

VRF AIR-CONDITIONER
「HEAT RECOVERY」

Technical Handbook

CHV6 URBAN HYPER HEAT
SERIES (208V+460V)

BASIC MODELS

CHV6-72URBHH(SRBHH)
CHV6-96URBHH(SRBHH)
CHV6-120URBHH(SRBHH)

COMBINATION MODELS

CHV6-144~240URBHH(SRBHH)



Dear user:

Thank you for choosing and using our products. For your better understanding and use of this product, be sure to read and comply with the following related matters before use.

IMPORTANT NOTICE

Signal words (danger, warning and caution) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words:



: A hazardous situation which, if not avoided, will result in death or serious injury.



: A hazardous situation which, if not avoided, could result in death or serious injury .



: Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE

: Useful information for operation and/or maintenance.

- This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.
- This manual gives a common description and information for this air conditioner which you operate as well for other models. Cooper&Hunter pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- Cooper&Hunter cannot anticipate every possible circumstance that might involve a potential hazard. This air conditioner is designed for standard air conditioning only. Do not use this heat recovery air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling or heating process. Do not install the unit in the following places. It may cause a fire, deformation, corrosion or failure.

* Places where oil (including machinery oil) sprays

* Places where a lot of sulfide gas drifts such as in hot spring.

* Places where inflammable gas may generate or flow

* Places where strong salty wind blows such as coast regions, or places with high acidity or alkalinity.

- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of electrical box. In the end, water leakage or electrical devices failure may occur.
- Do not install the unit in the place where the breeze directly catches the animals and plants. It could adversely affect the animals and plants.
- Installation and service engineering must comply with local standards, laws and regulations.
- As the "public inaccessible appliances", the indoor units are required to be installed at a height of no lower than 2.5m.
- The installation of the air conditioner can only be carried out by dealer or professional, and self installation by user may cause water leakage, electric shock or a fire.
- If you have any questions, contact your dealer or designated service center of Cooper&Hunter.
- To prevent the environment, please do not discard the product at will, and Cooper&Hunter can provide recycling services in accordance with the relevant provisions of the country and provide replaceable parts in accordance with national standard requirements.
- This air conditioner has been designed for the following temperatures. Operate the air conditioner within this range.

Temperature

DX Indoor Unit			Maximum	Minimum
Cooling Operation	Indoor	°F DB/°F WB (°C DB/°C WB)	89/73 (32/23)	69/59 (21/15)
	Outdoor	°F DB (°C DB)	126 (52)*	14 (-10)
Heating Operation	Indoor	°F DB (°C DB)	80 (27)	59 (15)
	Outdoor	°F WB (°C WB)	62 (16.5)	-22 (-30)**

Water Module			Maximum	Minimum
Cooling Operation	Indoor	°F (°C)	77 (25)	50 (10)
	Outdoor	°F DB (°C DB)	118 (48)*	50 (10)
Heating Operation	Indoor	°F (°C)	130 (54)	50 (10)
	Outdoor		110°F DB (43°C DB)	-22°F WB (-30°C WB)

NOTES:

(*) 118°F (48°C) DB ~ 126°F (52°C) DB, Operation Control Range

DB: Dry Bulb, WB: Wet Bulb

DANGER

- Do not perform installation work, refrigerant piping work, drain pump, drain piping and electrical wiring connection without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, electric shock or a fire. In case of a fire, cut off the power at the first time; do not touch the electrical parts by hand to avoid electric shock hazard.
- These products are equipped with electrical parts. Do not pour water into the indoor or outdoor unit. Otherwise, it will cause a serious electrical failures.
- Do not open the service cover of the indoor or outdoor units without turning OFF the main power supply, otherwise it may cause a serious safety accident. (In any cases, users of the equipment are not allowed to open the service cover).
- Do not touch or adjust safety devices inside the indoor unit or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Refrigerant R410A for this unit is incombustible, non-toxic and odorless; however if the refrigerant is leaked and is contacted with fire, toxic gas will generate. Also because the R410A is heavier than air, the floor surface will be filled with it, which could cause difficulty with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases can cause an explosion. It is recommended that nitrogen be used for these types of tests.
- Refrigerant safety leakage standards for construction and operation systems are determined in accordance with local regulations or standards.
- Use an GLB (Ground Leakage Breaker, with an actuation time of 0.1 second or less) at or above medium induction speed, otherwise it may cause an electric shock or a fire.
- For installation, firmly connect the refrigerant pipe before the compressor starts operating.
- For maintenance, relocation and disposal, remove the refrigerant pipe after the compressor stops.
- Do not perform a short-circuit of the protection device such as a pressure switch when operating. It may cause a fire and explosion.

WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately 3.3ft. (1m) from the system.
- If circuit breaker is often activated, stop the system and contact your dealer or service contractor.
Check that the ground wire is securely connected. If the unit is not correctly grounded, it leads electric shock. Do not connect the ground wiring to gas piping, water piping, lighting conductor or ground wiring for telephone.
- Before performing any brazing work, check to ensure that there is no flammable material around. When charging refrigerant be sure to wear leather gloves to prevent cold injuries.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not protected, rats may gnaw at unprotected parts and which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.
- Provide a sufficiently strong foundation. If not, the unit may fall down and it may lead to injuries.
- Perform electrical work according to Installation Manual and all the relevant regulation and standards.
- If the instructions are not followed, an electrical failure and fire may occur due to insufficient capacity and inadequate performance. Use specified cables between units and choose the cables correctly. If not, an electrical failure or a fire may break out.
- Ensure that the outdoor unit is not covered with ice and snow before use.
- This appliance is not intended for use by persons (including children aged under 8) with reduced physical, sensory or mental capacities, or lack of experience and knowledge, unless they have been given supervision or instruction by a responsible person concerning use of the appliance and hazard involved to ensure that they can use it safely. Children shall not play with the appliance. Cleaning and maintenance shall not be made by children without supervision.
- The A-weighted emission sound pressure level at workstations does not exceed 70 dB(A).
- Cancer and reproductive harm-www.P65Warnings.ca.gov.
- Take measures to ensure that the refrigerant limitations in ASHRAE Standard 15 (Canada: 852) or other local codes, are followed. If refrigerant gas has leaked during the installation work, ventilate the room immediately.

⚠ CAUTION

- Do not step on or put any objects on the product.
- Do not put any foreign matters on the unit or inside the unit.
- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 9.8ft. (3m) from strong electromagnetic wave radiators such as medical equipment.
- Starting the unit after longtime idleness requires the compressor temperature to meet the starting requirements or reach a certain heating time.

NOTE:

- It is recommended that the room will be ventilated every 3 to 4 hours.
- In some cases, the heat pump air conditioner may not operate properly in the following cases.
 - * In case that the power supplied by the power transformer is less than or equal to the electric power of the air conditioner.
 - * In case that the large power-consuming equipment is too close to the power supply wiring for the air conditioner, so that large surge voltage may be inducted in the power supply wiring of the air conditioner.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, auxiliary heating equipment is recommended on the job site when the unit is installed in a low temperature region.
- The repair and maintenance of this air conditioner can only be carried out by the professionals.

CHECKING PRODUCT RECEIVED

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

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Design

1. Introduction

1.1 Models Of Outdoor Unit

Basic Unit

Capacity kBTu/h(RT)	72(6RT)	96(8RT)	120(10RT)
Model	CHV-72URBHH	CHV-96URBHH	CHV-120URBHH

Capacity kBTu/h(RT)	72(6RT)	96(8RT)	120(10RT)
Model	CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH

Model 72 ~ 120



Combination Module

Capacity kBTu/h(RT)	144(12RT)	192(16RT)	240(20RT)
Model	CHV-144URBHH	CHV-192URBHH	CHV-1240URBHH
Combination	CHV-72URBHH	CHV-96URBHH	CHV-120URBHH
	CHV-72URBHH	CHV-96URBHH	CHV-120URBHH

Capacity kBTu/h(RT)	144(12RT)	192(16RT)	240(20RT)
Model	CHV-144SRBHH	CHV-192SRBHH	CHV-1240SRBHH
Combination	CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH
	CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH

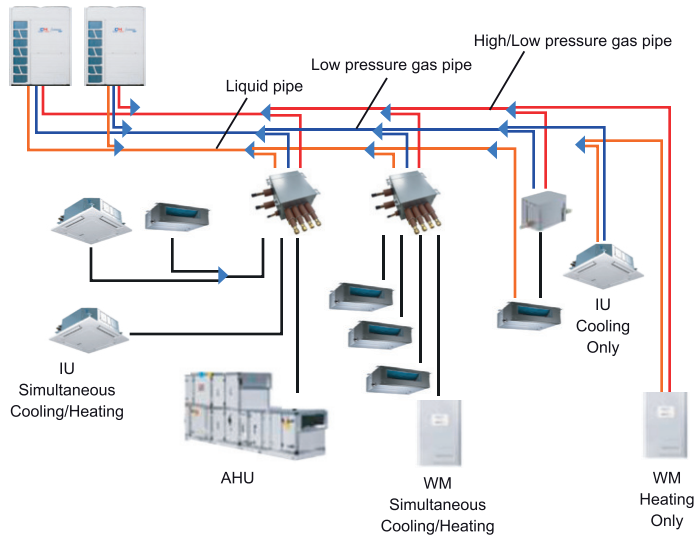
*Combine the specified basic units as shown in the table above. For any other types of combination, please consult technical personnel.

Model 144 ~ 240



1.2 Application Case

Application Case 1: Three Pipes Heat Recovery System with Switch Box



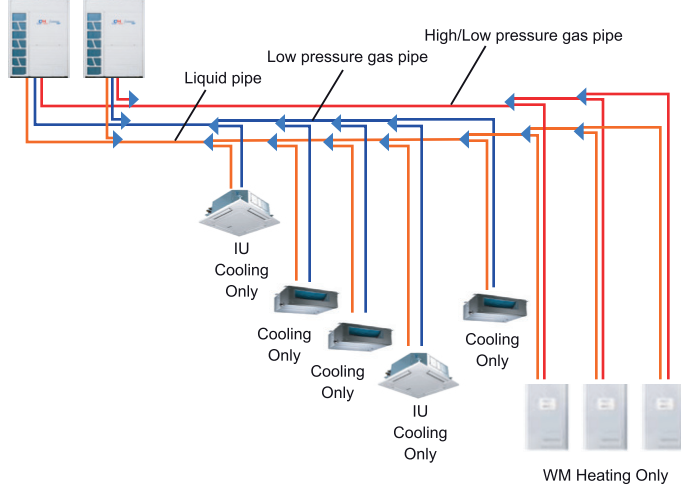
Capacity Ratio

Outdoor Unit Model (kBtu/h)		72/144	96/122	120/240
Total Capacity Ratio		90%~150%	75%~150%	70%~150%
Indoor Unit	Total	90%~150%	75%~150%	70%~150%
	Without SW Box (Cooling Only)	0%~50%		
Water Module		0%~60%		

NOTE:

- (1) The function setting of "H4" must be set to 0 on the outdoor unit PCB (default setting).
- (2) The function setting of "n3" must be set to correct value equal to the quantity of water module connected on the outdoor unit PCB.
- (3) WM with Simultaneous Cooling/heating must occupy one branch of SW Box exclusively.

Application Case 2: Three Pipes Heat Recovery System without Switch Box

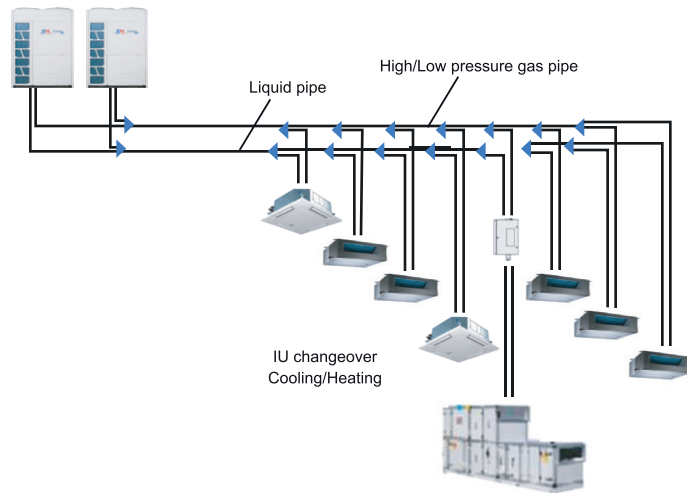


Total Capacity Ratio	100%~200%
Indoor Unit (Cooling Only)	50%~100%
Water Module (Heating Only)	50%~100%
Capacity Ratio of Indoor Unit to Water Module	80%~130%

NOTE:

- (1) The function setting of "H4" must be set to 0 on the outdoor unit PCB (default setting).
- (2) The function setting of "n3" must be set to correct value equal to the quantity of water module connected on the outdoor unit PCB.

Application Case 3: Two Pipes Heat Pump System

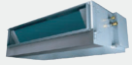


Outdoor Unit Model (kBtu/h)	72/144	96/192	120/140
Total Capacity Ration	90%~150%	75%~150%	70%~150%

The following indoor units can be combined with the outdoor unit.

For operation temperature range, please refer to page i.

Table 1.1 Indoor Unit Type List

Type	Picture	Nominal Power (kBtu/h)															
		05	07	09	12	14	15	17	18	19	22	24	27	30	38	48	54
Ceiling Ducted Type (AC)			●	●	●		●			●	●	●	●	●	●	●	●
Ceiling Ducted Type (DC)			●	●	●		●			●		●		●	●	●	●
Low-Height Ceiling Ducted Type (DC)		●	●	●	●		●	●		●	●	●					
4-Way Cassette Type				●	●		●			●	●	●	●	●	●	●	●
Mini 4-Way Cassette Type		●	●	●	●		●	●		●							
Wall-Mounted Type			●	●	●	●			●		●	●					

● : Available

- The number of connectable indoor units with the outdoor unit is as follows. Comply with the condition as follows when installing the unit.
- Total Capacity Ratio can be obtained by combination of the indoor units when compared with the nominal outdoor unit capacity.

1.3 Combiantion

Utilizing an inverter control, a wide range of operation capacity control is also available. Total Capacity Ratio can be chosen by combination of the indoor units when compared with the nominal outdoor unit capacity. Therefore, the new system can meet individual air conditioning requirements in most office buildings.

"Outdoor Unit Model (kBtu/h)"	Min. Single-Individual Operation (kBtu/h)	"Max.Number of Connectable I.U."	Recommended Number of Connectable I.U.	"Max. Number of Connectable Water Modules for Application Case 1&3 (Chapter 1.2)	"Max. Number of Connectable Water Modules for Application Case 2 (Chapter 1.2)
72	5	21	8	1	3
96		29	10	2	3
120		29	10	2	4
144		43	16	3	5
192		57	18	4	7
240		59	26	6	10

NOTE:

- (1) In a system where all indoor units operate at the same time and the same mode, total capacity of these indoor units should not be larger than combined capacity of the outdoor units, otherwise overload may occur under severe working condition or within narrow operating range.
- (2) If the system is used in the cold area (ambient temperature becomes under 14°F (-10°C)) or under the high heating load conditions, the total indoor unit capacity should be less than 100% against the outdoor unit and total piping length is less than 984ft. (300m).
- (3) 05/07 type indoor units are set with higher air flow. Determine the working environment and installation location carefully. Do not install these units in the place where the cold draft may occur during heating operation. If the unit is installed in such places, the number of connectable I.U. should be less than the recommended number on the table above.
- (4) When the connected indoor units contain Cassette Type or Wall-Mounted Type, and the nominal capacity is less than or equal to 12kBtu/h, the total indoor unit capacity should be equal to or less than 130% against the outdoor unit.
- (5) When the outdoor air temperature is more than 109.4°F (43°C) during the cooling operation, the total indoor unit capacity should be equal to or less than 100% against the outdoor unit.
- (6) If the operational capacity of indoor units at the same mode is more than 130% against the outdoor unit, the indoor units should be set to low airflow operation.

2. General Data

2.1 General Data

Capacity (RT)			6	8	10		
Model	Outdoor Model		CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH		
	Combination		CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH		
Power Supply			480V 3PH 60Hz				
Cooling Operation*1*2	Nominal Cooling Capacity	Btu/h	72000	96000	120000		
		kW	21.1	28.1	35.2		
	Power Consumption (Ducted/Non-ducted)		kW	6.00	8.19	10.01	
	EER (Ducted/Non-ducted)		(Btu/h)/W	12/12.8	11.7/12.5	12/12	
Heating Operation*1*2	Nominal Cooling Capacity (47°F)	Btu/h	81000	103000	129000		
		kW	23.7	30.2	37.8		
	Power Consumption (Ducted/Non-ducted)		kW	6.49	8.05	10.19	
	COP 47°F (Ducted/Non-ducted)		W/W	3.65/4.25	3.75/4.05	3.71/3.90	
	Low Temperature Heating Capacity (47°F)	Btu/h	52500	70000	81000		
		kW	15.4	20.5	23.7		
	Power Consumption (Ducted/Non-ducted)		kW	6.29	8.37	9.79	
	COP 17°F (Ducted/Non-ducted)		W/W	2.45/2.67	2.45/2.55	2.40/2.53	
Electrical Parameter	MCA		A	31.7	35.7		
	MOP		A	45	50		
Sound Pressure Level*3	Normal Mode		dB(A)	56.5/58	58.5/60	64/65	
Cabinet Color*4			-	Ivory White			
Outer Dimensions	Height	in.	68-1/8	68-1/8	68-1/8		
		mm	1730	1730	1730		
	Width	in.	53-5/32	53-5/32	53-5/32		
		mm	1350	1350	1350		
	Depth	in.	29-17/32	29-17/32	29-17/32		
		mm	750	750	750		
Packing Dimensions	Height	in.	76-3/4	76-3/4	76-3/4		
		mm	1950	1950	1950		
	Width	in.	55-29/32	55-29/32	55-29/32		
		mm	1420	1420	1420		
	Depth	in.	31-3/32	31-3/32	31-3/32		
		mm	790	790	790		
Weight	Net Weight	lbs.	816	818	820		
		kg	370	371	372		
	Gross Weight	lbs.	895	897	899		
		kg	406	407	408		
Refrigerating Installation	Compressor		-	Scroll Comp			
	Compressor Quantity		-	2	2		
	Refrigeration Oil	Type	-	FVC68D			
		Brand	-	Idemitsu Kosan			
		Chagre (Total)	gal	2.2	2.2	2.2	
			L	8.4	8.4	8.4	
	Refrigerant Charge Before Shipment		lbs.	17.2	18.7		
			kg	7.8	8.5		
	Refrigerant Flow Control		-	Micro-computer Control Expansion Valve			
	Heat Exchanger Type		-	Multi-Pass Cross-Finned Tube			
	Heat Recovery Operation System	Low Prerssure Gas Pipe	in.	Φ3/4	Φ7/8	Φ1	
			mm	Φ19.05	Φ22.20	Φ25.40	
		High/Low Pressure Gas Pipe	in.	Φ5/8	Φ3/4	Φ7/8	
			mm	Φ15.88	Φ19.05	Φ22.20	
		Heat Pump Operation System	Liquid Pipe	in.	Φ3/8	Φ3/8	Φ1/2
				mm	Φ9.53	Φ9.53	Φ12.70
	High/Low Pressure Gas Pipe		in.	Φ3.4	Φ7/8	Φ1	
			mm	Φ19.05	Φ22.20	Φ25.40	
Fan	Condenser Fan Quantity	-	2	2	2		
		CFM	9430	9430	9430		
		m³/min	267	267	267		
IEER (Ducted/Non-ducted)		(Btu/h)/W	19.5/23	19.7/22.6	20.65/22.1		
SCHE (Ducted/Non-ducted)		(Btu/h)/W	22.6/27	23.3/25.7	24.0/25.0		
Volume		m³	1.75	1.75	1.75		
Connectable Indoor Units	Quantity		PC	21	29		
Cooling Operating Range (DB)		°F	23~126°F				
Heating Operating Range (WB)		°F	-22~-62°F				

NOTES:

*1. The above cooling and heating capacities show the capacities when the outdoor unit operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 80°F DB (26.7°C DB)
67°F WB (19.4°C WB)
Outdoor Air Inlet Temperature: 95°F DB (35°C DB)

Heating Operation Conditions

Indoor Air Inlet Temperature: 70°F DB (21.1°C DB)
Outdoor Air Inlet Temperature: 47°F DB (8.3°C DB)
43°F WB (6.1°C WB)

Nominal Heating Condition

Low Temp.Heating Condition

70°F DB (21.1°C DB)
17°F DB (-8.37°C DB)
15°F WB (-9.4°C WB)

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

*2. Rated capacity and efficiency are certified under AHRI Standard 1230. Ratings are subject to change without notice. Current certified ratings are available at www.ahridirectory.org.

*3. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be included at the scene. Measurement point: 3.3ft. (1.0m) from the service cover surface and 4.9ft. (1.5m) from floor level.

*4. The final appearance of outdoor units is subject to the actual products.

*5. If the outdoor unit operate at the temperature that is below -4°F, please install the snow hood kits to the outdoor unit.

Capacity (RT)			12	16	20	
Model		Outdoor Model	CHV-144SRBHH	CHV-192SRBHH	CHV-240SRBHH	
		Combination	CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH	
			CHV-72SRBHH	CHV-96SRBHH	CHV-120SRBHH	
Power Supply			480V 3PH 60Hz			
Cooling Operation*1*2	Nominal Cooling Capacity		Btu/h	144000	192000	240000
			kW	42.2	56.2	70.4
	Power Consumption (Ducted/Non-ducted)		kW	11.52	16.67	21.07
	EER (Ducted/Non-ducted)		(Btu/h)/W	12.5/12.2	11.5/11.8	11.4/11.8
Heating Operation*1*2	Nominal Cooling Capacity (47°F)		Btu/h	162000	206000	258000
			kW	47.4	60.4	75.6
	Power Consumption (Ducted/Non-ducted)		kW	12.74	16.77	19.90
	COP 47°F (Ducted/Non-ducted)		W/W	3.72/4.10	3.6/3.94	3.5/3.80
	Low Temperature Heating Capacity (47°F)		Btu/h	105000	140000	162000
			kW	30.8	41.0	47.4
	Power Consumption (Ducted/Non-ducted)		kW	12.57	17.30	20.08
	COP 17°F (Ducted/Non-ducted)		W/W	2.45/2.45	2.37/2.40	2.36/2.38
Electrical Parameter	MCA		A	31.7+31/7	33.7+33.7	35.7+35.7
	MOP		A	45 + 45	45 + 45	50 + 50
Sound Pressure Level*3	Normal Mode		dB(A)	66/67	66/67	67/68
Cabinet Color*4			-	Ivory White		
Outer Dimensions	Height	in.	68-1/8	68-1/8	68-1/8	
		mm	1730	1730	1730	
	Width	in.	53-5/32 + 53-5/32	53-5/32 + 53-5/32	53-5/32 + 53-5/32	
		mm	1350 + 1350	1350 + 1350	1350 + 1350	
	Depth	in.	29-17/32	29-17/32	29-17/32	
		mm	750	750	750	
Packing Dimensions	Height	in.	76-3/4	76-3/4	76-3/4	
		mm	1950	1950	1950	
	Width	in.	55-29/32 + 55-29/32	55-29/32 + 55-29/32	55-29/32 + 55-29/32	
		mm	1420 + 1420	1420 + 1420	1420 + 1420	
	Depth	in.	31-3/32	31-3/32	31-3/32	
		mm	790	790	790	
Weight	Net Weight		lbs.	816 + 816	818 + 818	820 + 820
			kg	370 + 370	371 + 371	372 + 372
	Gross Weight		lbs.	895 + 895	897 + 897	899 + 899
			kg	406 + 406	407 + 407	408 + 408
Refrigerating Installation	Compressor		-	Scroll Comp		
	Compressor Quantity		-	2 + 2	2 + 2	2 + 2
	Refrigeration Oil	Type	-	FVC68D		
		Brand	-	Idemitsu Kosan		
		Chagre (Total)	gal	2.2 + 2.2	2.2 + 2.2	2.2 + 2.2
			L	8.4 + 8.4	8.4 + 8.4	8.4 + 8.4
	Refrigerant Charge Before Shipment		lbs.	17.2 + 17.2	18.7 + 18.7	18.7 + 18.7
			kg	7.8 + 7.8	8.5 + 8.5	8.5 + 8.5
	Refrigerant Flow Control		-	Micro-computer Control Expansion Valve		
	Heat Exchanger Type		-	Multi-Pass Cross-Finned Tube		
	Heat Recovery Operation System	Low Prerssure Gas Pipe	in.	Φ1	Φ1-1/8	Φ1-3/8
			mm	Φ25.40	Φ28.60	Φ34.93
		High/Low Pressure Gas Pipe	in.	Φ7/8	Φ7/8	Φ1-1/8
			mm	Φ22.20	Φ22.20	Φ28.6
		Liquid Pipe	in.	Φ1/2	Φ5/8	Φ3/4
			mm	Φ12.70	Φ15.88	Φ19.05
	Heat Pump Operation System	High/Low Pressure Gas Pipe	in.	Φ1	Φ1-1/8	Φ1-3/8
mm			Φ25.40	Φ28.60	Φ34.93	
Liquid Pipe		in.	Φ1/2	Φ5/8	Φ3/4	
		mm	Φ12.70	Φ15.88	Φ19.05	
Fan	Condenser Fan Quantity		-	2 + 2	2 + 2	2 + 2
	Air Flow Rate		CFM	9430 + 9430	9430 + 9430	9430 + 9430
			m³/min	267 + 267	267 + 267	267 + 267
IEER (Ducted/Non-ducted)			(Btu/h)/W	18.5/20	19/19.5	18.7/19
SCHE (Ducted/Non-ducted)			(Btu/h)/W	23/24.8	22.1/23.5	21.5/23.0
Volume			m³	-	-	-
Connectable Indoor Units	Quantity		PC	43	57	59
Cooling Operating Range (DB)			°F	23~126°F		
Heating Operating Range (WB)			°F	-22~-62°F		

NOTES:

*1. The above cooling and heating capacities show the capacities when the outdoor unit operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 80°F DB (26.7°C DB)
67°F WB (19.4°C WB)
Outdoor Air Inlet Temperature: 95°F DB (35°C DB)

Heating Operation Conditions

Indoor Air Inlet Temperature: 70°F DB (21.1°C DB)
47°F DB (8.3°C DB)
Outdoor Air Inlet Temperature: 43°F WB (6.1°C WB)

Nominal Heating Condition
Low. Temp. Heating Condition

70°F DB (21.1°C DB)
17°F DB (-8.37°C DB)
15°F WB (-9.4°C WB)

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

*2. Rated capacity and efficiency are certified under AHRI Standard 1230. Ratings are subject to change without notice. Current certified ratings are available at www.ahridirectory.org.

