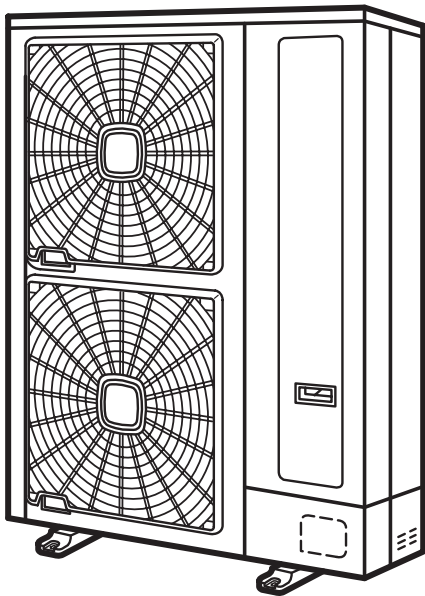


# ENGINEERING MANUAL

## INVERTER-DRIVEN MULTI-SPLIT SYSTEM HEAT PUMP AIR CONDITIONERS

### Engineering Manual



#### < Outdoor Units >

(H,Y,C)VAHP036B21S

(H,Y,C)VAHP048B21S

(H,Y,C)VAHP060B21S



# **IMPORTANT NOTICE AND SAFETY SUMMARY**



## **1. Introduction**

This Engineering Manual concentrates on heat pump air conditioning units. Read this manual carefully before performing installations or operations.


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

(Transportation/Installation Work) > (Refrigerant Piping Work) > (Electrical Wiring Work) > (Ref. Charge Work) > (Test Run) > (User)

## **2. Important Safety Instructions**

<b>Signal Words</b>	
 <b>WARNING</b>	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>	Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

### **General Precautions**

 <b>WARNING</b>	To reduce the risk of serious injury or death, read these instructions thoroughly and follow all warnings or cautions included in all manuals that accompanied the product and are attached to the unit. Refer back to these instructions as needed.
--	--

- This system should be installed by personnel certified by Johnson Controls, Inc. Personnel must be qualified according to local, state and national building and safety codes and regulations. Incorrect installation could cause leaks, electric shock, fire or explosion. In areas where Seismic "Performance requirements are specified, the appropriate measures should be taken during installation to guard against possible damage or injury that might occur in an earthquake if the unit is not installed correctly, injuries may occur due to a falling unit.
- Use appropriate Personal Protective Equipment (PPE), such as gloves and protective goggles and, where appropriate, have a gas mask nearby. Also use electrical protection equipment and tools suited for electrical operation purposes. Keep a quenching cloth and a fire extinguisher nearby during brazing. Use care in handling, rigging, and setting of bulky equipment.
- When transporting, be careful when picking up, moving and mounting these units. Although the unit may be packed using plastic straps, do not use them for transporting the unit from one location to another. Do not stand on or put any material on the unit. Get a partner to help, and bend with your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut fingers, so wear protective gloves.
- Do not touch or adjust any safety devices inside the indoor or outdoor units. All safety features, disengagement, and interlocks must be in place and functioning correctly before the equipment is put into operation. If these devices are improperly adjusted or tampered with in any way, a serious accident can occur. Never bypass or jump-out any safety device or switch.
- Johnson Controls will not assume any liability for injuries or damage caused by not following steps outlined or described in this manual. Unauthorized modifications to Johnson Controls products are prohibited as they...
  - May create hazards which could result in death, serious injury or equipment damage.
  - Will void product warranties.
  - May invalidate product regulatory certifications.
  - May violate OSHA standards.

## NOTICE

Take the following precautions to reduce the risk of property damage.

- Be careful that moisture, dust, or variant refrigerant compounds not enter the refrigerant cycle during installation work. Foreign matter could damage internal components or cause blockages.
- If air filters are required on this unit, do not operate the unit without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.
- Do not install this unit in any place where silicon gases can coalesce. If the silicon gas molecules attach themselves to the surface of the heat exchanger, the finned surfaces will repel water. As a result, any amount of drainage moisture condensate can overflow from the drain condensate pan and could run inside of the electrical box, possibly causing electrical failures.
- When installing the unit in a hospital or other facility where electromagnetic waves are generated from nearby medical and/or electronic devices, be prepared for noise and electronic interference Electromagnetic Interference (EMI). Do not install where the waves can directly radiate into the electrical box, controller cable, or controller. Inverters, appliances, high-frequency medical equipment, and radio communications equipment may cause the unit to malfunction. The operation of the unit may also adversely affect these same devices. Install the unit at least 10 ft. (approximately 3m) away from such devices.
- When a wireless controller is used, locate at a distance of at least 3.3 ft. (approximately 1m) between the indoor unit and electric lighting. If not, the receiver part of the unit may have difficulty receiving operation commands.
- Do not install the unit in any location where animals and plants can come into direct contact with the outlet air stream. Exposure could adversely affect the animals and plants.
- Do not install the unit with any downward slope to the side of the drain adaptor. If you do, you may have drain water flowing back which may cause leaks.
- Be sure the drain hose discharges water properly. If connected incorrectly, it may cause leaks.
- Do not install the unit in any place where oil can seep onto the units, such as table or seating areas in restaurants, and so forth. For these locations or social venues, use specialized units with oil-resistant features built into them. In addition, use a specialized ceiling fan designed for restaurant use. These specialized oil-resistant units can be ordered for such applications. However, in places where large quantities of oil can splash onto the unit, such as a factory, even the specialized units cannot be used. These products should not be installed in such locations.
- If the wired controller is installed in a location where electromagnetic radiation is generated, make sure that the wired controller is shielded and cables are sleeved inside conduit tubing.
- If there is a source of electrical interference near the power source, install noise suppression equipment (filter).
- During the test run, check the unit's operation temperature. If the unit is used in an environment where the temperature exceeds the operation boundary, it may cause severe damage. Check the operational temperature boundary in the manual. If there is no specified temperature, use the unit within the operational temperature boundary of 35 to 104°F (0 to 40°C).
- Read installation and appropriate user manuals for connection with PC or peripheral devices. If a warning window appears on the PC, the product stops, does not work properly or works intermittently, immediately stop using the equipment.

## Installation Precautions

### **WARNING**

To reduce the risk of serious injury or death, the following installation precautions must be followed.

- When installing the unit into...
  - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
  - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
  - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
  - An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable wall for wind prevention (field-supplied). Or install Wind Guard (optional).
  - A snowy area: Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow roof for snow prevention (field-supplied). Or install Snow Protection Hood (optional).
- If the remote sensors are not used with this controller, then do not install this controller...
  - in a room where there is no thermostat.
  - where the unit is exposed to direct sunshine or direct light.
  - where the unit will be in close proximity to a heat source.
  - where hot/cold air from the outdoors, or a draft from elsewhere (such as air vents, diffusers or grilles) can affect air circulation.
  - in areas with poor air circulation and ventilation.
- Do not install the unit in the following places. Doing so can result in an explosion, fire, deformation, corrosion, or product failure.
  - Explosive or flammable atmosphere.
  - Where fire, oil, steam, or powder can directly enter the unit, such as in close proximity or directly above a kitchen stove.
  - Where oil (including machinery oil) may be present.
  - Where corrosive gases such as chlorine, bromine, or sulfide can accumulate, such as near a hot tub or hot spring.
  - Where dense, salt-laden airflow is heavy, such as in coastal regions.
  - Where the air quality is of high acidity.
  - Where harmful gases can be generated from decomposition.
- Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration. Do not position the drain pipe for the indoor unit near any sanitary sewers where corrosive gases may be present.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed.
- During transportation, do not allow the backrest of the forklift make contact with the unit, otherwise, it may cause damage to the heat exchanger and also may cause injury when stopped or started suddenly.
- Remove gas inside the closing pipe when the brazing work is performed. If the brazing filler metal is melted with remaining gas inside, the pipes will be blown off and it may cause injury.
- Be sure to use nitrogen gas for an airtight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause explosion or gas intoxication.

After installation work for the system has been completed, explain the "Safety Precautions," the proper use and maintenance of the unit to the customer according to the information in all manuals that came with the system. All manuals and warranty information must be given to the user or left near the Indoor Unit.

## Refrigerant Precautions

### **WARNING**

To reduce the risk of serious injury or death, the following refrigerant precautions must be followed.

- As originally manufactured, this unit contains refrigerant installed by Johnson Controls. Johnson Controls uses only refrigerants that have been approved for use in the unit's intended home country or market. Johnson Controls distributors similarly are only authorized to provide refrigerants that have been approved for use in the countries or markets they serve. The refrigerant used in this unit is identified on the unit's faceplate and/or in the associated manuals. Any additions of refrigerant into this unit must comply with the country's requirements with regard to refrigerant use and should be obtained from Johnson Controls distributors. Use of any non-approved refrigerant substitutes will void the warranty and will increase the potential risk of injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. Refrigerant gases can cause asphyxiation (0.026 lbs/ft<sup>3</sup> (0.42 kg/m<sup>3</sup>) based on ISO 5149 for R410A). Consult with your distributor for countermeasures (ventilation system and so on). If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- Check the design pressure for this product is 601 psi (4.15MPa). The pressure of the refrigerant R410A is 1.4 times higher than that of the refrigerant R22. Therefore, the refrigerant piping for R410A shall be thicker than that for R22. Make sure to use the specified refrigerant piping. If not, the refrigerant piping may rupture due to an excessive refrigerant pressure. Besides, pay attention to the piping thickness when using copper refrigerant piping. The thickness of copper refrigerant piping differs depending on its material.
- The refrigerant R410A is adopted. The refrigerant oil tends to be affected by foreign matters such as moisture, oxide film, (or fat). Perform the installation work with care to prevent moisture, dust, or different refrigerant from entering the refrigerant cycle. Foreign matter can be introduced into the cycle from such parts as expansion valve and the operation may be unavailable.
- To avoid the possibility of different refrigerant or refrigerant oil being introduced into the cycle, the sizes of the charging connections have been changed from R407C type and R22 type. It is necessary to prepare the appropriate tools before performing installation work.
- Use refrigerant pipes and joints which are approved for use with R410A.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.
- Before installation is complete, make sure that the refrigerant leak test has been performed. If refrigerant gases escape into the air, turn OFF the main switch, extinguish any open flames and contact your service contractor. Refrigerant (Fluorocarbon) for this unit is odorless. If the refrigerant should leak and come into contact with open flames, toxic gas could be generated. Also, because the fluorocarbons are heavier than air, they settle to the floor, which could cause asphyxiation.
- When installing the unit, and connecting refrigerant piping, keep all piping runs as short as possible, and make sure to securely connect the refrigerant piping before the compressor starts operating. If the refrigerant piping is not connected and the compressor activates with the stop valve opened, the refrigerant cycle will become subjected to extremely high pressure, which can cause an explosion or fire.
- Tighten the flare nut with a torque wrench in the specified manner. Do not apply excessive force to the flare nut when tightening. If you do, the flare nut can crack and refrigerant leakage may occur.
- When maintaining, relocating, and disposing of the unit, dismantle the refrigerant piping after the compressor stops.
- When pipes are removed out from under the piping cover, after the insulation work is completed, cover the gap between the piping cover and pipes by a packing (field-supplied). If the gap is not covered, the unit may be damaged if snow, rain water or small animals enter the unit.
- Do not apply an excessive force to the spindle valve at the end of opening. Otherwise, the spindle valve flies out due to refrigerant pressure. At the test run, fully open the gas and liquid valves, otherwise, these devices will be damaged. (It is closed before shipment.)
- If the arrangement for outdoor units is incorrect, it may cause flowback of the refrigerant and result in failure of the outdoor unit.
- The refrigerant system may be damaged if the slope of the piping connection kit exceeds  $\pm 15^\circ$ .

## Electrical Precautions



Take the following precautions to reduce the risk of electric shock, fire or explosion resulting in serious injury or death.

- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- Perform all electrical work in strict accordance with this installation and maintenance manual and all the relevant regulatory standards.
- Before servicing, open and tag all disconnect switches. Never assume electrical power is disconnected. Check with meter and equipment.
- Only use electrical protection equipment and tools suited for this installation.
- Insulate a wired controller against moisture and temperature extremes.
- Use specified cables between units.
- The new air conditioner may not function normally in the following instances:
  - If electrical power for the new air conditioner is supplied from the same transformer as the device\* referred to below.
  - If the power source cables for this device\* and the new air conditioner unit are located in close proximity to each other.

Device\*: (Example): A lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch.

Regarding the cases mentioned above, surge voltage may be inducted into the power supply cables for the packaged air conditioner due to a rapid change in power consumption of the device and an activation of a switch.

Check field regulations and standards before performing electrical work in order to protect the power supply for the new air conditioner unit.
- Communication cabling shall be a minimum of AWG18 (0.82mm<sup>2</sup>), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- The polarity of the input terminals is important, so be sure to match the polarity when using contacts that have polarity.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.
- Highly dangerous electrical voltages may be used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- Before installing the controller or remote devices, ensure that the indoor and outdoor unit operation has been stopped. Further, be sure to wait at least five minutes before turning off the main power switch to the indoor or outdoor units. Otherwise, water leakage or electrical breakdown may result.
- Do not open the service cover or access panel to the indoor or outdoor units without turning OFF the main power supply. Before connecting or servicing the controller or cables to indoor or outdoor units, open and tag all disconnect switches. Never assume electrical power is disconnected. Check with a meter and equipment.
- This equipment can be installed with a Ground Fault Circuit Breaker (GFCI), which is a recognized measure for added protection to a properly grounded unit. Install appropriate sized breakers / fuses / overcurrent protection switches, and wiring in accordance with local, state and NEC codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements.

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## 1. General Informations (Features)

Johnson Controls presents the inverter-driven Mini VRF series product, which 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 comfort are particularly important. Specifically the business buildings, building offices, apartments and residential areas, need an intelligent and comfortable environment throughout the year. Better air conditioning solutions can be provided for these buildings using an improved inverter-driven and scroll compressor.

### ● VRF System

Johnson Controls has developed the VRF system with its customers in mind.

This system provides the consumer with greater flexibility for installation, which means that the air-conditioning systems will integrate better with complex facility structures.

### ● Wide Variety of Indoor Unit Line-Up

Various indoor units can be selected depending on the installation location, shape of air outlet and interior.

Table 1.1 Indoor Unit Models

Indoor Unit Type			Capacity (MBH)											
			6	8	12	15	18	24	27	30	36	48	54	60
Ducted	Ducted (High Static)	(H,Y)IDH_B21S					○	○		○	○	○		
		(H,Y,C)IDH_B22S				○	○	○	○	○	○	○	○	
	Ducted (Medium Static)	(H,Y,C>IDM_B21S	○	○	○	○	○	○		○	○	○		
		(H,Y,C)IDM_B22S	○	○	○	○	○	○	○	○	○	○	○	
	Ducted (Slim)	(H,Y,C)IDS_B21S	○	○	○	○	○							
	Ducted (EconoFresh)	(H,Y,C)IDM_B21E								○	○	○		
	Air Handler with DX-Kit	(H,Y,C)MAHP_(B,C,D)21S					○	○		○	○	○		○
Non-Ducted	Ceiling-Mounted 4-Way Cassette	(H,Y,C)IC4_B21S		○	○	○	○	○		○	○	○		
	Ceiling-Mounted 4-Way Cassette Mini	(H,Y,C)ICM_B21S		○	○	○	○							
	Ceiling-Mounted 2-Way Cassette	(H,Y,C)IC2_B21S					○	○						
	Ceiling-Mounted 1-Way Cassette	(H,Y,C)IC1_B21S	○	○	○	○								
	Wall-Mounted	TIWM_B21S	○	○	○	○	○	○		○				
	Ceiling Suspended	(H,Y,C)ICS_B21S				○		○		○	○			
	Floor Exposed	(H,Y,C)IFE_B21S	○	○	○	○								
	Floor Concealed	(H,Y,C)IFC_B21S	○	○	○	○								

○ : Available

### NOTE:

Please refer to Section 2.13 "Combination of Indoor Unit and Outdoor Unit".

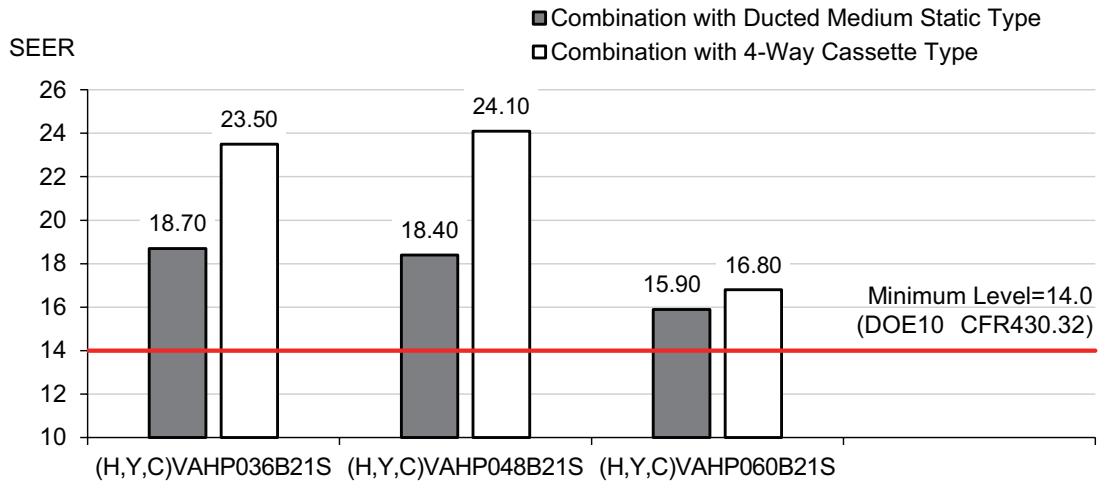
## FEATURES

### ● High Efficiency and Energy Saving

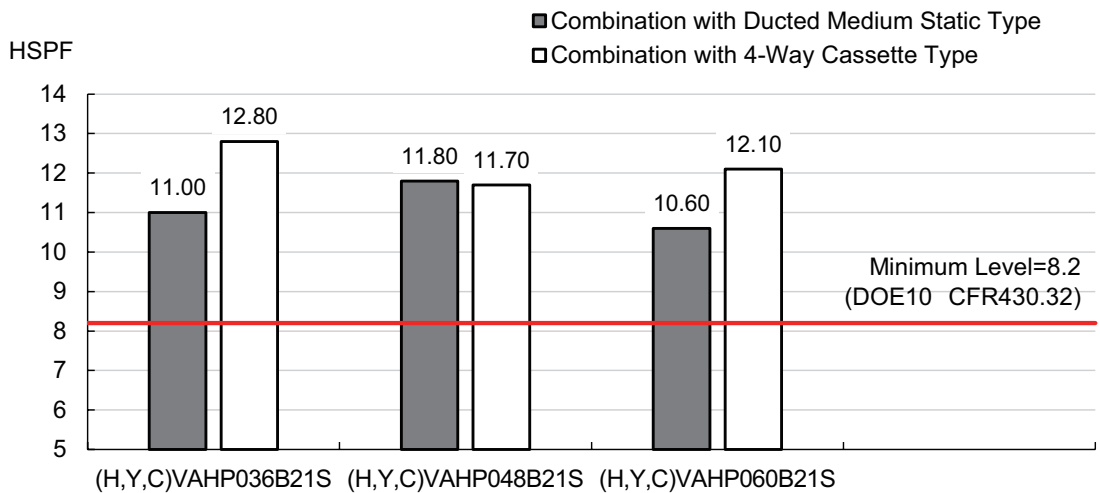
By improving the performance of the compressor and optimizing the refrigerant system, considerable energy savings for buildings are achieved with the Mini VRF.

Seasonal energy efficiency based on the AHRI 210/240 performance standard satisfies DOE minimum levels as follows.

#### < Cooling >



#### < Heating >

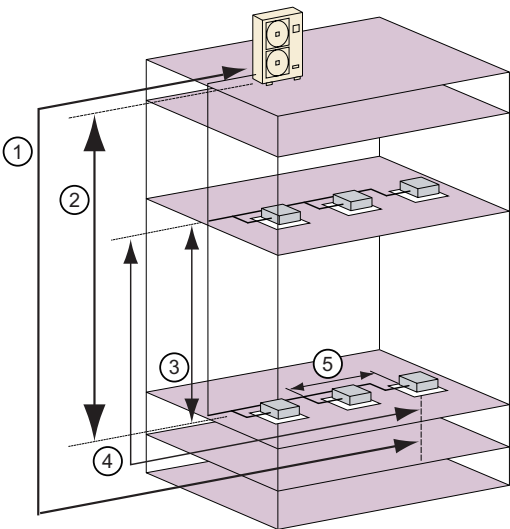


● Flexibility of Facility Design

The piping can be designed and constructed up to a maximum piping length of 492ft. (150m).

- ① Piping length: 492ft. (150m) \*1  
(Equivalent Length: 623ft. (190m))
- ② Height difference between Outdoor Unit and Indoor Unit  
Outdoor Unit is higher: 164ft. (50m)  
Outdoor Unit is lower: 131ft. (40m)
- ③ Height difference between Indoor Units: 49ft. (15m)
- ④ Maximum length after branch  
between 1st branch and each Indoor Unit: 131ft. (40m)
- ⑤ Maximum length after branch  
between each branch and each Indoor Unit: 131ft. (40m)

Total Piping Length: 984ft. (300m) \*1, \*2



**NOTE:**

For details of piping restriction, refer to Section 2.14.1 “Piping Work Conditions”.

- \*1: When operating the outdoor unit in cold areas with temperatures of 14°F (-10°C), or under high heating load conditions,the total piping length should be less than 310ft (95m) and the maximum piping length (actual length) should be less than 246ft (75m).
- \*2: Total piping length may be restricted by the maximum additional refrigerant charge.  
Field additional charge should not exceed the maximum additional refrigerant charge (table below).

< Max. Additional Refrigerant Charge Quantity Allowed >

Outdoor Unit Capacity (MBH)	36 - 60
Max. Additional Refrigerant Charge: lbs (kg)	18.5 (8.4)

Regarding additional refrigerant charge, refer to Section 2.16 “Additional Refrigerant Charge Calculation”.

## FEATURES

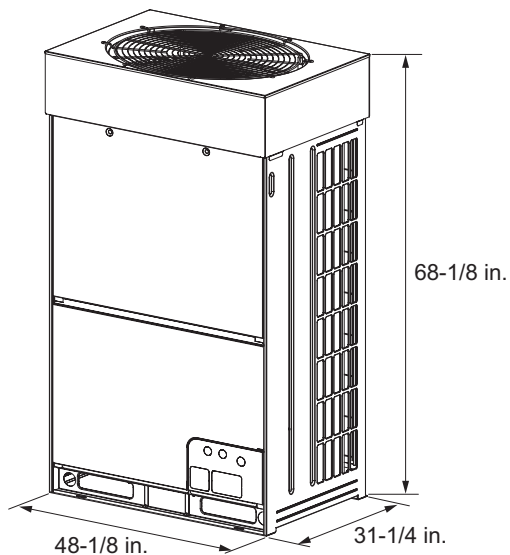
### ● Compact and Lightweight Design

Facilitation and flexibility at installation are further advanced by adopting a lightweight and compact design of the outdoor unit compared to a top-flow model.

< For Example: Comparing (H,Y,C)VAHP048B21S and (H,Y,C)VAHP096B21S >

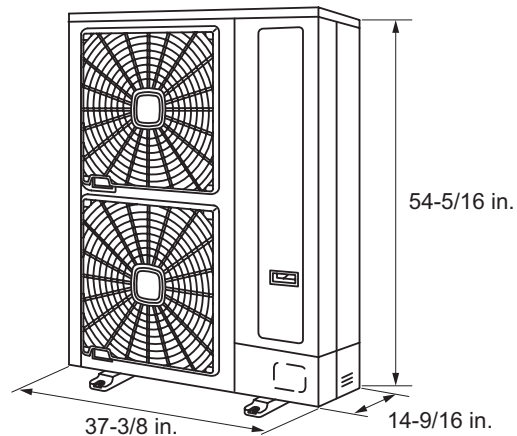
\* Floor Area per Nominal Capacity: **32% Decrease**

\* Net Weight per Nominal Capacity: **27% Decrease**



(H,Y)VAHP096B31S

Net Weight = **730 lbs**  
(331kg)  
Nominal Capacity = 96,000 Btu/h



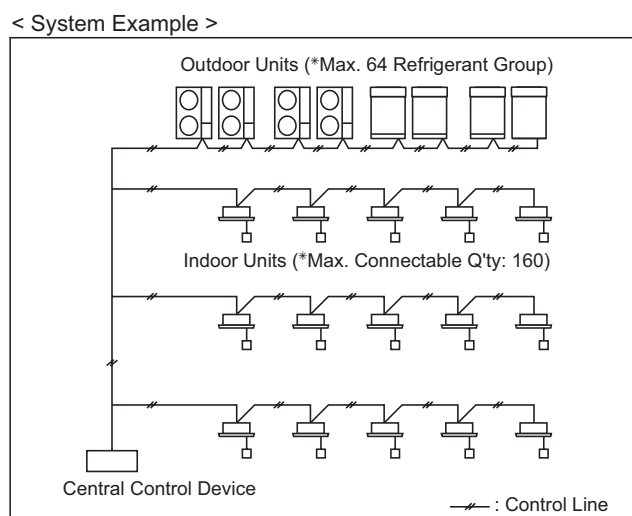
(H,Y,C)VAHP048B21S

Net Weight = **249 lbs**  
(113kg)  
Nominal Capacity = 48,000 Btu/h

- With a width of only 14-9/16 in. (370mm), a Mini VRF can be installed on a staircase landing or balcony on each floor. (Regarding service space, refer to Section 2.7 "Service Space".)
- Side-flow type Mini VRF can be installed under the eaves.
- With its light and compact body, Mini VRF can be easily carried in the elevator site. (No cranes required for delivery.)
- The Mini VRF can be transported by as few as two people.

### ● Corresponds to H-LINK II System

The outdoor units in the VRF Series correspond to the H-LINK II communication system. A maximum of 64 refrigerant groups and a maximum of 160 indoor units can be controlled by only one central control device when the equipment (central control device, indoor units, wired controller) in the same communication system all correspond to H-LINK II.



### ● H-LINK II System

The H-LINK II wiring system requires only two communication cables to connect each indoor unit and outdoor unit for up to 64 refrigerant systems, and to connect wires for all indoor units and outdoor units.

#### <Specifications>

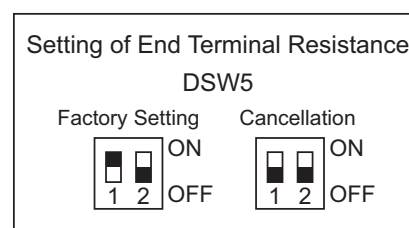
- \* Communication Cable: 2-Wire
- \* Polarity of Communication Cable: Non-Polar Cable
- \* Maximum Outdoor Units to be Connected: 64 Units per System
- \* Maximum Indoor Units to be Connected: 160 Units per H-LINK II System
- \* Maximum Cable Length: Total 3,280 ft. (1,000m) (including central controller)
- \* Recommended Cable: Communication Cable with Shield, over AWG18 (Equivalent to KPEV-S)
- \* Voltage: DC5V

#### NOTE:

When using an H-LINK II system, the setting of DIP switches for an outdoor unit and indoor unit is required. If the DIP switches are not set, or set incorrectly, an alarm may occur because of a communication failure.

### ● Setting of End Terminal Resistance

Factory setting of the No.1 pin of DSW5 is in the "ON" position. When the number of outdoor units in the same H-LINK system is two or more, set the No.1 pin of DSW5 at "OFF" at the second unit. If only one outdoor unit is used, no setting is required.

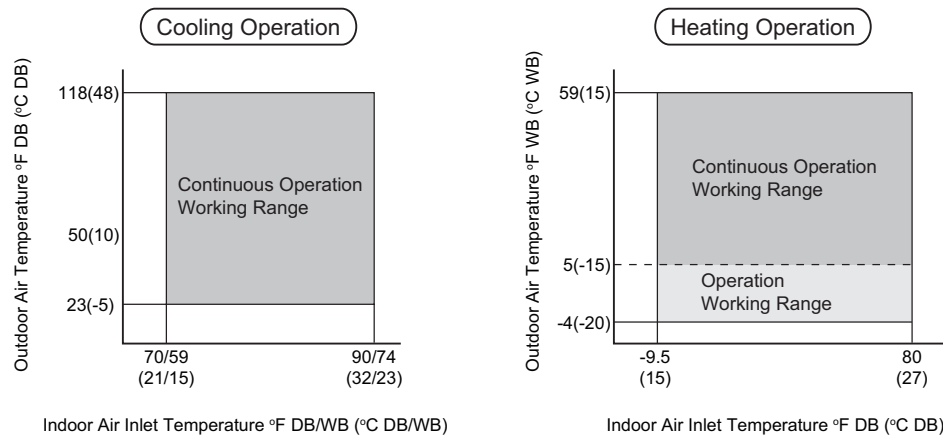


## FEATURES

### ● Wide Operation Range

This unit has been designed for cooling operations under low ambient temperatures down to 23°F (-5°C) DB.

This wide operation range enables cooling even in winter in buildings with high internal heat gains resulting from lighting, people and machines, particularly in areas such as shops, lecture rooms, and data processing areas. Heating operations under low ambient temperature down to -4°F (-20°C) WB can also be accomplished.



### NOTE:

For details, please refer to Section 2.12 "Operation Range".



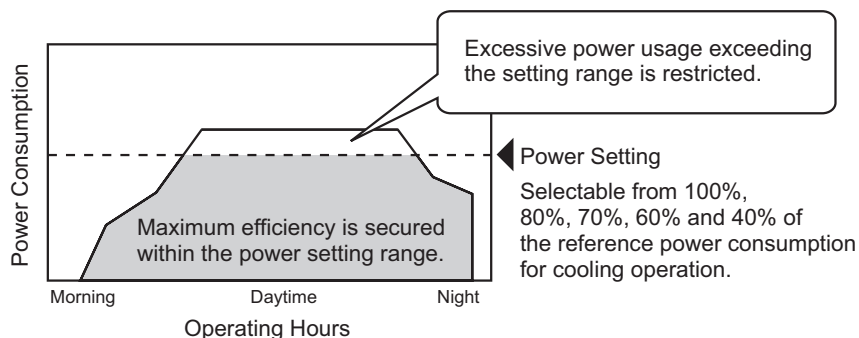
● Energy-Saving through Schedule Setting of “Self-Demand Function”

“Self-Demand Function”\* can be set for each outdoor unit from a Computerized Central Controller (CCCS01 and CCCA01) or Wired Controller (CIW01).

For small and medium buildings, it facilitates power saving. The energy-saving operation can be adjusted conforming to an operating environment and individual needs.

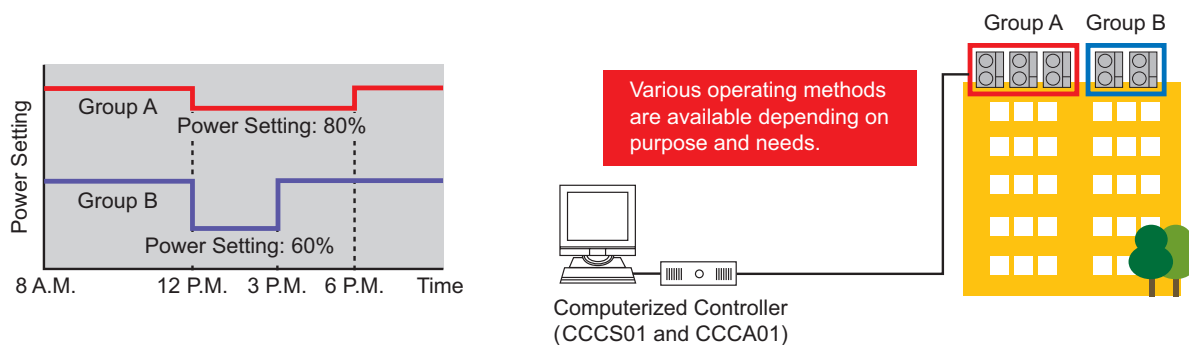
\* Self-Demand Function: It saves capacity so as not to exceed demand current control based on the electric power data detected.

< Self-Demand Function >



Outdoor Unit Capacity [MBH]	Reference Power Consumption [kW]
036	3.9
048	4.5
060	4.5

< Setting Example: Schedule Setting for Each Group by Computerized Controller >



The specific outdoor unit and the period of time can be set from computerized controller.

NOTES:

1. The demand current control (%) is indicated by approximate values. The value in this control which is calculated by the current is different from the value in the wattmeter.  
If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.
2. The range may temporarily be higher than the power-setting range (%) depending on the operating control condition such as protection control.
3. When the above self-demand control is set, performance is restricted because the rotation frequency of the compressor is automatically lowered.

● Operation Sound Reduction Function

(1) Night Shift Mode (Optional Function)

With the Night Shift Mode setting by optional function, when ambient temperature is 86°F (30°C) or less in a cooling operation, rotation speed of the compressor and the outdoor fan is automatically lowered.

Outdoor Unit Capacity [MBH]	Sound Pressure Level [dB]	
	Rated Operation	Night Shift
036	51	44
048	52	46
060	53	46

NOTES:

1. Night shift mode is recommended when cooling capacity has sufficient margin compared to cooling load and operation sound should be reduced at night time.
2. Cooling capacity may be decreased about 60%.
3. Regarding setting methods, refer to the Service Manual.

(2) Low Noise Setting Mode (Optional Function)

With Low Noise Setting Mode by optional function, rotation speed of the compressor is forcibly decreased regardless of ambient temperature.

Low Noise Setting Mode can be selected from three levels and time can be scheduled and set by the Wired Controller (CIW01).

Outdoor Unit Capacity [MBH]	Sound Pressure Level [dB]		
	Low Noise Setting 1	Low Noise Setting 2	Low Noise Setting 3
036	-1	-2	-3
048	-1	-2	-3
060	-2	-3	-4

NOTES:

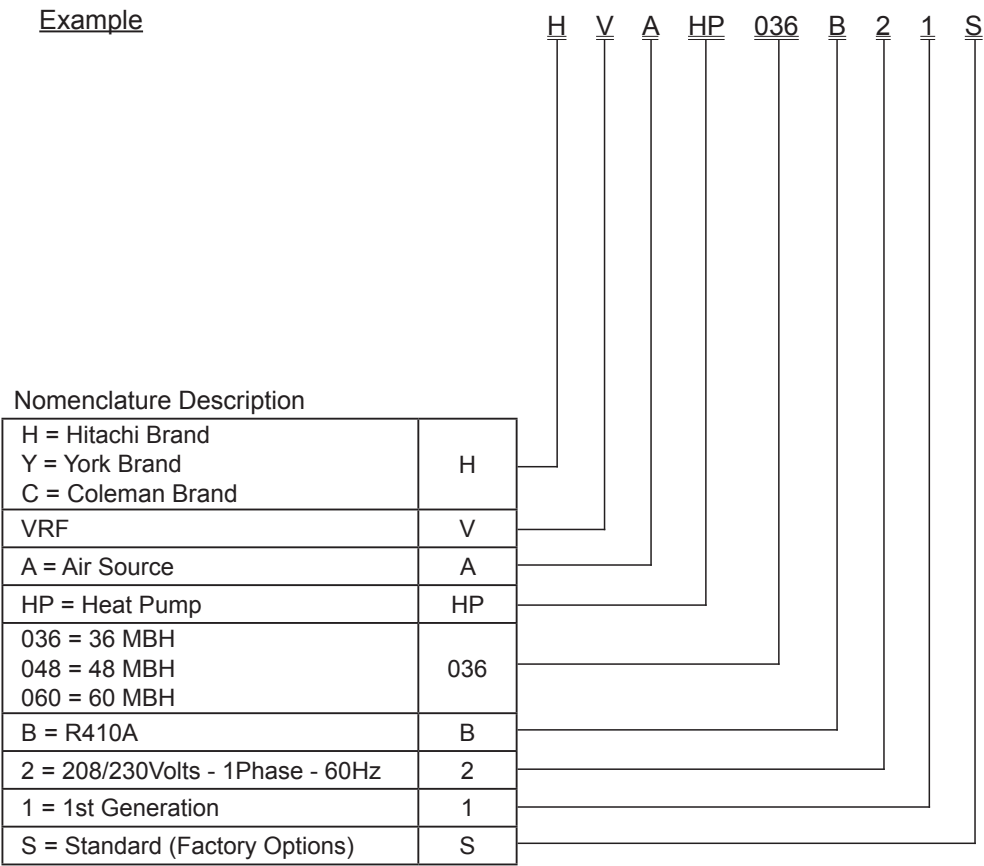
1. Cooling and heating capacity may drop to 80%, 70% and 60% in each setting mode.
2. Regarding setting method, refer to the Service Manual.
3. Regarding time schedule setting, refer to the Installation Manual for the Wired Controller.

