be no barriers at left and right sides of outdoor unit. Check and confirm that the air fluid director is used.</p> <p>A dimension table</p> <table border="1"> <thead> <tr> <th>L</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>$0 < L \leq 1/2H$</td> <td>min. 200</td> </tr> <tr> <td>$1/2H < L \leq H$</td> <td>min. 300</td> </tr> </tbody> </table> <p>If $L > H$, the unit should be padded to make $L < H$.</p>	L	A	$0 < L \leq 1/2H$	min. 200	$1/2H < L \leq H$	min. 300	<p>Several units are installed</p> <p>The distance of 50mm between the outdoor units should be ensured. Three or more units can not be installed at left and right sides of outdoor unit and there should be no barrier at left and right sides of unit. Check and confirm that the air fluid director is used.</p> <p>A dimension table</p> <table border="1"> <thead> <tr> <th>L</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>$0 < L \leq 1/2H$</td> <td>min. 200</td> </tr> <tr> <td>$1/2H < L \leq H$</td> <td>min. 350</td> </tr> </tbody> </table> <p>If $L > H$, the unit should be padded to make $L < H$.</p>	L	A	$0 < L \leq 1/2H$	min. 200	$1/2H < L \leq H$	min. 350
		L	A												
$0 < L \leq 1/2H$	min. 200														
$1/2H < L \leq H$	min. 300														
L	A														
$0 < L \leq 1/2H$	min. 200														
$1/2H < L \leq H$	min. 350														
<p>If there is barrier at the upper part</p> <p>There should be no barriers at left and right sides of outdoor unit. Check and confirm that the air fluid director is used.</p> <p>A dimension table</p> <table border="1"> <thead> <tr> <th>L</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>$0 < L \leq 1/2H$</td> <td>min. 600</td> </tr> <tr> <td>$1/2H < L \leq H$</td> <td>min. 1200</td> </tr> </tbody> </table>	L	A	$0 < L \leq 1/2H$	min. 600	$1/2H < L \leq H$	min. 1200	<p>If there is barrier at the upper part</p> <p>The distance of 50mm between the outdoor units should be ensured. Three or more units can not be installed at left and right sides of outdoor unit and there should be no barrier at left and right sides of unit. Check and confirm that the air fluid director is used.</p> <p>If $L > H$, the unit should be padded to make $L < H$.</p>								
L	A														
$0 < L \leq 1/2H$	min. 600														
$1/2H < L \leq H$	min. 1200														

Installation space (3)

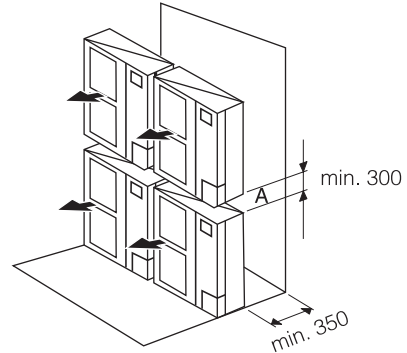
Installation at vertical direction (two sets in maximum)

One is vertically installed

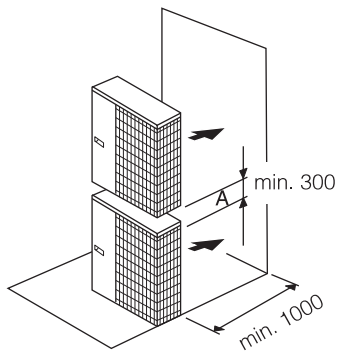


Padding the "A" space to avoid the air inlet and outlet short-circuit, do not make the condensation water drop from upper outdoor unit.

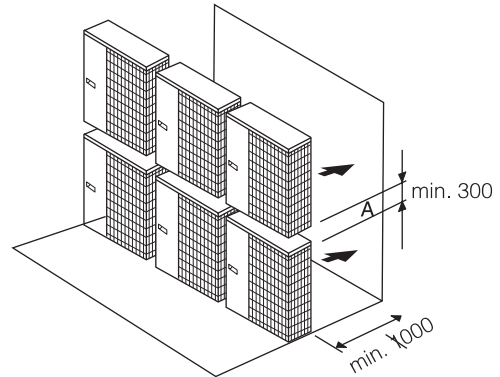
Several sets are vertically installed



If the space between outdoor units is more than 50mm, the number of outdoor unit can not exceed three. There should be no barrier at both sides of machine unit. Padding the "A" space to avoid the air inlet and outlet short-circuit; do not make the condensation water drop from upper outdoor unit.



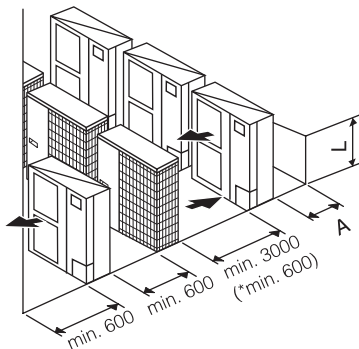
Padding the "A" space to avoid the air inlet and outlet short-circuit, do not make the condensation water drop from upper outdoor unit.



In case of that the space between outdoor units is more than 50mm, the number of outdoor unit can not exceed three. There should be no barrier at both sides of machine unit. Padding the "A" space to avoid the air inlet and outlet short-circuit; do not make the condensation water drop from upper outdoor unit.

Installation space (4)

Several units are installed simultaneously



The side distance of machine should be more than 50mm

Dimensions are as follows:

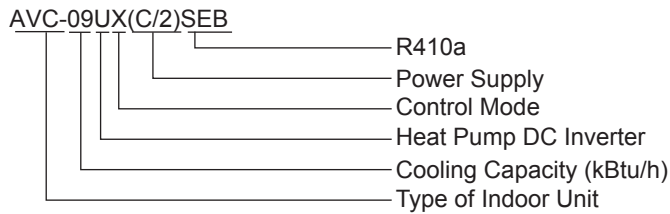
L	A
$0 < L \leq 1/2H$	min. 200
$1/2H < L \leq H$	min. 300

If $L > H$, the unit should be padded to make $L < H$.

Ensure the converter is used if the dimension is marked with "*"

4.2 Selection Guide

(1) Model Description



Indoor Unit Type

Ceiling Ducted Type (Low Static Pressure)	AVD
Ceiling Ducted Type (High Static Pressure)	AVD
Low-Height Ceiling Ducted Type	AVE
Low-Height Ceiling Ducted Type (DC)	AVE
Slim Ceiling Ducted Type	AVE
1-Way Cassette Type	AVY
2-Way Cassette Type	AVL
4-Way Cassette Type	AVC
Compact 4-Way Cassette Type	AVC
Wall-Mounted Type	AVS
Ceiling and Floor Type	AVV
Floor-Concealed Type	AVH

Note:

When selecting the indoor unit and outdoor unit, the total capacity of indoor units should match with that of outdoor unit.

(2) Indoor Unit Standard Capacity

Horsepower(HP) Capacity		0.8	1.0	1.3	1.5	1.8	2.0	2.3
Cooling Capacity	kW	2.2	2.8	3.6	4.3	5.0	5.6	6.3
	kcal/h	1,900	2,400	3,100	3,700	4,300	4,800	5,400
	Btu/h	7,500	9,600	12,300	14,700	17,000	19,100	21,500
Heating Capacity	kW	2.5	3.3	4.2	4.9	5.6	6.5	7.5
	kcal/h	2,100	2,800	3,600	4,200	4,800	5,600	6,500
	Btu/h	8,500	11,100	14,300	16,700	19,100	22,200	25,600

Horsepower(HP) Capacity		2.5	3.0	3.3	4.0	5.0	6.0
Cooling Capacity	kW	7.1	8.4	9.0	11.2	14.2	16.0
	kcal/h	6,100	7,200	7,700	9,600	12,200	13,800
	Btu/h	24,200	28,700	31,700	38,000	48,400	54,600
Heating Capacity	kW	8.5	9.6	10.0	13.0	16.3	18.0
	kcal/h	7,300	8,300	8,600	11,200	14,000	15,500
	Btu/h	29,000	32,800	34,100	44,400	55,500	61,400

(3) Standard Capacity of Outdoor Unit:

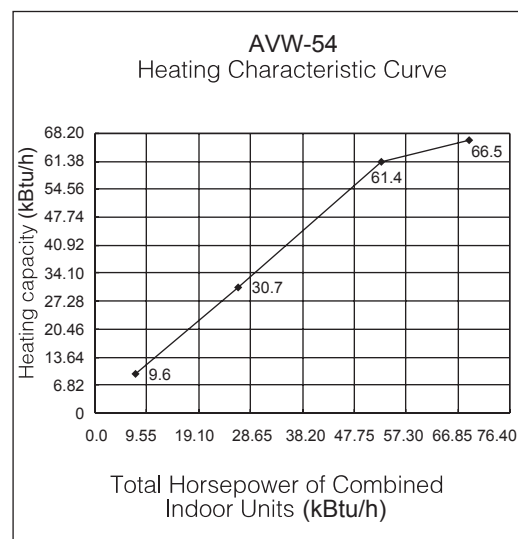
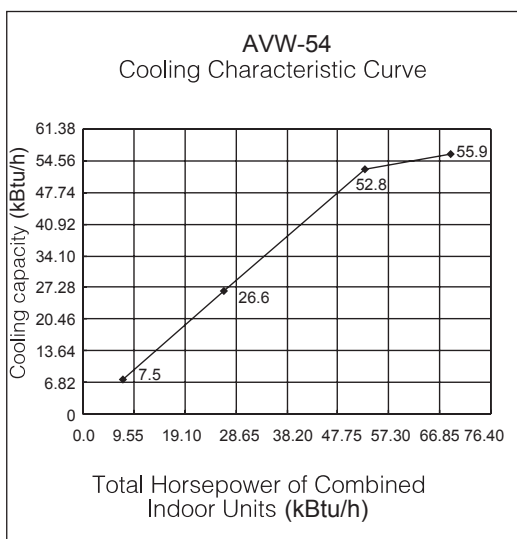
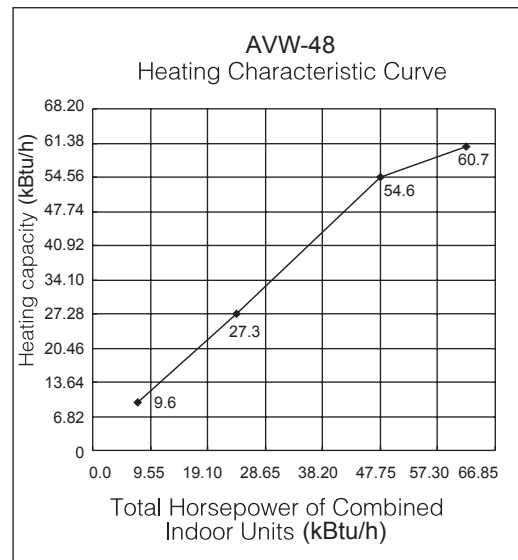
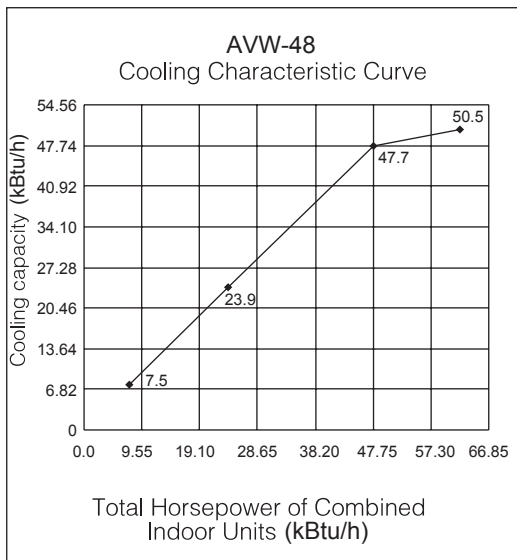
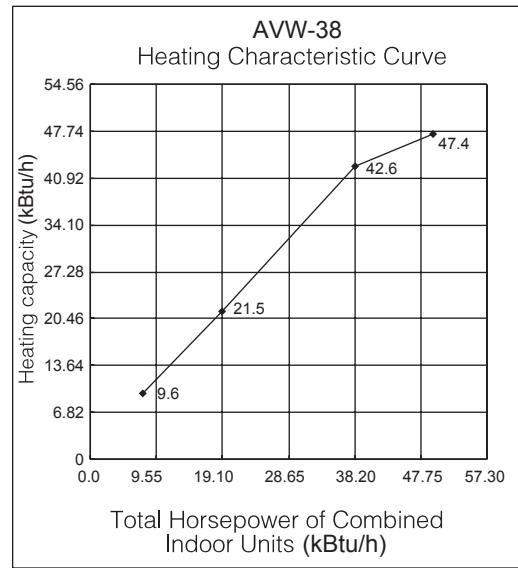
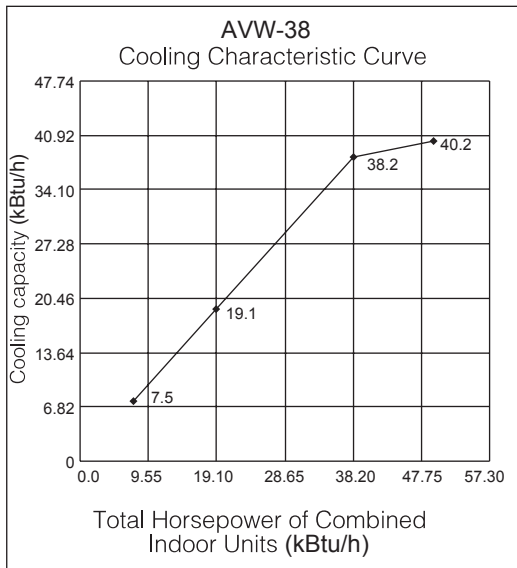
Model		AVW-38U(C/2)SC	AVW-48U(C/2)SC	AVW-54U(C/2)SC	AVW-48U(E/7)SC	AVW-54U(E/7)SC
Power Supply		AC1Φ, 220~240V/50Hz, 220V/60Hz			AC3Φ, 380~415V/50Hz, 380V/60Hz	
Cooling Capacity	kW	11.2	14.0	15.5	14.0	10.0
	kcal/h	9,600	12,000	13,300	12,000	13,300
	Btu/h	38,200	47,800	52,900	47,800	52,900
Heating Capacity	kW	12.5	16.0	18.0	16.0	10.0
	kcal/h	10,800	13,800	15,500	13,800	15,500
	Btu/h	42,700	54,600	61,500	54,600	61,400

(4) The standard capacity of outdoor unit is referred as the total capacity of all indoor units equals to that of outdoor unit (Combination rate is 100%). Please refer to the parameter shown in 4.3 "Capacity Performance Curve of Outdoor Unit", if the total capacity of all indoor units does not equal to that of outdoor unit.

(5) Maximum actual capacity of outdoor unit

Maximum actual capacity of outdoor unit = (capacity of outdoor unit under nominal working condition X correction factor of capacity of all indoor units X pipe length and height difference correction factor X working temperature correction factor).

4.3 Capacity Performance Curve of Outdoor Unit

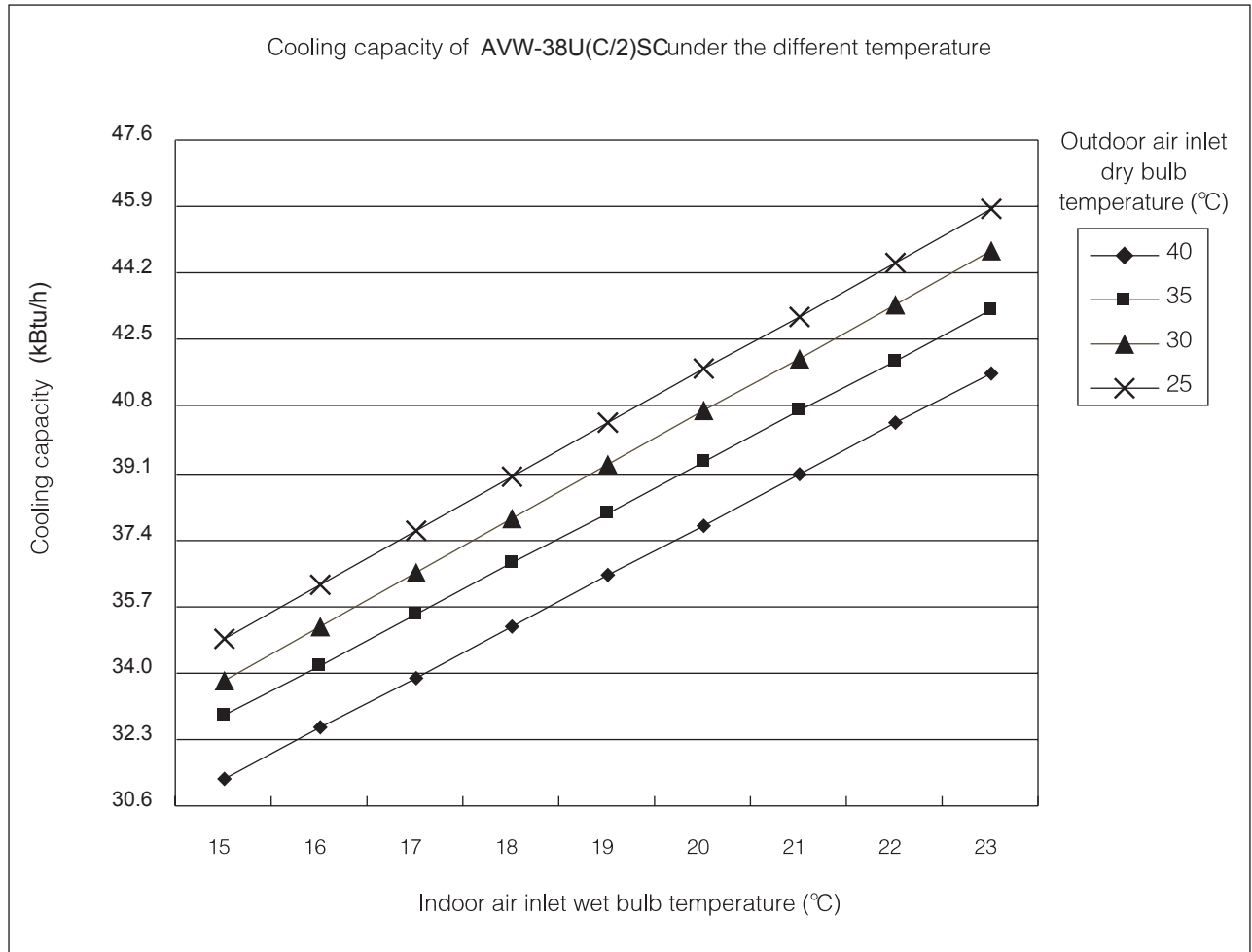


4.4 Temperature Correction in Cooling Operation

1. AVW-38U(C/2)SC

Cooling Temperature Correction Factor of AVW-38U(C/2)SC									
Indoor air inlet wet bulb temperature (°C) \ Outdoor air inlet dry bulb temperature (°C)	15	16	17	18	19	20	21	22	23
40	0.82	0.86	0.89	0.92	0.96	0.99	1.03	1.06	1.09
35	0.86	0.90	0.93	0.97	1.00	1.03	1.07	1.10	1.14
30	0.89	0.92	0.96	1.00	1.03	1.07	1.10	1.14	1.18
25	0.92	0.95	0.99	1.02	1.06	1.10	1.13	1.17	1.20

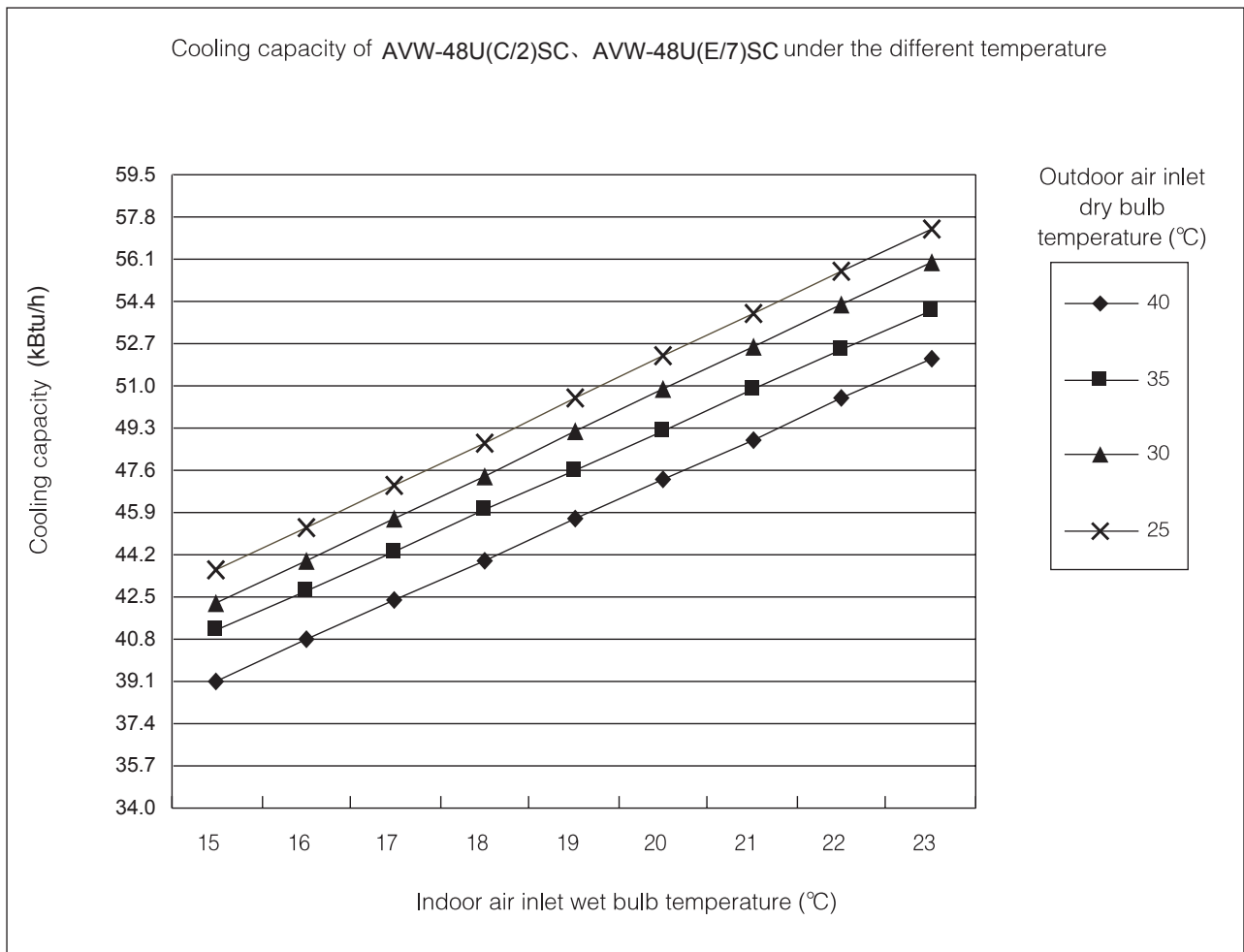
Cooling Capacity of AVW-38U(C/2)SC Under the Different Temperature									
									Unit: kBtu/h
Indoor air inlet wet bulb temperature (°C) \ Outdoor air inlet dry bulb temperature (°C)	15	16	17	18	19	20	21	22	23
40	31.3	32.8	34.0	35.1	36.7	37.8	39.3	40.5	41.6
35	32.8	34.4	35.5	37.0	38.2	39.3	40.9	42.0	43.5
30	34.0	35.1	36.7	38.2	39.3	40.9	42.0	43.5	45.1
25	35.1	36.3	37.8	39.0	40.5	42.0	43.2	44.7	45.8



2. AVW-48U(C/2)SC、AVW-48U(E/7)SC

Cooling Temperature Correction Factor of AVW-48U(C/2)SC、AVW-48U(E/7)SC									
Indoor air inlet wet bulb temperature (°C) \ Outdoor air inlet dry bulb temperature (°C)	15	16	17	18	19	20	21	22	23
40	0.82	0.86	0.89	0.92	0.96	0.99	1.03	1.06	1.09
35	0.86	0.90	0.93	0.97	1.00	1.03	1.07	1.10	1.14
30	0.89	0.92	0.96	1.00	1.03	1.07	1.10	1.14	1.18
25	0.92	0.95	0.99	1.02	1.06	1.10	1.13	1.17	1.20

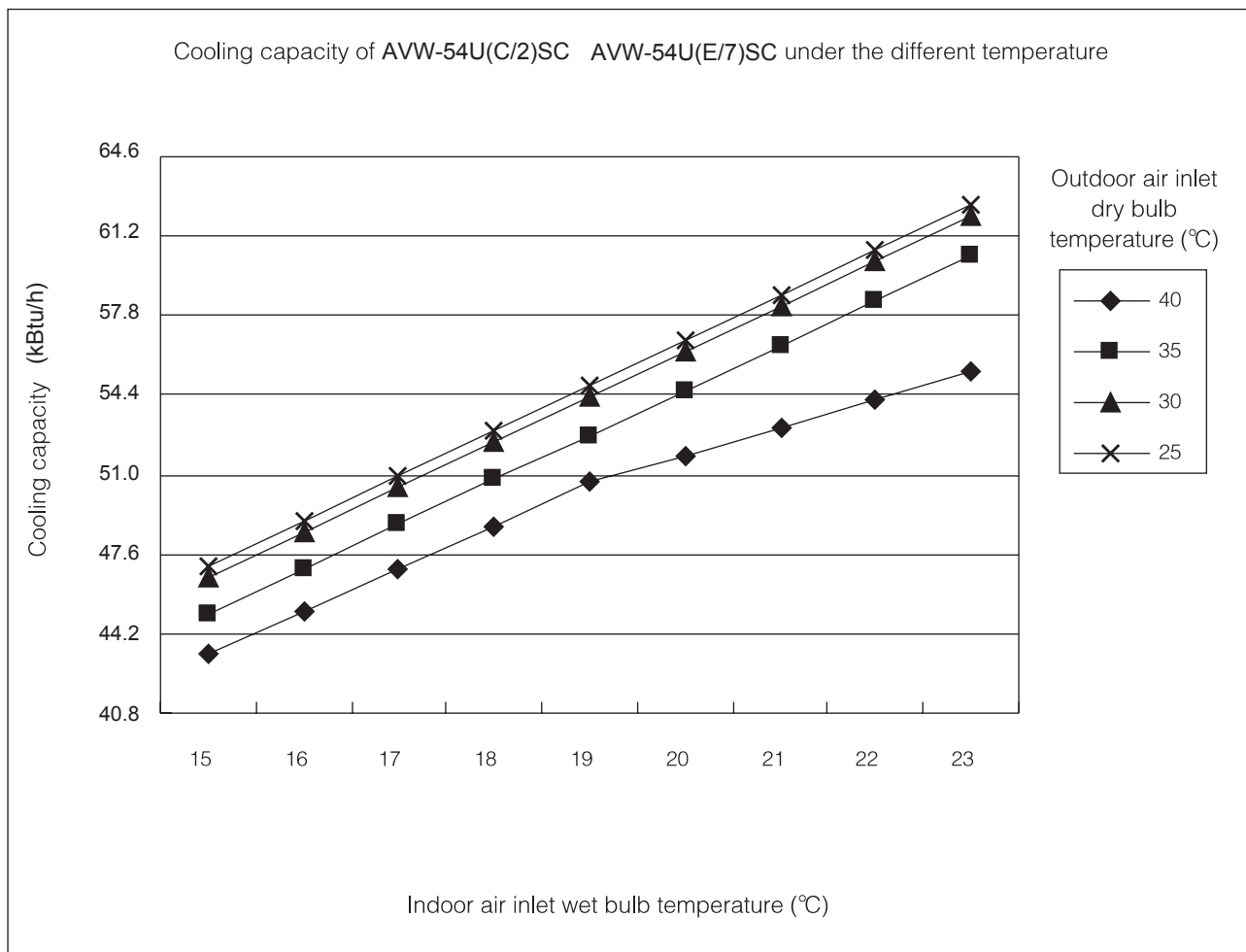
Cooling Capacity of AVW-48U(C/2)SC、AVW-48U(E/7)SC Under the Different Temperature Unit: kBtu/h									
Indoor air inlet wet bulb temperature (°C) \ Outdoor air inlet dry bulb temperature (°C)	15	16	17	18	19	20	21	22	23
40	39.2	41.1	42.5	44.0	45.9	47.3	49.2	50.7	52.1
35	41.1	43.0	44.5	46.4	47.8	49.2	51.1	52.6	54.5
30	42.5	44.0	45.9	47.8	49.2	51.1	52.6	54.5	56.4
25	44.0	45.4	47.3	48.8	50.7	52.6	54.0	55.9	57.4



3. AVW-54U(C/2)SC

		Cooling Temperature Correction Factor of AVW-54U(C/2)SC AVW-54U(E/7)SC								
Indoor air inlet wet bulb temperature (°C)	Outdoor air inlet dry bulb temperature (°C)	15	16	17	18	19	20	21	22	23
		40	0.82	0.86	0.89	0.93	0.96	0.98	1.01	1.03
35	0.85	0.89	0.93	0.96	1.00	1.04	1.07	1.11	1.15	
30	0.88	0.92	0.96	0.99	1.03	1.07	1.10	1.14	1.18	
25	0.89	0.93	0.97	1.00	1.04	1.08	1.11	1.15	1.19	

		Cooling Capacity of AVW-54U(C/2)SC AVW-54U(E/7)SC Under the Different Temperature Unit: kBtu/h								
Indoor air inlet wet bulb temperature (°C)	Outdoor air inlet dry bulb temperature (°C)	15	16	17	18	19	20	21	22	23
		40	43.4	45.5	47.1	49.2	50.8	51.8	53.4	54.5
35	45.0	47.1	49.2	50.8	52.9	55.0	56.6	58.7	60.8	
30	46.6	48.7	50.8	52.4	54.5	56.6	58.2	60.3	62.4	
25	47.1	49.2	51.3	52.9	55.0	57.1	58.7	60.8	63.0	

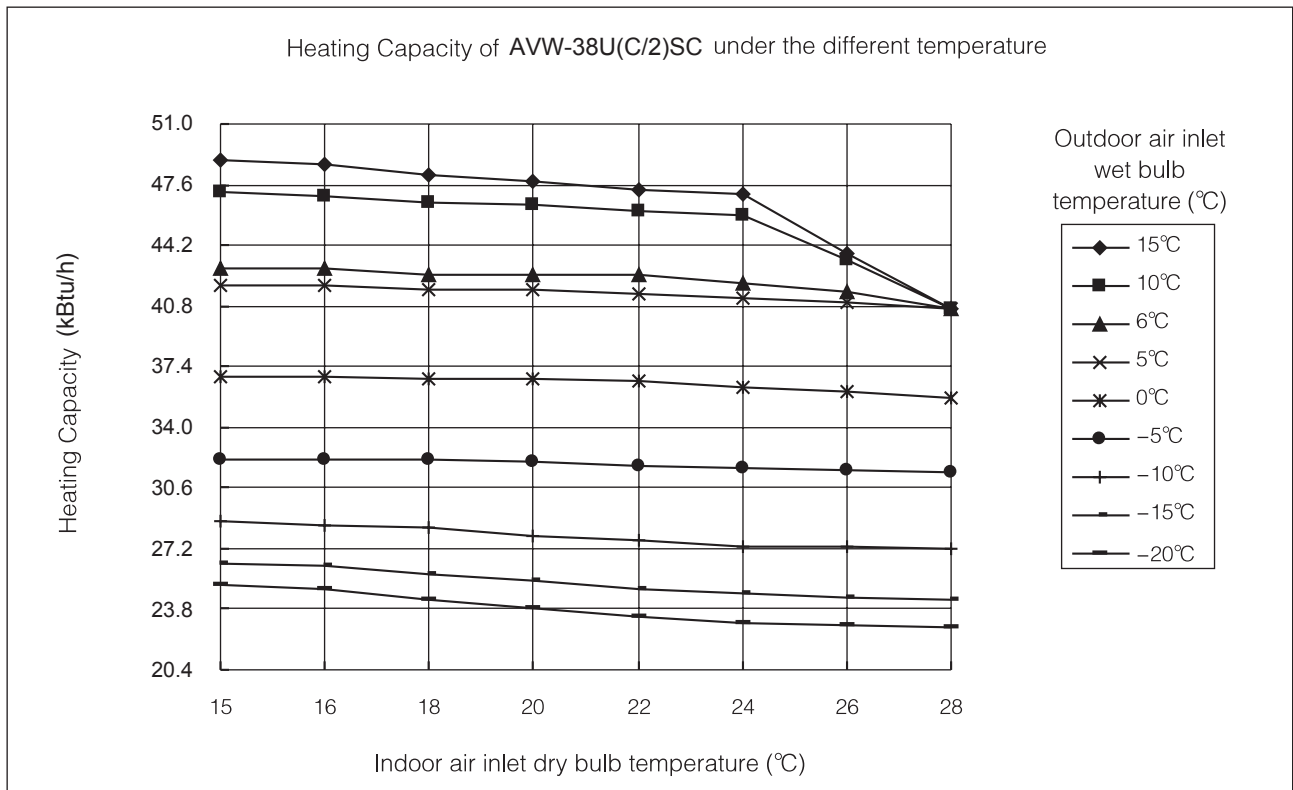


4.5 Temperature Correction in Heating Operation

1. AVW-38U(C/2)SC

Indoor air inlet dry bulb temperature (°C) \ Outdoor air inlet wet bulb temperature (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	1.15	1.15	1.13	1.13	1.11	1.11	1.03	0.96
10°C	1.11	1.10	1.10	1.09	1.09	1.08	1.02	0.96
6°C	1.01	1.01	1.00	1.00	1.00	0.99	0.98	0.96
5°C	0.99	0.99	0.98	0.98	0.98	0.97	0.96	0.96
0°C	0.87	0.87	0.86	0.86	0.86	0.85	0.85	0.84
-5°C	0.76	0.76	0.76	0.75	0.75	0.75	0.74	0.74
-10°C	0.68	0.67	0.67	0.66	0.65	0.64	0.64	0.64
-15°C	0.62	0.62	0.61	0.60	0.59	0.58	0.58	0.57
-20°C	0.59	0.59	0.57	0.56	0.55	0.54	0.54	0.54

