VRF AIR-CONDITIONER [HEAT PUMP]

VRF AIR-CONDITIONER

「HEAT PUMP」

Technical Handbook

CHV6 URBAN MINI

BASIC MODELS

CHV6-28URBM
CHV6-36URBM
CHV6-48URBM
CHV6-60URBM

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:

⚠ DANGER	:	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	:	Indicates a hazardous situation which, if not avoided, could result in death or serious injury .
⚠ CAUTION	:	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 inflammable gas may generate or flow
  - * Places where a lot of sulfide gas drifts such as in hot spring.
  - * 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.

Temperture

°F (°C)

		Maximum	Minimum
Cooling Operation	Indoor	89(32) DB/ 73(23) WB	69(21) DB/ 59(15) WB
	Outdoor	114(46) DB	23(-5) DB
Heating Operation	Indoor	86(30) DB	59(15) DB
	Outdoor	60 (15.5) WB	-4(-20) WB

DB: Dry Buld, 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.

-CONTENT-

SERVICE

Design

1. Introduction

1.1 Line-Up Of Outdoor Unit

Model		CHV6-28URBM	CHV6-36URBM	CHV6-48URBM	CHV6-60URBM
Outdoor Unit Power Supply		208/230V ~ 60Hz			
Nominal Cooling Capacity	kBtu/h	27.2	36	48	57.5
Nominal Heating Capacity	kBtu/h	32.4	42	54	61

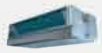
CHV6-28URBM

CHV6-36/48/60URBM

1.2 Application Case

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

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	28	30	36	38	42	48	54	60	76	96
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			●	●	●		●		●			●		●									
Ceilling Floor Type									●		●	●	●		●	●			●				
1-Way Cassette Type			●	●	●	●			●			●											
MPAHU									●			●				●					●		

● : Available

- The number of connectable indoor units with the outdoor unit is as follows. Comply with the condition as follows when installing the unit.

Outdoor Unit Capacity (kBtu/h)	Recommended Number of Connectable I.U.	Maximum Number of Connectable I.U.	Connectable Indoor Unit Capacity Ration	
			Minimum	Maximum
CHV6-28URBM	3	5	75%	125%
CHV6-36URBM	5	9	50%	150%
CHV6-48URBM	5	11	50%	150%
CHV6-60URBM	5	11	50%	150%

NOTES:

1. The connectable indoor unit capacity ratio can be calculated as follows:
   Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Outdoor Unit Capacity.
2. In cold areas (where the outdoor air temperature may be lower than 50ºF/10ºC) or areas with extremely high temperature (where the outdoor air temperature may be higher than 109°F/43ºC), the recommended number of connected units is not encouraged to be exceeded and the capacity ratio is not recommended to be greater than 100%.
   Otherwise, under certain operating limits, the temperature difference between the inlet and outlet air temperatures of the indoor unit may decrease, or the indoor unit may not reach high wind operation for a long time when it is started.
3. For the system which all the indoor units operate simultaneously, the total indoor unit capacity should be not bigger than the outdoor unit capacity. Otherwise, a decrease in operating performance and an increase in the operating limit can result in an overload.
4. When the system's farthest indoor unit pipe length or total piping length exceeds the recommended value(A), it is recommended that the number of connected indoor units should not exceed the recommended number, and the capacity ratio should not exceed 100%. Otherwise, under certain operating limits, the temperature difference between the inlet and outlet air temperatures of the indoor unit may decrease, or the indoor unit may not reach high wind operation for a long time when it is started.
5. For the system under which all the indoor units do not operate simultaneously, the total indoor unit capacity is available up to 150% or the number of connectable indoor units can be up to maximum,but the performance of each indoor unit will be reduced.
6. The maximum number of connectable indoor units differs depending on the model, capacity, environment and installation location of connected indoor units.
7. A system configuration with a combination ratio of more than 150% is unacceptable. Alarm activation and operation failure may occur.
8. For optional spare parts, please contact your local salesperson.

Outdoor Unit Capacity (kBtu/h)	Recommended value (A)	
	Maximum Piping Length	Total Piping Length
CHV6-28URBM	164ft(50m)	197ft(60m)
CHV6-36URBM	246ft(75m)	394ft(120m)
CHV6-48URBM	246ft(75m)	394ft(120m)
CHV6-60URBM	246ft(75m)	394ft(120m)

2. General Data

2.1 Key Parameter

Model			CHV6-28URBM	CHV6-36URBM	CHV6-48URBM	CHV6-60URBM
Power Supply			208/230 ~ 60Hz			
Cooling Operation	Rated Capacity	kW	8	10.6	14.1	16.9
		kBtu/h	27.2	36	48	57.5
	Power Input (Ducted/Non-ducted) *	kW	2.47/2.37	2.86/2.54	4.71/3.81	6.25/5.75
	EER(Ducted/Non-ducted)	(Btu/h)/W	11.00/11.50	12.60/14.20	10.20/12.60	9.20/10.00
	SEER2(Ducted/Non-ducted)	(Btu/h)/W	15.80/18.70	16.50/19.50	16.50/18.50	16.00/18.00
Heating Operation	Rated Capacity	kW	9.5	12.3	15.8	17.9
		kBtu/h	32.4	42	54	61
	Power Input *	kW	2.32/1.94	3.07/2.73	4.65/3.85	5.77/5.26
	COP 47°F (Ducted/Non-ducted)	kW/kW	4.10/4.90	4.00/4.50	3.40/4.10	3.10/3.40
	Low Temperature Heating Capacity	kW	5.3/5.1	7.6	9.4	10.3
		kBtu/h	18.1/17.5	26	32	35
	Power Input *	kW	2.21/1.83	2.62/2.38	3.92/3.48	4.68/4.48
	COP 17°F (Ducted/Non-ducted)	kW/kW	2.40/2.80	2.90/3.20	2.40/2.70	2.20/2.30
	HSPF2 (Ducted/Non-ducted)	(Btu/h)/W	7.90/8.65	10.00/10.40	8.55/10.00	9.00/10.00
MCA		A	25.3	31.4	32.8	33.2
MOP		A	35	40	45	45
Ventilation	Air Flow Rate	m³/min	49.5	90	90	100
		CFM	1747	3176	3176	3529
	Fan Quantity	-	1	2	2	2
Sound Pressure Level		dB(A)	50/52	50/52	52/54	53/55
Compressor	Type	-	Rotary			
	Quantity	PC	1	1	1	1
Refrigerant	Type	-	R410A	R410A	R410A	R410A
	Pre-charged Quantity	kg	2.8	3.8	3.8	4.1
		lbs.	6.2	8.4	8.4	9
Weight	Net Weight	kg	78	104	104	105
		lbs.	172	229	229	231
	Gross Weight	kg	88	116	116	116
		lbs.	194	256	256	256
Dimensions	External (H*W*D)	mm	800*950*370	1380*950*370		
		in.	31-1/2 * 37-13/32 * 14-9/16	54-11/32*37-13/32*14-9/16		
	Packing (H*W*D)	mm	951*1070*515	1531*1070*515		
		in.	37-7/16*42-1/8*20-9/32	60-9/32*42-1/8*20-9/32		
Cabinet Color		-	Ivory White			
Ref. Piping	Gas	mm	Φ15.88	Φ15.88	Φ15.88	Φ15.88
		in.	(5/8)	(5/8)	(5/8)	(5/8)
	Liquid	mm	Φ9.53	Φ9.53	Φ9.53	Φ9.53
		in.	(3/8)	(3/8)	(3/8)	(3/8)
Connectable Indoor Units	Quantity	PC	5	9	11	11
Piping Design	Height Difference Between ODU and IDU	m	20	30	30	30
		ft.	66	98.4	98.4	98.4
		m	20	30	30	30
		ft.	66	98.4	98.4	98.4
	Height Difference Between IDUs	m	3.5	10	10	10
		ft.	11.0	32.8	32.8	32.8
	Max. Piping Length	m	50	75	75	75
		ft.	164	246	246	246
Operation Range	Cooling	°C DB	-5~46	-5~46	-5~46	-5~46
		°F DB	23~114	23~114	23~114	23~114
	Heating	°C WB	-20~15.5	-20~15.5	-20~15.5	-20~15.5
		°F WB	-4~60	-4~60	-4~60	-4~60

NOTES:

1. Rated cooling capacity and rated heating/low temp. heating capacity are tested in the following conditions:

Cooling Operation Conditions

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

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

Heating Operation Conditions

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

Outdoor Air Inlet Temp: 47°F DB (8.3°C DB) 43°F WB (6.1°C WB)

Low Temp Heating Operation Conditions

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

Outdoor Air Inlet Temp: 17°F DB (-8.3°C DB) 15°F WB (-9.4°C WB)

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

2. The sound pressure level is based on the following conditions: 4.9ft. (1.5m) below the unit.

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

*For AHRI rating, refer to the AHRI website http://www.ahridirectory.org.