## 2. Outdoor Units

### 2.1 Unit Nomenclature

- Outdoor Units  
Model Descriptions

Example



### 2.2 Line-up

Voltage	Capacity (MBH)	Model Name
208/230V	36	(H,Y,C)VAHP036B21S
	48	(H,Y,C)VAHP048B21S
	60	(H,Y,C)VAHP060B21S

## 2.3 General Data

Category					Mini VRF Outdoor Unit					
Model					(H,Y,C)VAHP036B21S		(H,Y,C)VAHP048B21S		(H,Y,C)VAHP060B21S	
Power Supply					208/230V/ 1PH 60Hz		208/230V/ 1PH 60Hz		208/230V/ 1PH 60Hz	
Capacity (Nominal) *1	Cooling	Capacity (Nominal)	Btu/h	(kW)	36,000	(10.6)	48,000	(14.1)	60,000	(17.6)
		Power Input	kW		2.53		3.78		5.05	
		Current Input	A (208V/230V)		12.3 / 11.1		18.6 / 16.9		24.8 / 22.4	
	Heating	Capacity (Nominal)	Btu/h	(kW)	40,000	(11.7)	54,000	(15.8)	64,000	(18.8)
		Power Input	kW		2.36		3.95		4.42	
		Current Input	A (208V/230V)		11.8 / 10.6		19.6 / 17.7		21.7 / 19.6	
Efficiency Ratings *2 (Non-Ducted / Ducted)	Cooling	Rated Capacity	Btu/h	36,000 / 36,000		48,000 / 48,000		60,000 / 55,000		
		EER	Btu/Wh	16.70 / 13.80		16.70 / 13.10		12.20 / 9.70		
		SEER	Btu/Wh	23.50 / 18.70		24.10 / 18.40		16.80 / 15.90		
	Heating	Rated Capacity	Btu/h	40,000 / 40,000		54,000 / 54,000		64,000 / 64,000		
		COP	W/W	5.12 / 3.90		4.56 / 3.86		3.90 / 3.30		
		HSPF	Btu/Wh	12.80 / 11.00		11.70 / 11.80		12.10 / 10.60		
Cooling Operating Range	Indoor	°F WB (°C WB)		59 (15) ~ 73 (23)		59 (15) ~ 73 (23)		59 (15) ~ 73 (23)		
	Outdoor	°F DB (°C DB)		23 (-5) ~ 118 (48) *3		23 (-5) ~ 118 (48) *3		23 (-5) ~ 118 (48) *3		
Heating Operating Range	Indoor	°F DB (°C DB)		59 (15) ~ 80 (27)		59 (15) ~ 80 (27)		59 (15) ~ 80 (27)		
	Outdoor	°F WB (°C WB)		-4 (-20) ~ 59 (15) *4		-4 (-20) ~ 59 (15) *4		-4 (-20) ~ 59 (15) *4		
Cabinet Color (Munsell Code)			-	1.0Y8.5/0.5		1.0Y8.5/0.5		1.0Y8.5/0.5		
Outer Dimensions	Height	in.	(mm)	54-5/16	(1380)	54-5/16	(1380)	54-5/16	(1380)	
	Width	in.	(mm)	37-3/8	(950)	37-3/8	(950)	37-3/8	(950)	
	Depth	in.	(mm)	14-9/16	(370)	14-9/16	(370)	14-9/16	(370)	
Package Dimensions	Height	in.	(mm)	59-9/16	(1513)	59-9/16	(1513)	59-9/16	(1513)	
	Width	in.	(mm)	40-3/8	(1025)	40-3/8	(1025)	40-3/8	(1025)	
	Depth	in.	(mm)	18-1/8	(460)	18-1/8	(460)	18-1/8	(460)	
Weight	Net	lbs	(kg)	249	(113)	249	(113)	249	(113)	
	Gross	lbs	(kg)	267	(121)	267	(121)	267	(121)	
Connection Ratio	Total Indoor Unit Capacity		%	130-60		130-60		105-60		
	Max. Indoor Units/System		-	6		8		8		
Heat Exchanger	Type	-		Multi-Pass Cross-Finned Tube		Multi-Pass Cross-Finned Tube		Multi-Pass Cross-Finned Tube		
	Material	-		Cu-Al (Anti-corrosion)		Cu-Al (Anti-corrosion)		Cu-Al (Anti-corrosion)		
Compressor	Type	-		HA36PHD-A1S2		HA36PHD-A1S2		HA36PHD-A1S2		
	Motor Phase / Pole	- / -		3PH / 6		3PH / 6		3PH / 6		
	Start Method	-		Inverter		Inverter		Inverter		
	Operation Range	%		10 ~ 100		10 ~ 100		10 ~ 100		
	Refrigeration Oil Type	-		FVC68D		FVC68D		FVC68D		
Crank Case Heater			W × Qty	52W(208V) ×1		52W(208V) ×1		52W(208V) ×1		
Fan	Type	-		Propeller Fan		Propeller Fan		Propeller Fan		
	Quantity	Qty		2		2		2		
	Motor Output (Pole)	W (Pole)		58(10) + 58(10)		58(10) + 58(10)		58(10) + 58(10)		
	Airflow Rate	cfm	(m³/min)	3177	(90)	3530	(100)	3530	(100)	
	Drive	-		Direct-drive		Direct-drive		Direct-drive		
Electrical	Min. Circuit Amps	A		31		31		31		
	Max. Overcurrent Protective Device	A		40		40		40		
Sound Pressure Level *5	Cooling (Night-Shift)	dB (A)		51	(44)	52	(46)	53	(46)	
	Heating	dB (A)		52		54		56		
Protection Devices	Cycle	-		High pressure switch at 601psi (4.15MPa)		High pressure switch at 601psi (4.15MPa)		High pressure switch at 601psi (4.15MPa)		
	Compressor	-		Over-current protection Over-heat protection Circuit Breaker (30A)		Over-current protection Over-heat protection Circuit Breaker (30A)		Over-current protection Over-heat protection Circuit Breaker (30A)		
	Fan Motor	-		Over-current protection Over-heat protection Self-contained fuse (5A)		Over-current protection Over-heat protection Self-contained fuse (5A)		Over-current protection Over-heat protection Self-contained fuse (5A)		
	PCB (Control Circuit)	-		Fuse on PCB(5A)		Fuse on PCB(5A)		Fuse on PCB(5A)		
Refrigerant	Type	-		R410A		R410A		R410A		
	Charge Amount	lbs	(kg)	7.9	(3.6)	7.9	(3.6)	7.9	(3.6)	
Refrigeration Oil	Charge Amount	gal/Unit	(L/Unit)	0.34	(1.3)	0.34	(1.3)	0.34	(1.3)	
Defrost Method			-	Reversed Refrigerant Cycle		Reversed Refrigerant Cycle		Reversed Refrigerant Cycle		
Main Refrigerant Piping	Gas Line	in.	(mm)	5/8	(15.88)	5/8	(15.88)	5/8	(15.88)	
	Liquid Line	in.	(mm)	3/8	(9.52)	3/8	(9.52)	3/8	(9.52)	

### NOTES:

\*1 Rating Conditions:

#### Cooling

Indoor Air Inlet Temperature: 80°F (26.7°C) DB

67°F (19.4°C) WB

Outdoor Air Inlet Temperature: 95°F (35.0°C) DB

Piping Length: 24.6ft. (7.5m), Piping Lift: 0ft. (0m)

#### Heating

Indoor Air Inlet Temperature: 70°F (21.1°C) DB

Outdoor Air Inlet Temperature: 47°F (8.3°C) DB

43°F (6.1°C) WB

\*2 Efficiency ratings are based on the AHRI 210/240 test standard.

\*3 There are some exceptions and notes for cooling operation ranges. For details, refer to Section 2.12 "Operation Range".

\*4 There are some exceptions and notes for heating operation ranges. For details, refer to Section 2.12 "Operation Range".

\*5 Measurement Point: 3.3ft. (1m) from the air outlet side, 4.9ft. (1.5m) from floor level.

The operation sound is measured in an anechoic chamber. However, the actual operation sound may appear louder or with an echo because of surrounding environmental noise. Be sure to check environmental conditions before installation.

The sound of the air inlet side may be 3dB higher than that of the air outlet side.

## 2.4 Dimensional Data and Weights

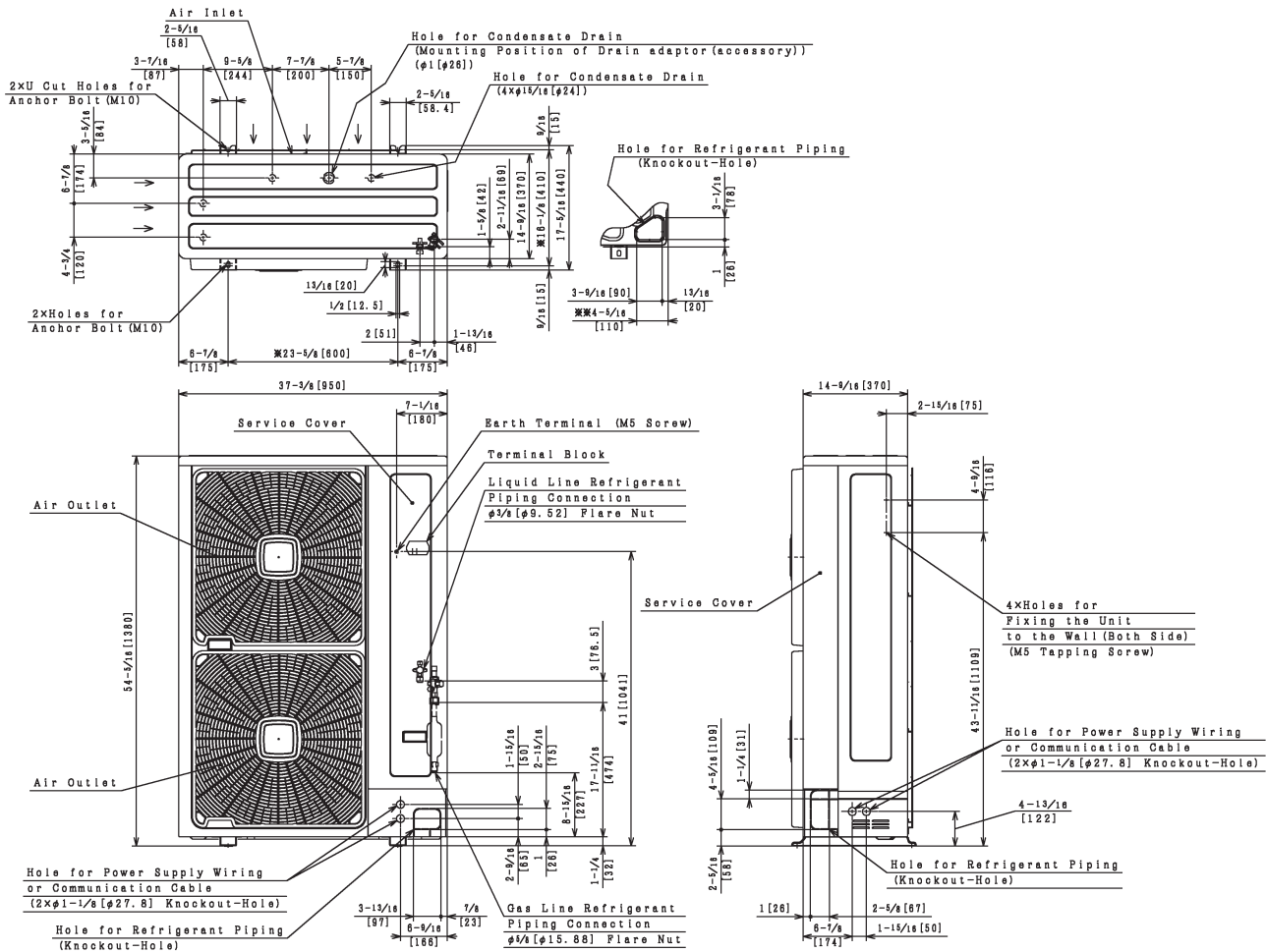
### 2.4.1 Overall Dimensional and Weight Data

Model	Height [in. (mm)]	Width [in. (mm)]	Depth [in. (mm)]	Net Weight [lbs (kg)]
(H,Y,C)VAHP036B21S	54-5/16 (1380)	37-3/8 (950)	14-9/16 (370)	249 (113)
(H,Y,C)VAHP048B21S	54-5/16 (1380)	37-3/8 (950)	14-9/16 (370)	249 (113)
(H,Y,C)VAHP060B21S	54-5/16 (1380)	37-3/8 (950)	14-9/16 (370)	249 (113)

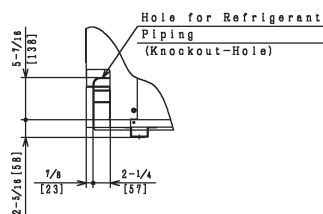
## 2.4.2 Outdoor Units

Model: (H,Y,C)VAHP036B21S to (H,Y,C)VAHP060B21S

inch [mm]



### • A side view



### Drain Water

Drain water is caused during heating operation or defrost operation.

- ① Choose a place where well drainage is available.  
Or provide a groove for drain.
- ② Do not provide an upward slope from the unit to avoid reverse flow of the drain.
- ③ When dripping drain water is not permissible, provide a second drain pan under the outdoor unit to ensure collection of drain water.

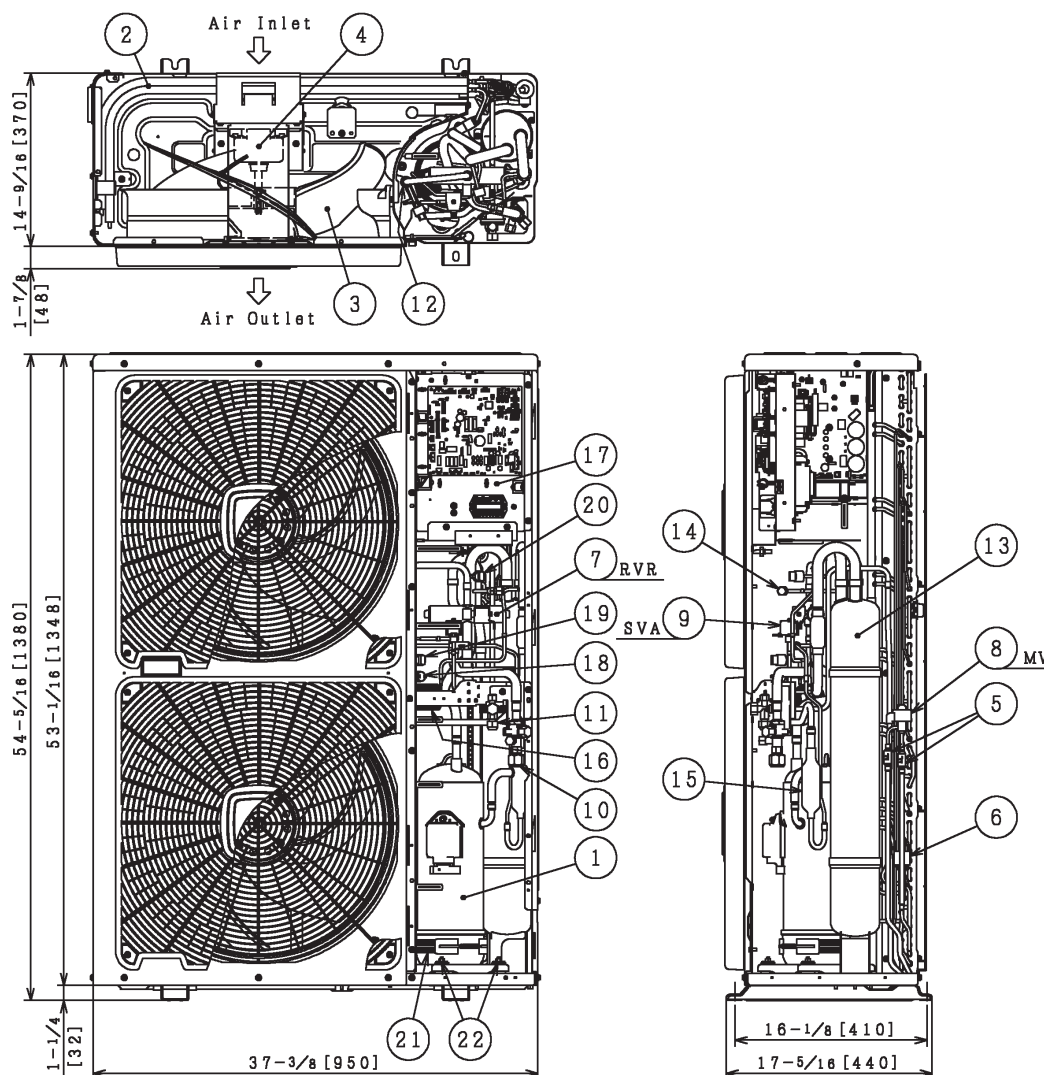
### NOTES:

1. There are stop valves in the cabinet.
2. When connecting field refrigerant piping from the bottom side of the unit, provide the space (marked with ※) for understructures such as foundation to avoid interference.
3. The dimension marked with ※ indicates the mounting pitch dimension for anchor bolts.

## 2.5 Structure

Model: (H,Y,C)VAHP036B21S to (H,Y,C)VAHP060B21S

inch [mm]



No.	Part Name
1	Compressor (Inverter)
2	Heat Exchanger
3	Propeller Fan (2 pcs.)
4	Fan Motor (2 pcs.)
5	Strainer (2 pcs.)
6	Distributor
7	Reversing Valve
8	Electronic Expansion Valve
9	Solenoid Valve
10	Stop Valve (Gas)
11	Stop Valve (Liquid)

No.	Part Name
12	Check Valve
13	Accumulator
14	Access Port
15	Oil Separator
16	Capillary Tube
17	Electrical Control Box
18	High Pressure Switch for Protection
19	High Pressure Sensor
20	Low Pressure Sensor
21	Crankcase Heater
22	Vibration Absorber (4 pce.)

## 2.6 Component Data

### Outdoor Heat Exchanger and Fan

Model		(H,Y,C)VAHP036B21S	(H,Y,C)VAHP048B21S	(H,Y,C)VAHP060B21S
Heat Exchanger Type		Multi-Pass Cross Finned Tube		
Tube	Material	Copper Tube		
	Outer Diameter	φin. (mm)	0.28 (7.0)	0.28 (7.0)
	Rows		2	2
	Number of Tube/Coil		132	132
Fin	Material	Aluminum		
	Pitch	in. (mm)	0.055 (1.4)	0.055 (1.4)
Maximum Operating Pressure		psi (MPa)	601 (4.15)	601 (4.15)
Total Face Area		ft <sup>2</sup>	14.42	14.42
		(m <sup>2</sup> )	(1.34)	(1.34)
Number of Coil/Unit			1	1
Outdoor Fan		Large Diameter Fan (Propeller Fan)		
Number/Unit			2	2
Outer Diameter		φin.	21-7/16	21-7/16
		(mm)	(544)	(544)
Nominal Airflow		cfm	3496	3885
		(m <sup>3</sup> /min)	(99)	(110)
Outdoor Fan Motor		Drip-Proof Type Enclosure		
Starting Method		DC Motor		
Nominal Output		W	58+58	58+58
Quantity			2	2
Insulation Class			E	E



## 2.7 Service Space

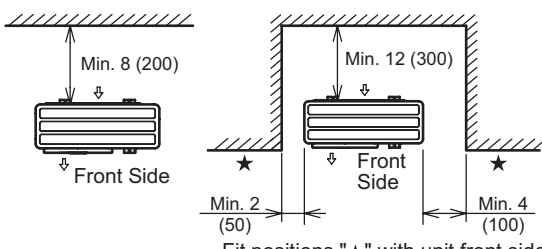
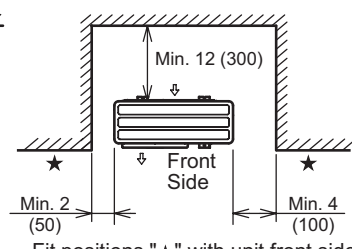
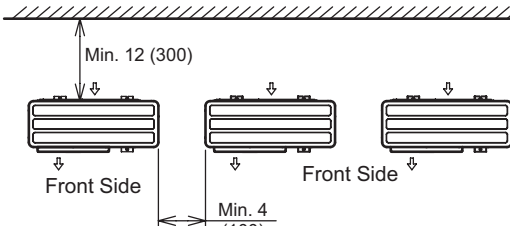
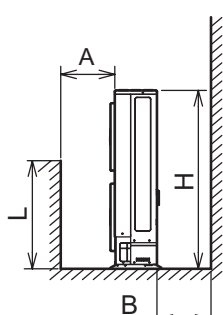
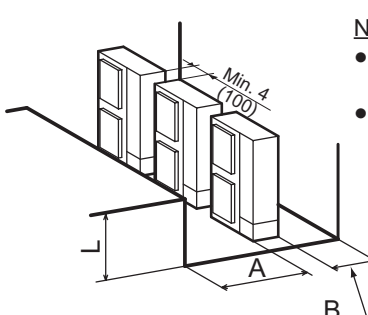
When an outdoor unit is installed, allow sufficient clearance as follows:

- If there is insufficient clearance for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake.
- Additionally, adequate clearance is required for service maintenance access.

### (1) Obstacles on Inlet Side

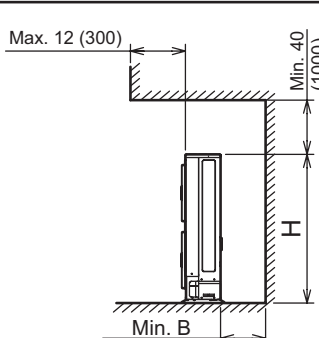
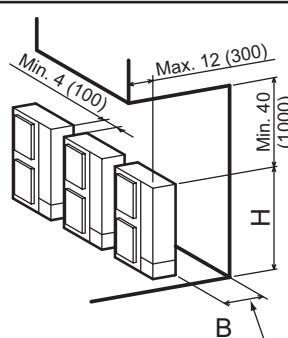
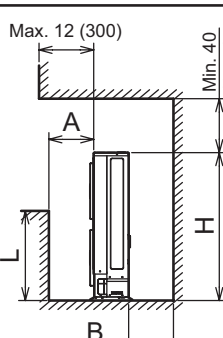
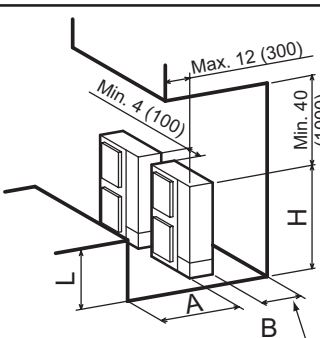
#### (a) Upper Side is Open.

inch (mm)

Single Installation	Multiple Installation
<p>* Around sides are open.</p>  <p>* Around sides are closed.</p>  <p>Fit positions "★" with unit front side.</p>	 <p>NOTE: Open both right and left sides.</p>
 <p>NOTES:</p> <ul style="list-style-type: none"> <li>• Install Airflow Guide (optional)</li> <li>• Open both right and left sides.</li> </ul>	 <p>NOTES:</p> <ul style="list-style-type: none"> <li>• Install Airflow Guide (optional)</li> <li>• Open both right and left sides.</li> </ul>

#### (b) Obstacles on Upper Side

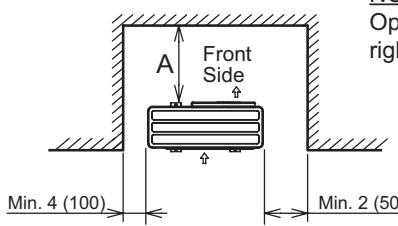
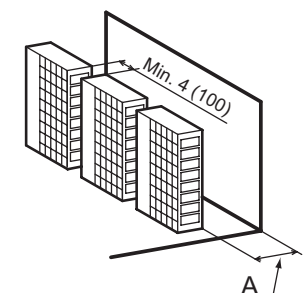
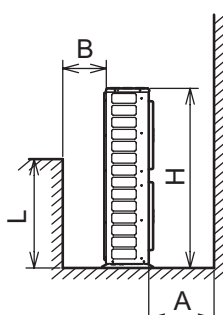
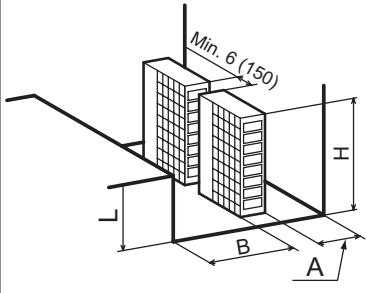
inch (mm)

Single Installation	Multiple Installation
	 <p>NOTE: Open both right and left sides.</p>
 <p>NOTES:</p> <ul style="list-style-type: none"> <li>• Install Airflow Guide (optional)</li> <li>• Open both right and left sides.</li> </ul>	 <p>NOTES:</p> <ul style="list-style-type: none"> <li>• Install Airflow Guide (optional)</li> <li>• Open both right and left sides.</li> <li>• No more than 2 units for multiple installation</li> </ul>

## (2) Obstacles on Outlet Side

### (a) Upper Side is Open.

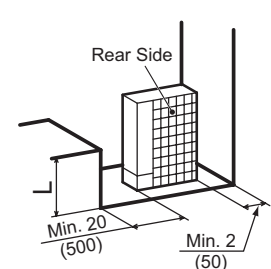
inch (mm)

Single Installation	Multiple Installation
 <p><b>NOTE:</b> Open either right or left side.</p>	 <p><b>NOTE:</b> Open both right and left sides.</p>
 <p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>• Install Airflow Guide (optional)</li> <li>• Open both right and left sides.</li> </ul>	 <p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>• Install Airflow Guide (optional)</li> <li>• Open both right and left sides.</li> <li>• No more than 2 units for multiple installation</li> </ul>

## (3) Obstacles on Right and Left Side

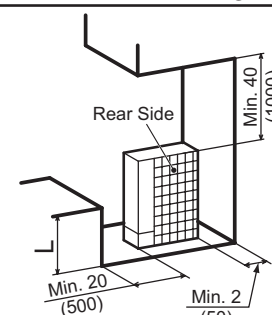
### (a) Upper Side is Open.

inch (mm)

Single Installation


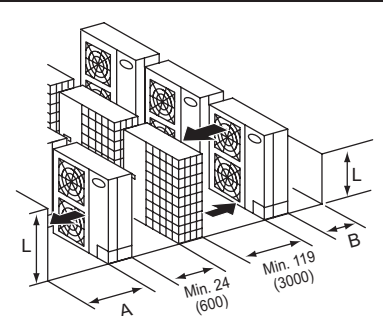
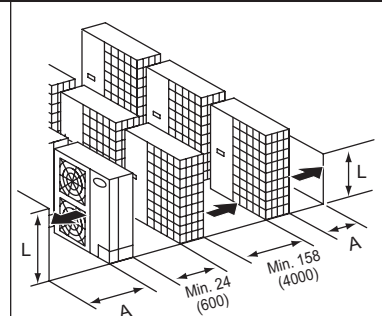
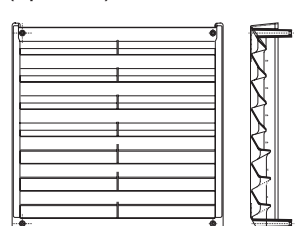
### (b) Obstacles on Upper Side

inch (mm)

Single Installation


## (4) Multi-Row and Multiple Installations

inch (mm)

 <p><b>NOTE:</b> Open both right and left sides.</p>	 <p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>• Open both right and left sides.</li> <li>• Install each outdoor unit not to inlet the outlet air from the other outdoor units.</li> </ul>	<p><b>NOTE:</b> Ensure that the outlet flow is not short-circuited to the air inlet side when using the Airflow Guide (optional).</p> 
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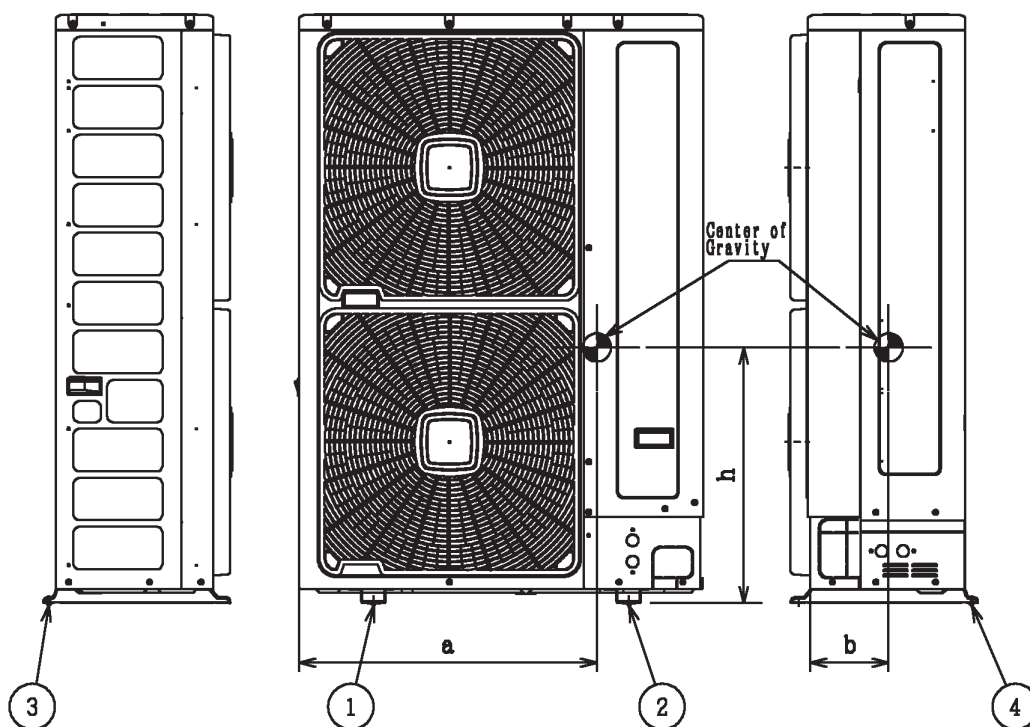
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**NOTE**

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- inch (mm)
- If L is larger than H, mount the units on a base so that H is greater or equal to L.  
Be sure to seal up every surface of the base. If the base allows the airflow to go, it may cause a short-circuit.
- | L                 | A                    | B                   |
|-------------------|----------------------|---------------------|
| $0 < L \leq 1/2H$ | 24 (600)<br>or more  | 12 (300)<br>or more |
| $1/2H < L \leq H$ | 56 (1400)<br>or more | 14 (350)<br>or more |
- The Airflow Guide (optional) is required when there are interferences in both the front and rear side of the outdoor unit.
  - The installation of multi-row and multiple outdoor units should be up to three outdoor units on a roof. Use the Airflow Guide (optional) in order to prevent short-circuiting if more than three outdoor units are installed.
-

## 2.8 Center of Gravity



Model	Net Weight [lbs (kg)]	Center of Gravity [inch (mm)]		
		a	b	c
(H,Y,C)VAHP036B21S	249 (113)	23-5/8 (600)	7-1/16 (180)	24-7/16 (620)
(H,Y,C)VAHP048B21S	249 (113)	23-5/8 (600)	7-1/16 (180)	24-7/16 (620)
(H,Y,C)VAHP060B21S	249 (113)	23-5/8 (600)	7-1/16 (180)	24-7/16 (620)

Model	Frequency of Vibration [Hz]	Amplitude Value [ $\times 10^{-3}$ inch ( $\mu\text{m}$ )]				Acceleration of Vibration [dB]			
		①	②	③	④	①	②	③	④
(H,Y,C)VAHP036B21S	44	0.04 (1)	0.04 (1)	0.08 (2)	0.04 (1)	72	72	78	72
(H,Y,C)VAHP048B21S	54	0.04 (1)	0.04 (1)	0.08 (2)	0.04 (1)	75	75	81	75
(H,Y,C)VAHP060B21S	74	0.04 (1)	0.04 (1)	0.08 (2)	0.04 (1)	81	81	87	81

### < Vibration Characteristics Measurement Conditions >

Above values are measured under the following conditions:

1. Outdoor unit is placed on a concrete floor 5 in (120mm) thick (concrete floor is directly cast on ground).
2. Outdoor unit is operated under our standard operating conditions.

## 2.9 Electrical Data

Model	Outdoor Unit							INV Comp.	
	Hz [Hz]	Voltage [V]	Max. [V]	Min. [V]	MCA [A]	MOP [A]	Max. Fuse [A]	RLA [A]	LRA [A]
(H,Y,C)VAHP036B21S	60	208/230	228/253	188/207	31	40	40	24	30
(H,Y,C)VAHP048B21S	60	208/230	228/253	188/207	31	40	40	24	30
(H,Y,C)VAHP060B21S	60	208/230	228/253	188/207	31	40	40	24	30

Model	Fan Motor		Wiring Size			Conduit Tube
	Output [kW]	FLA [A]	Power Supply Wiring [AWG]	Ground Wiring [AWG]	Communication Cable [AWG]	for Power Supply Wiring [in. (mm)]
(H,Y,C)VAHP036B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)
(H,Y,C)VAHP048B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)
(H,Y,C)VAHP060B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)

MCA: Minimum Circuit Ampacity (A)

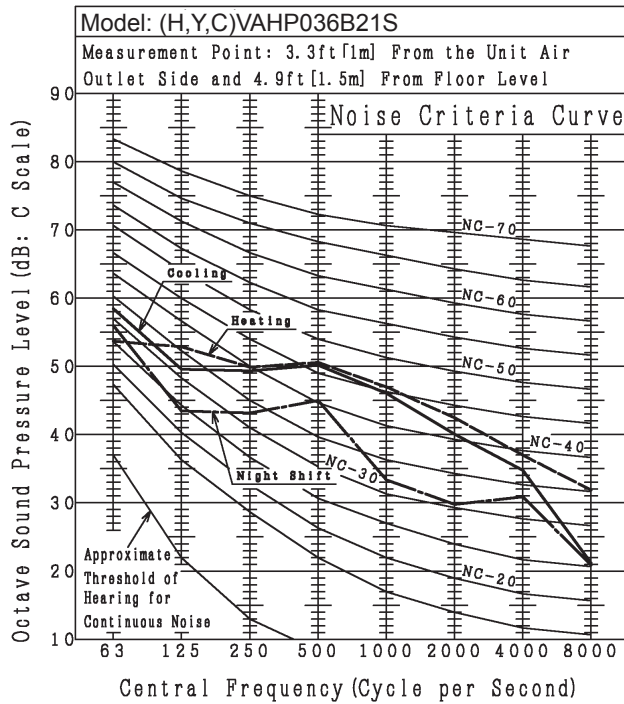
MOP: Maximum Overcurrent Protective Device (A)

RLA: Rated Load Ampacity (A)

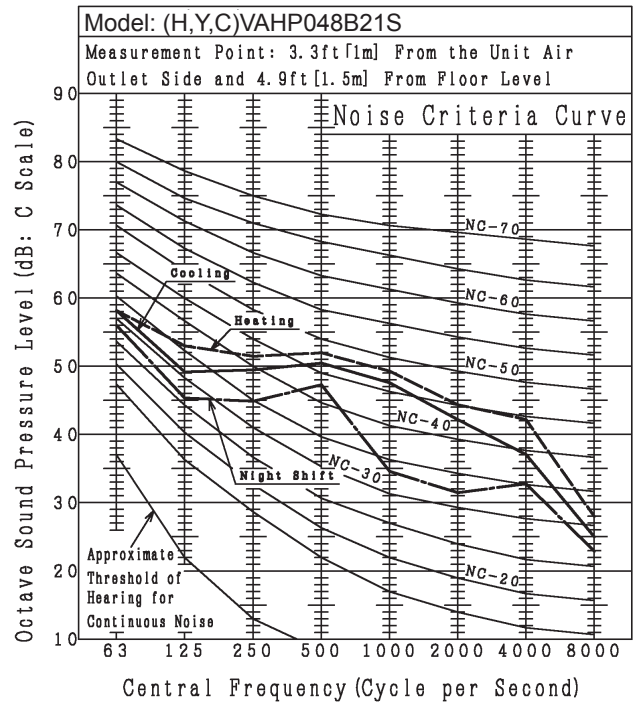
LRA: Locked Rotor Ampacity (A)

FLA: Full Load Ampacity (A)

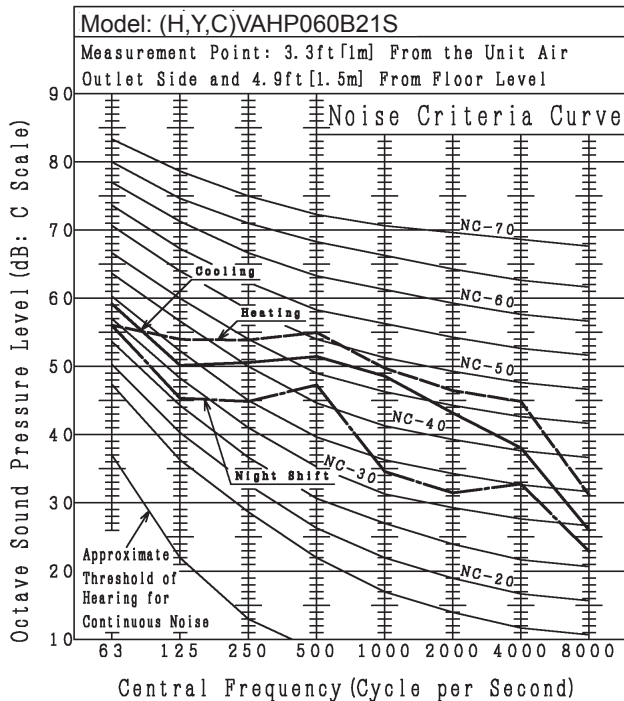
## 2.10 Sound Data



	Octave Band Central Frequency [Hz]								Overall [dB(A)]
	63	125	250	500	1k	2k	4k	8k	
Cooling	32.4	33.5	40.8	47.0	46.1	41.5	36.6	23.1	51
Cooling (Night Shift)	29.9	27.4	34.6	41.8	33.4	31.2	32.7	22.8	44
Heating	53.7	52.9	49.9	50.6	47.0	42.5	37.0	31.9	52



	Octave Band Central Frequency [Hz]								Overall [dB(A)]
	63	125	250	500	1k	2k	4k	8k	
Cooling	32.1	33.1	40.9	47.3	47.6	43.6	38.9	26.9	52
Cooling (Night Shift)	29.9	29.3	36.3	44.1	34.6	32.9	34.6	24.8	46
Heating	32.1	36.9	42.9	48.8	49.3	45.8	44.0	29.9	54



	Octave Band Central Frequency [Hz]								Overall [dB(A)]
	63	125	250	500	1k	2k	4k	8k	
Cooling	33.1	34.1	42.0	48.3	48.6	44.6	39.9	27.9	53
Cooling (Night Shift)	29.9	29.3	36.3	44.1	34.6	32.9	34.6	24.8	46
Heating	30.0	37.9	45.3	51.8	49.8	47.9	46.7	33.1	56

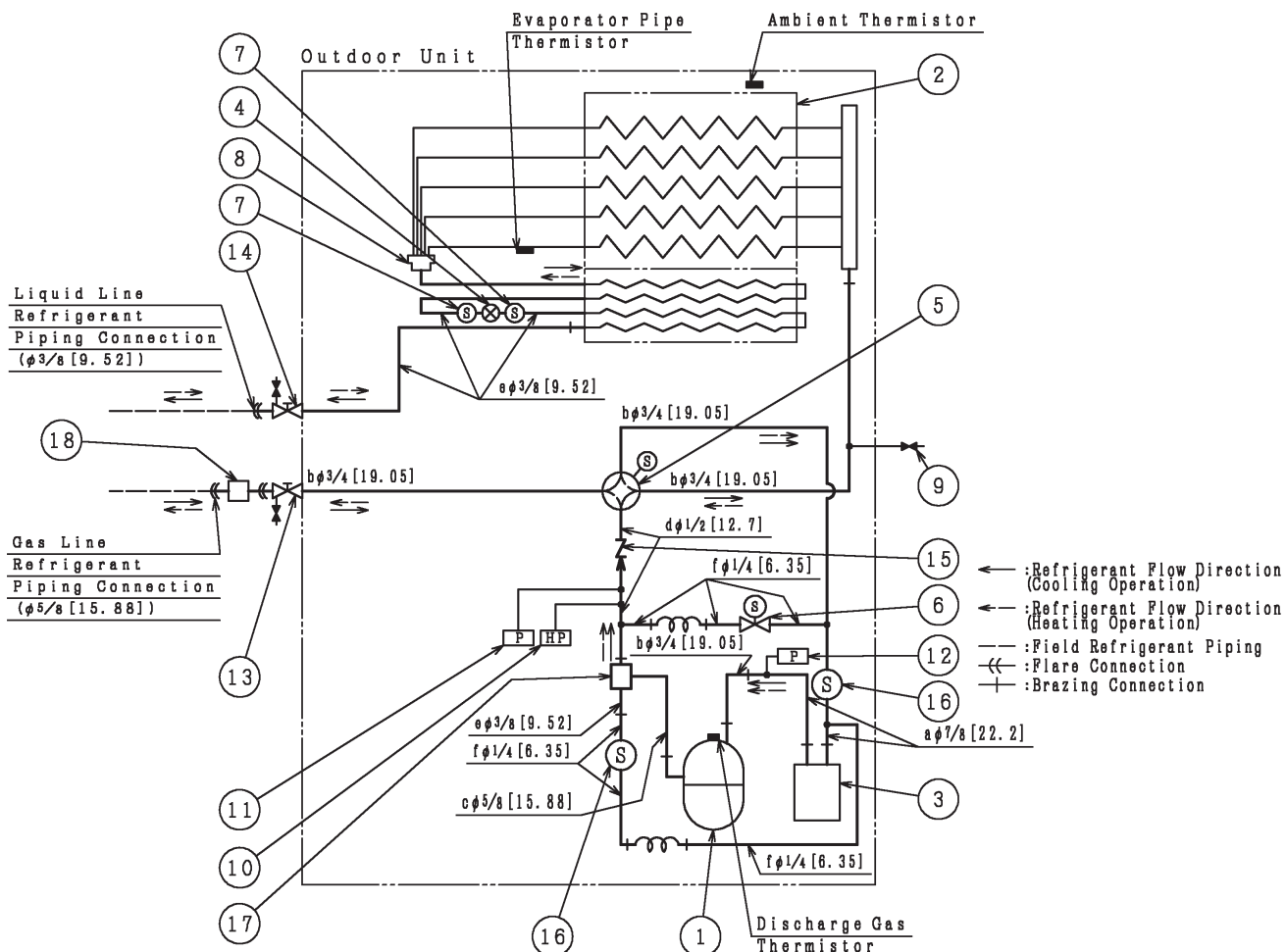
### NOTE:

The operation sound is measured in an anechoic chamber. However, the actual operation sound may appear louder because of ambient noise or echoing. Be sure to check ambient conditions before installation.  
The sound of the air inlet side may be 3dB higher than that of the air outlet side.