*3. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be included at the scene. Measurement point: 3.3ft. (1.0m) from the service cover surface and 4.9ft. (1.5m) from floor level.

*4. The final appearance of outdoor units is subject to the actual products.

*5. If the outdoor unit operate at the temperature that is below -4°F, please install the snow hood kits to the outdoor unit.

Capacity (RT)			6	8	10	
Model	Outdoor Model		CHV-72URBHH	CHV-96URBHH	CHV-120URBHH	
	Combination		CHV-72URBHH	CHV-96URBHH	CHV-120URBHH	
Power Supply			208/230V 3PH 60Hz			
Cooling Operation*1*2	Nominal Cooling Capacity	Btu/h	72000	96000	120000	
		kW	21.1	28.1	35.2	
	Power Consumption (Ducted/Non-ducted)	kW	6.00	8.19	10.01	
	EER (Ducted/Non-ducted)	(Btu/h)/W	12/12.8	11.7/12.5	12/12	
Heating Operation*1*2	Nominal Cooling Capacity (47°F)	Btu/h	81000	103000	129000	
		kW	23.7	30.2	37.8	
	Power Consumption (Ducted/Non-ducted)	kW	6.49	8.05	10.19	
	COP 47°F (Ducted/Non-ducted)	W/W	3.65/4.25	3.75/4.05	3.71/3.90	
	Low Temperature Heating Capacity (47°F)	Btu/h	52500	70000	81000	
		kW	15.4	20.5	23.7	
	Power Consumption (Ducted/Non-ducted)	kW	6.29	8.37	9.79	
	COP 17°F (Ducted/Non-ducted)	W/W	2.45/2.67	2.45/2.55	2.40/2.53	
Electrical Parameter	MCA	A	63.8	67.4	71.2	
	MOP	A	90	90	100	
Sound Pressure Level*3	Normal Mode	dB(A)	56.5/58	58.5/60	64/65	
Cabinet Color*4		-	Ivory White			
Outer Dimensions	Height	in.	68-1/8	68-1/8	68-1/8	
		mm	1730	1730	1730	
	Width	in.	53-5/32	53-5/32	53-5/32	
		mm	1350	1350	1350	
	Depth	in.	29-17/32	29-17/32	29-17/32	
		mm	750	750	750	
Packing Dimensions	Height	in.	76-3/4	76-3/4	76-3/4	
		mm	1950	1950	1950	
	Width	in.	55-29/32	55-29/32	55-29/32	
		mm	1420	1420	1420	
	Depth	in.	31-3/32	31-3/32	31-3/32	
		mm	790	790	790	
Weight	Net Weight	lbs.	796	798	800	
		kg	361	362	363	
	Gross Weight	lbs.	860	862	864	
		kg	390	391	392	
Refrigerating Installation	Compressor		-	Scroll Comp		
	Compressor Quantity		-	2	2	
	Refrigeration Oil	Type	-	FVC68D		
		Brand	-	Idemitsu Kosan		
		Chagre (Total)	gal	2.2	2.2	2.2
			L	8.4	8.4	8.4
	Refrigerant Charge Before Shipment	lbs.	17.2	18.7	18.7	
		kg	7.8	8.5	8.5	
	Refrigerant Flow Control		-	Micro-computer Control Expansion Valve		
	Heat Exchanger Type		-	Multi-Pass Cross-Finned Tube		
	Heat Recovery Operation System	Low Prerssure Gas Pipe	in.	Φ3/4	Φ7/8	Φ1
			mm	Φ19.05	Φ22.20	Φ25.40
		High/Low Pressure Gas Pipe	in.	Φ5/8	Φ3/4	Φ7/8
			mm	Φ15.88	Φ19.05	Φ22.20
		Liquid Pipe	in.	Φ3/8	Φ3/8	Φ1/2
			mm	Φ9.53	Φ9.53	Φ12.70
	Heat Pump Operation System	High/Low Pressure Gas Pipe	in.	Φ3.4	Φ7/8	Φ1
mm			Φ19.05	Φ22.20	Φ25.40	
Liquid Pipe		in.	Φ3/8	Φ3/8	Φ1/2	
mm	Φ9.53	Φ9.53	Φ12.70			
Fan	Condenser Fan Quantity		-	2	2	
	Air Flow Rate	CFM	9430	9430	9430	
		m³/min	267	267	267	
IEER (Ducted/Non-ducted)		(Btu/h)/W	19.5/23	19.7/22.6	20.65/22.1	
SCHE (Ducted/Non-ducted)		(Btu/h)/W	22.6/27	23.3/25.7	24.0/25.0	
Volume		m³	1.75	1.75	1.75	
Connectable Indoor Units	Quantity		PC	21	29	
Cooling Operating Range (DB)		*F	23~126°F			
Heating Operating Range (WB)		*F	-22~-62°F			

NOTES:

*1. The above cooling and heating capacities show the capacities when the outdoor unit operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 80°F DB (26.7°C DB)
67°F WB (19.4°C WB)

Outdoor Air Inlet Temperature: 95°F DB (35°C DB)

Heating Operation Conditions

Indoor Air Inlet Temperature: 70°F DB (21.1°C DB)
47°F DB (8.3°C DB)

Outdoor Air Inlet Temperature: 70°F DB (21.1°C DB)
17°F DB (-8.37°C DB)
15°F WB (-9.4°C WB)

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

*2. Rated capacity and efficiency are certified under AHRI Standard 1230. Ratings are subject to change without notice. Current certified ratings are available at www.ahridirectory.org.

*3. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be included at the scene. Measurement point: 3.3ft. (1.0m) from the service cover surface and 4.9ft. (1.5m) from floor level.

*4. The final appearance of outdoor units is subject to the actual products.

*5. If the outdoor unit operate at the temperature that is below -4°F, please install the snow hood kits to the outdoor unit.

Capacity (RT)			12	16	20			
Model	Outdoor Model		CHV-144URBHH	CHV-192URBHH	CHV-240URBHH			
	Combination		CHV-72URBHH	CHV-96URBHH	CHV-120URBHH			
			CHV-72URBHH	CHV-96URBHH	CHV-120URBHH			
Power Supply			208/230V 3PH 60Hz					
Cooling Operation*1*2	Nominal Cooling Capacity	Btu/h	144000	192000	240000			
		kW	42.2	56.2	70.4			
	Power Consumption (Ducted/Non-ducted)	kW	11.52	16.67	21.07			
	EER (Ducted/Non-ducted)	(Btu/h)/W	12.5/12.2	11.5/11.8	11.4/11.8			
Heating Operation*1*2	Nominal Cooling Capacity (47°F)	Btu/h	162000	206000	258000			
		kW	47.4	60.4	75.6			
	Power Consumption (Ducted/Non-ducted)	kW	12.74	16.77	19.90			
	COP 47°F (Ducted/Non-ducted)	W/W	3.72/4.10	3.6/3.94	3.5/3.80			
	Low Temperature Heating Capacity (47°F)	Btu/h	105000	140000	162000			
		kW	30.8	41.0	47.4			
	Power Consumption (Ducted/Non-ducted)	kW	12.57	17.30	20.08			
	COP 17°F (Ducted/Non-ducted)	W/W	2.45/2.45	2.37/2.40	2.36/2.38			
Electrical Parameter	MCA	A	63.8 + 63.8	67.4 + 67.4	71.2 + 71.2			
	MOP	A	90 + 90	90 + 90	100 + 100			
Sound Pressure Level*3	Normal Mode	dB(A)	66/67	66/67	67/68			
Cabinet Color*4		-	Ivory White					
Outer Dimensions	Height	in.	68-1/8	68-1/8	68-1/8			
		mm	1730	1730	1730			
	Width	in.	53-5/32 + 53-5/32	53-5/32 + 53-5/32	53-5/32 + 53-5/32			
		mm	1350 + 1350	1350 + 1350	1350 + 1350			
	Depth	in.	29-17/32	29-17/32	29-17/32			
		mm	750	750	750			
Packing Dimensions	Height	in.	76-3/4	76-3/4	76-3/4			
		mm	1950	1950	1950			
	Width	in.	55-29/32 + 55-29/32	55-29/32 + 55-29/32	55-29/32 + 55-29/32			
		mm	1420 + 1420	1420 + 1420	1420 + 1420			
	Depth	in.	31-3/32	31-3/32	31-3/32			
		mm	790	790	790			
Weight	Net Weight	lbs.	796 + 796	798 + 798	800 + 800			
		kg	361 + 361	362 + 362	363 + 363			
	Gross Weight	lbs.	860 + 860	862 + 862	864 + 864			
		kg	390 + 390	391 + 391	392 + 392			
Refrigerating Installation	Compressor		-	Scroll Comp				
	Compressor Quantity		-	2 + 2	2 + 2			
	Refrigeration Oil	Type	-	FVC68D				
		Brand	-	Idemitsu Kosan				
		Chagre (Total)	gal	2.2 + 2.2	2.2 + 2.2	2.2 + 2.2		
			L	8.4 + 8.4	8.4 + 8.4	8.4 + 8.4		
	Refrigerant Charge Before Shipment		lbs.	17.2 + 17.2	18.7 + 18.7			
			kg	7.8 + 7.8	8.5 + 8.5			
	Refrigerant Flow Control		-	Micro-computer Control Expansion Valve				
	Heat Exchanger Type		-	Multi-Pass Cross-Finned Tube				
	Heat Recovery Operation System	Low Prerssure Gas Pipe	in.	Φ1	Φ1-1/8	Φ1-3/8		
			mm	Φ25.40	Φ28.60	Φ34.93		
			High/Low Pressure Gas Pipe	in.	Φ7/8	Φ7/8	Φ1-1/8	
				mm	Φ22.20	Φ22.20	Φ28.6	
		Liquid Pipe	in.	Φ1/2	Φ5/8	Φ3/4		
			mm	Φ12.70	Φ15.88	Φ19.05		
			Heat Pump Operation System	High/Low Pressure Gas Pipe	in.	Φ1	Φ1-1/8	Φ1-3/8
					mm	Φ25.40	Φ28.60	Φ34.93
Liquid Pipe	in.	Φ1/2		Φ5/8	Φ3/4			
	mm	Φ12.70		Φ15.88	Φ19.05			
Fan	Condenser Fan Quantity		-	2 + 2	2 + 2			
	Air Flow Rate	CFM	9430 + 9430	9430 + 9430	9430 + 9430			
		m³/min	267 + 267	267 + 267	267 + 267			
IEER (Ducted/Non-ducted)		(Btuh)/W	18.5/20	19/19.5	18.7/19			
SCHE (Ducted/Non-ducted)		(Btuh)/W	23/24.8	22.1/23.5	21.5/23.0			
Volume		m³	-	-	-			
Connectable Indoor Units	Quantity		PC	43	59			
Cooling Operating Range (DB)		°F	23~126°F					
Heating Operating Range (WB)		°F	-22~-62°F					

NOTES:

*1. The above cooling and heating capacities show the capacities when the outdoor unit operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 80°F DB (26.7°C DB)
67°F WB (19.4°C WB)
Outdoor Air Inlet Temperature: 95°F DB (35°C DB)

Heating Operation Conditions

Indoor Air Inlet Temperature: 70°F DB (21.1°C DB)
47°F DB (8.3°C DB)
Outdoor Air Inlet Temperature: 43°F WB (6.1°C WB)
17°F DB (-8.37°C DB)
15°F WB (-9.4°C WB)

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

*2. Rated capacity and efficiency are certified under AHRI Standard 1230. Ratings are subject to change without notice. Current certified ratings are available at www.ahridirectory.org.

*3. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be included at the scene. Measurement point: 3.3ft. (1.0m) from the service cover surface and 4.9ft. (1.5m) from floor level.

*4. The final appearance of outdoor units is subject to the actual products.

*5. If the outdoor unit operate at the temperature that is below -4°F, please install the snow hood kits to the outdoor unit.

2.2 Component Data

Outdoor Heat Exchanger, Fan and Fan Motor

Model				CHV6-72*	CHV6-96*	CHV6-120*
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type		
	Tube	Material	-	Copper		
		Outside diameter	in.(mm)	9/32 (7)		
		Rows	-	3	3	3
	Fin	Material	-	Aluminum		
		Pitch	in.(mm)	1/16 (1.4)	1/16 (1.4)	1/16 (1.4)
	Quantity		-	2	2	2
	Max. operating pressure		psi(MPa)	601 (4.15)		
	Max. frontal area		ft. ² (m ²)	39.40(3.66)	39.40(3.66)	39.40(3.66)
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	1	1	2
		Outside diameter	in.(mm)	25-23/64 (644)	25-23/64 (644)	25-23/64 (644)
		Rotating speed	rpm	960+960	960+960	960+960
	Fan motor	Type	-	Waterproof three-phase motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	750+750	750+750	750+750
		Quantity	-	2	2	2
		Insulation grade	-	E	E	E

Parameters of Compressor

Compressor Model			Compressor Model	Compressor Quantity
Design Pressure	High Side	psi (MPa)	601 (4.15)	
	Low Side	psi (MPa)	320 (2.21)	
Compressor Motor	Model	-	Three-phase sync motor	
	Start-up mode	-	VFD	
	Polarities	-	6	
	Insulation grade	-	E	
Refrigerator oil	Brand	-	FVC68D	
	Quantity volume	L	2.3	

Model	Compressor Model	Compressor Quantity
CHV6-72URBHH	ANB52FZFMT	2
CHV6-96URBHH	ANB52FZFMT	2
CHV6-120URBHH	ANB52FZFMT	2
CHV6-72SRBHH	ANB52FZFMT	2
CHV6-96SRBHH	ANB52FZFMT	2
CHV6-120SRBHH	ANB52FZFMT	2

2.3 Safety and Control Device Setting

- Compressor Protection

The compressor is protected by the following devices and their combinations.

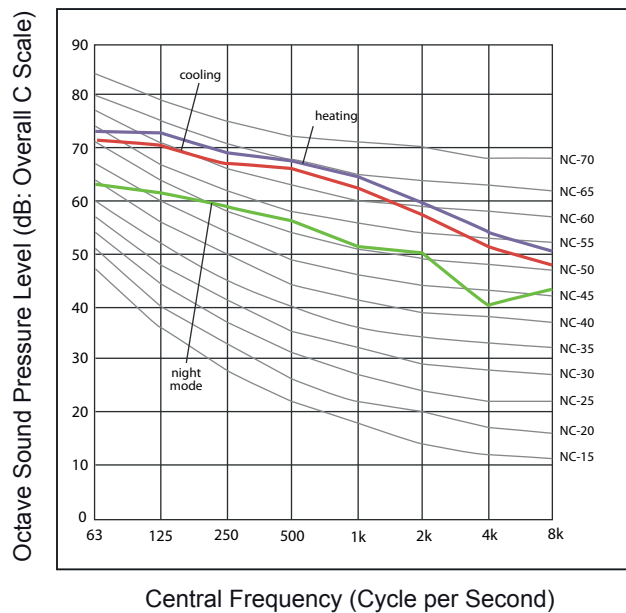
- (1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
- (2) Oil Heater: This band type heater protects against oil foaming during cold starting, as it is energized while the compressor is stopped.

Model			72	96	120
Compressor			"Reset automatically and non-adjustable (one for each compressor)"		
Pressure switch					
High	Open	psi	601	601	601
	Close	psi	464	464	464
Capacity of circuit breaker		A	63x6	63x6	63x6
Oil heater capacity		W	40x4	40x4	40x4
CCP Timer setting			Non-adjustable		
			3	3	3

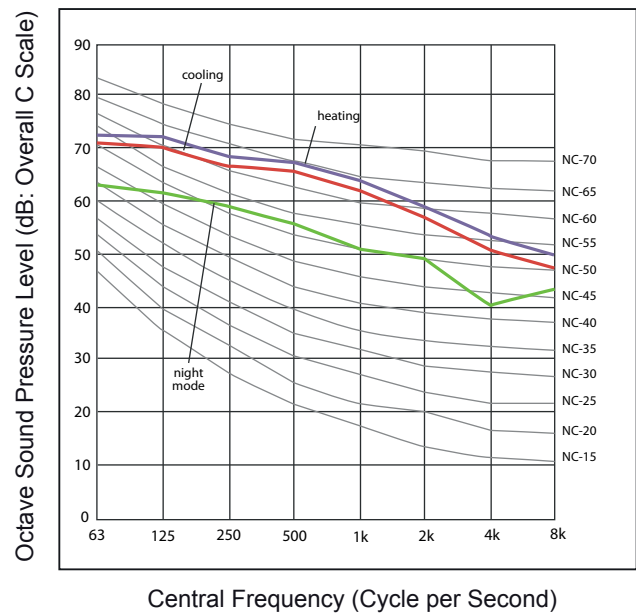
2.4 Sound Data

Measurement point: 3.3ft. (1m) from the service cover surface and 4.9ft. (1.5m) from floor level.

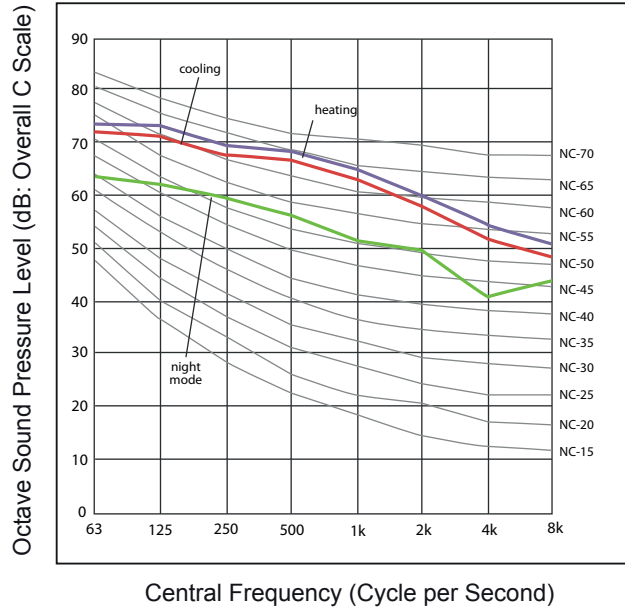
CHV-72U(S)RBHH



CHV-96U(S)RBHH



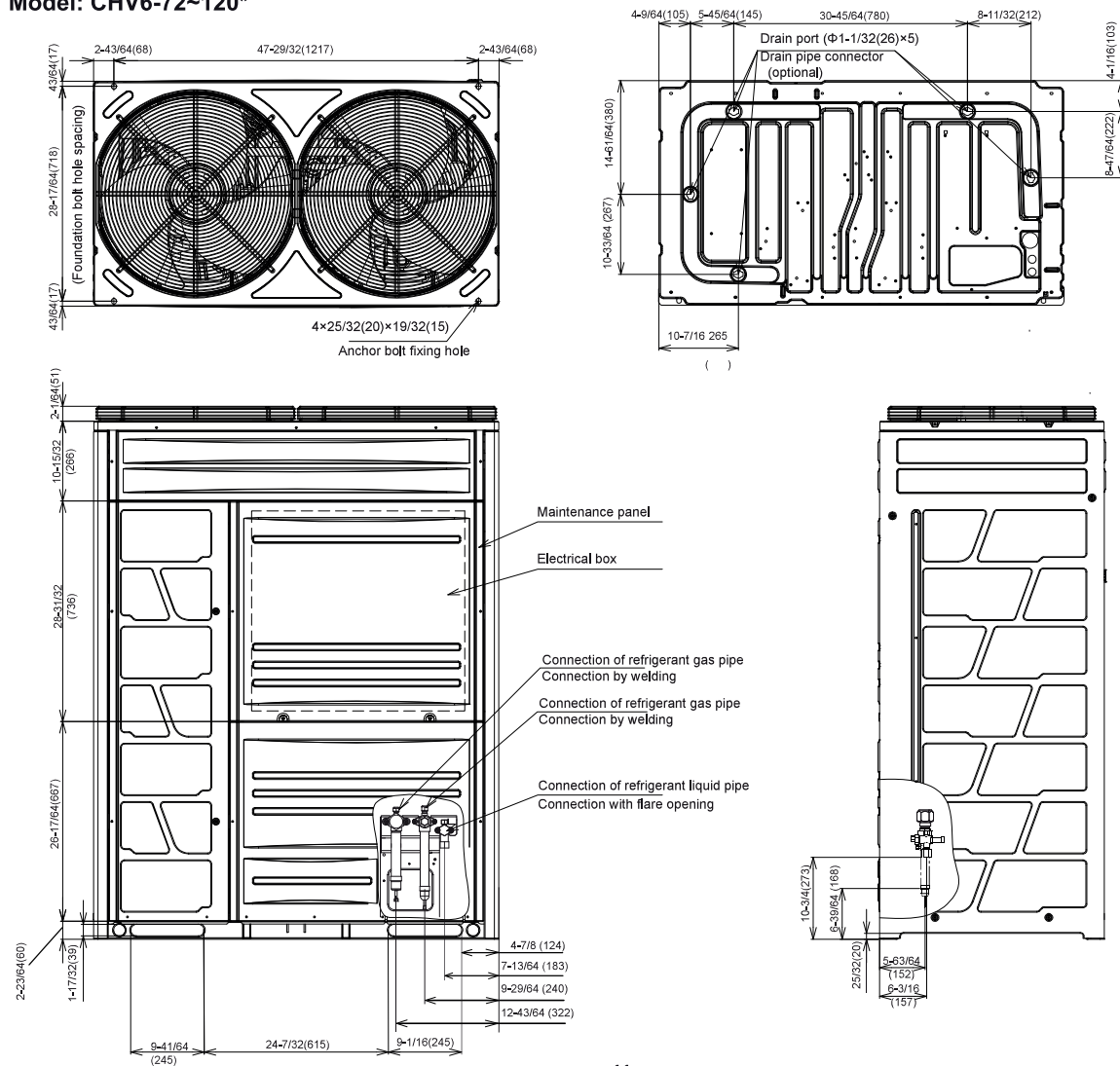
CHV-120U(S)RBHH



2.5 Dimension Data

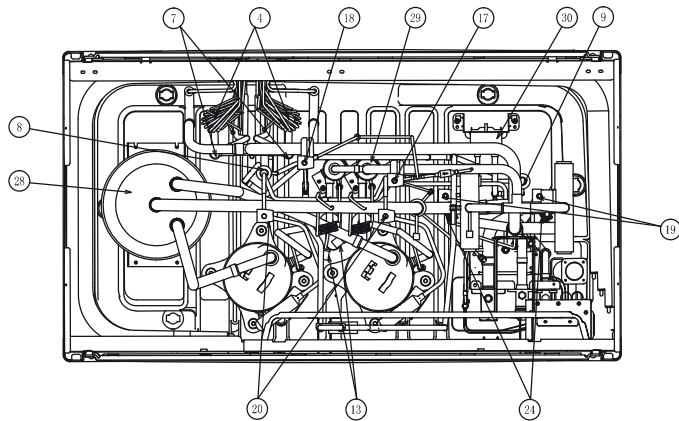
Model: CHV6-72~120*

unit: in.(mm)