2.2 Component Data

Outdoor Heat Exchanger, Fan and Fan Motor

Model				CHV6-28URBM	CHV6-36URBM	CHV6-48URBM	CHV6-60URBM
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type			
	Tube	Material	-	Copper			
		Outside diameter	Φ in.	9/32	9/32	9/32	9/32
		Rows	-	2	2	2	2
		Columns	-	38	132	132	132
	Fin	Material	-	Aluminum			
		Pitch	in	5/64	5/64	5/64	5/64
	Quantity		-	1	1	1	1
	Max. operating pressure		psi	601			
	Total frontal area		ft^2	8.29	14.64	14.61	14.64
Fan Part	Fan	Type	-	Propeller Fan			
		Outside diameter	Φ in.	21-27/64	21-27/64	21-27/64	21-27/64
		Revolution	rpm	505	568+464	568+464	600+516
		Nominal air flow	CFM	1748	3180	3180	3530
	Fan motor	Type	-	DC motor			
		Start-up mode	-	DC driven			
		Nominal output power	W	51	51+51	51+51	51+51
		Quantity	-	1	2	2	2
		Insulation grade	-	E	E	E	E

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 stopped.

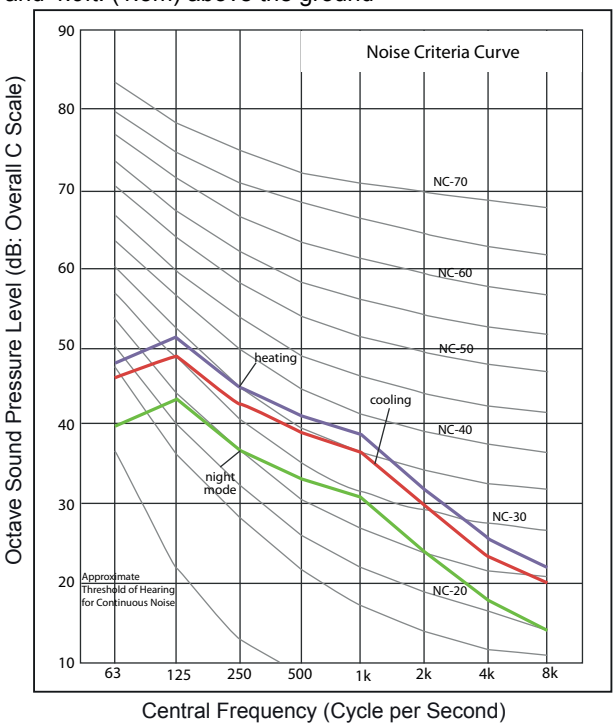
Model			CHV6-28URBM	CHV6-36/48/60URBM
Compressor Pressure switch			Reset automatically and non-adjustable	
High Pressure	Cut-Out	psi (MPa)	601(4.15)	
	Cut-In	psi (MPa)	464(3.2)	
Fuse on Main Circuit		A	40	50
CCP timer Time setting		min.	3	3
Control Circuit Fuse		A	5	5

2.2 Component Data

Outdoor Heat Exchanger, Fan and Fan Motor

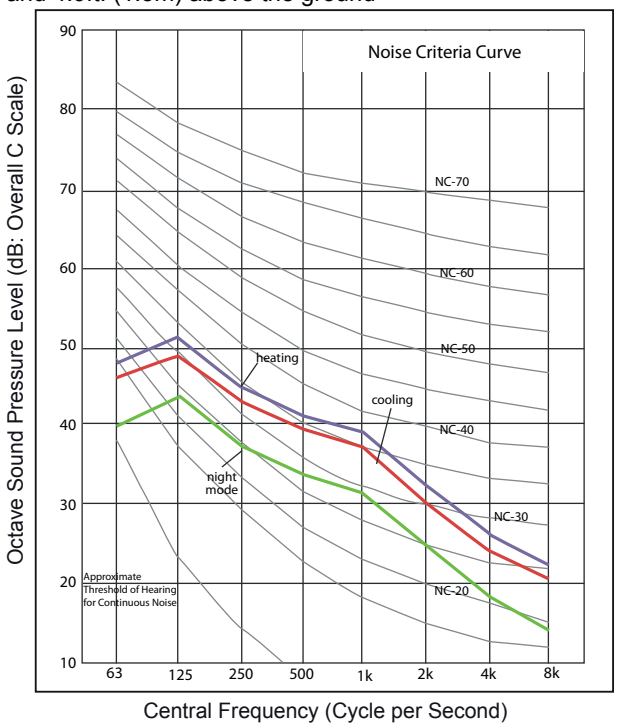
CHV6-28URBM

Measuring point: 3.3ft. (1m) from the front panel of unit and 4.9ft. (1.5m) above the ground



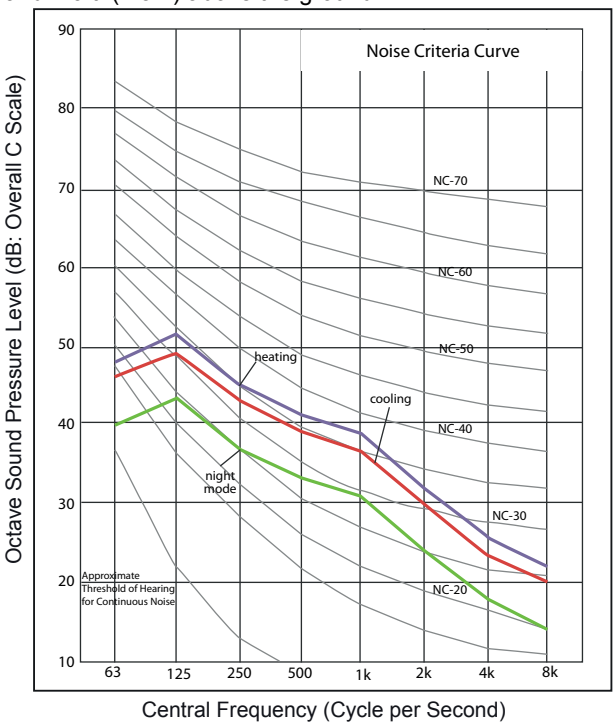
CHV6-36URBM

Measuring point: 3.3ft. (1m) from the front panel of unit and 4.9ft. (1.5m) above the ground