## 2.11 Control System

### 2.11.1 Refrigerant Cycle

Model: (H,Y,C)VAHP036B21S to (H,Y,C)VAHP060B21S



Mark	Part Name
①	Compressor
②	Heat Exchanger
③	Accumulator
④	Electronic Expansion Valve
⑤	Reversing Valve
⑥	Solenoid Valve
⑦	Strainer
⑧	Distributor
⑨	Access Port
⑩	High Pressure Switch for Protection
⑪	Sensor for Refrigerant Pressure (High Pressure Sensor)
⑫	Sensor for Refrigerant Pressure (Low Pressure Sensor)
⑬	Stop Valve for Gas Line
⑭	Stop Valve for Liquid Line
⑮	Check Valve
⑯	Strainer
⑰	Oil Separator
⑱	Silencer (accessory)

Mark	ODXT	Material
a	7/8×0.047 [22.2] × [1.2]	C1220T-0
b	3/4×0.047 [19.05] × [1.2]	
c	5/8×0.039 [15.88] × [1.0]	
d	1/2×0.039 [12.7] × [1.0]	
e	3/8×0.031 [9.52] × [0.8]	
f	1/4×0.028 [6.35] × [0.7]	

OD: Outer diameter  
T: Thickness

## 2.11.2 Control System

### Cycle Control

No.	Item		Details
1	Cooling Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a), (b) and (c).
		I.U. Electronic Exp. Valve Control	<ul style="list-style-type: none"> <li>Quasi PI Control: To determine the I.U. electronic expansion valve opening so as to keep (d) at an optimum value.</li> <li>To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.</li> </ul>
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To control the fan steps so that High Pressure is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during Operation Stop)
2	Heating Operation	Comp. Frequency Control	<ul style="list-style-type: none"> <li>PI Control: To determine the compressor frequency so as to keep High Pressure.</li> <li>To determine the compressor frequency from (a) and (c) when heating operation is started or the number of operating indoor units is changed.</li> </ul>
		I.U. Electronic Exp. Valve Control	<ul style="list-style-type: none"> <li>To determine the I.U. electronic expansion valve opening so that the indoor liquid pipe temperature (trl) is at an optimum level.</li> <li>To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.</li> </ul>
		O.U. Electronic Exp. Valve Control	<ul style="list-style-type: none"> <li>Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the temperature at the top of the compressor at an optimum level.</li> <li>When Operating Indoor Unit Number Changed: To determine the O.U. electronic expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.</li> </ul>
		Outdoor Fan Control	The fan steps are dependent on Ta in the beginning. After that to control the fan steps so that Pd is within a stable pressure range.
		Reversing Valve Control	Reversing Valve: ON
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
3	Defrost Operation	Comp. Frequency Control	Fixed Compressor Frequency
		I.U. Electronic Exp. Valve Control	To determine the I.U. electronic expansion valve opening depending on the temperature at the top of the compressor (Td).
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To stop the outdoor fan.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	at Start-up: ON
4	Comp. Preheating Control		Crankcase Heater Control

(a): Difference between Indoor Inlet Air Temperature and Setting Temperature

(b): Amount of Temperature Difference Change

(c): Capacity Ratio between Operating Indoor Unit and Outdoor Unit

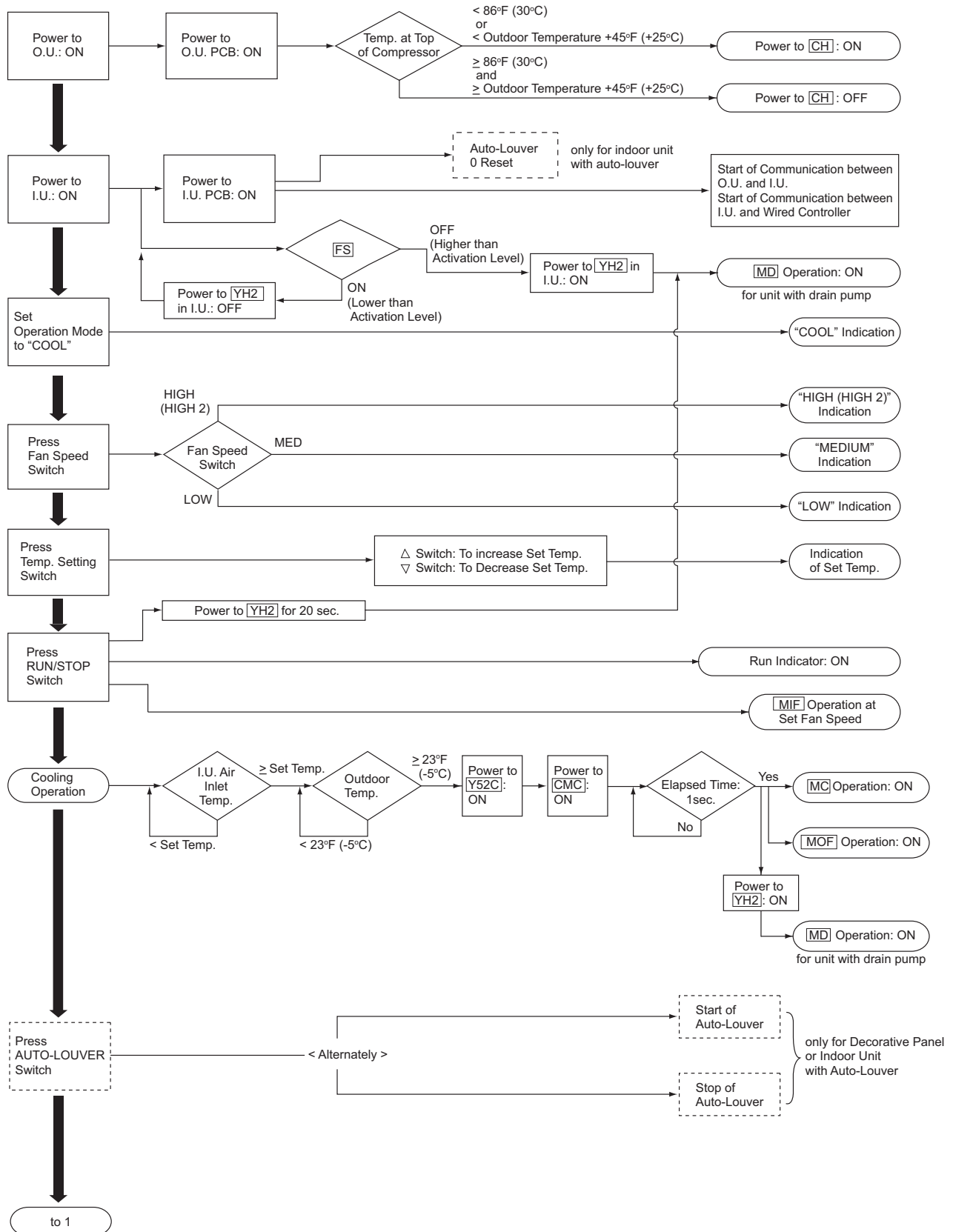
(d): Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe  
(= Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature)



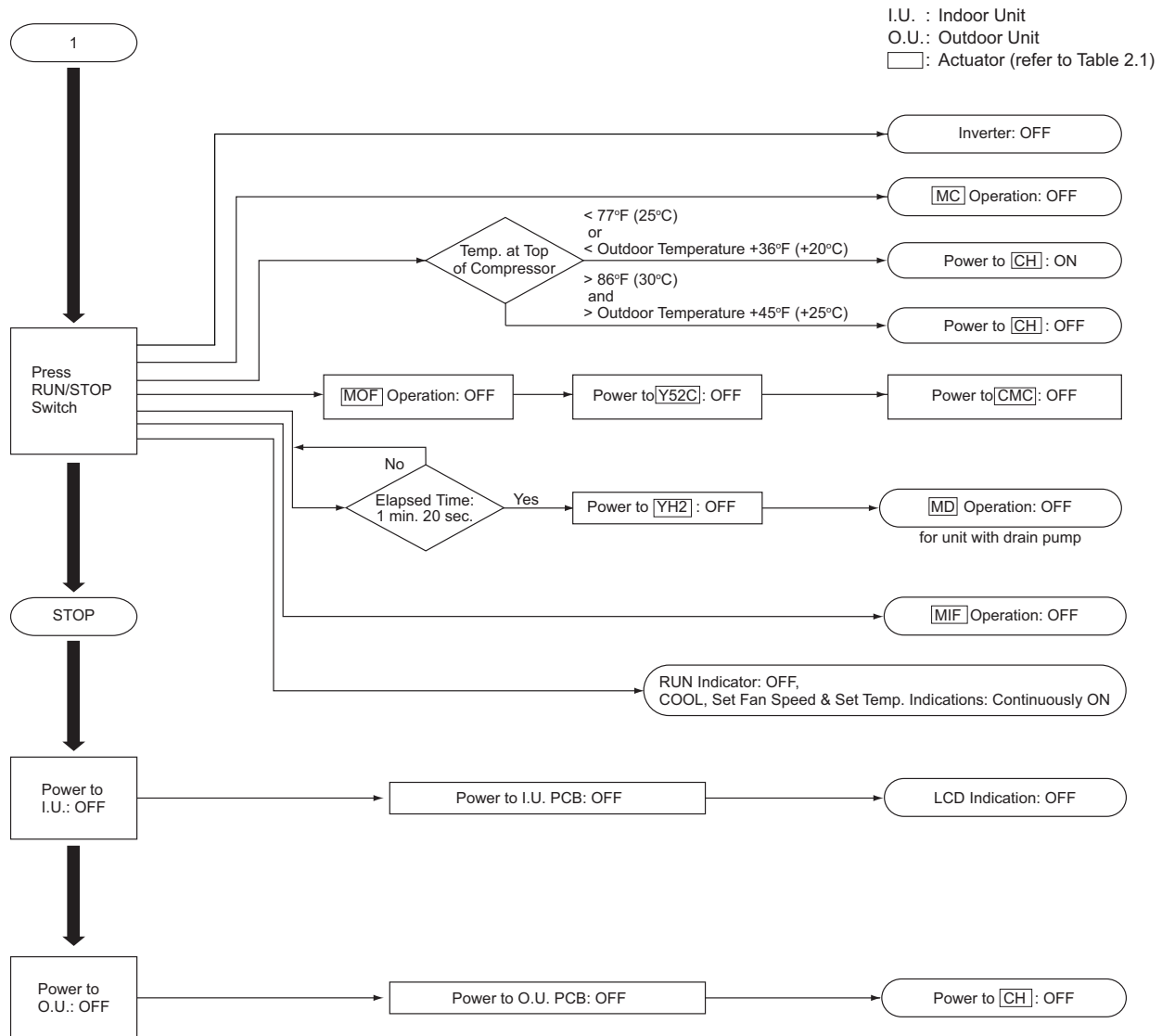
## 2.11.3 Standard Operation Sequence

### ■ Cooling Operation


I.U. : Indoor Unit  
O.U. : Outdoor Unit  
□ : Actuator (refer to Table 2.1)

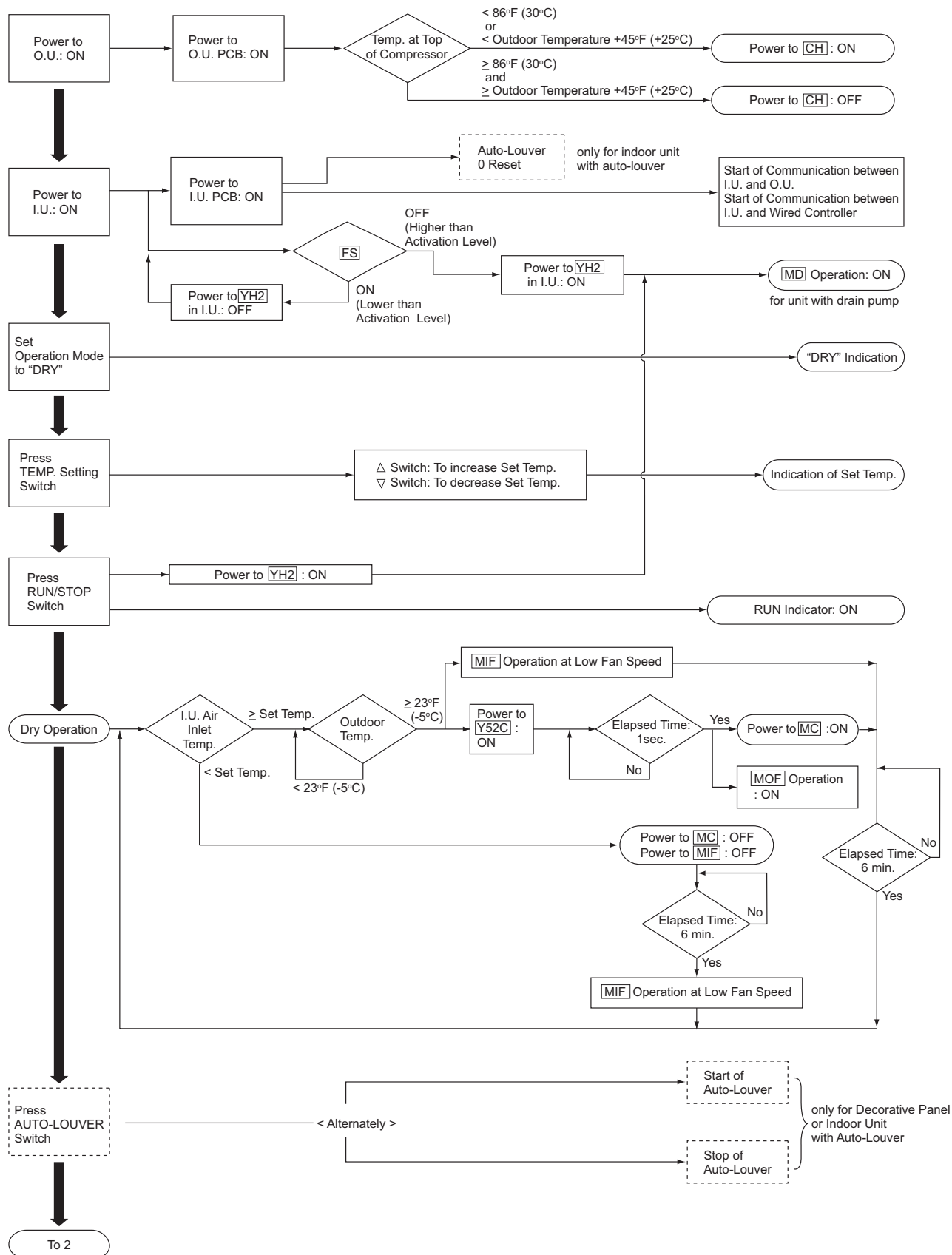


## ■ Cooling Operation

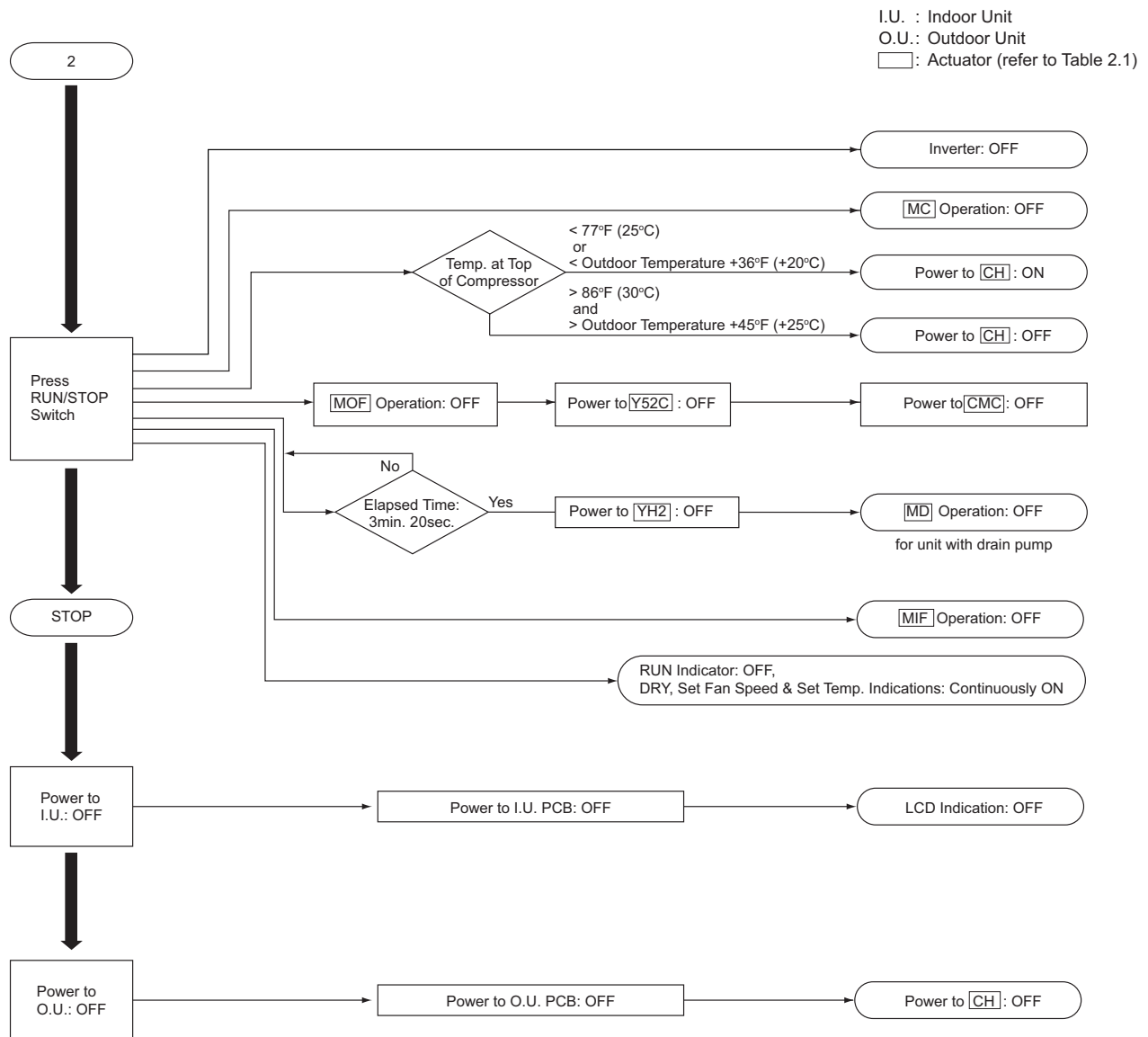


■ Dry Operation

I.U. : Indoor Unit  
O.U.: Outdoor Unit  
: Actuator (refer to Table 2.1)

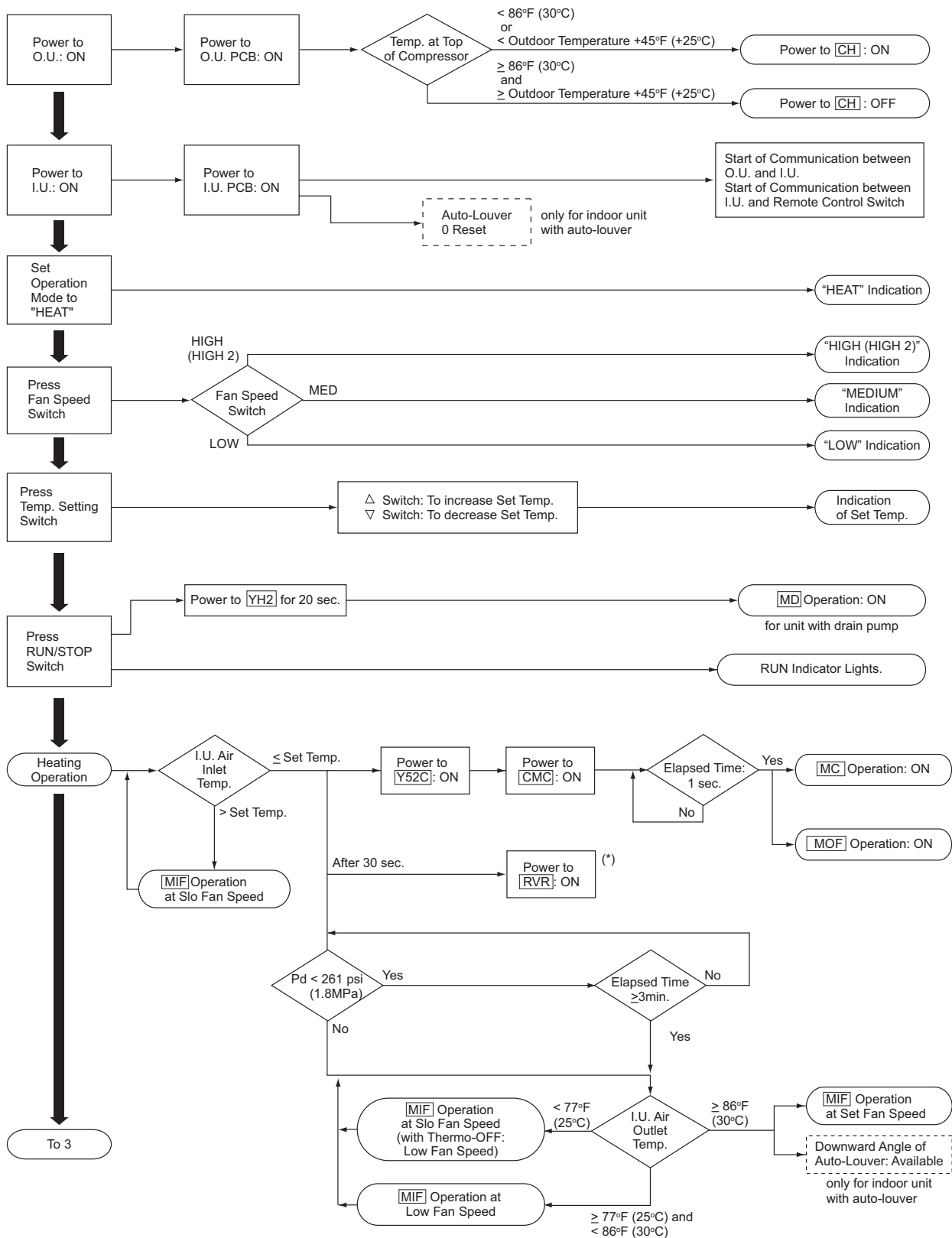


## ■ Dry Operation



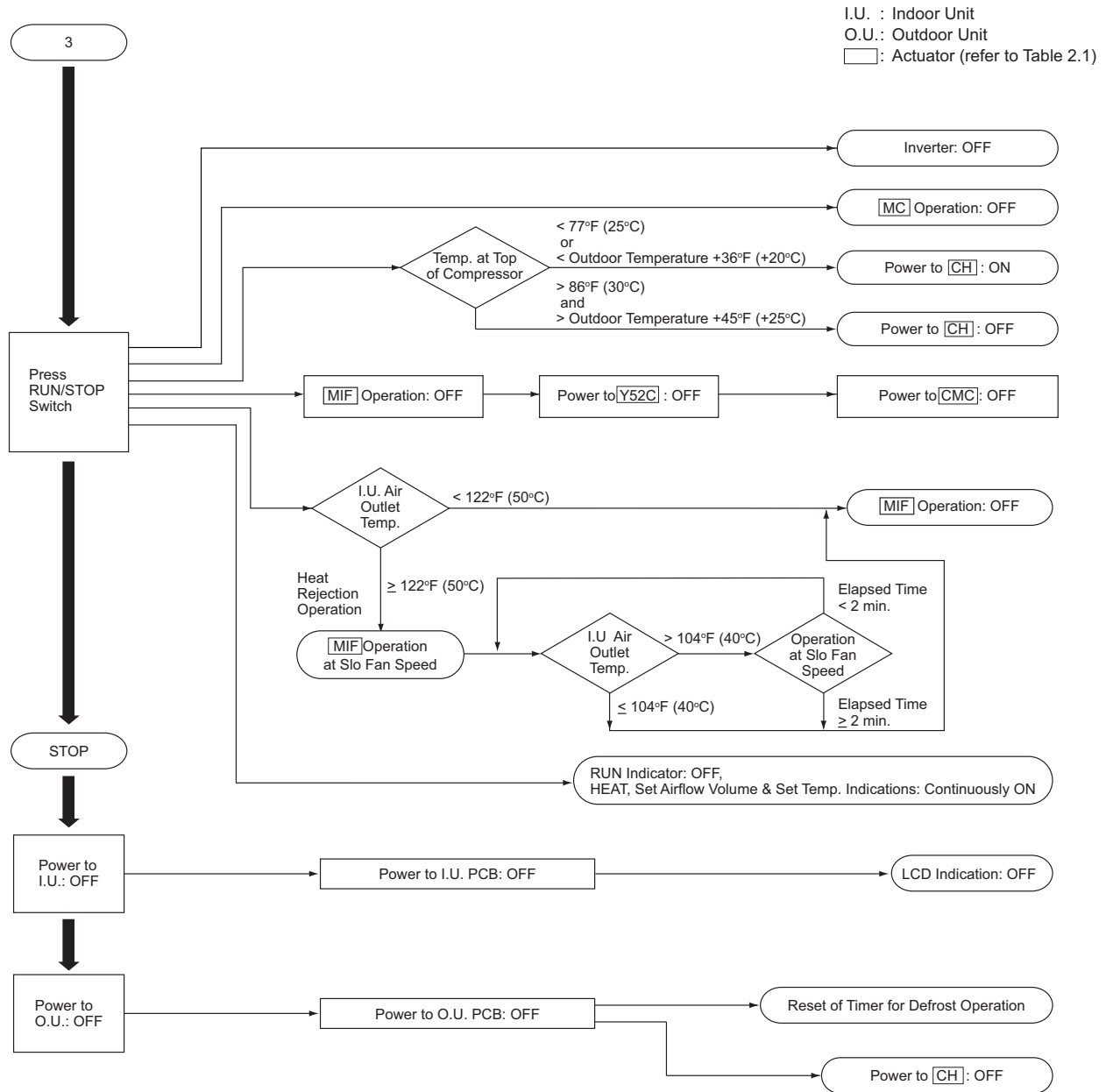
## ■ Heating Operation

I.U. : Indoor Unit  
O.U. : Outdoor Unit  
□ : Actuator (refer to Table 2.1)

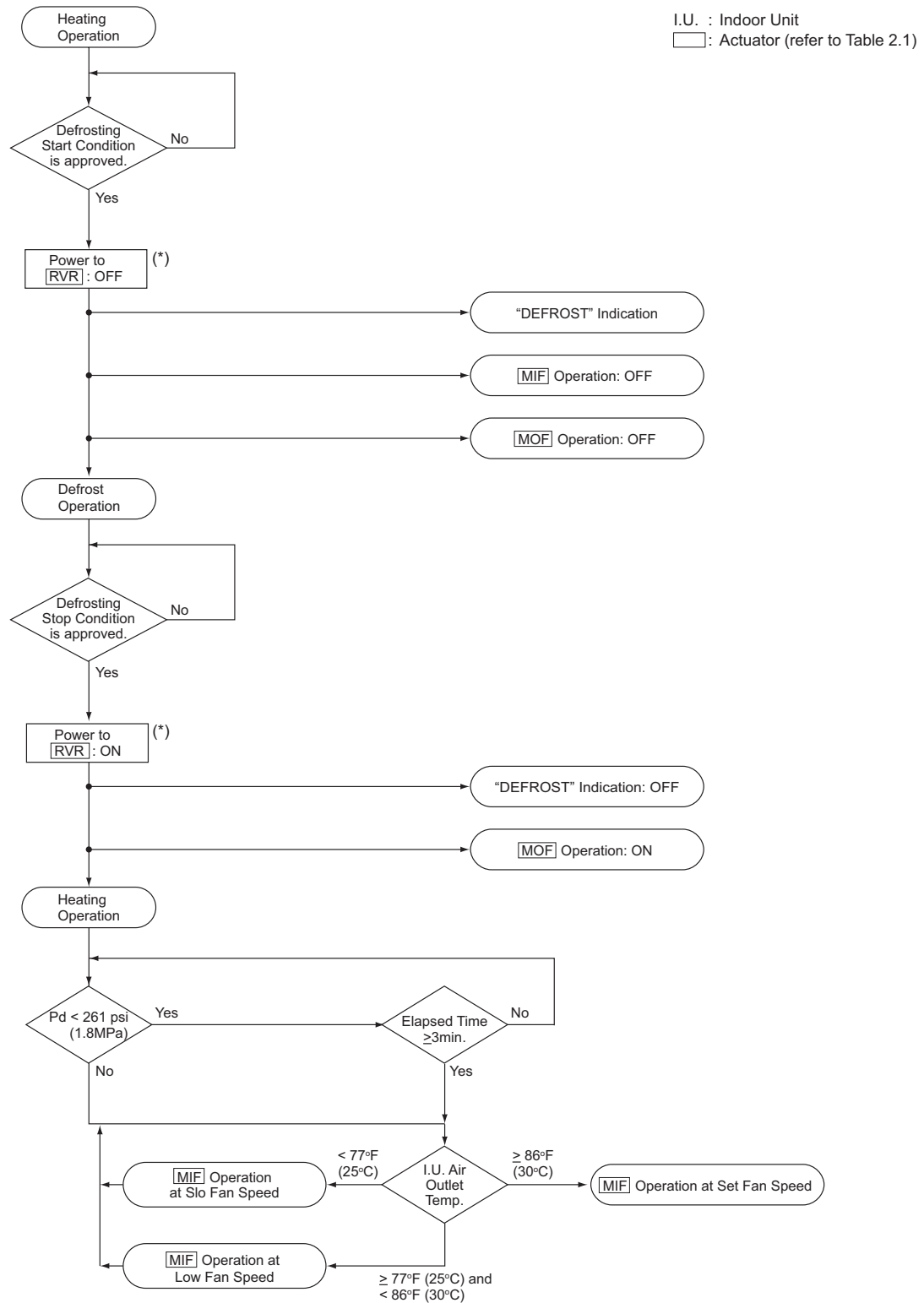


(\*) Refer to Service Manual for the timing diagram of the reversing valve.

## ■ Heating Operation



## Defrost Operation



(\*) Refer to Service Manual for the timing diagram of the reversing valve.

Table 2.1

CH	Crankcase Heater	in O.U.
FS	Float Switch	in I.U.
YH2	Relay for Drain Pump Motor	in I.U.
MD	Drain Pump Motor	in I.U.
MIF	Indoor Fan Motor	in I.U.
Y52C	Relay for Magnet Switch	in O.U.
CMC	Magnet Switch	in O.U.
MC	Compressor Motor	in O.U.
MOF	Outdoor Fan Motor	in O.U.
RVR	Reversing Valve	in O.U.

### < Defrost Operation >

The following defrost operations, “Standard Defrost”, “Forced Defrost” and “Manual Defrost” are available.

- (1) Standard Defrost  
This operation starts according to the outdoor temperature, the outdoor evaporating temperature and the operating time.
- (2) Forced Defrost  
This operation starts when the indoor unit repeats Thermo-ON/OFF\* operation and therefore cannot start the “Standard Defrost.”
- (3) Manual Defrost  
This operation starts when the push switch “PSW1” on the outdoor unit PCB is pressed for more than 3 seconds during maintenance, etc. (This function cannot be used when the pressure and the outdoor evaporating temperature is high or at the beginning of the operation.)

#### NOTE:

Do not repeatedly use “Manual Defrost” frequently.

\* Thermo-ON: The outdoor unit and some indoor units are running.

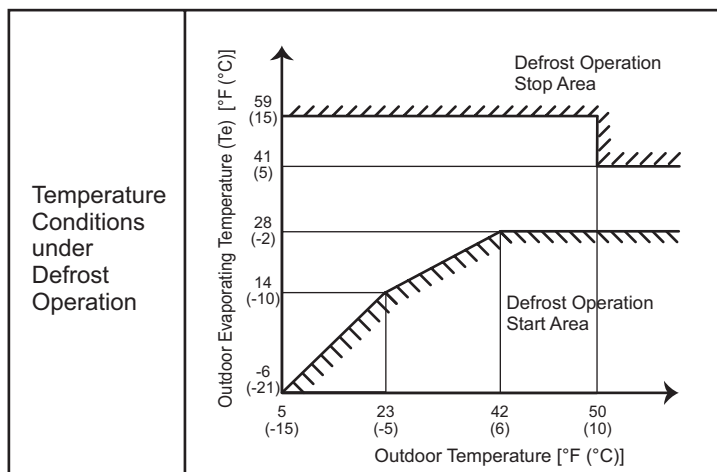
Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.



### < Condition for Starting Defrost Operation >

#### (1) Standard Defrost

##### (a) Temperature Condition



##### (b) Condition of Operating Time for Defrost Operation Start

The defrost operation starts when the temperature condition shown in “(a) Temperature Condition” is met after a heating operation of 40 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

#### (2) Forced Defrost

The “Forced Defrost” starts when all the following conditions are met.

- The reversing valve is “ON” for more than 120 minutes.
- The outdoor temperature is 50°F (10°C) or lower.
- The accumulated heating operation time is more than 60 minutes.  
(The accumulated time is reset when the operation is stopped or the defrost operation is performed.)
- The compressor is operated continuously for more than 90 seconds.
- The outdoor evaporating temperature is lower than 41°F (5°C) right before the operation starts.
- The pressure switch for control is “OFF”.

### < Condition for Completing Defrost Operation >

The defrost operation stops when any of the following conditions is met.

- The outdoor evaporating temperature reaches 77°F (25°C) within 2 minutes after the defrost operation starts.
- The outdoor evaporating temperature reaches 59°F (15°C) (the outdoor temperature < 50°F (10°C)) and high pressure reaches 218psi (1.5MPa) after a lapse of 2 minutes or more from the defrost operation start.
- The outdoor evaporating temperature reaches 41°F (5°C) (the outdoor temperature ≥ 50°F (10°C)) after a lapse of 2 minutes or more from the defrost operation start.
- The temperature at the top of the compressor reaches 270°F (132°C).
- The pressure switch for control is “ON”.
- The high pressure reaches 479psi (3.3MPa) within 20 seconds after the defrost operation starts.
- The high pressure reaches 450psi (3.1MPa) after a lapse of 2 minutes or more from the defrost operation start.
- More than 9 minutes have passed from the defrost operation start.