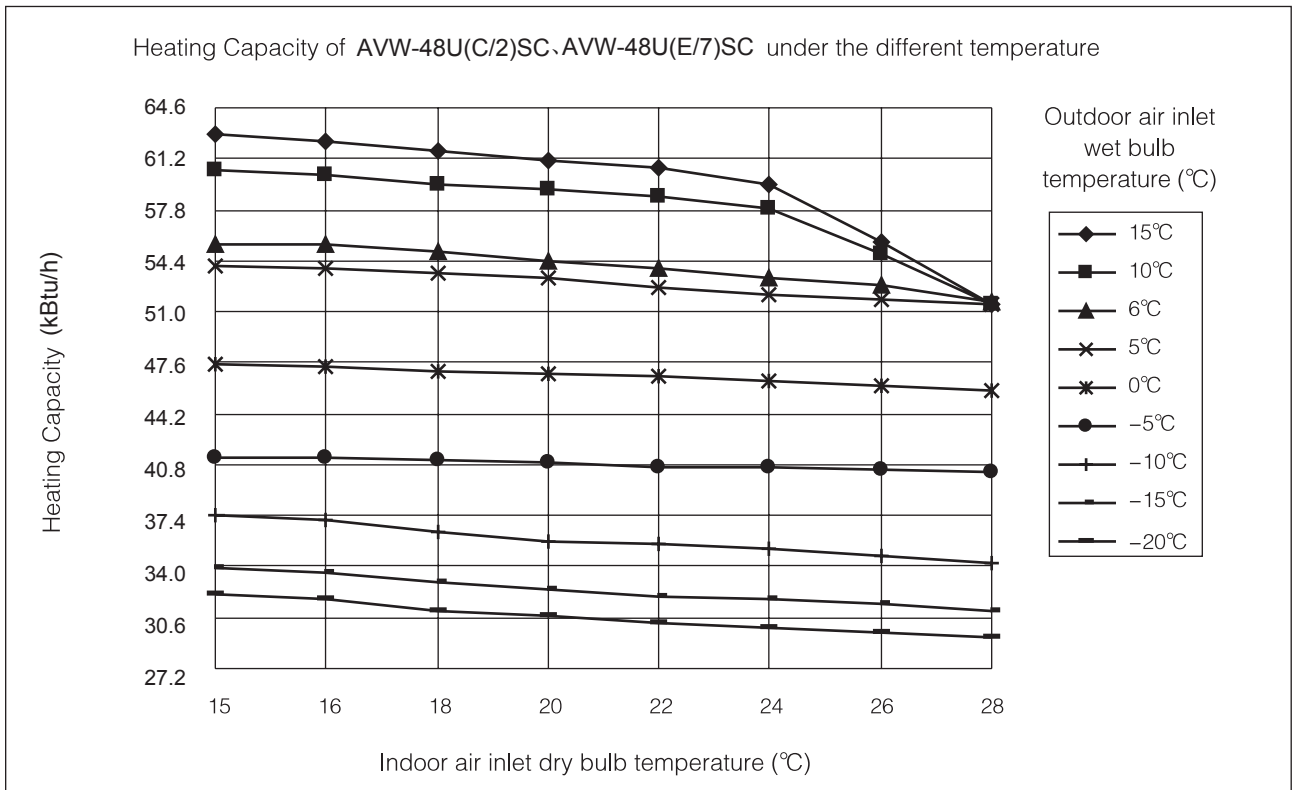
Indoor air inlet dry bulb temperature (°C) \ Outdoor air inlet wet bulb temperature (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	49.1	49.1	48.3	48.3	47.4	47.4	44.0	41.0
10°C	47.4	47.0	47.0	46.5	46.5	46.1	43.6	41.0
6°C	43.1	43.1	42.7	42.7	42.7	42.3	41.8	41.0
5°C	42.3	42.3	41.8	41.8	41.8	41.4	41.0	41.0
0°C	37.1	37.1	36.7	36.7	36.7	36.3	36.3	35.9
-5°C	32.5	32.5	32.5	32.0	32.0	32.0	31.6	31.6
-10°C	29.0	28.6	28.6	28.2	27.8	27.3	27.3	27.3
-15°C	26.5	26.5	26.0	25.6	25.2	24.8	24.8	24.3
-20°C	25.2	25.2	24.3	23.9	23.5	23.1	23.1	23.1



2. AVW-48U(C/2)SC、AVW-48U(E/7)SC

Heating Temperature Correction Factor of AVW-48U(C/2)SC、AVW-48U(E/7)SC								
Indoor air inlet dry bulb temperature (°C) \ Outdoor air inlet wet bulb temperature (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	1.15	1.15	1.13	1.12	1.11	1.09	1.02	0.95
10°C	1.11	1.11	1.09	1.09	1.08	1.06	1.01	0.95
6°C	1.02	1.02	1.01	1.00	0.99	0.98	0.97	0.95
5°C	0.99	0.99	0.99	0.98	0.97	0.96	0.95	0.95
0°C	0.87	0.87	0.87	0.86	0.86	0.85	0.85	0.84
-5°C	0.76	0.76	0.75	0.75	0.75	0.75	0.74	0.74
-10°C	0.69	0.68	0.67	0.66	0.65	0.65	0.64	0.63
-15°C	0.62	0.62	0.61	0.60	0.59	0.59	0.58	0.57
-20°C	0.59	0.59	0.57	0.57	0.56	0.55	0.54	0.54

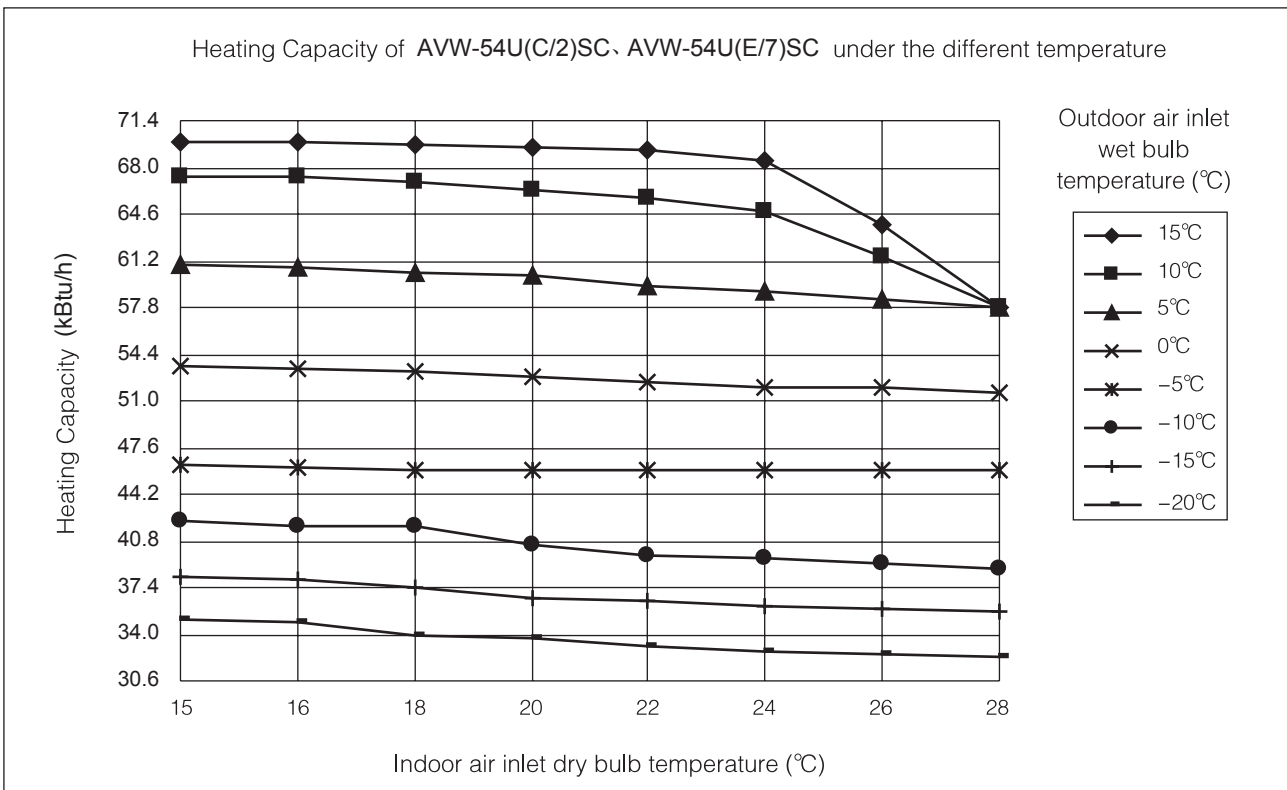
Heating Capacity of AVW-48U(C/2)SC、AVW-48U(E/7)SC Under the Different Temperature									Unit: kBtu/h
Indoor air inlet dry bulb temperature (°C) \ Outdoor air inlet wet bulb temperature (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C	
15°C	62.8	62.8	61.7	61.2	60.6	59.5	55.7	51.9	
10°C	60.6	60.6	59.5	59.5	59.0	57.9	55.1	51.9	
6°C	55.7	55.7	55.1	54.6	54.1	53.5	53.0	51.9	
5°C	54.1	54.1	54.1	53.5	53.0	52.4	51.9	51.9	
0°C	47.5	47.5	47.5	47.0	47.0	46.4	46.4	45.9	
-5°C	41.5	41.5	41.0	41.0	41.0	41.0	40.4	40.4	
-10°C	37.7	37.1	36.6	36.0	35.5	35.5	34.9	34.4	
-15°C	33.9	33.9	33.3	32.8	32.2	32.2	31.7	31.1	
-20°C	32.2	32.2	31.1	31.1	30.6	30.0	29.5	29.5	



3. AVW-54U(C/2)SC、AVW-54U(E/7)SC

Heating Temperature Correction Factor of								
Indoor air inlet dry bulb temperature (°C) \ Outdoor air inlet wet bulb temperature (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	1.14	1.14	1.14	1.14	1.13	1.12	1.04	0.94
10°C	1.10	1.10	1.09	1.09	1.07	1.06	1.01	0.94
6°C	1.01	1.01	1.01	1.00	0.99	0.98	0.97	0.94
5°C	0.99	0.99	0.99	0.98	0.97	0.96	0.95	0.94
0°C	0.87	0.87	0.87	0.86	0.86	0.85	0.85	0.84
-5°C	0.76	0.75	0.75	0.75	0.75	0.75	0.75	0.75
-10°C	0.69	0.69	0.68	0.66	0.65	0.65	0.64	0.63
-15°C	0.62	0.62	0.61	0.60	0.59	0.59	0.59	0.58
-20°C	0.57	0.57	0.55	0.55	0.54	0.54	0.53	0.53

Heating Capacity of AVW-54U(C/2)SC、AVW-54U(E/7)SC Under the Different Temperature Unit: kBtu/h								
Indoor air inlet dry bulb temperature (°C) \ Outdoor air inlet wet bulb temperature (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	70.0	70.0	70.0	70.0	69.4	68.8	63.9	57.7
10°C	67.5	67.5	66.9	66.9	65.7	65.1	62.0	57.7
6°C	62.0	62.0	62.0	61.4	60.8	60.2	59.6	57.7
5°C	60.8	60.8	60.8	60.2	59.6	58.9	58.3	57.7
0°C	53.4	53.4	53.4	52.8	52.8	52.2	52.2	51.6
-5°C	46.7	46.1	46.1	46.1	46.1	46.1	46.1	46.1
-10°C	42.4	42.4	41.8	40.5	39.9	39.9	39.3	38.7
-15°C	38.1	38.1	37.5	36.8	36.2	36.2	36.2	35.6
-20°C	35.0	35.0	33.8	33.8	33.2	33.2	32.5	32.5



4.6 Piping Length Correction Factor

Correction factor of cooling capacity of unit and corresponding pipe length

The cooling capacity can be corrected according to the following formula:

$$CCA = CC \times F$$

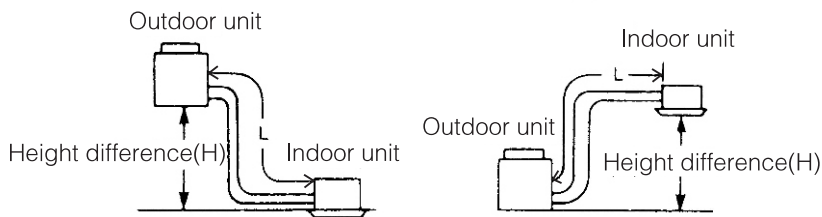
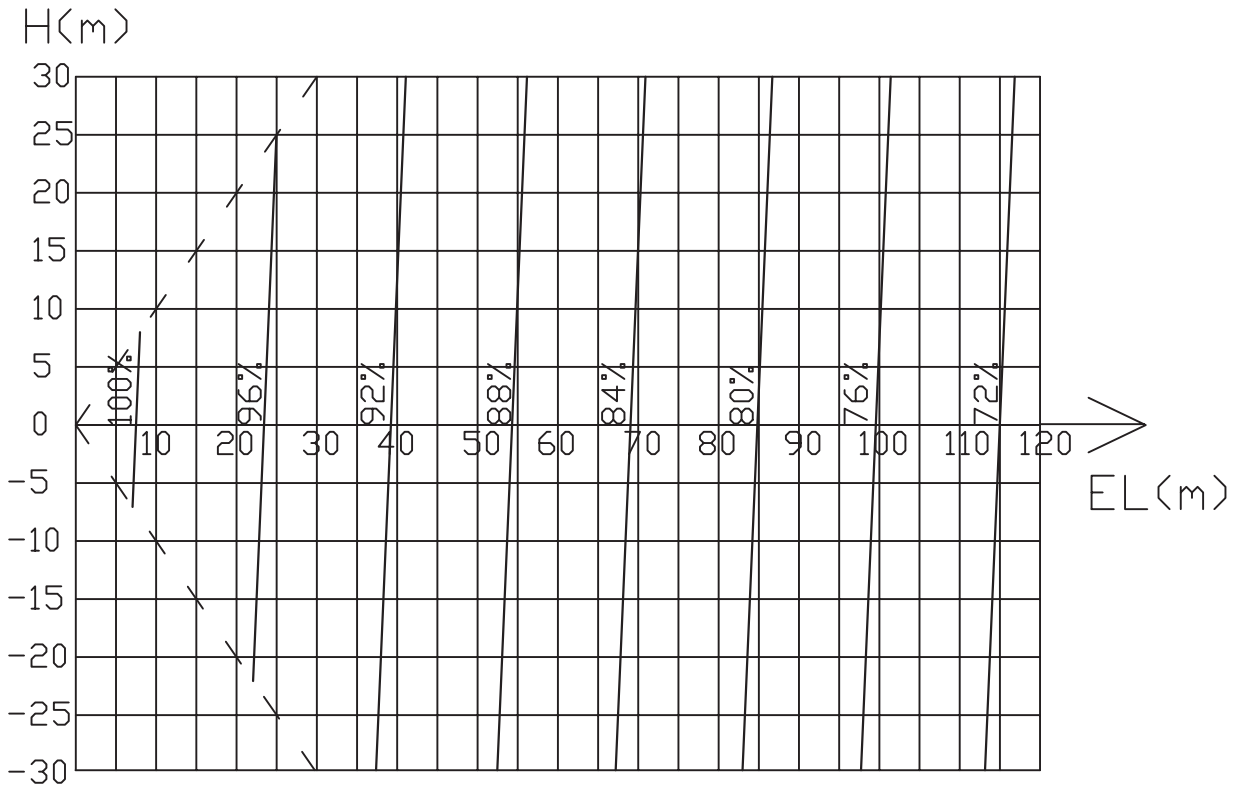
CCA: Actual cooling capacity after correction (kW)

CC: Cooling capacity in the system capacity characteristic table (kW)

F: The correction factor can be found in the following curve based on the equivalent pipe length

For other pipeline accessories, it can be considered based on the equivalent pipeline length:

- One 90° elbow is equivalent to 0.5m;
- One 180° bend is equivalent to 1.5m;
- One multi-kit is equivalent to 0.5m;



H: Vertical distance between the indoor unit and outdoor unit (m)

EL: Equivalent total distance between the indoor unit and outdoor unit (m)
(equivalent one-way piping length)

H>0: Installation position of outdoor unit is higher than that of indoor unit

L: Actual one-way piping length between the indoor unit and outdoor unit (m)

Correction factor of heating capacity of unit and corresponding pipe length

The heating capacity can be corrected according to the following formula:

$$HCA = HC \times F$$

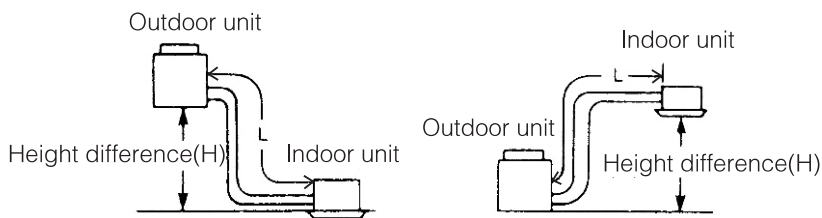
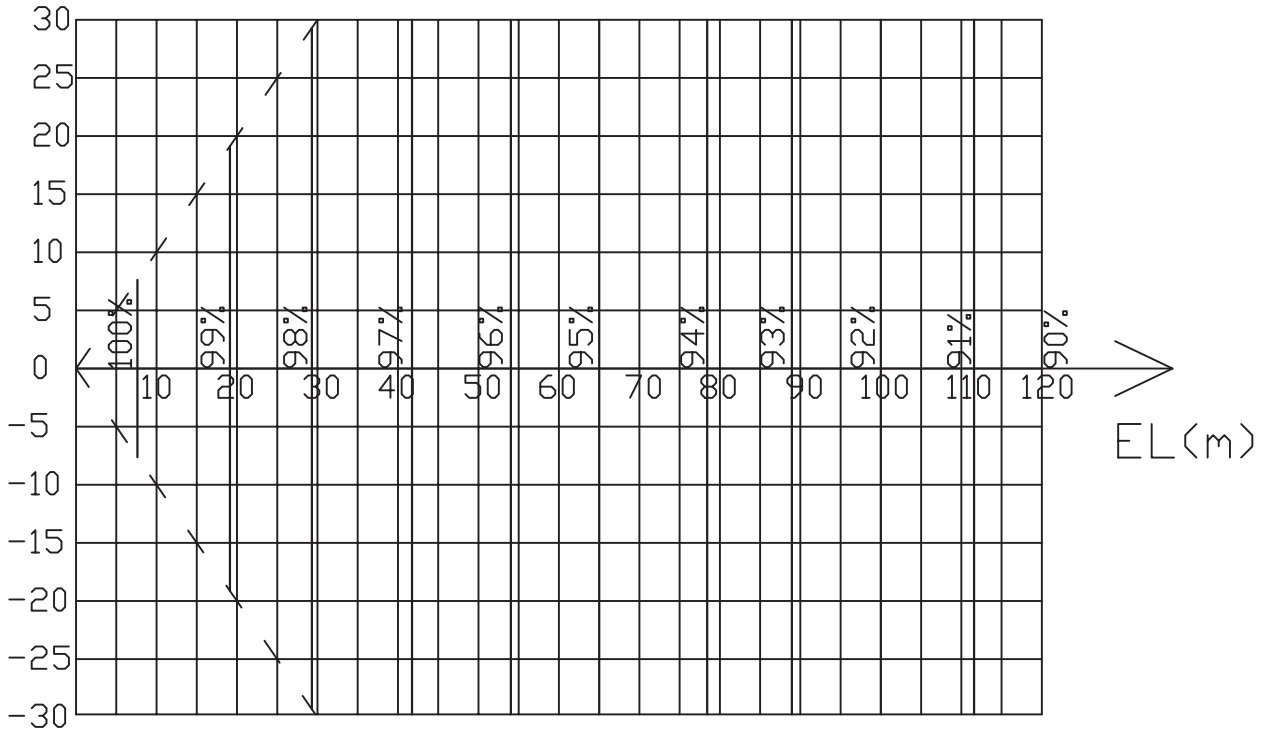
HCA: Actual heating capacity after correction (kW)
 HC: Heating capacity in the system capacity characteristic table (kW)

F: The correction factor can be found in the following curve based on the equivalent pipe length

For other pipeline accessories, it can be considered based on the equivalent pipeline length:

- One 90° elbow is equivalent to 0.5m;
- One 180° bend is equivalent to 1.5m;
- One multi-kit is equivalent to 0.5m;

H(m)



H: Vertical distance between the indoor unit and outdoor unit (m)

EL: Equivalent total distance between the indoor unit and outdoor unit (m)
 (equivalent one-way piping length)

H>0: Installation position of outdoor unit is higher than that of indoor unit

L: Actual one-way piping length between the indoor unit and outdoor unit (m)

4.7 Defrosting Correction Factor

The frosting situation of unit or defrosting operation process is not considered in the heating capacity of unit shown in the above table.

Considering the frosting situation and defrosting operation process, the heating capacity of unit can be corrected based on the following formula.

Correction value of heating capacity = Correction factor X heating capacity

Outdoor dry bulb temperature (°CDB) (relative humidity is 85% RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.0

Note: The correction factor is not available for the operation of unit under special situation, such as in snow weather or in the conversion process for operation mode.

5. Electrical Data

Outdoor Units

Model	Unit Main Power			Applicable Voltage		STC	Cooling Operation		Heating Operation		MAX. Current
	VOL	PH	HZ	Maximum	Minimum		RNC	IPT	RNC	IPT	MRC
AVW-38UCSC	220-240V	1	50	264	198	1A	15.1	3.25	15.5	3.33	28.0
AVW-48UCSC							20.0	4.32	21.6	4.64	28.0
AVW-54UCSC							24.3	5.25	26.0	5.58	28.0
AVW-38U2SC	220	1	60	242	198		15.1	3.25	15.5	3.33	28.0
AVW-48U2SC							20.0	4.32	21.6	4.64	28.0
AVW-54U2SC							24.3	5.25	26.0	5.58	28.0
AVW-48UESC	380-415V	3	50	456	342		6.62	3.92	6.80	4.03	16.2
AVW-54UESC							7.50	4.44	8.00	4.74	16.2
AVW-48U7SC	380	3	60	418	342		6.62	3.92	6.80	4.03	16.2
AVW-54U7SC							7.50	4.44	8.00	4.74	16.2

STC: Starting Current (A)

RNC: Running Current (A)

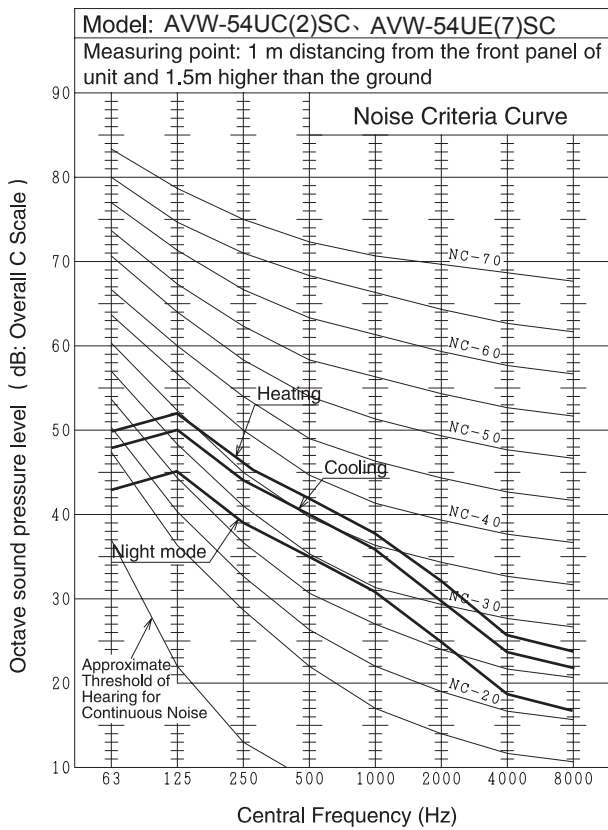
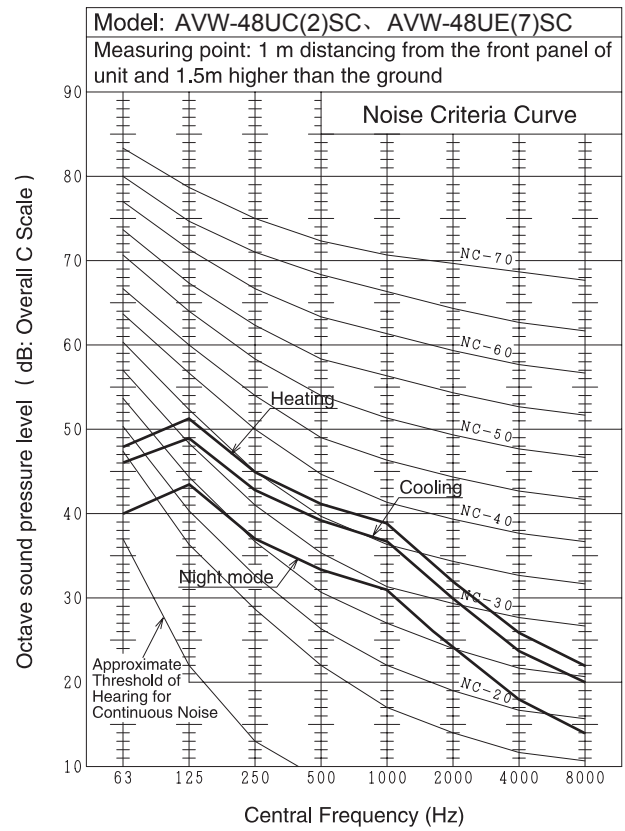
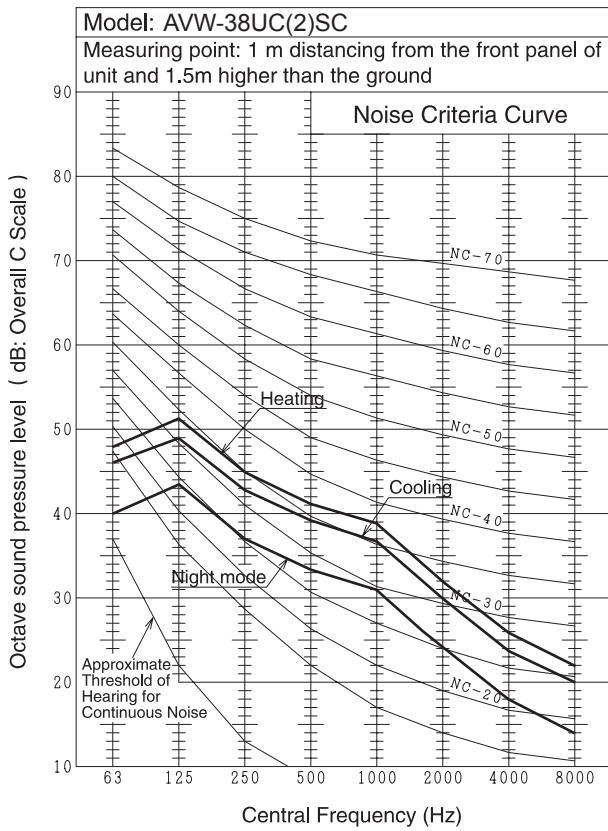
IPT: Input (kW)

MRC: Maximum Running Current (A)

Notes:

- 1 All the field wiring and equipment must comply with local codes.
- 2 The above compressor data is based on 100% capacity combination of the indoor units and rated operating frequency.
- 3 The above performance is based on 7.5m equivalent piping length and 0m piping lift.
- 4 These data are based on the same conditions as the nominal heating and cooling capacities.
- 5 The compressor is started by an inverter, resulting in extremely low starting current.

6. Sound Data



7. Working Range

Power Supply

- Working Voltage: 90%~110% of the rated voltage;
- Voltage Imbalance: The voltage deviation of each phase measured at main power wire end should be within 3%.
- Starting Voltage: It should be higher than 85% of the rated voltage.

Temperature Range

Temperature range is shown in the following table:

Temperature (°C)

		Maximum	Minimum
Cooling Operation	Indoor	23 WB	15 WB
	Outdoor	43(48)* DB	-5 DB
Heating Operation	Indoor	30 DB	15 DB
	Outdoor	15.5 WB	-20 WB

DB: Dry Bulb WB: Wet Bulb

- * Once F2=1 in function setting, the max. running condition temperature is 48°C in cooling mode. The ODU is intermittent running from 48°C to 50°C .

8. Component Data

Heat exchanger and fan of outdoor unit

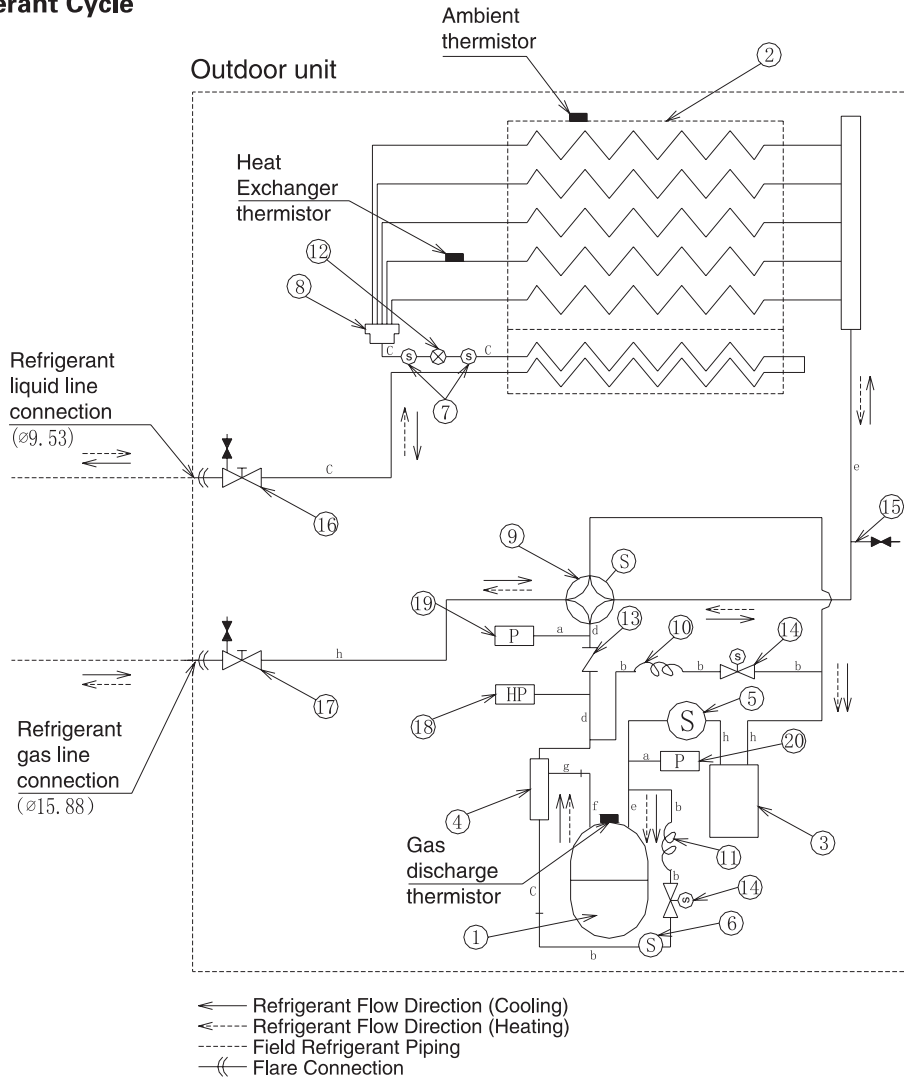
Model			AVW-38 *	AVW-48 *	AVW-54 *	
Heat exchanger	Type of heat exchanger		Multi-Pass Cross-Finned Tube			
	Tube	Material	Copper tube			
		Outer diameter	Φmm	7.0	7.0	7.0
		Quantity of rows	—	2	2	2
		Quantity of columns	—	132	132	132
	Fin	Material	Aluminum			
		Pitch	mm	1.9	1.9	1.9
	Maximum working pressure	MPa	4.15	4.15	4.15	
	Total Face Area	m ²	1.36	1.36	1.36	
	Quantity	—	1	1	1	
Air delivery part	Fan	Type	Propeller Fan			
		Quantity	2	2	2	
		Outer diameter	Φmm	544	544	544
		Revolution	rpm	Upper 568 + Lower 464	Upper 568 + Lower 464	Upper 600 + Lower 516
		Nominal air flow	m ³ /min.	90	90	100
	Fan motor	Type	DC Motor			
		Starting method	DC Driven			
		Nominal output power	W	51+51	51+51	51+51
		Quantity	—	2	2	2
		Insulation Class	—	E	E	E

Compresso

Model of Outdoor Unit			AVW-38U(C/2)SC	AVW-48U(C/2)SC	AVW-54U(C/2)C	AVW-48U(E/7)SC AVW-54U(E/7)SC
Model of Compressor			ATH356SDP9FQ	ATH356SDP9FQ	ATH356SDP9FQ	E500HHD
Power Supply			ACΦ1			ACΦ3
Type			Hermetic Rotary Type			Scroll type Hermetic
Air Tight Pressure	Discharge	MPa	2.60	2.80	2.90	4.2
	Suction	MPa	0.80	0.81	0.78	2.21
Motor of compressor	Type		DC Brushless Motor			Permanent Magnet synchronous Motor
	Starting method		Inverter-Driven			
	Poles		4	4	4	4
	Insulation class		E	E	E	E
Lubrication Oil Type			α68HES-H	α68HES-H	α68HES-H	FVC68D
Charged Volume of Lubrication		L	1.65	1.65	1.65	1.2

9. Control System

9.1 Refrigerant Cycle



Mark	Name of part	Remarks
1	Compressor	
2	Heat Exchanger	
3	Accumulator	
4	Oil Separator	
5	Strainer	
6	Strainer	
7	Strainer	
8	Distributor	
9	Reversing Valve	
10	Capillary Tube	
11	Capillary Tube	
12	Micro-Computer Control Expansion Valve	
13	Check Valve	
14	Solenoid Valve	
15	Check Joint	
16	Stop Valve for Liquid Line	
17	Stop Valve for Gas Line	
18	Pressure Switch	For High Pressure Protection
19	Pressure Sensor	High Pressure
20	Pressure Sensor	Low Pressure

Mark	O.D. x T	Material
a	φ 6.35 x 0.7 t	C1220T-0
b	φ 6.35 x 1.07 t	
c	φ 9.53 x 0.8 t	
d	φ 12.7 x 1.0 t	
e	φ 15.88 x 1.0 t	
f	φ 15.88 x 1.2 t	
g	φ 15.88 x 1.65 t	
h	φ 19.05 x 1.2 t	

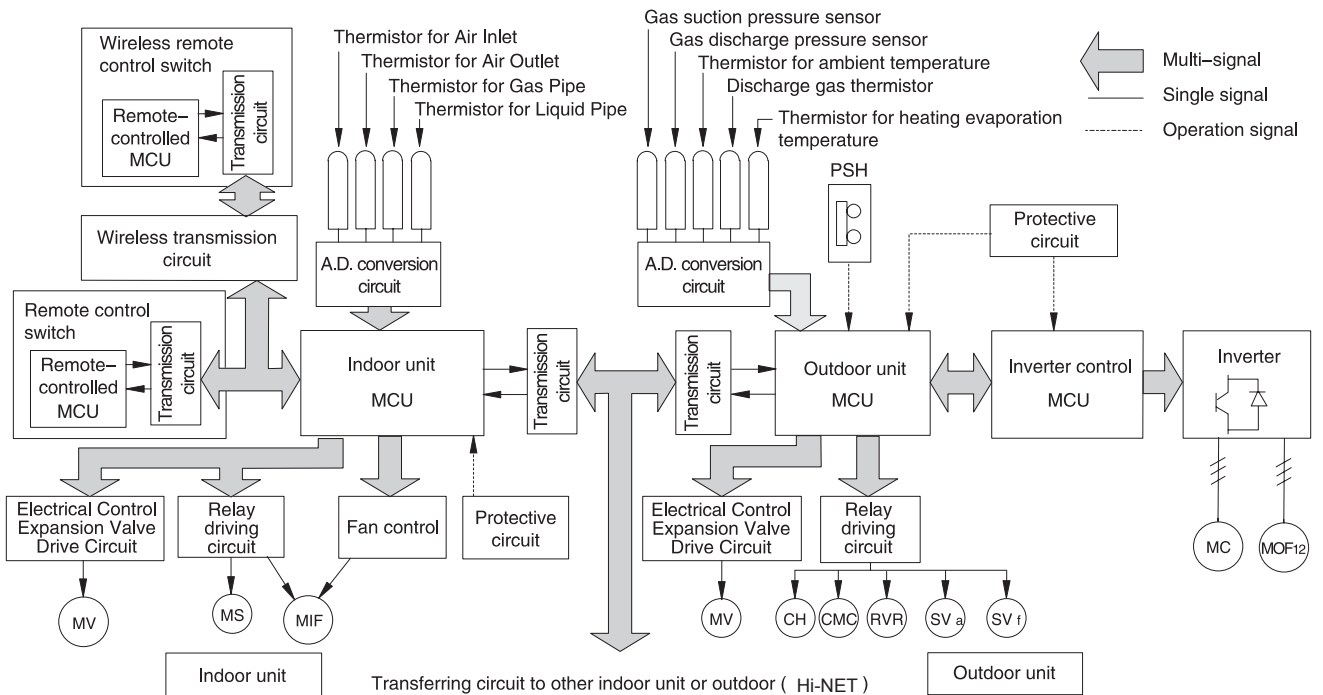
9.2 Function Control Unit

Table 1 lists the control system of refrigerating cycle separately

Table 1. Refrigerant Cycle Control

Control Item	Measures	
	Cooling Operation	Heating Operation
Revolution of Outdoor Fan	Control discharge pressure: Pd	The pressure can be controlled based on the outdoor air temperature
Opening degree of electronic expansion valve of outdoor unit	Full open	Control the Temperature of discharge gas superheat: Td SH
Opening degree of electronic expansion valve of indoor unit	<ol style="list-style-type: none"> Control the balance between the indoor units; Control the temperature difference between gas-liquid pipe of indoor heat exchanger; Control the Temperature of discharge gas superheat: Td SH 	<ol style="list-style-type: none"> Control the temperature difference of inlet and outlet indoors; Balance the temperature difference between the gas-liquid pipes of each indoor unit.
Inverter frequency of compressor	<ol style="list-style-type: none"> Refrigerant cycles of indoor unit should be fully operated; Pd control. 	<ol style="list-style-type: none"> Refrigerant cycles of indoor unit should be fully operated; Pd control.