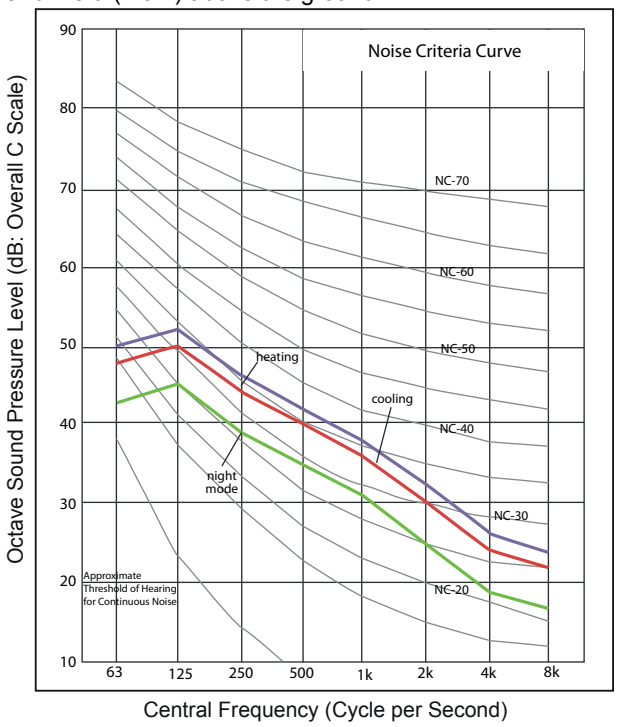
CHV6-48URBM

Measuring point: 3.3ft. (1m) from the front panel of unit and 4.9ft. (1.5m) above the ground



CHV6-60URBM

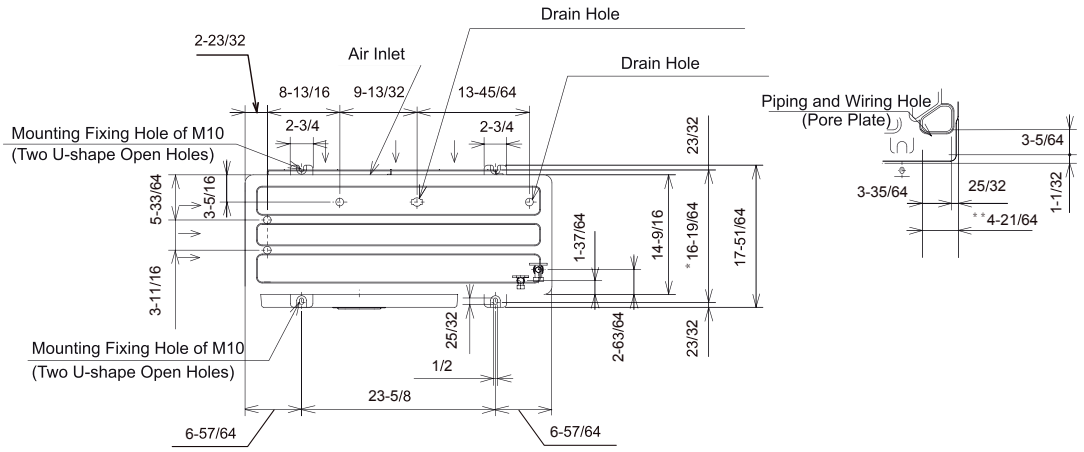
Measuring point: 3.3ft. (1m) from the front panel of unit and 4.9ft. (1.5m) above the ground

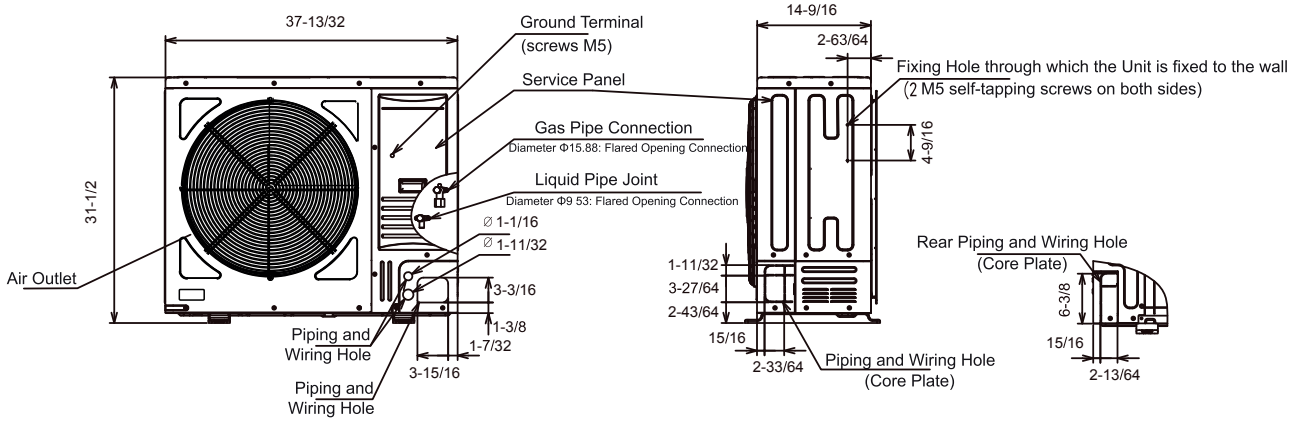


2.5 Dimensional Data

Model: CHV6-28URBM

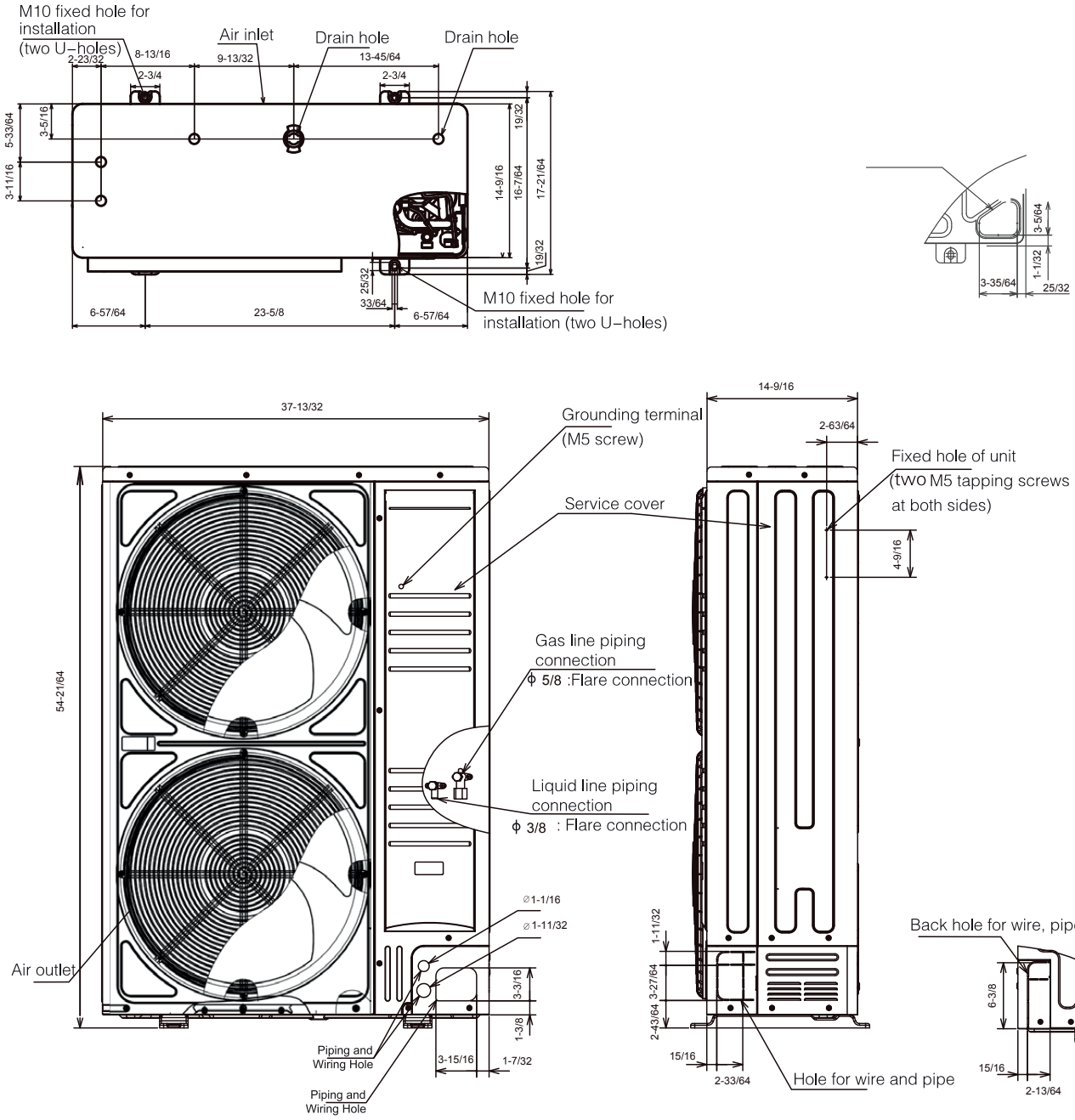
unit: in.