#### NOTE:

The defrost operation does not start immediately even if the above conditions are met, because these conditions may be met temporarily depending on the refrigerant system variability.

The defrost operations start when these conditions are met continuously for a certain period of time.

## Protection Control

- \* Whenever protection control sequences are activated, the corresponding code is displayed on the 7-segment LED array of the main control board.
- \* Protection control code is displayed while a function is working, and goes out when released.

### < Indicated Contents >

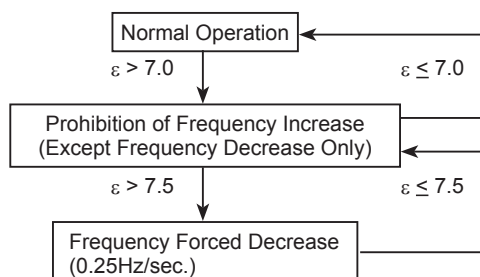
Indication	Protection Control Contents
P1	Pressure Ratio Protection Control
P2	High Pressure Increase Protection Control
P3	Inverter Current Protection Control
P4	Inverter Fin Temperature Increase Protection Control
P5	Discharge Temperature Increase Protection Control
P6	Low Pressure Decrease Protection Control
P9	High Pressure Decrease Protection Control
PA	Demand Current Control
Pd	Low Pressure Increase Protection Control

### (1) P1: Pressure Ratio Protection Control

#### (a) Pressure Ratio Increase Protection Control

Pressure Ratio Increase Protection Control is performed in order to protect the compressor from an increase of pressure ratio.

#### < Details of Control >



#### NOTE:

The pressure ratio is calculated as follows.

$$\varepsilon = (P_d [\text{psi}] + 15) / (P_s [\text{psi}] + 15)$$

$$\varepsilon = (P_d [\text{MPa}] + 0.1) / (P_s [\text{MPa}] + 0.1)$$

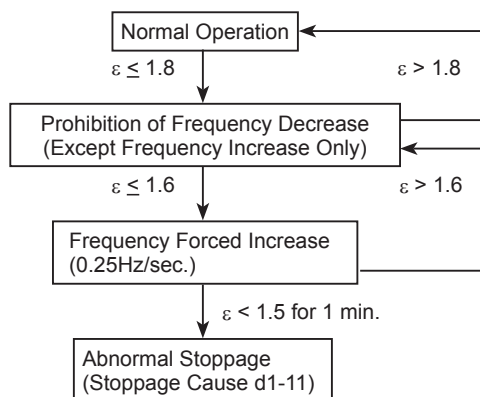
Pd: Detected Value of High Pressure Sensor [psi]

Ps: Detected Value of Low Pressure Sensor [psi]

#### (b) Low Compression Ratio Protection Function

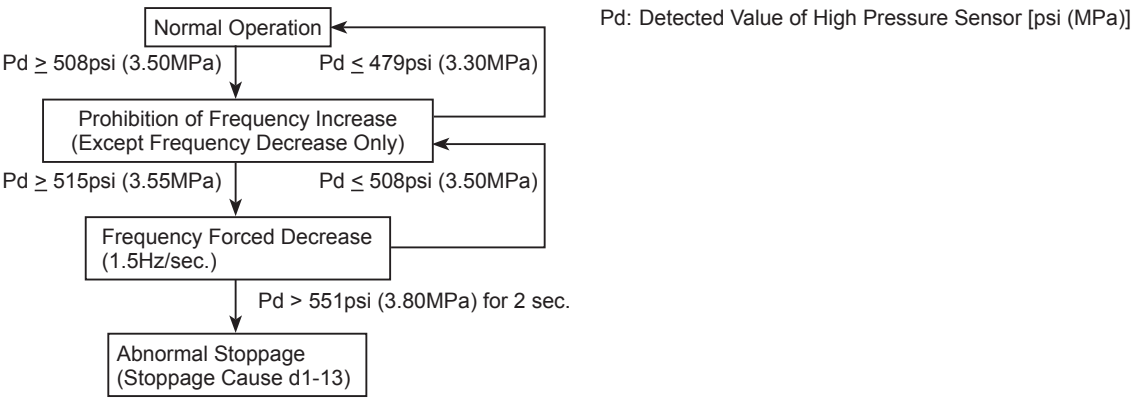
This function is activated to protect the compressor during occurrences of low compression ratio.

#### < Details of Control >



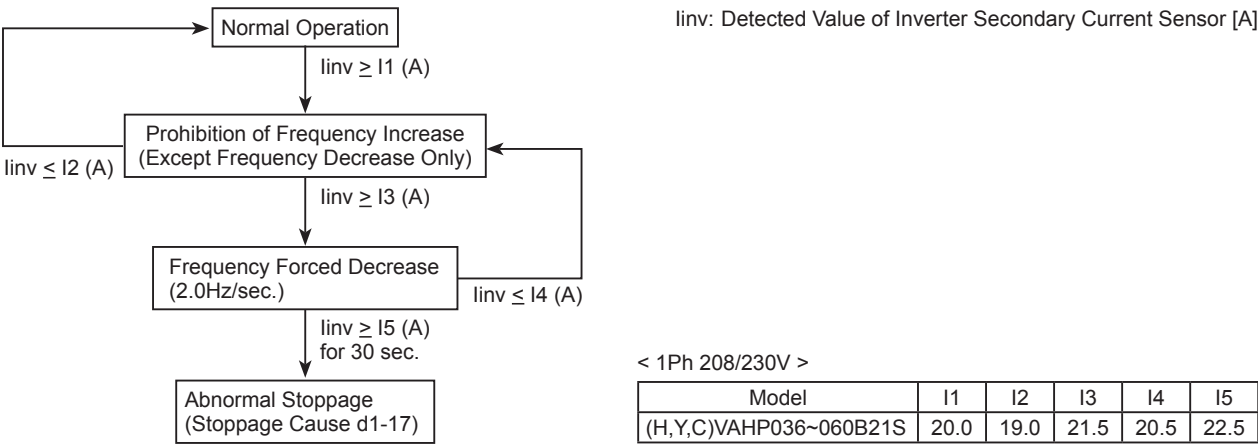
- (2) P2: High Pressure Increase Protection Control
- High Pressure Protection Control is performed in order to prevent activation of a protection device caused by a high pressure increase during an abnormality and to protect the compressor from an excessive increase of discharge pressure.

< Details of Control >



- (3) P3: Inverter Current Protection Control
- Inverter Current Protection Control is performed in order to prevent an inverter trip caused by an increase of inverter secondary current value.

< Details of Control >



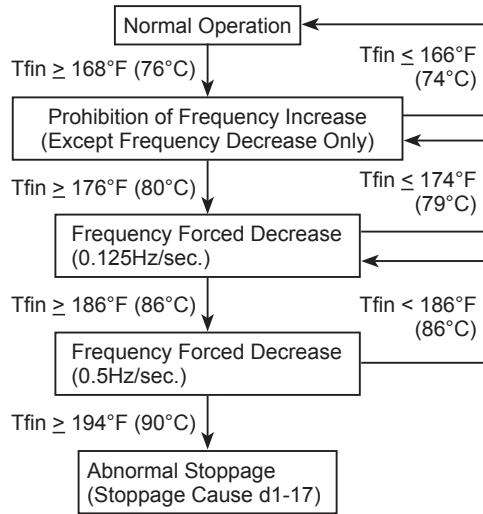
< 1Ph 208/230V >

Model	I1	I2	I3	I4	I5
(H,Y,C)VAHP036~060B21S	20.0	19.0	21.5	20.5	22.5

## (4) P4: Inverter Fin Temperature Increase Protection Control

Inverter Fin Temperature Increase Protection Control is performed in order to prevent an inverter trip caused by a temperature increase of the inverter fin.

< Details of Control >

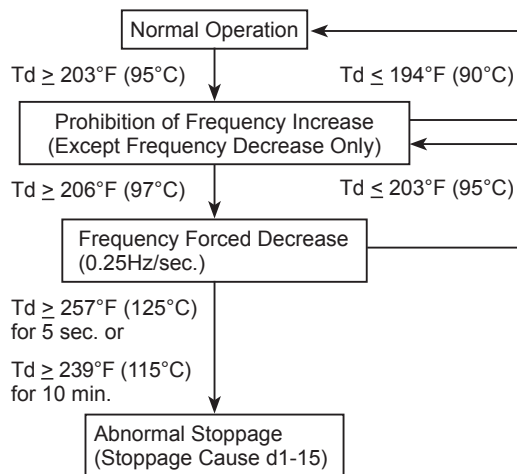


Tfin: Detected Value of Inverter Fin Thermistor [°F (°C)]

## (5) P5: Discharge Temperature Increase Protection Control

Discharge Temperature Increase Protection Control is performed in order to protect the compressor motor coil from an increase of discharge temperature during an abnormality.

< Details of Control >

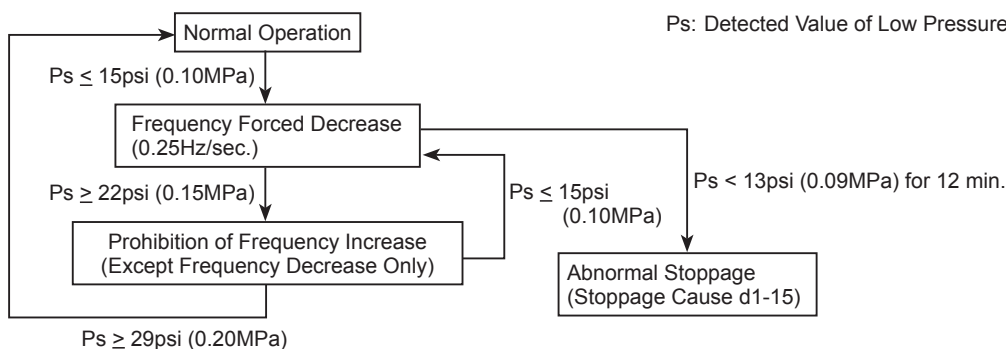


Td: Detected Value of Discharge Gas Thermistor [°F (°C)]

## (6) P6: Low Pressure Decrease Protection Control

Low Pressure Decrease Protection Control is performed in order to protect the compressor from a transitional decrease of suction pressure.

< Details of Control >



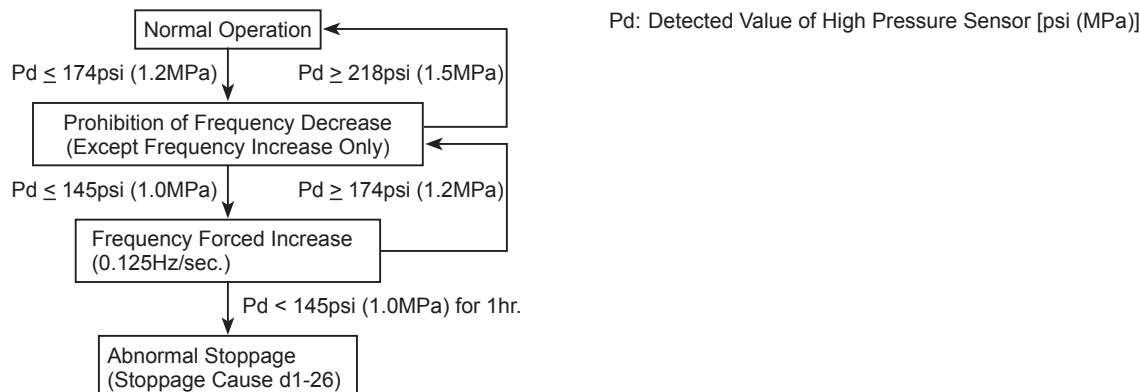
Ps: Detected Value of Low Pressure Sensor [psi (MPa)]

(7) P9: High Pressure Decrease Protection Control

When decreasing high pressure, the compressor operation frequency is controlled by this protection control for the following purposes.

- To prevent insufficient refrigerant supply to indoor units installed at different height locations.
- To keep the refrigerant oil supply in the compressor.

< Details of Control >



(8) PA: Demand Current Control

The compressor operation frequency is controlled to set at the setting value of the outdoor unit inverter primary current (40% to 100% of rated current of cooling operation). This function is detailed in the "External Input and Output Setting". Refer to the Service Manual for details.

< Operating Conditions >

The demand current control can be performed under the following conditions.

- The demand signal is input from the centralized operation controller.
- The demand signal is input at the external input terminals of the outdoor unit from external equipment such as a building management system or a utility with a smart meter.
- The demand function settings are set from the outdoor unit PCB.
- The wave function is set from the outdoor unit PCB.
- The demand signal is input from the indoor unit (wired controller).

If the operation current exceeds each setting function value, the compressor operation frequency is controlled.

< Cancellation Condition >

The input signal is stopped at each condition (a) to (e).

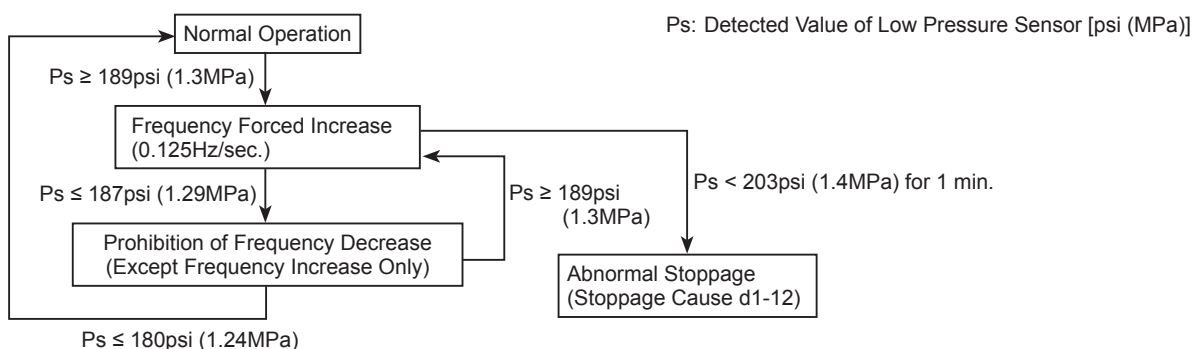
**NOTE:**

This function is not available when the compressor starts or during a defrost operation.

(9) Pd: Low Pressure Increase Protection Control

The compressor operation frequency is controlled to protect the compressor from suction pressure transitional increasing.

< Details of Control >



**(10) Priority of Protection Control**

If two or more protection controls meet a condition, the protection controls perform according to the following.

Rank Order.	Indication	Protection Control Performed
1	P1	Pressure Ratio Protection Control
2	P2	High Pressure Increase Protection Control
3	P3	Inverter Current Protection Control
4	P4	Inverter Fin Temperature Increase Protection Control
5	P5	Discharge Temperature Increase Protection Control
6	P6	Low Pressure Decrease Protection Control
7	PA	Demand Current Control
8	Pd	Low Pressure Increase Protection Control
9	P9	High Pressure Decrease Protection Control

		② Lower Rank Order of Protection Control Function			
		Forced Decrease	Forced Increase	Prohibition of Increase	Prohibition of Decrease
① Higher Rank Order of Protection Control Function	Forced Decrease	①	①	①	①
	Forced Increase	①	①	①	①
	Prohibited Increase	②	①	② *1	①
	Prohibited Decrease	②	②	②	②

\*1: Discharge Temperature Increase Protection Control (P5) is higher than the following protection controls.

- a) Low Pressure Decrease Protection Control (P6)
- b) Demand Current Control (PA)

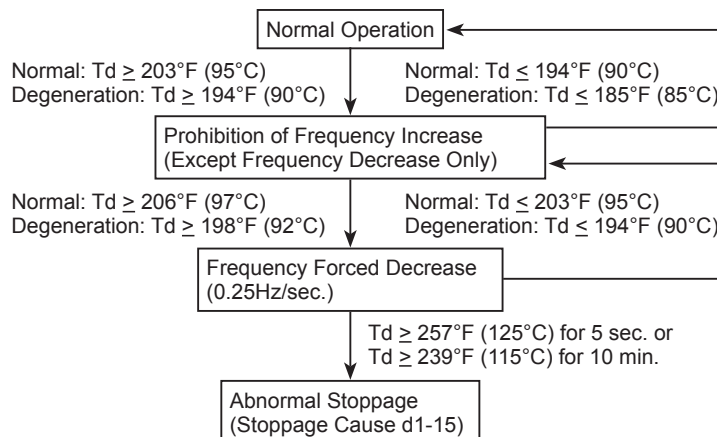
**(11) Degeneration Control**

Degeneration Control is performed to change the protection control range.

This control sequence will suppress re-occurring alarms in response to repeated equipment restarts during protection control conditions listed below.

**< Related Protection Control >**

- (1) Pressure Ratio Decrease Protection Control (P1)
- (2) High Pressure Increase Protection Control (P2)
- (3) Inverter Current Protection Control (P3)
- (4) Inverter Fin Temperature Increase Protection Control (P4)
- (5) Discharge Temperature Increase Protection Control (P5)

**< Example of Discharge Temperature Increase Protection Control >**


2.11.4 Safety and Control Device Setting

- Compressor Protection
The compressor is protected by the following devices and their combinations.
(1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
(2) Crankcase Heater: The band type heater is energized while the compressor is stopped in order to protect against oil foaming during cold starting.

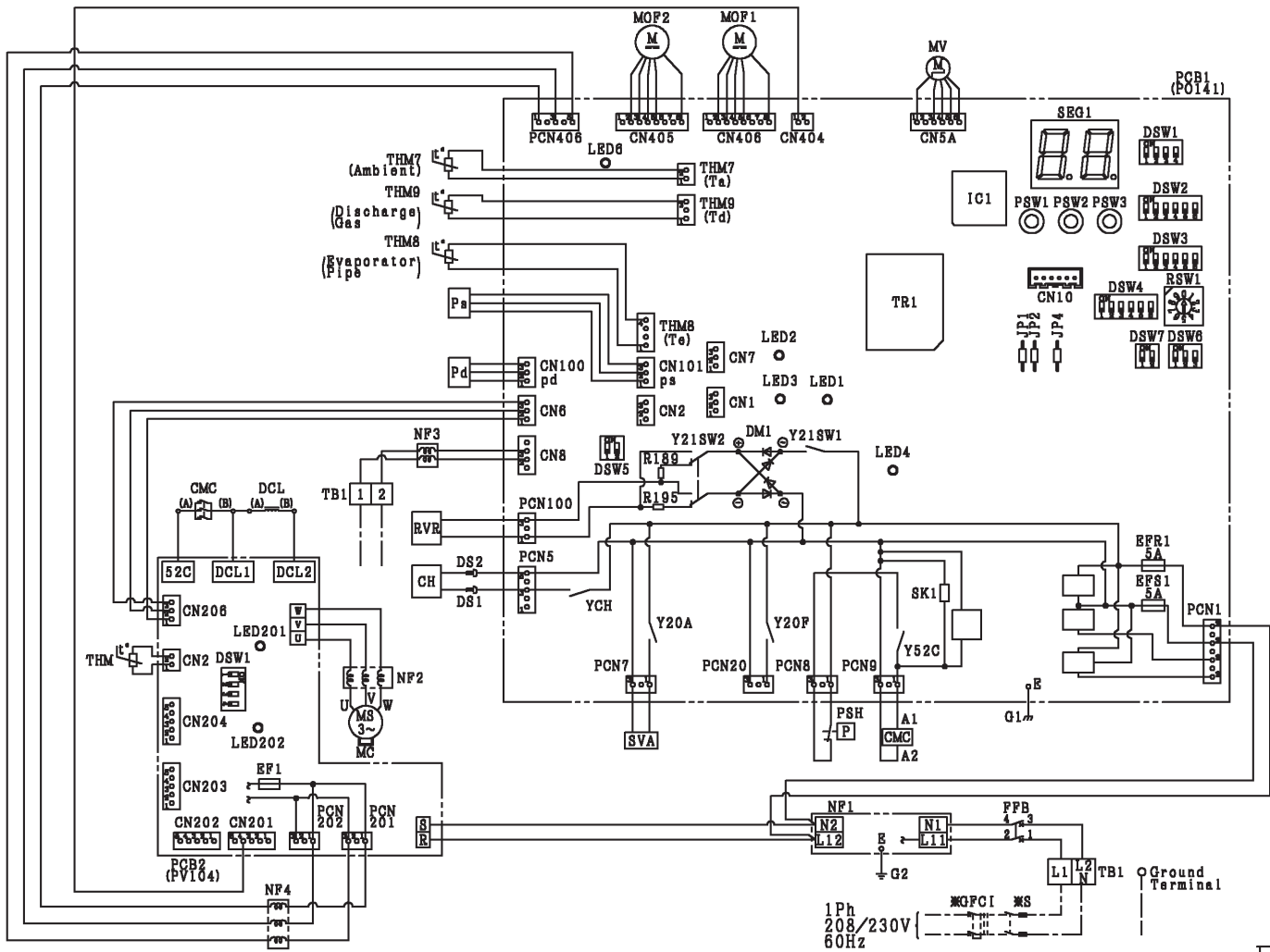
Model		(H,Y,C)VAHP036B21S	(H,Y,C)VAHP048B21S	(H,Y,C)VAHP060B21S
High Pressure Increase Protection		Automatic Reset, Non-Adjustable		
High Pressure Increase Protection Control	psi (MPa)	515 (3.55)	515 (3.55)	515 (3.55)
Pressure Switch	Cut-Out	(for each compressor)		
	psi (MPa)	601 -7 -21 (4.15 -0.05) -0.15)	601 -7 -21 (4.15 -0.05) -0.15)	601 -7 -21 (4.15 -0.05) -0.15)
	Cut-In	psi (MPa)	464 ±21 (3.20 ±0.15)	464 ±21 (3.20 ±0.15)
Inverter Compressor		Automatic Reset, Non-Adjustable		
Over Current				
Inverter Current Protection Control	A	21.5	21.5	21.5
Breaker	A	30.0	30.0	30.0
Over Heat		Automatic Reset, Non-Adjustable		
Discharge Temperature	°F	206	206	206
Increase Protection Control	(°C)	(97)	(97)	(97)
Fan Motor		Automatic Reset, Non-Adjustable		
Over Current Protection Control	A	1.72	1.72	1.72
Fuse	A	5	5	5





2.11.5 Electrical Wiring Diagram

MODEL: (H,Y,C)VAHP036B21S, (H,Y,C)VAHP048B21S and (H,Y,C)VAHP060B21S

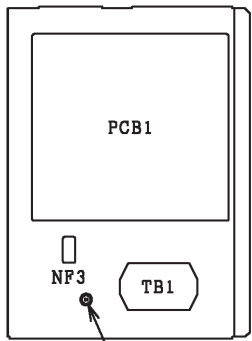
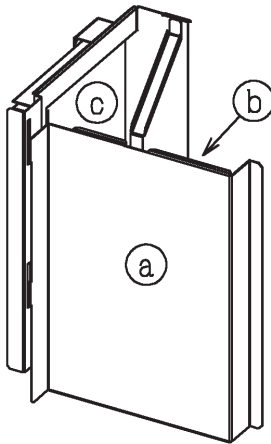
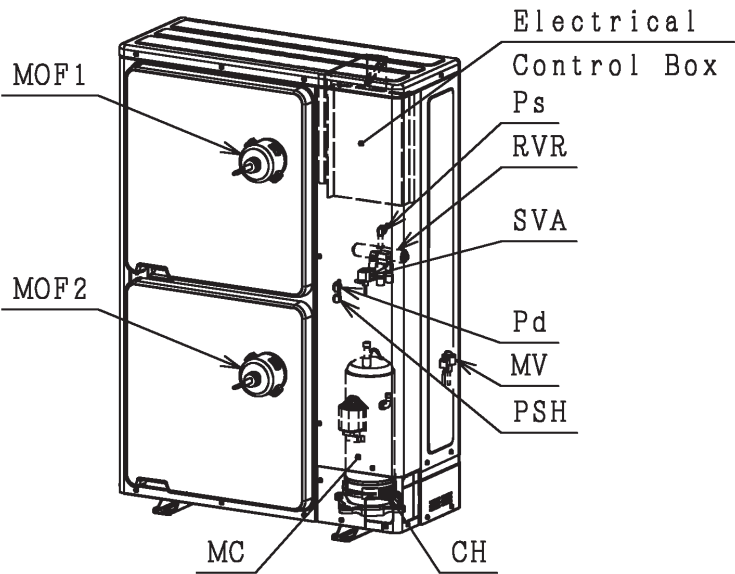


— : Factory Wiring  
— : Ground Wiring  
- - - : Field Wiring  
※ : Field-Supplied

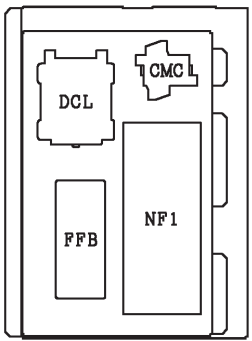
Mark	Name
CH	Crankcase Heater
CMC	Contactor for Compressor Motor
DCL	Reactor
DS1, 2	I. F Connector
DSW1~7	DIP Switch on PCB1
DSW1	DIP Switch on PCB2
EPR1, S1	Fuse on PCB1
FFB	Fuse-Free Breaker
G1, 2	Earth
LED1, 4, 6	LED (red) for Power Supply
LED2	LED (green) for INV Communication
LED3	LED (yellow) for IDU Communication
LED201	LED (red) for Power Supply
LED202	LED (yellow) for INV Communication
MC	Motor for Compressor
MOP1, 2	Motor for Outdoor Fan
MV	Electronic Expansion Valve
NF1~4	Noise Filter
PCB1	Printed Circuit Board
PCB2	Inverter Module
Pd, Ps	Sensor for Refrigerant Pressure
PSH	High Pressure Switch for Protection
PSW1~3	Push Switch on PCB1
RSW1	LED (red) for Power Supply
RVR	Reversing Valve Relay
SVA	Solenoid Valve
TB1	Terminal Block
THM7~9	Thermistor
THM	Thermistor for Fin Temperature
※S	Main Switch
※GFCI	Ground Fault Circuit Interrupter

Electrical Control Box

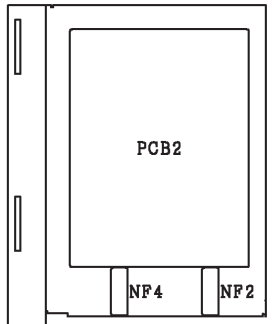
LOCATION OF MAIN PARTS



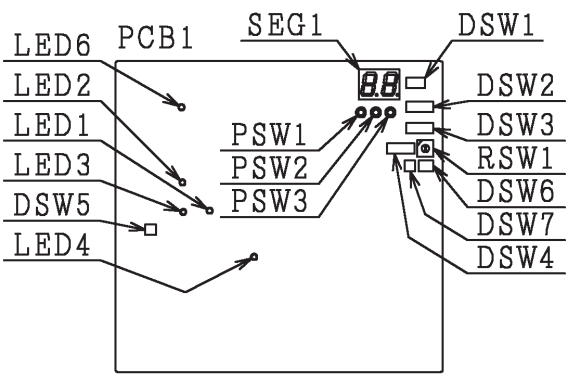
Plane (a)  
Ground Terminal



Plane (b)



Plane (c)





## 2.12 Operation Range

This unit has been designed for cooling operations under low ambient temperatures down to 23°F (-5°C) DB \*3).

This wide operation range enables cooling even in winter in buildings with high internal heat gains resulting from lighting, people and machines, particularly in areas such as shops, lecture rooms, and data processing areas. Heating operations under low ambient temperature down to -4°F (-20°C) WB \*5) can also be accomplished.

### Temperature

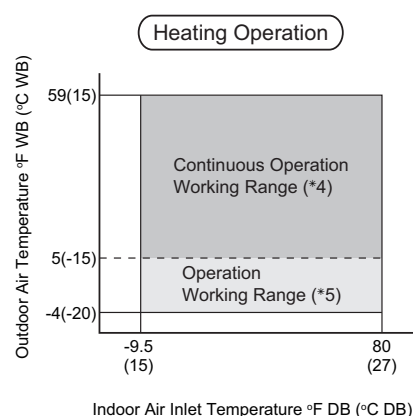
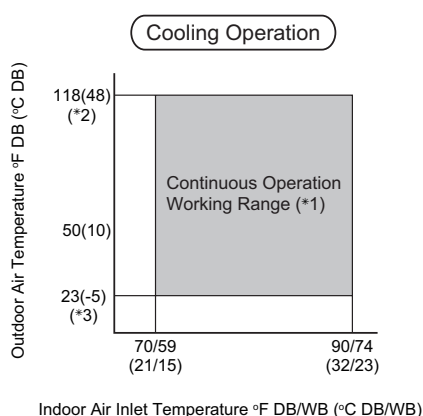
		Maximum	Minimum
Cooling Operation	Indoor	89°F DB/73°F WB (32°C DB/23°C WB)	69°F DB/59°F WB (21°C DB/15°C WB)
	Outdoor	118°F DB (48°C DB) *1), *2)	23°F DB (-5°C DB) *3)
Heating Operation	Indoor	80°F DB (27°C DB)	59°F DB (15°C DB)
	Outdoor	59°F WB (15°C WB) *4)	-4°F WB (-20°C WB) *5)

DB: Dry Bulb, WB: Wet Bulb

- \*1) When the outdoor air temperature is 100°F DB (38°C DB) or more and the outdoor unit operation capacity ratio is 100% or more, the outdoor unit will be Thermo-OFF to protect the compressor from failure.
- \*2) When the outdoor air temperature is 109°F (43°C) or more during the outdoor unit cooling operation, the maximum connectable indoor unit capacity ratio is 100%.
- \*3) When operating the outdoor unit under the low cooling load conditions and in the low outdoor air temperature, (approx. 50°F DB (10°C DB) or less), the indoor unit will be Thermo-OFF\* to prevent the heat exchanger of the indoor unit from being frosted.
- \*4) When operating the outdoor unit under low heating load conditions and the outdoor temperature is 59°F DB (15°C DB) or more, the outdoor unit will be Thermo-OFF\* to protect the compressor from failure.
- \*5) Operation in the outdoor temperature of 5~-4°F WB (-15~-20°C WB) is assumed to limited conditions such as start-up in early morning.  
Long time operation in this condition may shorten the life of the compressor.

\* Thermo-ON: The outdoor unit and some indoor units are running.

Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.



## 2.13 Combination of Indoor Unit and Outdoor Unit

Table 2.2 Indoor Unit Model List

Indoor Unit Type			Capacity (MBH)											
			6	8	12	15	18	24	27	30	36	48	54	60
Ducted	Ducted (High Static)	(H,Y)IDH_B21S					○	○		○	○	○		
		(H,Y,C)IDH_B22S				○	○	○	○	○	○	○	○	
	Ducted (Medium Static)	(H,Y,C)IDM_B21S	○	○	○	○	○	○		○	○	○		
		(H,Y,C)IDM_B22S	○	○	○	○	○	○	○	○	○	○	○	
	Ducted (Slim)	(H,Y,C)IDS_B21S	○	○	○	○	○							
	Ducted (EconoFresh)	(H,Y,C)IDM_B21E								○	○	○		
	Air Handler with DX-Kit	(H,Y,C)MAHP_(B,C,D)21S					○	○		○	○	○		○
Non-Ducted	Ceiling-Mounted 4-Way Cassette	(H,Y,C)IC4_B21S		○	○	○	○	○		○	○	○		
	Ceiling-Mounted 4-Way Cassette Mini	(H,Y,C)ICM_B21S		○	○	○	○							
	Ceiling-Mounted 2-Way Cassette	(H,Y,C)IC2_B21S					○	○						
	Ceiling-Mounted 1-Way Cassette	(H,Y,C)IC1_B21S	○	○	○	○								
	Wall-Mounted	TIWM_B21S	○	○	○	○	○	○		○				
	Ceiling Suspended	(H,Y,C)ICS_B21S				○		○		○	○			
	Floor Exposed	(H,Y,C)IFE_B21S	○	○	○	○								
	Floor Concealed	(H,Y,C)IFC_B21S	○	○	○	○								

○ : Available

- The number of indoor units that can be connected to an outdoor unit is as defined in Table 2.3: Comply with the following conditions when installing the unit.

Table 2.3 System Combination

Outdoor Unit Capacity (MBH)	Minimum Capacity at Individual Operation (MBH)	Maximum Number of Connectable I.U.	Connectable Indoor Unit Capacity Ratio	
			Maximum *1)	Minimum
36	6	6	130%	60%
48		8	130%	60%
60		8	105%	60%

\*1) When the outdoor air temperature is 109°F (43°C) or warmer during the outdoor unit cooling operation, the maximum connectable indoor unit capacity ratio is 100%.

### NOTES:

- The connectable indoor unit capacity ratio can be calculated as follows:  

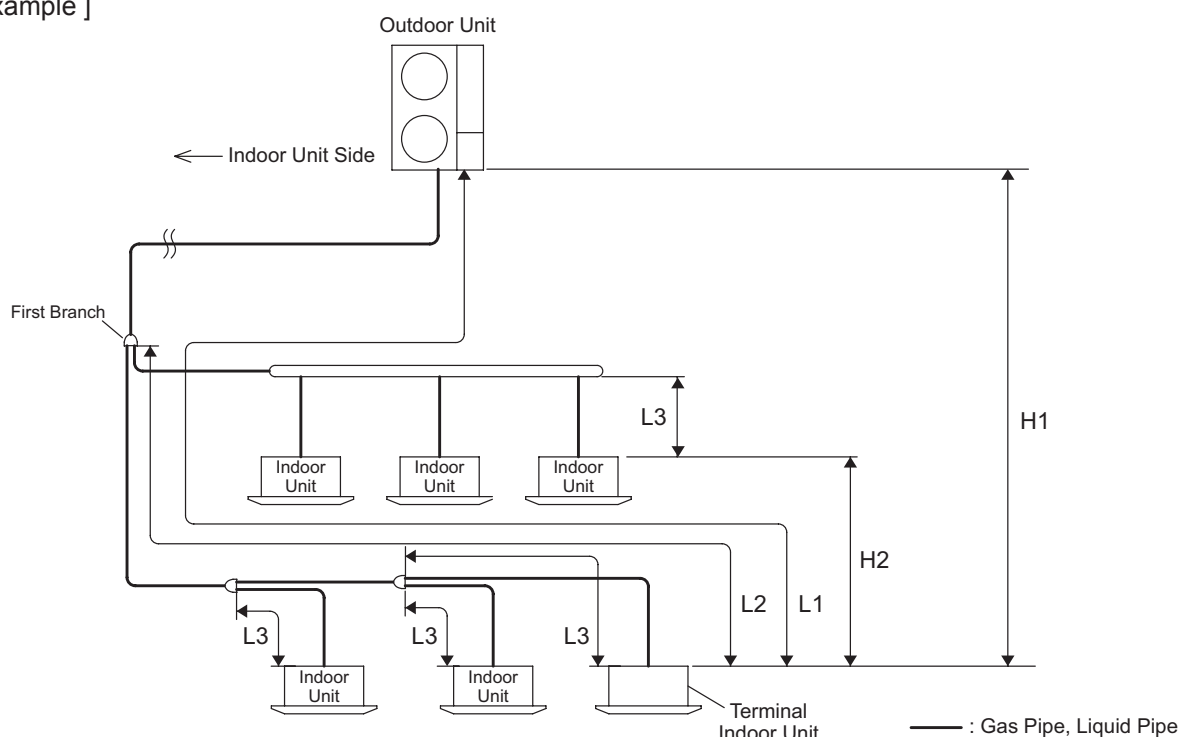
$$\text{Connectable Indoor Unit Capacity Ratio} = \frac{\text{Total Indoor Unit Capacity}}{\text{Total Outdoor Unit Capacity}}$$
- For the system under which all the indoor units operate simultaneously, the total indoor unit capacity should be less than the outdoor unit capacity. Otherwise, a decrease in operating performance and an increase in the operating limit can result in an overload.
- For the system under which all the indoor units do not operate simultaneously, the total indoor unit capacity is available up to 130% against the outdoor unit capacity except for 60 MBH.
- A maximum number of connectable indoor units differs depending on the model, capacity, environment and installation location of connected indoor units. Refer to "Engineering Manual" for the selection.
- When operating the outdoor unit in cold areas with temperatures of 14°F (-10°C), or under the high heating load conditions, the total indoor unit capacity should be less than 100% of the outdoor unit capacity.
- The airflow volume for indoor units of 6 and 8 MBH is set higher than that for indoor units of 12 MBH or more. Make sure to select appropriate indoor units for installation where cold drafts may occur during heating operation.
- Regarding the limitation of connected to Ducted (EconoFresh) type, refer to the "Engineering Manual" for Ducted (EconoFresh).

## 2.14 Piping Work

### 2.14.1 Piping Work Conditions

Comply with the following limitations when installing the unit.

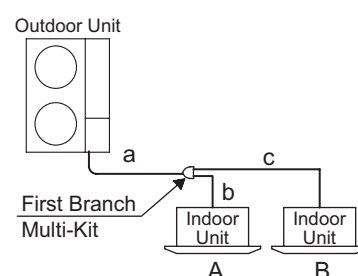
[ Example ]



Item		Mark	Allowable Piping Length
Total Piping Length		-	≤ 984 ft (300m)
Maximum Piping Length	Actual Length	L1	≤ 492 ft (150m)
	Equivalent Length		≤ 623 ft (190m)
Maximum Piping Length between Multi-kit of 1st Branch and Each Indoor Unit		L2	≤ 131 ft (40m)
Maximum Piping Length between Each Multi-kit and Each Indoor Unit		L3	≤ 131 ft (40m)
Height Difference between Outdoor Unit and Indoor Units	Outdoor Unit is Higher	H1	≤ 164 ft (50m)
	Outdoor Unit is Lower		≤ 131 ft (40m)
Height Difference between Indoor Units		H2	≤ 49 ft (15m)
Number of Main Branch	Including Header Branch	-	1 or less
	Not Including Header Branch	-	2 or less

Item	Mark	Details
Total Piping Length	a+b+c	The total amount of all piping actual length.
Maximum Piping Length	a+c	The actual piping length between the stop valve of the outdoor unit and the terminal indoor unit.
Piping Length	-	The actual length of pipe takes no account for equivalent lengths for pressure drops of elbows.
Equivalent Piping Length	-	The combination of the straight pipe length plus the equivalent length of elbows and other pressure drop calculations.