The network of control system can be displayed in the following table



Symbol	Name
MC	Motor of compressor
MIF	Fan motor of indoor unit
MOF ₁₂	Fan motor of outdoor unit
MS	Motor of auto-louver
MV	Electronic expansion valve

Symbol	Name
CMC	Electromagnetic contactor
RVR	Four-way valve
SV _{a, f}	Solenoid valve
PSH	Pressure switch
CH	Crankcase heater

9.3 System Control

9.3.1 Remote controller installed indoors

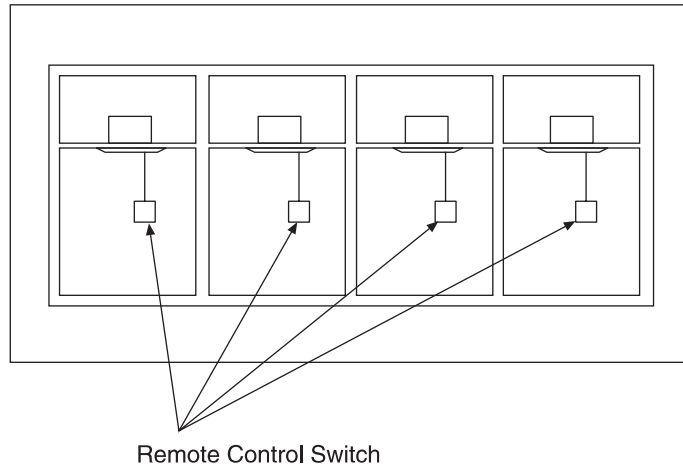
Individual operation system

“One to one” control – one indoor unit is controlled by one remote control switch.

Control mode	One to one
Operation mode	Independent
(1) ON/OFF	Yes
(2) Operation mode setting	Yes *
(3) Indoor temperature setting	Yes
(4) Fan speed setting	Yes
(5) Time setting	Yes
(6) ON/OFF by timer control	Yes
(7) Operation display	Yes
(8) Alarm display	Yes
(9) Self-check display	Yes
(10) Test mode	Yes

* Cooling and heating cannot be operated simultaneously.

Independent control

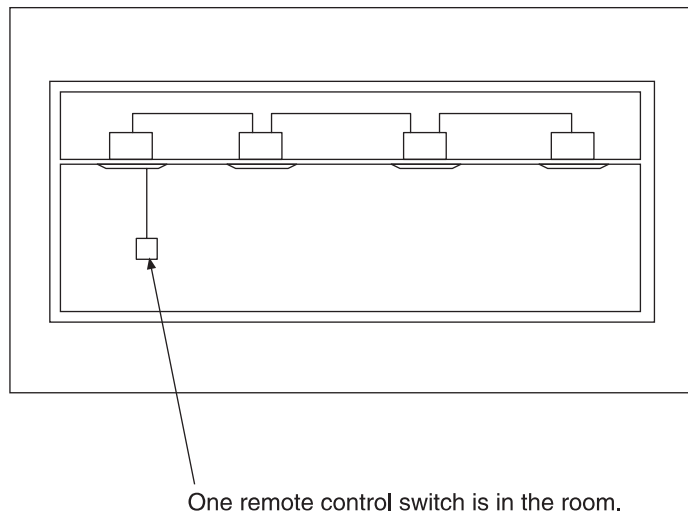


Group control operation system

One remote control switch can simultaneously control sixteen indoor units. This system is available for wider places, such as hospital, rest hall of hotel and restaurant, etc. All indoor units can be opened or closed quickly and easily using one remote controller.

Control mode	One remote controller
Operation mode	Based on group as unit
(1) ON/OFF	Yes
(2) Operation mode setting	Ok
(3) Indoor temperature setting	Yes
(4) Fan speed setting	Yes
(5) Time setting	Yes
(6) ON/OFF by timer control	Yes
(7) Operation display	Yes
(8) Alarm display	Yes
(9) Self-check function	Yes
(10) Test mode	Yes

Centralized control

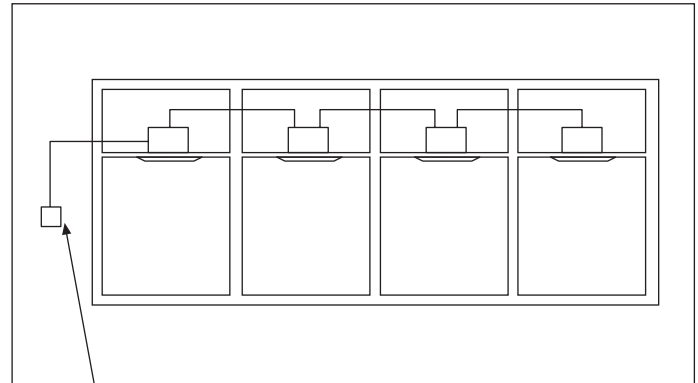


9.3.2 Group Control from a Remote Place

One remote controller can installed at the position far away from the site, which can simultaneously control sixteen indoor units. This system is especially available for the open air conditioning sites, such as hospital, rest hall of hotel and building. All unit switches can be opened or closed quickly and easily using one remote controller.

Control mode	Grouped control
Operation mode	Independent
(1) ON/OFF	Yes
(2) Operation mode setting	Yes
(3) Indoor temperature setting	Yes
(4) Fan speed setting	Yes
(5) Time setting	Yes
(6) ON/OFF by timer control	Yes
(7) Operation display	Yes
(8) Alarm display	Yes
(9) Self-check function	Yes
(10) Test mode	Yes

Simultaneously control



One remote control switch

9.3.3 Control in a Room / Control from a Remote Place

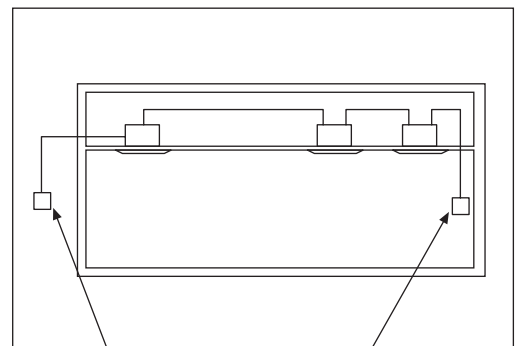
Sixteen indoor units can be controlled using main remote control switch and sub-remote control switch in maximum.

Simultaneous Operation System

Two remote control switches can be used for controlling mostly 16 sets of indoor units; one remote control switch is installed in the room and the other is installed in the remote central control room. This system is very available for open air conditioning site, such as rest hall of hotel and dining room.

Control mode	Selected remote controller used in room	Remote controller selected for long distance
Operation mode	One group	One group
(1) ON/OFF	Yes	Yes
(2) Operation mode setting	Yes *	Yes *
(3) Indoor temperature setting	Yes	Yes
(4) Fan speed setting	Yes	Yes
(5) Time setting	Yes	Yes
(6) ON/OFF by timer control	Yes	Yes
(7) Operation display	Yes	Yes
(8) Alarm display	Yes	Yes
(9) Self-check function	Yes	Yes
(10) Test mode	Yes	Yes

Two remote controlling



Main remote control switch

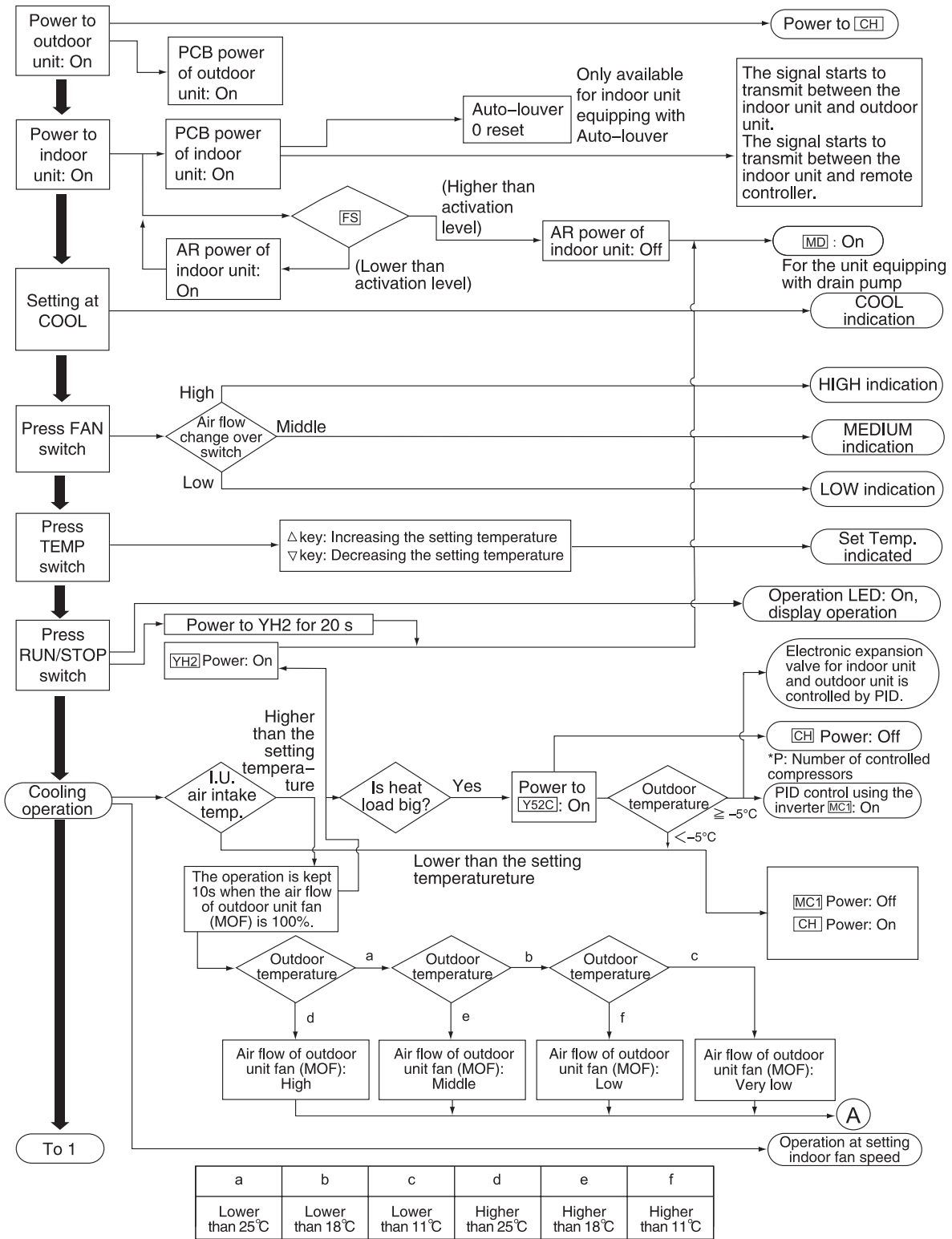
Sub-remote control switch

Note:

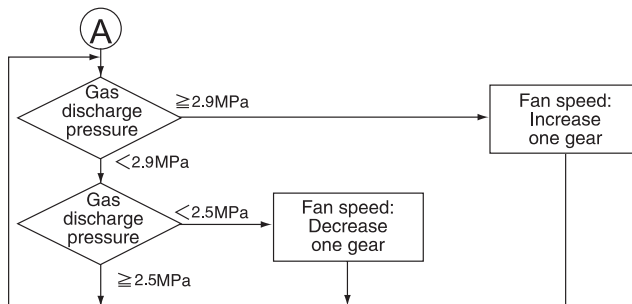
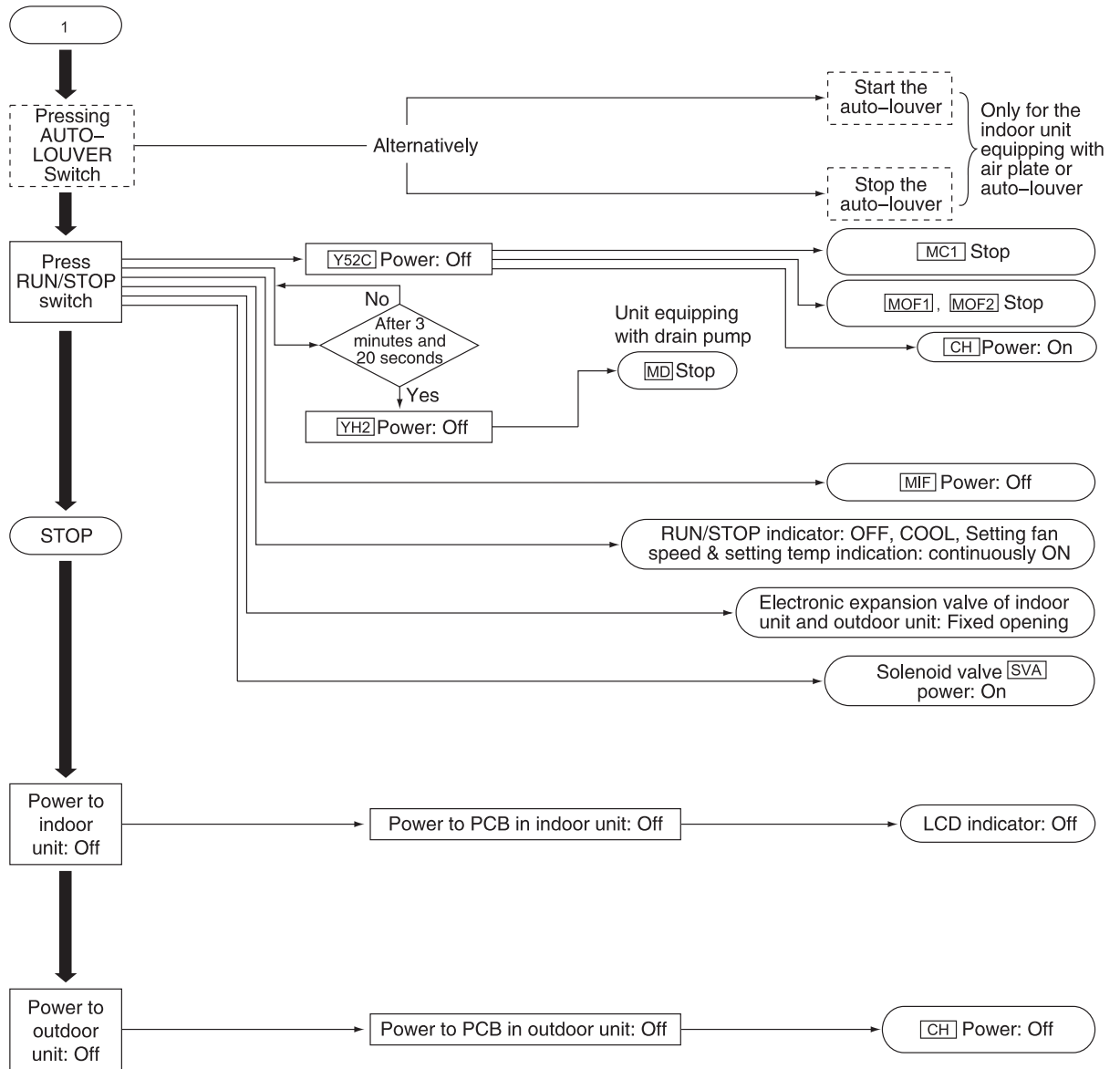
In this system, the remote controller set at last has the priority.

9.4 Standard Operation Procedure

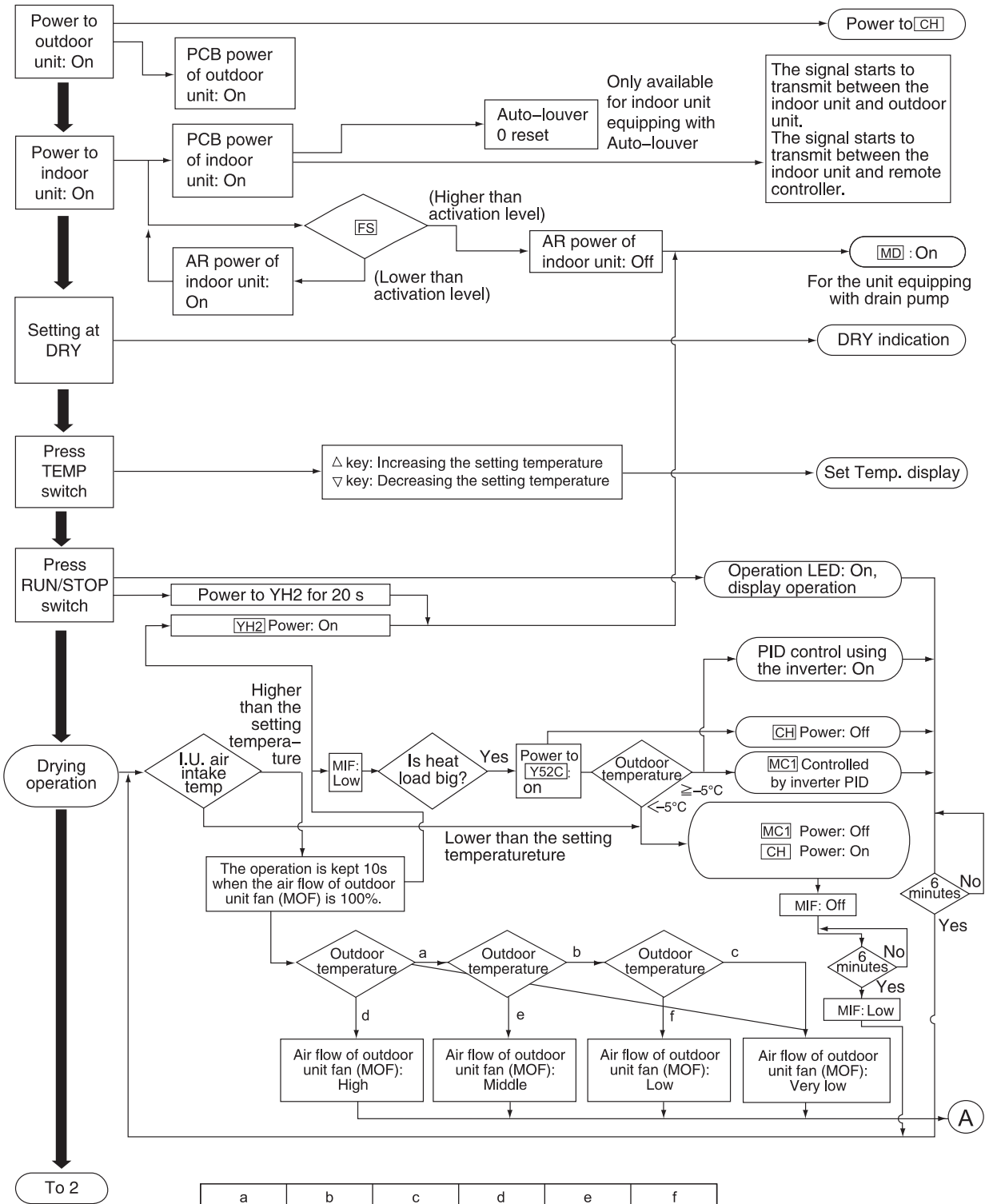
Cooling Operation



Cooling Operation

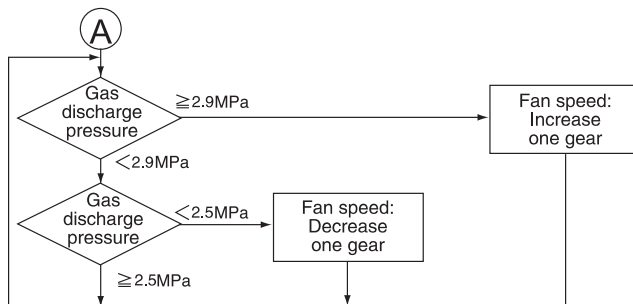
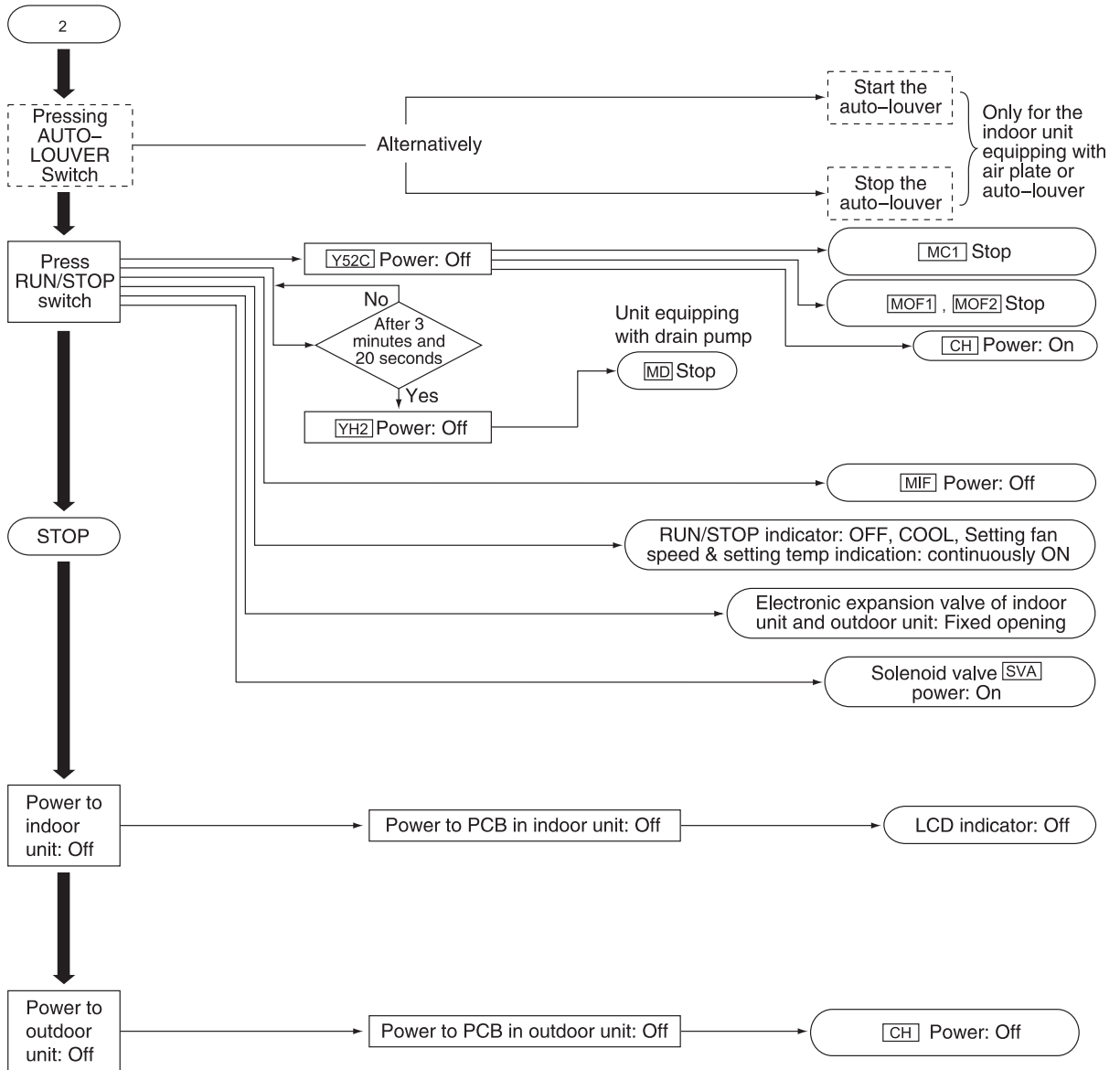


Drying Operation

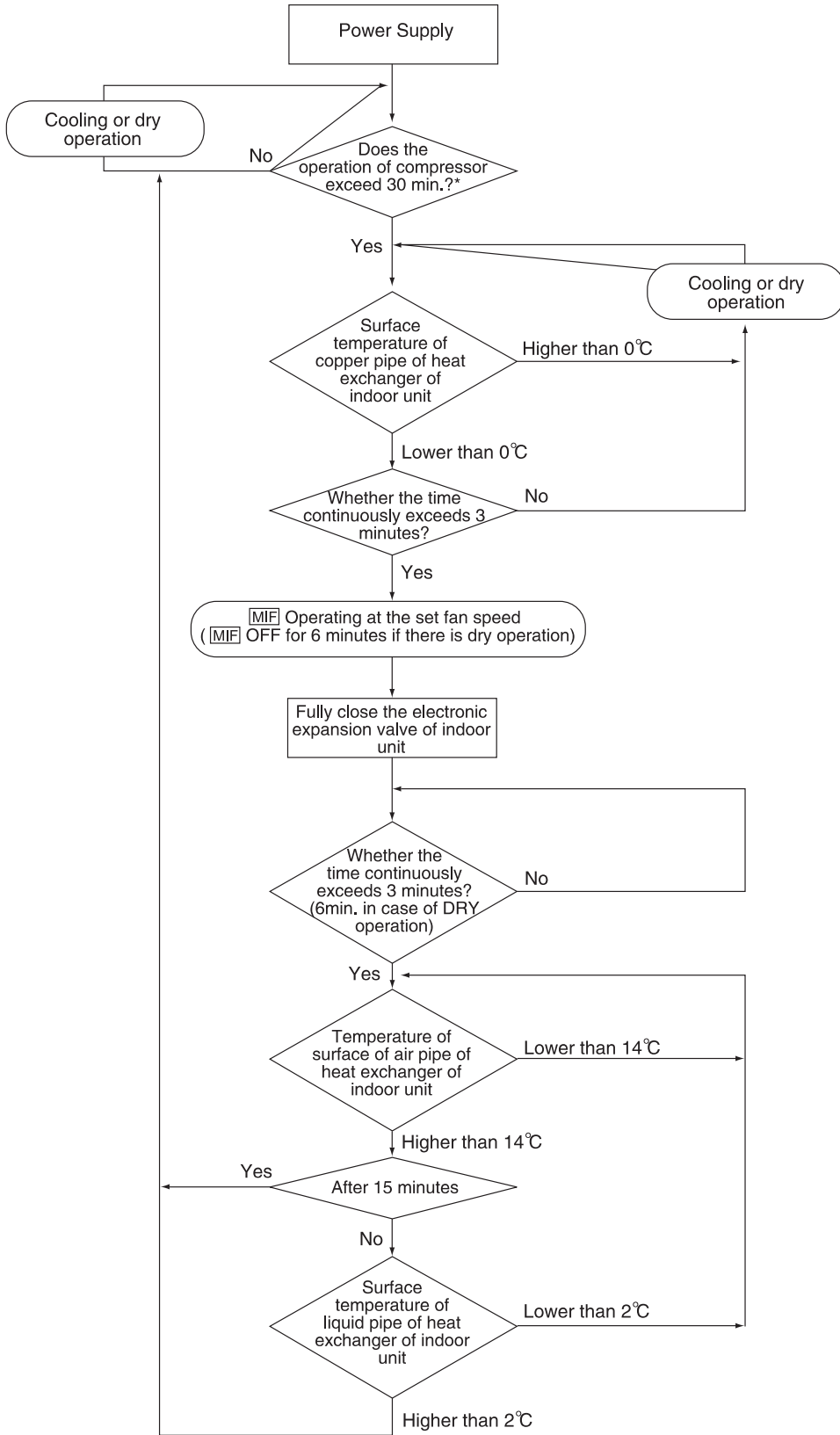


a	b	c	d	e	f
Lower than 25°C	Lower than 18°C	Lower than 11°C	Higher than 25°C	Higher than 18°C	Higher than 11°C

Drying Operation

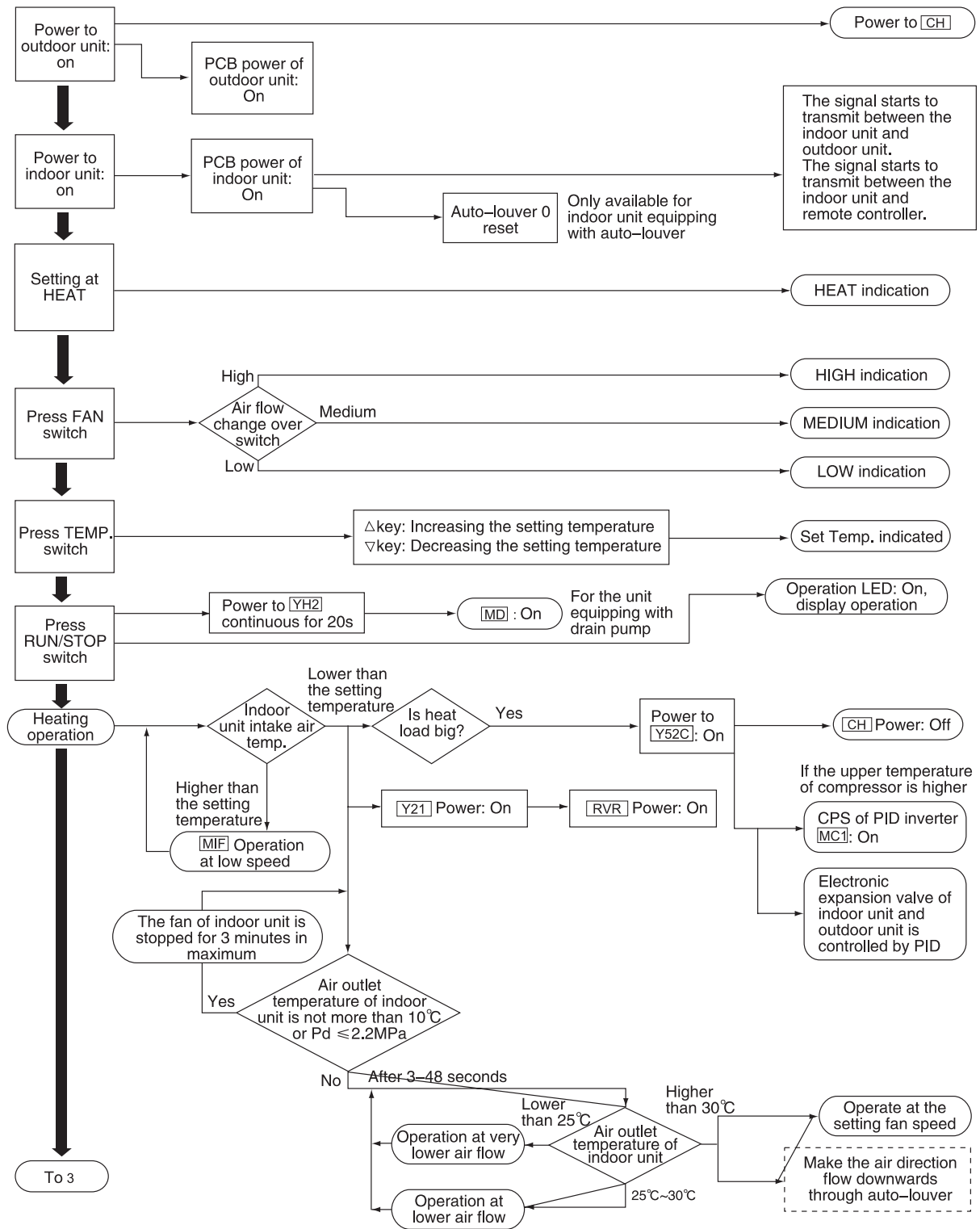


Freezing Protection Control during Cooling or Dry Operation

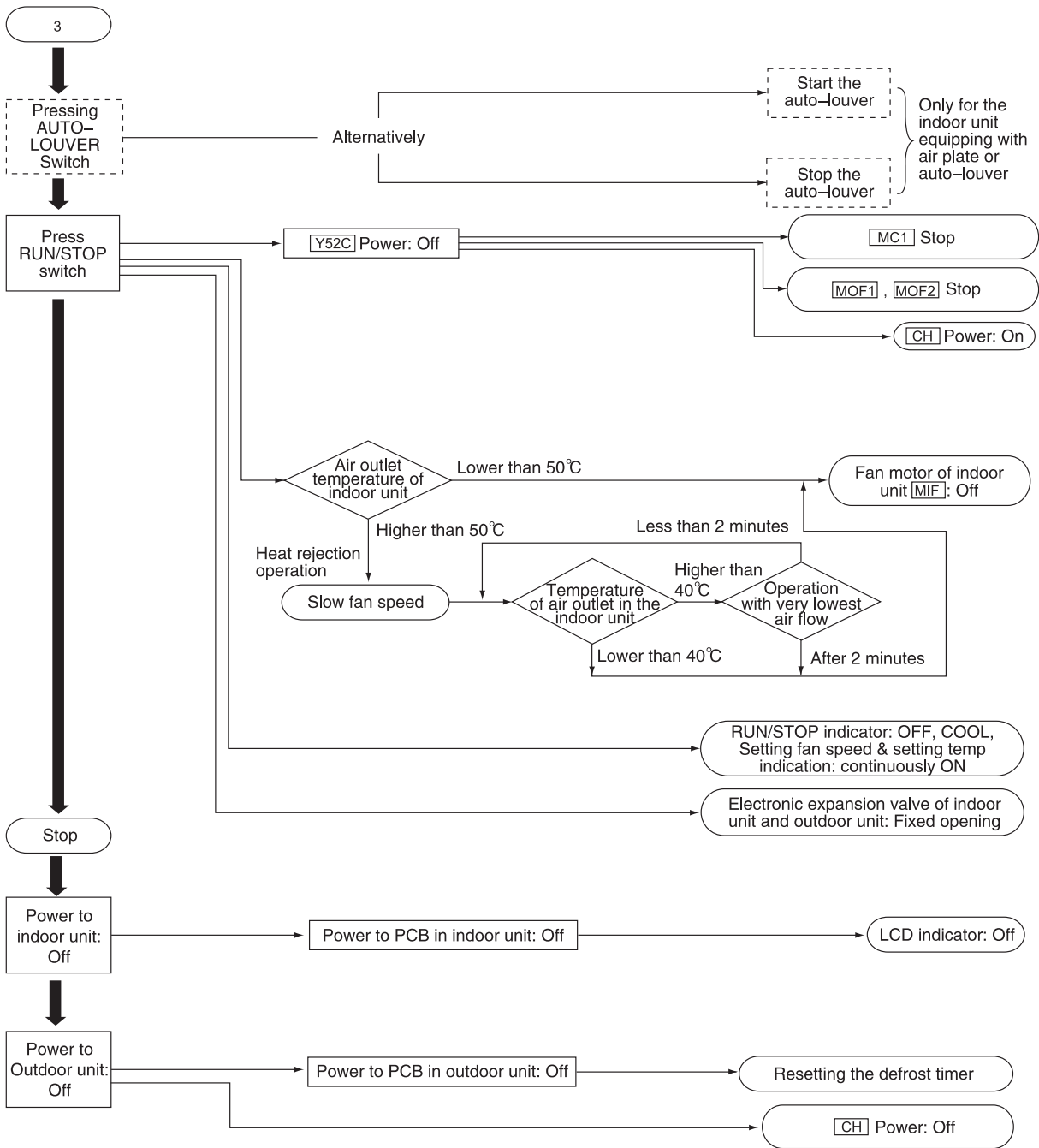


*: The operation time of compressor should be confirmed based on the operation condition.