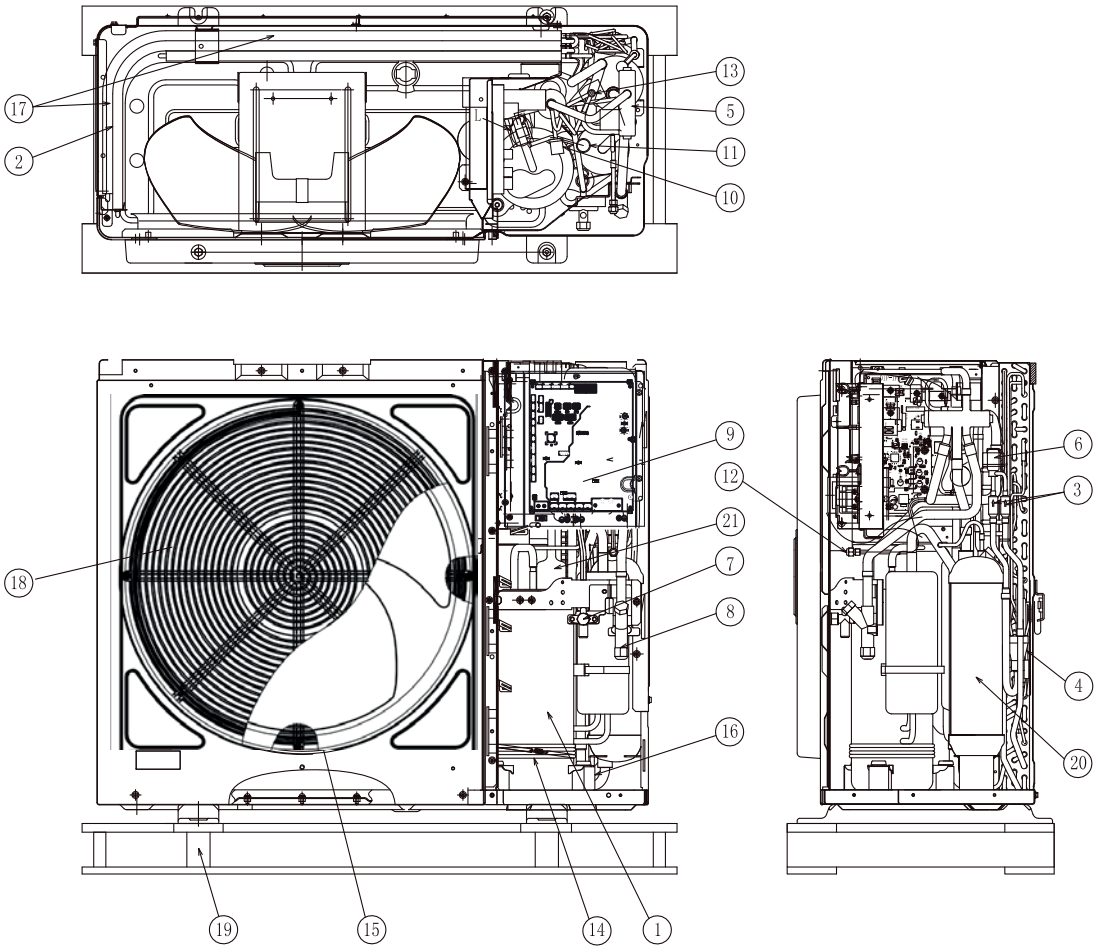
Model: CHV6-36/48/60URBM

unit: in.



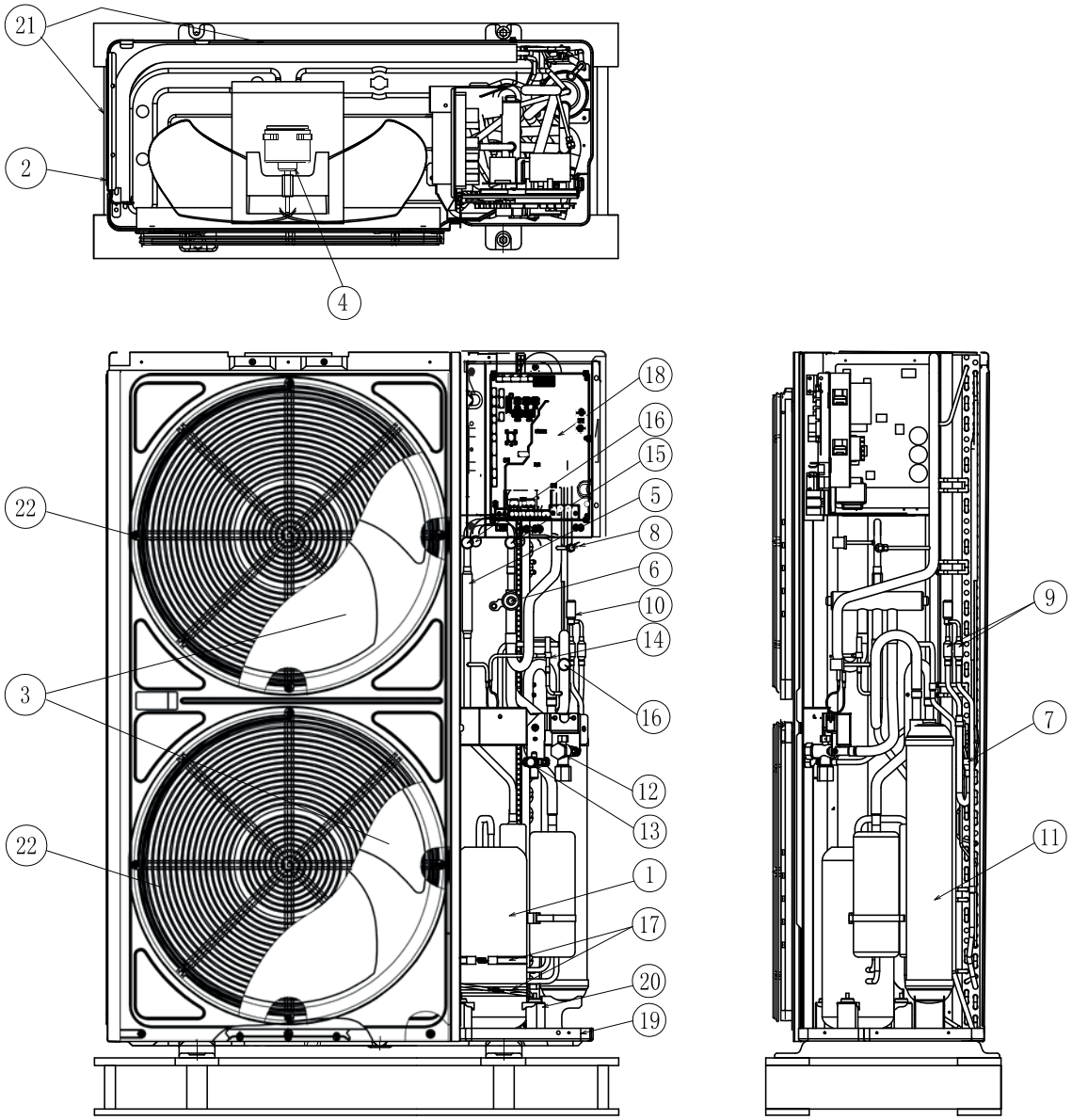
2.6 Structure

Model：CHV6-28URBM



Mark	Part Name	Mark	Part Name
1	Compressor	14	Crankcase Heater
2	Heat Exchanger	15	Propeller Fan
3	Strainer	16	Damping Rubber
4	Distributor	17	Air Inlet
5	Reversing Valve(RVR)	18	Air Outlet
6	Electrical Expansion Valve(EVO)	19	Base assembly
7	Stop Valve for Liquid Line	20	Accumulator
8	Stop Valve for Gas Line	21	Silencer
9	Electrical Box		
10	Pressure Switch for Controlling		
11	High Pressure Switch		
12	Check Joint for High/Low Pressure(Cool/Heat)		
13	Bypass Solenoid Valve		