[ Example ]



## OUTDOOR UNITS

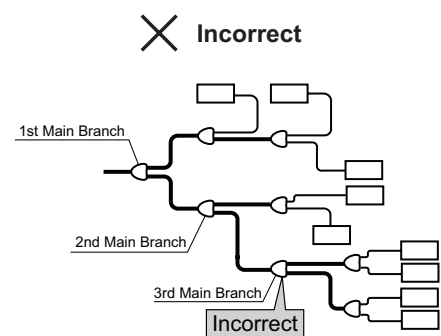
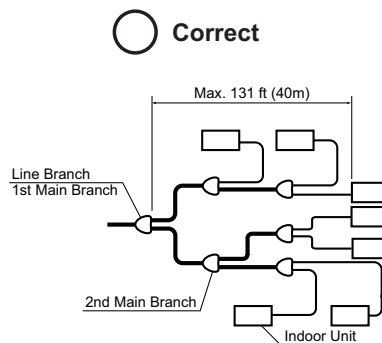
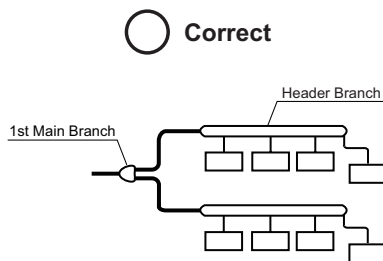
### NOTICE

Comply with the following conditions when installing the unit.

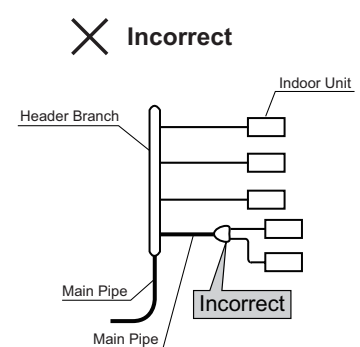
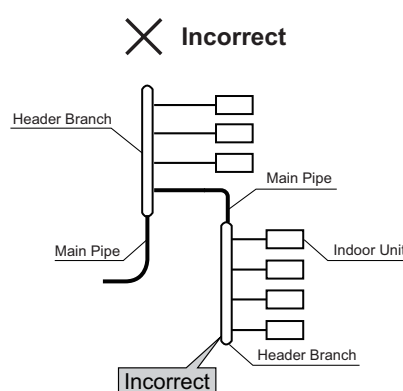
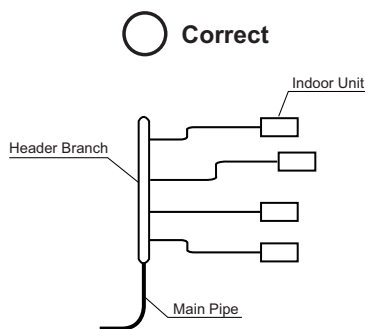
1. Allowable total piping length may not exceed 984 ft (300m) because of the limitation of maximum additional refrigerant amount as described in the following table. Make sure that the additional refrigerant volume does not exceed the maximum additional refrigerant amount as shown below.

Outdoor Unit Capacity (MBH)	36 - 60
Max. Additional Refrigerant Charge: lbs (kg)	18.5 (8.4)

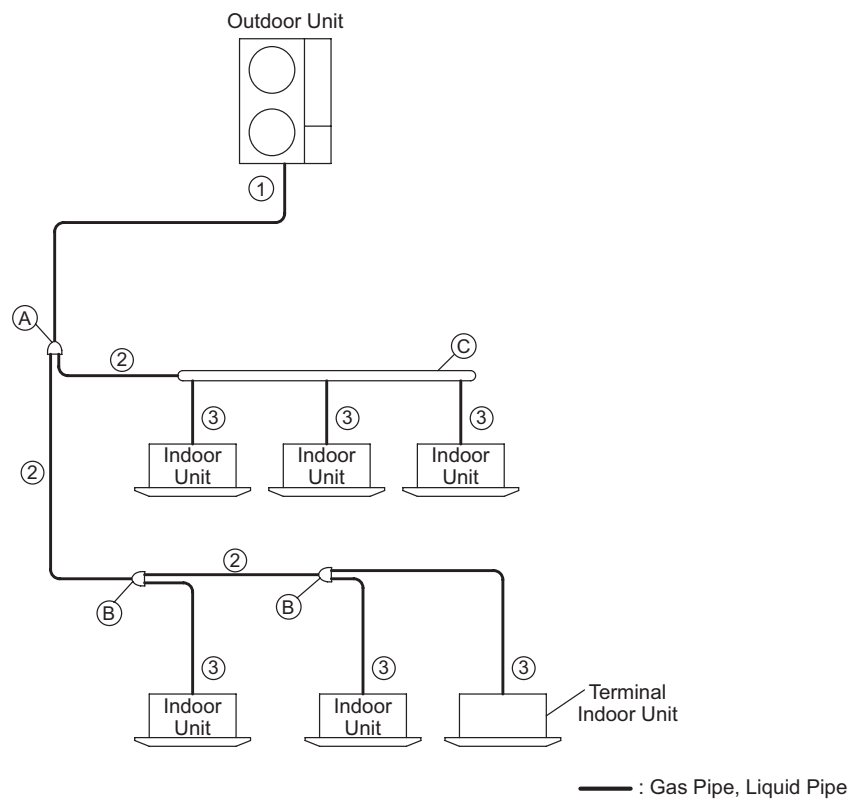
2. If the piping length (L3) between each multi-kit and indoor unit is considerably longer than other indoor unit, refrigerant may not flow well, lessening performance compared to other models.
3. When installing DOAS or Ducted (EconoFresh) in the system, the height difference between indoor units must be within 49 ft (15m).
4. When completing on-site piping, install bent piping or horizontal loop piping to absorb any expansion or contraction due to changing temperatures.
5. It is possible to make the first or the second main pipe branch.  
(In case of including header branch, it is possible to make the first main pipe branch.)
  - The word "Main Pipe Branch" indicates the pipe with both branches connected to another branch pipe.



6. A line branch and 2nd header branch cannot be connected to the 1st header branch.



2.14.2 Piping Size and Multi-Kit Selection



Multi-Kit (Optional Parts)

< Line Branch >

Ⓐ First Branch

Outdoor Unit Capacity (MBH)	Model
36 - 60	MW-NP282A3 *

Ⓑ Line Branch after First Branch

Total Indoor Unit Capacity (MBH)	Model
≤ 86	MW-NP282A3 *

\* A2 type is to be used in place of A3 type:  
The piping kits for A2 model numbers MW-NP282A2 is to be used in place of the piping kits for the A3 model numbers MW-NP282A3 as noted.

< Header Branch >

Ⓒ Header Branch

Total Indoor Unit Capacity (MBH)	No. of Header Branches	Model
36 - 60	4	MH-NP224A
36 - 72	8	MH-NP288A

## OUTDOOR UNITS

Refer to the figure on the previous page.

Piping Size < inch (mm) >

- ① [Main Pipe Diameter]  
(Outdoor Unit to First Branch)

Outdoor Unit Capacity (MBH)	Equivalent Piping Length			
	< 328 ft (100m)		≥ 328 ft (100m) *1)	
	Gas	Liquid	Gas	Liquid
36 - 60	5/8 (15.88)	3/8 (9.52)	3/4 (19.05)	3/8 (9.52)

\*1): It is required to prepare the reducer (field-supplied).

- ② [Diameter of Pipe after First Branch]

Gas	Liquid
5/8 (15.88)	3/8 (9.52)

- ③ [Diameter of Pipe between Multi-Kit and Indoor Unit]

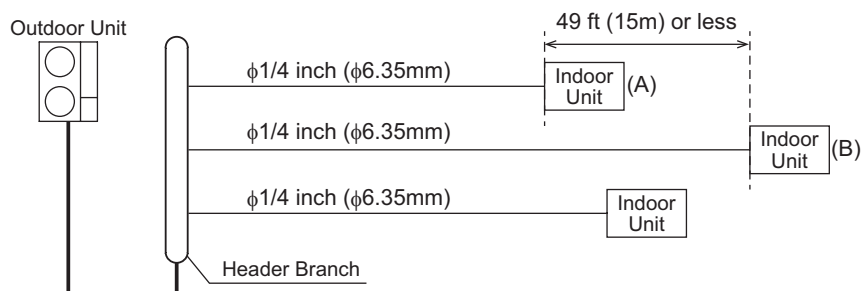
Indoor Unit Capacity (MBH)	Gas	Liquid
6 - 15	1/2 (12.7)	1/4 (6.35) *1)
18 - 48	5/8 (15.88)	3/8 (9.52)

\*1): When liquid piping length is longer than 49 ft (15m), use 3/8 inch (9.52mm) diameter piping with the reducer (accessory pipe for Multi-Kit).

When satisfies all the following piping conditions, the diameter of the piping remains.

- Installation with one header branch.
- The pipe length between the nearest indoor unit and the farthest indoor unit from the outdoor unit is within 49 ft (15m).

※ Not required to size up the liquid pipe.





### 2.14.3 Piping Connection Method

Perform the piping connection for the outdoor unit.

- Pipes can be connected from 4 directions.

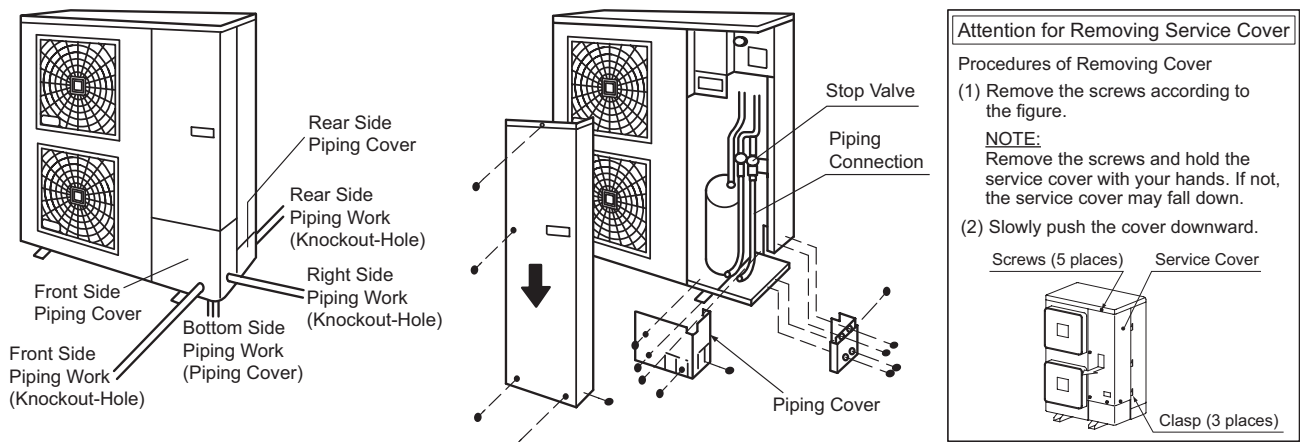
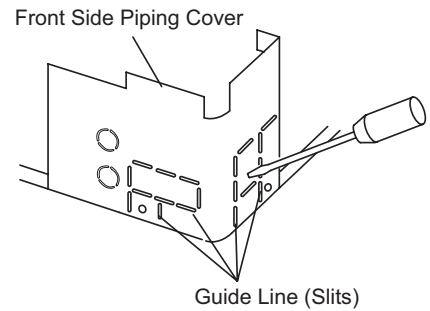


Figure 2.1 Piping Direction

- (1) The refrigerant piping can be installed in four directions (front, right, bottom or rear side) as shown in Figure 2.1. Make a knockout-hole in the front side pipe cover or bottom base to pass the pipe through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with a screwdriver and a hammer. Then, deburr the holes and attach insulation (Field-supplied) for protection of cables and pipes.



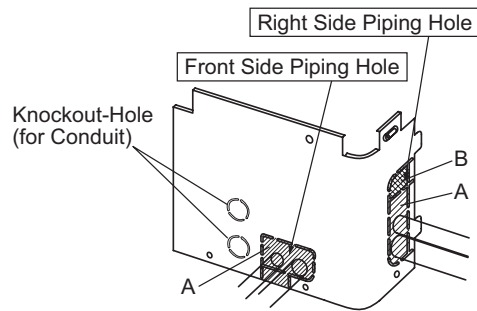
## (a) Front and Right Side Piping Work

Select the correct knockout size depending on the size of liquid and gas piping, power wiring, or communication wiring.

The liquid or gas piping can be connected from “A” part.

### NOTES:

- Protect cables and pipes from the edges of the cover with insulations, etc. (Field-supplied).
- “B” part is for communication cable. But conduit hole is recommended. (refer to Section 2.15.2 “Electrical Wiring Method”)

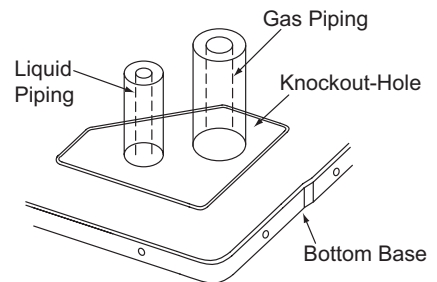


## (b) Bottom Side Piping Work

After removing bottom of the knockout-hole, perform piping.

### NOTE:

Prevent the cables from coming into direct contact with the piping work.

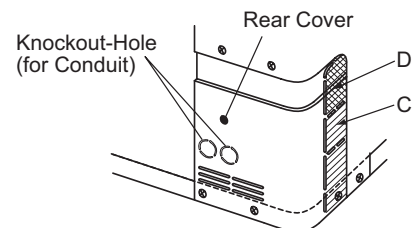


## (c) Rear Side Piping Work

After removing the rear side piping cover, punch out “C” hole along the guide line.

### NOTES:

- Protect cables and pipes from the edges of the cover with insulations, etc. (Field-supplied).
- “D” part is for communication cable. But conduit hole is recommended. (refer to Section 2.15.2 “Electrical Wiring Method”)



# NOTICE

For the right side and rear side piping work, secure enough space for the piping.

- (2) Be sure to attach the piping cover to prevent rain water from entering the unit. Completely seal the penetration parts of the pipes with field-supplied insulation in order to prevent rain water from entering the conduit.  
To make it easier to attach the piping cover, cut the lower side guide line of the piping cover.
- (3) Use a pipe bender or an elbow (Field-supplied) for bending work while connecting pipes.

## 2.15 Electrical Wiring

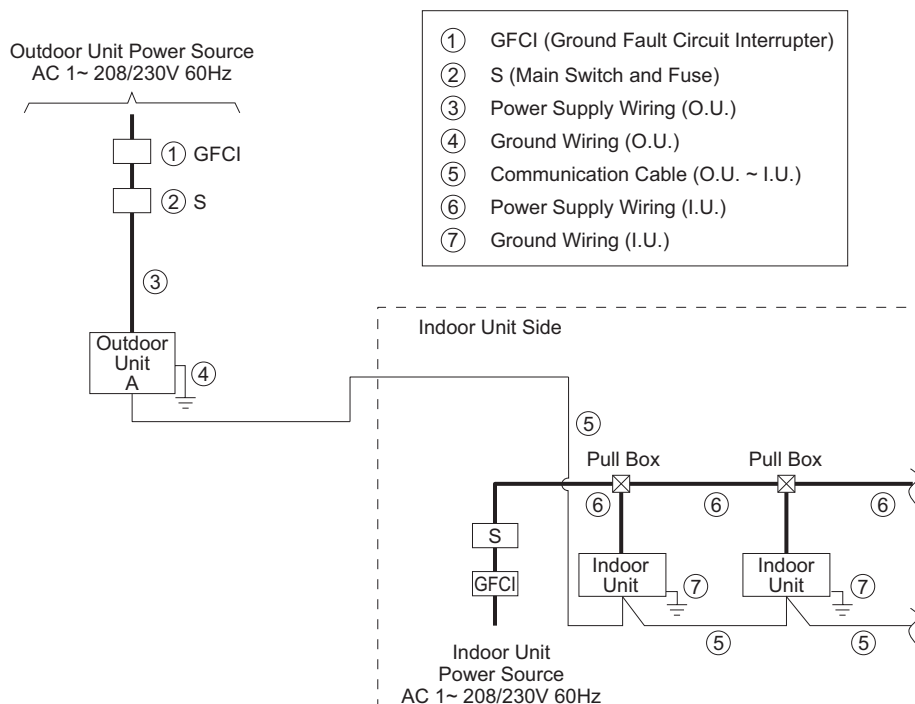
### 2.15.1 Electrical Wiring Connection

#### ! WARNING

- This equipment can be installed with a Ground Fault Circuit Interrupter (GFCI), which is a recognized measure for added protection to a properly grounded unit. Install appropriate sized breakers / fuses / overcurrent protection switches and wiring in accordance to local, state and NEC codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements. Failure to use a GFCI could result in electric shock or fire.
- Perform the electrical work according to the regulations of each region and this installation and maintenance manual. A separate, dedicated electrical circuit must be used. If the electrical wiring work is performed incorrectly or there is a capacity shortage of the power circuit, it will cause an electric shock or a fire.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it may lead to an electrical shock.  
Do not connect the ground wiring to gas piping, water piping, lighting conductor, or telephone ground wirings.

#### (1) Power Supply Wiring

Supply the power sources to each outdoor unit and indoor unit group respectively.  
Using this method is a basic principle of power supply wiring.



## (2) Electrical Characteristics

Table 2.4 Electrical Characteristics and Recommended Wiring Size

Model	Outdoor Unit							INV Comp.	
	Hz [Hz]	Voltage [V]	Max. [V]	Min. [V]	MCA [A]	MOP [A]	Max. Fuse [A]	RLA [A]	LRA [A]
(H,Y,C)VAHP036B21S	60	208/230	253	188	31	40	40	24	30
(H,Y,C)VAHP048B21S	60	208/230	253	188	31	40	40	24	30
(H,Y,C)VAHP060B21S	60	208/230	253	188	31	40	40	24	30

Model	Fan Motor		Wiring Size			Conduit Tube
	Output [kW]	FLA [A]	Power Supply Wiring [AWG]	Ground Wiring [AWG]	Communication Cable [AWG]	for Power Supply Wiring [in. (mm)]
(H,Y,C)VAHP036B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)
(H,Y,C)VAHP048B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)
(H,Y,C)VAHP060B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)

MCA: Minimum Circuit Ampacity (A)

MOP: Maximum Overcurrent Protective Device (A)

RLA: Rated Load Ampacity (A)

LRA: Locked Rotor Ampacity (A)

FLA: Full Load Ampacity (A)

### NOTES:

1. Select wire size based on the value of MCA.
2. MOP is used to select the fuse, circuit breaker, or a Ground Fault Circuit Interrupter (GFCI).
3. Communication cabling shall be a minimum of AWG18 (0.82mm<sup>2</sup>), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.

## CAUTION

**Install a multi-pole main switch with a space of 1/8 inch (3.5mm) or more between each phase.**

### NOTES:

1. When the power supply wiring is longer, select the minimum wiring size which the voltage drop is within 2%.
2. Power voltage ranges are the following.
  - Supply Voltage: Rated Voltage within  $\pm 10\%$
  - Starting Voltage: Rated Voltage within  $-15\%$
  - Operating Voltage: Rated Voltage within  $\pm 10\%$
3. Do not connect the ground wiring to gas piping, water piping, or a lightning conductor.
  - Gas Piping: An explosion and ignition may occur if there is escaping gas.
  - Water Piping: There is no effective electrical ground provided when hard vinyl piping is used.
  - Lightning Conductor: The electrical potential of the earth increases when a lightning conductor is used.

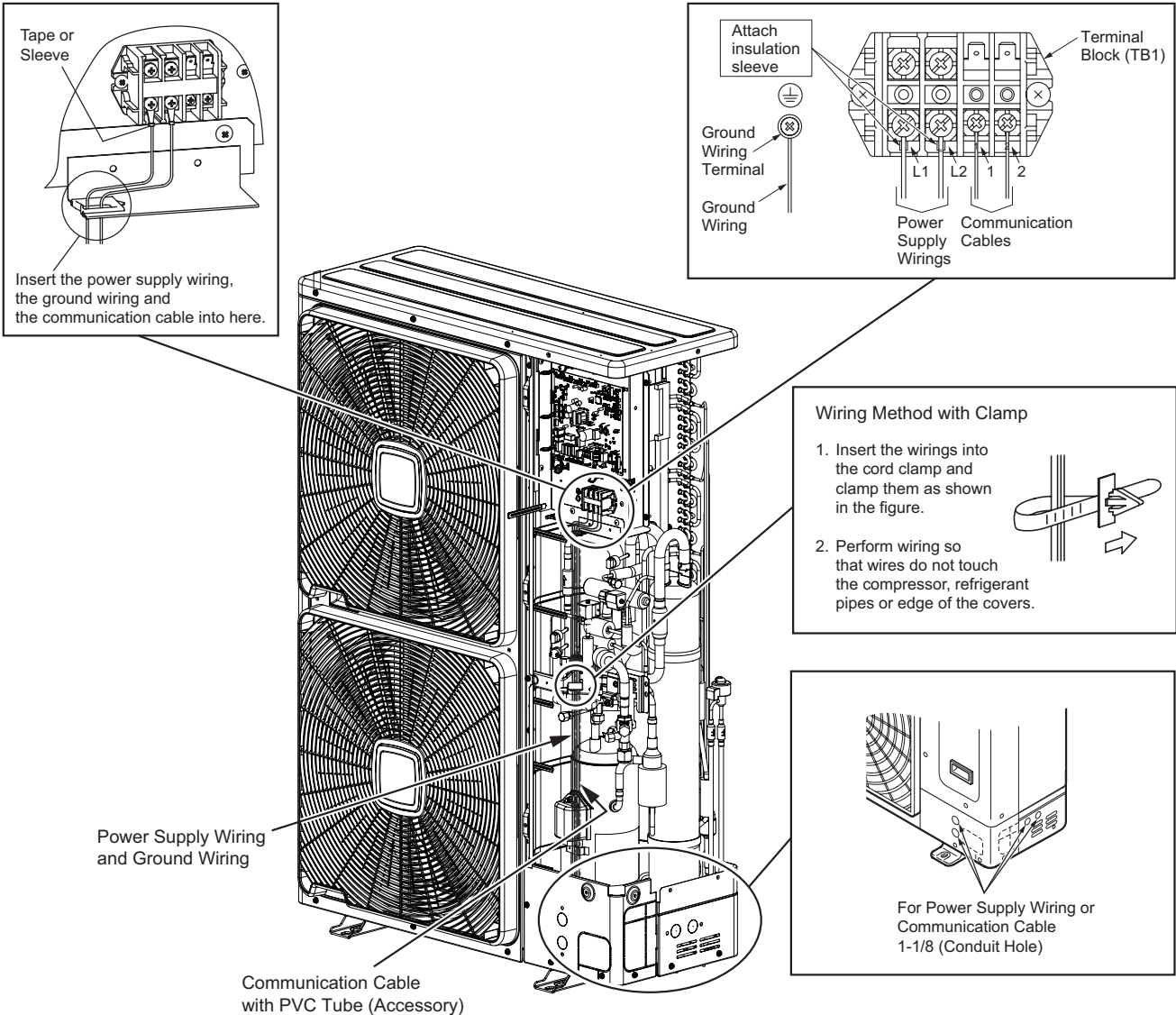
2.15.2 Electrical Wiring Method

Connect the electrical wiring according to the following figure:

- (1) Connect the power supply wirings to L1 and L2 for the power source on the terminal block TB1 and ground wiring to the terminal in the electrical control box.
- (2) Connect the communication cables between the outdoor unit and indoor units to the terminals 1 and 2 on the terminal block TB1. When shielded cabling is applied (M4), proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements. Communication cable shall be a minimum of AWG18 (0.82mm<sup>2</sup>), 2-Conductor, Stranded Copper.
- (3) Insert the communication cables into the PVC tube "VW-1 600V" (accessory) to separate from the power supply wirings and the communication cables in the outdoor unit. Then, tighten both ends of the PVC tubing with the cable bands (accessory) in order to secure the PVC tubing to the communication cables.
- (4) Tighten screws for the terminal block according to the following table.

< Required Tightening Torque >

Size	Tightening Torque	
M4	0.7 to 1.0 ft-lbs	(1.0 to 1.3 N·m)
M5	1.5 to 1.8 ft-lbs	(2.0 to 2.4 N·m)
M6	3.0 to 3.7 ft-lbs	(4.0 to 5.0 N·m)
M8	6.6 to 8.1 ft-lbs	(9.0 to 11.0 N·m)
M10	13.3 to 17.0 ft-lbs	(18.0 to 23.0 N·m)

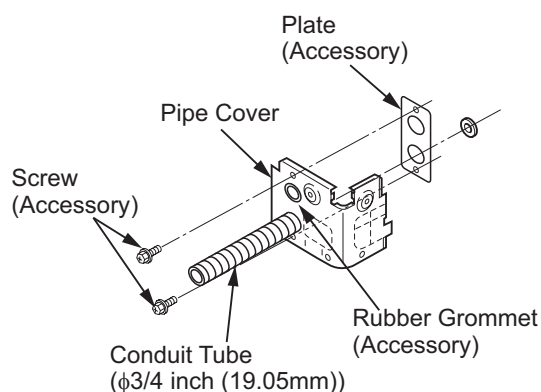


## CAUTION

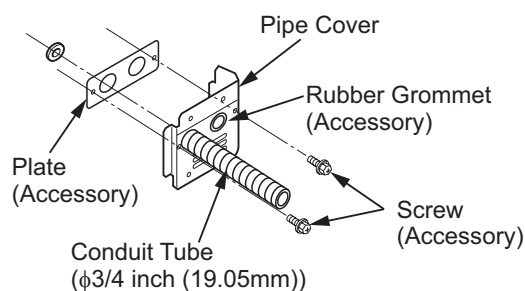
Be sure to note the following points when wirings under the unit using conduit tubing.

### NOTES:

1. When installing the power supply wiring, use the field-supplied conduit tube and the plate (accessory) as shown below. The conduit tube can be connected in two direction (front and right side). Open either side of the knockout-hole for conduit tube.
2. When installing the communication cables, run them through the rubber grommet (accessory). (Require to make a hole in the rubber grommet)
3. Draw each individual cable through its corresponding hole.
4. Maintain at least 5 inch (127mm) between the power supply wiring and communication cables.
5. Attach the pipe cover to prevent small animals or insects from entering the unit.
6. Prevent cables from touching or rubbing up against refrigerant piping, plate edges, and electrical components inside the unit.
7. Completely seal the end of conduit tube with sealing materials to prevent the rain from entering the conduit tube.
8. Create a drainage hole at the lowest part of the conduit tube.



Front Side Connection

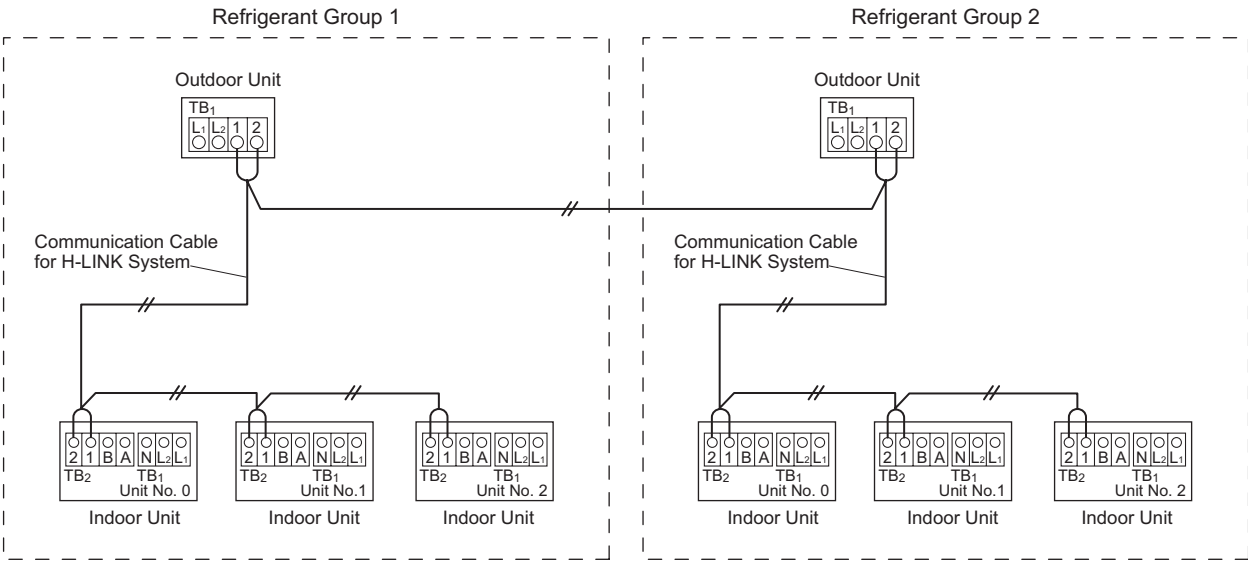


Right Side Connection

## CAUTION

Tightly secure the power supply wiring using a cable clamp inside the unit.

• Communication Cabling



- NOTES:**
1. If an alarm is indicated on the LCD of outdoor unit, follow the "7-segment" display at the outdoor unit for verification purposes.
  2. Perform a function setting at the outdoor unit.
  3. Maximum number of refrigerant groups with one central controller is 64 (for H-LINK II).  
Maximum number of indoor units to be connected is 160 (for H-LINK II).

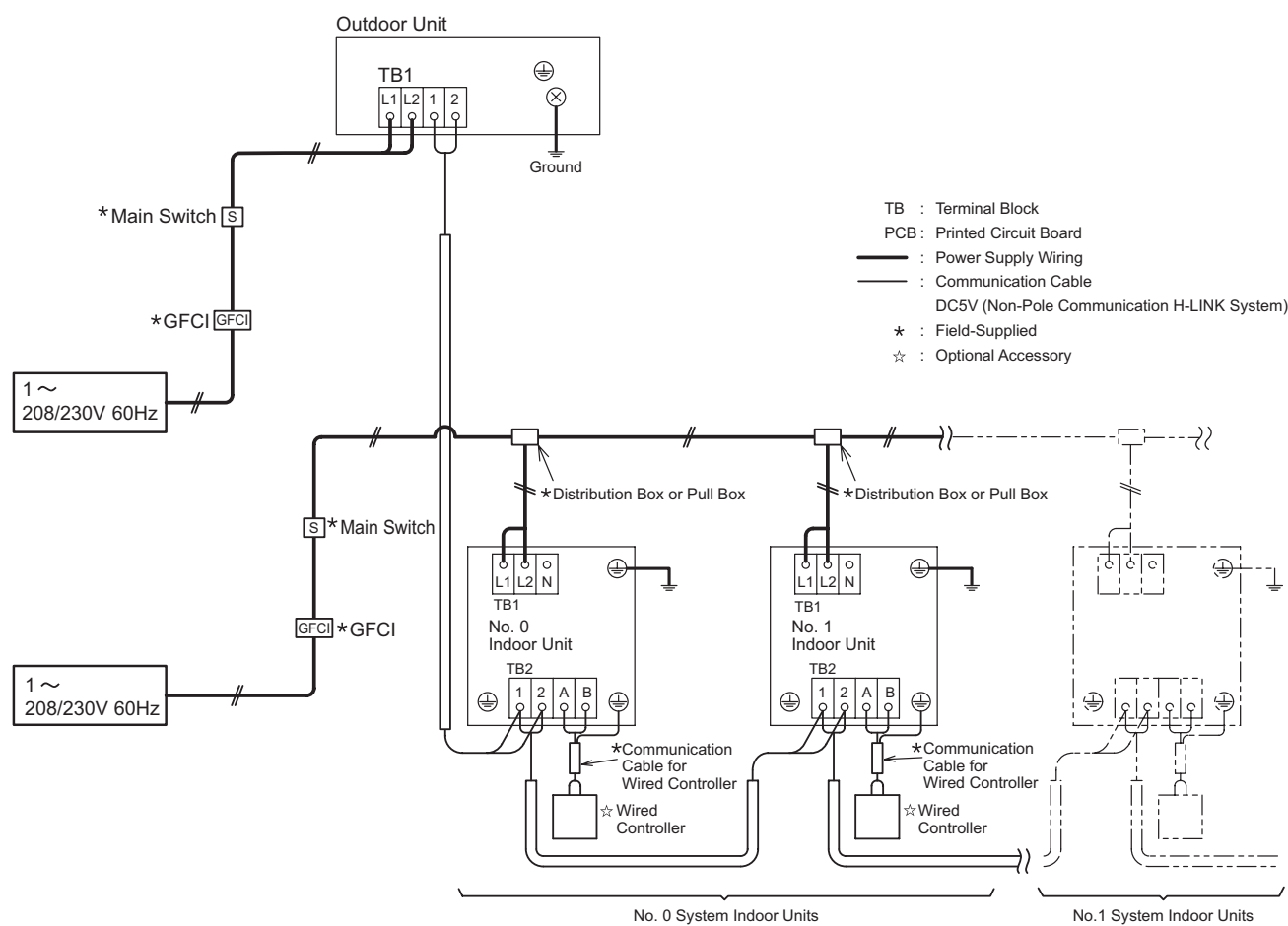


Figure 2.2 Instruction for Electrical Wiring Connection

## 2.16 Additional Refrigerant Charge Calculation

Although this unit has been charged with refrigerant, additional refrigerant charge is required depending on total piping length for the system.

Determine additional quantity of refrigerant required according to the following procedures, and charge it into the system. Record the additional refrigerant quantity to facilitate future maintenance and servicing.

### (1) Calculating Method of Additional Refrigerant Charge (① lbs)

Table 2.5 Additional Refrigerant Charge Calculation

①	Additional Refrigerant Charge Calculation	Liquid Piping Diameter [in. (mm)]	Refrigerant Amount For 1ft. Pipe [lbs./ft. (kg/m)]	Total Piping Length [ft. (m)]		Additional Charge [lbs. (kg)]	
		φ3/8 (9.52)	0.034 x (0.05 x)	<input type="text"/>	( <input type="text"/> )	<input type="text"/>	( <input type="text"/> )
		φ1/4 (6.35)	0.014 x (0.02 x)	<input type="text"/>	( <input type="text"/> )	<input type="text"/>	( <input type="text"/> )
		Additional Refrigerant Charge		<input type="text"/>	( <input type="text"/> )	<input type="text"/>	( <input type="text"/> )
②	Refrigerant Charge Amount of O.U. Before Shipment			Model		Precharge [lbs. (kg)]	
				036 - 060		7.9 (3.6)	
③	Total Refrigerant Charge Amount			③ = ① + ②		Total Charge [lbs. (kg)]	
						<input type="text"/>	( <input type="text"/> )

**NOTE:**

Ensure that the total additional charge ① does not exceed the maximum additional refrigerant charge quantity as shown in the table below.

#### < Max. Additional Refrigerant Charge Quantity Allowed >

Outdoor Unit Capacity (MBH)	36 - 60
Max. Additional Ref. Charge Quantity: lbs (kg)	18.5 (8.4)

#### < Initial Ref. Charge Amount of O.U. (Before Shipment) (② lbs) >

Outdoor Unit Capacity (MBH)	36 - 60
W0 Outdoor Unit Ref. Charge: lbs (kg)	7.9 (3.6)

**NOTE:**

W0 is the outdoor unit refrigerant charge prior to shipment.

If there is a combination of base units, calculate the total refrigerant charge prior to shipment of those combined outdoor units.

### (2) Record of Total Charge

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

$$\textcircled{3} \text{ Total Ref. Charge} = \textcircled{1} \text{ lbs} + \textcircled{2} \text{ lbs} = \text{ } \text{lbs} ( \text{ } \text{kg} )$$

**NOTES:**

- When refrigerant is recovered or charged due to repairs, operating, or adjusting the unit, record the refrigerant quantity again.
- Record the refrigerant charge amount on the nameplate attached to the reverse surface of the service cover as well.

## NOTICE

1. Emissions of the fluorocarbons without any reason are prohibited.
2. For disposal and maintenance of this product, recovery of fluorocarbons is required.



- Special Attention Regarding Refrigerant Gas Leakage

Make sure that the entire VRF system meets ASHRAE Standard 15, or any local codes, regarding Safety. The ASHRAE Standard 15 provides safeguards for life, limb, health, and property, and prescribes safety requirements. The standard is recognized as the main guide for personal safety involving refrigeration systems. It strives to ensure a safe application of refrigerant systems by limiting the maximum charge as follows so that a complete discharge due to a leak into a small, occupied, and enclosed room can never exceed the allowable limit for the room.



### 3. Optional Parts

#### 3.1 Line-Up

Item No.	Optional Parts Name		Optional Parts Model Name
3.2	Drain Adaptor		DBS-26
3.3	Airflow Guide		AG-335A
3.4	Wind Guard		WSP-160A
3.5	Wind Prevention Tool		THS-335A
3.6	Snow Protection Hood	for Front Side Air Outlet	ASG-SP11FCS2
		for Rear Side Air Inlet	ASG-SP11BAS2
		for Left Side Air Inlet	ASG-SP11LAS3
		Toppling Prevention Tool	ASG-SW20A
3.7	Protection Net		PN-SP10C1
3.8	Multi-Kit	Line Branch	MW-NP282A3 *
3.9		Header Branch	MH-NP224A, MH-NP288A

\* A2 type is to be used in place of A3 type:

The piping kits for A2 model numbers MW-NP282A2 is to be used in place of the piping kits for the A3 model numbers MW-NP282A3 as noted.