Heating Operation

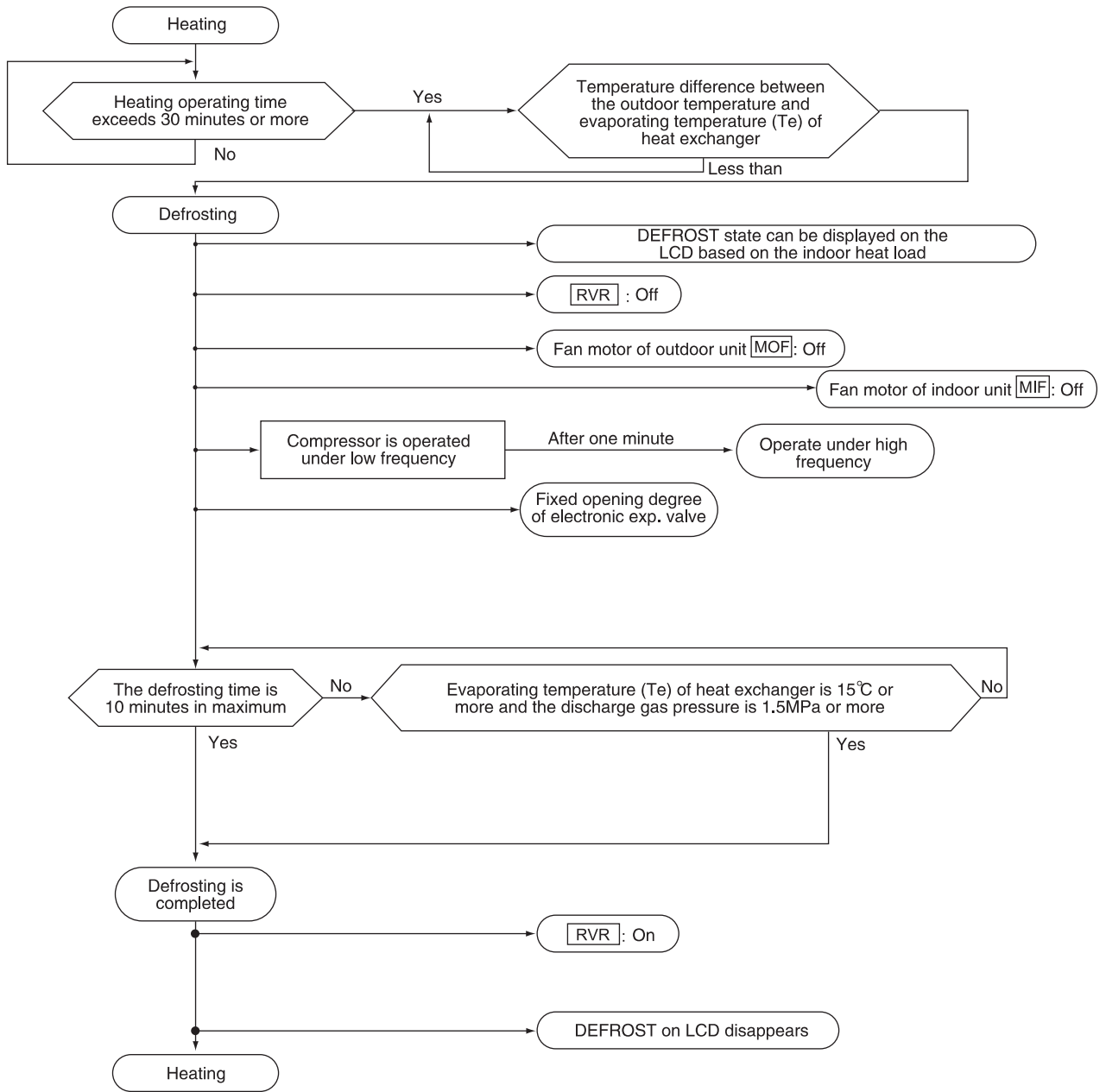


Heating Operation

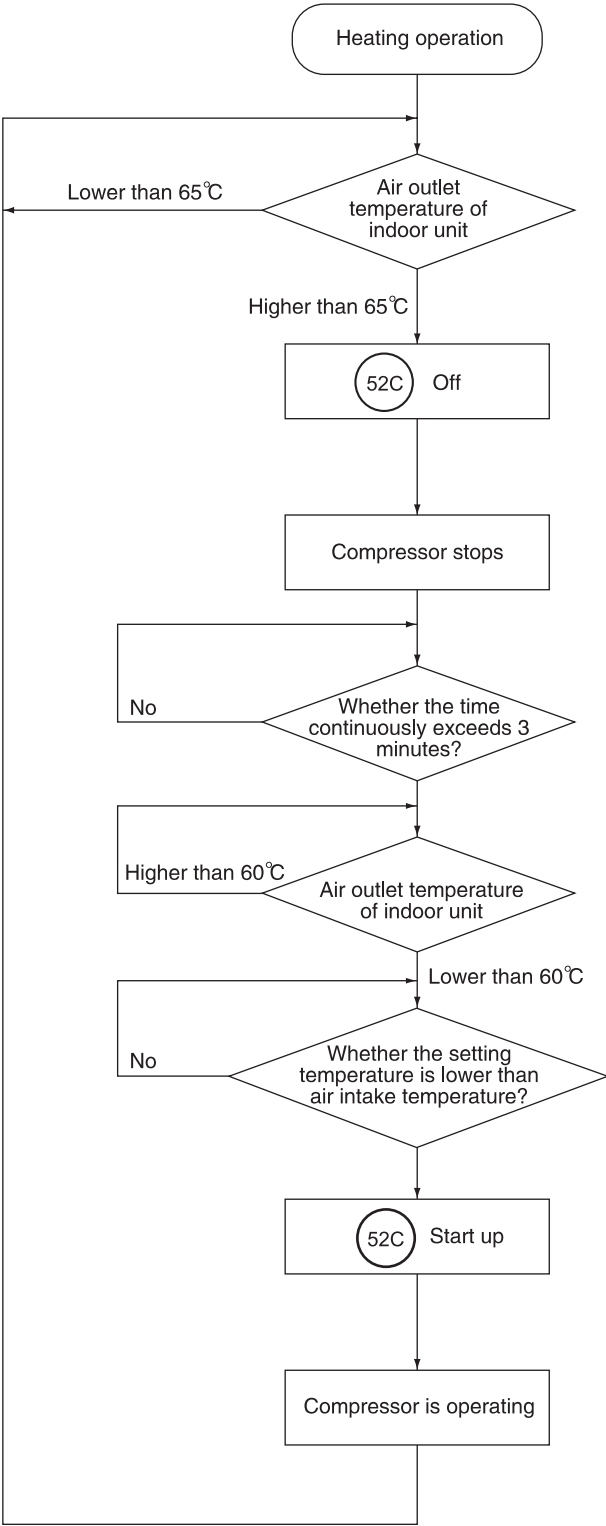


⎓ : Unequipped, optional component

Defrosting Operation



Air Blowing Temperature Overheat Protection



9.5 Protection and Safety Control

Compressor Protection

Protect the compressor by the following devices and their combined device.

High Pressure Switch – If the discharge pressure of compressor exceeds the setting value, this switch will be cut off (tipped off).

Oil Heater – This band type heater protects against oil carry-over during cold starting, as it is energized while the compressor is stopped.

Fan Motor Protection

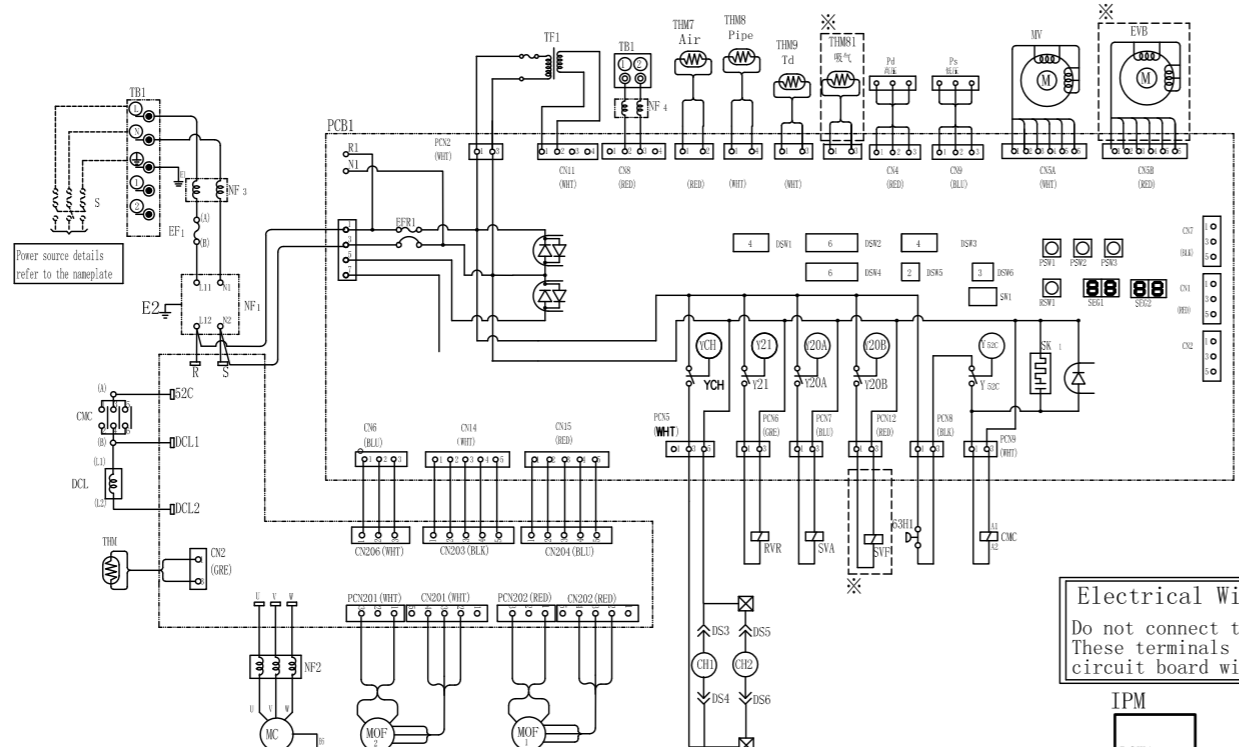
The automatic temperature controller is set in the motor coil of fan and can be automatically cut off (tipped off) if the temperature of coil of fan motor exceeds the setting value.

9.6 Safety and Control Device Setting

Outdoor Unit Model(KBtu/h)		38 ~ 54
For Compressor Pressure Switch High Pressure		Automatic Reset, Non-Adjustable
	Cut-Out	MPa 4.15 ^{-0.05} _{-0.20}
	Cut-In	MPa 3.2 ^{+0.15} _{-0.20}
Fuse on Main Circuit	A	50
Compressor Crank Heater Power	W	28 × 4
CCP Timer Set Time	Min	Non-Adjustable 3
Control Circuit Fuse	A	5

(ELECTRICAL WIRING DIAGRAM) (FOR MODELS: AVW-38/48/54U(C/2) SC)

Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.



Service Operation: Service Operation on the table below can be performed through the Setting of DSW1 and PSW1. Setting of DSW should be according to the Table 1. Take care of the remarks on the right during operation.

- Do not touch any other electrical parts when operating switches on the PCB.
- Do not attach or detach service cover when the power source for the outdoor unit is ON and the outdoor unit is operated.
- Turn all the dip switches of DSW1 OFF when the test run operation is completed.

Dip Switch Setting	Operation	Remarks
<p>1 Test Run</p> <ul style="list-style-type: none"> Setting of Operation Mode: Cooling: Set DSW1-2 OFF, Heating: Set DSW1-2 ON. Starting Test Run: Set DSW1-1 ON and the operation is started after a few 20 seconds. 	<ul style="list-style-type: none"> The indoor unit automatically starts to operate when the test run of the outdoor unit is set. The ON/OFF operation can be performed from the remote control switch of DSW1-1 of the outdoor unit. Continuous operation during 2 hours is performed without Thermo-OFF. 	<ul style="list-style-type: none"> Take care that the indoor units operate in accordance with the test run operation of the outdoor unit. In case that the plural indoor units are connected with one remote control switch, all the units start test run operation at the same time, therefore, turn the power source OFF for the indoor units not to operate test run. The setting of DSW1 is not required for the test run from the remote control switch.
<p>2 Manual Defrost</p> <ul style="list-style-type: none"> Manual Defrost Operation Starts: Press PSW-1 for more than 3 seconds during heating operation. Manual Defrost Operation Ends: Press PSW-1 for more than 3 seconds during Defrost operation. OR is automatically ended. 	<ul style="list-style-type: none"> Defrost operation is available regardless of frosting condition and total time of heating operation. Defrost operation is not performed when the temperature of outdoor heat exchanger is higher than 20°C, high pressure is higher or Thermo-OFF. 	<ul style="list-style-type: none"> Do not repeat defrost operation frequently.

Manual Defrost on the above table is performed only for heat pump.

Electrical Wiring Between Indoor Unit and Outdoor Unit
Do not connect the power source line to the terminals 1 and 2. These terminals are for the control line. If connected, the printed circuit board will be damaged.

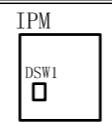
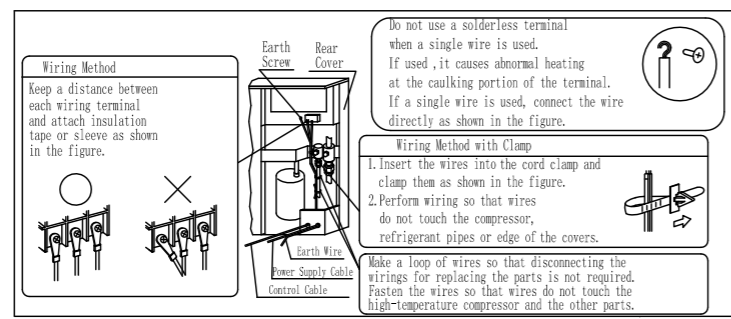
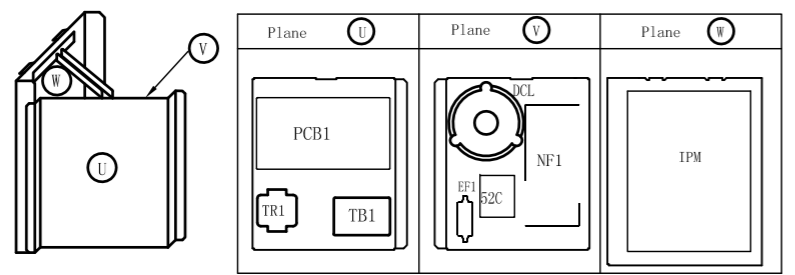


Table 2. Setting of DSW1 (IPM)
DSW1 (IPM)
Inspection of Current is not available when setting 1 ON. So reset it after assembly.

Table 1. DSW (PCB1)'s setting before shipment (The mark of ■ indicates the position of dip switches.)

DSW1 (Test Operation)	DSW2 (Optional Function Setting)	DSW3 (Capacity Setting)				
ON ■ OFF	ON ■ OFF	4 (38) ON ■ OFF	5 (48) ON ■ OFF	6 (54) ON ■ OFF	※ 5 (48) ON ■ OFF	※ 6 (54) ON ■ OFF
Ref. Cycle No. Setting (DSW4) ON ■ OFF		DSW6 (Piping length setting)				
		Setting before Shipment ON ■ OFF	The I.U. is located higher than O.U. (>20m) ON ■ OFF	The O.U. is located higher than I.U. (>25m) ON ■ OFF		
Ref. Cycle No. Setting 0~63						

(Electrical Control Box)



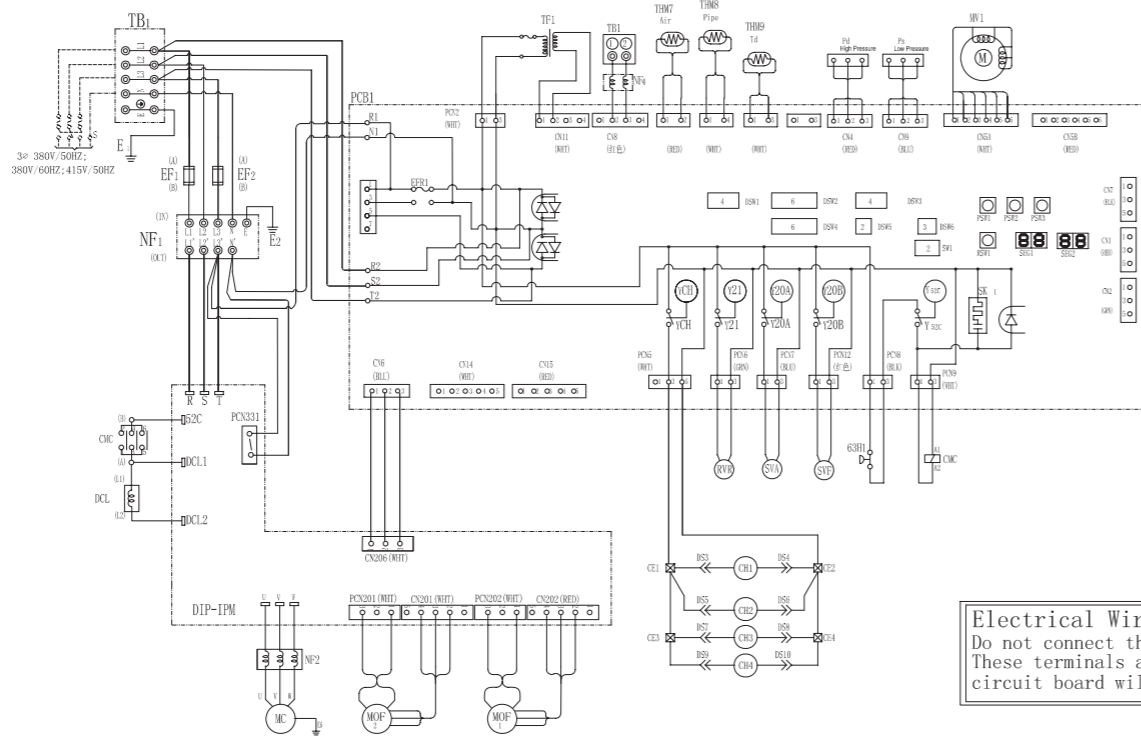
MARK	NAME
MC	Motor for Compressor
MOF1	Motor for Out Fan
MOF2	Motor for Out Fan
EF1	Fuse
CMC	Contactor for Compressor Motor
RVR	Reversing Valve Relay
MV	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
SVF	Solenoid Valve for Backing Off Oil
63H1	High Pressure Switch For Protection
Pa	Sensor for Refrigerant Pressure
Pb	Sensor for Refrigerant Pressure
TB1	Terminal Board
TF1	Transformer
PCB1	Printed Circuit Board
EFR1	Fuse
Y _{52C}	Relay (CMC)
Y ₂₁	Relay (RVR)
Y _{CH}	Relay (CH)
Y _{20A}	Relay (SVA)
Y _{20B}	Relay (SVF)
THM7	Thermistor
THM8	Thermistor
THM9	Thermistor
THM81	Thermistor
DCL	Reactor
IPM	Inverter System Power Podul.
NF1~4	Noise Filter
PSW1	Push Switch on PCB1
PSW2	Push Switch on PCB1
PSW3	Push Switch on PCB1
DSW1	Dip Switch on PCB1
DSW2	Dip Switch on PCB1
DSW3	Dip Switch on PCB1
DSW4	Dip Switch on PCB1
DSW5	Dip Switch on PCB1
DSW6	Dip Switch on PCB1
CH1~2	Crankcase Heater

Code	Content of Abnormality	Leading Cause
01	Activation of Protection Device	Activation of Float Switch, High Water Level in Drain Pan
02	Activation of Protection Device	Activation of FSH, Pipe Clogging, Excessive Ref., Inert Gas Mixing
03	Abnormality between I.U. and O.U./O.U. and O.U.	Incorrect Wiring, Loose Terminals, Disconnected Wire, Tripping of Fuse
04	Abnormality between Inverter PCB and O.U. PCB	Transmission Failure (Loose Connector)
05	Abnormal Power Source Phases	Incorrect Power Source Connection to Reversed-Phase, Open Phase
06	Abnormal Inverter Voltage	O.U. Voltage Drop, Insufficient Power Capacity
07	Decrease of Discharge Gas Superheat	Excessive Ref. Charge, Failure of Thermistor, Incorrect Wiring
08	Increase of Discharge Gas Temperature	Insufficient Ref. Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring
09	Activation of Protection Device for Indoor Unit Fan	Fan Motor Overheat, Locking
11	Inlet Air Thermistor	
12	Outlet Air Thermistor	
13	Freeze Protection Thermistor	Incorrect Wiring,
14	Gas Piping Thermistor	Disconnected Wiring
16	Remote Control Thermistor	
17	Remote Control Switch Thermistor	
21	High Pressure Sensor	
22	Outdoor Air Thermistor	
23	Discharge Gas Thermistor	Incorrect Wiring,
24	Evaporating Piping Thermistor	Disconnected Wiring
27	Suck Gas Thermistor	
29	Low Pressure Sensor	
31	Incorrect Capacity of O.U. and I.U.	Incorrect Setting of Capacity Combination
35	Incorrect Setting of I.U. No.	Duplication of Indoor Unit No.
36	Incorrect Combination of I.U. No.	Refrigerant of Indoor Unit No.
38	Abnormality of Protective Circuit in O.U.	Failure of Protection Detecting Circuit
43	Activation of Low-Pressure Decrease Protection Device	Detective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44	Activation of Low-Pressure Increase Protection Device	Overload at Cooling High Temp. at Heating Locking (Loose Connector)
45	Activation of High-Pressure Increase Protection Device	Overload Operation (Clogging, Short-Pass), Pipe Clogging, insufficient Ref., Inert Gas Mixing
47	Activation of Low-Pressure Decrease Protection Device (Vacuum Operation)	Insufficient Ref., Ref. Pipe Clogging, Locking (Loose Connector)
48	Activation of Inverter Overcurrent Protection Device	Overload Operation, Comp. Failure
51	Abnormal Current Sensor	Current Sensor Failure
53	Inverter Error Signal Detection	Driver IC Error Signal Detection, (Protection for Overcurrent, Low Voltage, Short-Circuit)
54	Increase of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Abnormal Fan
55	Inverter Failure	Inverter PCB Failure
57	Fan Motor Abnormality	Disconnected Wiring/Incorrect Wiring between Control PCB (PCB1) and Fan Relay PCB (PCB3, PCB5), Fan Motor Failure
EF	Compressor Protection Alarm	Failure of Compressor
b1	Incorrect O.U. No. Setting	Over 64 No. is set for Address or Ref. Cycle
b5	Incorrect I.U. No. Setting	More than 17 Non-Corresponding to H-4.1NK2 Units are Connected to One System

Note: ※ indicates that it only applies to floor radiant heating unit

(ELECTRICAL WIRING DIAGRAM) (FOR MODELS: AVW-48/54U (E/7) SC)

Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.



Service Operation Service Operation on the table below can be performed through the Setting of DSW1 and PSW1. Setting of DSW should be according to the Table 1. Take care of the remarks on the right during operation.

- Do not touch any other electrical parts when operating switches on the PCB.
- Do not attach or detach service cover when the power source for the outdoor unit is ON and the outdoor unit is operated.
- Turn all the dip switches of DSW1 OFF when the test run operation is completed.

	Dip Switch Setting	Operation	Remarks	
1	Test Run	<ul style="list-style-type: none"> Setting of Operation Mode Cooling: Set DSW1-2 OFF. Heating: Set DSW1-2 ON. Starting Test Run Set DSW1-1 ON and the operation is started after a few 20 seconds. 	<ul style="list-style-type: none"> The indoor unit automatically start to operate when the test run of the outdoor unit is set. The ON/OFF operation can be performed from the remote control switch of DSW1-1 of the outdoor unit. Continuous operation during 2 hours is performed without Thermo-OFF. 	<ul style="list-style-type: none"> Take care that the indoor units operate in accordance with the test run operation of the outdoor unit. In case that the plural indoor units are connected with one remote control switch, all the units start test run operation at the same time, therefore, turn the power source OFF for the indoor units not to operate test run. The setting of DSW1 is not required for the test run from the remote control switch.
2	Manual OFF of Compressor	<ul style="list-style-type: none"> Setting Compressor Manual OFF: Set DSW1-4 ON Compressor Manual OFF Release: Set DSW1-4 OFF 	<ul style="list-style-type: none"> When DSW1-4 is ON during compressor operation, the compressor stops to operate immediately and the indoor unit is under the condition of Thermo-OFF. When DSW1-4 is OFF, the compressor starts to operate after the cancellation of 3-minutes guard. 	<ul style="list-style-type: none"> Do not repeat compressor ON/OFF frequently.
3	Manual Defrost	<ul style="list-style-type: none"> Manual Defrost Operation Starts Press PSW-1 for more than 3 seconds during heating operation. Manual Defrost Operation Ends Press PSW-1 for more than 3 seconds during Defrost operation. OR is automatically ended. 	<ul style="list-style-type: none"> Defrost operation is available regardless of frosting condition and total time of heating operation. Defrost operation is not performed when the temperature of outdoor heat exchanger is higher than 20°C, high pressure is higher or Thermo-OFF. 	<ul style="list-style-type: none"> Do not repeat defrost operation frequently.

Manual Defrost on the above table is performed only for heat pump.

Electrical Wiring Between Indoor Unit and Outdoor Unit
Do not connect the power source line to the terminals 1 and 2. These terminals are for the control line. If connected, the printed circuit board will be damaged.

Table 1, DSW (PCB1)'s setting before shipment (The mark of ■ indicates the position of dip switches.)

DSW1 (Test Operation)		DSW2 (Optional Function Setting)						DSW3 (Capacity Setting)			
ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
1	2	3	4	5	6	7	8	9	10	11	12
Ref. Cycle No. Setting (DSW4&RSW1)		DSW4 (High Digit Setting)		RSW1 (Low Digit Setting)		DSW5		DSW6 (Piping length setting)			
DSW4 (High Digit Setting)		RSW1 (Low Digit Setting)		DSW5		Setting before Shipment		The I.L. is located higher than 0.U. (>20m)		The U.L. is located higher than I.L. (>25m)	
ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
1	2	3	4	5	6	1	2	1	2	1	2
Ref. Cycle No. Setting 0~63											

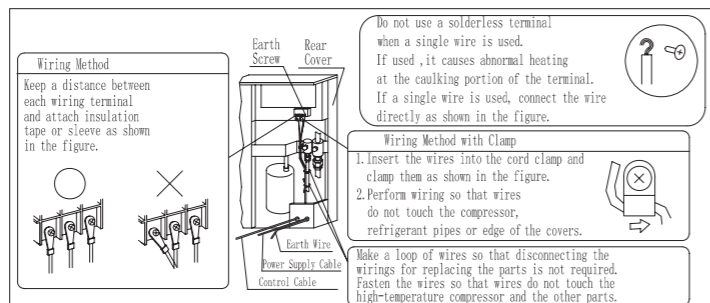
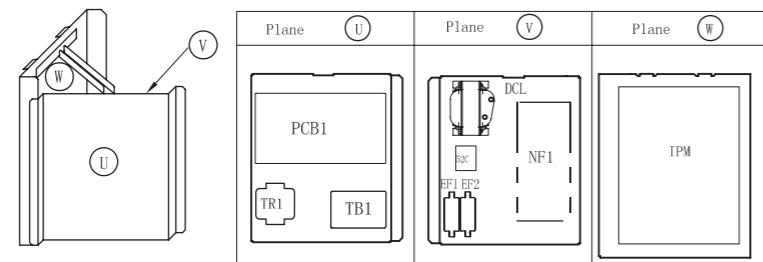
IPM



Table 2, Setting of DSW1 (IPM)

DSW1 (IPM)	
ON	OFF
1	2
3	
Inspection of Current is not available when setting 1 ON. So reset it after assembly.	

(Electrical Control Box)



MARK	NAME
MC	Motor for Compressor
MOF1	Motor for Out Fan
MOF2	Motor for Out Fan
EF1.2	Fuse
CMC	Contact for Compressor Motor
RVR	Reversing Valve Relay
MV	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
SVF	Solenoid Valve for Backing Of Oil
63H1	High Pressure Switch For Protection
Pa	Sensor for Refrigerant Pressure
P _s	Sensor for Refrigerant Pressure
TB _i	Terminal Board
TF1	Transformer
PCB1	Printed Circuit Board
EFR1	Fuse
Y _{SSC}	Relay (CMC)
Y ₂₁	Relay (RVR)
Y _{CH}	Relay (CH)
Y _{20A}	Relay (SVA)
Y _{20B}	Relay (SVF)
THM7	Thermistor
THM8	Thermistor
THM9	Thermistor
DCL	Reactor
IPM	Inverter System Power Podule
NF1.2.4	Noise Filter
PSW1	Push Switch on PCB1
PSW2	Push Switch on PCB1
PSW3	Push Switch on PCB1
DSW1	Dip Switch on PCB1
DSW2	Dip Switch on PCB1
DSW3	Dip Switch on PCB1
DSW4	Dip Switch on PCB1
DSW5	Dip Switch on PCB1
DSW6	Dip Switch on PCB1
CH1-4	Crankcase Heater

Code	Content of Abnormality	Leading Cause
01	Activation of Protection Device	Activation of Float Switch, High Water Level in Drain Pan
02	Activation of Protection Device	Activation of PSW, Pipe Clogging, Excessive Ref., Inert Gas Mixing
03	Abnormality between I.U. and O.U./O.U. and O.U.	Incorrect Wiring, Loose Terminals, Disconnected Wire, Tripping of Fuse
04	Abnormality between Inverter PCB and O.U. PCB	Transmission Failure (Loose Connector)
05	Abnormal Power Source Phases	Incorrect Power Source Connection to Reversed-Phase, Open Phase
06	Abnormal Inverter Voltage	O.U. Voltage Drop Insufficient Power Capacity
07	Decrease of Discharge Gas Superheat	Excessive Ref. Charge, Failure of Thermistor, Incorrect Wiring
08	Increase of Discharge Gas Temperature	Insufficient Ref. Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring
09	Activation of Protection Device for Indoor Unit Fan	Fan Motor Overheat, Locking
11	Inlet Air Thermistor	
12	Outlet Air Thermistor	
13	Freeze Protection Thermistor	Incorrect Wiring, Disconnected Wiring
14	Gas Piping Thermistor	
16	Remote Control Thermistor	
17	Remote Control Switch Thermistor	
21	High Pressure Sensor	
22	Outdoor Air Thermistor	
23	Discharge Gas Thermistor	Incorrect Wiring, Disconnected Wiring
24	Evaporating Piping Thermistor	
29	Low Pressure Sensor	
31	Incorrect Capacity of O.U. and I.U.	Incorrect Setting of Capacity Combination
35	Incorrect Setting of I.U. No.	Duplication of Indoor Unit No.
36	Incorrect Combination of I.U. No.	Refrigerant of Indoor Unit No.
38	Abnormality of Protective Circuit in O.U.	Failure of Protection Detecting Circuit
43	Activation of Low-Pressure Decrease Protection Device	Detective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44	Activation of Low-Pressure Increase Protection Device	Overload at Cooling High Temp. at Heating Locking (Loose Connector)
45	Activation of High-Pressure Increase Protection Device	Overload Operation (Clogging, Short-Pass), Pipe Clogging, Insufficient Ref., Inert Gas Mixing
47	Activation of Low-Pressure Decrease Protection Device (Vacuum Operation)	Insufficient Ref., Ref. Pipe Clogging, Locking (Loose Connector)
48	Activation of Inverter Overcurrent Protection Device	Overload Operation, Comp. Failure
51	Abnormal Current Sensor	Current Sensor Failure
53	Inverter Error Signal Detection	Driver IC Error Signal Detection, (Protection for Overcurrent, Low Voltage, Short-Circuit)
54	Increase of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Abnormal Fan
55	Inverter Failure	Inverter PCB Failure
57	Fan Motor Abnormality	Disconnected Wiring/Incorrect Wiring between Control PCB (PCB1) and Fan Relay PCB (PCB3, PCB5), Fan Motor Failure
FF	Compressor Protection Alarm	Failure of Compressor
b1	Incorrect O.U. No. Setting	Over 64 No. is set for Address or Ref. Cycle
b5	Incorrect I.U. No. Setting	More than 17 Non-Corresponding to H-LINK2 Units are Connected to the System

INSTALLATION

IMPORTANT NOTICE

- HISENSE pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- HISENSE cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioner is designed for standard air conditioning only. Do not use this heat pump air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling or heating process.
- The installer and system specialist shall secure safety against leakage according to local regulations or standards. The following standards may be applicable if local regulations are not available. British Standard, BS4434.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

▲ DANGER	:	Immediate hazards which WILL result in severe personal injury or death.
▲ WARNING	:	Hazards or unsafe practices which COULD result in severe personal injury or death.
▲ CAUTION	:	Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.
NOTE	:	Useful information for operation and/or maintenance.

- It is assumed that this heat pump air conditioner will be operated and serviced by English speaking people. If this is not the case, the customer should add safety, caution and operating signs in the native language.
- If you have any questions, contact your distributor or dealer of HISENSE.
- This manual gives a common description and information for this heat pump air conditioner which you operate as well as for other models.
- Install these air conditioners by local regulations or standards.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range .

Temperature		(°C)	
		Maximum	Minimum
Cooling	Indoor	23 WB	15 WB
	Operation	43(48)* DB	-5 DB
Heating	Indoor	30 DB	15 DB
	Operation	15.5 WB	-20 WB

DB: Dry Bulb, WB: Wet Bulb

NOTE:

These air conditioners only are applicable of cooling or heating mode, do not operate cool and heat mode together, if operate cool and heat mode at the same time, air conditioner system will be fluctuated for large difference in temperature for changing operate mode.

This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.



Correct Disposal of this product

This marking indicates that this product should not be disposed with other household wastes. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

SAFETY SUMMARY

DANGER

- Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not touch or adjust safety devices inside the indoor or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use an ELB (Electric Leakage Breaker). In the event of a fault, there is danger of an electric shock or a fire if it is not used.
- Do not install the outdoor unit where there is a high level of oil mist, flammable gases, salty air or harmful gases such as sulphur.

WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one (1) meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Do not perform installation work, refrigerant piping work, drain piping and electrical wiring connection without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, electric shock or a fire.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it lead electric shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Do not put any foreign material on the unit or inside the unit.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- Before performing any brazing work, check to ensure that there is no flammable material around.
When using refrigerant be sure to wear leather gloves to prevent cold injuries.
- Protect the wires, electrical parts, etc. from rats or other small animals.
If not protected, rats may gnaw at unprotected parts and which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.

SAFETY SUMMARY

CAUTION

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before start-up after a long shutdown.
- Do not step or put any material on the product.
- Provide a strong and correct foundation so that;
 - a. The outdoor unit is not on an incline.
 - b. Abnormal sound does not occur.
 - c. The outdoor unit will not fall down due to a strong wind or earthquake.
- The appliance is not to be used by children or person with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised they do not play with the appliance.

NOTE:

- It is recommended that the room be ventilated every 3 to 4 hours.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, it is recommended that auxiliary heating equipment be used in the field when the unit is installed in a low temperature region.
- Operate the heat pump air conditioner within this range.
 - Regarding installation altitude below 1000 meters;
 - Regarding frequency of supply power within $\pm 1\%$ Hz of rated frequency.
 - Regarding transport storage temperature within $-25\sim 55^{\circ}\text{C}$.

CHECKING PRODUCT RECEIVED

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.
- The standard utilization of the unit shall be explained in these instructions.
- Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.
- Please contact your local agent, as the occasion arises.
- HISENSE's liability shall not cover defects arising from the alteration performed by a customer without HISENSE's consent in a written form.