Model: CHV6-36/48/60URBM



Mark	Part Name	Mark	Part Name
1	Compressor	14	Solenoid Valve
2	Heat Exchanger	15	Pressure Switch (H)
3	Propeller Fan	16	Pressure Sensor
4	Fan Motor	17	Crankcase Heater
5	Check Valve	18	Electrical Box
6	Reversing Valve(RVR)	19	Base Assembly
7	Distributor	20	Damping Rubber
8	Check Joint	21	Air Inlet Grille
9	Strainer	22	Air Outlet Grille
10	Electronic Expansion Valve(EVO)		
11	Accumulator		
12	Stop Valve for Gas Line		
13	Stop Valve for Liquid Line		

2.7 Electrical Data

Model	Power Source	MCA (A)	MOP (A)	Minimum transmission cable size
CHV6-28URBM	208/230V~60Hz	25.3	35	AWG 18
CHV6-36URBM		31.4	40	AWG 18
CHV6-48URBM		32.8	45	AWG 18
CHV6-60URBM		33.2	45	AWG 18

NOTES:

(1) Field wiring shall be in conformity to local laws and regulations, and all wiring operations must be performed by qualified professionals.

(2) Select the power supply cable type and size in accordance with relevant local and national regulations.

(3) It is assumed that the power wire should be copper and rated 167°F(75°C), however it should vary according to actual current.

(4) The wiring specifications for weak-current communication circuit shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.

(5) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 7/64in.(3mm).

(6) Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.

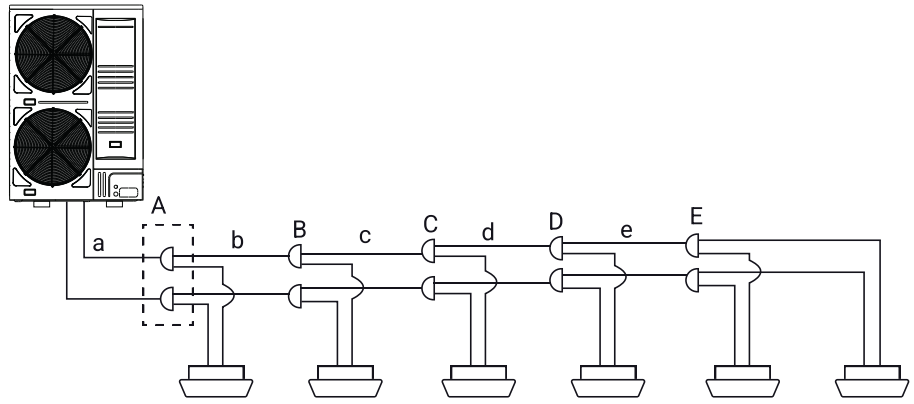
(7) For the installation of power cord, the ground wire must be longer than the current- carrying conductor.

(8) Please refer to the above table and select the models of power supply cable, transmission supply cable, ELB, fuse in accordance with relevant local and national regulations.

(9) The cascade connection from the main module is not allowed for power line of combination module.

3. Piping System

3.1 Connection of Refrigerant Pipes

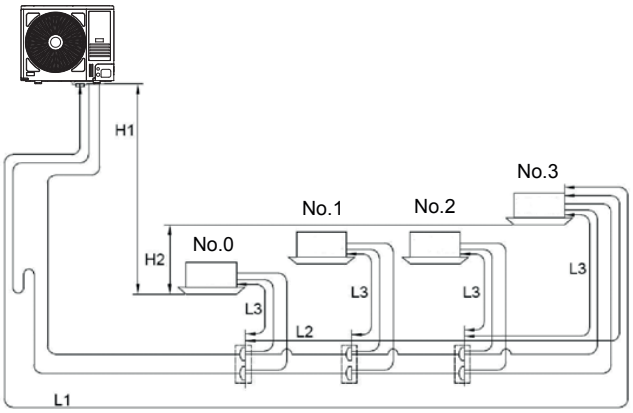


Applicable Model	Pipe Size	Model of Branch Pipe
	a~e	A
CHV6-28URBM	Φ5/8 / Φ3/8in. (Φ15.88 / Φ9.53mm)	SPBPK-102HP
CHV6-36URBM	Φ5/8 / Φ3/8in. (Φ15.88 / Φ9.53mm)	
CHV6-48URBM	Φ5/8 / Φ3/8in. (Φ15.88 / Φ9.53mm)	
CHV6-60URBM	Φ5/8 / Φ3/8in. (Φ15.88 / Φ9.53mm)	

Note:

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

Table (a) Refrigerant Pipe System

<table>
<tr><td colspan="3">Item / System</td><td colspan="2">Branch pipe for Line Branch</td></tr>
<tr><td colspan="3">Example
One outdoor unit joint four indoor units,
pipe materials are acquires from local</td><td colspan="2">Outdoor Unit
Oil Trap is recommended at every 32.8ft.(10m) lift
  </td></tr>
<tr><td rowspan="2">Max.Pipe Length</td><td colspan="2">CHV6-28URBM</td><td colspan="2">L1 ≤ 164ft.(50m)</td></tr>
<tr><td colspan="2">CHV6-36URBM
CHV6-48URBM
CHV6-60URBM</td><td colspan="2">L1 ≤ 246ft.(75m)</td></tr>
<tr><td rowspan="6">High Distance between Outdoor and Indoor Unit</td><td rowspan="3">Outdoor is Higher than Indoor Unit</td><td>CHV6-28URBM</td><td colspan="2">H1 ≤ 66ft.(20m)</td></tr>
<tr><td>CHV6-36URBM
CHV6-48URBM
CHV6-60URBM</td><td colspan="2">H1 ≤ 98.4ft.(30m)</td></tr>
<tr><td rowspan="3">Indoor is Higher than Outdoor Unit</td><td>CHV6-28URBM</td><td colspan="2">H1 ≤ 66ft.(20m)</td></tr>
<tr><td>CHV6-36URBM
CHV6-48URBM
CHV6-60URBM</td><td colspan="2">H1 ≤ 98.4ft.(30m)</td></tr>
<tr><td colspan="2" rowspan="2">Max.High Distance between Indoor and Indoor or Indoor and Branch Pipe</td><td>CHV6-28URBM</td><td colspan="2">H2 ≤ 11ft.(3.5m)</td></tr>
<tr><td>CHV6-36URBM
CHV6-48URBM
CHV6-60URBM</td><td colspan="2">H2 ≤ 32.8ft.(10m)</td></tr>
<tr><td rowspan="2">Max.Pipe Length between the First Branch Pipe and Indoor Unit</td><td colspan="2">CHV6-28URBM</td><td colspan="2">L2 ≤ 66ft.(20m)</td></tr>
<tr><td colspan="2">CHV6-36URBM
CHV6-48URBM
CHV6-60URBM</td><td colspan="2">L2 ≤ 98.4ft.(30m)</td></tr>
<tr><td rowspan="2">Pipe Length from every Brabch Pipe to Indoor Unite</td><td colspan="2">CHV6-28URBM</td><td colspan="2">L3 ≤32.8ft.(10m)</td></tr>
<tr><td colspan="2">CHV6-36URBM
CHV6-48URBM
CHV6-60URBM</td><td colspan="2">L3 ≤ 32.8ft.(10m)</td></tr>
</table>

3.2 Calculation Of Additional Refrigerant

It is necessary to charge additional refrigerant as follows.