### 3.2 Drain Adaptor: DBS-26

When the base of the outdoor unit is temporarily utilized as a drain receiver and the drain water in it is discharged, this Drain Adaptor is utilized to connect the drain piping.

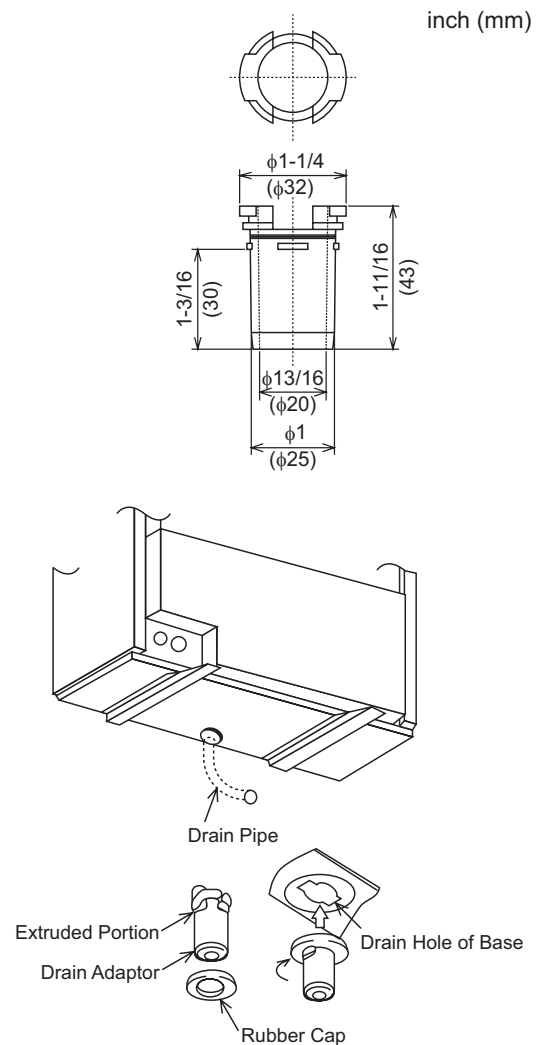
#### < Connecting Procedure >

##### Connecting Drain Adaptor

- (1) Insert the rubber cap into the Drain Adaptor up to the extruded portions four Portions around the Boss).
- (2) Insert the boss into the unit base, and turn approximately 40° counterclockwise.
- (3) Size of the Drain Adaptor is VP25.  
(Inner Diameter: 1 inch (25mm))
- (4) A drain pipe should be field-supplied.

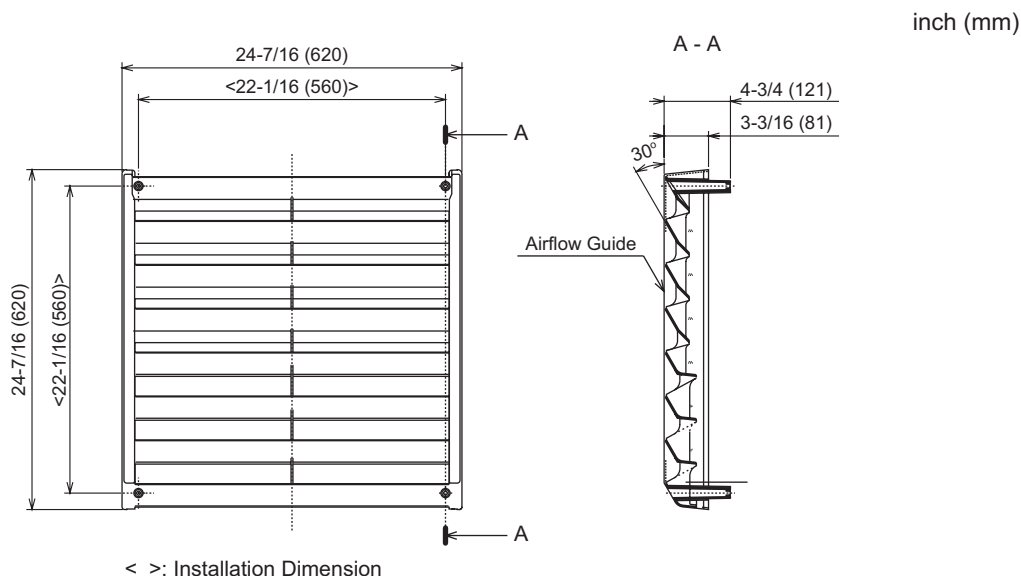
##### NOTES:

1. Do not use this Drain Adaptor in a cold area, because the drain water may freeze.
2. This Drain Adaptor is not sufficient to collect all the drain water.  
If collecting drain water is completely required, provide a drain pan that is bigger than the unit base, and install it under the unit with drainage.



### 3.3 Airflow Guide: AG-335A

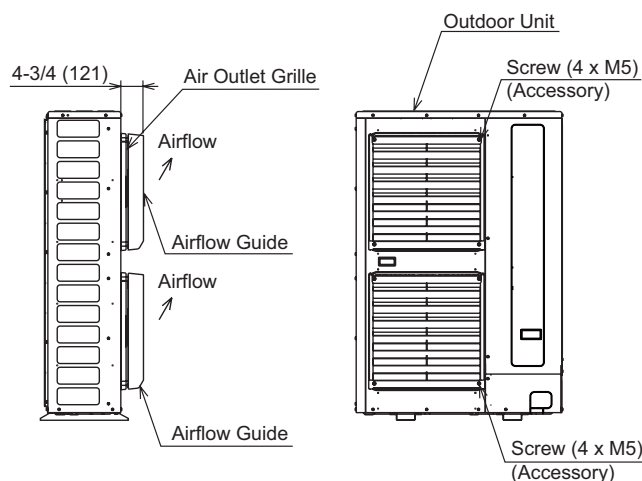
This optional Airflow Guide allows outlet airflow in four directions (up, down, left right) if there are obstacles in front of the outdoor unit.



#### < Installation >

- (1) To attach the Airflow Guide, remove the four securing screws at the corner of the resin air outlet grille. Then, attach the Airflow Guide using four screws (accessory).  
(Tightening Torque: 1.8 - 2.2 ft·lbs (2.4 - 3.1 N·m))
- (2) When the Airflow Guide is attached, do not remove the air outlet grille.  
(If it is removed, there is a danger of it touching the fan rotating parts.)

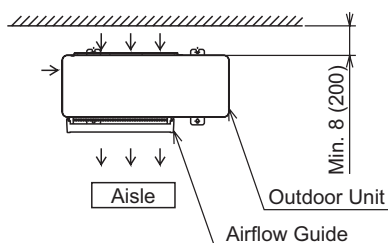
#### < Installation for Two Airflow Guides >



**NOTE:**

Two Airflow Guides should be taken in the same air outlet direction

#### < Service Space >



**NOTES:**

1. For the left and right air outlets, maintain enough service space for outlet air.
2. For the air outlet downward, install a foundation in order to secure enough service space downward.
3. If multiple outdoor units are installed serially, the upward air outlet should be utilized.

**Specifications**

Item		Model	AG-335A
Applicable Outdoor Unit Model			036 to 060
Quantity (per outdoor unit)			2
Airflow Direction			Upward (Downward), Left and Right
Material			PP
Color			Natural Gray
Weight	lbs (kg)		4.2 (1.9)
Accessory			Securing Screw (M5 (SUS) x L=13/16 inch (20mm) x 4), Installation Manual
Installation Restriction			It can not be utilized with the Wind Guard and the Snow Protection Hood.

**NOTES:**

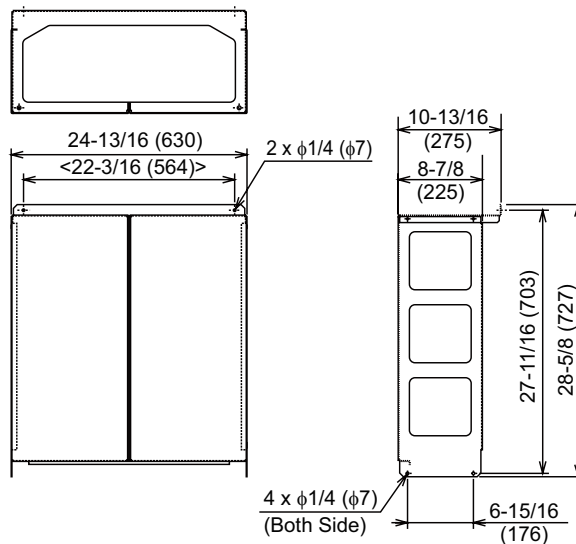
1. This optional Airflow Guide lets the outlet airflow upward (downward) or left and right if there are obstacles in front of the outdoor unit.
2. Do not put any obstacles at the airflow direction.  
If there are obstacles, a short-circuit will occur or the airflow volume will decrease. Secure the appropriate service space according to the installation and maintenance manual of the outdoor unit.
3. For the left and right air outlets, do not install outdoor units next to each other. One outdoor unit will suck the airflow from the Airflow Guide.
4. The operation noise is slightly increased by attaching an Airflow Guide.
5. The Snow Protection Hood should be utilized in a snow covered area.
6. In the case of icing at the air outlet in a cold area, melt ice using lukewarm water (approx. 104°F (40°C)).  
The Airflow Guide may be damaged when trying to crack ice with hard blows (such as with a hammer).

### 3.4 Wind Guard: WSP-160A

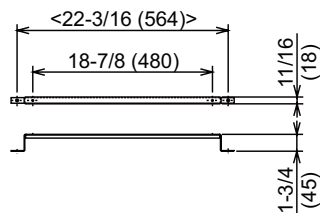
This Wind Guard is to protect the outdoor unit from strong winds.

< Wind Guard (Upper) >

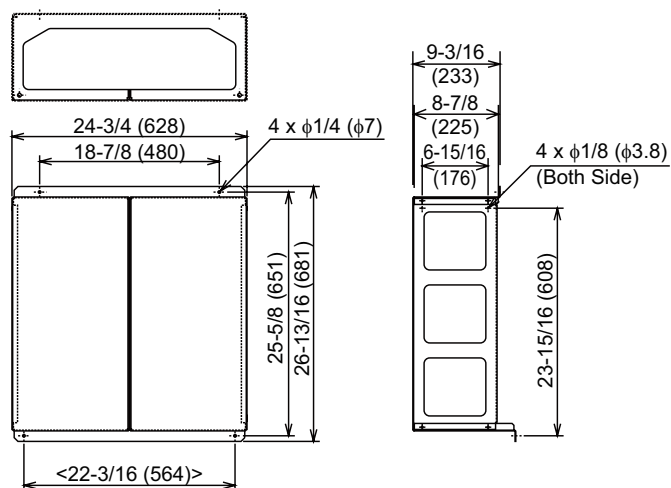
inch (mm)



< Securing Stay >



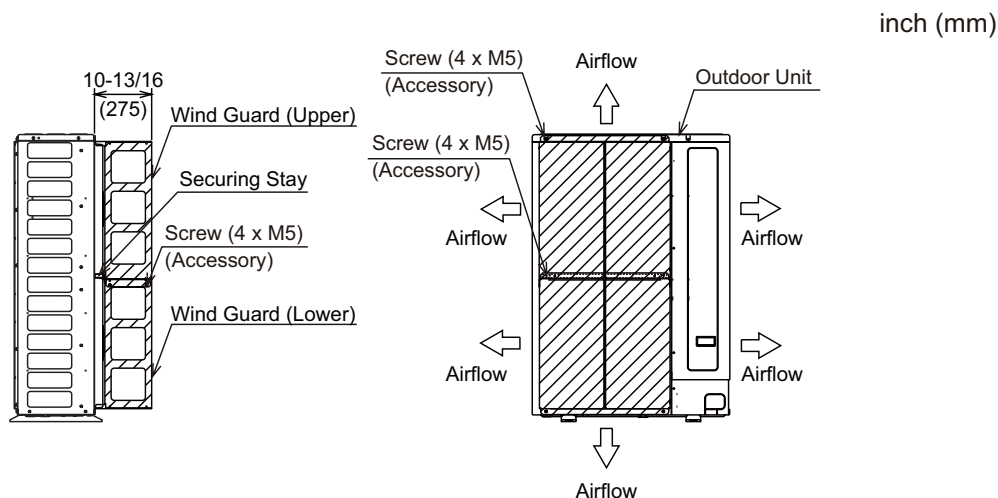
< Wind Guard (Lower) >



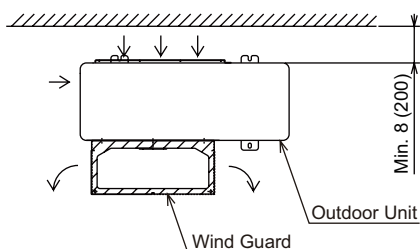
< >: Installation Dimension

### < Installation >

- (1) To attach the Wind Guard, secure the securing stay in the middle of air outlet grille. Attach the lower Wind Guard to the outdoor unit and the securing stay by securing screws. Then attach the upper Wind Guard to the upper cover and the lower Wind Guard using the securing screws.
- (2) When the Airflow Guide is attached, do not remove the air outlet grille.  
(If it is removed, there is a danger of touching the fan rotating parts.)



### < Service Space >



#### NOTES:

1. Secure the appropriate service space at both left and right side of outdoor unit.
2. Do not put any obstacles at the airflow direction.

### Specifications

Model		WSP-160A
Item		
Applicable Outdoor Unit Model		036 to 060
Quantity (per outdoor unit)		1
Material		Galvanized Steel Sheet + Baked with Synthetic Resin Paint
Color		Natural Gray (1.0Y 8.5 / 0.5)
Weight	lbs (kg)	24.3 (11.0)
Accessory		2 Wind Guards, 1 Securing Stay, Securing Screw (M5 (SUS) x L=1/2 inch (12mm) x 12), Installation Manual
Installation Restriction		It can not be utilized with the Airflow Guide and the Snow Protection Hood.



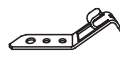





#### NOTES:

1. This optional Wind Guard is to protect the air outlet from strong winds.
2. Do not put any obstacles at the airflow direction.  
If there are obstacles, a short-circuit will occur or the airflow volume will decrease.  
Secure the appropriate service space according to the "Installation Manual" for the outdoor unit.
3. Do not install another outdoor unit next to the air outlet direction. Another outdoor unit will suck the airflow from the Wind Guard.
4. The operation noise is slightly increased by attaching a Wind Guard.
5. The Snow Protection Hood should be utilized in a snow covered area.
6. In the case of icing at the air outlet in a cold area, melt ice using lukewarm water (approx. 104°F (40°C)).  
The Wind Guard may be damaged when trying to crack ice with hard blows (such as with a hammer).



### 3.5 Wind Prevention Tool: THS-335A

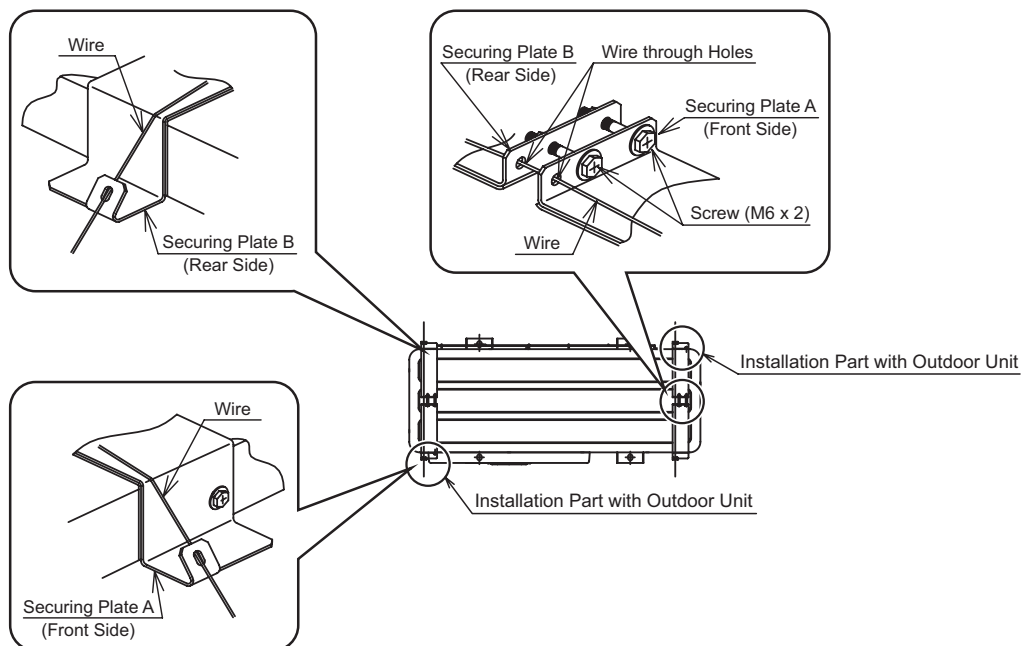
The Wind Prevention Tool should be utilized to prevent the outdoor unit from overturning because of an earthquake, typhoon, etc.

No.	Accessory		Qty.
①	Securing Plate A (Front Side)		2
②	Securing Plate B (Rear Side)	 (with Nut)	2
③	Securing Plate C		4
④	Fastening Fitting		4
⑤	Adjustment Pin		1
⑥	Wire (SUS)	 $\phi 1/16$ inch (2mm) x 66 ft (20m)	1
⑦	Screw (SUS, M6)	 L=1-9/16 inch (40mm) (with Spring Washer and Flat Washer)	4
⑧	Screw (SUS, M5)	 L=13/16 inch (20mm)	2

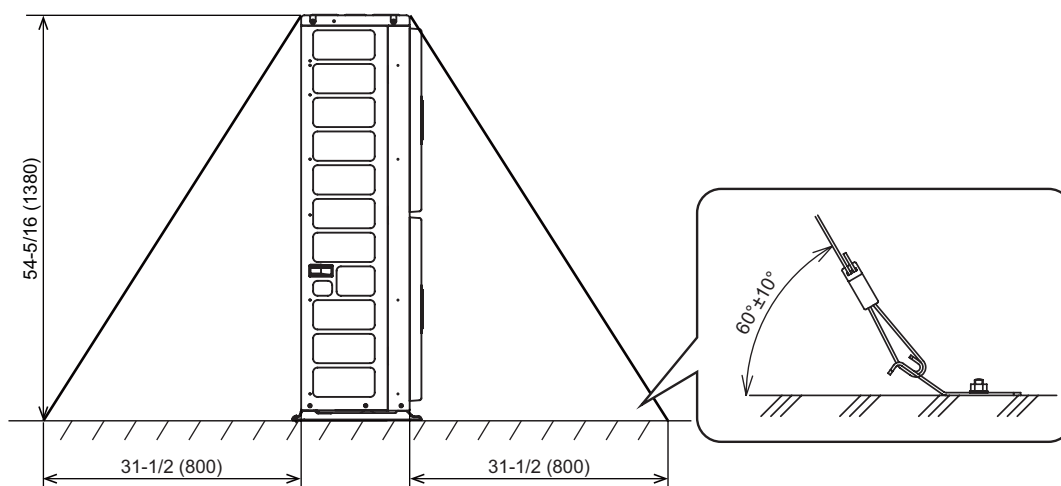
## OPTIONAL PARTS

### < Installation Position >

#### Upper Side View



#### Left Side View



\* The estimated dimensions of installation with a wire angle of 60°.

### Specifications

Model		THS-335A
Item		
Applicable Outdoor Unit Model		036 to 060
Quantity (per outdoor unit)		1
Material		Stainless (SUS304)
Weight	lbs (kg)	4.4 (2.0)
Installation Restriction		<ol style="list-style-type: none"> <li>1. It is not possible to use the wind protection tool along with Airflow Guide.</li> <li>2. If the Snow Protection Hood is installed, Toppling Prevention Tool must be used instead of Wind Prevention Tool.</li> <li>3. Adjust the wire fixing position to prevent interference in case of use in combination with Wind Guard or Protection Net.</li> </ol>

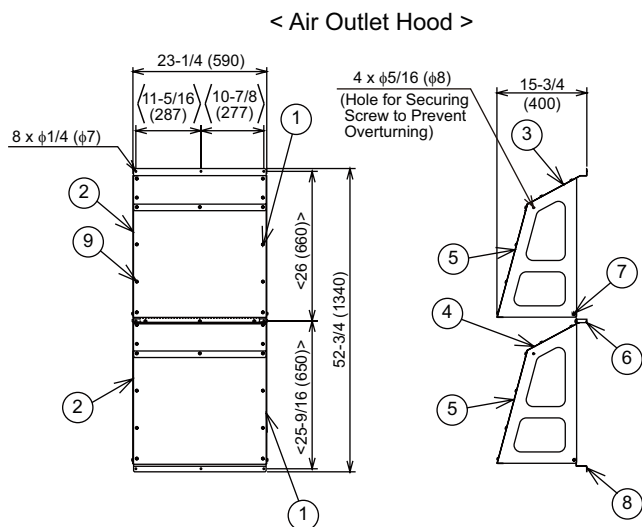
### 3.6 Snow Protection Hood

This Snow Protection Hood prevents snow from entering the outdoor unit and prevents strong winds from blowing against the heat exchanger.

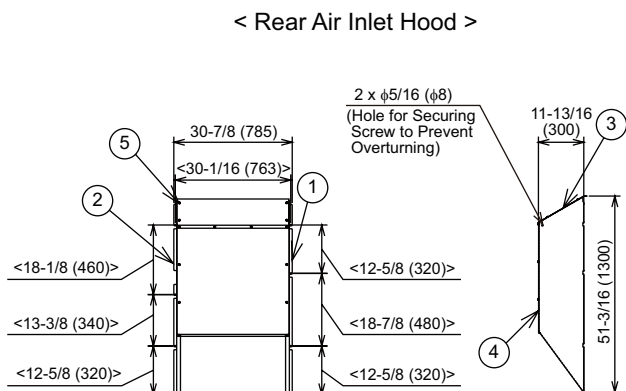
(1) Full Type: ASG-SP11FCS2, ASG-SP11BAS2, ASG-SP11LAS2

inch (mm)

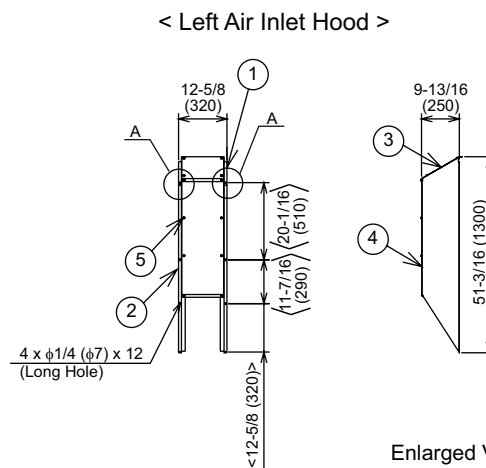
< >: Installation Dimension



No.	Part Name	Qty.
①	Right Plate	2
②	Left Plate	2
③	Front Plate for Upper (Upper)	1
④	Front Plate for Lower (Upper)	1
⑤	Front Plate (Lower)	2
⑥	Installing Stay	1
⑦	Securing Plate for Upper	1
⑧	Securing Plate for Lower	1
⑨	Assembling Screw (Accessory)	33

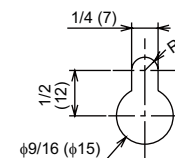


No.	Part Name	Qty.
①	Right Plate	1
②	Left Plate	1
③	Front Plate (Upper)	1
④	Front Plate (Lower)	1
⑤	Assembling Screw (Accessory)	14



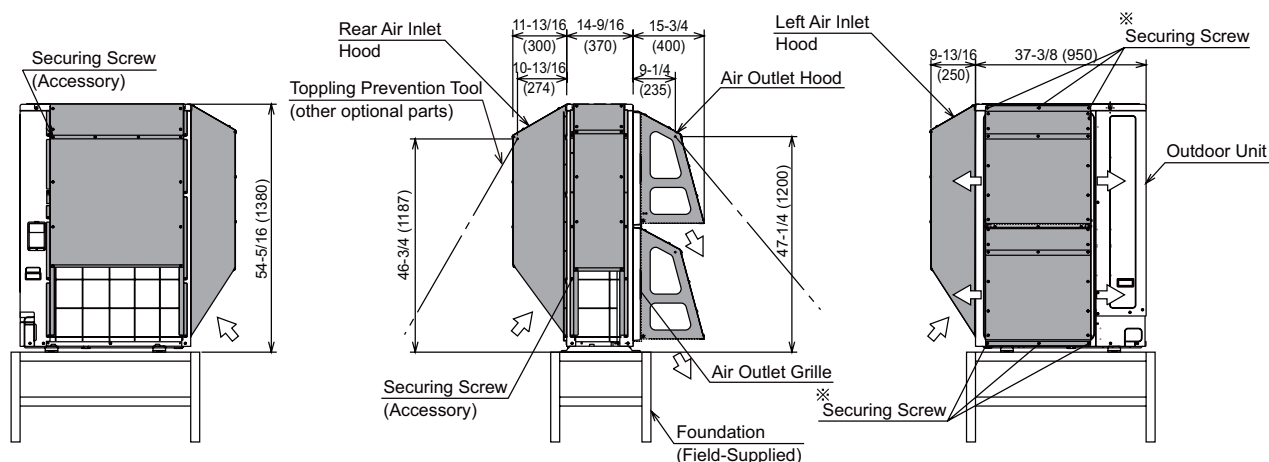
No.	Part Name	Qty.
①	Right Plate	1
②	Left Plate	1
③	Front Plate (Upper)	1
④	Front Plate (Lower)	1
⑤	Assembling Screw (Accessory)	12

Enlarged View of A (Securing Hole)



**< Installation >**

inch (mm)


**NOTE:**

When securing parts (marked ※), the securing screws for upper cover and front cover for air outlet hood should be utilized. Securing screws (accessory) should be utilized to secure others.

**Specifications**

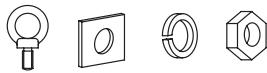
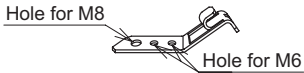


Part Name		Air Outlet Hood	Rear Air Inlet Hood	Left Air Inlet Hood
Model		ASG-SP11FCS2	ASG-SP11BAS2	ASG-SP11LAS2
Item				
Applicable Outdoor Unit Model		036 to 060		
Quantity (per outdoor unit)		1		
Material		Stainless (SUS304)	Stainless (SUS304)	Stainless (SUS304)
Weight	lbs (kg)	28.7 (13.0)	28.7 (13.0)	17.6 (8.0)
Configuration		Assembly on site		
Accessory	Hood	1 (for Upper) 1 (for Lower)	1	1
	Securing Screw [Spare]	M5 (SUS) x L=1/2 inch (12mm) x 4 [2]	M5 (SUS) x L=1/2 inch (12mm) x 7 [2]	M5 (SUS) x L=1/2 inch (12mm) x 10 [2]
	Assembling Screw [Spare]	M5 (SUS) x L=9/16 inch (14mm) x 35 [2]	M5 (SUS) x L=9/16 inch (14mm) x 16 [2]	M5 (SUS) x L=9/16 inch (14mm) x 14 [2]
		Installation Manual		
Installation Restriction		1. It can not be used with the Wind Guard and the Airflow Guide. 2. The installation height of outdoor unit should be considered with snow accumulation. Heighten the foundation or install the frame (higher than snow accumulation). Install the outdoor unit on it and secure using anchor bolts. The service space should be secured with consideration of snow accumulation and snow removal. 3. When multiple outdoor units are installed serially and horizontally, secure a distance of more than 4 in (100mm) between the outdoor units. Do not put any obstacles in the airflow direction. If there are obstacles, a short-circuit will occur or the airflow volume will decrease.		
Cautions		1. Paint touch-up or caulk at screw parts for corrosion prevention (field-supplied). 2. If the outdoor unit is installed in an area where snow blows up from the ground, install a partition (field-supplied). 3. The outdoor unit does not have strength to maintain the Snow Protection Hood from strong winds or earthquake. Attach the stay or Toppling Prevention Tool to protect the Snow Protection Hood from falling.		

**NOTES:**

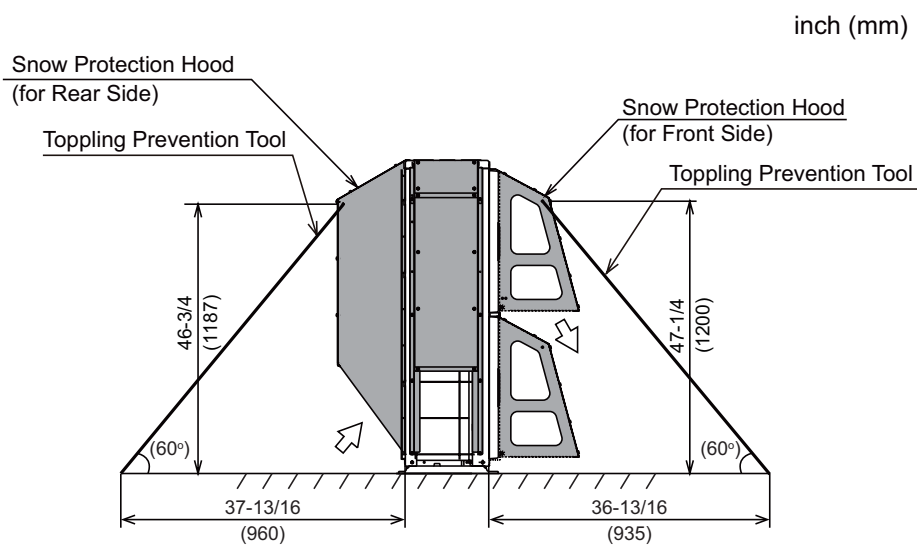
1. This Snow Protection Hood is to prevent snow from entering the outdoor unit.
2. It is assembled onsite. (Securely tighten the screws to assemble. If not, the screws may become loose and cause a vibration.)
3. The operation noise is slightly increased by attaching a Snow Protection Hood.

(2) Toppling Prevention Tool (for Snow Protection Hood attached): ASG-SW20A

The Toppling Prevention Tool should be utilized to prevent the outdoor unit from overturning.  
(It is not possible to use the toppling prevention tool along with the Wind Prevention Tool.)

No.	Accessory		Qty.
①	Eyebolt (SUS, M6)	 (with Square Washer, Spring Washer and Nut)	4 sets for each
②	Securing Plate (SUS)		4
③	Wire (SUS)	 f1/16 inch (2mm) x 66 ft (20m)	1
④	Fastening Fitting		8

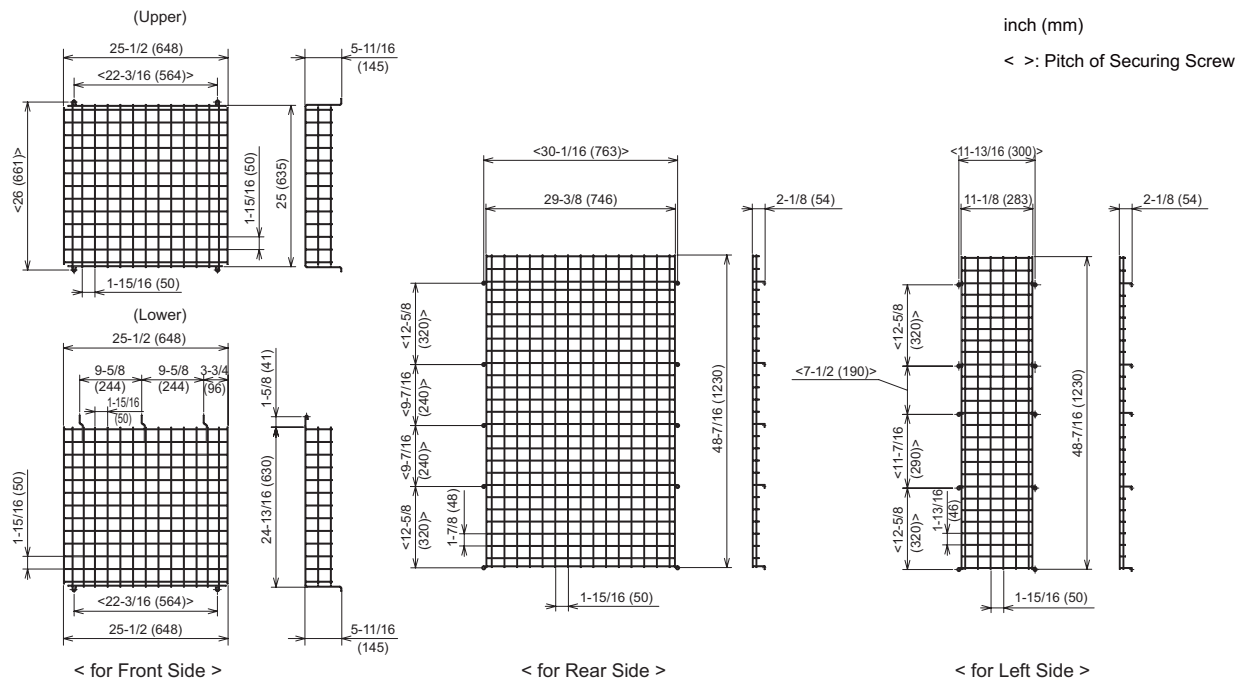
< Installation Position >



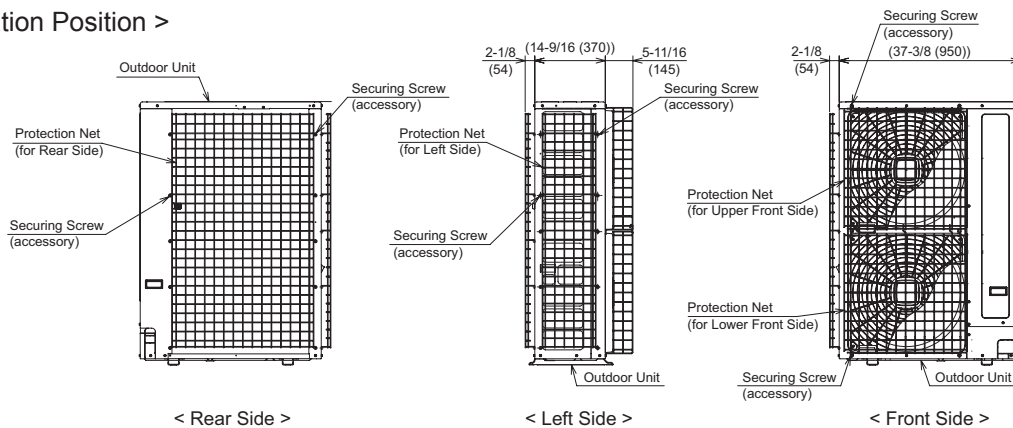
\* The estimated dimensions of installation with a wire angle of 60°.

### 3.7 Protection Net: PN-SP10C1

The Protection Net should be utilized to protect the outdoor unit air outlet grille and heat exchanger from external damages such as being hit by a ball.



#### < Installation Position >



#### Specifications

Model		PN-SP10C1
Item		
Applicable Outdoor Unit Model		036 to 060
Quantity (per outdoor unit)		1
Material		Low Carbon Steel Wire Rods (SWRM)
Color		Beige
Weight	lbs (kg)	23.1 (10.5)
Accessory	Protection Net	for Front Side (Upper): 1 for Front Side (Lower): 1 for Rear Side: 1 for Left Side: 1
	Securing Screw	M5 x L=5/8 inch (16mm) x 24
Installation Restriction		It is not possible to use the Protection Net with Wind Guard and Snow Protection Hood. Remove the existing Protection Net attached to the outdoor unit. (The combination with Airflow Guide is acceptable.)
Cautions		<ol style="list-style-type: none"> <li>The Protection Net is not to prevent human hand intrusion.</li> <li>Be sure to install in correct direction.</li> <li>Remove the existing screws on the outdoor unit, then tighten with the supplied screws (accessories). (Do not tighten with the existing screws. The length will not tighter securely.)</li> <li>When installing for the rear side and left side Protection Net, maintain the extra service space for installation and removal.</li> </ol>

### 3.8 Multi-Kit (Line Branch): MW-NP282A2 and MW-NP282A3

#### < Piping Connection Size >

The ends of the Multi-Kits are finished as shown in the following figures. Cut the end of the pipe to meet with the pipe size.

#### (1) MW-NP282A2

Model	Branch Pipe for Gas Line	Branch Pipe for Liquid Line	Reducer for Liquid Line
MW-NP282A2			<p>Qty.: 2</p>

#### (2) MW-NP282A3

Model	Branch Pipe for Gas Line	Branch Pipe for Liquid Line	Reducer for Liquid Line
MW-NP282A3			<p>Qty.: 2</p>

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

#### NOTE:

Refer to the "Installation Manual for Multi-Kit" for more details.

### 3.9 Multi-Kit (Header Branch): MH-NP224A and MH-NP288A

#### < Piping Connection Size >

The ends of the Multi-Kits are finished as shown in the following figures. Cut the end of the pipe to meet with the pipe size.

Models	Gas Line	Liquid Line	Expander	Closing Pipe
MH-NP224A			(For Gas Line)	<p>Qty.: 2</p>
			(For Liquid Line)	<p>Qty.: 2</p>
MH-NP288A			(For Gas Line)	<p>Qty.: 6</p>
			(For Liquid Line)	<p>Qty.: 6</p>

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

#### NOTE:

Refer to the "Installation Manual for Multi-Kit" for more details.



## 4. Selection Data

### 4.1 Selection Guide

#### (1) Key for Terms Used for Indoor Units

Nomenclature Description		H	I	C4	012	B	2	1	S
H = Hitachi Brand Y = York Brand C = Coleman Brand T = Tag in the Bag	H								
Indoor Unit	I								
Indoor Unit Type C4 = 4-Way Cassette Type C4M = 4-Way Cassette Mini Type C2 = 2-Way Cassette Type C1 = 1-Way Cassette Type DH = Ducted High Static Type DM = Ducted Medium Static Type DS = Ducted Slim Type DE = Ducted EconoFresh Type WM = Wall Mount Type CS = Ceiling Suspended Type FE = Floor Exposed Type FC = Floor Concealed Type	C4								
Capacity (MBH)	012								
Refrigerant Type B = R410A	B								
Power Supply 2 = 208/230Volts - 1Phase - 60Hz	2								
1 = 1st Generation	1								
S = Standard Type	S								

**NOTE:**

Select the indoor units and outdoor unit so the total indoor capacity is near the outdoor capacity.