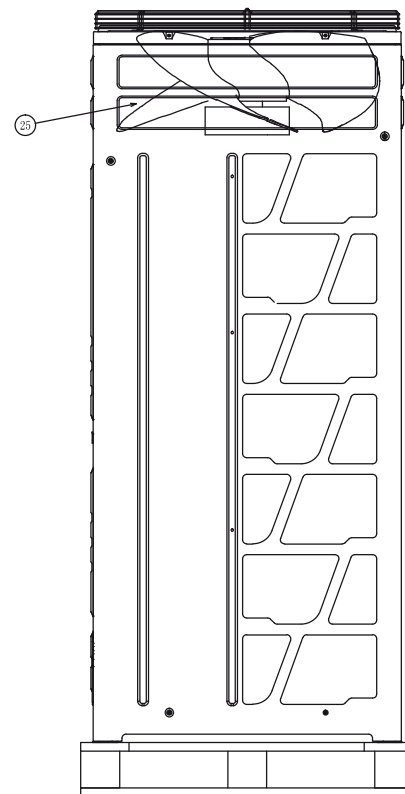
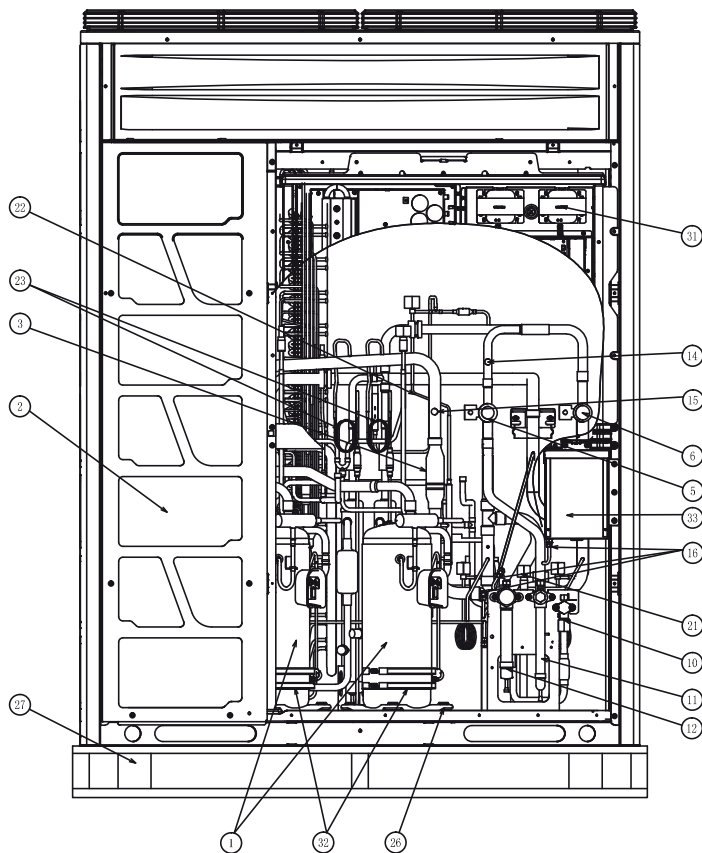


2.6 Structure

Model: CHV6-72~120*

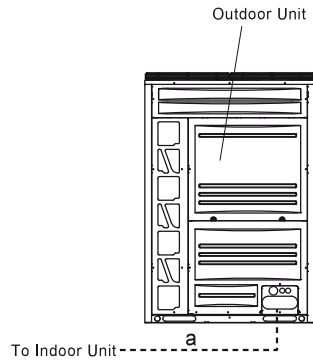


SN	Part Name	SN	Part Name
1	Compressor	17	Solenoid valve (SVA)
2	Heat exchanger	18	Solenoid valve (SVC)
3	Strainer	19	Solenoid valve (SVG)
4	Splitter	20	Solenoid valve (SVJ)
5	Four-way valve (21-1)	21	Solenoid valve (SVS)
6	Four-way valve (21-2)	22	Capillary tube (SVA)
7	Electronic expansion valve (EVO)	23	Capillary tube (SVF)
8	Electronic expansion valve (MV5)	24	Capillary tube (SVG)
9	Electronic expansion valve (EVB)	25	Propeller fan
10	Stop valve (liquid)	26	Damping rubber pad
11	Stop valve (high/low pressure gas)	27	Wooden pallet
12	Stop valve (low pressure gas)	28	Accumulator
13	High pressure switch	29	Oil separator
14	High pressure sensor	30	Subcooler
15	Low pressure sensor	31	Electrical box
16	Test connector	32	Crankcase heater
33	Auxiliary electronic control box (only for CHV6-72/96/120SRBH)		



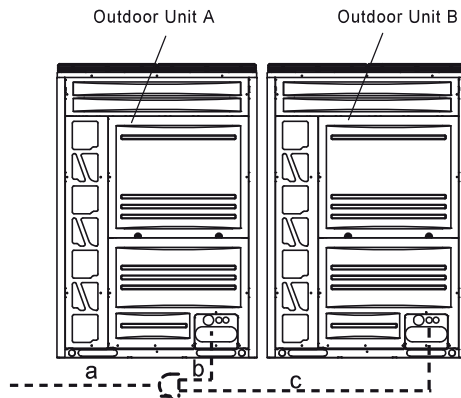
3. Piping System

3.1 Connection of Refrigerant Pipes for 3 Pipes Heat Recovery System

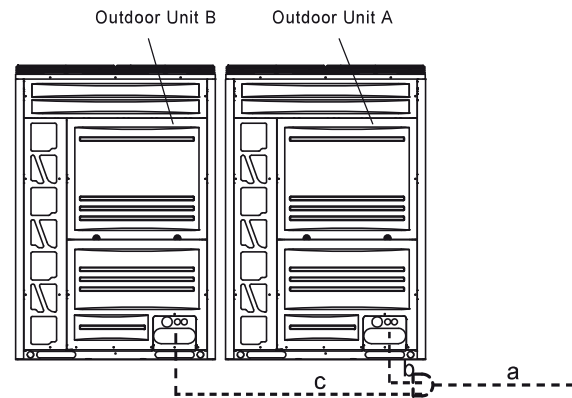


Model (kBtu/h)		72 (6RT)	96 (8RT)	120 (10RT)
"Piping Size Φ in.(mm)"	a	Low Pressure Gas	3/4 (19.05)	7/8 (22.2)
		High/Low Pressure Gas	5/8 (15.88)	3/4 (19.05)
		Liquid	3/8 (9.53)	3/8 (9.53)
				1/2 (12.7)

Indoor unit on the left side

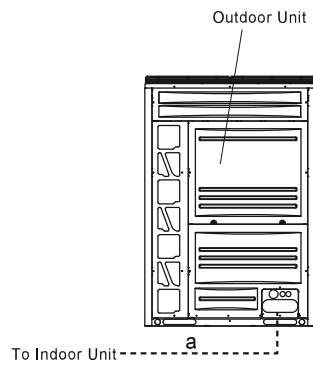


Indoor unit on the right side



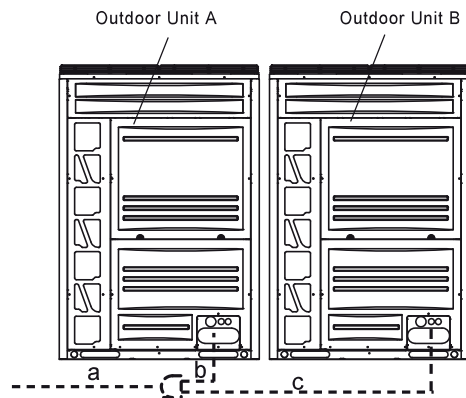
Model (kBtu/h)		144 (12RT)	192 (16RT)	240 (20RT)
Combination of Basic Unit	Outdoor Unit A	72 (6RT)	96 (8RT)	120 (10RT)
	Outdoor Unit B	72 (6RT)	96 (8RT)	120 (10RT)
Manifold Pipe		SPBPK-M282HR	SPBPK-M202HR	SPBPK-M212HR
"Piping Size Φ in.(mm)"	a	Low Pressure Gas	1-1/8 (28.6)	1-3/8 (34.93)
		High/Low Pressure Gas	7/8 (22.2)	1-1/8 (28.6)
		Liquid	1/2 (12.7)	3/4 (19.05)
	b	Low Pressure Gas	3/4 (19.05)	1 (25.4)
		High/Low Pressure Gas	5/8 (15.88)	7/8 (22.2)
		Liquid	3/8 (9.53)	1/2 (12.7)
	c	Low Pressure Gas	3/4 (19.05)	1 (25.4)
		High/Low Pressure Gas	5/8 (15.88)	7/8 (22.2)
		Liquid	3/8 (9.53)	1/2 (12.7)

3.2 Connection of Refrigerant Pipes for 2 Pipes Heat Pump System

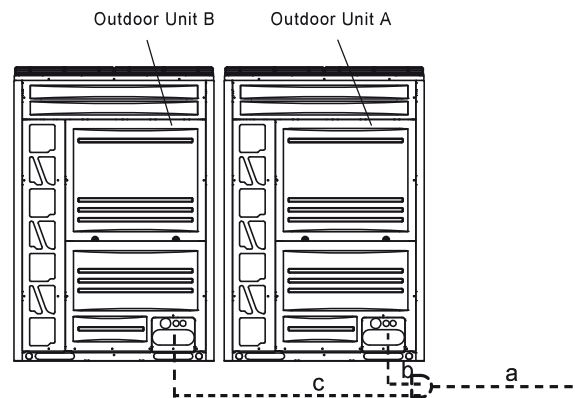


Model (kBtu/h)			72 (6RT)	96 (8RT)	120 (10RT)
“Piping Size Φ in.(mm)”	a	High/Low Pressure Gas	3/4 (19.05)	7/8 (22.2)	1 (25.4)
		Liquid	3/8 (9.53)	3/8 (9.53)	1/2 (12.7)

Indoor unit on the left side

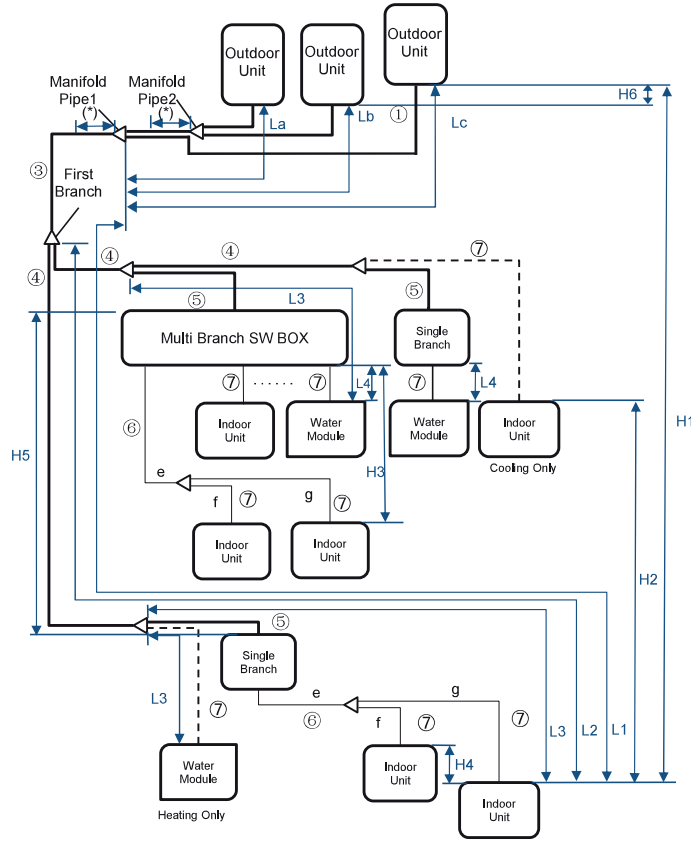


Indoor unit on the right side



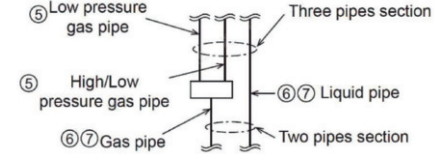
Model (kBtu/h)			144 (12RT)	192 (16RT)	240 (20RT)
Combination of Basic Unit	Outdoor Unit A		72 (6RT)	96 (8RT)	120 (10RT)
	Outdoor Unit B		72 (6RT)	96 (8RT)	120 (10RT)
Manifold Pipe			SPBPK-162HP	SPBPK-242HP	SPBPK-M32HP
“Piping Size Φ in.(mm)”	a	High/Low Pressure Gas	1 (25.4)	1-1/8 (28.6)	1-3/8 (34.93)
		Liquid	1/2 (12.7)	5/8 (15.88)	3/4 (19.05)
	b	High/Low Pressure Gas	3/4 (19.05)	7/8 (22.2)	1 (25.4)
		Liquid	3/8 (9.53)	3/8 (9.53)	1/2 (12.7)
	c	High/Low Pressure Gas	3/4 (19.05)	7/8 (22.2)	1 (25.4)
		Liquid	3/8 (9.53)	3/8 (9.53)	1/2 (12.7)

3.3 Pipe Connection Design Guidance for 3 Pipes Heat Recovery System

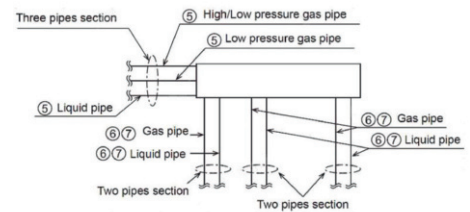


(*) Keep the straight line distance of 19-11/16 in. (500mm) or more after the manifold pipe

For single branch SW BOX:



For multi branch SW BOX:



— : High/Low Pressure Gas Pipe, Low Pressure Gas Pipe, Liquid Pipe
 — : Gas Pipe, Liquid Pipe
 - - - : Low Pressure Gas Pipe, Liquid Pipe (For Cooling Only Indoor Unit)
 - - - : High/Low Pressure Gas Pipe, Liquid Pipe (For Heating Only Indoor Water Module)

Pipe Length and Height Difference

Item	Mark	Permitted Value	
		< Recommended Connectable Number of Indoor Unit and Water Module	≥ Recommended Connectable Number of Indoor Unit and Water Module
Total Piping Length	Total Liquid Piping Actual Length	≤3280.8ft.(1000m)	≤984.3ft.(300m)
Piping Length between Manifold Pipe 1 and Each Outdoor Unit	La, Lb, Lc	≤32.8ft.(10m)	
Maximum Piping Length	Actual Length	≤541.3ft.(165m)	
	Equivalent Length	≤623.4ft.(190m)	
Maximum Piping Length between First Branch and Each Indoor Unit	L2	≤295.3ft.(90m)	≤131.2ft.(40m)
Maximum Piping Length between Each Branch Pipe and Each Indoor Unit	L3	≤131.2ft.(40m)	≤98.4ft.(30m)
Total Piping Length between Switch Box and Each Indoor Unit	L4 e+f+g	≤131.2ft.(40m)	
Height Difference between Outdoor Units and Indoor Units	O.U. is Higher	≤164ft.(50m)	
	O.U. is Lower	≤131.2ft.(40m)	
Height Difference between Indoor Units	H2	≤98.4ft.(30m)	
Height Difference between Switch Box and Indoor Units	H3	≤49.2ft.(15m)	
Height Difference between Indoor Units using the Same Branch of Switch Box	H4	≤13.1ft.(4m)	
Height Difference between Switch Box	H5	≤49.2ft.(15m)	
Height Difference between Outdoor Units	H6	≤0.3ft.(0.1m)	

NOTE:

- Check the gas pipe and liquid pipe are equivalent in terms of the piping length and piping system.
- Piping length between outdoor units should be $L_a \leq L_b \leq L_c \leq 32.8\text{ft.}(10\text{m})$.
- If the piping length between branch and indoor unit (L3) is considerably longer than others, refrigerant may not flow well and also performance may be deteriorated compared to other models. (Recommended: $L_3 \leq 49.2\text{ft.}(15\text{m})$).
- When the liquid piping length is longer than 49.2ft. (15m), use $\Phi 3/8\text{in.}$ (9.53mm) pipe and reducer (field-supplied).
- Allowable total piping length may become shorter than 3280.Bft.(1,000m) due to the limitation of maximum additional refrigerant amount.
- Function setting of Ci is required ($C_i=2$), in case of height difference between indoor units: $49.2\text{ft.}(15\text{m}) < H_2 \leq 98.4\text{ft.}(30\text{m})$.
- In case of the height difference between outdoor units and indoor units: $164\text{ft.}(131.2\text{ft.}) < H_1 \leq 295.3\text{ft.}$, contact technical department of the manufacture.

①② Piping between outdoor unit Refer to section 3.1.

③ Main Pipe (Basic Unit or Manifold Pipe 1 to First Branch)

Outdoor Unit Capacity (kBtu/h)	Low Pressure Gas Φ in.(mm)	High/Low Pressure Gas Φ in.(mm)	"Liquid Φ in.(mm)"	First Branch Model
72	3/4 (19.05)	5/8 (15.88)	3/8 (9.53)	SPBPK-M282HR
96	7/8 (22.2)	3/4 (19.05)	3/8 (9.53)	
120~144	1-1/8 (28.6)	7/8 (22.2)	1/2 (12.7)	SPBPK-M452HR
192	1-1/8 (28.6)	7/8 (22.2)	5/8 (15.88)	SPBPK-M562HR
240	1-1/4 (31.75)	1-1/8 (28.6)	3/4 (19.05)	SPBPK-M692HR

NOTE:

When maximum length of the equivalent refrigerant pipe (L1) from the outdoor unit/manifold pipe1 to the indoor unit is over 328ft. (100m), the pipe size of low pressure gas, high/low pressure gas and liquid line from base unit/manifold pipe1 to first branch should be increased one size with the reducer (field-supplied), but for 240 model, the pipe size can not be increased.

④ Pipe after first branch (3 pipes portion)

Total Indoor Unit Capacity (kBtu/h)	Low Pressure Gas Φ in.(mm)	High/Low Pressure Gas Φ in.(mm)	"Liquid Φ in.(mm)"	First Branch Model
Q < 54	5/8 (15.88)	1/2 (12.7)	3/8 (9.53)	SPBPK-M142HR
54 ≤ Q < 86	3/4 (19.05)	5/8 (15.88)	3/8 (9.53)	SPBPK-M282HR
86 ≤ Q < 114	7/8 (22.2)	3/4 (19.05)	3/8 (9.53)	
114 ≤ Q < 154	1-1/8 (28.6)	7/8 (22.2)	1/2 (12.7)	SPBPK-M452HR
154 ≤ Q < 170	1-1/8 (28.6)	7/8 (22.2)	1/2 (12.7)	SPBPK-M562HR
170 ≤ Q < 212	1-1/8 (28.6)	7/8 (22.2)	5/8 (15.88)	
212 ≤ Q < 250	1-1/8 (28.6)	1-1/8 (28.6)	5/8 (15.88)	SPBPK-M692HR

NOTE:

Even if the equivalent refrigerant piping length (L1) is more than 328ft.(100m), no need to increase the pipe size after first branch. If the branch pipe size is larger than the first branch, adjust the branch pipe size to the first branch. In case that the selected pipe size after the first branch is larger than the pipe size before the first branch, use the same pipe size as the one before the branch.

⑤ Pipe Diameter between Switch Box to Branch Pipe (3 pipes or 2 pipes portion)

Type	SW BOX Model	Number of Branch	Number of Connectable Indoor Unit per Branch	Maximum Combination of Indoor Unit Capacity (kBtu/h)		Low Pressure Gas	High/Low Pressure Gas	Liquid
				per SW BOX	per Branch			
Single	SPSBD-16	1	1-8" ¹	54	38	5/8(15.88)	1/2(12.7)	3/8(9.53) ^{*2}
					54	3/4(19.05)	5/8(15.88)	3/8(9.53) ^{*2}
	SPSBD-28	1	1-8" ¹	96	76	5/8(15.88)	1/2(12.7)	3/8(9.53) ^{*2}
					96	3/4(19.05)	5/8(15.88)	3/8(9.53) ^{*2}
Multi	SPMBD-4/45	4	1-8" ¹	154	38	Refer to ④		
	SPMBD-8/85	8	1-8" ¹	290	54			
	SPMBD-12/85	12	1-6" ¹	290	54			
	SPMBD-16/85	16	1-6" ¹	290	54			

NOTE:

- When multiple indoor units are connected to the same branch, they are controlled with the same operation mode.
- The liquid pipe is not required to connect to the single SW BOX.
- In case that the number of connectable indoor units exceeds four, the high/low pressure gas pipe, low pressure gas pipe and liquid pipe need to increase one size respectively.

⑥ Pipe after first branch (2 pipes portion)

Total Indoor Unit (kBtu/h)	Gas Φ in.(mm)	Liquid Φ in.(mm)	Branch Pipe Model
$Q < 54$	5/8 (15.88)	3/8 (9.53)	SPBPK-102HP
$54 \leq Q < 86$	3/4 (19.05)	3/8 (9.53)	
$86 \leq Q < 114$	7/8 (22.2)	3/8 (9.53)	
$114 \leq Q < 154$	1-1/8 (28.6)	1/2 (12.7)	SPBPK-162HP
$154 \leq Q < 170$	1-1/8 (28.6)	1/2 (12.7)	SPBPK-242HP
$170 \leq Q < 250$	1-1/8 (28.6)	5/8 (15.88)	

⑦ Pipe between last branch and indoor unit (2-pipe portion)

- (1) The pipe diameter should be the same as the indoor unit piping connection size, details refer to the technical catalog of indoor unit.
- (2) When the liquid piping length is longer than 49.2ft.(15m), use $\Phi 3/8$ in.(9.53mm) pipe and reducer (fieldsupplied) instead of $\Phi 1/4$ in.(6.35mm)pipe.

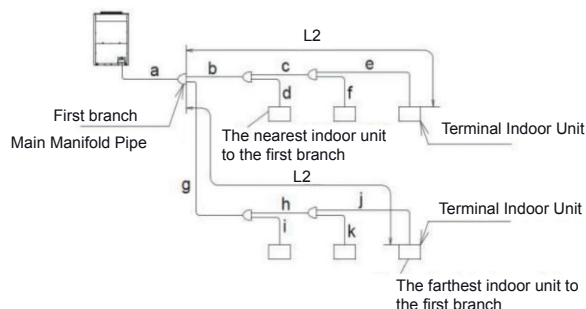
Piping Branch Restrictions

In the case that the piping length from the first branch to the farthest indoor unit (L2) is over 131.2ft.(40m), follow the instructions below when performing the field-supplied piping work.

Example 1: Installation with Main Piping Branch

In the case that piping length from the first branch to the terminal Indoor Units is within 131.2ft.(40m) - 295.3ft.(90m).

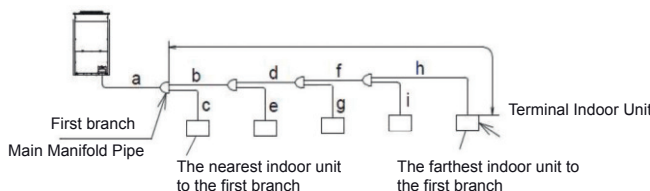
- (1) If the piping length L2 is over 131.2ft.(40m), the diameter of gas and liquid lines "b and c" or "g and h" should be increased by one size with reducers (field-supplied). If (a) is smaller than (b) after increasing the size, increase the size of (a) to the same size as (b), but for 240 model, if the (a) is smaller than (b), the size of (a) and (b) can not be increased.
- (2) The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the nearest indoor unit must be within 131.2ft.(40m).