1. Safety Summary

! WARNING

- Do not perform installation work, refrigerant piping work, drain piping and electrical wiring connection without referring to the installation manual.
- Check that the ground wire is securely connected.
- Connect a fuse of specified capacity.

! CAUTION

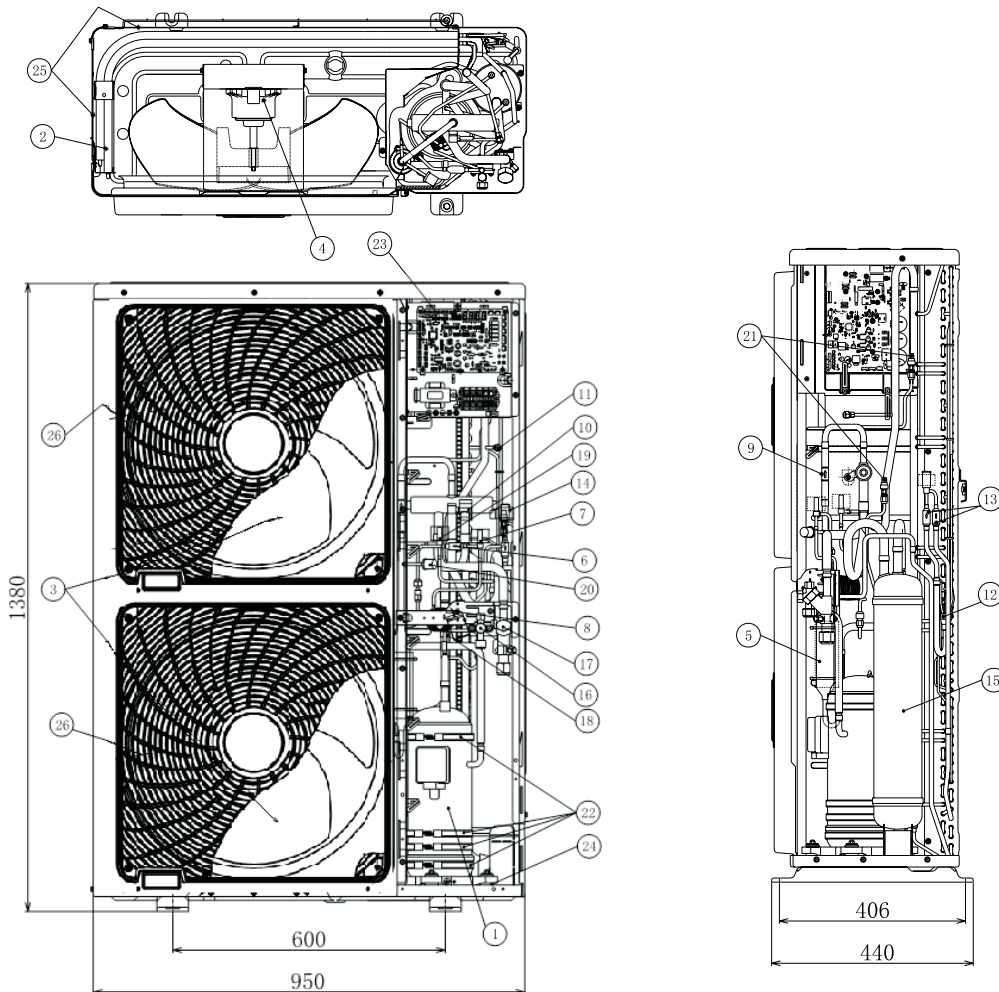
Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.

Table 1.1 Line-Up of Outdoor Unit

Capacity(KBtu/h)	38	48	54		
Model	AVW-38U(C/2)SC	AVW-48U(C/2)SC	AVW-54U(C/2)C	AVW-48U(E/7)SC	AVW-54U(E/7)SC

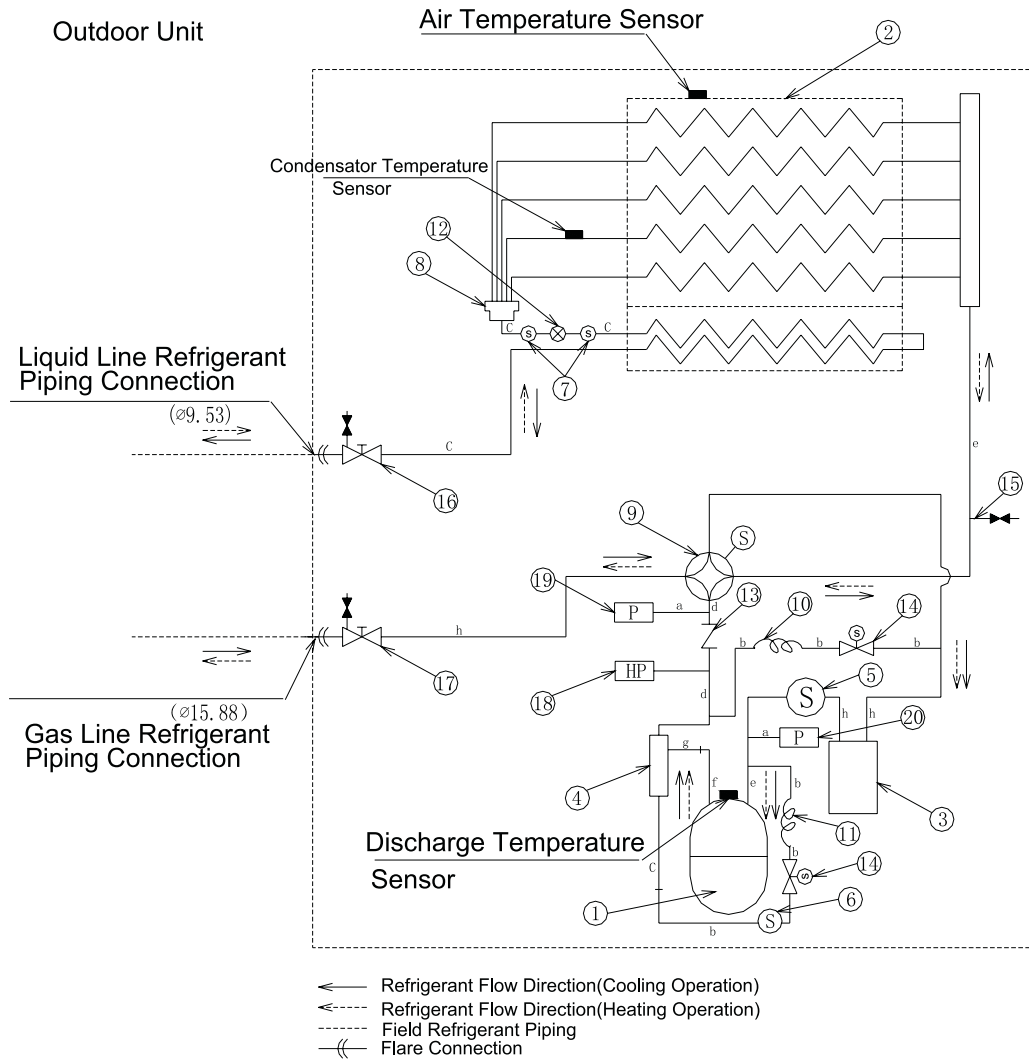
2. Structure

2.1 Outdoor Unit & Refrigerant Cycle <Outdoor Unit>



No.	Part Name	No.	Part Name
1	Compressor	14	Electrical Expansion Valve
2	Heat Exchanger	15	Gas & Liquid Separator
3	Propeller Fan	16	Stop Valve for Liquid Line
4	Fan Motor	17	Stop Valve for Gas Line
5	Oil Separator	18	Strainer
6	Strainer	19	Bypass Solenoid Valve
7	Return Oil Solenoid Valve	20	High Pressure Switch
8	Return Oil Solenoid Tube	21	Pressure Sensor
9	Individual Valve	22	Crankcase Heater
10	Reversing Valve	23	Electrical Box
11	Check Joint for High/Low Pressure(Cool/Heat)	24	Vibration Absorbing Rubber
12	Distributor	25	Air Inlet
13	Strainer	26	Air Outlet

<Refrigerant Cycle>



NO.	Part Name	Remark
1	Compressor	
2	Heat Exchanger	
3	Gas & Liquid Separator	
4	Oil Separator	
5	Strainer	
6	Strainer	
7	Strainer	
8	Distributor	
9	Reversing Valve	
10	Capillary Tube	Bypass
11	Capillary Tube	Return Oil
12	Electrical Expansion Valve	
13	Individual Valve	
14	Solenoid Valve	Bypass&Return Oil
15	Check Joint	
16	Stop Valve for Liquid Line	
17	Stop Valve for Gas Line	
18	Pressure Switch	High Pressure Protect
19	Pressure Sensor	High Pressure
20	Pressure Sensor	Low Pressure

NO.	O.D. × T	Material
a	Φ6.35 × 0.7 t	C1220T-0
b	Φ6.35 × 1.07 t	
c	Φ9.53 × 0.8 t	
d	Φ12.7 × 1.0 t	
e	Φ15.88 × 1.0 t	
f	Φ15.88 × 1.2 t	
g	Φ15.88 × 1.65 t	
h	Φ19.05 × 1.2 t	

2.2 Necessary Tools and Instrument List for Installation

No.	Tool	No.	Tool	No.	Tool	No.	Tool
1	Handsaw	6	Copper Pipe Bender	11	Spanner	16	Leveller
2	Phillips Screwdriver	7	Manual Water Pump	12	Charging Cylinder	17	Clamper for Solderless Terminals
3	Vacuum Pump	8	Pipe Cutter	13	Gauge Manifold	18	Hoist (for Indoor Unit)
4	Refrigerant Gas Hose	9	Brazing Kit	14	Cutter for Wires	19	Ammeter
5	Megohmmeter	10	Hexagon Wrench	15	Gas Leak Detector	20	Voltage Meter

Use tools and measuring instruments only for the new refrigerant which is directly touch to refrigerant.

◇: Interchangeability is available with current R22

●: only for Refrigerant R410A (No Interchangeability with R22)

×: Prohibited

◆: only for Refrigerant R407C (No Interchangeability with R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (★: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter Chamfering Reamer	◇	◇	-	Cutting Pipe Removing Burrs
	Flaring Tool	◇ ●	◇	* The flaring tools for R407C are applicable to R22.	Flaring for Tubes
	Extrusion Adjustment Gauge	●	-	* If using flaring tube, make dimension of tube larger for R410A. * In case of material 1/2H, flaring is not available.	Dimensional Control for Extruded Portion of Tube after Flaring
	Pipe Bender	◇	◇	* In case of material 1/2H, bending is not available. Use elbow for bend and braze.	Bending
	Expanding Tool	◇	◇	* In case of material 1/2H, expanding of tube is not available. Use socket for connecting tube.	Expanding Tubes
	Torque Wrench	●	◇	* For φ12.7, φ15.88, spanner size is up 2mm.	Connection of Flare Nut
		◇	◇	* For φ6.35, φ9.53, φ19.05, spanner size is the same.	
	Brazing Tool	◇	◇	* Perform correct brazing work.	Brazing for Tubes
	Nitrogen Gas	◇	◇	* Strict Control against Contamin (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing
Lubrication Oil (for Flare Surface)	●	◆	* Use a synthetic oil which is equivalent to the oil used in the refrigeration cycle. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface	
Vacuum Drying Refrigerant Charge	Refrigerant Cylinder	●	◆	* Check refrigerant cylinder color. ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.	Refrigerant Charging
	Vacuum Pump	◇	◇	★ The current ones are applicable. However, it is required to mount a vacuum pump adapter which can prevent from reverse flow when a vacuum pump stops, resulting in no reverse oil flow.	Vacuum Pumping
	Adapter for Vacuum Pump	* ●	◆		
	Manifold Valve	●	◆	* No interchangeability is available due to higher pressures when compared with R22.	Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures
	Charging Hose	●	◆	* Do not use current ones to the different refrigerant. If used, mineral oil will flow into the cycle and cause sludges, resulting in clogging or compressor failure. Connection diameter is different; R410A: UNF1/2, R407C: UNF7/16.	
	Charging Cylinder	×	×	* Use the weight scale.	
	Weight Scale	◇	◇	-	Measuring Instrument for Refrigerant Charging
Refrigerant Gas Leakage Detector	* ●	◆	* The current gas leakage detector (R22) is not applicable due to different detecting method.	Gas Leakage Check	

*: Interchangeability with R407C.

3. Transportation and Handling

3.1 Indoor Unit&Outdoor Unit Matching

- Below Indoor Unit matching Hi Smart L outdoor unit.

Table 3.1 Indoor Unit Model

Indoor Unit Type	Nominal Capacity (kBtu/h)													
	05	07	09	12	14	17	18	22	24	27	30	38	48	54
Ceiling Ducted Type (Low Static Pressure)		○	○	○	○	○	○	○	○	○	○	○	○	○
Ceiling Ducted Type (High Static Pressure)		○	○	○	○	○	○	○	○	○	○	○	○	○
Low-Height Ceiling Ducted Type		○	○	○	○	○	○	○	○					
Low-Height Ceiling Ducted Type (DC)	○	○	○	○	○	○	○	○	○					
Slim Ceiling Ducted Type		○	○	○	○									
1-Way Cassette Type		○	○	○	○	○		○						
2-Way Cassette Type		○	○	○	○		○		○					
4-Way Cassette Type			○	○	○	○	○	○	○	○	○	○	○	○
Compact 4-Way Cassette Type	○	○	○	○	○	○								
Wall-Mounted Type		○	○	○	○	○	○	○	○					
Ceiling and Floor Type						○	○	○	○	○	○	○	○	
Floor-Concealed Type			○		○		○		○					

○: Allow

- Indoor Unit total Capacity must be 50% to 130% for Outdoor Unit Rated Capacity

Table 3.2 System Matching

Outdoor Unit Model Capacity(KBtu/h)	Rated Capacity(×100W)			
	Min. Matching Capacity (×100W)	Max. Matching Capacity (×100W)	Matching Quantity	Min. Single Operate Capacity (×100W)
38	56	168	2 to 6	18
48	70	210	2 to 7	18
54	78	232.5	2 to 7	18

		Connection Ratio	
		≤130%	≤150%
Number of Connectable I.U.	Max. Number of Connectable I.U. of 7	(1)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.	(1)No more than 1 unit is allowed for Models 07/09 of wall type indoor units, or the capacity of these units in addition to 1 unit are calculated as two times declared data in case of more than 1 units connection. (2)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.
	Max. Number of Connectable I.U. of 9	(1)No more than 1 unit is allowed for Models 07/09 of wall type indoor units, or the capacity of these units in addition to 1unit are calculated as two times declared data in case of more than 1 units connection. (2)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.	(1)No more than 1 unit is allowed for Models 07/09 of wall type indoor units, or the capacity of these units in addition to 1 unit are calculated as two times declared data in case of more than 1 units connection. (2)Models 05/07/09 of compact cassette type indoor units are forbidden, or the capacity of these units are calculated as two times declared data in case of connection.

3.2 Transportation

Transport the product as close to the installation location as practical before unpacking.

CAUTION

Do not put any material on the product. Apply two lifting wires onto the outdoor unit, when lifting it by crane.

● Hanging Method

When hanging the unit, ensure a balance of the unit, check safety and lift up smoothly.

- (1) Do not remove any packing materials.
- (2) Hang the unit under packing condition with two (2) ropes, as shown in Fig. 3.1.

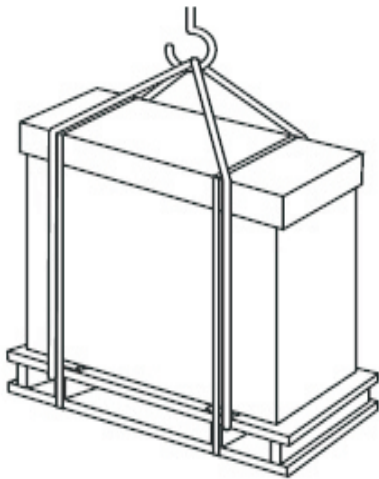


Fig. 3.1 Hanging Work for Transportation

CAUTION

If have no package to move, Please protect with cloth or paper

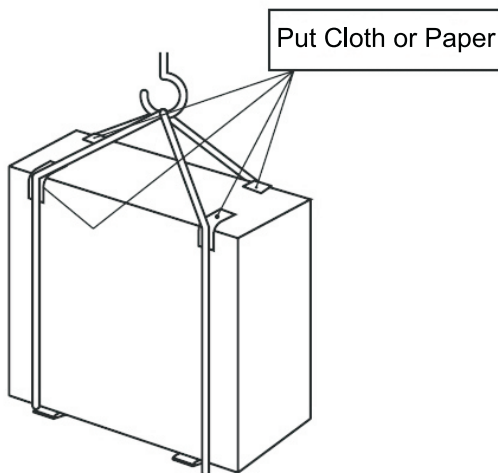


Fig.3.2 Transportation for no wooden base

(kg)

Outdoor Unit Model (KBut/h)	Net Weight
AVW-38/48/54U(C/2)*	93
	95
	97
AVW-48/54U(E/7) *	103
	103

WARNING

Do not put any foreign material into the outdoor unit and check to ensure that none exists in the outdoor unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.

4. Outdoor Unit Installation

4.1 Factory-Supplied Accessories

Check to ensure that the following accessories are packed with the outdoor unit.

Table 4.1 Factory-Supplied Accessories

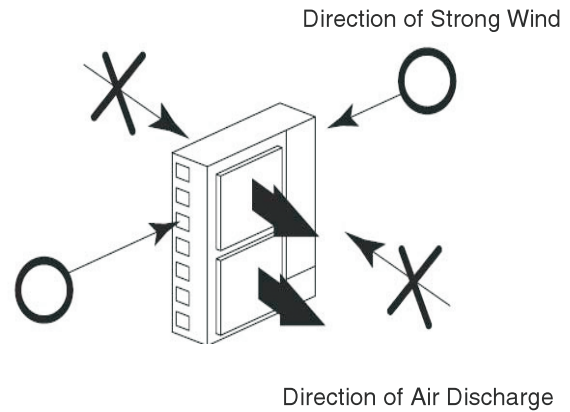
Accesso	Q'ty	Recommend
Washer	4	for Anchor Bolts

NOTE

If any of these accessories are not packed with the unit, please contact your contractor.

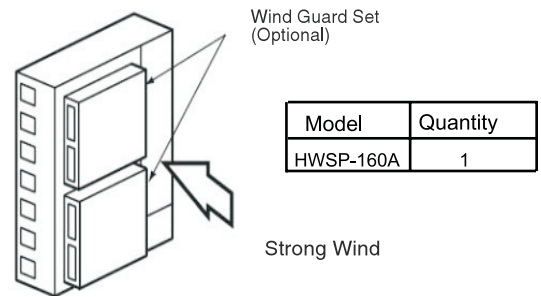
4.2 Initial Check

- Install the outdoor unit where good ventilation is available, and where it is dry.
- Install the outdoor unit where the sound or the discharge air from the outdoor unit does not affect neighbors or surrounding vegetation. The operating sound at the rear or right/left sides is higher than the value in the catalog at the front side.
- Check to ensure that the foundation is flat, level and sufficiently strong.
- Do not install the outdoor unit where there is a high level of oil mist, salty air or harmful gases such as sulphur.
- Do not install the outdoor unit where the electromagnetic wave is directly radiated to the electrical box.
- Install the outdoor unit as far as practical, being at least 3 meters from the electromagnetic wave radiator.
- When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger.
- Install the outdoor unit where it is in the shade or it will not be exposed to direct sunshine or direct radiation from high temperature heat source.
- Do not install the outdoor unit where dust or other contamination could block the outdoor heat exchanger.
- Install the outdoor unit in a space with limited access to general public.
- Do not install the outdoor unit in a space where a seasonal wind directly blows to the outdoor heat exchanger or a wind from a building space directly blows to the outdoor fan.

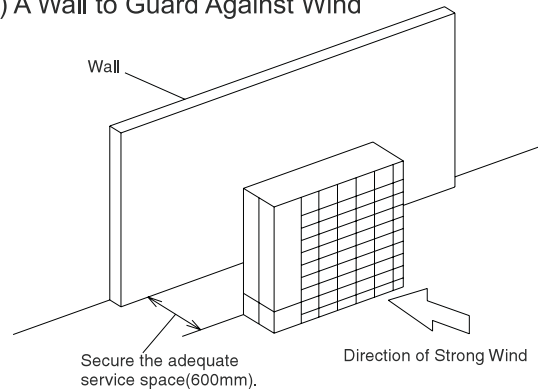


- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, adopt the wind guard set or install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

(1) Using Wind Guard



(2) A Wall to Guard Against Wind



NOTE:

If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

CAUTION

Aluminum fins have very sharp edges. Pay attention to the fins to avoid any injury.

NOTE

Install the outdoor unit on a roof or in an area where people except service engineers can not touch the outdoor unit.

4.3 Service Space

Install the outdoor unit with a sufficient space around the outdoor unit for operation and maintenance as shown below Fig4.1.

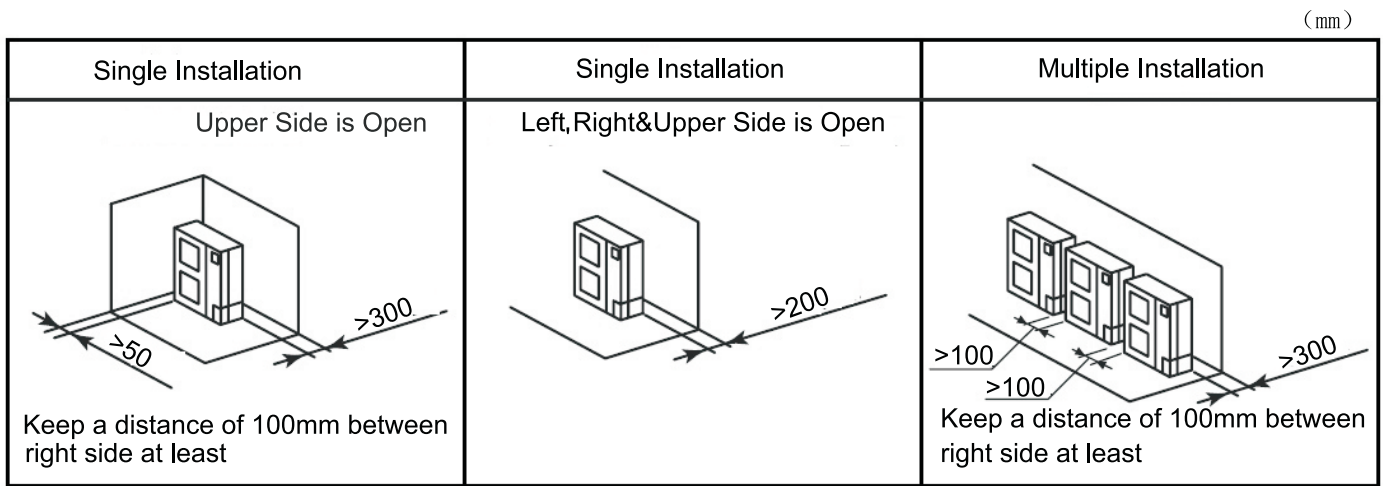


Fig. 4.1 Installation Space

4.4 Installation Work

- (1) Secure the outdoor unit with the anchor bolts.

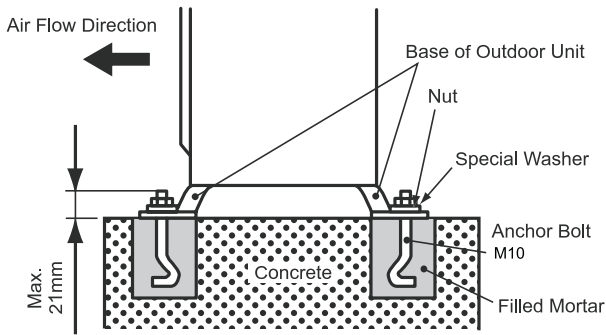


Fig. 4.2 Installation of Anchor Bolts

Fix the outdoor unit to the anchor bolts by special washer of factory-supplied accessory.

- (2) When installing the outdoor unit, fix the unit by anchor bolts. Refer to Fig. 4.3

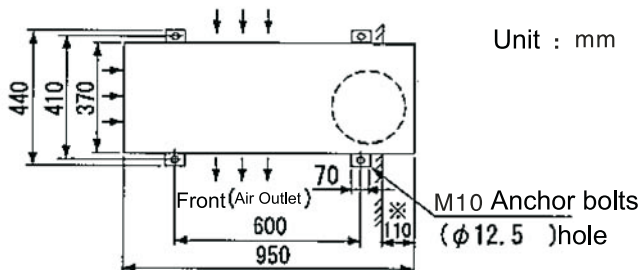


Fig. 4.3 Position of Anchor Bolts

NOTE:

When the mark * dimension is secured, piping work from bottom side is easy without interference of foundation.

- (3) Example of fixing outdoor unit by anchor bolts.

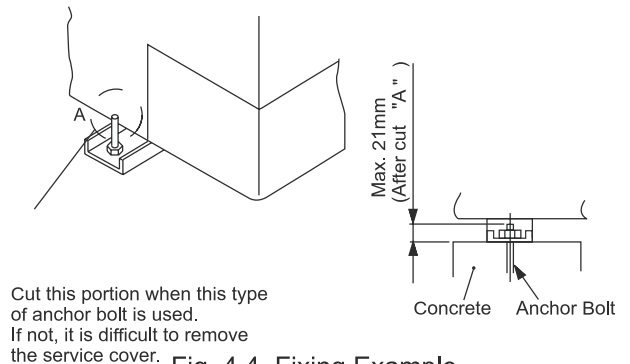


Fig. 4.4 Fixing Example

- (4) Fix the outdoor unit firmly so that declining, making noise, and falling down by strong wind or earthquake is avoided.

Fixing Plate (Field-Supplied)

Both sides on the unit fixing can be possible.

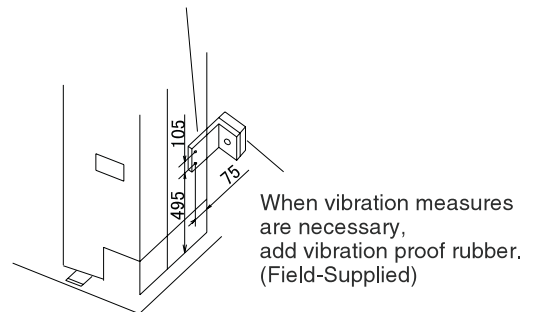
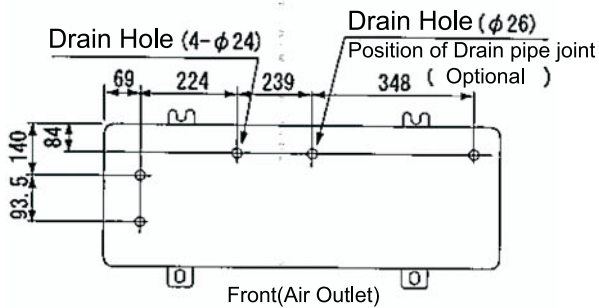


Fig. 4.5 Additional Fixing Arrangement

- (5) When installing the unit on a roof or a veranda, drain water sometimes turns to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery.

- (6) In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DC-01Q L:Optional Parts) .



Recommended Metal Plate Size (Field-Supplied)

Material: Hot-Rolled Mild Steel Plate (SPHC)
Plate Thickness: 4.5T

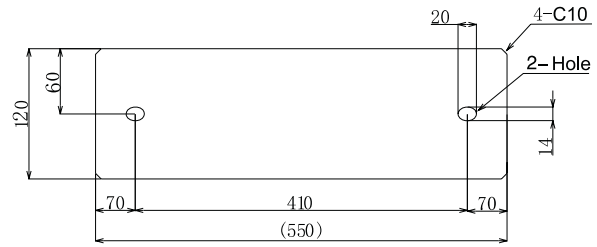
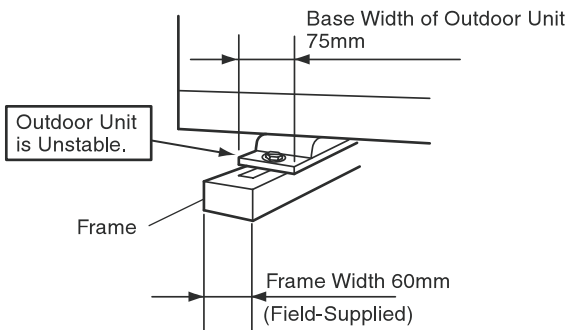


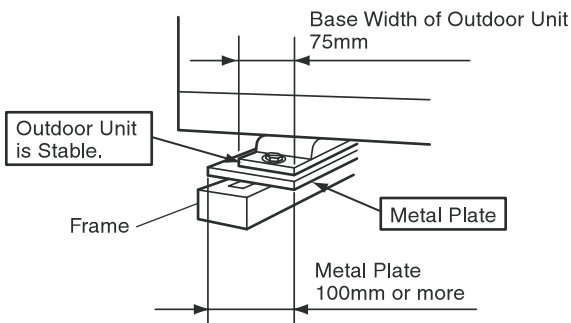
Fig. 4.6 Frame and Base Installation

- (7) The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned the same way. When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in Fig. 4.6.

Incorrect



Correct



5. Refrigerant Piping Work

⚠ DANGER

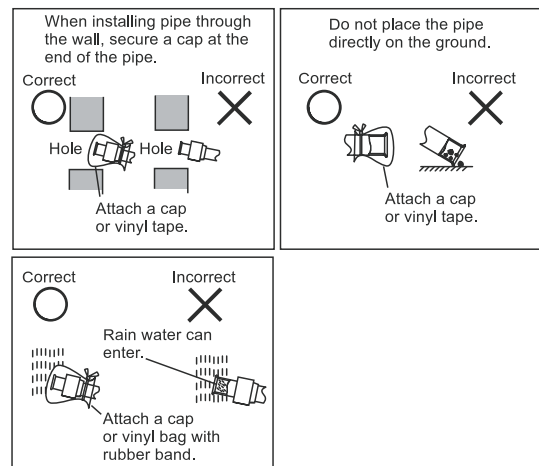
Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.

5.1 Piping Materials

- (1) Prepare locally-supplied copper pipes.
- (2) Select the piping size from the Table 5.1.
- (3) Select clean copper pipes. Make sure there is no dust and moisture inside of the pipes. Blow the inside of the pipes with nitrogen or dry air, to remove any dust or foreign materials before connecting pipes.

NOTE

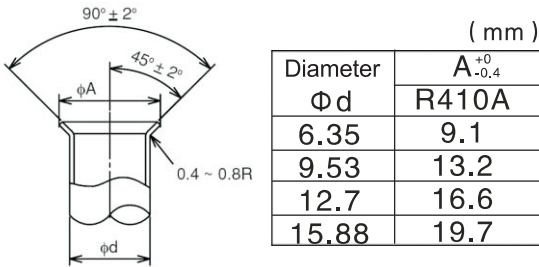
● Cautions for Refrigerant Pipe Ends



! CAUTION

- Cap the end of the pipe when the pipe is to be inserted through a hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.

- Flaring Dimension
Perform the flaring work as shown below.



- Piping Thickness and Material
Use the pipe as below.

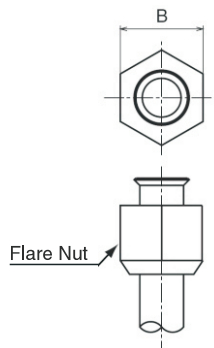
Diameter	R410A	
	Thickness	Material
φ 6.35	0.8	0
φ 9.53	0.8	0
φ 12.7	0.8	0
φ 15.88	1.0	0

Material is based on a JIS standard (JIS B8607).

- Flare Nut Dimension
Use the flare nut as below.

<Flare Nut Dimension B (mm)

Diameter	R410A
φ 6.35	17
φ 9.53	22
φ 12.7	26
φ 15.88	29



Dimension is based on a JIS standard (JIS B8607).

5.2 Refrigerant Piping Work

- (1) Ensure that the directions for refrigerant piping work according to the tables.

Table 5.1 Limitation of Outdoor Unit

Capacity (KBtu/h)	Outer Diameter of Pipe (mm)		
	Gas	Liquid	Branch Pipe
38	φ 15.88	φ 9.53	HFQ-052F
48			
54			

Table 5.2 Indoor Unit Pipe Model

Indoor Unit Pipe Model	Gas Pipe	Liquid Pipe
05~14	φ 12.7 (1/2)	φ 6.35 (1/4)
17~18	φ 15.88 (5/8)	φ 6.35 (1/4)
22~24	φ 15.88 (5/8)	φ 9.53 (3/8)

- (2) Additional Refrigerant Charge R410A

Although refrigerant has been charged into this unit, it is required that additional refrigerant be charged according to piping length.

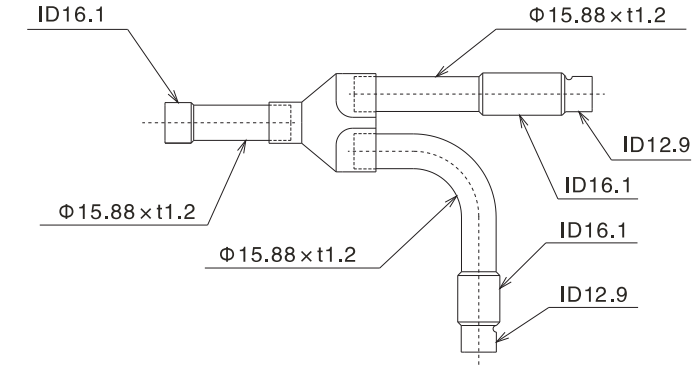
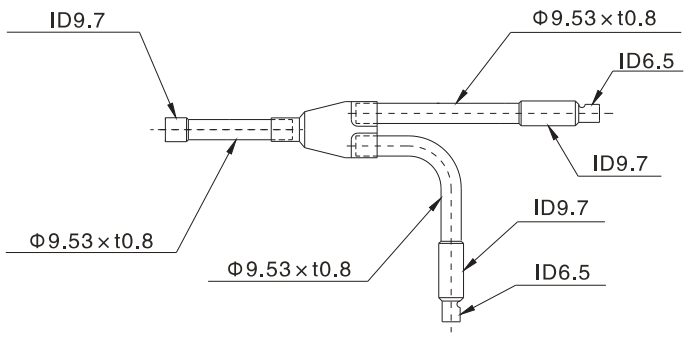
Refer to 5.8

Table 5.4 Refrigerant Pipe System&Additional Refrigerant Quantity

Item		System	Branch lipe for Line Branch																								
<p>Example</p> <p>One outdoor unit joint six indoor units, pipe materials are acquired from local</p>																											
Max.Pipe Length	Max.Saving Length Lt		$Lt \leq 75m$																								
	Total Pipe Lentth $L_{to} = Lt + L_0 + L_1 + L_2 + L_3 + L_4$		$L_{to} \leq 120m$																								
High Distance between Outdoor and Indoor Unit	Outdoor is Higher than Indoor Unit		$H1 \leq 30m$																								
	Indoor is Higher than Outdoor Unit		$H1 \leq 30m$																								
Max.High Distance between Indoor and Indoor or Indoor and Branch Pipe			$H2 \leq 15m$																								
Max.Pipe Length between Branch Pipe and Indoor	From "a" Branch Pipe to Indoor of Max. Distance		$L \leq 30m$																								
	From every Branch Pipe to Indoor of connecting		$L_0, L_1, L_2, L_3, L_4, L_5 \leq 15m$																								
Choose Branch Pipe(KBtu/h)	38~54		"a、 b、 c、 d、 e" with HFQ-052F																								
<p>Total refrigerant charge of this system is calculated in the following formula.:</p> <p>$W = W_{11} + W_{12}(kg)$</p> <p>thereinto</p> <p>$W_{11}(kg) = \phi 9.53 \text{ Total Liquid Length}(m) \times 0.04$</p> <p>$W_{12}(kg) = \phi 6.35 \text{ Total Liquid Length}(m) \times 0.02$</p>		Liquid Pipe	<p><Example></p> <p>(AVW-54UCSC)</p> <table border="1"> <thead> <tr> <th>Symbol</th> <th>Lt-L5</th> <th>L0</th> <th>L1</th> <th>L2</th> <th>L3</th> <th>L4</th> <th>L5</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>$\phi 9.53$</td> <td>$\phi 6.35$</td> <td>$\phi 6.35$</td> <td>$\phi 6.35$</td> <td>$\phi 6.35$</td> <td>$\phi 6.35$</td> <td>$\phi 6.35$</td> </tr> <tr> <td>Length</td> <td>21</td> <td>5</td> <td>3</td> <td>5</td> <td>3</td> <td>5</td> <td>3</td> </tr> </tbody> </table> <p>$W_{11} = 21 \times 0.04 = 0.84kg$</p> <p>$W_{12} = (5+3+5+3+5+3) \times 0.02 = 0.48kg$</p>	Symbol	Lt-L5	L0	L1	L2	L3	L4	L5	Model	$\phi 9.53$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	Length	21	5	3	5	3	5	3
Symbol	Lt-L5		L0	L1	L2	L3	L4	L5																			
Model	$\phi 9.53$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$																				
Length	21	5	3	5	3	5	3																				
Total			$W = W_{11} + W_{12}(kg) = 1.32 kg$																								

5.3 Branch Pipe for Line Branch

Table 5.5 T Shape Branch Pipe

Branch	HFQ-052F
Gas Line	
Liquid Line	

Unit : mm , ID: Inner Diameter , OD: Outer Diameter

5.4 Piping Connection

Pipes can be connected from 4 directions.