#### (2) Nominal Capacity of Indoor Units

Capacity		006	008	012	015	018	024	030	036	048
Nominal Cooling Capacity	Btu/h (kW)	6,000 (1.8)	8,000 (2.3)	12,000 (3.5)	15,000 (4.4)	18,000 (5.3)	24,000 (7.0)	30,000 (8.8)	36,000 (10.5)	48,000 (14.1)
Nominal Heating Capacity	Btu/h (kW)	6,700 (2.0)	9,000 (2.6)	13,500 (4.0)	17,000 (5.0)	20,000 (5.9)	27,000 (7.9)	34,000 (10.0)	40,000 (11.7)	54,000 (15.8)

## SELECTION DATA

### (3) Key for Terms Used for Outdoor Unit

Nomenclature Description		H	V	A	HP	036	B	2	1	S
H = Hitachi Brand Y = York Brand C = Coleman Brand	H									
VRF	V									
A = Air Source	A									
HP = Heat Pump	HP									
036=36MBH 048=48MBH 060=60MBH	036									
B = R410A	B									
2 = 208/230Volts - 1Phase - 60Hz	2									
1 = 1st Generation	1									
S = Standard (Factory Options)	S									

### (4) Nominal Capacity of Outdoor Unit

Model		(H,Y,C)VAHP036B21S	(H,Y,C)VAHP048B21S	(H,Y,C)VAHP060B21S
Nominal Cooling Capacity	Btu/h (kW)	36,000 (10.6)	48,000 (14.1)	60,000 (17.6)
Nominal Heating Capacity	Btu/h (kW)	40,000 (11.7)	54,000 (15.8)	64,000 (18.8)

Nominal Capacity of Outdoor Unit is under the condition that the total indoor unit capacity is same as outdoor unit capacity.

## (5) Given Condition (Example)

## ● Estimated Load

Item		Room (1)	Room (2)	Room (3)
Estimated Cooling Load	Btu/h (kW)	11,000 (3.5)	11,000 (3.5)	13,000 (4.4)
Estimated Heating Load	Btu/h (kW)	11,400 (3.3)	11,400 (3.3)	13,700 (4.2)

## ● Temperature Condition

Cooling	Heating
Outdoor Coil Air Inlet Dry Bulb: 100°F (38°C)	Outdoor Coil Air Inlet Dry Bulb: 37°F (2.8°C)
Indoor Coil Air Inlet Dry Bulb: 75°F (24°C)	Indoor Coil Air Inlet Dry Bulb: 68°F (20°C)
Wet Bulb: 63°F (17°C)	Wet Bulb: 35°F (1.7°C)

## ● Altitude Condition: 1000 ft (305m)

Equivalent Piping Length between Indoor Units and Outdoor Unit: 200 ft (61m)

Piping Lift: 25 ft (8m)

Power Supply: 60Hz

## (6) Selecting Matching Indoor Units and Nominal Capacity

## Select Ducted Medium Type Indoor Units (Example)

Item		Room (1)	Room (2)	Room (3)	Total
Selected Model		HIDM015B21S	HIDM015B21S	HIDM018B21S	(1) ~ (3)
Nominal Cooling Capacity	Btu/h (kW)	15,000 (4.4)	15,000 (4.4)	18,000 (5.3)	48,000 (14.1)
Nominal Heating Capacity	Btu/h (kW)	17,000 (5.0)	17,000 (5.0)	20,000 (5.9)	54,000 (15.8)

Item		Outdoor Unit
Selected Model		HVAHP240B31S
Nominal Cooling Capacity	Btu/h (kW)	48,000 (14.1)
Nominal Heating Capacity	Btu/h (kW)	54,000 (15.8)

Connected Indoor Unit Capacity Ratio = 100%

## SELECTION DATA

### (7) Actual Capacity

In the example, the total indoor unit capacity is 48MBH (= 15MBH x 2 + 18MBH), and outdoor unit capacity is 48MBH.

Therefore, the connected indoor unit capacity ratio is 100%.

#### a) Actual Capacity of Outdoor Unit

Maximum Actual Capacity of Outdoor Unit

- = ① Outdoor Unit Capacity According to Temperature Condition and Connected IDU Capacity Ratio
- × ② Correction Factor According to Piping Length and Lift
- × ③ Correction Factor According to Defrosting Operation (only heating)
- × ④ Correction Factor According to Altitude

	①	②	③	④
Cooling	37 MBH	1.00	-	0.97
Heating	49 MBH	0.90	0.87	0.97
Note	Section 4.2	Section 4.3	Section 4.4	Section 4.5

Maximum Actual Capacity of Outdoor Unit

Cooling = 48,000Btu/h × 1.0 × 0.97 = 35,890Btu/h

Heating = 54,000Btu/h × 0.9 × 0.87 × 0.97 = 37,216Btu/h

#### b) Actual Capacity of Each Indoor Unit

Actual Capacity of Each Indoor Unit

= Actual Capacity of Outdoor Unit × Each Indoor Unit Capacity ÷ Summation of Indoor Units Capacity

< Result >

Item			Room (1)	Room (2)	Room (3)	Total
Selected Model			HIDM015B21S	HIDM015B21S	HIDM018B21S	(1) ~ (3)
Actual Capacity	Actual Maximum Cooling Capacity	Btu/h (kW)	11,216 (3.3)	11,216 (3.3)	13,459 (3.9)	35,890 (10.5)
	Actual Maximum Heating Capacity	Btu/h (kW)	11,630 (3.4)	11,630 (3.4)	13,956 (4.1)	37,216 (10.9)
Design Load	Estimated Cooling Load	Btu/h (kW)	11,000 (3.2)	11,000 (3.2)	13,000 (3.8)	35,000 (10.3)
	Estimated Heating Load	Btu/h (kW)	11,400 (3.3)	11,400 (3.3)	13,700 (4.0)	36,500 (10.7)

## 4.2 Outdoor Unit Capacity According to Temperature Condition and Connected IDU Capacity Ratio

### (1) Cooling Capacity

(H,Y,C)VAHP036B21S

Conne- ction ratio	Outdoor air temp	Indoor air temp. °FDB																Conne- ction ratio	Outdoor air temp	Indoor air temp. °FWB																																			
		59		61		63		65		67		69		71		73				59		61		63		65		67		69		71		73																					
		TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP			TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP																						
130	%	°FDB																																%	°FDB																				
	23	26.7	2.84	30.4	2.83	34.1	2.82	37.9	2.81	41.6	2.80	42.9	2.85	44.1	2.90	45.4	2.94	23	21.1	1.96	24.0	1.95	27.0	1.95	29.9	1.94	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03	23	21.1	1.96	24.0	1.95	27.0	1.95	29.9	1.94	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03				
	32	26.7	2.74	30.4	2.75	34.1	2.77	37.9	2.79	41.6	2.80	42.9	2.85	44.1	2.90	45.4	2.94	32	21.1	1.89	24.0	1.90	27.0	1.91	29.9	1.92	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03	32	21.1	1.89	24.0	1.90	27.0	1.91	29.9	1.92	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03				
	42	26.7	2.62	30.4	2.67	34.1	2.71	37.9	2.76	41.6	2.80	42.9	2.85	44.1	2.90	45.4	2.94	42	21.1	1.81	24.0	1.84	27.0	1.87	29.9	1.90	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03	42	21.1	1.81	24.0	1.84	27.0	1.87	29.9	1.90	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03				
	50	26.7	2.53	30.4	2.60	34.1	2.67	37.9	2.74	41.6	2.80	42.9	2.85	44.1	2.90	45.4	2.95	50	21.1	1.74	24.0	1.79	27.0	1.84	29.9	1.88	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03	50	21.1	1.74	24.0	1.79	27.0	1.84	29.9	1.88	32.9	1.93	33.8	1.96	34.8	2.00	35.8	2.03				
	54	26.7	2.50	30.4	2.58	34.1	2.65	37.9	2.73	41.6	2.80	42.9	2.85	44.1	2.90	45.4	2.96	54	21.1	1.72	24.0	1.77	27.0	1.83	29.9	1.88	32.9	1.93	33.8	1.97	34.8	2.00	35.8	2.04	54	21.1	1.72	24.0	1.77	27.0	1.83	29.9	1.88	32.9	1.93	33.8	1.97	34.8	2.00	35.8	2.04				
	58	26.7	2.47	30.4	2.55	34.1	2.63	37.9	2.72	41.6	2.80	42.9	2.86	44.1	2.91	45.4	2.96	58	21.1	1.70	24.0	1.76	27.0	1.82	29.9	1.87	32.9	1.93	33.8	1.97	34.8	2.00	35.8	2.04	58	21.1	1.70	24.0	1.76	27.0	1.82	29.9	1.87	32.9	1.93	33.8	1.97	34.8	2.00	35.8	2.04				
	62	26.7	2.43	30.4	2.53	34.1	2.62	37.9	2.71	41.6	2.80	42.9	2.86	44.1	2.91	45.4	2.97	62	21.1	1.68	24.0	1.74	27.0	1.80	29.9	1.87	32.9	1.93	33.8	1.97	34.8	2.01	35.8	2.04	62	21.1	1.68	24.0	1.74	27.0	1.80	29.9	1.87	32.9	1.93	33.8	1.97	34.8	2.01	35.8	2.04				
	66	26.7	2.40	30.4	2.50	34.1	2.60	37.9	2.70	41.6	2.80	42.9	2.86	44.1	2.92	45.4	2.97	66	21.1	1.65	24.0	1.72	27.0	1.79	29.9	1.86	32.9	1.93	33.8	1.97	34.8	2.01	35.8	2.05	66	21.1	1.65	24.0	1.72	27.0	1.79	29.9	1.86	32.9	1.93	33.8	1.97	34.8	2.01	35.8	2.05				
	70	26.7	2.36	30.4	2.47	34.1	2.58	37.9	2.69	41.6	2.80	42.9	2.86	44.1	2.92	45.4	2.98	70	21.1	1.63	24.0	1.70	27.0	1.78	29.9	1.86	32.9	1.93	33.8	1.97	34.8	2.01	35.8	2.05	70	21.1	1.63	24.0	1.70	27.0	1.78	29.9	1.86	32.9	1.93	33.8	1.97	34.8	2.01	35.8	2.05				
	74	26.7	2.35	30.4	2.47	34.1	2.60	37.9	2.73	41.5	2.86	42.8	2.92	44.1	2.98	45.4	3.04	74	21.1	1.62	24.0	1.71	26.9	1.79	29.9	1.88	32.8	1.97	33.8	2.01	34.8	2.05	35.8	2.09	74	21.1	1.62	24.0	1.71	26.9	1.81	29.8	1.91	32.7	2.01	33.7	2.05	34.8	2.09	35.8	2.13				
	78	26.7	2.33	30.4	2.48	34.1	2.62	37.8	2.77	41.4	2.97	42.7	3.03	44.0	3.09	45.4	3.15	78	21.1	1.59	24.0	1.71	26.9	1.82	29.8	1.94	32.7	2.05	33.7	2.09	34.7	2.13	34.7	2.17	35.7	2.21	78	21.1	1.59	24.0	1.71	26.9	1.82	29.8	1.94	32.7	2.05	33.7	2.09	34.7	2.13	34.7	2.17	35.7	2.21
	82	26.7	2.31	30.3	2.48	34.0	2.64	37.7	2.81	41.3	3.03	42.6	3.09	44.0	3.15	45.4	3.20	82	21.1	1.58	23.9	1.71	26.8	1.84	29.7	1.96	32.6	2.09	33.7	2.13	34.7	2.17	35.8	2.21	82	21.1	1.58	23.9	1.71	26.8	1.84	29.7	1.96	32.6	2.09	33.7	2.13	34.7	2.17	35.8	2.21				
	86	26.7	2.28	30.3	2.48	33.9	2.68	37.6	2.89	41.2	3.09	42.6	3.15	44.0	3.20	45.4	3.26	86	21.1	1.57	23.9	1.71	26.8	1.85	29.7	1.99	32.6	2.13	33.6	2.17	34.7	2.21	35.8	2.25	86	21.1	1.57	23.9	1.71	26.8	1.85	29.7	1.99	32.6	2.13	33.6	2.17	34.7	2.21	35.8	2.25				
	90	26.7	2.23	30.3	2.46	33.9	2.68	37.5	2.91	41.1	3.12	42.5	3.18	43.9	3.24	45.4	3.29	90	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32	90	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32				
95	26.7	2.18	30.3	2.43	33.9	2.68	37.5	2.93	41.0	3.16	42.5	3.21	43.9	3.27	45.4	3.33	95	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32	95	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32					
100	25.5	2.11	29.5	2.40	33.9	2.68	37.4	2.96	41.0	3.20	42.5	3.25	43.9	3.31	45.4	3.36	100	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32	100	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32					
106	23.4	1.83	26.5	2.02	29.7	2.21	32.8	2.39	36.0	2.58	37.3	2.63	38.5	2.67	39.8	2.72	106	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32	106	21.1	1.56	23.9	1.72	26.7	1.88	29.6	2.04	32.6	2.20	33.5	2.24	34.7	2.28	35.8	2.32					
110	21.6	1.19	24.1	1.27	26.7	1.25	29.1	1.43	31.5	1.50	32.5	2.46	33.5	2.44	34.6	2.48	110	21.1	2.05	23.6	2.13	26.0	2.19	28.3	2.26	30.7	2.32	31.6	2.28	32.5	2.25	33.5	2.29	110	21.1	2.05	23.6	2.13	26.0	2.19	28.3	2.26	30.7	2.32	31.6	2.28	32.5	2.25	33.5	2.29					
114	19.9	2.33	21.7	2.31	23.5	2.29	25.3	2.27	27.1	2.25	27.8	2.16	28.6	2.08	29.3	2.12	114	19.9	2.27	21.7	2.25	23.5	2.23	25.3	2.21	27.1	2.19	27.8	2.10	28.6	2.02	29.3	2.06	114	19.9	2.27	21.7	2.25	23.5	2.23	25.3	2.21	27.1	2.19	27.8	2.10	28.6	2.02	29.3	2.06					
120	23	25.6	2.64	29.2	2.63	32.8	2.62	36.4	2.61	40.0	2.60	41.2	2.64	42.4	2.69	43.6	2.73	80	23	18.7	1.69	21.3	1.69	24.0	1.68	26.6	1.67	29.2	1.67	30.1	1.70	30.9	1.72	31.8	1.75	70	23	16.4	1.45	18.7	1.44	21.0	1.44	23.3	1.43	25.6	1.43	28.3	1.45	27.1	1.47	27.8	1.50		
	32	25.6	2.54	29.2	2.55	32.8	2.57	36.4	2.56	40.0	2.60	41.2	2.64	42.4	2.69	43.6	2.73		32	18.7	1.63	21.3	1.64	24.0	1.65	26.6	1.66	29.2	1.67	30.1	1.70	30.9	1.72	31.8	1.75		32	16.4	1.39	18.7	1.40	21.0	1.41	23.3	1.42	25.6	1.43	28.3	1.45	27.1	1.47	27.8	1.50		
	42	25.6	2.43	29.2	2.47	32.8	2.51	36.4	2.56	40.0	2.60	41.2	2.64	42.4	2.69	43.6	2.73		42	18.7	1.56	21.3	1.59	24.0	1.61	26.6	1.64	29.2	1.67	30.1	1.70	30.9	1.72	31.8	1.75		42	16.4	1.33	18.7	1.36	21.0	1.38	23.3	1.40	25.6	1.43	28.3	1.45	27.1	1.47	27.8	1.50		
	50	25.6	2.35	29.2	2.41	32.8	2.47	36.4	2.54	40.0	2.60	41.2	2.65	42.4	2.69	43.6	2.74		50	18.7	1.51	21.3	1.55	24.0	1.59	26.6	1.63	29.2	1.67	30.1	1.70	30.9	1.73	31.8	1.76		50	16.4	1.29	18.7	1.32	21.0	1.36	23.3	1.39	25.6	1.43	28.3	1.45	27.1	1.48	27.8	1.50		
	54	25.6	2.32	29.2	2.39	32.8	2.46	36.4	2.53	40.0	2.60	41.2	2.65	42.4	2.69	43.6	2.74		54	18.7	1.49	21.3	1.53	24.0	1.58	26.6	1.62	29.2	1.67	30.1	1.70	30.9	1.73	31.8	1.76		54	16.4	1.27	18.7	1.31	21.0	1.35	23.3	1.39	25.6	1.43	28.3	1.45	27.1	1.48	27.8	1.50		
	58	25.6	2.29	29.2	2.37	32.8	2.44	36.4	2.52	40.0	2.60	41.2	2.65	42.4																																									

## SELECTION DATA

(H,Y,C)VAHP048B21S

Con- nection ratio	Outdoor air temp	Indoor air temp. °FWB																Con- nection ratio	Outdoor air temp	Indoor air temp. °FWB																															
		59		61		63		65		67		69		71		73				59		61		63		65		67		69		71		73																	
		TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP			TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP																		
%	°FDB	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	%	°FDB	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	%	°FDB	MBH	kW	MBH	kW	MBH	kW										
130	23	34.3	3.11	43.2	4.04	47.0	4.20	50.9	4.38	54.7	4.50	58.8	4.50	58.8	4.50	60.8	4.50	23	27.0	2.14	34.1	2.78	37.1	2.89	40.2	3.00	43.2	3.10	44.8	3.10	46.4	3.10	48.0	3.10	23	27.0	2.14	34.1	2.78	37.1	2.89	40.2	3.00	43.2	3.10	44.8	3.10	46.4	3.10	48.0	3.10
	32	34.3	3.12	43.2	4.04	47.0	4.21	50.9	4.38	54.7	4.54	58.8	4.59	58.8	4.64	60.8	4.64	32	27.0	2.15	34.1	2.78	37.1	2.90	40.2	3.02	43.2	3.13	44.8	3.16	46.4	3.16	48.0	3.16	32	27.0	2.15	34.1	2.78	37.1	2.90	40.2	3.02	43.2	3.13	44.8	3.16	46.4	3.16	48.0	3.16
	42	34.3	3.13	43.2	4.04	47.0	4.22	50.9	4.41	54.7	4.59	58.8	4.69	58.8	4.79	60.8	4.79	42	27.0	2.15	34.1	2.78	37.1	2.91	40.2	3.04	43.2	3.16	44.8	3.23	46.4	3.30	48.0	3.30	42	27.0	2.15	34.1	2.78	37.1	2.91	40.2	3.04	43.2	3.16	44.8	3.23	46.4	3.30	48.0	3.30
	50	34.3	3.14	43.2	4.06	47.0	4.25	50.9	4.43	54.7	4.62	58.8	4.76	58.8	4.90	60.8	4.90	50	27.0	2.16	34.1	2.79	37.1	2.92	40.2	3.05	43.2	3.18	44.8	3.28	46.4	3.37	48.0	3.38	50	27.0	2.16	34.1	2.79	37.1	2.92	40.2	3.05	43.2	3.18	44.8	3.28	46.4	3.37	48.0	3.38
	54	34.3	3.15	43.2	4.07	47.0	4.26	50.9	4.45	54.7	4.63	58.8	4.79	58.8	4.94	60.8	4.95	54	27.0	2.17	34.1	2.80	37.1	2.93	40.2	3.06	43.2	3.19	44.8	3.30	46.4	3.40	48.0	3.41	54	27.0	2.17	34.1	2.80	37.1	2.93	40.2	3.06	43.2	3.19	44.8	3.30	46.4	3.40	48.0	3.41
	58	34.3	3.16	43.2	4.08	47.0	4.27	50.9	4.46	54.7	4.65	58.8	4.81	58.8	4.98	60.8	4.99	58	27.0	2.18	34.1	2.81	37.1	2.94	40.2	3.07	43.2	3.20	44.8	3.32	46.4	3.43	48.0	3.44	58	27.0	2.18	34.1	2.81	37.1	2.94	40.2	3.07	43.2	3.20	44.8	3.32	46.4	3.43	48.0	3.44
	62	34.3	3.17	43.2	4.09	47.0	4.28	50.9	4.47	54.7	4.66	58.8	4.84	58.8	5.02	60.8	5.03	62	27.0	2.18	34.1	2.82	37.1	2.95	40.2	3.08	43.2	3.21	44.8	3.34	46.4	3.46	48.0	3.47	62	27.0	2.18	34.1	2.82	37.1	2.95	40.2	3.08	43.2	3.21	44.8	3.34	46.4	3.46	48.0	3.47
	66	34.3	3.18	43.2	4.10	47.0	4.29	50.9	4.48	54.7	4.67	58.8	4.87	58.8	5.07	60.8	5.08	66	27.0	2.19	34.1	2.83	37.1	2.96	40.2	3.09	43.2	3.22	44.8	3.35	46.4	3.48	48.0	3.50	66	27.0	2.19	34.1	2.83	37.1	2.96	40.2	3.09	43.2	3.22	44.8	3.35	46.4	3.48	48.0	3.50
	70	34.3	3.19	43.2	4.12	47.0	4.31	50.9	4.50	54.7	4.69	58.8	4.90	58.8	5.07	60.9	5.07	70	27.0	2.19	34.1	2.84	37.1	2.97	40.2	3.10	43.2	3.23	44.8	3.37	46.4	3.52	48.0	3.53	70	27.0	2.19	34.1	2.84	37.1	2.97	40.2	3.10	43.2	3.23	44.8	3.37	46.4	3.52	48.0	3.53
	74	34.3	3.20	43.2	4.13	47.0	4.32	50.9	4.51	54.7	4.70	58.8	4.93	58.2	5.09	60.1	5.09	74	27.0	2.20	34.1	2.85	37.1	2.98	40.2	3.11	43.2	3.24	44.8	3.40	46.4	3.55	48.0	3.56	74	27.0	2.20	34.1	2.85	37.1	2.98	40.2	3.11	43.2	3.24	44.8	3.40	46.4	3.55	48.0	3.56
	78	34.3	3.20	43.2	4.14	47.0	4.33	50.9	4.52	54.7	4.72	58.8	4.96	57.8	5.09	59.6	5.09	78	27.0	2.21	34.1	2.85	37.1	2.99	40.2	3.12	43.2	3.25	44.8	3.42	46.4	3.59	48.0	3.60	78	27.0	2.21	34.1	2.85	37.1	2.99	40.2	3.12	43.2	3.25	44.8	3.42	46.4	3.59	48.0	3.60
	82	34.3	3.21	43.2	4.16	47.0	4.35	50.9	4.54	54.7	4.73	58.8	4.99	57.3	5.09	59.1	5.09	82	27.0	2.21	34.1	2.86	37.1	2.99	40.2	3.13	43.2	3.26	44.8	3.44	46.4	3.62	48.0	3.63	82	27.0	2.21	34.1	2.86	37.1	2.99	40.2	3.13	43.2	3.26	44.8	3.44	46.4	3.62	48.0	3.63
	86	34.3	3.22	43.2	4.17	47.0	4.36	50.9	4.55	54.7	4.74	58.8	5.02	56.9	5.09	58.7	5.09	86	27.0	2.22	34.1	2.87	37.1	3.00	40.2	3.14	43.2	3.27	44.8	3.46	46.4	3.65	48.0	3.66	86	27.0	2.22	34.1	2.87	37.1	3.00	40.2	3.14	43.2	3.27	44.8	3.46	46.4	3.65	48.0	3.66
	90	34.3	3.23	43.2	4.18	47.0	4.37	50.9	4.57	54.7	4.76	58.8	5.05	56.5	5.09	58.2	5.09	90	27.0	2.23	34.1	2.88	37.1	3.01	40.2	3.15	43.2	3.28	44.8	3.48	46.4	3.69	48.0	3.70	90	27.0	2.23	34.1	2.88	37.1	3.01	40.2	3.15	43.2	3.28	44.8	3.48	46.4	3.69	48.0	3.70
	95	34.3	3.24	43.2	4.19	47.0	4.38	50.9	4.57	54.7	4.73	58.8	5.07	56.3	5.09	58.0	5.09	95	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74	95	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74
	100	34.3	3.24	43.2	4.19	47.0	4.38	50.9	4.58	54.7	4.71	58.8	5.08	56.1	5.09	57.8	5.09	100	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74	100	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74
106	34.3	3.24	43.2	4.20	47.0	4.39	50.9	4.58	54.7	4.67	58.8	5.09	55.9	5.09	57.6	5.09	106	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74	106	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74	
110	30.0	2.62	37.8	3.39	41.1	3.54	44.6	3.70	48.0	3.86	49.8	4.11	51.6	4.37	53.3	4.38	110	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74	110	27.0	2.24	34.1	2.89	37.1	3.03	40.2	3.16	43.2	3.29	44.8	3.51	46.4	3.73	48.0	3.74	
114	25.9	2.80	31.6	3.28	35.1	3.43	38.6	3.58	42.1	3.73	43.5	3.86	44.9	3.98	46.3	4.01	114	25.1	2.58	30.4	2.98	33.9	3.14	37.4	3.30	42.0	3.63	42.2	3.57	43.6	3.68	44.9	3.70	114	25.1	2.58	30.4	2.98	33.9	3.14	37.4	3.30	42.0	3.63	42.2	3.57	43.6	3.68	44.9	3.70	
118	21.8	2.68	25.4	3.28	29.0	3.02	32.5	3.19	36.1	3.36	37.2	3.38	38.2	3.40	39.3	3.42	118	21.8	2.68	25.4	2.77	29.0	2.93	32.5	3.10	36.1	3.27	37.2	3.29	38.2	3.31	39.3	3.33	118	21.8	2.68	25.4	2.77	29.0	2.93	32.5	3.10	36.1	3.27	37.2	3.29	38.2	3.31	39.3	3.33	
120	23	32.9	2.88	41.5	3.75	45.2	3.89	48.9	4.03	52.6	4.18	54.5	4.18	56.5	4.18	58.4	4.18	23	24.0	1.85	30.3	2.41	33.0	2.50	35.7	2.59	38.4	2.68	39.8	2.68	41.3	2.68	42.6	2.68	23	24.0	1.85	30.3	2.41	33.0	2.51	35.7	2.60	38.4	2.70	39.8	2.70	41.3	2.70	42.6	2.70
	32	32.9	2.89	41.5	3.75	45.2	3.90	48.9	4.03	52.6	4.22	54.5	4.26	56.5	4.26	58.4	4.26	32	24.0	1.86	30.3	2.41	33.0	2.51	35.7	2.60	38.4	2.70	39.8	2.70	41.3	2.70	42.6	2.70	32	24.0	1.86	30.3	2.41	33.0	2.51	35.7	2.60	38.4	2.70	39.8	2.70	41.3	2.70	42.6	2.70
	42	32.9	2.90	41.5	3.75	45.2	3.92	48.9	4.09	52.6	4.26	54.5	4.35	56.5	4.44	58.4	4.44	42	24.0	1.86	30.3	2.41	33.0	2.51	35.7	2.62	38.4	2.73	39.8	2.73	41.3	2.73	42.6	2.73	42	24.0	1.86	30.3	2.41	33.0	2.51	35.7	2.62	38.4	2.73	39.8	2.73	41.3	2.73	42.6	2.73
	50	32.9	2.91	41.5	3.76	45.2																																													

## (H,Y,C)VAHP060B21S

Conne- ction ratio	Outdoor air temp	Indoor air temp. °F/WB																Conne- ction ratio	Outdoor air temp	Indoor air temp. °F/WB															
		59		61		63		65		67		69		71		73				59		61		63		65		67		69		71		73	
		TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP			TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP		
%	°F/DB	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	%	°F/DB	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW		
105	23	36.6	2.79	42.1	3.52	48.6	4.09	55.0	4.67	60.0	5.09	60.6	5.09	61.1	5.09	61.5	5.09	70	23	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.88	42.0	3.24	42.4	3.24	42.9	3.25	42.9	3.23
	32	36.6	2.79	42.1	3.52	48.6	4.09	55.0	4.67	60.0	5.09	60.6	5.09	61.1	5.09	61.5	5.09		32	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.88	42.0	3.24	42.4	3.24	42.9	3.25	42.9	3.23
	42	36.6	2.79	42.1	3.52	48.6	4.09	55.0	4.67	60.0	5.09	60.6	5.09	61.1	5.09	61.5	5.09		42	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.24	42.4	3.25	42.9	3.25	42.9	3.24
	50	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.67	59.9	5.09	60.5	5.09	61.1	5.09	61.4	5.09		50	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.24
	54	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.3	5.09		54	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.24
	58	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.3	5.09		58	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.24
	62	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.3	5.09		62	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.24
	66	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.3	5.09		66	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	70	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.2	5.09		70	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	74	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.2	5.09		74	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	78	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.2	5.09		78	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	82	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.2	5.09		82	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	86	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.5	5.09	61.1	5.09	61.2	5.09		86	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	90	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	59.9	5.09	60.6	5.09	61.3	5.09	61.5	5.09		90	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.25	42.4	3.25	42.9	3.25	42.9	3.25
	100	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	57.6	5.09	58.5	5.09	59.3	5.09	59.8	5.09		100	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.40	42.4	3.39	42.9	3.38	42.9	3.35
	106	36.6	2.79	42.1	3.52	48.6	4.10	55.0	4.68	54.7	5.09	55.6	5.09	56.6	5.09	57.5	5.09		106	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.63	42.4	3.60	42.9	3.56	42.9	3.50
	110	35.7	2.68	41.1	3.39	47.4	3.95	53.7	4.51	53.6	5.07	54.3	5.03	55.1	5.00	55.8	4.97		110	25.0	1.72	28.8	2.17	33.2	2.53	37.6	2.89	42.0	3.72	42.4	3.68	42.9	3.65	42.9	3.57
	114	31.1	2.89	34.8	3.27	38.9	3.59	43.0	3.90	43.4	4.22	47.3	4.44	50.0	4.63	52.5	4.78		114	25.0	2.16	28.8	2.53	33.2	2.88	37.6	3.24	42.0	3.93	42.4	3.79	42.9	3.75	42.9	3.68
	118	26.8	2.85	29.3	2.99	31.7	3.12	34.1	3.26	36.5	3.40	40.7	3.77	45.0	4.14	49.2	4.50		118	25.0	2.56	28.8	2.86	31.7	3.05	34.1	3.18	36.5	3.32	40.7	3.68	42.9	3.82	42.9	3.75
	100	23	35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.03	60.6	5.04	61.3	5.05	61.3		5.02	60	23	21.4	1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.74	36.8	2.75
32		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.03	60.6	5.04	61.3	5.05	61.3	5.02	32	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.74	36.8	2.75	36.8	2.73
42		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.04	60.6	5.04	61.3	5.05	61.3	5.03	42	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.74	36.8	2.75	36.8	2.74
50		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.04	60.6	5.04	61.3	5.05	61.3	5.03	50	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.74	36.8	2.75	36.8	2.74
54		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.04	60.6	5.05	61.3	5.05	61.3	5.03	54	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.75	36.8	2.75	36.8	2.74
58		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.04	60.6	5.05	61.3	5.05	61.3	5.04	58	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.75	36.8	2.75	36.8	2.74
62		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.04	60.6	5.05	61.3	5.05	61.3	5.04	62	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.74	36.4	2.75	36.8	2.75	36.8	2.74
66		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.04	66	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.74
70		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.04	70	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.74
74		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.05	74	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.74
78		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.05	78	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.75
82		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.05	82	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.75
86		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.05	86	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.75
90		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	60.0	5.05	60.6	5.05	61.3	5.05	61.3	5.05	90	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.75	36.4	2.75	36.8	2.75	36.8	2.75
100		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	57.8	5.05	58.4	5.04	59.1	5.03	59.4	5.01	100	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	2.87	36.4	2.86	36.8	2.85	36.8	2.83
106		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	54.8	5.05	55.5	5.02	56.2	5.00	56.9	4.97	106	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44	36.0	3.06	36.4	3.03	36.8	3.00	36.8	2.95
110		35.7	2.67	41.1	3.38	47.4	3.93	53.7	4.49	51.6	5.03	52.3	4.99	53.0	4.96	53.7	4.93	110	21.4		1.46	24.7	1.84	28.4	2.14	32.2	2.44								