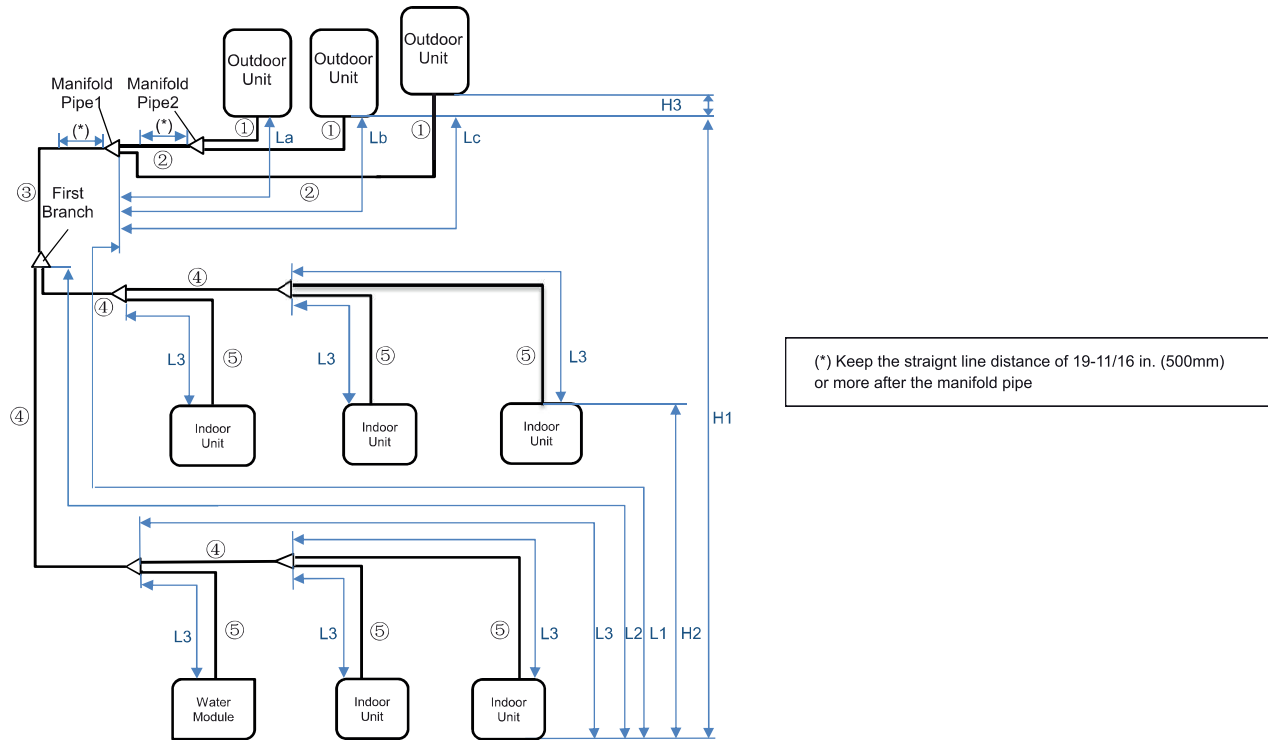
Example 2: Installation without Main Piping Branch

In the case that piping length from the first branch to the terminal Indoor Units is within 131.2ft.(40m) - 295.3ft.(90m).

- (1) If the piping length L2 is over 131.2ft.(40m), the diameter size of gas and liquid lines "b, d and f" should be increased by one size with reducers (field-supplied). If (a) is smaller than (b) after increasing the size, increase the size of (a) to the same size as (b), but for 240 model, if the (a) is smaller than (b), the size of (a) and (b) can not be increased.
- (2) The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the nearest indoor unit must be within 131.2ft.(40m).



3.4 Pipe Connection Design Guidance for 2 Pipes Heat Pump System



Item	Mark	Permitted Value	
		< Recommended Connectable Number of Indoor Unit and Water Module	≥ Recommended Connectable Number of Indoor Unit and Water Module
Total Piping Length	Total Liquid Piping Actual Length	≤3280.8ft.(1000m)	≤984.3ft.(300m)
Piping Length between Manifold Pipe 1 and Each Outdoor Unit	La, Lb, Lc	≤32.8ft.(10m)	
Maximum Piping Length	Actual Length	≤541.3ft.(165m)	
	Equivalent Length	≤623.4ft.(190m)	
Maximum Piping Length between First Branch and Each Indoor Unit	L2	≤295.3ft.(90m)	≤131.2ft.(40m)
Maximum Piping Length between Each Branch Pipe and Each Indoor Unit	L3	≤131.2ft.(40m)	≤98.4ft.(30m)
Height Difference between Outdoor Units and Indoor Units	O.U. is Higher	≤164ft.(50m)	
	O.U. is Lower	≤131.2ft.(40m)	
Height Difference between Indoor Units	H2	≤98.4ft.(30m)	
Height Difference between Outdoor Units	H6	≤0.3ft.(0.1m)	

NOTE:

- (1) Check the gas pipe and liquid pipe are equivalent in terms of the piping length and piping system.
- (2) Piping length between outdoor units should be $L_a \leq L_b \leq L_c \leq 32.8\text{ft.}(10\text{m})$.
- (3) If the piping length between branch and indoor unit (L_3) is considerably longer than others, refrigerant may not flow well and also performance may be deteriorated compared to other models. (Recommended: $L_3 \leq 49.2\text{ft.}(15\text{m})$).
- (4) When the liquid piping length is longer than 49.2ft. (15m), use $\Phi 3/8\text{in.}(9.53\text{mm})$ pipe and reducer (field-supplied).
- (5) Allowable total piping length may become shorter than 3280.Bft.(1,000m) due to the limitation of maximum additional refrigerant amount.
- (6) Function setting of C_i is required ($C_i=2$), in case of height difference between indoor units: $49.2\text{ft.}(15\text{m}) < H_2 \leq 98.4\text{ft.}(30\text{m})$.
- (7) In case of the height difference between outdoor units and indoor units: $164\text{ft.}(131.2\text{ft.}) < H_1 \leq 295.3\text{ft.}$, contact technical department of the manufacture.

①② Piping between outdoor unit Refer to section 3.2.

③ Main Pipe (Basic Unit or Manifold Pipe 1 to First Branch)

Outdoor Unit Capacity (kBtu/h)	Gas Φ in.(mm)	Liquid Φ in.(mm)	Branch Pipe Model
72	3/4 (19.05)	3/8 (9.53)	SPBPK-102HP
96	7/8 (22.2)	3/8 (9.53)	
120~140	1-1/8 (28.6)	1/2 (12.7)	SPBPK-162HP
192	1-1/8 (28.6)	5/8 (15.88)	SPBPK-242HP
240	1-1/4 (31.75)	3/4 (19.05)	SPBPK-302HP

NOTE:

When maximum length of the equivalent refrigerant pipe (L1) from the outdoor unit/manifold pipe1 to the indoor unit is over 328ft. (100m), the pipe size of low pressure gas, high/low pressure gas and liquid line from base unit/manifold pipe1 to first branch should be increased one size with the reducer (field-supplied), but for 240 model, the pipe size can not be increased.

④ Pipe after first branch (2 pipes portion)

Total Indoor Unit(kBtu/h)	Gas Φ in.(mm)	Liquid Φ in.(mm)	Branch Pipe Model
$Q < 54$	5/8 (15.88)	3/8 (9.53)	SPBPK-102HP
$54 \leq Q < 86$	3/4 (19.05)	3/8 (9.53)	
$86 \leq Q < 114$	7/8 (22.2)	3/8 (9.53)	
$114 \leq Q < 154$	1-1/8 (28.6)	1/2 (12.7)	SPBPK-162HP
$154 \leq Q < 170$	1-1/8 (28.6)	1/2 (12.7)	
$170 \leq Q < 250$	1-1/8 (28.6)	5/8 (15.88)	SPBPK-242HP

NOTE:

Even if the equivalent refrigerant piping length (L1) is more than 328ft. (100m), no need to increase the pipe size after first branch. If the branch pipe size is larger than the first branch, adjust the branch pipe size to the first branch. In case that the selected pipe size after the first branch is larger than the pipe size before the first branch, use the same pipe size as the one before the branch.

⑤ Pipe between last branch and indoor unit

- (1) The pipe diameter should be the same as the indoor unit piping connection size, details refer to the technical catalog of indoor unit.
- (2) When the liquid piping length is longer than 49.2ft.(15m), use $\Phi 3/8$ in.(9.53mm) pipe and reducer (field-supplied) instead of $\Phi 1/4$ in.(6.35mm) pipe.

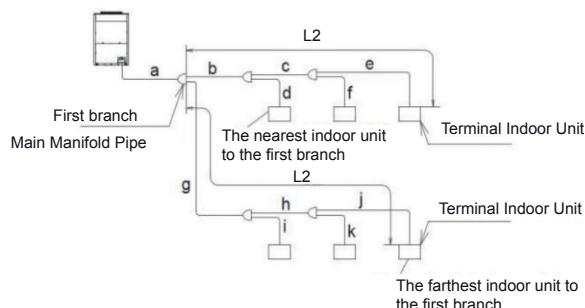
Piping Branch Restrictions

In the case that the piping length from the first branch to the farthest indoor unit (L2) is over 131.2ft.(40m), follow the instructions below when performing the field-supplied piping work.

Example 1: Installation with Main Piping Branch

In the case that piping length from the first branch to the terminal Indoor Units is within 131.2ft.(40m) - 295.3ft.(90m).

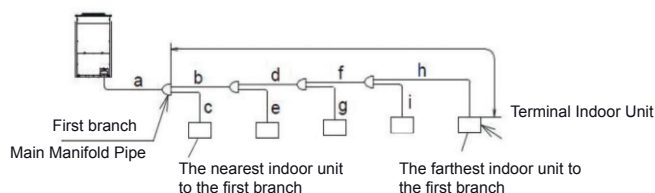
- (1) If the piping length L2 is over 131.2ft.(40m), the diameter of gas and liquid lines "b and c" or "g and h" should be increased by one size with reducers (field-supplied). If (a) is smaller than (b) after increasing the size, increase the size of (a) to the same size as (b), but for 240 model, if the (a) is smaller than (b), the size of (a) and (b) can not be increased.
- (2) The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the nearest indoor unit must be within 131.2ft.(40m).



Example 2: Installation without Main Piping Branch

In the case that piping length from the first branch to the terminal Indoor Units is within 131.2ft.(40m) - 295.3ft.(90m).

- (1) If the piping length L2 is over 131.2ft.(40m), the diameter size of gas and liquid lines "b, d and f" should be increased by one size with reducers (field-supplied). If (a) is smaller than (b) after increasing the size, increase the size of (a) to the same size as (b), but for 240 model, if the (a) is smaller than (b), the size of (a) and (b) can not be increased.
- (2) The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the nearest indoor unit must be within 131.2ft.(40m).



3.5 Calculation of Additional Refrigerant

Table 3.1 Additional Refrigerant Charge Calculation

Although refrigerant has been charged into this unit, additional refrigerant charge is required. Determine the additional refrigerant quantity according to the following procedure, and charge it into the system. Record the additional refrigerant quantity to facilitate maintenance and servicing activities thereafter.

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

(1) Additional refrigerant charge calculation for liquid piping (W1)

Pipe Diameter	Total Piping Length (ft.)	Refrigerant Amount for 1 ft Pipe (lbs/ft)	Additional Charge (lbs)
1-1/8 (28.6)	ft.	x 0.45 =	
1 (25.4)	ft.	x 0.35 =	
7/8 (22.2)	ft.	x 0.24 =	
3/4 (19.05)	ft.	x 0.175 =	
5/8 (15.88)	ft.	x 0.114 =	
1/2 (12.7)	ft.	x 0.074 =	
3/8 (9.53)	ft.	x 0.038 =	
1/4 (6.35)	ft.	x 0.016 =	
Total Additional Charge for Liquid Piping =			

(2) Additional refrigerant charge calculation for indoor unit and water module (W2)

Total Capacity of Indoor Unit Used in Heat Recovery System and NOT Connected to SW BOX (Cooling Only Indoor Unit) (kBtu/h)	Refrigerant Charge (lbs/kBTu/h)	Additional Charge (lbs)
	x 0.0231 =	
Total Other Indoor Unit and Water Module Capacity (kBtu/h)	Refrigerant Charge (lbs/kBTu/h)	Additional Charge (lbs)
	x 0.0516 =	
Additional Charge for Indoor Unit and Water Module =		

(3) Additional refrigerant charge calculation for switch box (W3)

SW BOX Model	Number of SW BOX Connected	Refrigerant Charge (lbs/unit)	Additional Charge (lbs)
SPMBD - 4/45		x 0.22 =	
SPMBD - 8/85		x 0.44 =	
SPMBD - 12/85		x 0.66 =	
SPMBD - 16/85		x 0.88 =	
Total Additional Charge for SW BOX =			

(4) Additional refrigerant charge calculation for connection ratio (W4)

Connection Ratio (Total Capacity of Indoor Unit and Water Module / Outdoor Unit Capacity)	Refrigerant Charge (lbs)
≤ 100%	0.0lbs
101% ~ 115%	1.1lbs
116% ~ 130%	2.2lbs
131% ~ 150%	3.3lbs

Total additional refrigerant charge can be calculated as follows: $W=W1 +W2+W3+W4=$ lbs

Maximum Additional Refrigerant Charge

Total additional charge must not exceed the maximum additional refrigerant charge indicated in the following table. Accordingly, allowable total piping length may become shorter than maximum value due to the limitation of maximum additional refrigerant amount.

Capacity (kBtu/h)	72	96	120	144	192	240
Max. Additional Refrigerant Charge (lbs(kg))	66.8 (30.3)	73.4 (33)	73.4 (33)	88.8 (40.3)	102.5 (46.5)	102.5 (46.5)

Ref. Charge of O.U. Before Shipment (W0) lbs

Outdoor Unit (kBtu/h)	"W0 Outdoor Unit Ref. Charge (lbs(kg))
72	17.2 (7.8)
96	18.7 (8.5)
120	18.7 (8.5)

NOTE:

- W0 is outdoor unit ref. charge before shipment.
- In case of the combination of the basic unit, calculate the total ref. charge before shipment of the outdoor units to be combined.

2. Charging Work

Charge refrigerant (R410A) into the system according to Section 6.3. in INSTALLATION chapter.

3. Record of Additional Charge

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

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

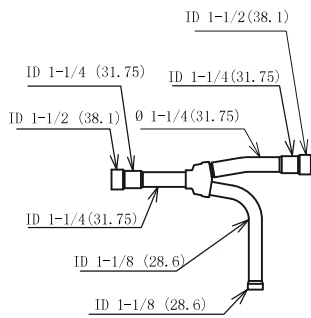
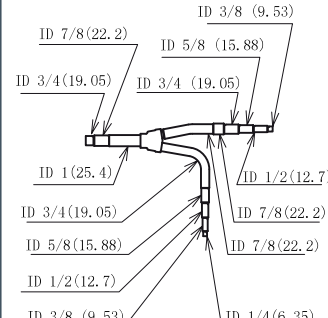
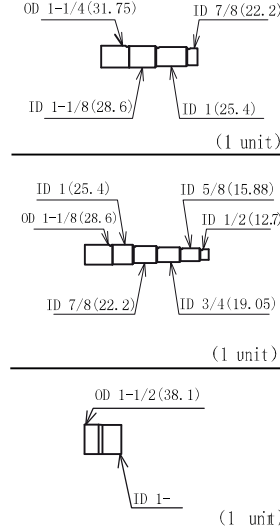
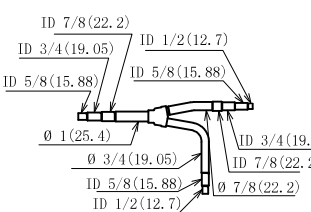
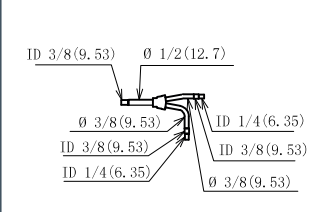
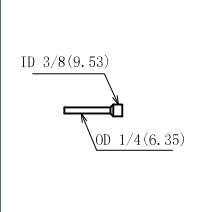
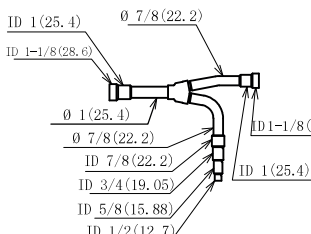
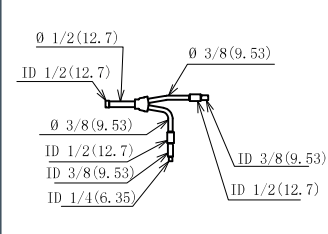
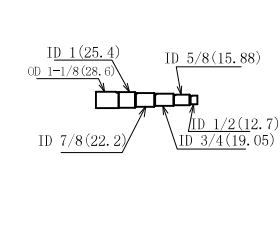
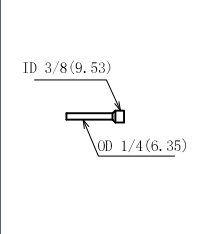
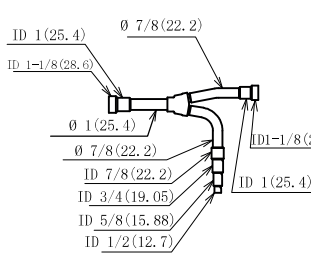
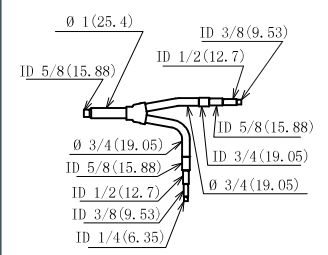
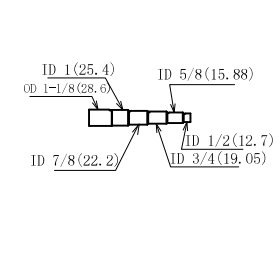
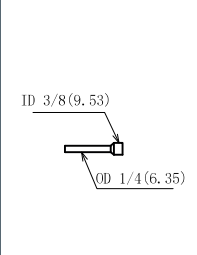
Total Additional Charge: W lbs

Total Ref. Charge: lbs

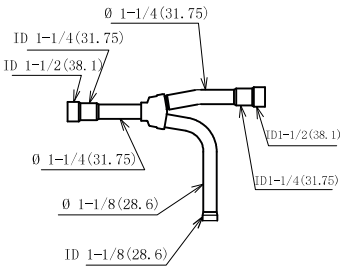
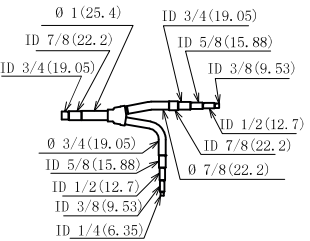
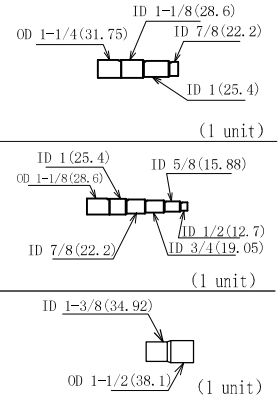
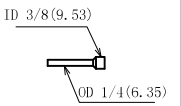
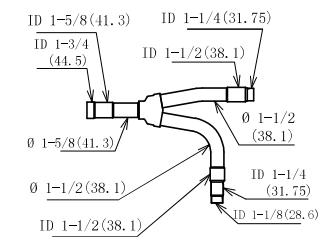
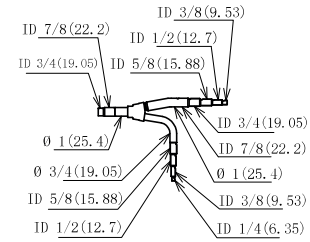
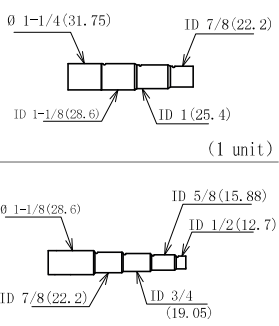
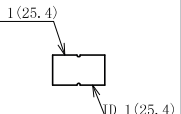
Date of Ref. / /

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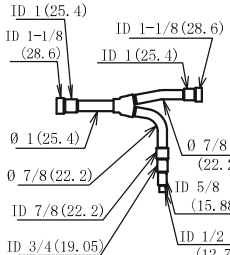
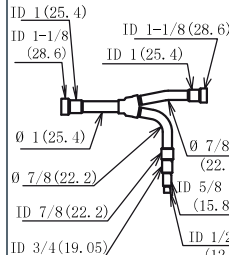
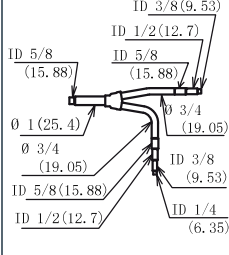
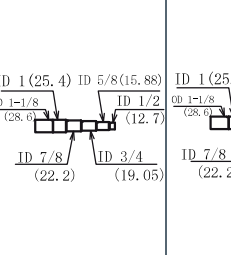
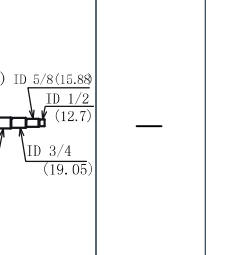
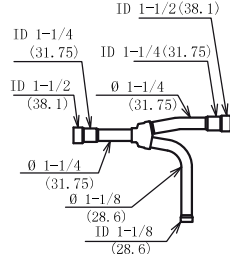
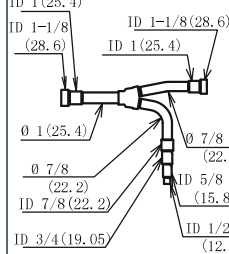
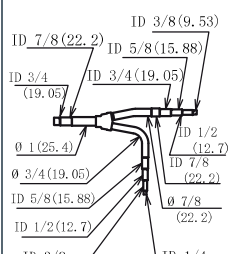
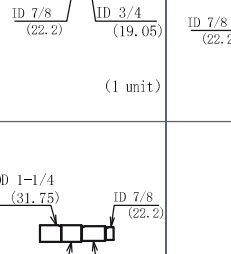
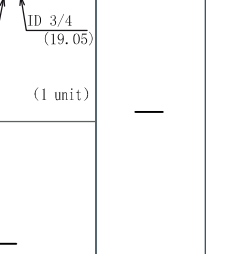
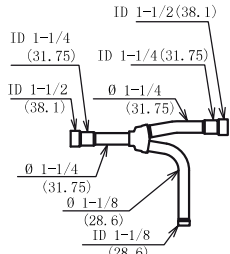
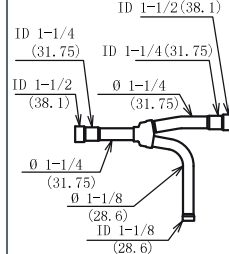
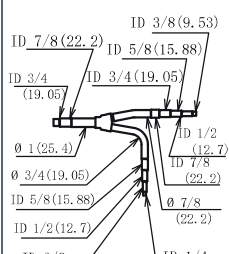
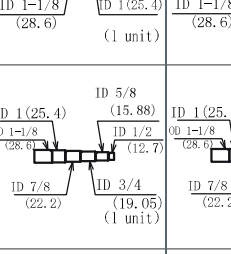
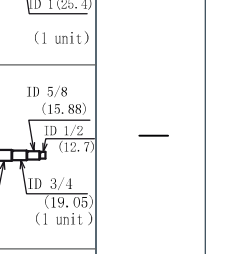
3.6 Piping Connection Kit Dimensions (optional)

Model	Gas Line	Liquid Line	Reducer for Gas Line	Reducer for Liquid Line
SPBPK-M32HP	 Diagram showing Gas Line connection for SPBPK-M32HP. Key dimensions include: ID 1-1/2 (38.1), ID 1-1/4 (31.75), ID 1-1/8 (28.6), and Ø 1-1/4 (31.75).	 Diagram showing Liquid Line connection for SPBPK-M32HP. Key dimensions include: ID 7/8 (22.2), ID 5/8 (15.88), ID 3/4 (19.05), ID 1 (25.4), ID 1/2 (12.7), ID 3/8 (9.53), and ID 1/4 (6.35).	 Diagram showing Reducer for Gas Line for SPBPK-M32HP. Key dimensions include: OD 1-1/4 (31.75), ID 7/8 (22.2), ID 1-1/8 (28.6), ID 1 (25.4), ID 5/8 (15.88), ID 1/2 (12.7), ID 3/4 (19.05), and OD 1-1/2 (38.1).	
SPBPK-102HP	 Diagram showing Gas Line connection for SPBPK-102HP. Key dimensions include: ID 7/8 (22.2), ID 3/4 (19.05), ID 5/8 (15.88), ID 1/2 (12.7), Ø 1 (25.4), Ø 3/4 (19.05), ID 5/8 (15.88), ID 7/8 (22.2), and ID 1/2 (12.7).	 Diagram showing Liquid Line connection for SPBPK-102HP. Key dimensions include: ID 3/8 (9.53), Ø 1/2 (12.7), Ø 3/8 (9.53), ID 1/4 (6.35), ID 3/8 (9.53), ID 1/4 (6.35), and Ø 3/8 (9.53).		 Diagram showing Reducer for Liquid Line for SPBPK-102HP. Key dimensions include: ID 3/8 (9.53) and OD 1/4 (6.35).
SPBPK-162HP	 Diagram showing Gas Line connection for SPBPK-162HP. Key dimensions include: ID 1 (25.4), Ø 7/8 (22.2), ID 1-1/8 (28.6), Ø 1 (25.4), Ø 7/8 (22.2), ID 7/8 (22.2), ID 3/4 (19.05), ID 5/8 (15.88), ID 1/2 (12.7), and ID 1-1/8 (28.6).	 Diagram showing Liquid Line connection for SPBPK-162HP. Key dimensions include: Ø 1/2 (12.7), ID 1/2 (12.7), Ø 3/8 (9.53), ID 1/2 (12.7), ID 3/8 (9.53), ID 1/4 (6.35), ID 3/8 (9.53), and ID 1/2 (12.7).	 Diagram showing Reducer for Gas Line for SPBPK-162HP. Key dimensions include: ID 1 (25.4), OD 1-1/8 (28.6), ID 5/8 (15.88), ID 7/8 (22.2), ID 1/2 (12.7), and ID 3/4 (19.05).	 Diagram showing Reducer for Liquid Line for SPBPK-162HP. Key dimensions include: ID 3/8 (9.53) and OD 1/4 (6.35).
SPBPK-242HP	 Diagram showing Gas Line connection for SPBPK-242HP. Key dimensions include: ID 1 (25.4), Ø 7/8 (22.2), ID 1-1/8 (28.6), Ø 1 (25.4), Ø 7/8 (22.2), ID 7/8 (22.2), ID 3/4 (19.05), ID 5/8 (15.88), ID 1/2 (12.7), and ID 1-1/8 (28.6).	 Diagram showing Liquid Line connection for SPBPK-242HP. Key dimensions include: Ø 1 (25.4), ID 5/8 (15.88), ID 1/2 (12.7), ID 3/8 (9.53), ID 1/2 (12.7), ID 3/4 (19.05), ID 5/8 (15.88), ID 3/8 (9.53), ID 1/4 (6.35), and ID 3/4 (19.05).	 Diagram showing Reducer for Gas Line for SPBPK-242HP. Key dimensions include: ID 1 (25.4), OD 1-1/8 (28.6), ID 5/8 (15.88), ID 7/8 (22.2), ID 1/2 (12.7), and ID 3/4 (19.05).	 Diagram showing Reducer for Liquid Line for SPBPK-242HP. Key dimensions include: ID 3/8 (9.53) and OD 1/4 (6.35).