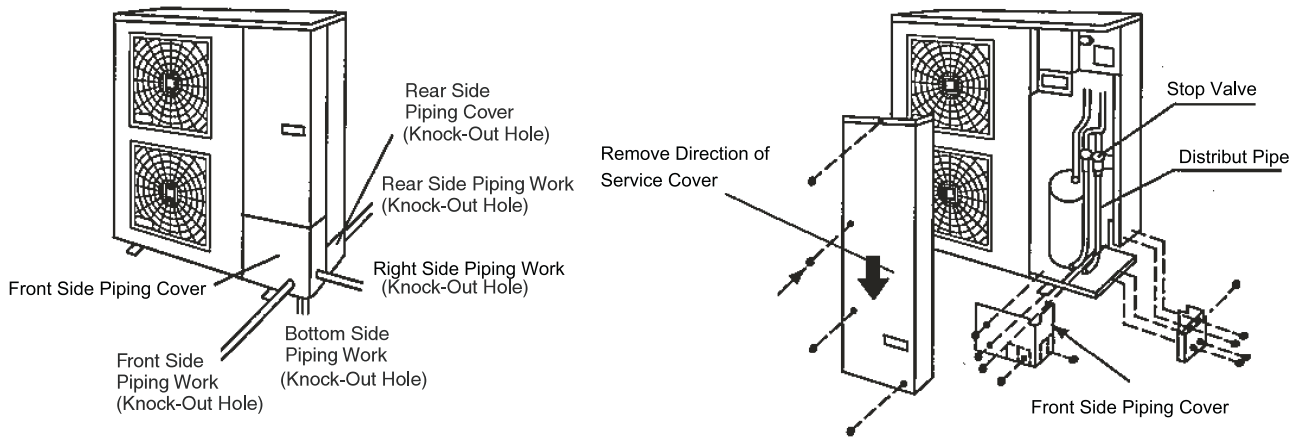


Fig. 5.1 Piping Direction

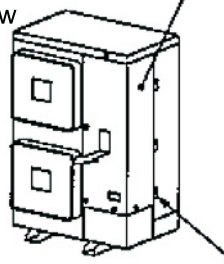
Note Item for Remove Service Cover

Main Points for Remove Service Cover

① Remove the bolts of service cover follow right Fig.

- Note -

Press the service cover when remove the bolts. It is possible for service cover to slide down.



Service Cover

Fix Hook (3 Points)

② Press the service cover at front, then remove it down slowly.

Fig. 5.2 Remove Service Cover

- (1) Confirm that the valve is closed.
- (2) Prepare a field-supplied bend pipe for liquid line. Connect it to the liquid valve by flare nut through the square hole of bottom base.
- (3) For Gas Piping Connection Prepare a field-supplied bend pipe for gas line. Braze it and the factory-supplied pipe flange at the outside of the unit.

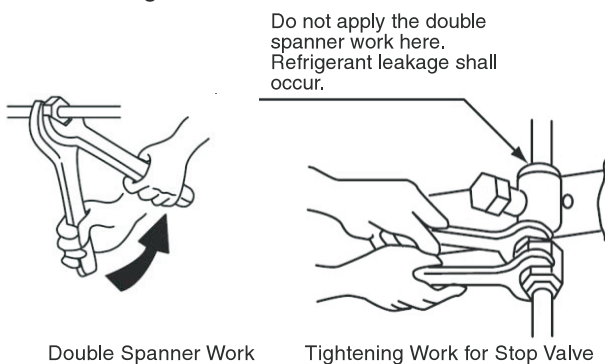
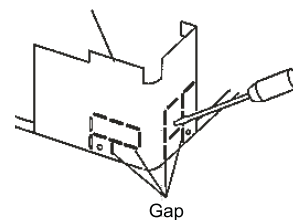


Table 5.6 Tightening Torque for Flare Nut

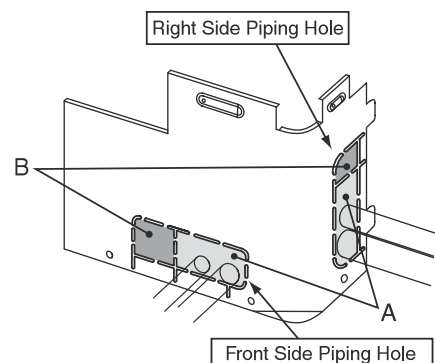
Pipe Size	Torque
Φ6.35(1/4)	20N · m (2kgf · m)
Φ9.53(3/8)	40N · m (4kgf · m)
Φ12.7(1/2)	60N · m (6kgf · m)
5.88(5/8)	80N · m (8kgf · m)

- (4) Pipes can be connected from 4 directions as shown Fig. 5.1. Make a knock-out hole in the front pipe cover or bottom base to pass through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with screwdriver and a hammer. Then, cut the edge of the holes and attach insulation (Field-Supplied) for cables and pipes protection.

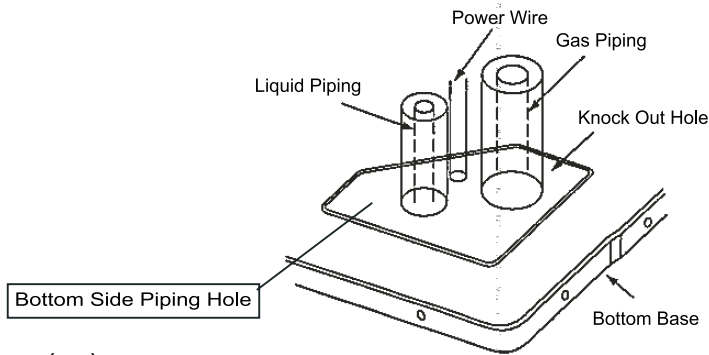
Front Side Piping Cover



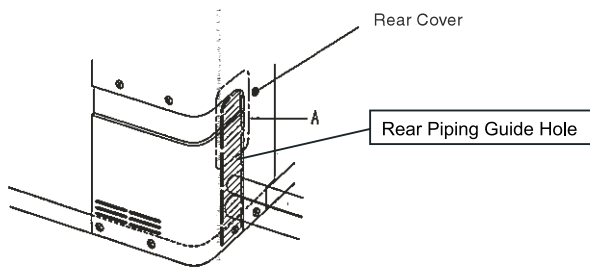
(a) Connect Front and Right Side Pipe



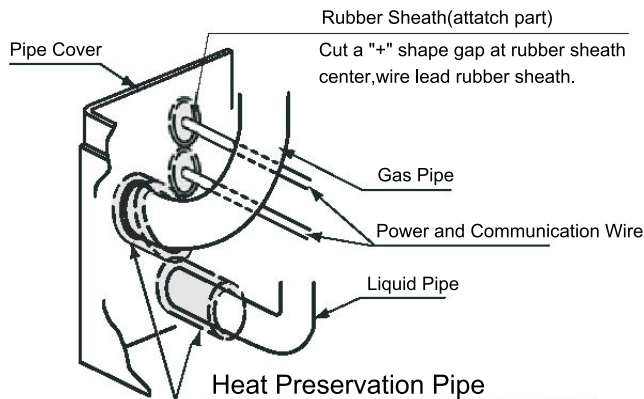
(b) Bottom Side Piping Work



(c) Rear Piping Work



(5) To avoid damage protect cables and pipes with rubber sheath (Field-Supplied).



To prevent gaps use a rubber bush and insulation (Factory-Supplied) adequately when installing the piping cover. Cut the lower side guide line of the piping cover when attaching work is difficult.

5.5 Air Tight Test

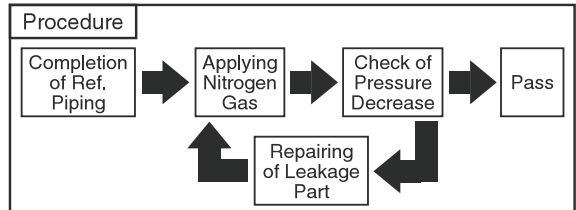
- (1) The stop valve has been closed before shipment, however, make sure that the stop valves are closed completely.
- (2) Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping. Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc. (If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length.)

- (3) Apply the oil thinly at the seat surface of the flare nut and pipe before tightening. And when tightening the flare nut, use two spanners.

Refrigerant Oil is field-supply.

Model: FVC68D (Ether Oil)
Manufacturer: IDEMITSU KOSAN Co., Ltd.

Model a68HES-H Manufacturer: sunoco Inc



(4) Stop Valve

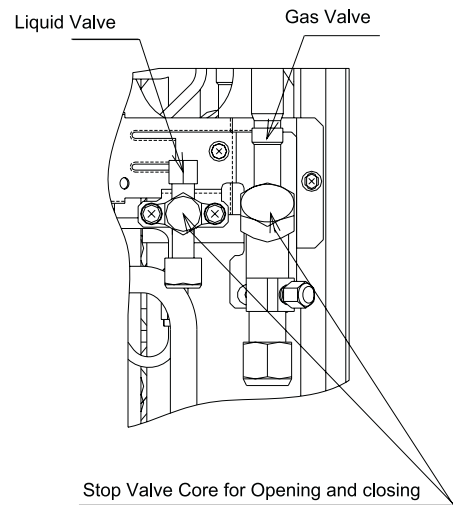
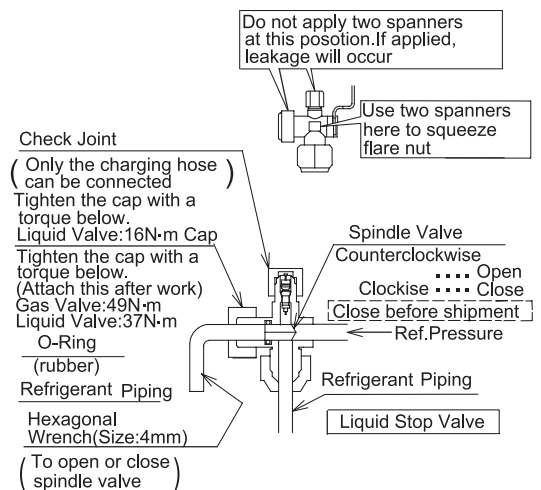


Fig.5.3 Stop Valve Position

Operation of the stop valve should be performed according to the below.

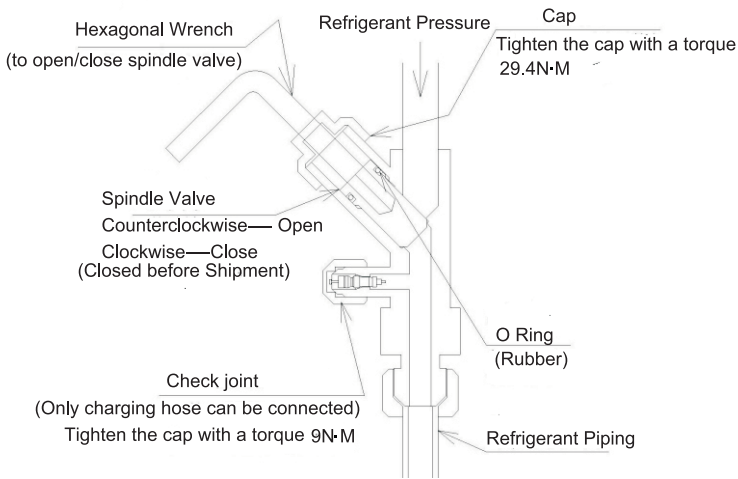
<Liquid Valve>



Spindle Valve Torque (N·m)

Gas	Liquid
11~14	7~9

<Gas Valve>



Hexagonal Wrench Size (mm)

Gas	Liquid
8	4

CAUTION

- Do not apply an abnormal big force to the spindle valve at the end of opening (5.0N·m or smaller). The back seat construction is not provided.
- Do not loosen the stop ring. If the stop ring is loosened, it is dangerous, since the spindle will hop out.

- (5) Connect the gauge manifold using charging hoses with a nitrogen cylinder to the check joints of the liquid line and the gas line stop valves. Perform the air-tight test. Do not open the stop valves. Apply nitrogen gas pressure of 4.15MPa.
- (6) Check for any gas leakage at the flare nut connections, or brazed parts by gas leak detector or foaming agent.
- (7) After the air tight test, release nitrogen gas.

CAUTION

After pipe and nut cap connected,when make air test , open the stop valve spindle cap,make sure valve closed already(clock wise).

- Tighten nut cap below torque,great torque will bring on refrigerant leakage of valve spindle.

Pipe Diameter	Tighten Torque
Φ6.35(1/4)	14 ~ 18N · m
Φ9.53(3/8)	34 ~ 42N · m
Φ12.7(1/2)	49 ~ 61N · m
Φ15.88(5/8)	68 ~ 82N · m

- Make air tighten test after valve spindle turn off closely.

Note:

Do not connect nut cap on test joint,supply for connecting refrigerant charge soft pipe.It have no effect for system capacity when connect jonit cap and valce cap opened together "pu chi" light sound.

5.6 Vacuum Pumping and charge refrigerant

- (1) Connect a mani-fold gauge to the check joints at the both sides.

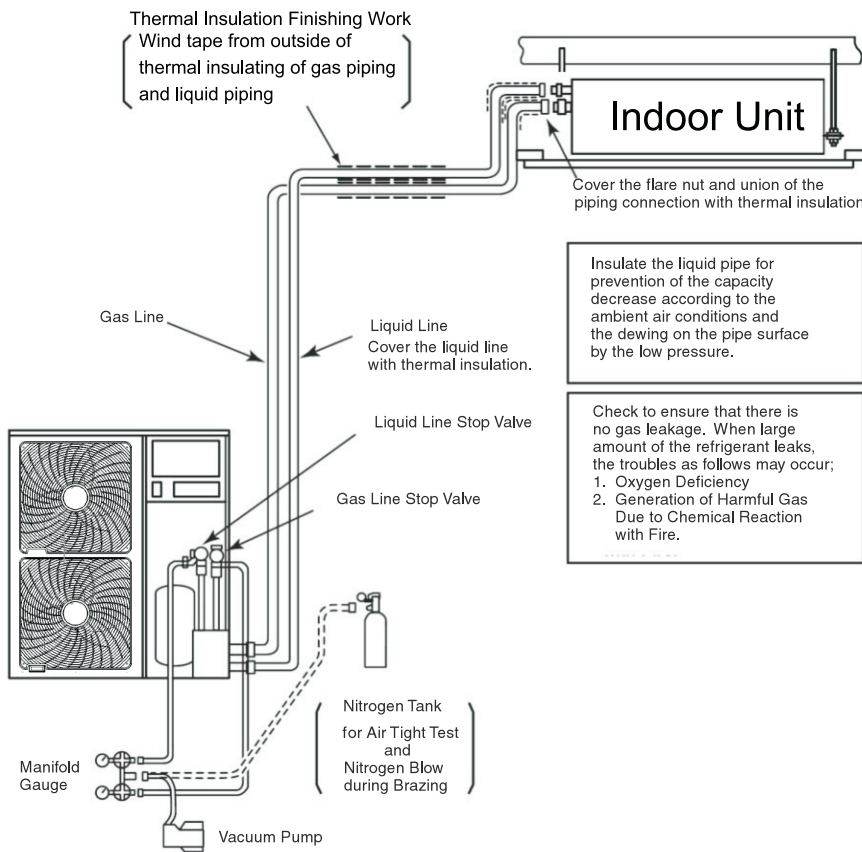
Continue vacuum pumping work until the pressure reaches 756mmHg or lower for one to two hours.

After vacuum pumping work, stop the mani-fold valve's valve, stop the vacuum pump and leave it for one hour. Check to ensure that the pressure in the mani-fold gauge does not increase.

Note:

1. This unit is only for the refrigerant R410A. The manifold gauge and the charging hose should be exclusive use for R410A.
2. If vacuum degree of -0.1MPa (756mmHg) is not available, it is considered of gas leakage or entering moisture. Check for any gas leakage once again. If no leakage exists, operate the vacuum pump for more than one to two hours.
- (2) Connect adjusted valve and charge kettle to check joint of liquid valve.
- (3) Fully open the gas valve and liquid valve slowly.
- (4) Open adjusted valve to add refrigerant (must be refrigerant is liquid).
- (5) Operate cool mode,charge stated refrigerant.
- (6) Confirm the capacity of charging refrigerant with balance.an excess or a shortage of refrigerant is cause of trouble to the units.
- (7) Fully open the liquid valve.

**Never use the refrigerant charged in the outdoor unit for air purging.
Insufficient refrigerant will lead to failure.**



CAUTION

- **At the test run, fully open the spindle. If not fully opened, the devices will be damaged.**
- **An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of service cover.**
- **Check for refrigerant leakage in detail. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.**

1. Maximum Permissible Concentration of HFC GAS R410A charged in the DC INVERTER is an incombustible and non-toxic gas.

However, if leakage occurs and gas fills a room, it may cause suffocation. The maximum permissible concentration of HCFC gas, R410A in air is 0.3kg/m^3 , according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan. Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.3kg/m^3 , in case of leakage.

2. Calculation of Refrigerant Concentration

- (1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of objective rooms.
- (2) Calculate the room volume V (m^3) of each objective room.
- (3) Calculate the refrigerant concentration C (kg/m^3) of the room according to the following equation.

$$\frac{\text{R: Total Quantity of Charged Refrigerant (kg)}}{\text{V: Room Volume (m}^3\text{)}} = \text{C: Refrigerant Concentration} \leq 0.3 \text{ (kg/m}^3\text{)}$$

If local codes or regulations are specified, follow them.

5.7 Caution of the Pressure by Check Joint

When the pressure is measured, use the check joint of gas stop valve ((A) in the figure below) and use the check joint of liquid piping ((B) in the figure below).

At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

	Cooling Operation	Heating Operation
Check Joint for Gas Stop Valve "A"	Low Pressure	High Pressure
Check Joint for Piping "B"	High Pressure	Low Pressure
Check Joint for Liquid Stop Valve "C"	Exclusive for Vacuum Pump and Refrigerant Charge	

NOTE:

Be careful that refrigerant and oil do not splash to the electrical parts at removing the charge hoses.

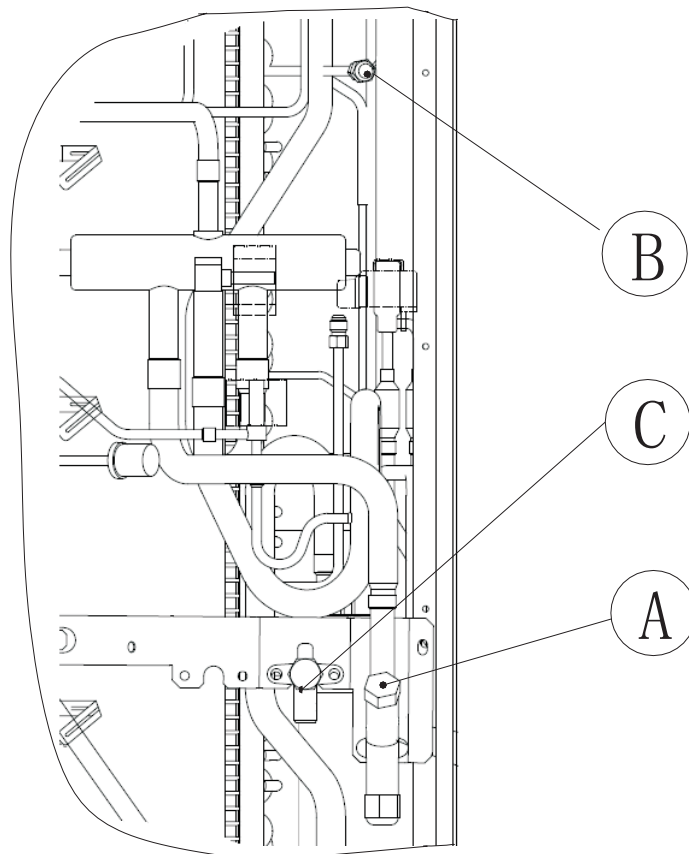


Fig 5.4 Check Joint Position

5.8 Additional Refrigerant Charge

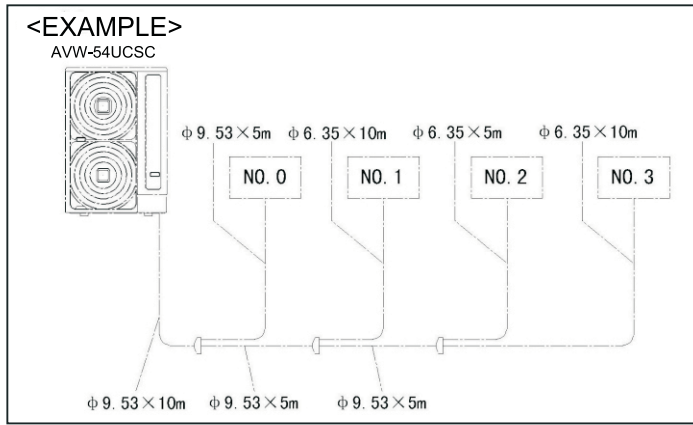
It is necessary additional refrigerant charge as follows.

Additional Refrigerant Charge Calculation

Although refrigerant has been charged into this unit, it is required that additional refrigerant be charged according to piping length.

- Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
- Record the additional refrigerant quantity to facilitate service activities thereafter.

1. Calculating Method of Additional Refrigerant Charge (W kg)



See Example for Model AVW-54UCSC, and fill in the following table.

Pipe Diameter (mm)	Total Piping Length (m)	Additional Charge (kg)
W11= $\Phi 9.53$	(10 + 5 + 5 + 5)	$\times 0.04 = 1$
W12= $\Phi 6.35$	(10 + 10 + 5)	$\times 0.02 = 0.50$

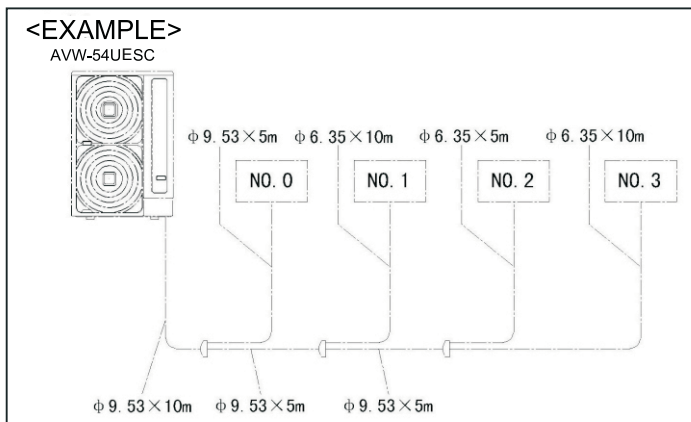
Total Piping Length 50 m Additional Charge $W = W11 + W12 = 1.50$ (kg)

W1: Additional Ref.Charge according to Connection Ratio /kg		Max. Total Ref. Charge/kg
100-130%	130%-150%	
0.15Kg for each 10% ^①	0.6Kg for each 10% ^①	7.9

NOTE: ① Less than 10% is calculate as 10%.

Total $W = W0 + W11 + W12 + W1$

Calculating Method of Additional Refrigerant Charge (W kg)



See Example for Model AVW-54UESC, and fill in the following table.

Pipe Diameter (mm)	Total Piping Length (m)	Additional Charge (kg)
W11= $\Phi 9.53$	(10 + 5 + 5 + 5)	$\times 0.05 = 1.25$
W12= $\Phi 6.35$	(10 + 10 + 5)	$\times 0.02 = 0.50$

Total Piping Length 50 m Additional Charge $W = W11 + W12 = 1.75$ (kg)

<Table >

(kg)

Outdoor Unit Model Capacity (KBtu/h)		W0: Outdoor Unit Ref. Charge	
AVW-	38		UCSC
	48	3.8	
	54	4.1	
AVW-	38	U2SC	3.6
	48		
	54		

NOTE:

W₀ is outdoor unit ref. charge before shipment.

<Table >

(kg)

Outdoor Unit Model Capacity (KBtu/h)	W0: Outdoor Unit Ref. Charge
AVW-48/54U(E/7)SC	3.6

NOTE:

W₀ is outdoor unit ref. charge before shipment.

W1: Additional Ref.Charge according to Connection Ratio /kg		Max. Total Ref. Charge/kg
100-130%	130%-150%	
0.15Kg for each 10% ^①	0.6Kg for each 10% ^①	7.9

NOTE: ①Less than 10% is calculate as 10%.

Total W=W0+W11+W12+W1

One to One application can be obtained as the following requirements are met for L Series Outdoor Units.(W2)

Connection Ratio	1		2		3	
	Indoor Unit Type	The Additional Refrigerant Need to be Reduced	Indoor Unit Type	The Additional Refrigerant Need to be Reduced	Indoor Unit Type	The Additional Refrigerant Need to be Reduced
100%	Duct Type	400g	Cassette Type	600g	2-way_Cassette Type	600g

$$W=W0+W11(W12)-W2$$

2. Charging Work

Charge refrigerant (R410A) into the system as follows.

- (1) For charging refrigerant, connect the gauge mani-fold using charging hoses with a refrigerant cylinder to the check joint of the liquid line stop valve.
- (2) Fully open the gas line stop valve and slightly open the liquid line stop valve.
Charge refrigerant by opening the gauge mani-fold valve.
- (3) Charge the required refrigerant by operating the system in cooling.
Ensure to charge correct volume by utilizing a weight scale. An excess or shortage of refrigerant is the main cause of trouble to the units.
Fully open the liquid line stop valve after completing refrigerant charge.

3. Record of Additional Charge

Record the refrigerant charging quantity in order to facilitate maintenance and servicing activities.

Total refrigerant charge of this system is calculated in the following formula.

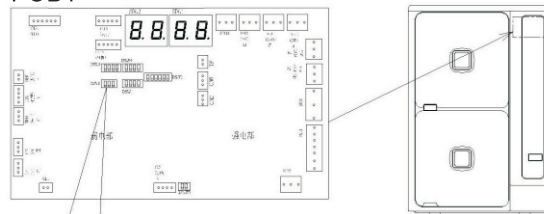
$$\begin{aligned} \text{Total Ref. Charge of This System} &= W + W_0 \\ \text{This System} &= \boxed{} + \boxed{} = \boxed{} \text{ kg} \end{aligned}$$

Total Additional Charge W	<input type="text"/>	kg
Total Ref. Charge of This System	<input type="text"/>	kg
Date of Ref. Charge Work		
Day	<input type="text"/>	Month <input type="text"/> Year <input type="text"/>

4. Dip-Switch Setting for Piping Length

Follow below ,setting the Dip-Switch for piping length.

PCB1

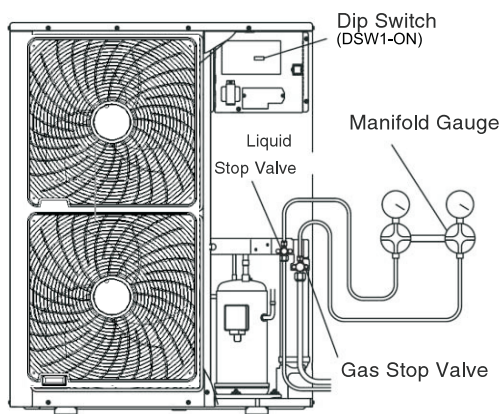


DSW6 (Mark "■" Show Switch Key Position)		
Shipment	I.U.is located higher than O.U.20m	O.U.is located higher than I.U. 25m
ON	ON	ON
OFF	OFF	OFF

5.9 Collecting Refrigerant

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows.

- (1) Attach the manifold gauge to the gas stop valve and the liquid stop valve.
- (2) Turn ON the power source.
- (3) Set the DSW1-1 pin of the outdoor unit PCB at the "ON" side for cooling operation. Close the liquid stop valve and collect the refrigerant.
- (4) When the pressure at lower pressure side (gas stop valve) indicates -0.01MPa (684mmHg), perform the following procedures immediately.
 - * Close the gas stop valve.
 - * Set the DSW1-1 pin at the "OFF" side. (To stop the unit operation.)
- (5) Turn OFF the power source.



CAUTION

Measure the low pressure by the pressure gauge and keep it not to decrease than -0.01MPa . If the pressure is lower than -0.01MPa , the compressor may be faulty.

6. Electrical Wiring

WARNING

- Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.
- Check to ensure that the indoor fan and the outdoor fan have stopped before electrical wiring work or a periodical check is performed.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not protected, rats may gnaw at unprotected parts and at the worst, a fire will occur.
- Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not do, the wires will be damaged and at the worst, a fire will occur.

CAUTION

- Tightly secure the power source wiring using the cord clamp inside the unit.

NOTE

Fix the rubber bushes with adhesive when conduit tubes to the outdoor unit are not used.

6.1 General Check

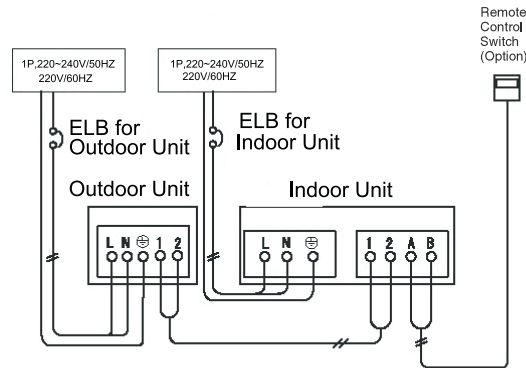
- (1) Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data. Make sure that the components comply with National Electrical Code (NEC).
- (2) Check to ensure that the voltage of power supply is within $\pm 10\%$ of nominal voltage and earth phase is contained in the power supply wires. If not, electrical parts will be damaged.
- (3) Check to ensure that the capacity of power supply is enough. If not, the compressor will be not able to operate cause of voltage drop abnormally at starting.
- (4) Check to ensure that the earth wire is connected.
- (5) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.

6.2 Electrical Wiring Connection

- (1) Connect the power supply wires to the terminal board in the electrical control box of both outdoor unit and indoor unit. And connect the earth wire to the electrical control box of outdoor unit. In addition, connect the earth wire to earth screw in the electrical control box of indoor unit. Refer to Fig. 6.2.

- (2) Connect the wires between the outdoor and indoor units to terminals 1 and 2 on the terminal board.
If power supply wiring is connected to 1 and 2 of terminal board (TB1), printed circuit board will be damaged.
Refer to Fig. 6.1.

CORRECT (ONE PHASE)



INCORRECT (ONE PHASE)

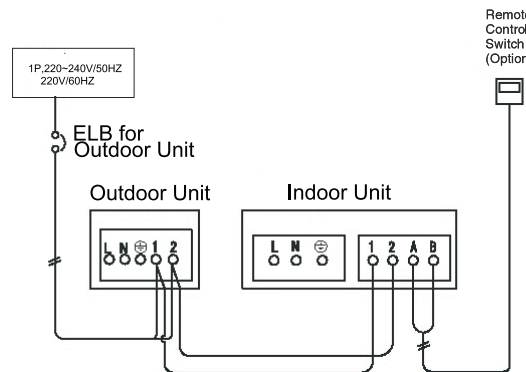
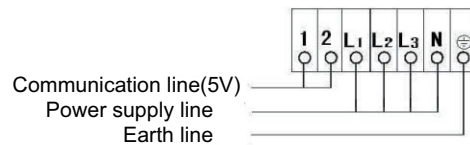


Fig. 6.1 One phase indoor unit and outdoor unit communication wire connection

Do not connect the Power Source Line to the terminal 1 and 2. These terminals are for the Control. If connected, the printed circuit board will be damaged.



Three Phase Outdoor Unit Connect Wire

NOTES:

- (3) Do not wire in front of the fixing screw of the service panel. If do, the screw can not be removed.
 - (4) Use twist pair cable with shielded for control between outdoor unit and indoor unit, control wiring between indoor units, wiring (1 and 2) for remote control switch and transmission wiring (A and B) for remote control switch .
1. In case of total wiring length at intermediate wiring between outdoor unit and indoor unit and between indoor units is less than 100m, it is possible to use the normal wiring (more than 0.75mm²) except twist pair cable.
 2. Total wiring length for remote control switch can be extended up to 500m. If total wiring length less than 30m, it is possible to use the normal wiring (0.3mm²) except twist pair cable.