Additional Refrigerant Charge Calculation

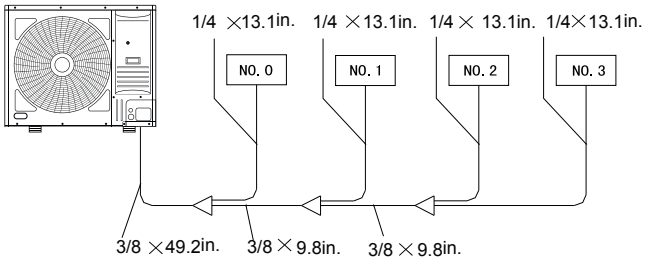
Although refrigerant has been charged into this unit, it is required that additional refrigerant be charged according to piping length.
A. Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
B. Record the additional refrigerant quantity to facilitate service activities thereafter.

Model：CHV6-28URBM

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

<EXAMPLE>

CHV6-28URBM



See Example for Model CHV6-28URBM and fill in the following table.

	Pipe Diameter (in.)	Total Piping Length (ft.)	Additional Charge (lbs)
W11 =	3/8 ...	(49.2+9.8+9.8)	x 0.0201 = 1.38 (lbs)
W12 =	1/4 ...	(13.1+13.1+13.1+13.1)	x 0.0134 = 0.70 (lbs)

Total Piping Length 121.2ft. (37m) Additional W=W11+W12=2.08 (lbs)

	Pipe Diameter (in.)	Total Piping Length (ft.)		Additional Charge (lbs)
W11 =	3/8 ...		x a =	
W12 =	1/4 ...		x b =	

Total Piping Length ____ ft.

Additional Ref.Charge W=W11____+W12____=____( )

2. Charging Work

Charge refrigerant (R410A) into the system as follows

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

3. Record of Additional Charge

Record the refrigerant charging quantity in order to facilitate maintenance and servicing activities.
Total refrigerant charge of this system is calculated in the following formula.
Total Ref. Charge of This System = W + W0
This System = ____ + ____ =____ lbs

Total Additional Charge W ____ lbs
Total Ref.Charge of This System ____ lbs
Date of Ref.Charge Work
Day ____ Month ____ Year ____

<Table 1>

unit: lbs (kg)

Outdoor Unit Capacity (kBtu/h)	W0: Outdoor Unit Ref. Charge	a	b	Max.Total Ref.Charge
28	6.2(2.8)	0.0201	0.0134	11.4(5.2)

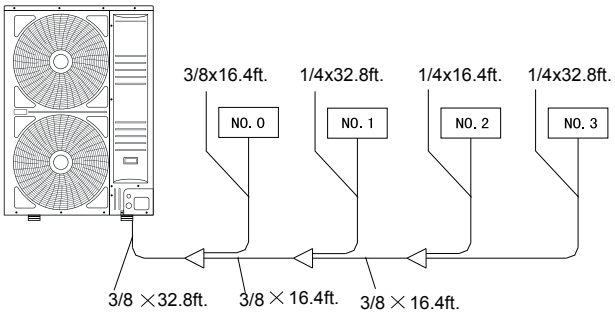
NOTE:
W0 is outdoor unit ref. charge before shipment.

Model：CHV6-36/48/60URBM

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

<EXAMPLE>

CHV6-36/48/60URBM



See Example for Model CHV6-36/48/60URBM and fill in the following table.

Pipe Diameter (in.) Total Piping Length (ft.) Additional Charge (lbs)

W11 = 3/8 ... (32.8+16.4+16.4+16.4) x 0.0268 = 2.2 (lbs)

W12 = 1/4 ... (32.8+32.8+16.4) x 0.0134 = 1.1 (lbs)

Total Piping Length 164ft.

Additional Ref.Charge W=W1+W2=W11+W12+W2=3.3 (lbs)

Pipe Diameter (in.) Total Piping Length (ft.)

W11 = 3/8 ... [ ] x a = [ ]

W12 = 1/4 ... [ ] x b =

Total Piping Length [ ] m

Additional Ref.Charge W1=W11 [ ] +W12 [ ] = [ ] (lbs) (lbs)

W2= [ ] (lbs)

Total Ref.Charge Wt=W0+W1+W2= [ ] + [ ] + [ ] = [ ]

Additional refrigerant charge according to table below.

Table. Additional Refrigerant Charge Calculation

Model	W0: Ref.Charge before shipment (lbs)	W1: Additional Ref.Charge according to piping (lbs/ft.)		W2: Additional Ref.Charge according to Connection Ration(lbs)		Wt: Total Ref. Charge (lbs)	Max.Total Ref.Charge (lbs)
		a	b	100%~130%	130%~150%		
CHV6-36URBM	8.4	0.0268	0.0134	0.33lbs for each 10%①	1.32lbs for each 10%①	W0+W1+W2	17.4
CHV6-48URBM	8.4	0.0268	0.0134				17.4
CHV6-60URBM	9.0	0.0268	0.0134				17.4
NOTE: ① Less than 10% is calculated as 10%							

2. Charging Work

Charge refrigerant (R410A) into the system as follows

(1) For charging refrigerant, connect the gauge mani-fold using charging hoses with a refrigerant cylinder to the check joint of the liquid line stop valve.

(2) Fully open the gas line stop valve and slightly open the liquid line stop valve.
Charge refrigerant by opening the gauge manifold valve.

(3) Charge the required refrigerant by operating the system in cooling.
Ensure to charge correct volume by utilizing a weight scale. An excess or shortage of refrigerant is the main cause of trouble to the units.
Fully open the liquid line stop valve after completing refrigerant charge.

3. Record of Additional Charge

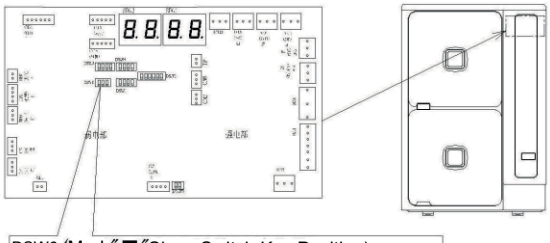
Record the refrigerant charging quantity in order to facilitate maintenance and servicing activities.
Total refrigerant charge of this system is calculated in the following formula.
Total Ref. Charge of This System = W0 + W1+W2
This System = ☐ + ☐ =☐ lbs

Total Additional Charge W	☐ lbs
Total Ref.Charge of This System	☐ lbs
Date of Ref.Charge Work	
Day ☐ Month ☐ Year ☐	

4. Dip-Switch Setting for Piping Length

Follow below, setting the Dip-Switch for piping length

PCB1



DSW6 (Mark″ ■ ″Show Switch Key Position)

Shipment	I.U.is located higher than O.U.65.6ft.(20m)	O.U.is located higher than O.U.82.0ft.(25m)
		

5. Notice of Additional Charge

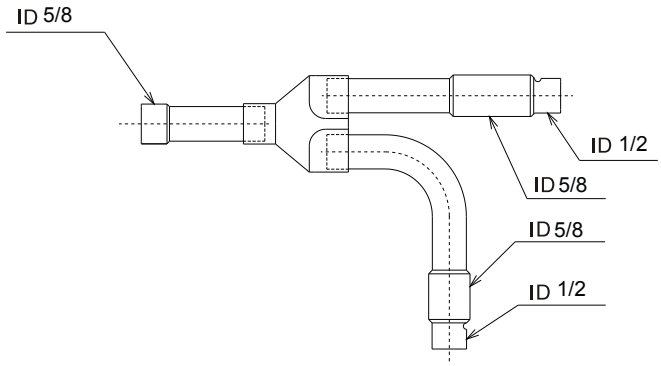
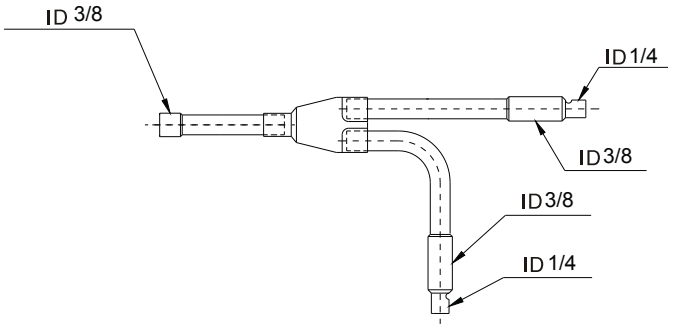
When the system is connected one-to-one, the connection ratio must be 100%, and the additional refrigerant need to be reduced as the following requirements:

Reduced Refrigerant Charge for Special Indoor Units

unit: lbs (kg)

Model	Connection ratio	Indoor Unit Type	
		a	b
CHV6-36URBM	100%	0.33(0.15)	-
CHV6-48URBM		-	0.44(0.20)
CHV6-60URBM		0.88(0.40)	0.44(0.20)

3.3 Piping Connection Branch Pipe Dimensions (Optional)

Branch Pipe	SPBPK-102HP
Gas Line	
Liquid Line	

Unit: in., 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 Ьe taken into account when selecting the location for installation of the outdoor unit.

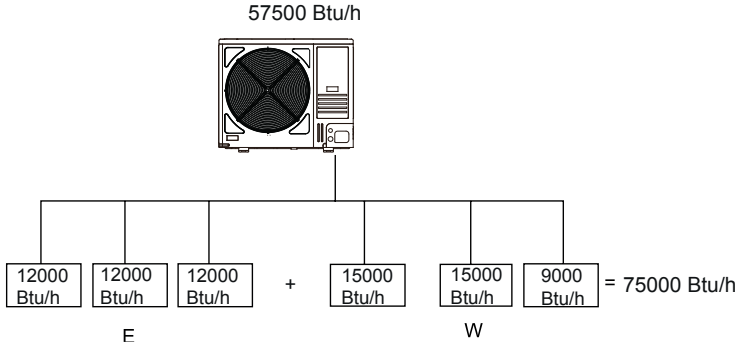
4.1.1 Unique features of the system

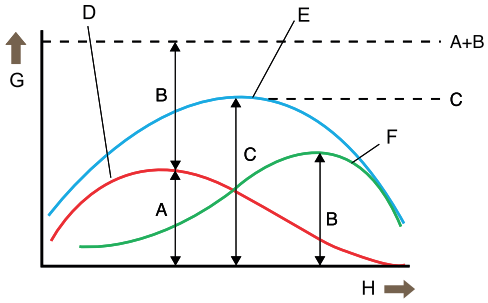
The system boasts some unique features that must be taken into account before selecting the outdoor unit.

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 (36000 Btu/h)
W: West zone (39000 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 75000 Btu/h outdoor unit, matching the total installed indoor capacity (36000 Btu/h + 39000 Btu/h). However, the maximum simultaneous load in the whole building occurs at noon, and is equal to 57500 Btu/h of unit capacity. Therefore, a 57500 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 ratio of total combined capacity is calculated with the following formula:

Ratio of total combined capacity = (Total capacity of the indoor units / Capacity of the outdoor unit) x 100% = (75000 Btu/h / 57500 Btu/h) x 100% ≈ 134%

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".

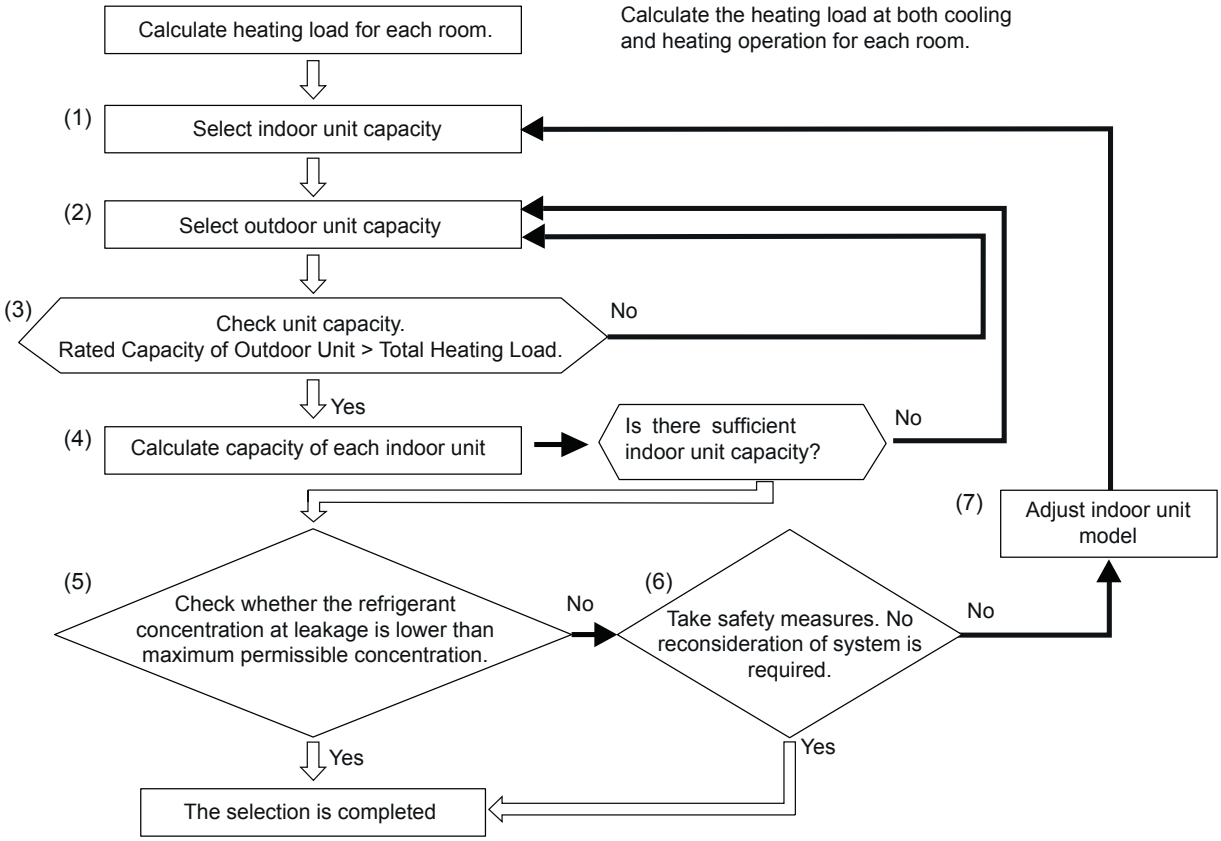
For heating correction factor depending on the piping length: 4.2 "Capacity Correction Based on Refrigerant Piping Length".

For sensible heat factor: VRF Indoor Units Technical Catalog.

In case of an installation with ducts (outdoor unit with AVD indoor unit) the fan performance for duct calculations should be considered. The AVD 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 capacit (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 DB / 67.0°F WB; heating: 70.0°F 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

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 DB; heating: 47.0°FDB / 43.0°F WB), select the outdoor unit capacity at the estimated load from the 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.)

Unit capacity for each room = Outdoor Unit Capacity (value at item 2) x (indoor unit capacity in concerned room / 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:

- When select the temperature, 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 selecting 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 36ºF 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)	6140	6140	5110	5110	6140	6140	5110
Estimated cooling load (Btu/h)	6820	6820	5800	5800	6820	6820	5800

Temperature condition unit: °F °(C)

Operating conditions		Cooling	Heating
Indoor air inlet temperature	DB	80	70
	WB	67	-
Outdoor air inlet temperature	DB	86	34
	WB	-	32

DB: dry bulb; WB: wet bulb.