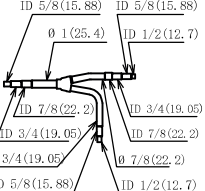
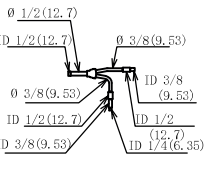
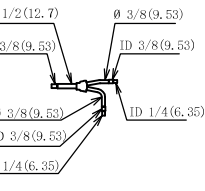
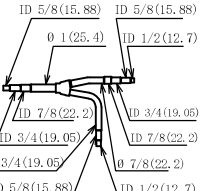
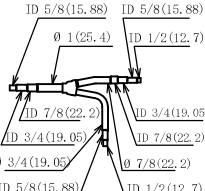
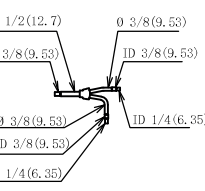
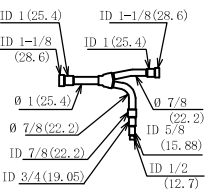
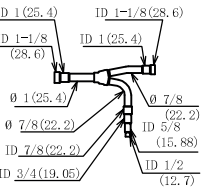
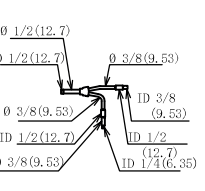
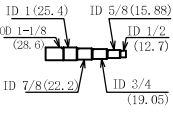
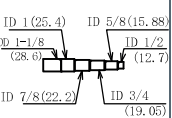
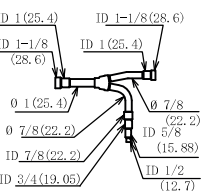
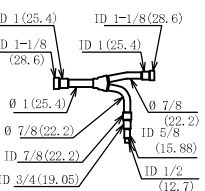
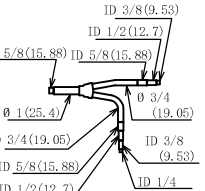
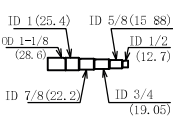
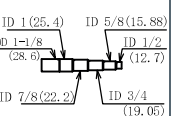
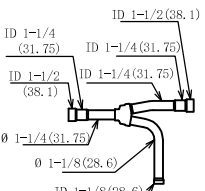
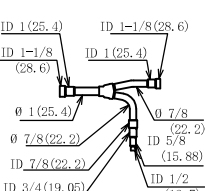
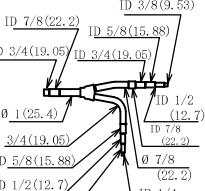
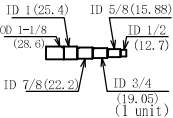
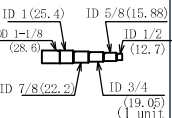
unit: in.(mm), ID: Inner Diameter, OD: Outer Diameter

Model	Gas Line	Liquid Line	Reducer for Gas Line	Reducer for Liquid Line
SPBPK302HP				
SPBPK-M462HP				

unit: in.(mm), ID: Inner Diameter, OD: Outer Diameter

Model	Low Pressure Gas Line	High Pressure Gas Line	Liquid Line	Reducer for Low Pressure Gas Line	Reducer for High Pressure Gas Line	Reducer for Liquid Line
SPBPK-M202HR				 (1 unit)	 (2 unit)	—
SPBPK-M212HR				 (1 unit)	 (1 unit)	—
SPBPK-M302HR				 (1 unit)	 (1 unit)	—
	 (1 unit)					—

unit: in.(mm), ID: Inner Diameter, OD: Outer Diameter

Model	Low Pressure Gas Line	High Pressure Gas Line	Liquid Line	Reducer for Low Pressure Gas Line	Reducer for High Pressure Gas Line	Reducer for Liquid Line
SPBPK-M142HR				—	—	 (2 unit)
SPBPK-M282HR				—	—	 (2 unit)
SPBPK-M452HR				 (1 unit)	 (2 unit)	 (1 unit)
SPBPK-M562HR				 (1 unit)	 (2 unit)	 (1 unit)
SPBPK-M692HR				 (1 unit)	 (1 unit)	 (1 unit)

unit: in.(mm), ID: Inner Diameter, OD: Outer Diameter

4. Capacities and Selection Data

4.1 Procedure for Selection of the System

This section explains the procedure to select the most suitable outdoor unit, with the values to be taken into account and the necessary steps to be carried out.

This procedure allows to select the unit with the best characteristics to provide the greatest level of efficiency and comfort, considering the building layout, the specifications of the indoor units to be installed and the distribution of air and refrigerant flows.

The ease of access for installation and maintenance work must be taken into account when selecting the location for installation of the outdoor unit.

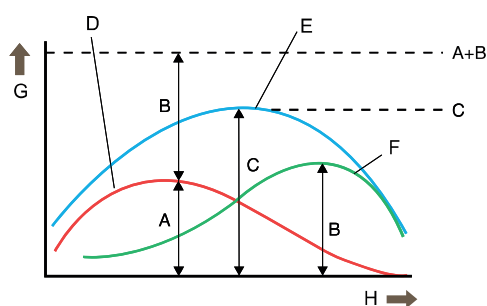
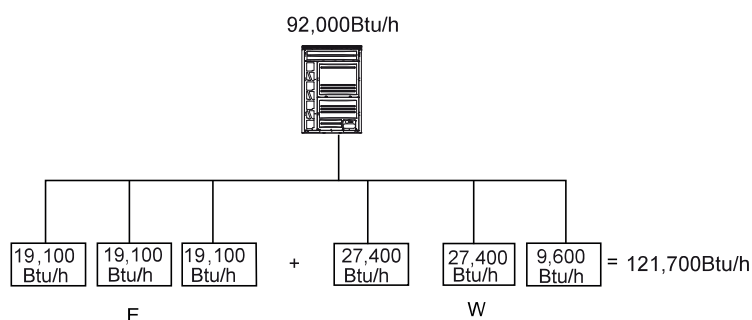
4.1.1 Unique features of the system

The system boasts some unique features that must be taken into account before selecting the outdoor unit.

Possibility of installing a reduced total unit capacity

The system allows the connection of a total combined indoor capacity as low as 70% and as high as 150%, of the nominal capacity of the outdoor unit. In comparison with other air conditioning systems requiring the indoor and outdoor nominal capacities to be equal, the system allows the installation of an outdoor unit with a nominal capacity up to 0% smaller than the total combined indoor capacity. This possibility is explained in the following example:

The diagram shows a typical building with a morning peak heat load on the east zone equivalent to a 57,300 Btu/h unit. In the afternoon, a peak equivalent to a 64,400 Btu/h unit occurs on the west zone.



Indoor unit capacity

E: East zone (57,300 Btu/h)

W: West zone (64,400 Btu/h)

A: morning peak heat load in the eastern area

B: evening peak heat load in the western area

C: maximum simultaneous load for the entire building

D: eastern area load

E: total load

F: western area load

G: load

H: time

In this case, a conventional system would require the installation of a 121,700 Btu/h outdoor unit, matching the total installed indoor capacity (57,300 Btu/h + 64,400 Btu/h). However, the maximum simultaneous load in the whole building occurs at noon, and is equal to 92,000 Btu/h of unit capacity. Therefore, a 92,000 Btu/h outdoor unit could be selected, directing its capacity to either the east or the west zone as dictated by the system controls.

NOTE:

- The maximum required loads of east and west zone must not be simultaneous.
- In systems in which all the indoor units are operated simultaneously, the total indoor capacity must not exceed the nominal capacity of the outdoor unit. Otherwise, poor performance or a narrowing of the operation range in overload conditions may occur.
- The lowest total capacity ratio varies based on the outdoor unit selected, Please refer to the section 1.2 for details.

The ratio of total combined capacity is calculated with the following formula:

$$\text{Ratio of total combined capacity} = (\text{Total capacity of the indoor units} / \text{Capacity of the outdoor unit}) \times 100\% = (121,700 \text{ Btu/h} / 92,000 \text{ Btu/h}) \times 100\% \approx 132\%$$

4.1.2 Selection Parameters

To select the outdoor units, it will be necessary to consult and/or use a series of parameters shown in tables and graphics presented in the different chapters of this handbook. A summarized list is shown below:

For cooling and heating capacities: manual of "Engineering Data".

For cooling correction factor depending on the piping length: 4.2 "Capacity Correction Based on Refrigerant Piping Length".

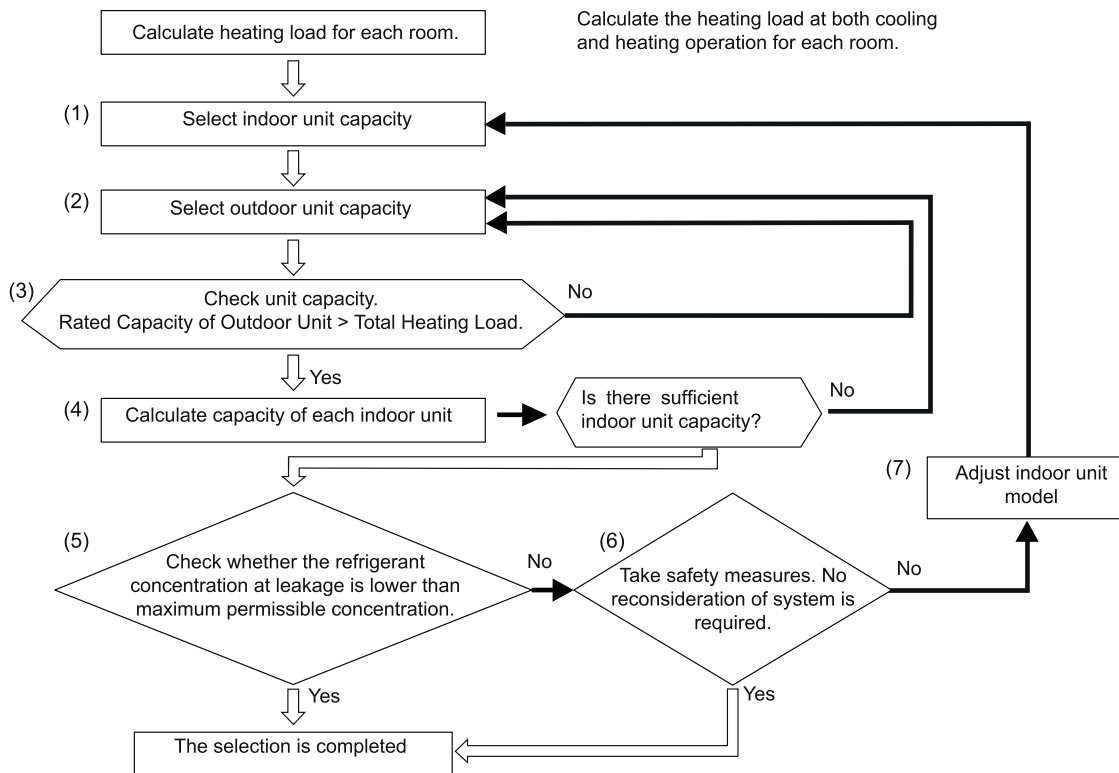
For heating correction factor depending on the piping length: 4.2 "Capacity Correction Based on Refrigerant Piping Length".

For sensible heat factor: VRF Indoor Units Technical Catalog.

In case of an installation with ducts (outdoor unit with SDL(H)SP indoor unit) the fan performance for duct calculations should be considered. The SDHSP units are designed with difference static pressure ranges in order to fulfill all installation necessities.

4.1.3 Check points for system installation

For selecting the unit capacity, perform the system selection with checking the refrigerant concentration at leakage in order not to exceed the maximum permissible concentration.



(1) Selecting indoor unit capacity.

Set temporarily the indoor unit model and capacity in each room as following:

Heating Load for each room < Capacity of Indoor Unit

At this time, consider the correction factor according to room temperature.

Then, sum up each indoor unit capacity (The calculation is required for cooling and heating operation).

Indoor unit capacity = Rated capacity x correction Factor (room temperature)

Correction factor according to room temperature: When the estimated load for each room differs from the rated capacity (cooling: 80.0°F (26.7°C) DB / 67.0°F (19.4°C) WB; heating: 70.0°F (21.1°C) DB, select the outdoor unit capacity at the estimated load from the manual of Engineering Data.

Correction Factor (room temperature) = Outdoor unit capacity at estimated load / Rated outdoor unit capacity

(2) Selecting outdoor unit capacity

Set temporarily the outdoor unit capacity according to the total connectable indoor unit capacity at the item (1). Then, calculate maximum outdoor unit capacity with considering the correction factors according to temperature condition, piping length and lift, and defrosting correction factor (for heating operation).

The calculation is required for cooling and heating operation

Outdoor unit capacity = Outdoor unit capacity at estimated load x
Correction factors (total indoor unit capacity, piping length, defrosting correction factor (for heating operation))

Outdoor unit capacity at estimated load: When calculating heating load for outdoor unit, check the ambient temperature. If the ambient temperature differs from the temperature indicated in the rated capacity (cooling: 95.0°F (35°C) DB; heating: 47.0°F (8.3°C) DB / 43.0°F (6.1°C) WB), select the outdoor unit capacity at the estimated load from the manual of Engineering Data.

Correction factor according to total indoor unit capacity:

- Select the correction factor according to manual of Engineering Data.
- Correction factor according to piping length:
Select the correction factor according to 4.2 "Capacity Correction Based on Refrigerant Piping Length".
- Correction factor according to defrosting condition (for heating operation):
Select the correction factor according to 4.3 "Correction Factor According to Defrosting Operation".

(3) Checking unit capacity.

Compare the outdoor unit capacity calculated in the item (2) with the total heating load.

(4) Calculating each indoor unit capacity.

Recalculate the indoor unit capacity as follows. (The calculation is required for cooling and heating operation.)

$$\text{Unit capacity for each room} = \text{Outdoor Unit Capacity (value at item 2)} \\ \times (\text{indoor unit capacity in concerned room (model)} / \text{Total indoor unit capacity (model)})$$

If the outdoor unit capacity is insufficient against the necessary heating load for each room, recalculate it from the item (2) after the outdoor unit capacity is increased.

(5) Checking Refrigerant Concentration at Refrigerant Leakage < Permissible Refrigerant Concentration .

(6) Taking Safety Measure (Reconsideration of system is not required).

(7) Correction of outdoor unit model if the condition of both (5) and (6) are negative.

NOTE:

- Refer to 6.3 Charge Operation in Installation Chapter for items from (5) through (7).
- When the temperature is set, consider that the ambient temperature increases by short circuit. Especially, if multiple outdoor units are installed or there is obstacle around the outdoor unit, pay attention to increase the ambient temperature.
- For the setting temperature at the heating operation in the ducted and cassette indoor unit type, consider the temperature irregularity between the floor and the ceiling surface. The temperature around the ceiling surface normally becomes 2°C higher than the floor surface during the heating operation.
- For selecting indoor unit capacity, if the sensible heating load is considered, consider the sensible heat factor together.
- In the case that the total indoor unit capacity exceeds the outdoor unit capacity, the temperature is low or the piping length is long, if the indoor units operate simultaneously, the air outlet temperature decreases so that may be felt uncomfortably. Therefore, the facility should be designed that the cooling/heating capacity for indoor unit calculated from the cooling/heating capacity for system is more than the heating load.

4.1.4 Selection procedure example

Given conditions

Once considered the system possibilities, it's the moment to start with the selection procedure. In order to do this, it has been assumed an installation consisting of several rooms with different required cooling loads and temperature conditions.

Total load required for each room

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Estimated cooling load (Btu/h)	13,470	17,250	17,250	20,700	27,930	30,750	30,760
Estimated cooling load (Btu/h)	14,590	18,620	18,620	22,410	29,440	32,050	32,050

Temperature condition

unit: °F °(C)

Operating conditions		Estimated cooling load (Btu/h)	Estimated cooling load (Btu/h)
Indoor air inlet temperature	DB	80 (27.0)	68 (20.0)
	WB	66 (19.0)	-
Outdoor air inlet temperature	DB	86 (30.0)	34 (1.0)
	WB	-	32 (0.0)

DB: dry bulb; WB: wet bulb.

In this example, the maximum required loads will not be simultaneous.

Piping dimensions:

- Equivalent pipe length between outdoor unit and indoor units: 196.85 ft. (60 m).
- Pipe height: 82.02 ft. (25 m).
- Cooling capacity correction factor depending on the pipe length =0.90.
- Heating capacity correction factor depending on the pipe length =0.95.
- Heat recovery system (3 pipes).

Appropriate selection of indoor units and nominal capacity

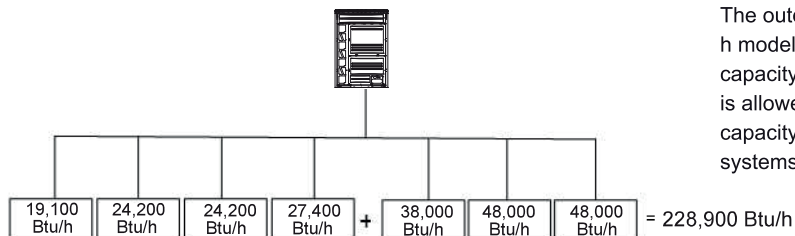
Example: selection of SDHSP ducted indoor units.

The pre-selected capacity of the different indoor units has not been the immediately higher in all the units, in order to apply a safety factor considering the different correction factors existing, which will reduce the capacity.

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	19SDHSP	24SDHSP	24SDHSP	27SDHSP	38SDHSP	48SDHSP	48SDHSP
Nominal cooling load (Btu/h)	19,100	24,200	24,200	27,400	38,000	48,000	48,000
Nominal heating load (Btu/h)	21,600	27,400	27,400	30,800	42,500	54,500	54,500

Then, it's shown a diagram of the installation resulting:

192,000Btu/h



The resulting total indoor unit capacity is 228,900 Btu/h. The outdoor unit with the exact capacity is the 228,900 Btu/h model, but the possibility "Reduced total outdoor unit capacity" allows the 192,000 Btu/h model selection. Thus, it is allowed at the outdoor unit to be up to 19% smaller capacity when compared with other air conditioning systems.

Tota

$$\text{Total combination capacity} = (\text{Total indoor unit capacity} / \text{Outdoor unit capacity}) \times 100\% = (228,900 \text{ Btu/h} / 192,000 \text{ Btu/h}) \times 100\% = 119\%$$

NOTE:

The maximum simultaneous load on the installation must not be higher than 192,000 Btu/h for this example. To determine the outdoor unit pre-selected nominal cooling and heating capacity, it's necessary refer to manual of Engineering Data, in which the total capacity combination (119%) and the temperature condition have been taken into consideration.

Concept	Room 1+2+3+4+5+6+7 (228,900 Btu/h)	Outdoor unit pre-selected (216,000 Btu/h ~ 119%)
Total nominal cooling loads (Btu/h)	228,900	202,114
Total nominal heating loads (Btu/h)	258,700	222,008

NOTE:

- If the air inlet temperature for the indoor unit or outdoor unit is not contained in the capacity tables, an interpolation should be carried out using the values above and below those of the air inlet temperature.
- If the total combination capacity is not shown in the capacity tables (for example, 119%), an interpolation should be carried out using the values above and below (110% and 120%) those of the total combination

Next step will be the capacity correction using the different correction factors shown in this chapter.

Defrost factor

Due to frost build-up during heating, defrosting is needed so capacity is reduced. Defrost time is affecting overall capacity so capacity correction is necessary.

In consideration of the frost or the defrosting operation, the heating capacity is corrected by the equation below.

Corrected Heating Capacity = Correction Factor x Heating Capacity

Outdoor Inlet Air Temp. (°F)(°C)DB) (Humidity=85% RH)	20 (-7)	23 (-5)	26 (-3)	32 (0)	38 (3)	41 (5)	44 (7)
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.0

Outdoor inlet air temp.(°C DB)=1, then Defrost correction factor = 0.857.

Actual capacity of the outdoor unit

Actual maximum capacity of the outdoor unit = (nominal capacity of the outdoor unit) x
(correction factor according to pipe length and height) x (correction factor according to temperature)

See manual of Engineering Data for the nominal capacity at the total capacity of combined indoor units.

See "Capacity Correction Based on Refrigerant Piping Length " for the correction factor according to the pipe length.

Cooling: (202,114 Btu/h) x (0.90) = 181,903 Btu/h.

Heating: (222,008 Btu/h) x (0.95) x (0.95) = 180,748 Btu/h.

Actual capacity of each indoor unit

Actual capacity of each indoor unit = (actual capacity of the outdoor unit) x
(power value of each range of indoor units / sum of the power of each indoor unit)

Example:

19SDHSP

Cooling: $181,903 \times (19,100 / (19,100 + 24,200 + 24,200 + 27,400 + 38,000 + 48,000 + 48,000)) = 15,178 \text{ Btu/h}$

Cooling: $180,748 \times (21,600 / (21,600 + 27,400 + 27,400 + 30,800 + 42,500 + 54,500 + 54,500)) = 15,091 \text{ Btu/h}$

24SDHSP

Cooling: $181,903 \times (24,200 / (19,100 + 24,200 + 24,200 + 27,400 + 38,000 + 48,000 + 48,000)) = 19,231 \text{ Btu/h}$

Cooling: $180,748 \times (27,400 / (21,600 + 27,400 + 27,400 + 30,800 + 42,500 + 54,500 + 54,500)) = 19,143 \text{ Btu/h}$

27SDHSP

Cooling: $181,903 \times (27,400 / (19,100 + 24,200 + 24,200 + 27,400 + 38,000 + 48,000 + 48,000)) = 21,774 \text{ Btu/h}$

Cooling: $180,748 \times (30,800 / (21,600 + 27,400 + 27,400 + 30,800 + 42,500 + 54,500 + 54,500)) = 21,519 \text{ Btu/h}$

38SDHSP

Cooling: $181,903 \times (38,000 / (19,100 + 24,200 + 24,200 + 27,400 + 38,000 + 48,000 + 48,000)) = 30,198 \text{ Btu/h}$

Cooling: $180,748 \times (42,500 / (21,600 + 27,400 + 27,400 + 30,800 + 42,500 + 54,500 + 54,500)) = 29,694 \text{ Btu/h}$

48SDHSP

Cooling: $181,903 \times (48,000 / (19,100 + 24,200 + 24,200 + 27,400 + 38,000 + 48,000 + 48,000)) = 38,145 \text{ Btu/h}$

Cooling: $180,748 \times (54,500 / (21,600 + 27,400 + 27,400 + 30,800 + 42,500 + 54,500 + 54,500)) = 38,078 \text{ Btu/h}$

Results

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	19SDHSP	24SDHSP	24SDHSP	27SDHSP	38SDHSP	48SDHSP	48SDHSP
Actual cooling capacity (Btu/h)	15,178	19,231	19,231	21,774	30,198	38,145	38,145
Actual heating capacity (Btu/h)	15,091	19,143	19,143	21,519	29,694	38,078	38,078
Estimated cooling load (Btu/h)	13,470	17,250	17,250	20,700	27,930	30,760	30,760
Estimated heating load (Btu/h)	14,590	18,620	18,620	22,410	29,440	32,050	32,050

Concept	Room 1+2+3+4+5+6+7
Actual total cooling capacity (Btu/h)	181,903
Actual total heating capacity (Btu/h)	180,748
Estimated total cooling load (Btu/h)	158,120
Estimated total heating load (Btu/h)	167,780

As can be seen, the actual total cooling and heating capacity are higher than the estimated total cooling and heating load. Therefore, it can be said that the CHV6-192U(S)RBHH unit meets the minimum cooling and heating requirements set for the system.