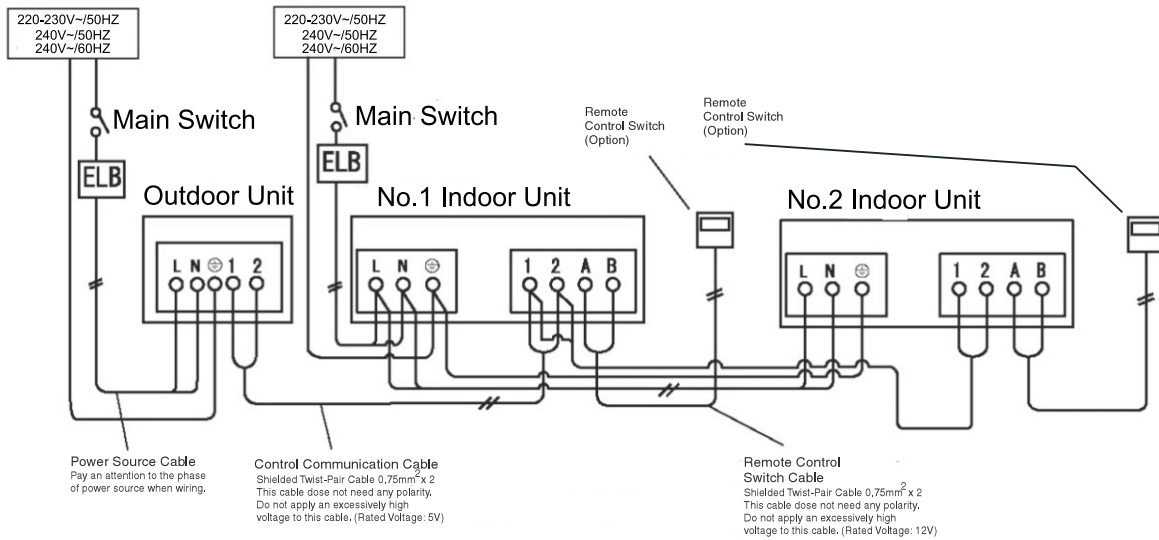


Fig. 6.2 Wiring Connection for Indoor & Outdoor (1 PHASE)

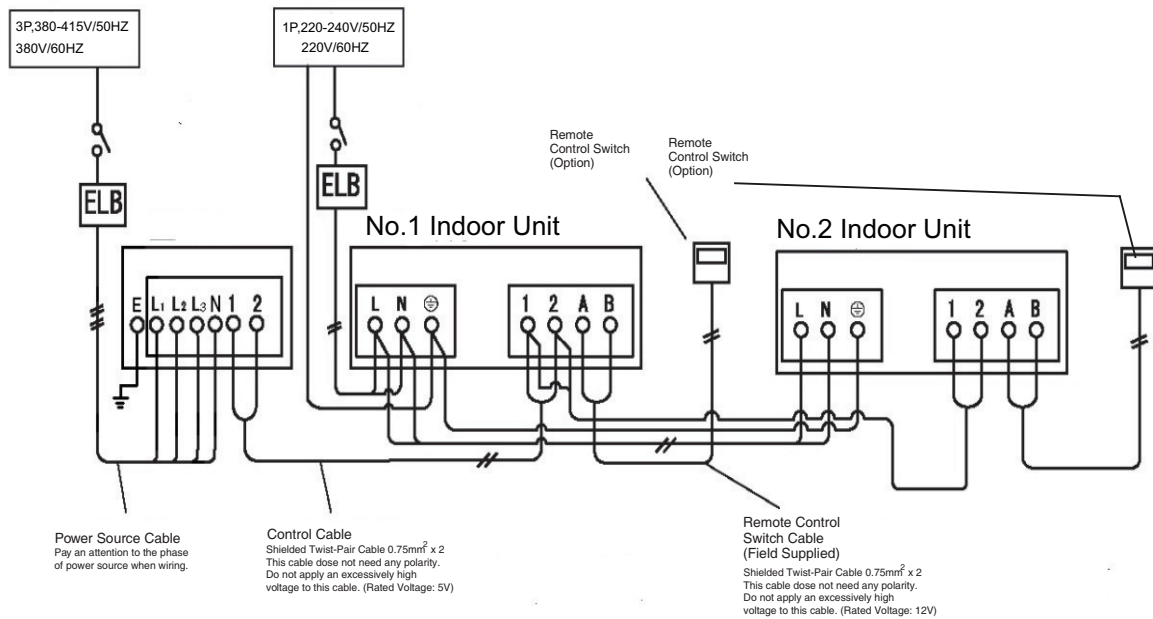


Fig. 6.4 Wiring Connection for Indoor & Outdoor (3 PHASE)

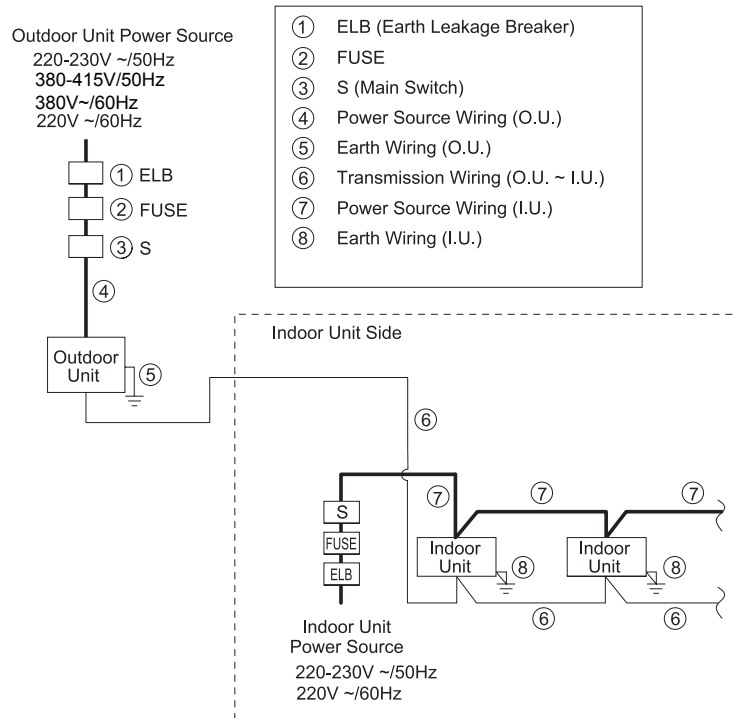
- (5) The recommended fuse sizes etc. are shown in 6.1.
- (6) In the case that a conduit tube for field-wiring not used, fix rubber bushes with adhesive on the panel.

⚠ WARNING

- **Install an ELB in the power source. If ELB is not used, it will cause electric shock or fire at the worst.**
 - **The tightening torque of each screw shall be as follows.**
 - M4: 1.0 to 1.3 N-m
 - M5: 2.0 to 2.5 N-m
 - M6: 4.0 to 5.0 N-m
 - M8: 9.0 to 11.0 N-m
 - M10: 18.0 to 23.0 N-m
- Keep the above tightening torque when wiring work.**
- **Install main switch and ELB for each system separately. Select the high response type ELB that is acted within 0.1 second.**
 - **Separate the control wiring between outdoor unit and indoor unit more than approximately 5 to 6cm from power supply wiring. Do not use a coaxial cable.**

NOTE:
Supply the power source of outdoor units and indoor units respectively.

- (1) Power Source Wiring
Power source wiring is fundamentally according to this method.
- (1) Power Source Wiring



6.1 Electrical Data and Recommended Wiring, Breaker Size/1 Outdoor Unit

Model	Power Supply	Maximum Running Current (A)	Power Source Cable Size (mm ²)	Transmitting Cable Size (mm ²)	Earth Wire Size (mm ²)	ELB		Fuse (A)
						Nominal Current (A)	Nominal Sensitive Current / (mA)	
38~54	220-240V/50Hz 220V/60Hz	27.3	4.0	0.75	4.0	32	30	32
48~54	380-415V/50Hz 380V/60Hz	16.2	2.5	0.75	4.0	25	30	25

*1 Refer to the NOTES for selection of the power source cable size.

ELB: Earth Leakage Breaker

NOTES:

- 1) Follow local codes and regulations when selecting field wires.
- 2) The wire sizes marked with *1 in the above table are selected at the maximum current of the unit according to the European Standard, EN60335-1. Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).
- 3) Use a shielded cable for the transmitting circuit and connect it to ground.
- 4) In the case that power cables are connected in series, add each unit maximum current and select wires below.

Selection According to EN60335-1

Current i (A)	Wire Size (mm ²)
$i \leq 3$	1.0~2.5
$3 < i \leq 6$	1.0~2.5
$6 < i \leq 10$	1.0~2.5
$10 < i \leq 16$	1.5~4.0
$16 < i \leq 25$	2.5~6.0
$25 < i \leq 32$	4.0~10.0
$32 < i \leq 50$	6.0~16.0
$50 < i \leq 63$	10.0~25.0
$63 < i$	*2

- 5) Run through the cables using conduit tube, and Completely seal the end of conduit tube with sealing materials.

*2: In the case that current exceeds 63A, do not connect cables in series.

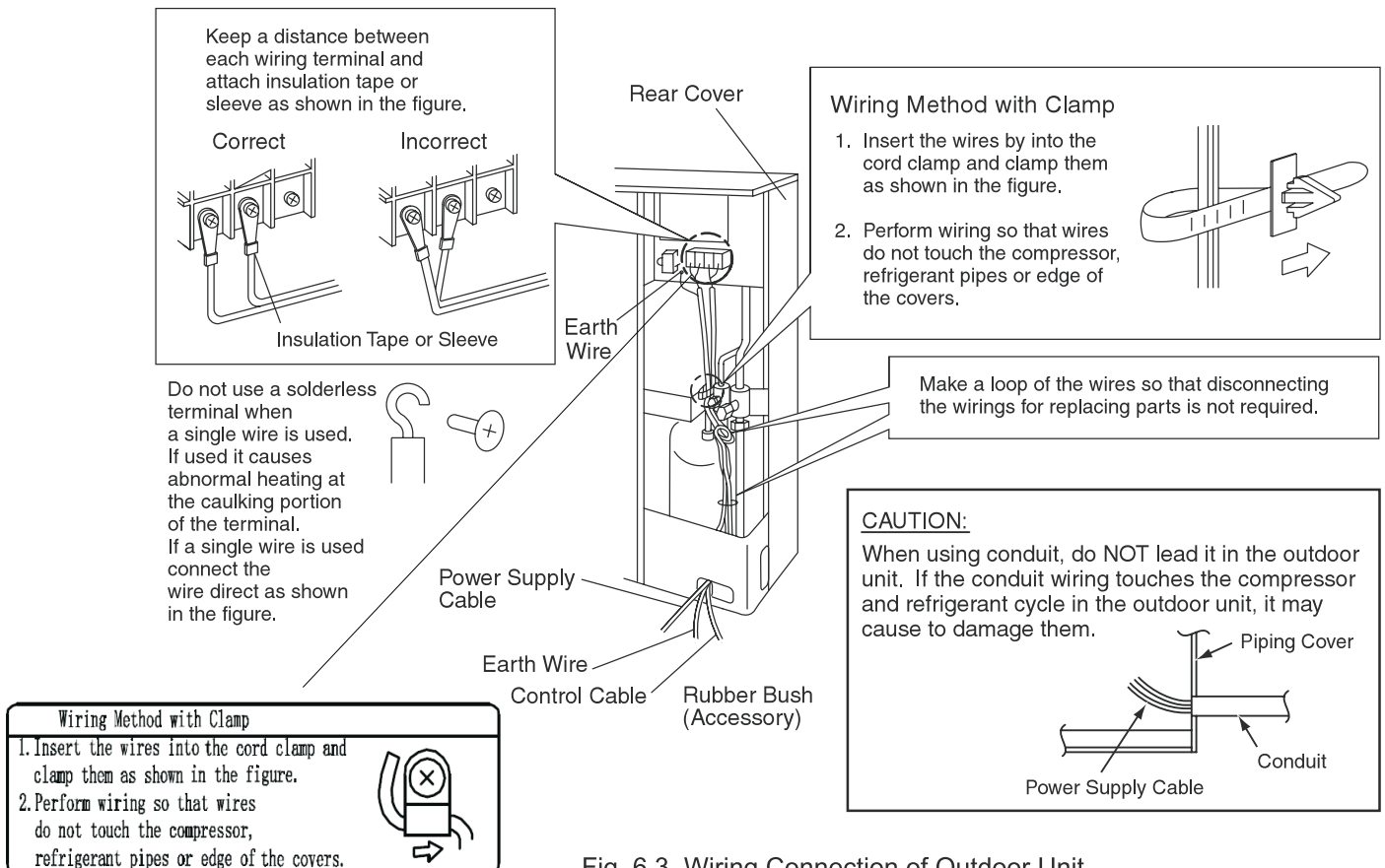


Fig. 6.3 Wiring Connection of Outdoor Unit

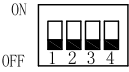



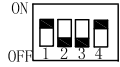
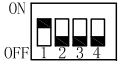




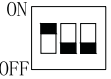
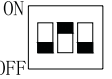
! CAUTION

Install a multi-pole main switch with a space of 3.5mm or more between each phase.

7. Outdoor Unit Dip-Switch Setting

Turn off all power switch before setting Dip-Switch, else Dip-Switch is of no effect.

Follow this table setting Dip-Switch, "■" symbol denote the position of Dip-Switch contact joint.

DSW1	DSW2	DSW4	DSW5
 <p>ALL OFF: Shipment Set</p> <p>1 ON: Test Run(Cool)</p> <p>1、 2 ON: Test Run(Heat)</p> <p>4 ON: Forbid Compressor Stop</p>	 <p>ALL OFF: Shipment Set</p> <p>5 ON: Optional Function Setting</p> <p>6 ON: Input Power Setting</p>	<p>Ref. Cycle No. Setting</p> 	<p>Communication Setting</p> 
	DSW3	DSW6	
	<p style="text-align: center;">Capacity Setting</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>AVW-38U(C/2)SC</p>  </div> <div style="text-align: center;"> <p>AVW-48U(C/2)SC</p>  </div> <div style="text-align: center;"> <p>AVW-54U(C/2)SC</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>AVW-48U(E/7)SC</p>  </div> <div style="text-align: center;"> <p>AVW-54U(E/7)SC</p>  </div> </div>	<p style="text-align: center;">Pipe length Setting</p> <p style="text-align: center;">Shipment</p>  <p>I.U. is located higher than O.U. (>20m)</p>  <p>O.U. is located higher than I.U. (>25m)</p> 	

- Communication Setting
It is necessary to set Ref. cycle system No. and terminal resistor connect to Hi-NET system.

- Setting Ref.cycle system No.
Setting Ref.cycle (DSW4&RSW1)

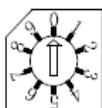
DSW4

High Digit Setting



RSW1

Low Digit Setting



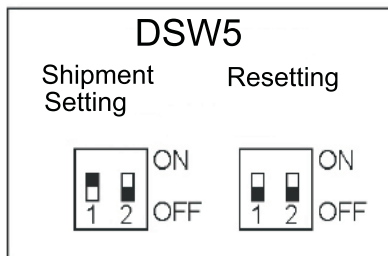
Ten A Bit	0	1	2	~	5	6
0				~		
1				~		
2				~		
3				~		
4				~		Forbid Setting
5				~		
}	}	}	}	}	}	
9				~		

- Terminal Resistor Setting

The first key of DSW5 is "ON" position shipment. It is not necessary to set when Hi-NET joint one outdoor unit.

It is necessary to set the first key of DSW5 to "OFF" position from the second outdoor unit when a Hi-NET system joint more outdoor unit

Setting Terminal Resistor



8. Test Run

Test run should be performed according to the 8.1 on page 84 . And use the Table 8.2 on page 85 for recording test run.

WARNING

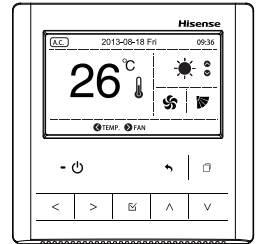
- Do not operate the system until all the check points have been cleared.
 - (A) Check and confirm Ref. pipe system and communication wire link to same Ref. cycle system.
 - (B) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.
 - (C) Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system.
 - (D) Check to ensure that the switch on the main power source has been ON for more than 12 hours, to warm the compressor oil by the oil heater.
- Pay attention to the following items while the system is running.
 - (A) Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge side are heated higher than 90°C.
 - (B) DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). It will cause a serious accident.
- Do not touch any electrical components for more than three minutes after turning OFF the main switch.
- Operate every indoor unit one by one, check and confirm their Ref. cycle and connect wire joint to same Ref. cycle system.

8.1 Checking of Wire Connection by Test Run

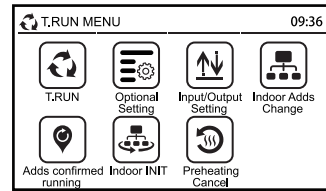
(1) Turn ON the power supply for all the indoor units.

(2) For the models with the auto-address function, wait for 3 minutes approximately. The addressing is automatically performed. (There is a case that 5 minutes is required according to the setting condition.) After that, select using language from "Menu". Refer to the operation manual for details.

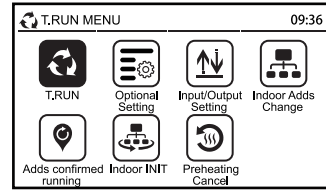
(3) Press and hold "☐" (menu) and "↵" (return) simultaneously for at least 3 seconds.



a. The test run menu will be displayed.

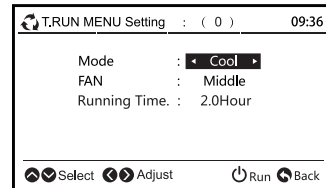


b. Select "☐" and press "☑". The test run settings will be displayed.

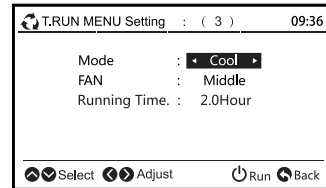


NOTE

When "0" is indicated, the auto-address function may be performing. Cancel "Test Run" mode and set it again.



(4) The total number of the indoor units connected is indicated on the LCD (liquid crystal display). The case of the twin combination (one (1) set with two (2) indoor units) is indicated " 2 ", and the triple combination (one (1) set with three (3) indoor units) is indicated " 3 ".

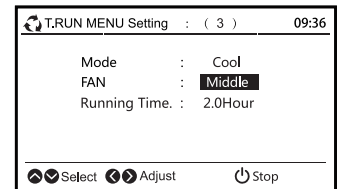


a. If the indicated number is not equal to the actual connected number of indoor unit, the auto-address function is not performed correctly due to incorrect wiring, the electric noise or etc. Turn OFF the power supply and correct the wiring after checking the following points; (Do not repeat turning ON and OFF within 10 seconds.)

- Power supply for indoor unit is not turned ON or incorrect wiring.
- Incorrect connection of connecting cable between indoor units or incorrect connection of controller cable.
- Incorrect setting of rotary switch and dip switch (the setting is overlapped) on the indoor units PCB.

b. Press "⏻" (run/stop) to start the test run.

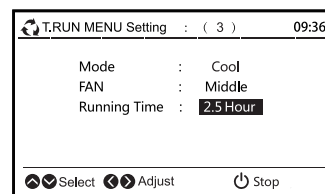
c. Press "< > ^ v" and set each item.



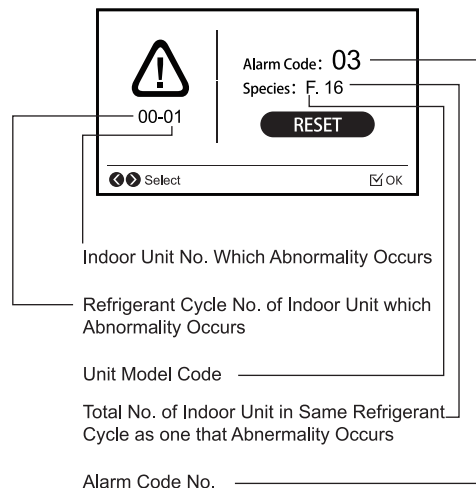
(5) Press "⏻" (run/stop). At this time, 2-hour OFF timer will be set automatically.

(6) The temperature detections by the thermistors are invalid though the protection devices are valid during the test run.

(7) To finish the test run, press "⏻" (run/stop) again or pass over the set test run time. When changing the test run time, press "^" or "v" to select "Running Time". Then, set the test run time (30 to 600 minutes) by pressing "<" or ">".



- The RUN indicator on the remote control switch flashes when some abnormalities such as protection devices activated occur during the test run as well as the RUN indicator (red) on the indoor unit flashes (0.5 second ON/ 0.5 second OFF). Additionally, the alarm code, the unit model code and connected number of indoor units will be displayed on the LCD as shown in the figure below. If the RUN indicator on HYXE-J01H flashes, it may be a failure in the transmission between the indoor unit and the remote control switch (loosening of connector, disconnecting wiring or breaking wire, etc.). Consult to authorized service engineers if abnormality can not be recovered.



8.2 Test Run and Maintenance Record

MODEL:	SERIAL. No.	COMPRESSOR MFG. No.
CUSTOMER'S NAME AND ADDRESS:		DATE:

1. Is the rotation direction of the indoor coil fan correct?
2. Is the rotation direction of the outdoor coil fan correct?
3. Are there any abnormal compressor sounds?
4. Has the unit been operated at least twenty (20) minutes?
5. Check Room Temperature

Inlet:	<u>No. 1 DB /WB °C,</u>	<u>No. 2 DB /WB °C,</u>	<u>No.3 DB /WB °C,</u>	<u>No.4 DB /WB °C</u>
Outlet:	<u>DB /WB °C,</u>	<u>DB /WB °C,</u>	<u>DB /WB °C,</u>	<u>DB /WB °C</u>
6. Check Outdoor Ambient Temperature

Inlet:	<u>DB °C,</u>	<u>WB °C</u>
Outlet:	<u>DB °C,</u>	<u>WB °C</u>
7. Check Refrigerant Temperature

Liquid Temperature:	<u>°C</u>
Discharge Gas Temperature:	<u>°C</u>
8. Check Pressure

Discharge Pressure:	<u>MPa</u>
Suction Pressure:	<u>MPa</u>
9. Check Voltage

Rated Voltage:	<u>V</u>
Operating Voltage:	<u>V,</u>
Starting Voltage:	<u>V</u>
10. Check Compressor Input Running Current

Input:	<u>kW</u>
Running Current:	<u>A</u>
11. Is the refrigerant charge adequate?
12. Do the operation control devices operate correctly?
13. Do the safety devices operate correctly?
14. Has the unit been checked for refrigerant leakage?
15. Is the unit clean inside and outside?
16. Are all cabinet panels fixed?
17. Are all cabinet panels free from rattles?
18. Is the filter clean?
19. Is the heat exchanger clean?
20. Are the stop valves open?
21. Does the drain water flow smoothly from the drain pipe?

8.3 Alarm Code

Code No.	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activating of Protection Device	High Water Level in Drain Pan, Activated Float Switch.
02	Outdoor Unit	Activating of Protection Device (Except Alarm Code 41 and 42)	Activated High Pressure Switch, Locked Motor in Cooling Operation, Abnormality of Power Supply Phase
03	Transmission	Abnormality between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnected wire, Tripping of Fuse.
04		Abnormality between Inverter and Control PCB	Failure in Transmission of PCB for Inverter.
05	Supply Phases	Abnormality of Power Supply Phases (for 220V/60Hz Unit Only)	Abnormal Waveform of one or more the Supply Phases (Ex. Distortion of the Voltage Signal).
06	Voltage Drop	Voltage Drop by Excessively Low or High Voltage to Outdoor Unit	Voltage Drop of Power Supply Insufficient Capacity of Power Supply Wiring.
07	Cycle	Decrease of Discharge Gas Superheat	Discharge Gas SUPERHEAT less than 10 deg. is maintained for one hour.
08		Increase of Discharge Gas Temperature	Temperature of the top of Compressor: Td Td ≥ 127°C(Cooling), Td ≥ 120°C(Heating) over 10 minutes, or Td ≥ 140°C over 5 seconds.
11	Sensor on Indoor Unit	Inlet Air Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
19		Tripping of Protection Device	Activated Internal Thermo of Fan Motor.
20	Sensor on Outdoor Unit	Compressor Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire, Locked Motor in Heating Operation.
22		Outdoor Air Thermistor	
24		Evaporating Thermistor	
31	System	Incorrect Capacity of Outdoor and Indoor Unit	Incorrect Setting of Capacity Combination or Incorrect O.U. Capacity Setting.
35		Incorrect Indoor Unit No. Setting	Duplication of Indoor Unit No.
38		Abnormality of Protective Circuit in outdoor Unit	Failure of Protection detecting Circuit
41	Pressure	Overload cooling (Possibility of high pressure device activation.)	O.U. Pipe Thermistor Temp. is Higher than 55°C and the Comp. Top Temp. is Higher than 95°C when O.U. Protection Device is activated.
42		Overload heating (Possibility of high pressure device activation.)	I.U. Freeze Protection Thermistor Temp. is Higher than 55°C and the Comp. Top Temp. is Higher than 95°C when O.U. Protection Device is activated.
47		Activation of Low Pressure Decrease Protection Device	Stoppage by Excessively Decrease of evaporating Temperature (Te ≤ -35°C) is activated 3 times in one hour, Locked Motor in Heating Operation.
51	Inverter	Abnormality of Current Sensor for Inverter	Failure of Control PCB1, IPM or PCB2
52		Overcurrent Protection Activation	Failure of IPM or PCB2, Clogging of Heat Exchanger.
53		Protection Activation of IPM or PCB2	IPM or PCB2 Abnormality Failure of Compressor, clogging of Heat Exchanger.
54		Inverter Fin Temperature Increase	Abnormal Inverter Fin Thermistor, Clogging of Heat Exchanger Abnormal Outdoor Fan
55		IPM or PCB2 Abnormality	Failure of IPM or PCB2
57	Outdoor Fan	Fan Motor Abnormality	Disconnected wire or Incorrect wiring between Control PCB and Inverter PCB. Incorrect Wiring or Fan Motor Abnormality
59	Inverter	Thermistor of Inverter Fin Abnormality (for Inverter Fin Temp.)	Loose Connector, Disconnected Wire, Short Circuit
b1	Indoor Unit No. Setting	Incorrect Unit No. Setting	Over 64 I.U. Setting by Ref. No. or I.U. Address.
EE	Compressor	Compressor Protection Alarm	Failure of Compressor.

9. Safety and Control Device Setting

● Compressor Protection

High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

Outdoor Unit Model(KBtu/h)		38 ~ 54
For Compressor Pressure Switch High Pressure		Automatic Reset, Non-Adjustable
Cut-Out	MPa	4.15 ^{-0.05} _{-0.20}
Cut-In	MPa	3.2 ^{+0.15} _{-0.20}
Fuse on Main Circuit	A	50
Compressor Crank Heater Power	W	28 × 4
CCP Timer Set Time	Min	Non-Adjustable 3
Control Circuit Fuse	A	5

MAINTENANCE & SERVICE

1. Maintenance

1.1 Regular Inspection

In order to ensure the operation reliability and prolong the service life, please pay attention to the following additional items.

- 1) For Indoor Unit and Outdoor Unit
 - a) Fan and Fan Motor
 - Lubrication – All fan motors are pre-lubricated and sealed at the factory. Therefore, no lubricating maintenance is required.
 - Sound and Vibration – Inspect for abnormal sound and vibration.
 - Rotation – Inspect for rotation and rotating speed. It should clockwise rotate and check the rotary speed.
 - Insulation – Inspect for electrical insulation resistance.
 - b) Heat Exchanger
 - Clogging – Inspect and remove any accumulated dirt and dust from the heat exchanger at regular intervals. As for outdoor unit, other obstacles such as growing lawn and paper, which might restrict air flow, should also be removed.
 - c) Piping Connection
 - Leakage – Inspect for refrigerant leakage at piping connection.
 - d) Cabinet
 - Stain and Lubrication – Inspect and remove any stain and lubrication.
 - Fixing Screw – Inspect and fix loosened or lost screws.
 - Insulation – Inspect and repair peeled thermal insulation material on cabinet.
 - e) Electrical Equipment
 - Activation – Inspect for abnormal activation of the AC contactor, auxiliary relay, PCB and etc.
 - Line Condition – Pay attention to working voltage, amperage and phase balance. Inspect for faulty contact caused by loosened terminal connections, oxidized contacts, foreign matter, and other items. Inspect for electrical insulation resistance.
 - f) Control and Protective Devices
 - Setting – Do not readjust the setting in the field unless the setting is maintained at a point other than the point listed in “SAFETY AND CONTROL DEVICE SETTING” .
- 2) For Indoor Unit
 - a) Air Filter
 - Cleaning – Inspect and remove any accumulated dirt and dust according to “Filter Cleaning” .
 - b) Drain Pan, Drain-up Mechanism and Drain Pipe
 - Drain Line – Inspect and clean the condensate drain line at least twice a year.
 - Drain-up Mechanism – Inspect for activation of drain-up mechanism.
 - c) Float Switch
 - Activation – Inspect for activation of float switch.
- 3) For Outdoor Unit
 - a) Compressor
 - Sound and Vibration – Inspect for abnormal sound and vibration.
 - Activation – Inspect for that the voltage drop of power supply line is within 16% at start and within 2% during operation.
 - b) Reverse Valve
 - Activation – Inspect for any abnormal activation sound.
 - c) Strainer
 - Clogging – Inspect for that no temperature difference between both ends.
 - d) Earth Wire
 - Earth Wire – Inspect for continuity to the earth.
 - e) Oil Heater
 - Activation – The oil heater should be activated at least 12 hours before start-up, by switching ON the main power source.
- 4) For Remote Control Switch
 - Switch and Indication – Inspect for activation of switch

1.2 Filter Cleaning

⚠ CAUTION

Do not operate the system without the air filter to protect the indoor unit heat exchanger against being clogged.

Turn OFF the main power switch before taking out the filter.

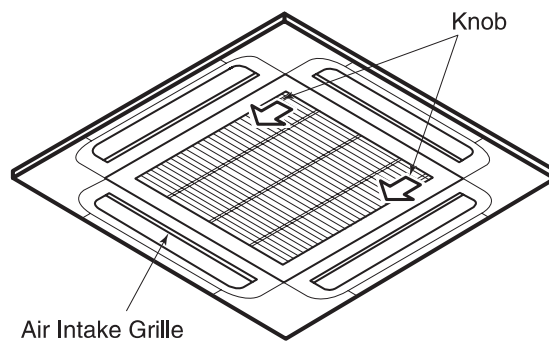
1.2.1 Take Out the Filter

1) 4-Way Cassette Type

The indication, "FILTER" is shown on the display of the remote control switch after approximately 1,200 hour operation. Take out the air filter according to the following steps.

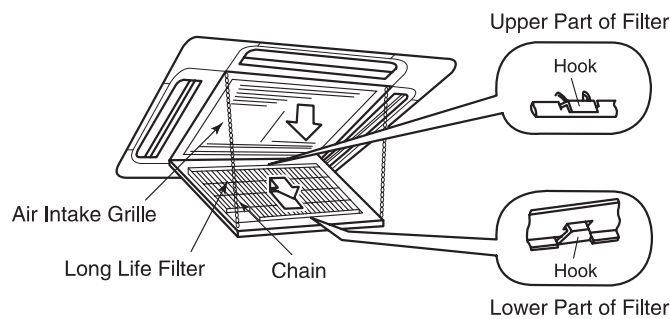
Step 1:

Open the air intake grille after pushing the two knobs toward the arrow mark as shown in the figure below.



Step 2:

Take out the air filter from the air intake grille by supporting the air grille and lifting the air filter after detaching the filter from two hinges.



For other indoor units, please refer to the related information of Indoor Units Technical Catalog.

2. Troubleshooting

2.1 Initial Troubleshooting

2.1.1 This is Not Abnormal

1) Smells from Indoor Unit

Smell adheres on indoor unit after a long period of time. Clean the air filter and panels or allow a good ventilation.

2) Sound from Deforming Parts

During system starting or stopping, an abrading sound might be heard. However, this is due to thermal deformation of plastic parts. It is not abnormal.

3) Steam from Outdoor Heat Exchanger

During defrosting operation, ice on the outdoor heat exchanger is melted, resulting in making steam.

4) Dew on Air Panel

When the cooling operation continues for a long period of time under high humidity conditions (higher than 27°C DB/80% R.H), dew can form on the air panel.

5) Refrigerant Flow Sound

While the system is being started or stopped, sound from the refrigerant flow may be heard.

2.1.2 Not Cooling or Heating Well

- Check for obstruction of air flow of the outside or inside units.
- Check if too much heat source exists in the room.
- Check if the air filter is clogged with dust.
- Check to see if the doors or windows are opened or not.
- Check if the temperature condition is not within the operation range.

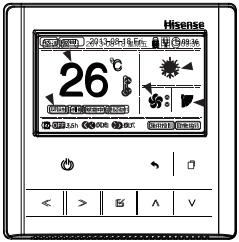
2.1.3 Not Operated

- Check for electrical wiring.
- Check for DIP switch setting.
- Check whether the “SET TEMP” is set at the correct temperature.
- In the case that “RUN” lamp on remote control switch is flickering every 2 seconds, refer to “Service Manual” because abnormality of some device is suspected.

2.2 Troubleshooting by Alarm Code

The Alarm Codes shown below are indicated when a fault occurs during operation.

CAUTION: Before servicing electric parts, cut off power supply completely.

Indication	Trouble	Possible Causes	Action																																
RUN lamp flashes for 2 seconds.	Failure inTransmission between Indoor Unit and Remote Control Switch	Remote Control Cable Broken Contact Failure in Remote Control Cable IC or Microcomputer Defective	Locate the cause and repair. Check by remote control self-checking function. (See Service Manual.)																																
RUN lamp flashes 5 times (5 seconds) with unit number and alarm code displayed.	“Failure”																																		
Remote Control Switch	03 Unit No.3																																		
	02 Alarm Code of "Outdoor Unit Protection Activated"																																		
		Indication of Unit Number in Remote Control Switch																																	
		<table border="1"> <thead> <tr> <th>Unit No.0</th> <th>Unit No.1</th> <th>Unit No.2</th> <th>Unit No.3</th> <th>Unit No.4</th> <th>Unit No.5</th> <th>Unit No.6</th> <th>Unit No.7</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>01</td> <td>02</td> <td>03</td> <td>04</td> <td>05</td> <td>06</td> <td>07</td> </tr> <tr> <th>Unit No.8</th> <th>Unit No.9</th> <th>Unit No.10</th> <th>Unit No.11</th> <th>Unit No.12</th> <th>Unit No.13</th> <th>Unit No.14</th> <th>Unit No.15</th> </tr> <tr> <td>08</td> <td>09</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> </tr> </tbody> </table>	Unit No.0	Unit No.1	Unit No.2	Unit No.3	Unit No.4	Unit No.5	Unit No.6	Unit No.7	00	01	02	03	04	05	06	07	Unit No.8	Unit No.9	Unit No.10	Unit No.11	Unit No.12	Unit No.13	Unit No.14	Unit No.15	08	09	10	11	12	13	14	15	
Unit No.0	Unit No.1	Unit No.2	Unit No.3	Unit No.4	Unit No.5	Unit No.6	Unit No.7																												
00	01	02	03	04	05	06	07																												
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08	09	10	11	12	13	14	15																												
		NOTE:																																	
		Alarm code is also indicated on 7-segment display on outdoor unit PCB1, if a trouble occurs.																																	

Alarm Code

Code No.	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activating of Protection Device	High Water Level in Drain Pan, Activated Float Switch.
02	Outdoor Unit	Activating of Protection Device (Except Alarm Code 41 and 42)	Activated High Pressure Switch. Locked Motor in Cooling Operation. Abnormality of Power Supply Phase
03	Transmission	Abnormality between Indoor and Outdoor	Incorrect Wiring. Loose Terminals, Disconnected wire, Tripping of Fuse.
04		Abnormality between Inverter and Control PCB	Failure in Transmission of PCB for Inverter.
05	Supply Phases	Abnormality of Power Supply Phases (for 220V/60Hz Unit Only)	Abnormal Waveform of one or more the Supply Phases (Ex. Distortion of the Voltage Signal).
06	Voltage Drop	Voltage Drop by Excessively Low or High Voltage to Outdoor Unit	Voltage Drop of Power Supply Insufficient Capacity of Power Supply Wiring.
07	Cycle	Decrease of Discharge Gas Superheat	Discharge Gas SUPERHEAT less than 10 deg. is maintained for one hour.
08		Increase of Discharge Gas Temperature	Temperature of the top of Compressor: Td Td \geq 127°C(Cooling), Td \geq 120°C(Heating) over 10 minutes, or Td \geq 140°C over 5 seconds.
11	Sensor on Indoor Unit	Inlet Air Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
19		Tripping of Protection Device	Activated Internal Thermo of Fan Motor.
20	Sensor on Outdoor Unit	Compressor Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire. Locked Motor in Heating Operation.
22		Outdoor Air Thermistor	
24		Evaporating Thermistor	
31	System	Incorrect Capacity of Outdoor and Indoor Unit	Incorrect Setting of Capacity Combination or Incorrect O.U. Capacity Setting.
35		Incorrect Indoor Unit No. Setting	Duplication of Indoor Unit No.
38		Abnormality of Protective Circuit in outdoor Unit	Failure of Protection detecting Circuit
41	Pressure	Overload cooling (Possibility of high pressure device activation.)	O.U. Pipe Thermistor Temp. is Higher than 55°C and the Comp. Top Temp. is Higher than 95°C when O.U. Protection Device is activated.
42		Overload heating (Possibility of high pressure device activation.)	I.U. Freeze Protection Thermistor Temp. is Higher than 55°C and the Comp. Top Temp. is Higher than 95°C when O.U. Protection Device is activated.
47		Activation of Low Pressure Decrease Protection Device	Stoppage by Excessively Decrease of evaporating Temperature (Te \leq -35°C) is activated 3 times in one hour, Locked Motor in Heating Operation.
51	Inverter	Abnormality of Current Sensor for Inverter	Failure of Control PCB1, IPM or PCB2
52		Overcurrent Protection Activation	Failure of IPM or PCB2, Clogging of Heat Exchanger.
53		Protection Activation of IPM or PCB2	IPM or PCB2 Abnormality Failure of Compressor, clogging of Heat Exchanger.
54		Inverter Fin Temperature Increase	Abnormal Inverter Fin Thermistor, Clogging of Heat Exchanger Abnormal Outdoor Fan
55		IPM or PCB2 Abnormality	Failure of IPM or PCB2
57	Outdoor Fan	Fan Motor Abnormality	Disconnected wire or Incorrect wiring between Control PCB and Inverter PCB. Incorrect Wiring or Fan Motor Abnormality
59	Inverter	Thermistor of Inverter Fin Abnormality (for Inverter Fin Temp.)	Loose Connector, Disconnected Wire, Short Circuit
b1	Indoor Unit No. Setting	Incorrect Unit No. Setting	Over 64 I.U. Setting by Ref. No. or I.U. Address.
EE	Compressor	Compressor Protection Alarm	Failure of Compressor.