## SELECTION DATA

## (2) Heating Capacity

(H,Y,C)VAHP036B21S

Connection ratio	Outdoor air temp	Indoor air temp. °FDB																Connection ratio	Outdoor air temp	Indoor air temp. °FDB																															
		59		63		66		68		70		74		77		81				59		63		66		68		70		74		77		81																	
		TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP			TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP																
%	°FWB	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	%	°FWB	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW																
130	-4	24.6	2.89	24.3	3.02	24.1	3.12	23.9	3.18	23.8	3.25	23.4	3.42	23.2	3.55	22.8	3.73	-4	24.6	3.57	24.3	3.74	24.1	3.86	23.9	3.94	23.8	4.02	23.4	4.23	23.2	4.40	22.8	4.62	-4	24.6	3.57	24.3	3.74	24.1	3.86	23.9	3.94	23.8	4.02	23.4	4.23	23.2	4.40	22.8	4.62
	-1	25.6	2.73	25.3	2.85	25.0	2.94	24.9	3.00	24.7	3.06	24.3	3.24	24.0	3.37	23.6	3.54	-1	25.4	3.39	25.1	3.54	24.9	3.65	24.7	3.73	24.6	3.80	24.2	4.03	24.0	4.20	23.6	4.42	-1	25.4	3.39	25.1	3.54	24.9	3.65	24.7	3.73	24.6	3.80	24.2	4.03	24.0	4.20	23.6	4.42
	3	26.8	2.51	26.5	2.62	26.3	2.71	26.2	2.76	26.0	2.82	25.5	2.99	25.1	3.11	24.6	3.28	3	26.4	3.14	26.1	3.28	25.9	3.39	25.7	3.46	25.6	3.52	25.2	3.75	25.0	3.93	24.7	4.17	3	26.4	3.14	26.1	3.28	25.9	3.39	25.7	3.46	25.6	3.52	25.2	3.75	25.0	3.93	24.7	4.17
	7	28.1	2.29	27.8	2.40	27.6	2.47	27.4	2.52	27.2	2.58	26.7	2.74	26.2	2.86	25.6	3.02	7	27.5	2.90	27.2	3.03	26.9	3.13	26.8	3.19	26.6	3.25	26.3	3.48	26.0	3.66	25.7	3.91	7	27.5	2.90	27.2	3.03	26.9	3.13	26.8	3.19	26.6	3.25	26.3	3.48	26.0	3.66	25.7	3.91
	11	29.3	2.07	29.1	2.17	28.9	2.24	28.7	2.28	28.6	2.33	27.9	2.49	27.4	2.61	26.7	2.76	11	28.5	2.67	28.2	2.78	28.0	2.87	27.8	2.92	27.7	2.98	27.3	3.22	27.1	3.40	26.7	3.65	11	28.5	2.67	28.2	2.78	28.0	2.87	27.8	2.92	27.7	2.98	27.3	3.22	27.1	3.40	26.7	3.65
	15	30.6	1.85	30.3	1.94	30.2	2.00	30.0	2.04	29.9	2.08	29.1	2.24	28.5	2.35	27.7	2.50	15	29.6	2.44	29.3	2.54	29.0	2.62	28.9	2.67	28.7	2.72	28.4	2.95	28.1	3.13	27.8	3.39	15	29.6	2.44	29.3	2.54	29.0	2.62	28.9	2.67	28.7	2.72	28.4	2.95	28.1	3.13	27.8	3.39
	19	32.0	1.80	31.8	1.88	31.6	1.94	31.5	1.98	31.3	2.02	30.6	2.16	30.0	2.27	29.3	2.41	19	30.6	2.35	30.3	2.45	30.1	2.53	29.9	2.58	29.8	2.63	29.4	2.84	29.2	3.00	28.8	3.22	19	30.6	2.35	30.3	2.45	30.1	2.53	29.9	2.58	29.8	2.63	29.4	2.84	29.2	3.00	28.8	3.22
	23	33.5	1.74	33.2	1.82	33.0	1.88	32.9	1.92	32.8	1.96	32.1	2.08	31.6	2.18	30.9	2.31	23	31.6	2.26	31.3	2.36	31.1	2.44	30.9	2.49	30.8	2.54	30.5	2.72	30.2	2.87	29.9	3.06	23	31.6	2.26	31.3	2.36	31.1	2.44	30.9	2.49	30.8	2.54	30.5	2.72	30.2	2.87	29.9	3.06
	27	35.0	1.68	34.7	1.76	34.5	1.81	34.3	1.85	34.2	1.89	33.6	2.01	33.1	2.09	32.5	2.21	27	32.7	2.18	32.4	2.28	32.1	2.35	32.0	2.40	31.8	2.45	31.5	2.62	31.3	2.74	30.9	2.92	27	32.7	2.18	32.4	2.28	32.1	2.35	32.0	2.40	31.8	2.45	31.5	2.62	31.3	2.74	30.9	2.92
	31	36.5	1.62	36.2	1.69	35.9	1.75	35.8	1.79	35.6	1.83	35.1	1.93	34.7	2.01	34.1	2.11	31	33.7	2.10	33.4	2.20	33.2	2.27	33.0	2.32	32.9	2.37	32.5	2.51	32.3	2.62	32.0	2.77	31	33.7	2.10	33.4	2.20	33.2	2.27	33.0	2.32	32.9	2.37	32.5	2.51	32.3	2.62	32.0	2.77
	35	37.9	1.56	37.6	1.63	37.4	1.69	37.2	1.73	37.1	1.76	36.6	1.85	36.2	1.92	35.8	2.01	35	34.7	2.03	34.4	2.12	34.2	2.19	34.1	2.24	33.9	2.29	33.6	2.41	33.3	2.51	33.0	2.64	35	34.7	2.03	34.4	2.12	34.2	2.19	34.1	2.24	33.9	2.29	33.6	2.41	33.3	2.51	33.0	2.64
	39	39.4	1.50	39.1	1.57	38.9	1.63	38.7	1.66	38.5	1.70	38.1	1.78	37.8	1.83	37.4	1.91	39	35.8	1.95	35.5	2.05	35.3	2.12	35.1	2.16	35.0	2.21	34.6	2.32	34.4	2.40	34.1	2.51	39	35.8	1.95	35.5	2.05	35.3	2.12	35.1	2.16	35.0	2.21	34.6	2.32	34.4	2.40	34.1	2.51
	43	40.9	1.44	40.6	1.51	40.3	1.56	40.2	1.60	40.0	1.64	39.6	1.70	39.4	1.75	39.0	1.81	43	36.8	1.88	36.5	1.97	36.3	2.04	36.1	2.09	36.0	2.13	35.7	2.22	35.4	2.29	35.1	2.39	43	36.8	1.88	36.5	1.97	36.3	2.04	36.1	2.09	36.0	2.13	35.7	2.22	35.4	2.29	35.1	2.39
	47	42.9	1.41	42.5	1.48	42.3	1.54	42.1	1.57	41.9	1.61	41.5	1.67	41.2	1.72	40.9	1.78	47	37.9	1.86	37.6	1.95	37.3	2.01	37.2	2.06	37.0	2.10	36.7	2.20	36.5	2.27	36.2	2.36	47	37.9	1.86	37.6	1.95	37.3	2.01	37.2	2.06	37.0	2.10	36.7	2.20	36.5	2.27	36.2	2.36
	51	44.8	1.38	44.5	1.45	44.2	1.51	44.0	1.54	43.8	1.58	43.4	1.64	43.1	1.69	42.7	1.75	51	38.9	1.83	38.6	1.92	38.4	1.99	38.2	2.03	38.1	2.08	37.8	2.17	37.5	2.24	37.2	2.33	51	38.9	1.83	38.6	1.92	38.4	1.99	38.2	2.03	38.1	2.08	37.8	2.17	37.5	2.24	37.2	2.33
	55	46.8	1.36	46.4	1.43	46.1	1.48	45.9	1.51	45.7	1.55	45.3	1.61	45.0	1.66	44.6	1.72	55	39.9	1.81	39.6	1.90	39.4	1.96	39.3	2.01	39.1	2.05	38.8	2.14	38.5	2.21	38.2	2.31	55	39.9	1.81	39.6	1.90	39.4	1.96	39.3	2.01	39.1	2.05	38.8	2.14	38.5	2.21	38.2	2.31
	59	48.7	1.34	48.3	1.41	48.0	1.46	47.8	1.49	47.6	1.52	47.2	1.58	46.9	1.63	46.6	1.69	59	41.0	1.79	40.7	1.88	40.5	1.94	40.3	1.99	40.0	2.03	39.8	2.12	39.6	2.19	39.3	2.28	59	41.0	1.79	40.7	1.88	40.5	1.94	40.3	1.99	40.0	2.03	39.8	2.12	39.6	2.19	39.3	2.28
120	-4	24.6	3.25	24.3	3.39	24.1	3.50	23.9	3.57	23.8	3.65	23.4	3.85	23.2	3.99	22.8	4.19	-4	24.6	3.62	24.3	3.78	24.1	3.90	23.9	3.98	23.8	4.07	23.4	4.29	23.2	4.45	22.8	4.67	-4	24.6	3.62	24.3	3.78	24.1	3.90	23.9	3.98	23.8	4.07	23.4	4.29	23.2	4.45	22.8	4.67
	-1	25.6	3.08	25.3	3.22	25.0	3.33	24.9	3.40	24.7	3.47	24.3	3.66	24.0	3.80	23.6	4.00	-1	25.1	3.39	24.8	3.54	24.6	3.66	24.4	3.73	24.3	3.81	24.0	4.03	23.7	4.20	23.4	4.43	-1	25.1	3.39	24.8	3.54	24.6	3.66	24.4	3.73	24.3	3.81	24.0	4.03	23.7	4.20	23.4	4.43
	3	26.8	2.87	26.5	3.00	26.3	3.09	26.2	3.16	26.0	3.22	25.5	3.41	25.1	3.55	24.6	3.74	3	25.8	3.11	25.5	3.24	25.3	3.35	25.1	3.41	25.0	3.48	24.7	3.71	24.4	3.88	24.1	4.12	3	25.8	3.11	25.5	3.24	25.3	3.35	25.1	3.41	25.0	3.48	24.7	3.71	24.4	3.88	24.1	4.12
	7	28.1	2.65	27.8	2.77	27.6	2.86	27.4	2.92	27.3	2.98	26.7	3.16	26.2	3.30	25.6	3.48	7	26.5	2.83	26.2	2.96	26.0	3.05	25.8	3.11	25.7	3.17	25.4	3.40	25.1	3.57	24.8	3.81	7	26.5	2.83	26.2	2.96	26.0	3.05	25.8	3.11	25.7	3.17	25.4	3.40	25.1	3.57	24.8	3.81
	11	29.3	2.43	29.1	2.54	28.9	2.62	28.7	2.68	28.6	2.73	27.9	2.91	27.4	3.04	26.7	3.22	11	27.6	2.57	27.3	2.68	27.1	2.77	26.9	2.82	26.8	2.87	26.4	3.10	26.1	3.27	25.8	3.51	11	27.6	2.57	27.3	2.68	27.1	2.77	26.9	2.82	26.8	2.87	26.4	3.10	26.1	3.27	25.8	3.51
	15	30.6	2.21	30.3	2.31	30.2	2.38	30.0	2.43	29.9	2.48	29.1	2.66	28.5	2.79	27.7	2.97	15	27.6	2.32	27.3	2.42	27.1	2.50	27.0	2.54	26.9	2.59	26.8	2.61	26.4	2.89	26.2	3.22	15	27.6	2.32	27.3	2.42	27.1	2.50	27.0	2.54	26.9	2.59	26.8	2.61	26.4	2.89	26.2	3.22
	19	32.0	2.15	31.8	2.25	31.6	2.32	31.5	2.37	31.3	2.42	30.6	2.58	30.0	2.70	29.3	2.87	19	28.6	2.22	28.3	2.31	28.1	2.38	27.9	2.43	27.8	2.48	27.5	2.68	27.2	2.83	26.9	3.03	19	28.6	2.22	28.3	2.31	28.1	2.38	27.9	2.43	27.8	2.48	27.5	2.68	27.2	2.		



## (H,Y,C)VAHP048B21S

Conne- ction ratio	Outdoor air temp	Indoor air temp. °FDB																							
		59		63		66		68		70		74		77		81									
		TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP
		%	°FWB	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW
130	-4	31.7	4.00	30.7	4.06	29.9	4.11	28.7	4.17	27.5	4.23	26.8	4.41	26.3	4.54	25.5	4.64								
	-1	33.2	3.95	32.1	4.02	31.4	4.07	30.3	4.13	29.1	4.19	28.4	4.37	27.9	4.51	27.1	4.61								
	3	35.1	3.89	34.1	3.97	33.4	4.02	32.3	4.08	31.3	4.15	30.6	4.33	30.0	4.46	29.2	4.56								
	7	37.0	3.83	36.1	3.91	35.4	3.97	34.4	4.04	33.4	4.10	32.7	4.28	32.1	4.41	31.4	4.51								
	11	38.9	3.77	38.0	3.86	37.3	3.92	36.4	3.99	35.5	4.05	34.8	4.23	34.2	4.36	33.5	4.46								
	15	40.8	3.71	40.0	3.81	39.3	3.88	38.5	3.94	37.7	4.01	36.9	4.18	36.4	4.31	35.7	4.42								
	19	42.7	3.65	41.9	3.75	41.3	3.83	40.6	3.90	39.9	3.96	39.0	4.14	38.5	4.27	37.8	4.37								
	23	44.6	3.59	43.9	3.70	43.3	3.78	42.6	3.85	41.9	3.92	41.2	4.09	40.6	4.22	40.0	4.32								
	27	46.5	3.53	45.8	3.65	45.3	3.73	44.7	3.80	44.1	3.87	43.4	4.04	42.7	4.17	42.1	4.27								
	31	48.4	3.47	47.8	3.59	47.3	3.68	46.7	3.75	46.2	3.82	45.4	3.99	44.9	4.12	44.3	4.22								
	35	50.4	3.41	49.7	3.54	49.3	3.64	48.8	3.71	48.3	3.78	47.5	3.95	46.9	4.07	46.4	4.17								
	39	53.1	3.42	52.5	3.56	52.1	3.66	51.6	3.74	51.2	3.81	50.3	3.99	49.7	4.12	49.1	4.22								
	43	55.9	3.42	55.3	3.57	54.8	3.69	54.4	3.77	54.0	3.85	53.1	4.03	52.4	4.16	51.9	4.26								
	47	58.1	3.45	57.8	3.61	57.5	3.73	57.2	3.81	57.0	3.89	56.1	4.07	55.5	4.21	55.0	4.31								
	51	60.4	3.49	60.2	3.65	60.1	3.77	60.1	3.85	60.0	3.94	59.2	4.12	58.6	4.26	58.1	4.37								
	55	62.6	3.52	62.7	3.69	62.7	3.81	62.9	3.90	63.0	3.98	62.2	4.17	61.6	4.31	61.2	4.42								
	59	64.9	3.49	65.1	3.67	65.3	3.80	65.7	3.88	66.0	3.97	65.3	4.15	64.7	4.29	64.3	4.38								
120	-4	31.7	4.05	30.7	4.11	29.9	4.16	28.7	4.22	27.5	4.28	26.8	4.46	26.3	4.60	25.5	4.70								
	-1	33.2	4.00	32.1	4.07	31.4	4.12	30.3	4.18	29.1	4.25	28.4	4.43	27.9	4.56	27.1	4.67								
	3	35.1	3.94	34.1	4.02	33.4	4.07	32.3	4.14	31.3	4.20	30.6	4.38	30.0	4.51	29.2	4.62								
	7	37.0	3.88	36.1	3.96	35.3	4.02	34.4	4.09	33.4	4.15	32.7	4.33	32.1	4.47	31.4	4.57								
	11	38.9	3.82	38.0	3.91	37.3	3.98	36.4	4.04	35.5	4.11	34.8	4.29	34.2	4.42	33.5	4.52								
	15	40.8	3.76	40.0	3.86	39.3	3.93	38.5	3.99	37.7	4.06	36.9	4.24	36.4	4.37	35.7	4.47								
	19	42.7	3.70	41.9	3.80	41.3	3.88	40.6	3.95	39.9	4.01	39.0	4.19	38.5	4.32	37.8	4.42								
	23	44.6	3.64	43.9	3.75	43.3	3.83	42.6	3.90	41.9	3.97	41.2	4.14	40.6	4.27	40.0	4.38								
	27	46.5	3.58	45.8	3.70	45.3	3.78	44.7	3.85	44.1	3.92	43.3	4.10	42.7	4.23	42.1	4.33								
	31	48.4	3.52	47.8	3.64	47.3	3.73	46.7	3.81	46.2	3.88	45.4	4.05	44.8	4.18	44.3	4.28								
	35	50.4	3.46	49.7	3.59	49.3	3.69	48.8	3.76	48.3	3.83	47.5	4.00	46.9	4.13	46.4	4.23								
	39	53.1	3.46	52.5	3.61	52.1	3.71	51.6	3.79	51.2	3.86	50.3	4.04	49.7	4.17	49.1	4.28								
	43	55.9	3.47	55.3	3.62	54.8	3.74	54.4	3.82	54.0	3.90	53.1	4.08	52.4	4.21	51.9	4.32								
	47	58.1	3.50	57.8	3.66	57.5	3.78	57.2	3.86	57.0	3.95	56.1	4.13	55.5	4.27	55.0	4.37								
	51	60.4	3.54	60.2	3.70	60.1	3.82	60.1	3.91	60.0	3.99	59.2	4.18	58.6	4.32	58.1	4.42								
	55	62.6	3.57	62.7	3.74	62.7	3.86	62.9	3.95	63.0	4.03	62.2	4.23	61.6	4.37	61.2	4.48								
	59	64.9	3.54	65.1	3.72	65.3	3.85	65.7	3.94	66.0	4.02	65.3	4.21	64.7	4.34	64.3	4.43								
110	-4	31.7	4.07	30.7	4.14	29.9	4.18	28.7	4.24	27.5	4.31	26.8	4.49	26.3	4.63	25.5	4.73								
	-1	33.2	4.03	32.1	4.10	31.4	4.15	30.3	4.21	29.1	4.27	28.4	4.45	27.9	4.59	27.1	4.69								
	3	35.1	3.97	34.1	4.04	33.4	4.12	32.3	4.19	31.3	4.25	30.6	4.41	30.0	4.54	29.2	4.65								
	7	37.0	3.91	36.1	3.99	35.4	4.05	34.4	4.11	33.4	4.18	32.7	4.36	32.1	4.50	31.4	4.60								
	11	38.9	3.85	38.0	3.94	37.3	4.00	36.4	4.07	35.5	4.13	34.8	4.31	34.2	4.45	33.5	4.55								
	15	40.8	3.79	40.0	3.88	39.3	3.95	38.5	4.02	37.7	4.09	36.9	4.27	36.4	4.40	35.7	4.50								
	19	42.7	3.73	41.9	3.83	41.3	3.90	40.6	3.97	39.9	4.04	39.0	4.22	38.5	4.35	37.8	4.45								
	23	44.6	3.67	43.9	3.78	43.3	3.86	42.6	3.93	41.9	3.99	41.2	4.17	40.8	4.30	40.0	4.40								
	27	46.5	3.61	45.8	3.72	45.3	3.81	44.7	3.88	44.1	3.95	43.3	4.12	42.7	4.26	42.1	4.36								
	31	48.4	3.55	47.8	3.67	47.3	3.76	46.7	3.83	46.2	3.90	45.4	4.08	44.8	4.21	44.3	4.31								
	35	50.4	3.49	49.7	3.62	49.3	3.71	48.8	3.78	48.3	3.86	47.5	4.03	46.9	4.16	46.4	4.26								
	39	53.1	3.49	52.5	3.63	52.1	3.74	51.6	3.82	51.2	3.89	50.3	4.07	49.7	4.20	49.1	4.30								
	43	55.9	3.49	55.3	3.65	54.8	3.77	54.4	3.85	54.0	3.93	53.1	4.11	52.4	4.24	51.9	4.35								
	47	58.1	3.53	57.8	3.69	57.5	3.81	57.2	3.89	57.0	3.97	56.1	4.16	55.5	4.29	55.0	4.40								
	51	60.4	3.56	60.2	3.72	60.1	3.85	60.1	3.93	60.0	4.02	59.2	4.20	58.6	4.34	58.1	4.45								
	55	62.6	3.60	62.7	3.76	62.7	3.89	62.9	3.97	63.0	4.06	62.2	4.25	61.6	4.40	61.2	4.50								
	59	64.9	3.56	65.1	3.74	65.3	3.87	65.7	3.96	66.0	4.05	65.3	4.23	64.7	4.37	64.3	4.46								
100	-4	31.7	4.10	30.7	4.16	29.9	4.21	28.7	4.27	27.5	4.33	26.8	4.52	26.3	4.66	25.5	4.76								
	-1	33.2	4.05	32.1	4.12	31.4	4.17	30.3	4.23	29.1	4.30	28.4	4.48	27.9	4.62	27.1	4.72								
	3	35.1	3.99	34.1	4.07	33.4	4.12	32.3	4.19	31.3	4.25	30.6	4.43	30.0	4.57	29.2	4.68								
	7	37.0	3.93	36.1	4.01	35.4	4.07	34.4	4.14	33.4	4.21	32.7	4.39	32.1	4.52	31.4	4.63								
	11	38.9	3.87	38.0	3.96	37.3	4.03	36.4	4.09	35.5	4.16	34.8	4.34	34.2	4.48	33.5	4.58								
	15	40.8	3.81	40.0	3.91	39.3	3.98	38.5	4.05	37.7	4.11	36.9	4.29	36.4	4.43	35.7	4.53								
	19	42.7	3.75	41.9	3.85	41.3	3.93	40.6	4.00	39.9	4.07	39.0	4.25	38.5	4.38	37.8	4.48								
	23	44.6	3.69	43.9	3.80	43.3	3.88	42.6	3.95	41.9	4.02	41.2	4.20	40.6	4.33	40.0	4.43								
	27	46.5	3.63	45.8	3.75	45.3	3.83	44.7	3.90	44.1	3.97	43.3	4.15	42.7	4.28	42.1	4.39								

## SELECTION DATA

(H,Y,C)VAHP060B21S

Con- nection ratio	Outdoor air temp	Indoor air temp. °FDB																Con- nection ratio	Outdoor air temp	Indoor air temp. °FDB															
		59		63		66		68		70		74		77		81				59		63		66		68		70		74		77		81	
		TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP			TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP	TC	IP		
%	°FWB	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	%	°FWB	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW	MBH	KW		
105	-4	33.4	4.08	31.8	4.19	30.6	4.32	29.4	4.39	28.1	4.47	27.4	4.75	26.9	4.95	26.0	4.95	-4	33.4	4.25	31.8	4.37	30.6	4.50	29.4	4.58	28.1	4.66	27.4	4.95	26.9	5.17	26.0	5.16	
	-1	35.4	4.04	33.9	4.18	32.8	4.30	31.6	4.38	30.4	4.46	29.6	4.73	29.1	4.94	28.3	4.93	-1	34.2	4.07	32.7	4.20	31.6	4.32	30.4	4.39	29.2	4.46	28.5	4.74	27.9	4.94	27.1	4.93	
	3	38.0	4.00	36.7	4.15	35.6	4.28	34.5	4.36	33.4	4.44	32.6	4.71	32.0	4.92	31.3	4.91	3	35.3	3.86	33.9	4.00	32.8	4.11	31.7	4.17	30.6	4.24	29.9	4.50	29.3	4.69	28.6	4.67	
	7	40.7	3.97	39.4	4.13	38.5	4.26	37.4	4.34	36.3	4.42	35.5	4.69	34.9	4.90	34.2	4.89	7	36.4	3.69	35.1	3.83	34.1	3.93	33.1	3.99	32.0	4.05	31.3	4.30	30.7	4.48	30.0	4.46	
	11	43.4	3.94	42.2	4.11	41.3	4.24	40.3	4.32	39.3	4.40	38.5	4.67	37.8	4.88	37.2	4.87	11	37.5	3.54	36.3	3.68	35.4	3.77	34.4	3.83	33.5	3.89	32.7	4.12	32.1	4.30	31.5	4.28	
	15	46.1	3.92	45.0	4.09	44.1	4.22	43.2	4.30	42.3	4.38	41.4	4.65	40.8	4.85	40.2	4.85	15	38.6	3.42	37.5	3.54	36.6	3.64	35.7	3.69	34.9	3.75	34.1	3.97	33.4	4.14	32.9	4.13	
	19	48.8	3.90	47.8	4.07	47.0	4.20	46.1	4.28	45.3	4.36	44.4	4.63	43.7	4.83	43.2	4.83	19	39.7	3.30	38.7	3.42	37.9	3.51	37.1	3.57	36.3	3.63	35.5	3.84	34.8	4.00	34.4	3.99	
	23	51.5	3.88	50.5	4.05	49.8	4.18	49.1	4.26	48.3	4.34	47.3	4.61	46.5	4.81	46.2	4.81	23	40.8	3.20	39.8	3.32	39.1	3.41	38.4	3.46	37.7	3.52	36.9	3.73	36.2	3.88	35.9	3.87	
	27	54.1	3.86	53.3	4.03	52.7	4.16	52.0	4.24	51.3	4.32	50.3	4.59	49.5	4.79	49.2	4.79	27	41.9	3.10	41.0	3.22	40.4	3.31	39.8	3.36	39.1	3.42	38.3	3.62	37.6	3.78	37.3	3.77	
	31	56.8	3.84	56.1	4.01	55.5	4.14	54.9	4.22	54.3	4.30	53.2	4.57	52.4	4.77	52.2	4.77	31	43.0	3.02	42.2	3.13	41.6	3.22	41.1	3.28	40.5	3.33	39.7	3.53	39.0	3.68	38.8	3.68	
	35	59.5	3.82	58.8	3.99	58.4	4.11	57.8	4.20	57.3	4.28	56.2	4.55	55.4	4.75	55.2	4.75	35	44.1	2.94	43.4	3.05	42.9	3.14	42.4	3.20	42.0	3.25	41.1	3.45	40.4	3.59	40.2	3.59	
	39	62.9	3.86	62.1	4.04	61.6	4.17	61.1	4.25	60.6	4.34	59.4	4.61	58.5	4.82	58.4	4.81	39	45.2	2.88	44.6	3.00	44.1	3.10	43.8	3.16	43.4	3.22	42.5	4.42	41.7	3.56	41.7	3.56	
	43	66.2	3.90	65.4	4.08	64.9	4.22	64.4	4.31	64.0	4.39	62.6	4.67	61.6	4.88	61.6	4.88	43	46.3	2.83	45.8	2.96	45.4	3.06	45.1	3.12	44.8	3.19	43.9	3.39	43.1	3.54	43.1	3.54	
	47	68.8	3.93	68.4	4.12	68.0	4.25	67.9	4.34	67.7	4.43	66.3	4.72	65.3	4.93	65.1	4.93	47	47.4	2.85	47.0	2.99	46.7	3.09	46.4	3.15	46.2	3.21	45.3	3.42	44.5	3.58	44.6	3.58	
	51	71.5	3.96	71.3	4.15	71.2	4.29	71.1	4.38	71.4	4.47	70.0	4.76	69.0	4.98	68.6	4.98	51	48.5	2.87	48.2	3.01	47.9	3.11	47.8	3.17	47.6	3.24	46.6	3.45	45.9	3.61	46.0	3.61	
	55	74.2	3.99	74.3	4.18	74.4	4.32	74.7	4.41	75.1	4.50	73.7	4.81	72.7	5.04	72.2	5.03	55	49.7	2.90	49.4	3.03	49.2	3.13	49.1	3.20	49.1	3.27	48.0	3.49	47.3	3.65	47.5	3.65	
	59	76.8	3.92	77.2	4.11	77.6	4.25	78.2	4.34	78.8	4.44	77.4	4.75	76.4	4.98	75.7	4.97	59	50.8	2.84	50.6	2.98	50.4	3.08	50.5	3.15	50.6	3.22	49.4	3.44	48.7	3.61	49.0	3.61	
100	-4	33.4	4.10	31.8	4.22	30.6	4.34	29.4	4.42	28.1	4.50	27.4	4.78	26.9	4.98	26.0	4.98	-4	33.4	4.30	31.8	4.42	30.6	4.55	29.4	4.63	28.1	4.72	27.4	5.01	26.9	5.23	26.0	5.22	
	-1	35.4	4.07	33.9	4.20	32.6	4.33	31.6	4.40	30.4	4.48	29.6	4.76	29.1	4.97	28.3	4.96	-1	33.8	4.07	32.3	4.20	31.2	4.32	30.0	4.39	28.8	4.46	28.1	4.73	27.5	4.94	26.7	4.92	
	3	38.0	4.02	36.7	4.18	35.6	4.31	34.5	4.38	33.4	4.46	32.6	4.74	32.0	4.95	31.3	4.94	3	34.3	3.81	32.9	3.94	31.9	4.05	30.8	4.11	29.7	4.17	28.9	4.42	28.4	4.61	27.7	4.59	
	7	40.7	3.99	39.4	4.16	38.5	4.28	37.4	4.36	36.3	4.44	35.5	4.72	34.9	4.93	34.2	4.92	7	34.6	3.59	33.6	3.72	32.6	3.81	31.6	3.87	30.5	3.92	29.8	4.16	29.2	4.34	28.6	4.32	
	11	43.4	3.97	42.2	4.14	41.3	4.26	40.3	4.34	39.3	4.42	38.5	4.70	37.8	4.91	37.2	4.90	11	35.4	3.40	34.2	3.52	33.3	3.61	32.3	3.66	31.4	3.72	30.7	3.94	30.1	4.10	29.5	4.08	
	15	46.1	3.95	45.0	4.12	44.1	4.24	43.2	4.32	42.3	4.40	41.4	4.68	40.8	4.88	40.2	4.88	15	35.9	3.24	34.9	3.35	34.0	3.44	33.1	3.49	32.3	3.54	31.5	3.75	31.0	3.90	30.5	3.89	
	19	48.8	3.93	47.8	4.10	47.0	4.22	46.1	4.30	45.3	4.39	44.4	4.66	43.7	4.86	43.2	4.86	19	36.5	3.09	35.5	3.20	34.7	3.28	33.9	3.33	33.2	3.38	32.4	3.58	31.8	3.73	31.4	3.72	
	23	51.5	3.90	50.5	4.07	49.8	4.20	49.1	4.28	48.3	4.37	47.3	4.64	46.6	4.84	46.2	4.84	23	37.0	2.96	36.1	3.07	35.4	3.14	34.7	3.19	34.0	3.24	33.3	3.43	32.7	3.58	32.3	3.57	
	27	54.1	3.88	53.3	4.05	52.7	4.18	52.0	4.26	51.3	4.35	50.3	4.62	49.5	4.82	49.2	4.82	27	37.6	2.84	36.7	2.94	36.1	3.02	35.5	3.07	34.9	3.12	34.1	3.30	33.5	3.44	33.2	3.43	
	31	56.8	3.86	56.1	4.03	55.5	4.16	54.9	4.24	54.3	4.33	53.2	4.60	52.4	4.80	52.2	4.80	31	38.1	2.73	37.4	2.83	36.8	2.91	36.3	2.96	35.8	3.01	35.0	3.19	34.4	3.32	34.2	3.32	
	35	59.5	3.84	58.8	4.01	58.4	4.14	57.8	4.22	57.3	4.31	56.2	4.58	55.4	4.78	55.2	4.78	35	38.6	2.63	38.0	2.73	37.5	2.81	37.1	2.86	36.3	2.91	35.9	3.08	35.3	3.21	35.1	3.21	
	39	62.9	3.88	62.1	4.06	61.6	4.19	61.1	4.28	60.6	4.36	59.4	4.64	58.5	4.85	58.4	4.84	39	39.2	2.56	38.6	2.67	38.2	2.75	37.9	2.80	37.5	2.85	36.7	3.03	36.1	3.16	36.0	3.16	
	43	66.2	3.93	65.4	4.11	65.0	4.25	64.4	4.33	64.0	4.42	62.6	4.70	61.6	4.91	61.6	4.91	43	39.7	2.49	39.3	2.61	38.9	2.69	38.7	2.75	38.4	2.80	37.6	2.98	37.0	3.11	37.0	3.11	
	47	68.8	3.96	68.4	4.14	68.0	4.28	67.9	4.37	67.7	4.46	66.3	4.75	65.3	4.96	65.1	4.97	47	40.3	2.51	39.9	2.63	39.6	2.71	39.4	2.77	39.1	2.83	38.5	3.01	37.8	3.15	37.9	3.15	
	51	71.5	3.99	71.3	4.17	71.2	4.31	71.1	4.40	71.4	4.50	70.0	4.79	69.0	5.01	68.6	5.01	51	40.8	2.53	40.5	2.65	40.3	2.73	40.2	2.79	40.0	2.85	39.3	3.04	38.7	3.18	38.8	3.18	
	55	74.2	4.02	74.3	4.21	74.4	4.35	74.7	4.44	75.1	4.53	73.7	4.84	72.7	5.07	72.2	5.06	55	41.3	2.55	41.2	2.67	41.0	2.76	41.0	2.81	40.7	2.87	40.2	3.07	39.6	3.21	39.8	3.21	
	59	76.8	3.94	77.3	4.13	77.3	4.28	77.4	4.37	78.1	4.47	77.4	4.78	76.3	5.01	70.8	5.00	59	41.9	2.50	41.8	2.62	41.7	2.71	41.8	2.77	41.9	2.83	41.1	3.03	40.4	3.18	40.7	3.17	
90	-4	33.4	4.15	31.8	4.27	30.6	4.39	29.4	4.47	28.1	4.55	27.4	4.83	26.9	5.04	26.0	5.04	-4	33.4	4.35	31.8	4.47	30.6	4.60	29.4	4.68	28.1	4.76	27.4	5.05	26.9	5.27	26.0	5.26	
	-1	35.0	4.07	33.5	4.20	32.4	4.33	31.2	4.40	30.0	4.48	29.3	4.76	28.7	4.96	27.9	4.95	-1	34.2	4.12	32.4	4.25	31.2	4.35	30.0	4.43	29.2	4.51	28.5	4.79	27.9	4.97	27.1	4.95	
	3	37.3	3.98	35.8	4.13	34.8	4.25	33.6	4.32	32.5	4.40	31.7	4.66	31.1	4.86	30.4	4.85	3	34.6	3.82	33.1	3.95	32.1	4.08	31.1	4.17									

### 4.3 Correction Factor According to Piping Length

#### < Cooling Capacity >

#### Correction Factor for Cooling Capacity According to Piping Length

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

$$CCA = CC \times F$$

CCA: Actual Corrected Cooling Capacity

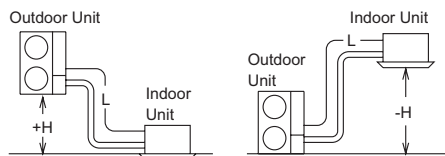
CC: Cooling Capacity in the Performance Table

F: Correction Factor Based on the Equivalent Piping Length

The correction factors are shown in the figure.

Equivalent Piping Length for

- One 90° Elbow is 1.6ft (0.5m).
- One 180° Bend is 4.9ft (1.5m).
- One Multi-Kit is 1.6ft (0.5m).



H: Vertical Distance Between Indoor Unit and Outdoor Unit

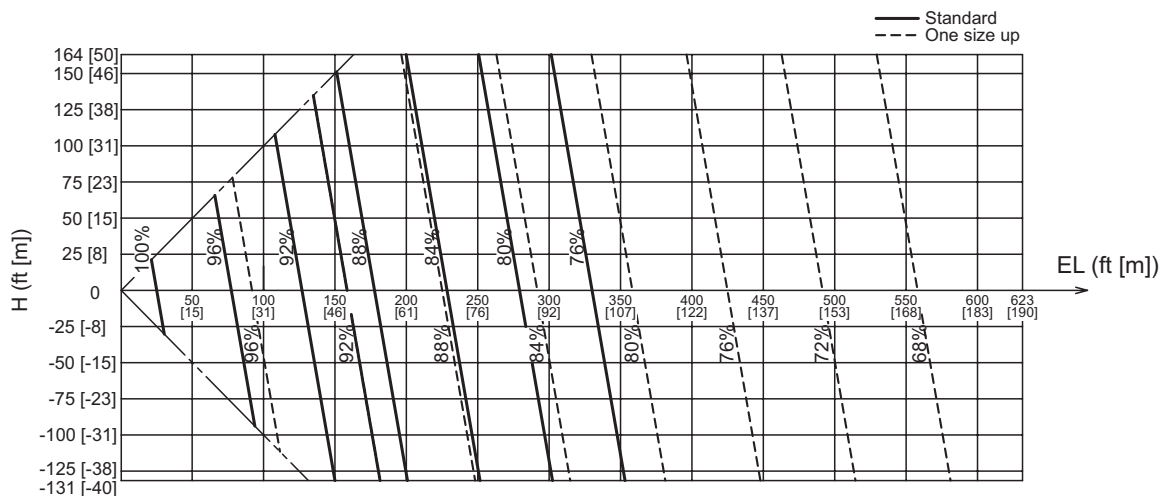
EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

\* Liquid piping size for Equivalent Piping Length < 328ft [100m] and Equivalent Piping Length ≥ 328ft [100m] are different. Refer to the "Installation Manual for Outdoor Unit" or Section 2.14.2 "Piping Size and Multi-Kit Selection" for details.

Models: (H,Y,C)VAHP036B21S, (H,Y,C)VAHP048B21S, (H,Y,C)VAHP060B21S



## SELECTION DATA

### < Heating Capacity >

#### Correction Factor for Heating Capacity According to Piping Length

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

$$HCA = HC \times F$$

HCA: Actual Corrected Heating Capacity

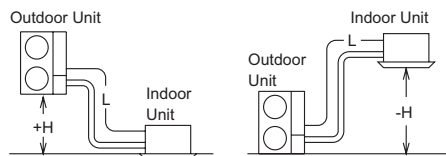
HC: Heating Capacity in the Performance Table

F: Correction Factor Based on the Equivalent Piping Length

The correction factors are shown in the figure.

Equivalent Piping Length for

- One 90° Elbow is 1.6ft (0.5m).
- One 180° Bend is 4.9ft (1.5m).
- One Multi-Kit is 1.6ft (0.5m).



H: Vertical Distance Between Indoor Unit and Outdoor Unit

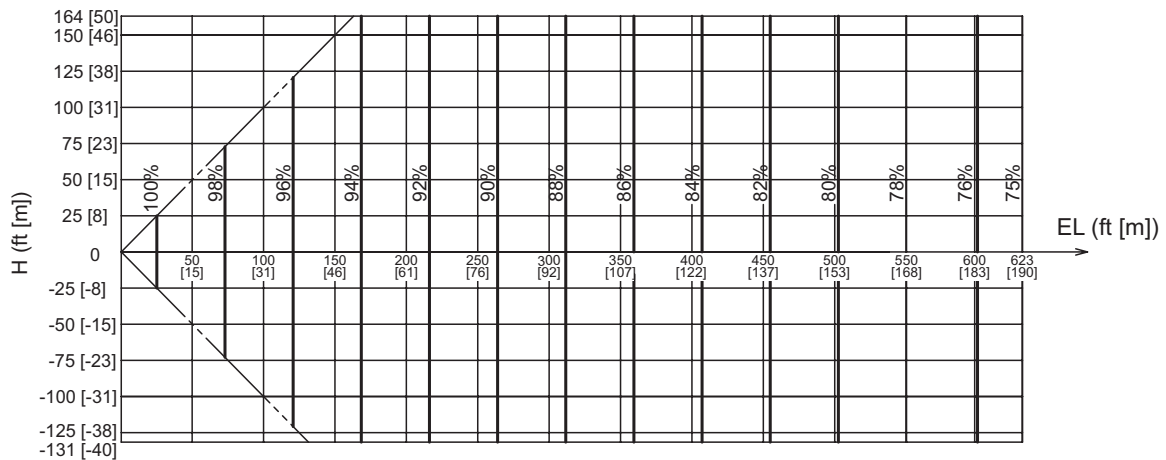
EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

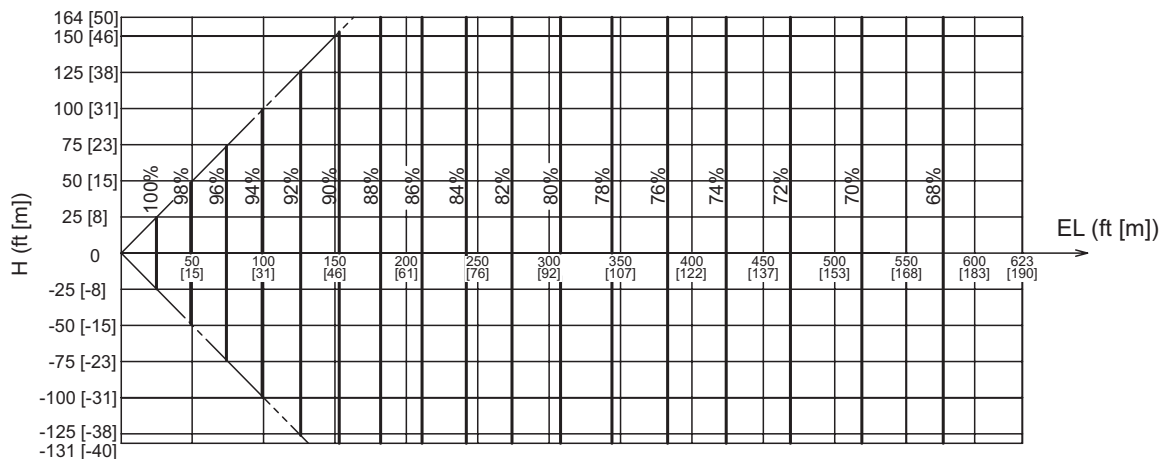
L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

\* Liquid piping size for Equivalent Piping Length < 328ft [100m] and Equivalent Piping Length ≥ 328ft [100m] are different. Refer to the "Installation Manual for Outdoor Unit" or Section 2.14.2 "Piping Size and Multi-Kit Selection" for details.

Models: (H,Y,C)VAHP036B21S, (H,Y,C)VAHP048B21S



Model: (H,Y,C)VAHP060B21S



#### 4.4 Correction Factor According to Defrost Operation

The heating capacity in the preceding paragraph does not include defrost operation periods. Therefore, capacity should be corrected as follows:

Corrected Heating Capacity = Correction Factor x Heating Capacity

Outdoor Air Temp. °F DB (°C DB) (Humidity=85% RH)	19 (-7.2)	23 (-5.0)	27 (-2.8)	31 (-0.6)	35 (1.7)	39 (3.9)	45 (7.2)	47 (8.3)
Correction Factor	0.95	0.93	0.88	0.85	0.86	0.88	1.0	1.0

**NOTE:**

The correction factor is not available for special conditions like snowfall or operation in a transitional period.

#### 4.5 Correction Factor According to Altitude

The capacity is affected by the altitude.

Corrected Capacity = Correction Factor x Capacity

Altitude	ft (m)	0 (0)	1000 (305)	2000 (610)	3000 (914)	4000 (1219)	5000 (1524)	6000 (1829)	7000 (2133)	8000 (2438)	9000 (2743)	10000 (3048)
Correction Factor		1.00	0.97	0.93	0.90	0.87	0.83	0.80	0.77	0.75	0.72	0.69