NOTE:

If the actual total cooling or heating capacity calculated is lower than the estimated total cooling or heating load, the calculation must be done again with the unit immediately.

4.2 Capacity Correction Based on Refrigerant 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

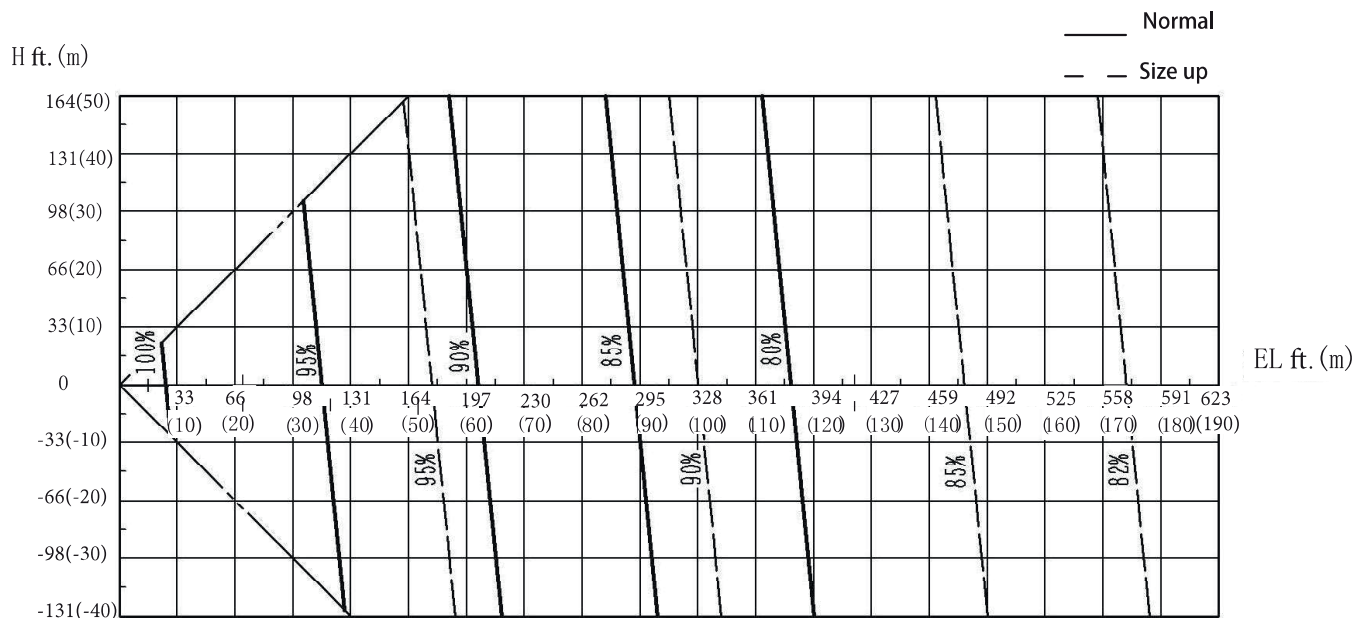
F: correction factor based on the equivalent piping length

The correction factors are shown in the following figure.

Equivalent piping length for

- one 90° elbow is 1.6ft. (0.5m).
- one 180° bend is 4.9ft. (1.5m).
- one branch pipe is 1.6ft. (0.5m).

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< Heating Capacity >

Correction factor for cooling capacity according to piping length.

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

$$HCA = HC \times F$$

HCA: actual corrected cooling capacity

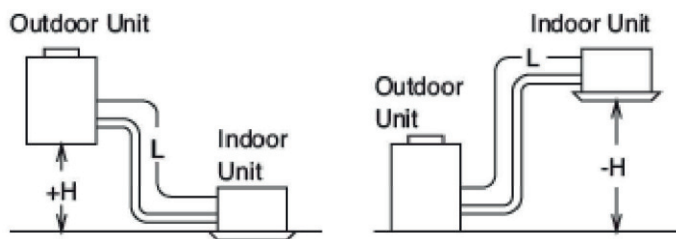
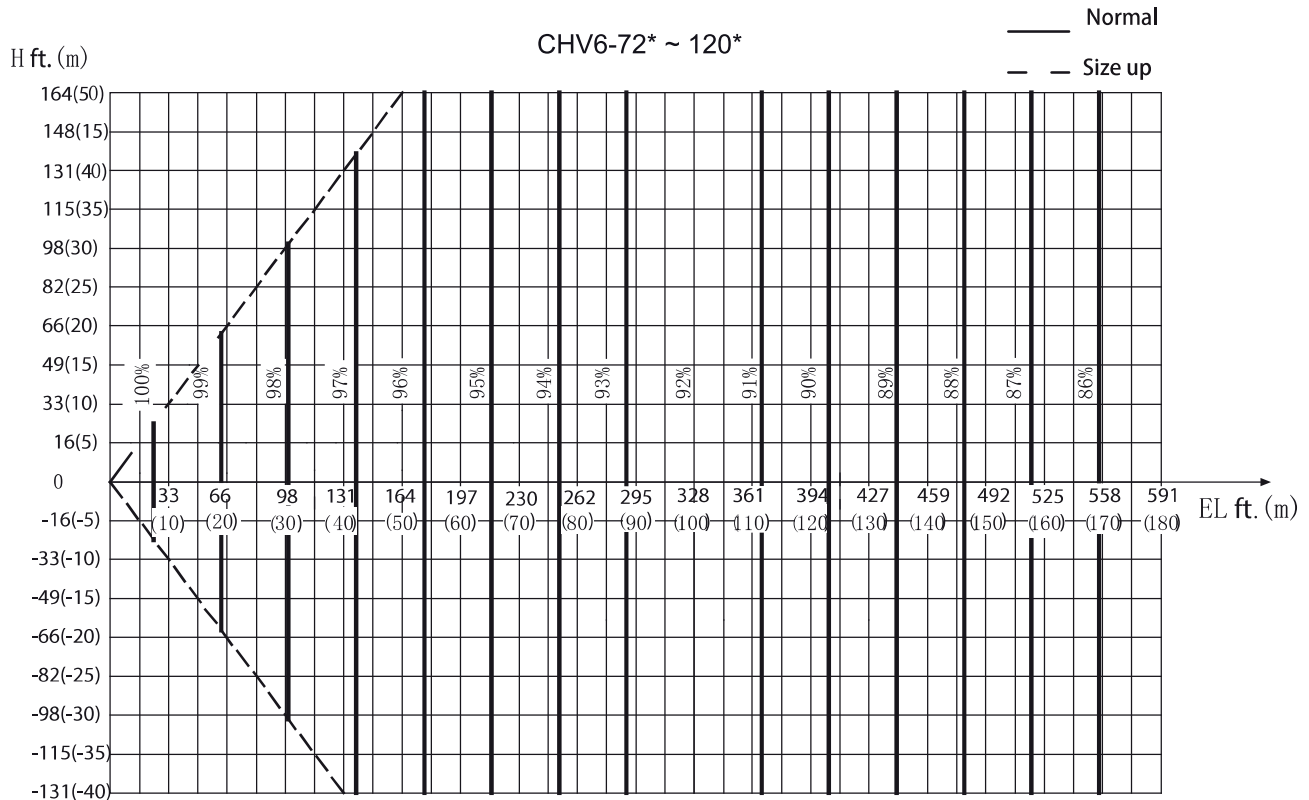
HC: cooling capacity in the performance table

F: correction factor based on the equivalent piping length

The correction factors are shown in the following figure.

Equivalent piping length for

- one 90° elbow is 1.6ft. (0.5m).
- one 180° bend is 4.9ft. (1.5m).
- one branch pipe 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.

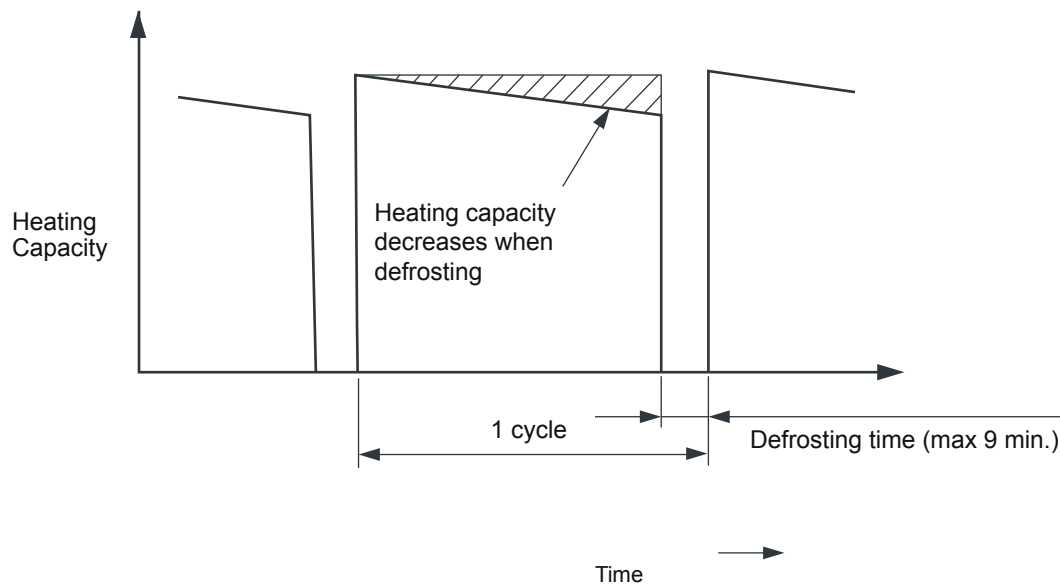
4.3 Correction Factor According to Defrosting Operation

The heating capacity in the preceding paragraph excludes the condition of the frost or the defrosting operation period.

In consideration of the frost or the defrosting operation, the heating capacity is corrected by the equation below.

Corrected Heating Capacity = Correction Factor x Heating Capacity.

Outdoor Inlet Air Temp. (°F°(C)DB) (Humidity=85% RH)	20 (-7)	23 (-5)	26 (-3)	32 (0)	38 (3)	41 (5)	44 (7)
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.0



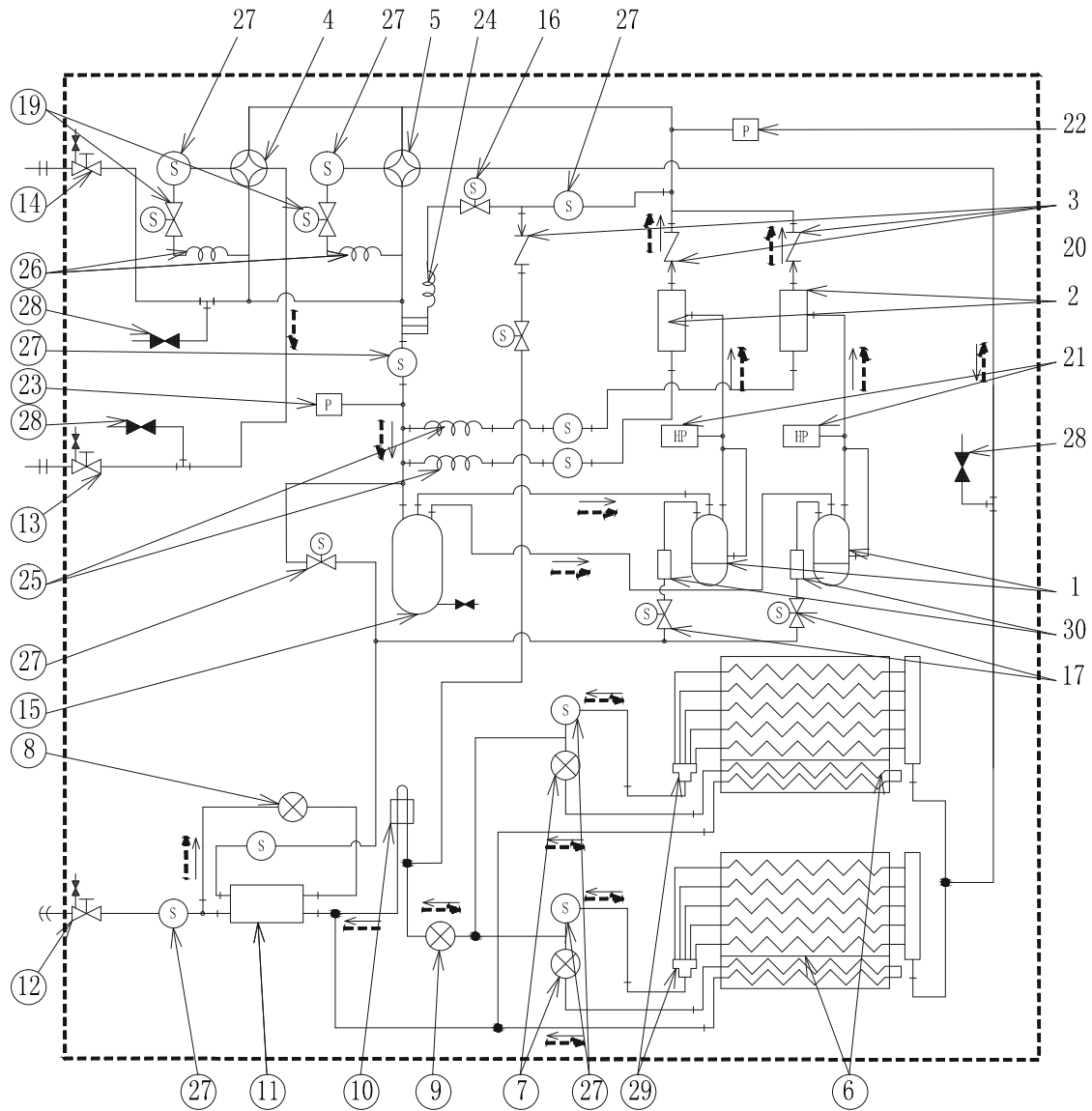
NOTE:

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

5. Control System

5.1 Refrigerant Cycle

CHV6-72* ~ 120*



← Refrigerant flow direction (Cooling)

--- Refrigerant flow direction (Heating)

— Field refrigerant Piping

≡≡ Flare connection

≡≡ Brazing connection

No.	Name	No.	Name	No.	Name
1	Compressor	11	Subcooler	21	High pressure switch
2	Oil separator	12	Stop valve	22	Pressure sensor
3	Check valve	13		23	
4	4-way reversing valve	14		24	Capillary tube
5		15	Heat exchanger	25	
6	Heat exchanger	16	Solenoid valve	26	
7	Expansion valve	17		27	Strainer
8		18		28	Check joint
9		19		29	Splitter
10	Refrigerant cooler	20		30	Muffler

5.2 Control Logic

(1) Cycle Control

Control Device		Summary of Control					
		Cooling Operation*		Heating Operation		Simultaneous Operation	
		Purpose of Control	Contents of Control	Purpose of Control	Contents of Control	Purpose of Control	Contents of Control
MC	Inverter Frequency of Compressor	Cooling Capacity Control	Inverter Frequency control is carried out to bring the I.U. air inlet temperature to temperature setpoint by evaporation temperature control	Heating Capacity Control	Inverter Frequency control is carried out to bring the I.U. air inlet temperature to temperature setpoint by condensation temperature control	Mainly Cooling: Cooling Capacity Control	Inverter Frequency Control is carried out to bring the Cooling I.U. air inlet temperature to temperature setpoint.
						Mainly Cooling: Heating Capacity Control	Inverter Frequency Control is carried out to bring the Heating I.U. air inlet temperature to temperature setpoint.
EVO	Electronic Expansion Valve for HEX	HEX SC Control	EVO opening is adjusted to achieve the target value of HEX SC	HEX SH Control	EVO opening is adjusted to achieve the target value of HEX SH	Mainly Cooling: SC-Pd Control	EVO opening is adjusted to achieve the target value of SC-Pd
						Mainly Cooling: HEX SH Control	EVO opening is adjusted to achieve the target value of HEX SH
MV5	Electronic Expansion Valve for Inverter Radiation	Inverter Temperature Control	MV5 opening is adjusted to suppress Inverter Temperature Increase	Inverter Temperature Control	MV5 opening is adjusted to suppress Inverter Temperature Increase	Inverter Temperature Control	MV5 opening is adjusted to suppress Inverter Temperature Increase
EVb	Electronic Expansion Valve for plate Type HEX	Compressor discharge temperature and SC of liquid refrigerant	EVb opening is adjusted to achieve the target value of compressor discharge temperature and SC of liquid refrigerant	Compressor discharge temperature and SC of liquid refrigerant	EVb opening is adjusted to achieve the target value of compressor discharge temperature and SC of liquid refrigerant	Compressor discharge temperature and SC of liquid refrigerant	EVb opening is adjusted to achieve the target value of compressor discharge temperature and SC of liquid refrigerant
EVI	Electronic Expansion Valve for Indoor Unit	I.U. HEX SH Control	EVI opening is adjusted to achieve the target value of I.U. HEX SH	I.U. HEX SC Control	EVI opening is adjusted to achieve the target value of I.U. HEX SC	Cooling Operation I.U.: I.U. HEX SH Control	EVI opening is adjusted to achieve the target value of I.U. HEX SH
						Cooling Operation I.U.: I.U. HEX SC Control	EVI opening is adjusted to achieve the target value of I.U. HEX SC
SVA	Solenoid Valve to Bypass High/Low Pressure	1. Pd Increase Protection 2. Ps Decrease Protection	1. Pd<522 psi (3.6MPa) Open 2. Ps<29psi (0.2MPa) Open	1. Pd Increase Protection 2. Ps Decrease Protection	1. Pd>522 psi (3.6MPa) Open 2. Ps<29psi (0.2MPa) Open	1. Pd Increase Protection 2. Ps Decrease Protection	1. Pd>522 psi (3.6MPa) Open 2. Ps<29psi (0.2MPa) Open
SVC	Solenoid Valve to Bypass Inverter Radiation Piping	1. Inverter Condensation Protection 2. Pd Decrease Protection	1. Tf<ambient Temperature Open 2. Pd<232psi (1.6MPa) Open	1. Pd Decrease Protection	1. Pd<232psi (1.6MPa) Open	1. Inverter Condensation Protection 2. Pd Decrease Protection	1. Tf<ambient Temperature Open 2. Pd<232psi (1.6MPa) Open
SVG	Solenoid Valve to Blocking High/Low Pressure	Blocking High/Low Pressure Gas Bypass during Stoppage	During Operation: Open During Stoppage: Close	Blocking High/Low Pressure Gas Bypass during Stoppage	During Operation: Open During Stoppage: Close	Blocking High/Low Pressure Gas Bypass during Stoppage	During Operation: Open During Stoppage: Close

(*): Dry operation is included in the cooling operation

Pd: Discharge Pressure

Ps: Suction Pressure

SH: Superheat

SC: Subcool

Tf: Inverter Temperature

I.U.: Indoor Unit

HEX: Heat Exchanger

(2) Heat Exchanger Mode Control

In accordance with the connectable indoor unit operation mode, the outdoor unit heat exchanger is switched as shown in the table below.

Heat Exchanger Mode at Cooling: Condenser COND

Heat Exchanger Mode at Heating: Evaporator EVAP

The Number of Outdoor Unit: 1 (one)

Heat Exchanger Mode		Cooling Mode	Mainly Cooling Mode		Mainly Heating Mode	Heating Mode
		COND	D1	D1-1	D4	EVAP
Heat Exchanger Condition		COND	COND	COND	EVAP	EVAP
Reversing Valve	RVR 2	OFF	OFF	OFF	ON	ON
	RVR 1	ON	OFF	OFF	OFF	OFF
Expansion Valve	EVO	HEX SC	HEX SC-Pd	HEX SC-Pd	HEX SH	HEX SH
	MV5	Tf	Tf	Tf	Tf	Tf
	EVB	Td-SC	Td-SC	Td-SC	Td-SC	Td-SC

NOTE:

(1) Heat Exchanger Condition

COND: Use as Condenser

cond: Avoid the use of Heat Exchanger (under a high pressure condition)

EVAP: Use as Evaporator

(2) Control Method of Expansion Valve

HEX SC: To adjust to achieve the target value of heat exchanger SC

HEX SH: To adjust to achieve the target value of heat exchanger SH

Pd: To adjust to achieve the target value of Discharge Pressure

Tf: To adjusted to suppress Inverter Temperature increase

Td-SC: To adjusted to achieve the target value of compressor discharge temperature and SC of liquid refrigerant.

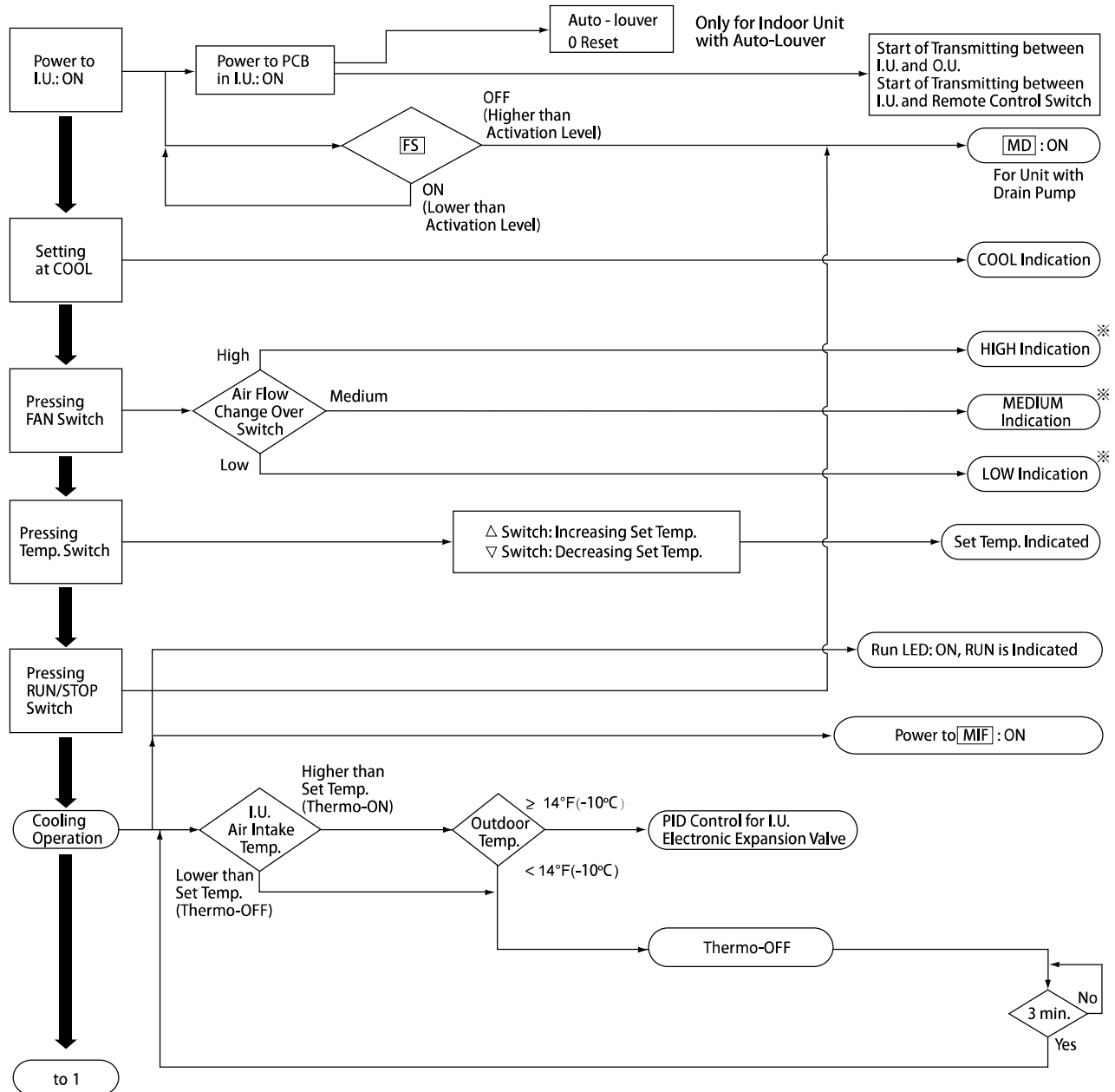
(3) COND, D1, D1-1, D4 and EVAP are the reference numbers.