2.3 Troubleshooting in Check Mode

Each “Check Menu” item and its function are explained in the following table.

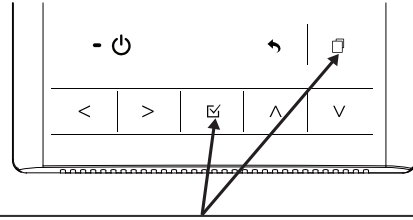
Check menu item	Function
Check 1	Sensor condition of air conditioner will be monitored and indicated.
Check 2	Sensor data of air conditioner prior to alarm occurrence will be indicated.
Alarm Record	Previous alarm record (date, time, alarm code) will be indicated. ※
Species	Model name and manufacturing number will be indicated.
IDU/ODU Diagnosis	The result of PCB check will indicated.
Self Diagnosis	Checking of remote control switch will be carried out.

※ To Erase Alarm Record

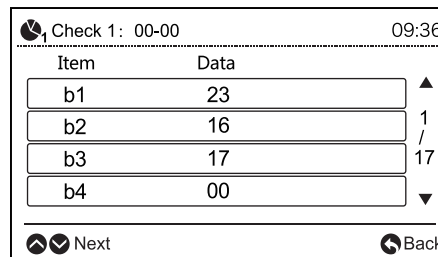
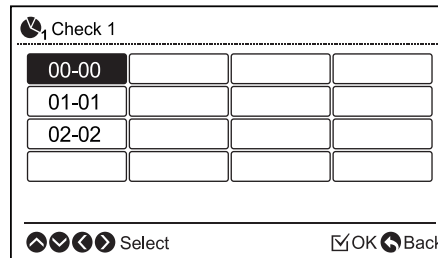
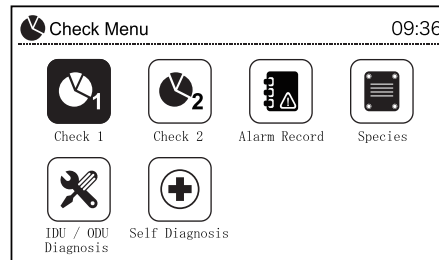
Press “☑” when the abnormality record is indicated. After that, the confirmation screen will be displayed.

Select “Yes” and press “☑” so that the alarm record will be deleted.

Indication of Check Menu

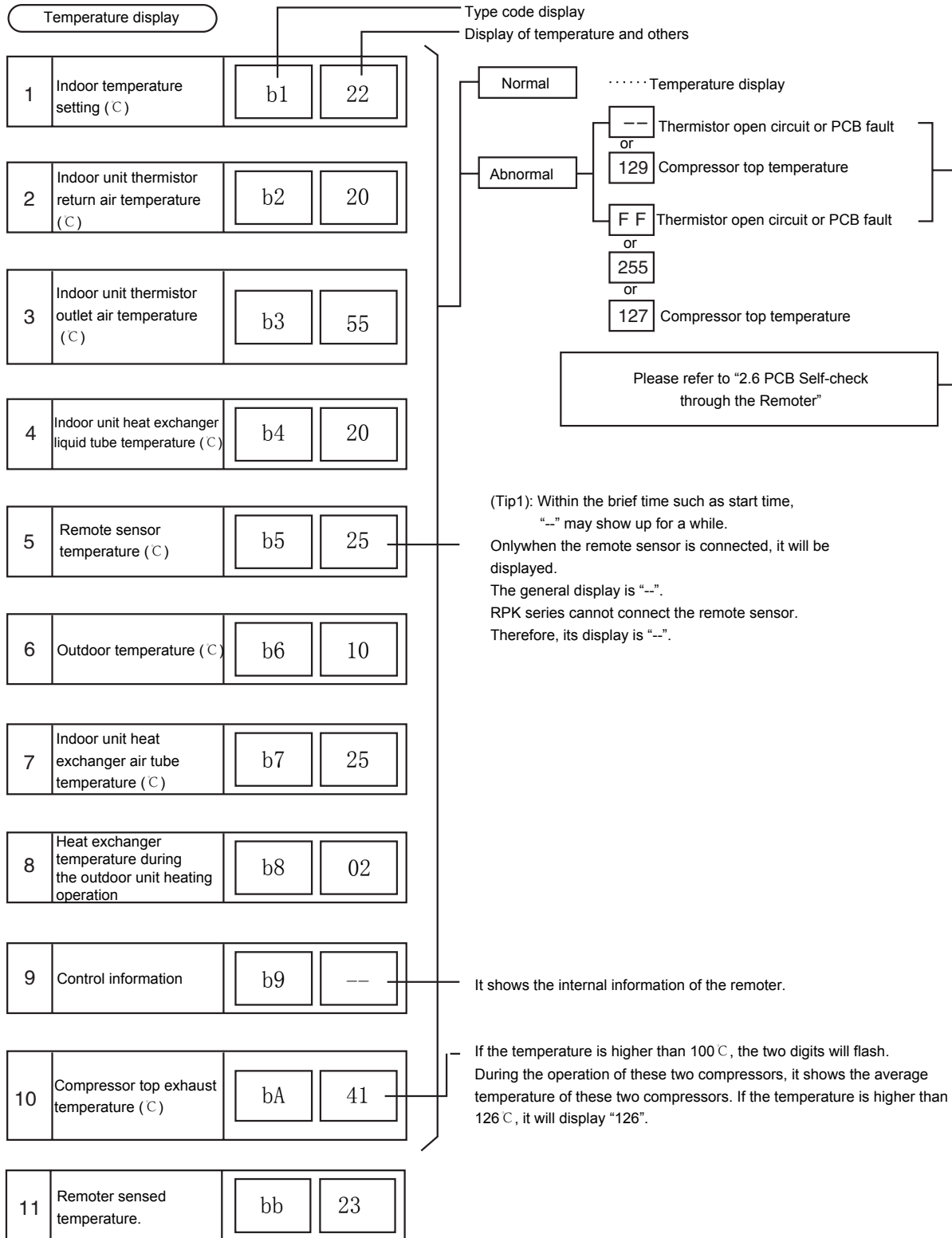


Press and hold “☐” (menu) and “☑” simultaneously for at least 3 seconds during the normal mode. The check menu will be displayed.



2.3.1 Contents of Check Mode 1

Press check1 button, the next content will be displayed. Press \wedge \vee the previous content will be displayed.

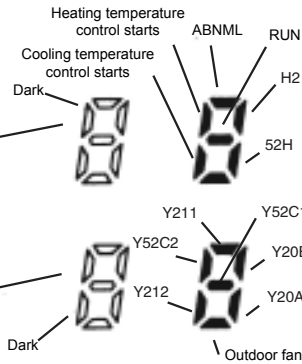


12	Remoter sensed humidity (optional).	bC	00
----	-------------------------------------	----	----

Microcomputer output/ input display

13	Indoor unit microcomputer input/ output.	C1	
----	--	----	--

14	Outdoor unit microcomputer input/ output.	C2	
----	---	----	--



Symbols with the letter "Y" are PCB relays.

Shutdown cause display

15	Cause for shutdown	d1	01
----	--------------------	----	----

Abnormal occurrences counter

16	Abnormal occurrence times	E1	01
----	---------------------------	----	----

17	Indoor unit momentary power failure occurrence times.	E2	00
----	---	----	----

18	Remoter and indoor unit transmission error occurrence times	E3	00
----	---	----	----

19	Frequency converter abnormal occurrence times	E4	00
----	---	----	----

Automatic louver state display

20	Louver sensor	F1	00
----	---------------	----	----

00	Stop the operation and turn off the power
01	Temperature control switch (Tip1)
02	Alarm (Tip2)
03	Freeze protection, overheat protection
05	Outdoor unit momentary power failure, reset (Tip3)
06	Indoor unit momentary power failure, reset (Tip4)
07	Cease of cooling operation due to low outdoor temperature and cease of heating operation due to high outdoor temperature
09	It needs four-way valves to shift to the shutdown
10	It needs forced shutdown.
11	Restart due to the reduced pressure ratio
12	Restart due to the increased low pressure
13	Restart due to the increased high pressure
15	Restart due to the excessively high exhaust temperature and low air inlet pressure.
16	Restart due to the reduced exhaust superheat
17	Restart due to the tripping of the frequency converter
18	Restart due to the reduced voltage
19	Expansion valve opening change protection
20	Indoor unit run mode shift (Tip5)
21	Forced temperature controlled shutdown
22	Forced temperature controlled shutdown (Preheating)
26	Insufficient high pressure, restart

- (Tip1): Term definition
 Temperature controlled startup: The indoor unit requires the running of the compressor.
 Temperature controlled shutdown: The indoor unit does not require the running of the compressor.
- (Tip2): Even if the poweroff is caused by the "AlarmABNML", "02" will not always be displayed.
- (Tip3): If the communication between the frequency converter PCB and control PCB cannot be carried out within 30 seconds, the outdoor unit will be closed down. In this case, the shutdown is the cause for d1-05 and the alarm code "04" may be displayed.
- (Tip4): If the communication between the indoor unit and outdoor unit cannot be carried out within 3 minutes, the outdoor unit will be closed down. In this case, the shutdown is the cause for d1-06 and the alarm code "03" may also be displayed.
- (Tip5): "20" will be displayed in different modes of the indoor units. It can be numbered to 99. If over 99, "99" will always be displayed.
- (Tip1): If the communication error lasts for 3 minutes, the occurrence times will be added with 1.
- (Tip2): The reserved parameters can be removed with the method indicated in 2.6 "PCB Self-Check through the Remoter".

Next page

Compressor pressure/ frequency display

21	Exhaust pressure (high pressure) (0.1MPa)	H1	18
----	---	----	----

22	Air inlet pressure (low pressure) (0.01MPa)	H2	04
----	---	----	----

23	Control information	H3	44
----	---------------------	----	----

It shows the internal information of the remoter. There's no special meaning.

24	Operation frequency (Hz)	H4	44
----	--------------------------	----	----

When two compressors are running together, it displays the total frequency.

Indoor unit capacity display

25	Indoor unit capacity	J1	08
----	----------------------	----	----

Indoor unit capacity is shown as below.

26	Outdoor unit number	J2	U. n
----	---------------------	----	------

27	Cooling system number	J3	01
----	-----------------------	----	----

28	Cooling system number	J4	00
----	-----------------------	----	----

Indoor unit capacity code:

Code	Indoor unit capacity mark	Horsepower
06	22	0.8
08	28	1.0
10	36	1.3
11	40	1.5
13	45	1.8
14	50	2.0
16	56	2.3
18	63	2.5
20	71	2.8
22	80	3.0
26	90	3.3
32	112	4.0
40	140	4.5

"n" represents the total quantity of indoor units.

n= 01-16

J3:01-16 (01, decimal display before delivery (DSW5))
J4:00-0F (00, hexadecimal display before delivery (DSW5))

Expansion valve opening display

29	Indoor unit expansion valve opening (%)	L1	20
----	---	----	----

30	Outdoor unit expansion valve MV1 opening (%)	L2	99
----	--	----	----

31	Outdoor unit expansion valve MV2 opening (%)	L3	99
----	--	----	----

In case of the unit without expansion valves, it displays the same digits.

32	Control information	L4	00
----	---------------------	----	----

Estimated current display

	Compressor working current (A)	P1	25
--	--------------------------------	----	----

When several compressors are running at the same time, it displays the total current.
When the inverter compressor is running, it displays the current on the frequency converter side.

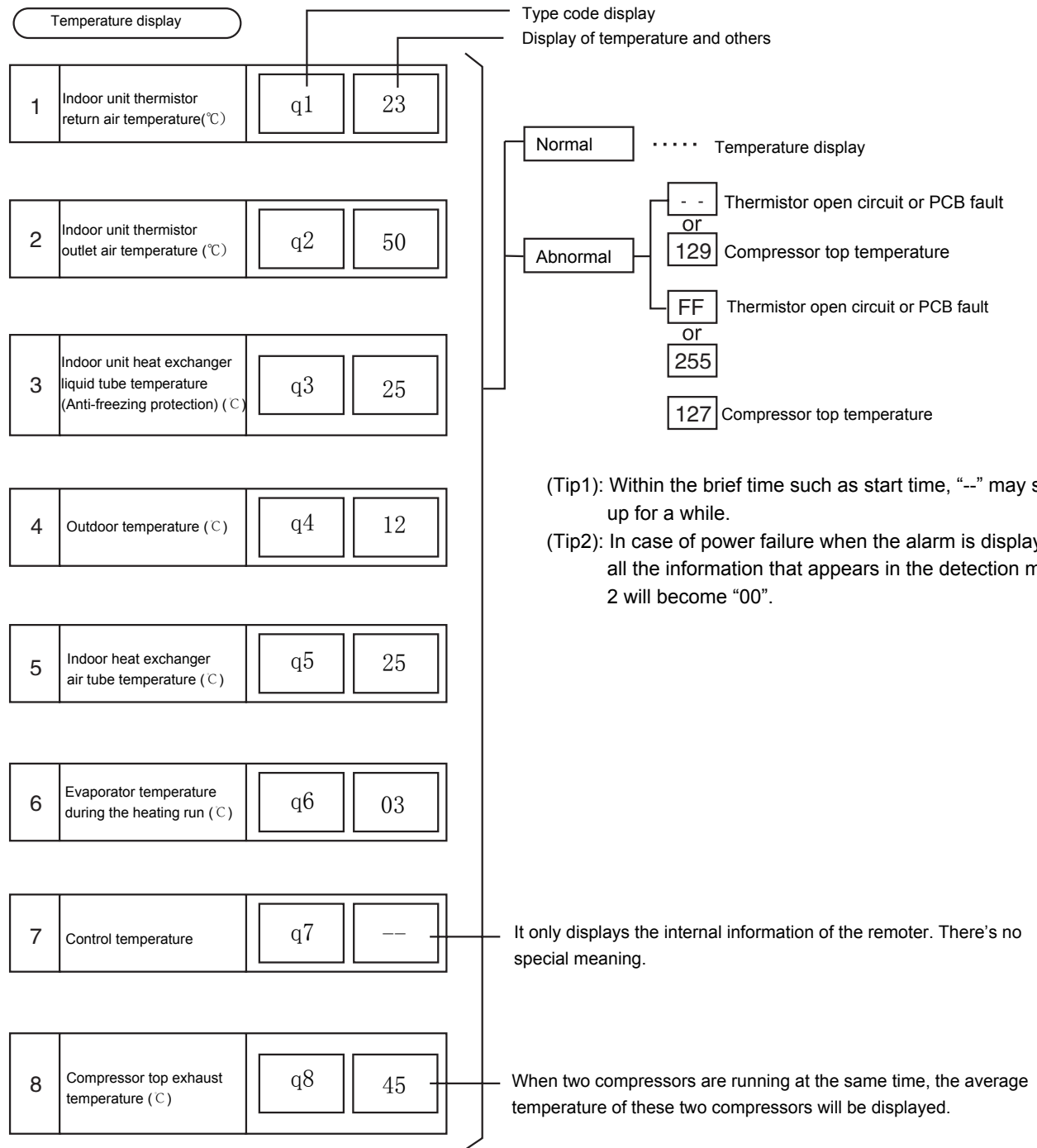
Back to temperature display

Temperature display

2.3.2 Contents of Check Mode 2

When over three units are connected to one remoter, the updated parameters of the first three indoor units will be displayed.

Press 'check2" button, the next content will be displayed. Press "V" the previous content will be displayed.



Next page

Compressor pressure/ frequency display

9	Exhaust pressure (high pressure) (0.1MPa)	q9	18
---	---	----	----

10	Air inlet pressure (low pressure) (0.1MPa)	qA	04
----	--	----	----

11	Control information	qb	44
----	---------------------	----	----

It displays the internal information of the remoter.
There's no special meaning.

12	Operation frequency (Hz)	qC	44
----	-----------------------------	----	----

When two compressors are running at the same time,
it'll display the total frequency.

Expansion valve opening display

13	Indoor unit expansion valve opening (%)	qd	20
----	--	----	----

14	Outdoor unit expansion valve MV1 opening (%)	qE	99
----	---	----	----

Estimated current display

15	Compressor working current (A)	qF	20
----	-----------------------------------	----	----

When two compressors are running at the same
time, it'll display the total current.

Back to temperature display

Temperature Indication

2.4 Troubleshooting by 7-Segment Display

2.4.1 Simple Checking by 7-Segment Display

1 * Turn on All Indoor Units

* All the Indoor Units Connected to the Outdoor Unit

2 Turn on the Outdoor Unit

3 Auto-addressing Starts

Outdoor Unit
Circuit Board
PCB1

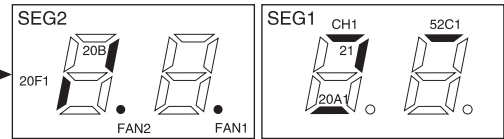
During auto-addressing, the following items can be checked
using the outdoor unit's on-board 7-segment LED display.

- (1) Disconnection of power supply to the indoor unit.
- (2) Reverse connection of the operating line between the
outdoor and indoor units.
- (3) Duplication of indoor unit number.

2.4.2 Checking Method by 7-Segment Display

By using the 7-segment display and check switch (PSW) on the PCB1 in the outdoor unit, check each part of refrigerant cycle and operation. During the data check, do not touch other electrical parts except for the following switches to avoid electrical shock. The tools can not touch the electrical part. Otherwise, the electrical part may be damaged.

Checking Item	Item Display		Data Display	
	Check No	Display	Display	Display Content Description
Output State of Outdoor Micro-Computer	01	5C	--	Refer to the display position of right table
Indoor Units Capacity	02	0P	24	Display the capacity of indoor unit
Running Frequency of Inverter	03	H1	100	Unit is Hz
Number of Running Compressor	04	CC	1	
Shifts of fan	05	F0	5	Display the gear (0-16) of outdoor unit, larger number denotes the larger air flow
Opening of Expansion Valve of Outdoor Unit	06	0E1	50	Display by %; the larger number denotes the larger opening.
Discharge Pressure	08	Pd	18	Unit is MPa
Suction Pressure	09	PS	05	Unit is MPa
Temperature on the Top of Compressor	10	Td1	85	Unit is °C
Temperature at Liquid side of Heat Exchanger	11	TE1	30	Unit is °C
Ambient Temperature	12	To	35	Unit is °C
Current of Inverter Compressor	14	A1	20	Unit is A. Display the current of one time of inverter (input)
Opening of Expansion Valve of Indoor Unit 0-F Unit	15	1E0	20	Display by %; the larger number denotes the larger opening. Only display the connecting indoor unit.
Temperature of indoor liquid line 0-F Unit	16	FL0	20	Unit is °C. Only display the connecting indoor unit.
Temperature of indoor gas line 0-F Unit	17	FG0	5	Unit is °C. Only display the connecting indoor unit.
Indoor Unit Intake Air Temperature 0-F Unit	18	Fi0	25	Unit is °C. Only display the connecting indoor unit.
Indoor Unit Discharge Air Temperature 0-F Unit	19	Fo0	18	Unit is °C. Only display the connecting indoor unit.
Indoor Capacity 0-F Unit	20	CR0	6	Display the capacities of all indoor units
Stoppage Cause of Indoor Unit 0-F Unit	21	d10	01	Display the cause of stoppage of indoor unit; please refer to the cause code in right table
Pressure Ratio Fall Protection Degeneration Control	22	c11	1	0: Degeneration Control does not act 1: Degeneration Control is acting
High-Pressure Rise Protection Degeneration Control	23	c13	1	0: Degeneration Control does not act 1: Degeneration Control is acting
Inverter Temperature Rise Protection Degeneration Control	24	c14	1	0: Degeneration Control does not act 1: Degeneration Control is acting
Discharge Gas Temperature Increase Protection Degeneration Control	25	c15	1	0: Degeneration Control does not act 1: Degeneration Control is acting
Discharge Gas Temperature Decrease Protection Degeneration Control	26	c16	1	0: Degeneration Control does not act 1: Degeneration Control is acting
Current Protection Degeneration Control	27	c17	1	0: Degeneration Control does not act 1: Degeneration Control is acting
Control information	28	UU1	50	
Alarm code of outdoor unit	30	AL	02	Display the latest alarm code of stoppage of outdoor unit
Code of inverter stop cause	31	IFC	1	Display the cause of stopping inverter. The cause codes refer to right table
Indoor unit capacity	33	CP	52	Denotes the capacity of connecting indoor unit, displayed by 3.5 times
Number of connecting indoor units	34	RR	4	
Address of refrigerant system	35	CR	2	0-63



[Table of Stoppage Cause Codes of Indoor Unit]

Display	Description of display
00	Shut down, cut off power
01	Thermostat closes
02	Alarm
03	Antifreeze protection, overheat protection
05	Power of indoor unit is cut off instantly; chip is reset
06	Power of indoor unit is cut off instantly; chip is reset
07	Ambient temperature is too low, so cooling is stopped; Ambient temperature is too high, so heating is stopped;
10	Compulsorily shutting down the machine is required
11	Pressure ratio is low; retry
12	Low pressure rises, retry
13	High pressure rises, retry
15	Vacuum is abnormal Discharge gas temperature rises, retry
16	Degree of superheat of exhaust gas is low; retry
17	Tipping of inverter, retry
18	Voltage is low (or over-voltage); retry And the inverter retry for other causes
19	Prevent the opening change of expansion valve; retry
20	Operating modes of indoor and outdoor units are not consistent
21	Thermostat is compulsorily shut down
22	Thermostat is compulsorily shut down (preheating)
26	High pressure is low; retry

Release the CHECK — If you want to release CHECK, please press the PSW2 for continuously above 3s.

Table of capacity codes of indoor unit

Code	Capacity code of indoor unit	Equivalent Horsepower
06	22	0.8
08	28	1.0
10	36	1.3
11	40	1.5
13	45	1.8
14	50	2.0
16	56	2.3
18	63	2.5
20	71	2.8
22	80	3.0
26	90	3.3
32	112	4.0
40	140	4.5

- Remark: 1. Even there is alarm stoppage, the stoppage code may not be "02". Because before the alarm, the stoppage cause code can be left due to the shut down of thermostat.
2. For the machine equipped with inverter, if the transmission between the inverter and base board of outdoor unit is cut off for 30s, the outdoor chip will be reset. Therefore, when the 04 alarm is given, the stoppage cause code may be 05.
3. If the transmission between the indoor unit and outdoor unit is cut off 3 minutes, the indoor chip is reset. Therefore, the stoppage cause code may be 06 when 03 alarm is given.
4. When display the "21", please confirm the stoppage cause of other unit.

Stoppage Cause of Inverter

Code	Cause	Stoppage cause code of unit	Remarks	
			Retry display	Alarm code
1	Triode module automatically stops (ISMP error) (over-current; low voltage; short circuit protection)	17	P17	59
2	Instant over-current	17	P17	52
3	Inverter radiator is abnormal; protection control	17	P17	54
4	Electronic thermostat acts	17	P17	52
5	Inverter voltage lows (lack of voltage)	18	P18	06
6	Over-current	18	P18	06
7	Transmission is abnormal	05	-	04
8	Current sensor is abnormal	17	P17	51
9	Instant loss of power inspection	18	-	-
11	Inverter chip reset	10	-	-
12	Compressor ground detection (only for startup)	17	P17	53
13	Phase missing check	18	-	-
16	Inverter acts	18	P18	55
17	Transmission is abnormal	18	P18	55
18	Protective device acts	-	-	02
19	Protective checkout device is abnormal	18	-	38
20	63H reset is too early	18	-	-

2.5 Protection Control Code on 7-Segment Display

- 1) If the protection controller acts, the protection control code can be shown on the 7-segment digital display.
- 2) The sign will be eliminated with the cancellation of protective function.
- 3) If several kinds of protection controller acts, the protective codes can be displayed based on the priority level. (the priority level is as follows)
 - a) The codes of protection controller related with the frequency control are privileged than other codes.

< Priority order >

(1) Pressure ratio control	(P01)
(2) Pd protection control	(P02)
(3) Current protection control	(P03)
(4) Inverter temperature raise protection control	(P04)
(5) Td rise protection	(P05)
(6) Ps protection control	(P06)
(7) Pd decrease protection	(P09)
(8) Current control is required	(P0A)

- b) For retry control, if there is no the protection control display related with the frequency control, the latest retry will be displayed.

Code	Protection Control	Code	Protection Control
P01	Pressure ratio control	P11	Pressure ratio decrease retry control
P02	High pressure rise protection	P12	Low pressure rise retry control
P03	Inverter current protection control	P13	High pressure rise retry control
P04	Inverter fin temperature rise protection	P15	Vacuum and Td rise retry control
P05	Td increase protection	P16	TdSH decrease retry control
P06	Low-pressure decrease protection	P17	Inverter trip retry
P0A	Demand current control	P18	Insufficient voltage/excessive voltage retry
P09	High-pressure decrease protection	P26	High pressure decrease retry control

Note: The "P01~5°C" in the degeneration control is instead by "PC1~5°C"

- Retry display will be continuous for 30 minutes, unless there is protection control needed to be displayed.
- The retry display will disappear if the stoppage signal is given from all indoor units.

Note:

If the operation is abnormal, the protection control code on the 7-segment digital display will be instead by alarm code. At the same time, the same alarm code is also displayed on remote control switch.

In order to adapt to conditions such as temperature change, the control of frequency and other items is performed to prevent the abnormal conditions by the protection control.

The activating conditions of protection control are shown in the table below.

Table 2.1 Activating Condition of Protection Control Code

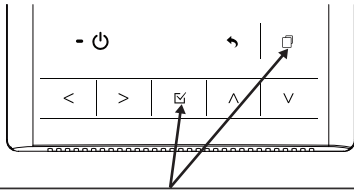
Code	Protection Control	Activating Condition	Remarks
P01	Pressure Ratio Control	Compression Ratio $>9 \rightarrow$ Frequency Decrease (Pd+0.1)/(Ps+0.1) $\leq 2.2, \rightarrow$ Frequency Increase	Ps: Suction Pressure of Compressor [MPa]
P02	High-pressure Protection	Pd ≥ 3.6 MPa \rightarrow Frequency Decrease	Pd: Discharge Pressure of Compressor [MPa]
P03	Current Protection	If current is over larger when frequency changes two times \rightarrow Frequency Decrease	
P04	Inverter Fin Temperature Increase Protection	Inverter Fin Temperature $\geq 89^{\circ}\text{C} \rightarrow$ Frequency Decrease	
P05	Discharger Gas Temperature Increase Protection	Temperature at the top of compressor is high \rightarrow Frequency Decrease (Maximum temperature is different depending on the frequency)	–
P06	Low-Pressure Decrease Protection	Low pressure is too low \rightarrow Frequency Decrease (Minimum pressure is different depending on the environmental temperature)	–
P09	High-Pressure Decrease Protection	Discharge pressure of compressor is too low \rightarrow Frequency Increase	–
P0A	Running Current Limit Control	Running Current for Compressor \geq Setting value \rightarrow Frequency Decrease	Setting Value: Set by external input; upper limit value of total running current of compressor is set 80%, 70% and 60% at normal operation.
P11	Pressure Ratio Decrease Retry	Compression Ratio (Pd+0.1)/(Ps+0.1) <1.8	When activating 3 times in 30 minutes. “43” alarm is indicated
P12	Low-Pressure Increase Retry	Ps >1.5 MPa	When activating 3 times in 30 minutes. “44” alarm is indicated
P13	High-Pressure Increase Retry	Ps >3.8 MPa	When activating 3 times in 30 minutes. “45” alarm is indicated
P15	Vacuum/Discharge Gas Temperature Increase Retry	In case of Ps <0.09 MPa over 12minutes. Discharge Gas Temperature $\geq 132^{\circ}\text{C}$ over 10 minutes or Discharge Gas Temperature $\geq 140^{\circ}\text{C}$ over 5 seconds	When activating 3 times in 1 hour, “47” (Ps) or “08” (Discharge Gas) alarm is indicated.
P16	Discharge Gas SUPER HEAT Decrease Retry	Discharge Gas Superheat Less than 10 degrees is maintained for 30 minutes.	When activating 3 times in 2 hours, “07” alarm is indicated.
P17	Inverter Trip Retry	Automatic Stoppage of Transistor Module. Activation of Electronic Thermal or Abnormal Current Sensor	When activating 3 or 6 times in 30 minutes, “48” , “51” or “53” alarm is indicated.
P18	Insufficient Voltage / Excessive Voltage Retry	Insufficient/Excessive Voltage at Inverter Circuit or CB Connector Part	When activating 3 times in 30 minutes, “06” alarm is indicated.
P26	High pressure decrease retry	Pd <1.00 MPa has been continued for one hour	Non alarm

NOTES:

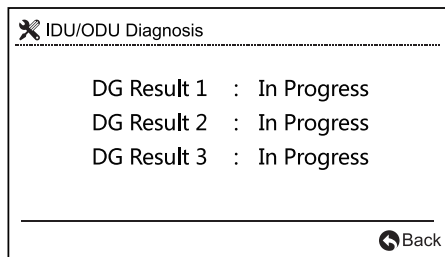
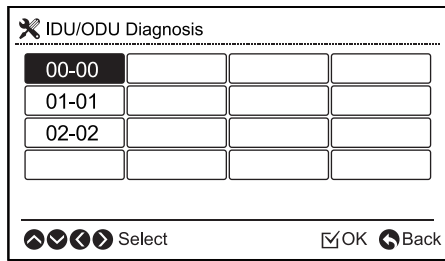
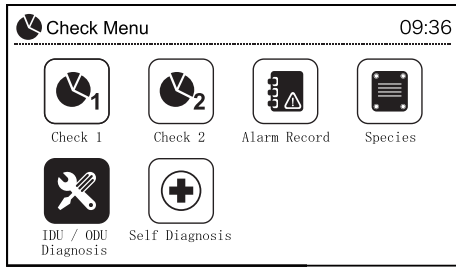
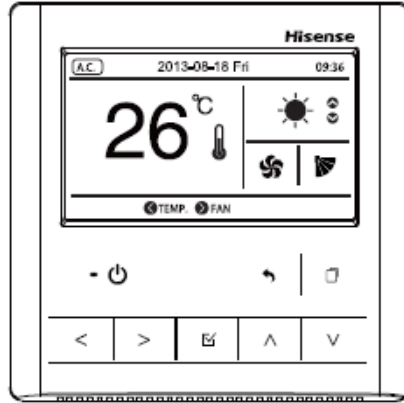
1. During protection control (except during alarm stoppage), the protection control code is indicated.
2. The protection control code is indicated during protection control and turns off when canceling the protection control.
3. After retry control, the condition of monitoring is continued for 30 minutes.

2.6 Self-Checking of PCB using Remote Control Switch

The function test of the indoor and outdoor unit PCB can be performed with the following fault location procedures.

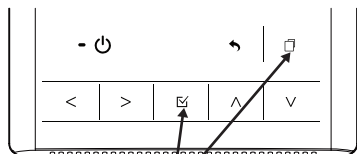


Press and hold “☐” (menu) and “☑” simultaneously for at least 3 seconds during the normal mode. The check menu will be displayed.

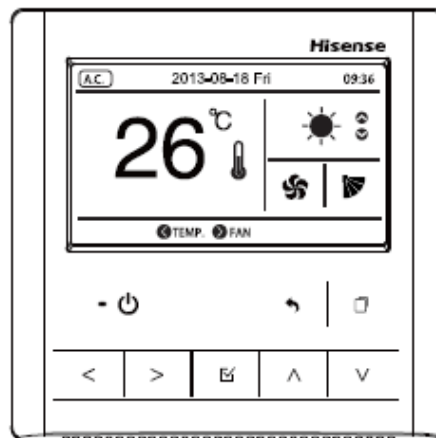
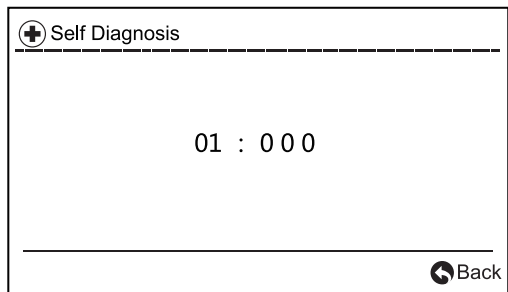
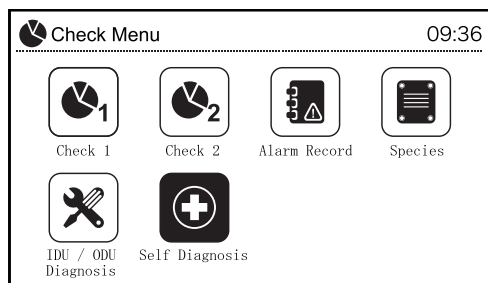


Display	Content	
00	Normal	
01	Malfunctions in the following circuits (open circuit, short circuit, etc)	
02	Return air temperature thermistor	Indoor unit PCB
03	Supply air temperature thermistor	
04	Liquid tube temperature thermistor	
05	Remote thermistor fault	
06	Air tube temperature thermistor	
08	Remote sensor	
0A	Central controller transmission	
0B	EEPROM	
0E	Indoor unit communication in the detection mode	
07	Outdoor unit communication	Outdoor unit PCB
F4	49FC input fault	
F5	63H2 input fault	
F6	Detection circuit protection code	
F7	Phase detection	
F8	Frequency converter transmission	
FA	High pressure sensor	
Fb	Compressor exhaust temperature thermistor	
Fc	Low pressure sensor	
Fd	Heat exchanger evaporator temperature thermistor	
FF	Environment temperature thermistor	

2.7 Self-Checking of Remote Control Switch



Press and hold “☐” (menu) and “☑” simultaneously for at least 3 seconds during the normal mode. The check menu will be displayed.



3. Caution on Refrigerant Leakage

3.1 Maximum Permissible Concentration of HFC Gas

The refrigerant R410A, charged in the Hi-Smart L system, is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation.

The maximum permissible concentration of R410A in air is 0.3 kg/m^3 , according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan.

Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.3 kg/m^3 , in case of leakage.

3.2 Calculation of Refrigerant Concentration

1. Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of rooms to be air-conditioned.
2. Calculate the room Volume V (m^3) of each room.
3. Calculate the refrigerant concentration C (kg/m^3) of the room according to the following equation.

$$\frac{R: \text{Total Quantity of Charged Refrigerant (kg)}}{V: \text{Room Volume}} = C \text{ (Refrigerant concentration)} \leq 0.3(\text{kg/m}^3)$$

3.3 Countermeasure for Refrigerant Leakage According to KHK Standard

The facility shall be arranged as follows referring to the KHK standards, so that the refrigerant concentration will be below 0.3 kg/m^3 .

1. Provide a shutterless opening which will allow fresh air to circulate into the room.
2. Provide a doorless opening of 0.15% or more size to the floor area.
3. Provide a ventilator, linked with a gas leak detector, of $0.4 \text{ m}^3/\text{min}$. or more ventilating capacity of the air conditioning system utilizing refrigerant R410A.

1 ton = Displacement of compressor $\text{m}^3/\text{h}/5.7$

AVW-38U* 1.35 ton

AVW-48U* 1.72 ton

AVW-54U* 2.05 ton

4. Pay attention to the installation place, such as a basement, etc., where refrigerant may stay since it is heavier than air.