5.3 Standard Operation Procedure Chart

CHV6-72* ~ 120*

Cooling operation

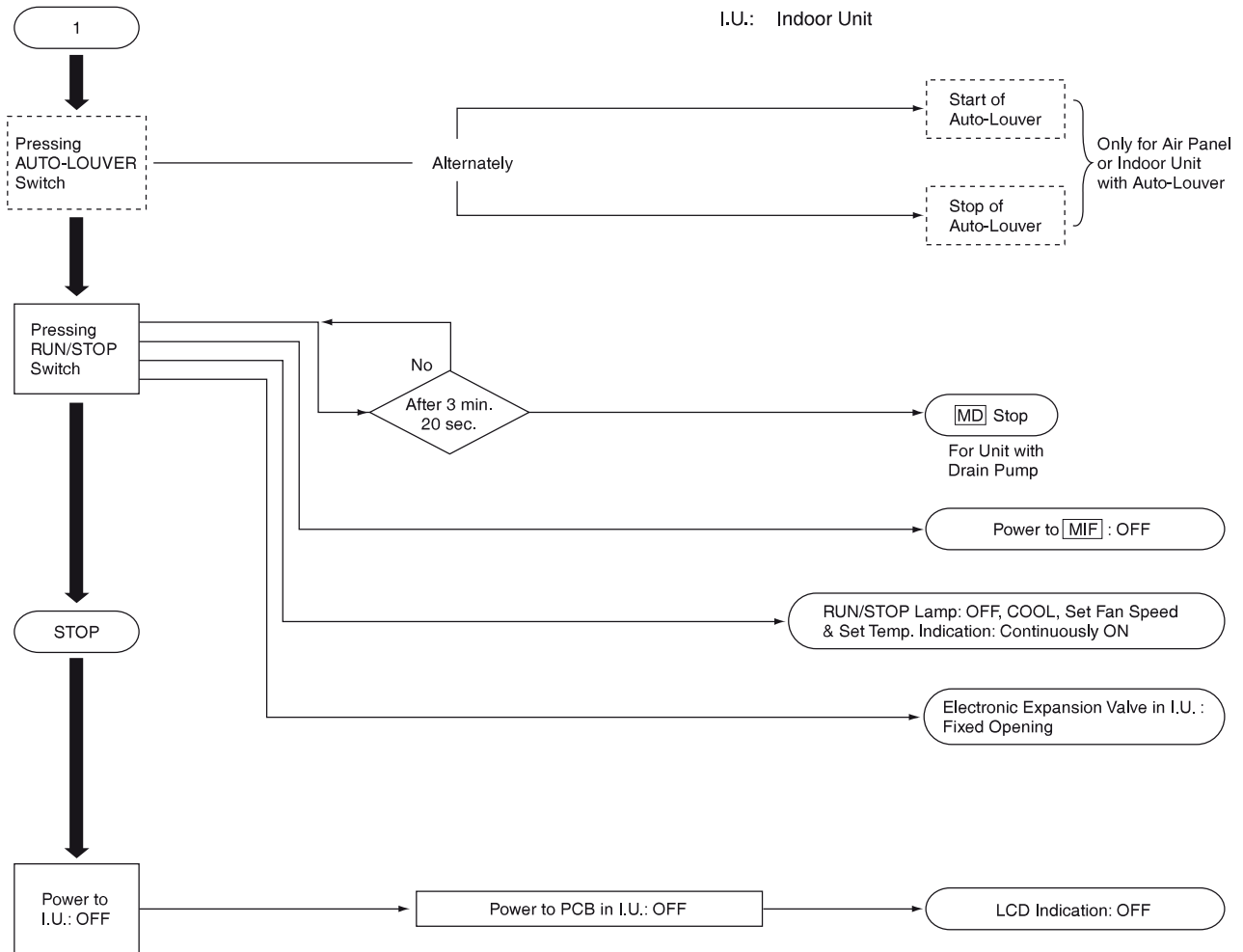
I.U.: Indoor Unit
O.U.: Outdoor Unit



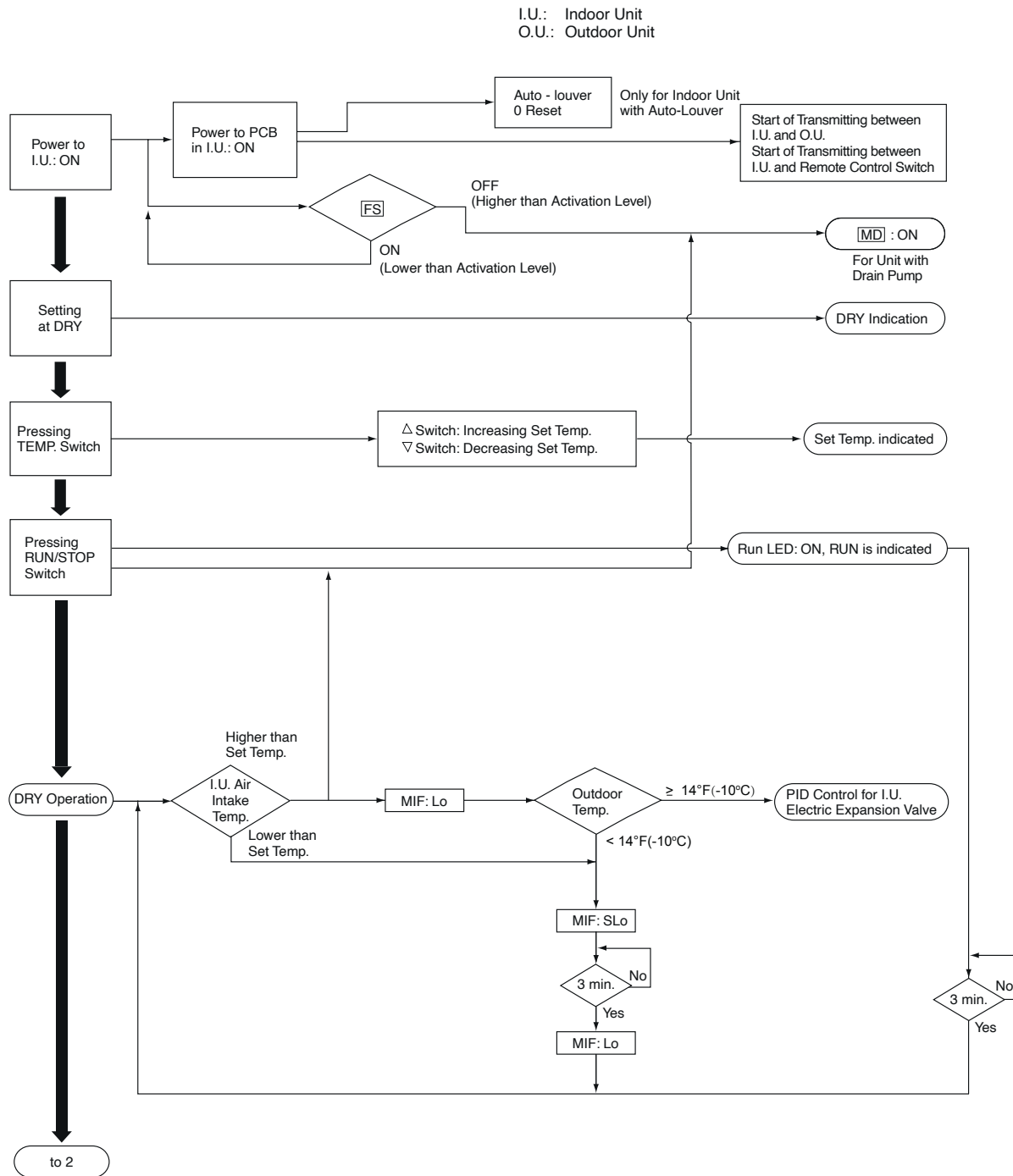
NOTE:

- ※ By pressing the FAN SPEED SWITCH of Remote Control Switch, indication of LCD changes as Hi→Me→Lo , but actual fan speed is “High” only.

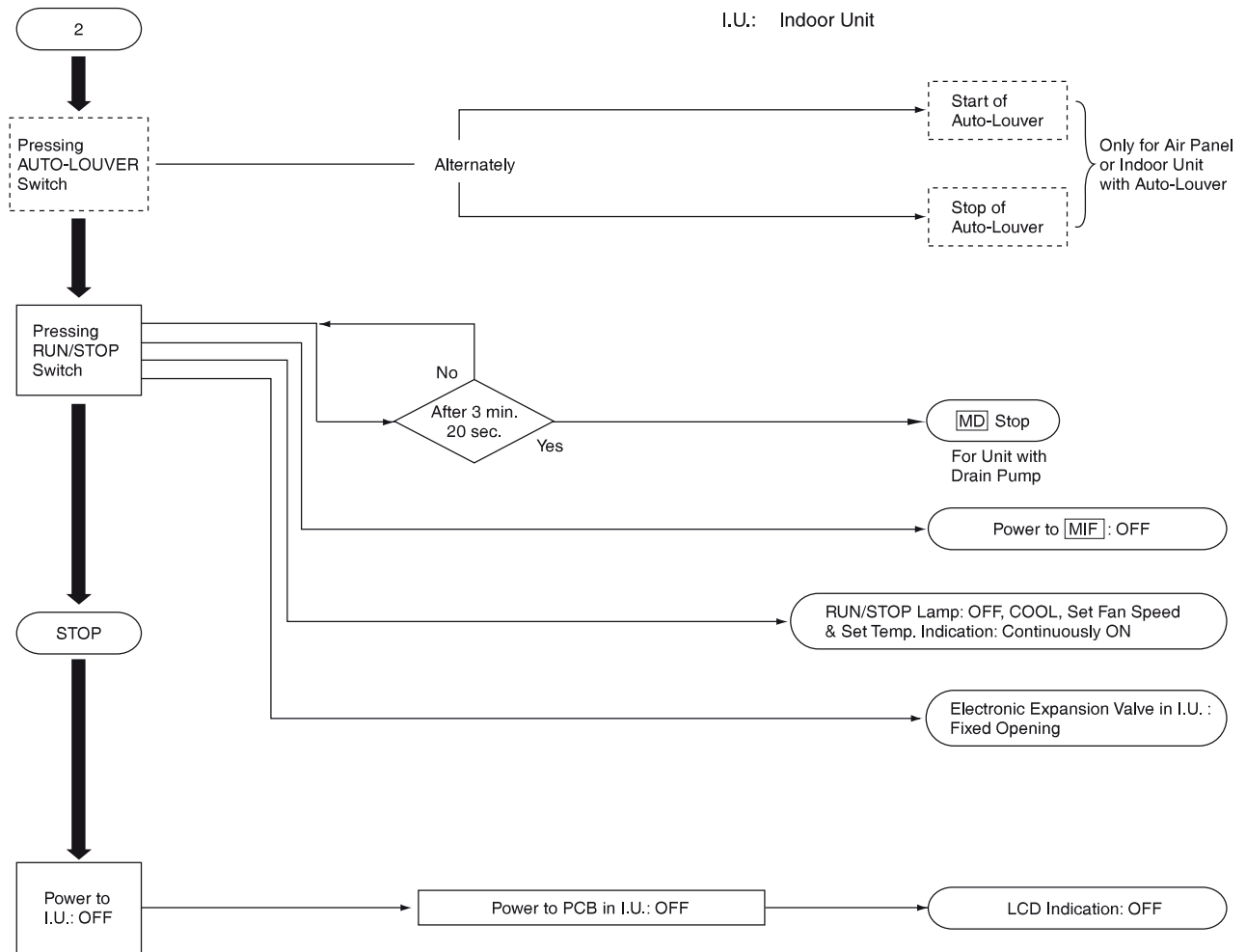
Cooling operation



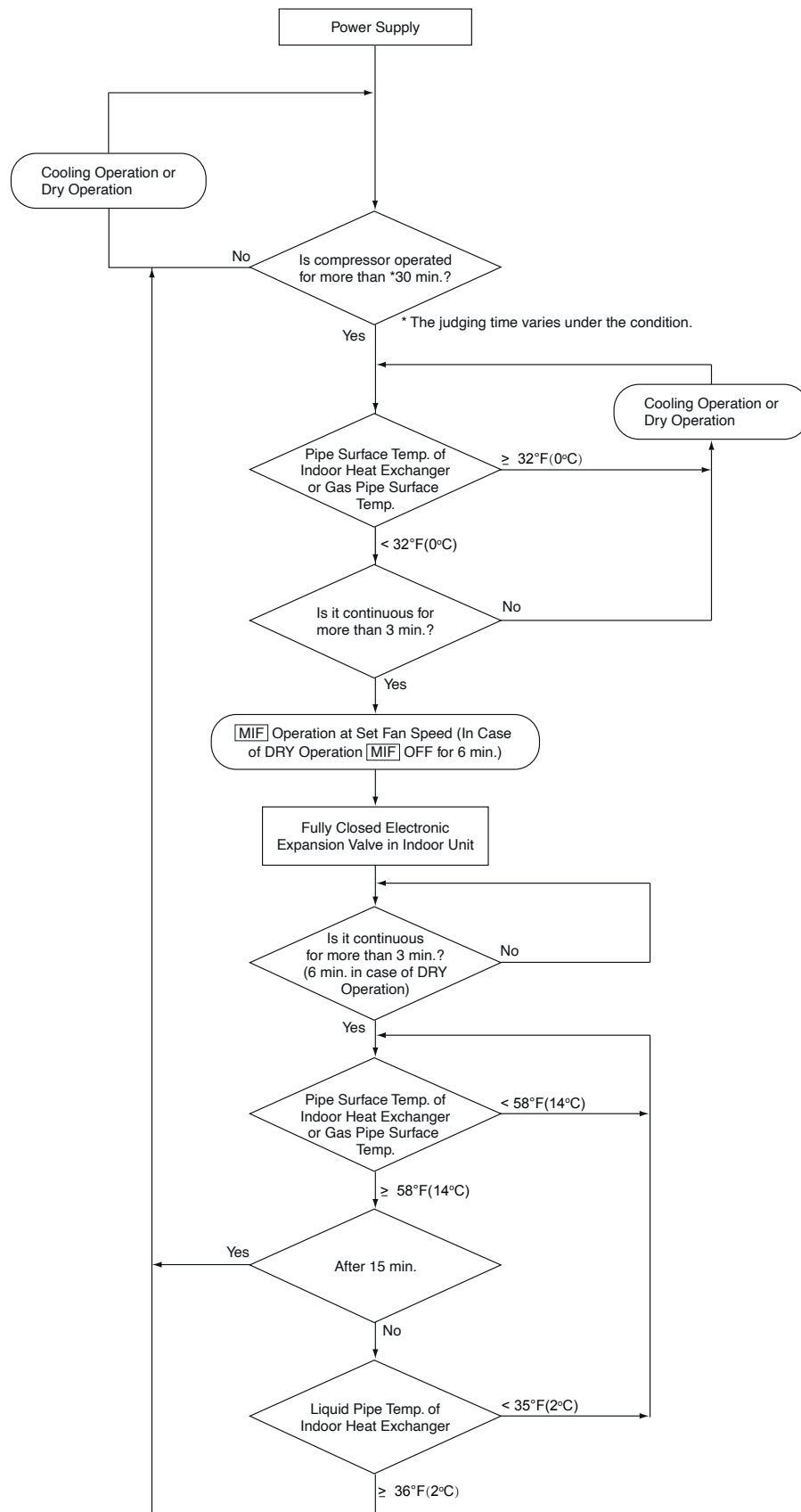
Dry run



Dry run

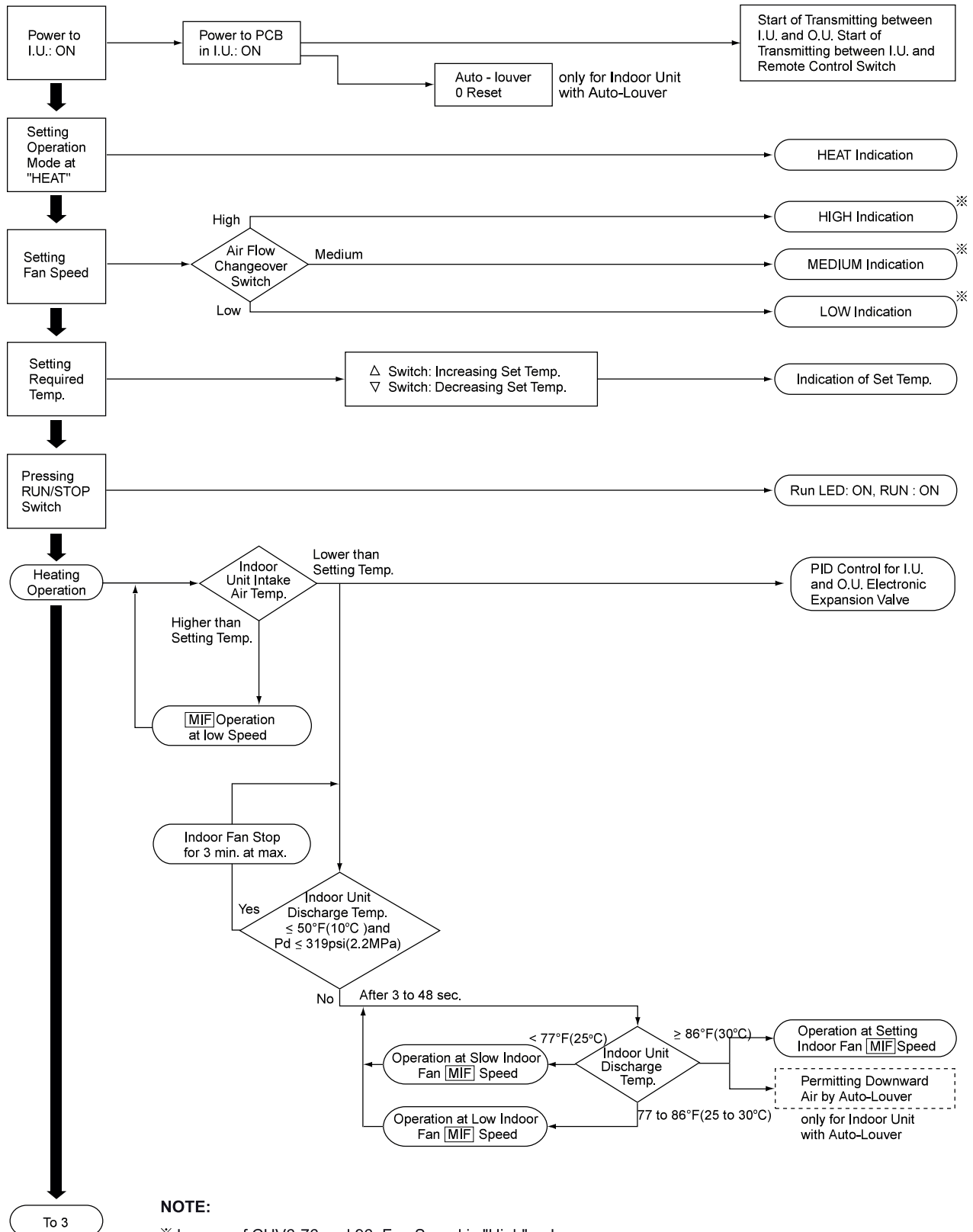


Freeze protection control during the cool run



Heating operation

I.U.: Indoor Unit
O.U.: Outdoor Unit

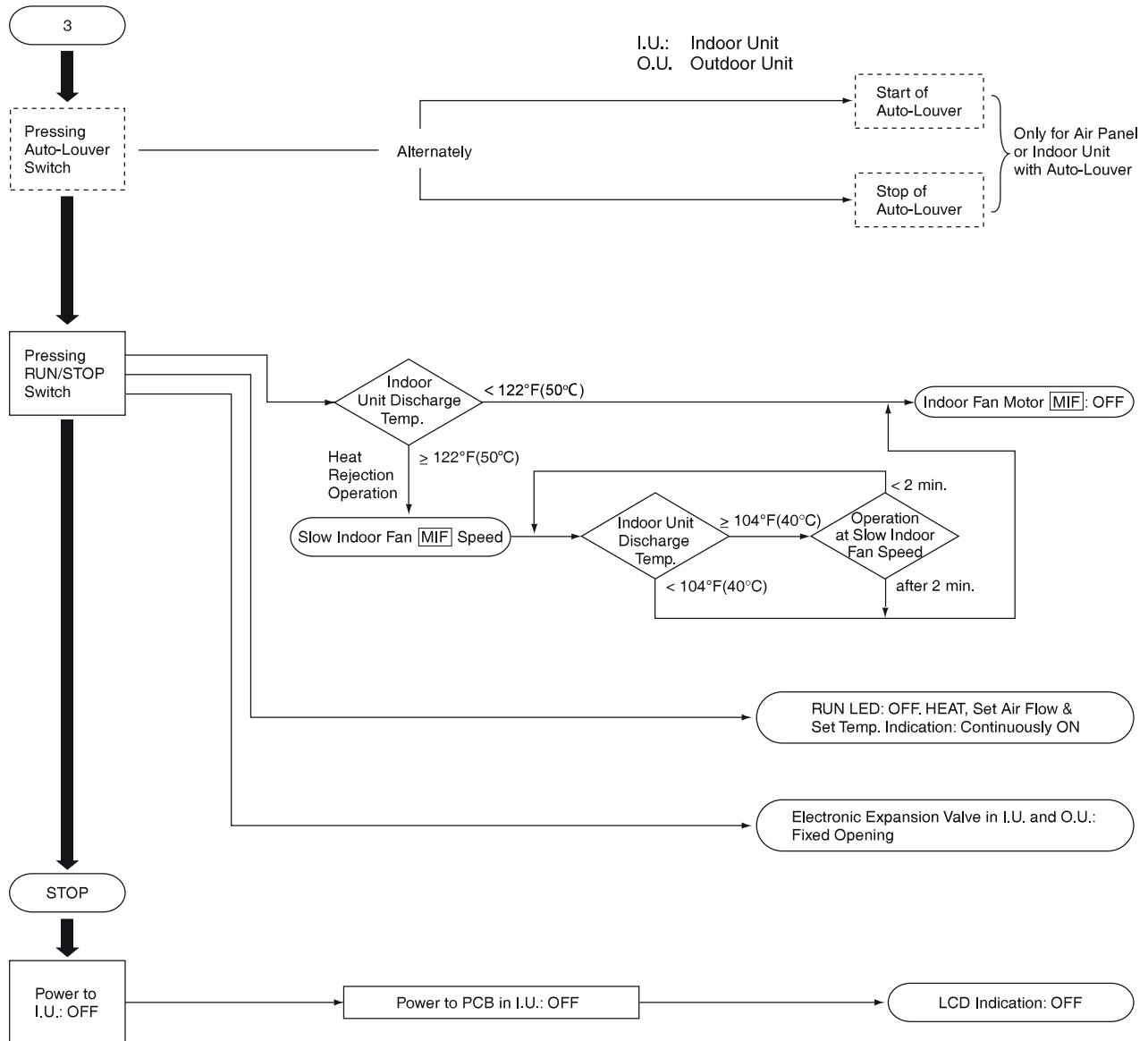


NOTE:

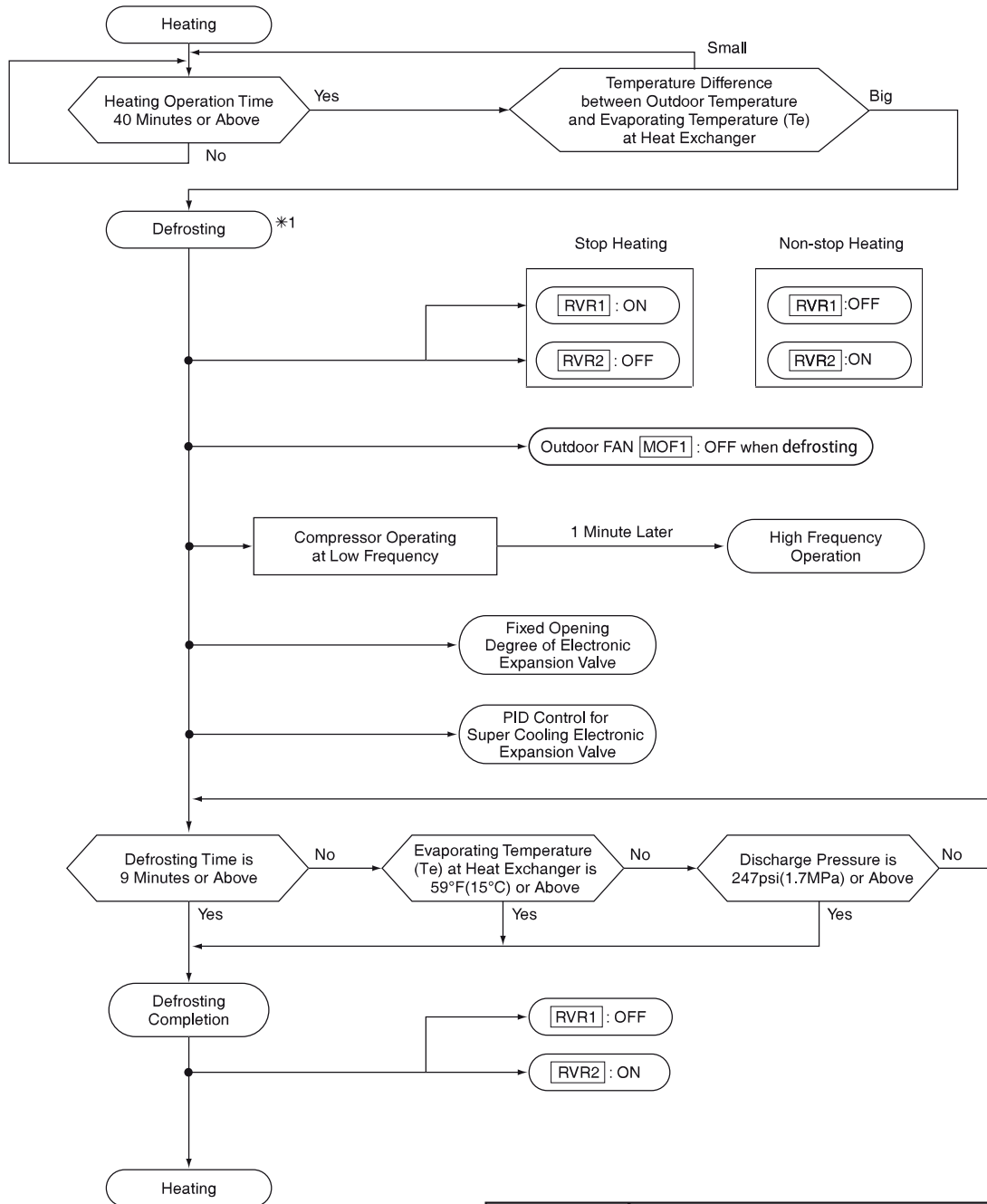
※ In case of CHV6-76 and 96, Fan Speed is "High" only.

By pressing the FAN SPEED SWITCH of Remote Control Switch, indication of LCD changes as $\boxed{\text{Hi}} \rightarrow \boxed{\text{Me}} \rightarrow \boxed{\text{Lo}}$, but actual fan speed is "High" only.

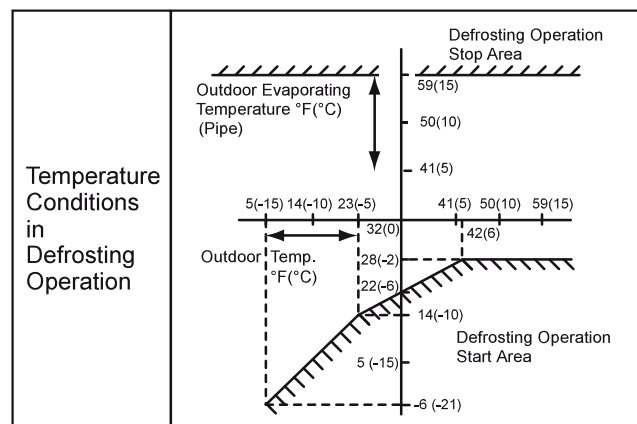
Heating operation



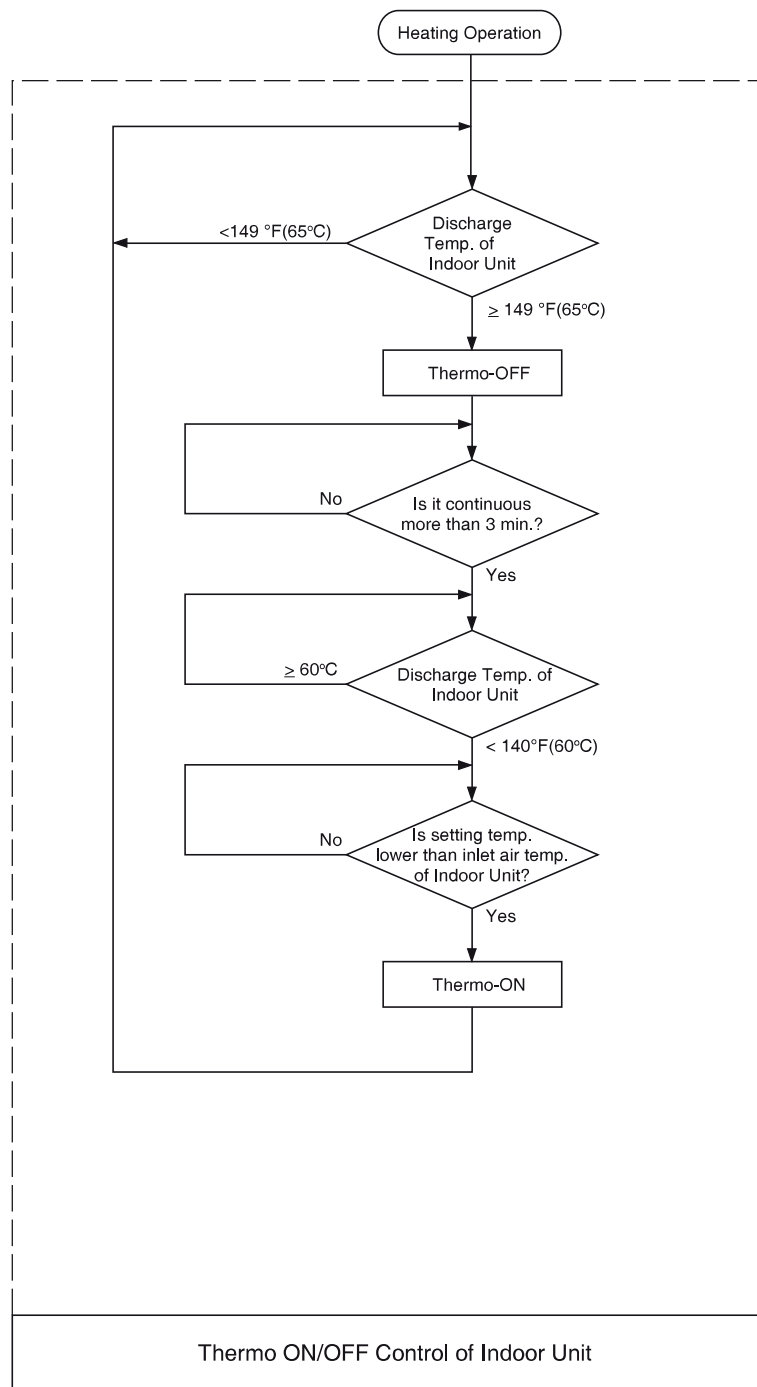
Defrosting operation



1: Defrost operation signal is transmitted to the indoor unit during the defrost operation. After the signal is received, "DEFROST" will indicated on LCD of remote control switch and the indoor fan will be stopped.

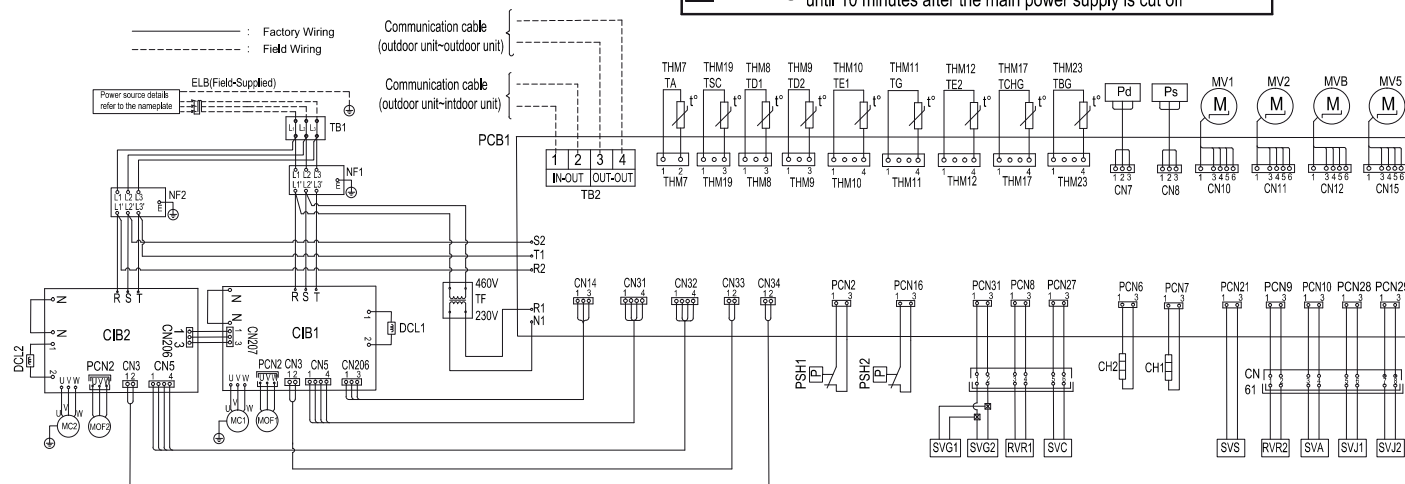


Supply air temperature overheat protection



460V

ELECTRICAL WIRING DIAGRAM



Mark	Name
CH	Crankcase Heater
CIB	Convert Inverter Break
CN, PCN	Connector
DCL	Reactor
FANM	Fan Module
⊕	Protective Earth
MC	Motor for Compressor
MOF	Motor for Outdoor Fan
MV(1,2,B,5)	Micro-Computer Control Expansion Valve
NF	Noise Filter
PCB	Printed Circuit Board
P ₁ , P ₂	Sensor for Refrigerant Pressure
PSH	Pressure Switch for Protection
RVR	Reversing Valve Relay
SV(A,G,C,S,J)	Solenoid Valve
TB	Terminal Board
TF	Transformer
THM	Thermistor
○	Terminals

Note:

All the field wiring and equipment must comply with local codes.

Refrigerant Charge

(1) Calculation of Additional Refrigerant

1 Additional refrigerant charge calculation for liquid piping (W1)

Pipe Diameter Ø (in./mm)	Total Piping Length (ft./m)	Refrigerant Charge	Additional Charge
1-1/8 (28.6)	ft.	$\times 0.45 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.67 \text{ kg/m} =$	kg
1 (25.4)	ft.	$\times 0.35 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.50 \text{ kg/m} =$	kg
7/8 (22.2)	ft.	$\times 0.24 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.36 \text{ kg/m} =$	kg
3/4 (19.05)	ft.	$\times 0.175 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.26 \text{ kg/m} =$	kg
5/8 (15.88)	ft.	$\times 0.14 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.17 \text{ kg/m} =$	kg
1/2 (12.7)	ft.	$\times 0.074 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.11 \text{ kg/m} =$	kg
3/8 (9.53)	ft.	$\times 0.038 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.056 \text{ kg/m} =$	kg
1/4 (6.35)	ft.	$\times 0.016 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.024 \text{ kg/m} =$	kg

2 Additional refrigerant charge calculation for indoor unit and water module (W2)

Heat Recovery System and NOT Connected to SW BOX (Cooling Only Indoor Unit) (kBtu/h)	Refrigerant Charge	Additional Charge
	$\times 0.0231 \text{ lbs./kBtu/h} =$	lbs.
	$\times 0.0105 \text{ kg/kBtu/h} =$	kg
Total Other Indoor Unit and Water Module Capacity (kBtu/h)	Refrigerant Charge	Additional Charge
	$\times 0.0516 \text{ lbs./kBtu/h} =$	lbs.
	$\times 0.0234 \text{ kg/kBtu/h} =$	kg
Additional Charge For Indoor Unit and Water Module =		lbs.
		kg

3 Additional refrigerant charge calculation for SW BOX (W3)

SW BOX Model	Number of SW BOX Connected	Refrigerant Charge	Additional Charge
HCHM-N04XB		$\times 0.22 \text{ lbs./unit} =$	lbs.
		$\times 0.1 \text{ kg/unit} =$	kg
HCHM-N08XB		$\times 0.44 \text{ lbs./unit} =$	lbs.
		$\times 0.2 \text{ kg/unit} =$	kg
HCHM-N12XB		$\times 0.66 \text{ lbs./unit} =$	lbs.
		$\times 0.3 \text{ kg/unit} =$	kg
HCHM-N16XB		$\times 0.88 \text{ lbs./unit} =$	lbs.
		$\times 0.4 \text{ kg/unit} =$	kg
Total Additional Charge For SW BOX =			lbs.
			kg

4 Additional refrigerant charge calculation for connection ratio (W4)

Connection Ratio (Total Capacity of Indoor Unit and Water Module / Outdoor Unit Capacity)	Refrigerant Charge
$\leq 100\%$	0.0 lbs., 0.0 kg
(101%~115%)	1.1 lbs., 0.5 kg
(116%~130%)	2.2 lbs., 1.0 kg
(131%~150%)	3.3 lbs., 1.5 kg

Total additional refrigerant charge can be calculated as follows:

$$W = W1 + W2 + W3 + W4 = \text{lbs./kg}$$

Note: Ensure that the total additional charge should not be exceeded the max. additional refrigerant charge quantity as shown in (3).

(2) Refrigerant and Oil Charge before Shipment

Outdoor Unit	Oil Charge(gal./L)
(~F)FSHB	
(kBtu/h)	V (Total) + V (Compressor)
72	2.2(8.4) + 1.2(4.6)
96	2.2(8.4) + 1.2(4.6)
120	2.2(8.4) + 1.2(4.6)

(3) Additional Refrigerant Charge

- 1 Additional Refrigerant Charge Calculation refers to (1).
- 2 Max. Additional Refrigerant Charge as the Table below

Outdoor Unit(kBtu/h)	Additional Charge
(~F)FSHB	
72	71.6(32.5)
96	73.4(33.3)
120	74.3(33.3)
144~240	112.2(51.2)

(4) Record of Refrigerant Charge

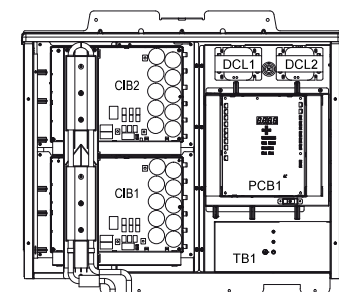
Total Additional Charge lbs(kg)

Total Ref. Charge of This System lbs(kg)

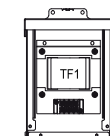
Date of Ref. Charge Work

Year Month Day

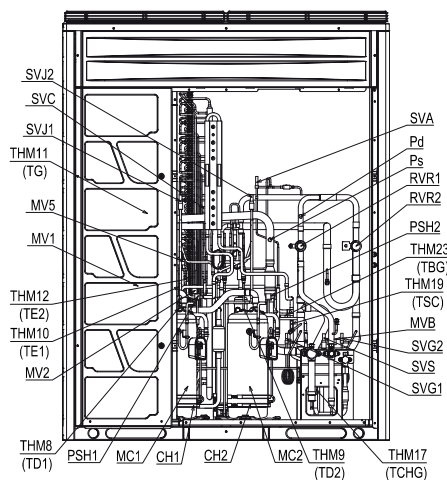
Electrical Control Box of Outdoor Unit



The Auxiliary Electrical Control Box



Location of Main Parts

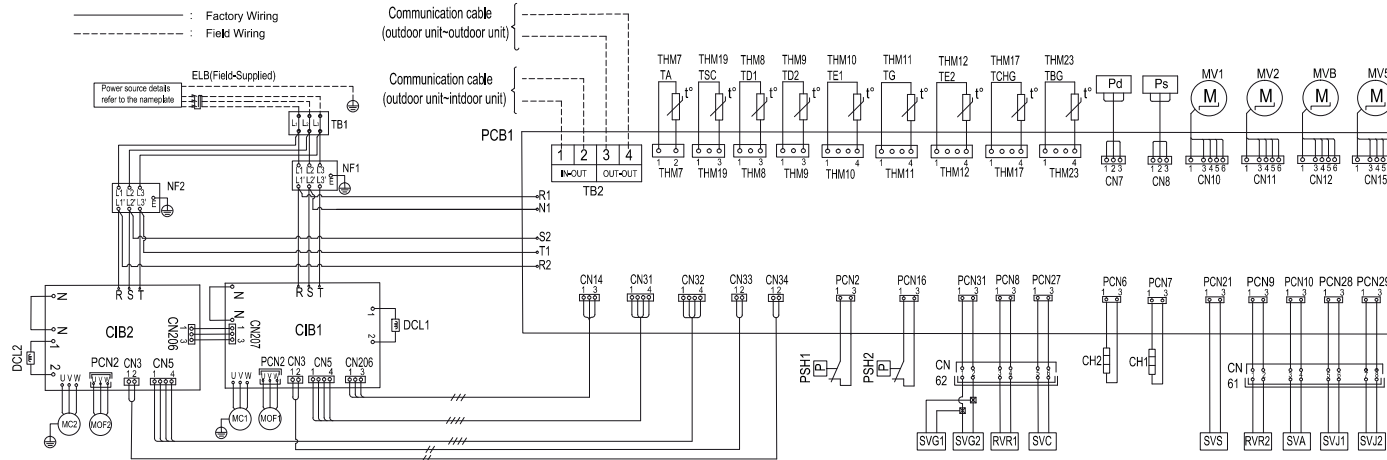


Note: This figure is only used to indicate the position of the components, the specific details are subject to the actual product.

208~230V

ELECTRICAL WIRING DIAGRAM

Warning Electrical operation and regular inspection are not allowed until 10 minutes after the main power supply is cut off



Mark	Name
CH	Crankcase Heater
CB	Convert Inverter Break
CN, PCN	Connector
DCL	Reactor
FANM	Fan Module
⊕	Protective Earth
MC	Motor for Compressor
MOF	Motor for Outdoor Fan
MV(1.2, B.5)	Micro-Computer Control Expansion Valve
NF	Noise Filter
PCB	Printed Circuit Board
P _h , P _s	Sensor for Refrigerant Pressure
PSH	Pressure Switch for Protection
RVR	Reversing Valve Relay
SV(A, G, C, S, J)	Solenoid Valve
TB	Terminal Board
THM	Thermistor
○	Terminal

Refrigerant Charge

(1) Calculation of Additional Refrigerant

Pipe Diameter Ø (in./mm)	Pipe Length (ft./m)	Refrigerant Charge	Additional Charge
1-1/8 (28.6)	ft.	$\times 0.45 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.67 \text{ kg/m} =$	kg
1 (25.4)	ft.	$\times 0.35 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.54 \text{ kg/m} =$	kg
7/8 (22.2)	ft.	$\times 0.24 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.36 \text{ kg/m} =$	kg
3/4 (19.05)	ft.	$\times 0.175 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.26 \text{ kg/m} =$	kg
5/8 (15.88)	ft.	$\times 0.114 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.17 \text{ kg/m} =$	kg
1/2 (12.7)	ft.	$\times 0.074 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.11 \text{ kg/m} =$	kg
3/8 (9.53)	ft.	$\times 0.038 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.056 \text{ kg/m} =$	kg
1/4 (6.35)	ft.	$\times 0.018 \text{ lbs./ft.} =$	lbs.
	m	$\times 0.024 \text{ kg/m} =$	kg

(2) Additional refrigerant charge calculation for indoor unit and water module (W2)

Heat Recovery System and NOT Connected to SW BOX (Cooling Only Indoor Unit) (kBtu/h)	Refrigerant Charge	Additional Charge
	$\times 0.0231 \text{ lbs./kBtu/h} =$	lbs.
	$\times 0.0105 \text{ kg/kBtu/h} =$	kg
Total Other Indoor Unit and Water Module Capacity (kBtu/h)	Refrigerant Charge	Additional Charge
	$\times 0.0516 \text{ lbs./kBtu/h} =$	lbs.
	$\times 0.0234 \text{ kg/kBtu/h} =$	kg
Additional Charge For Indoor Unit and Water Module =		lbs. kg

(3) Additional refrigerant charge calculation for SW BOX (W3)

SW BOX Model	Number of SW BOX Connected	Refrigerant Charge	Additional Charge
HCHM-N04XB		$\times 0.22 \text{ lbs./unit} =$	lbs.
		$\times 0.1 \text{ kg/unit} =$	kg
HCHM-N08XB		$\times 0.44 \text{ lbs./unit} =$	lbs.
		$\times 0.2 \text{ kg/unit} =$	kg
HCHM-N12XB		$\times 0.66 \text{ lbs./unit} =$	lbs.
		$\times 0.3 \text{ kg/unit} =$	kg
HCHM-N16XB		$\times 0.88 \text{ lbs./unit} =$	lbs.
		$\times 0.4 \text{ kg/unit} =$	kg
Total Additional Charge For SW BOX =			lbs. kg

(4) Additional refrigerant charge calculation for connection ratio (W4)

Connection Ratio (Total Capacity of Indoor Unit and Water Module / Outdoor Unit Capacity)	Refrigerant Charge
$\leq 100\%$	0.0 lbs., 0.0 kg
(101%~115%)	1.1 lbs., 0.5 kg
(116%~130%)	2.2 lbs., 1.0 kg
(131%~150%)	3.3 lbs., 1.5 kg

Total additional refrigerant charge can be calculated as follows:

$W = W1 + W2 + W3 + W4 =$ lbs. / kg

Note: Ensure that the total additional charge should not be exceeded the max. additional refrigerant charge quantity as shown in (3).

(2) Refrigerant and Oil Charge before Shipment

Outdoor Unit (kBtu/h)	Oil Charge (gal./L)
72	$2.2(8.4) + 1.2(4.6)$
96	$2.2(8.4) + 1.2(4.6)$
120	$2.2(8.4) + 1.2(4.6)$

Note: For refrigerant charge before shipment, please refer to the nameplate.

(3) Additional Refrigerant Charge

① Additional Refrigerant Charge Calculation refers to (1).

② Max. Additional Refrigerant Charge as the Table below

Outdoor Unit (kBtu/h)	Additional Charge
72	71.6(32.5)
96	73.4(33.3)
120	73.4(33.3)
144~240	112.4(51.0)

(4) Record of Refrigerant Charge

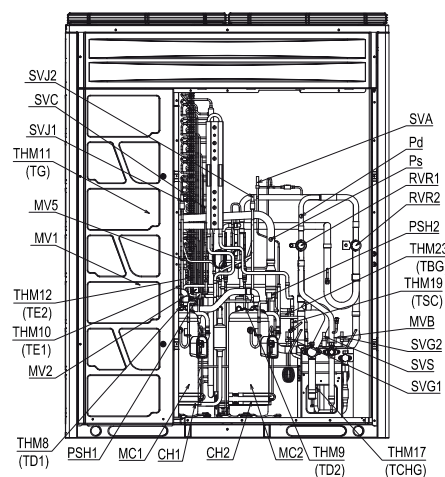
Total Additional Charge lbs.(kg)

Total Ref. Charge of This System lbs.(kg)

Date of Ref. Charge Work

Year Month Day

Location of Main Parts



Note: This figure is only used to indicate the position of the components, the specific details are subject to the actual product.

Electrical Control Box of Outdoor Unit