Piping dimensions:

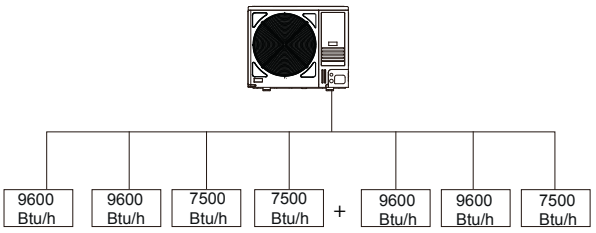
- Equivalent pipe length between outdoor unit and indoor units: 197 ft.
- Pipe height: 82 ft.

Appropriate selection of indoor units and nominal capacity

Example: selection of CHV 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	CHV-09*	CHV-09*	CHV-07*	CHV-07*	CHV-09*	CHV-09*	CHV-07*
Nominal cooling load (Btu/h)	9600	9600	7500	7500	9600	9600	7500
Nominal cooling load (Btu/h)	11300	11300	8500	8500	11300	11300	8500

Then, it's shown a diagram ofthe installation resulting:
57500Btu/h



The resulting total indoor unit capacity is 60900 Btu/h.The outdoor unit with the exact capacity is the 60900 Btu/h model, but the possibility “Reduced total outdoor unit capacity” allows the CHV6-60URBM model (nominal capacity: 57500 Btu/h) to be selected. Thus, it’s allowed at the outdoor unit to be up to 6% smaller capacity when compared with other air conditioning systems.

Total combination capacity = (Total indoor unit capacity / Outdoor unit capacity) x 100% = (60900 Btu/h / 57500 Btu/h) x100%"' 106%

NOTE:

The maximum simultaneous load on the installation must not be higher than 57500 Btu/h for this example. To determine the outdoor unit pre-selected nominal cooling and heating capacity, it’s necessary refer to Engineering Data, in which the total capacity combination (106%) and the temperature condition have been taken into consideration.

Concept	Room 1+2+3+4+5+6+7	Outdoor init pre-selected (CHV6-60URBM ~ 115%)
Total nominal cooling loas (Btu/h)	60900	58870
Total nominal heating loas (Btu/h)	74700	61420

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 the air inlet temperature.
- If the total combination capacity is not shown in the capacity tables (for example, 106%), an interpolation should be carried out using the values above and below (110% and 120%) the total combination.

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

Correction factor according to piping length:

According to 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

- Cooling capacity correction factor depending on the pipe length =0.870.
- Heating capacity correction factor depending on the pipe length =0.954.

Correction factor according to defrosting condition (for heating operation):

According to 4.3 “Correction Factor According to Defrosting Operation”.

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

Actual capacity of the outdoor unit

Actual maximum capacity of the outdoor unit = (Outdoor unit pre-selected capacity) x (Correction factor according to pipe length and height) x (Correction factor according to defrosting operation) x (Correction factor according to altitude)

Cooling: 58870 Btu/h×(0.870)×(1.0)=51217Btu/h.

Heating: 61420 Btu/h×(0.954)×(0.857)=50216Btu/h.

Actual capacity of each indoor unit.

Actual capacity of each indoor unit = (Actual maximum capacity of the outdoor unit) x (Nominal capacity of each indoor units / Total nominal capacity of each indoor unit)

CHV-07*

Cooling: 51217×7500/(9600+9600+7500+7500+9600+9600+7500)=6307Btu/h.

Heating: 50216×8500/(11300+11300+8500+8500+11300+11300+8500)=6036Btu/h.

CHV-09*

Cooling: 51217×9500/(9600+9600+7500+7500+9600+9600+7500)=7990Btu/h.

Heating: 50216×11300/(11300+11300+8500+8500+11300+11300+8500)=8025Btu/h.

Results:

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	CHV-09*	CHV-09*	CHV-07*	CHV-07*	CHV-09*	CHV-09*	CHV-07*
Actual cooling capacity (Btu/h)	7990	7990	6307	6307	7990	7990	6307
Actual heating capacity (Btu/h)	8025	8025	6036	6036	8025	8025	6036
Estimated cooling load (Btu/h)	6140	6140	5110	5110	6140	6140	5110
Estimated heating load (Btu/h)	6820	6820	5800	5800	6820	6820	5800

Concept	Room 1+2+3+4+5+6+7
Actual total cooling capacity (Btu/h)	50811
Actual total heating capacity (Btu/h)	50208
Estimated total cooling load (Btu/h)	39890
Estimated total heating load (Btu/h)	44680

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 CHV6-60URBM unit meets the minimum cooling and heating requirements set for the system.

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

4.2 Capacity Correction Based on Refrigerant Piping Length

< Cooling Capacity >

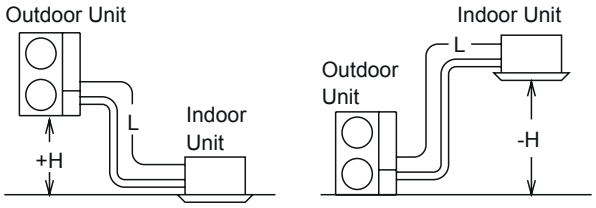
Correction factor for cooling capacity according to piping length.

The cooling capacity should be corrected according to the following formula:
CCA=CCxF
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).



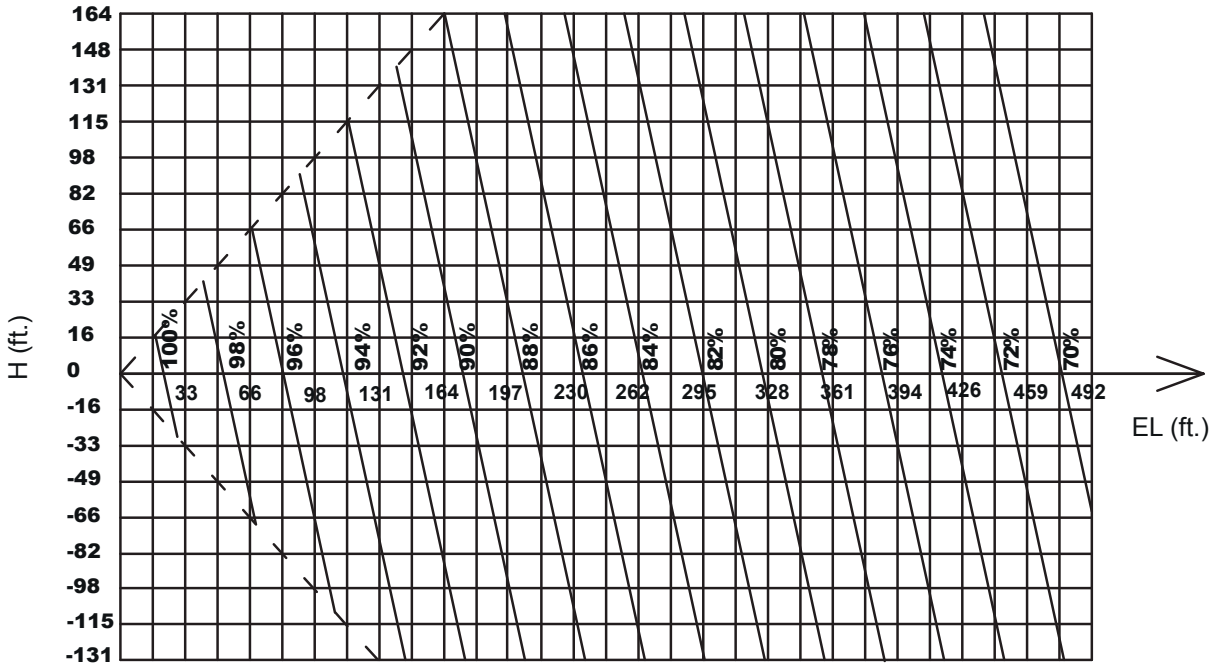
H: Vertical Distance Between Indoor Unit and Outdoor Unit

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

* H and EL please refer to Refrigerant Piping Work



< Heating Capacity >

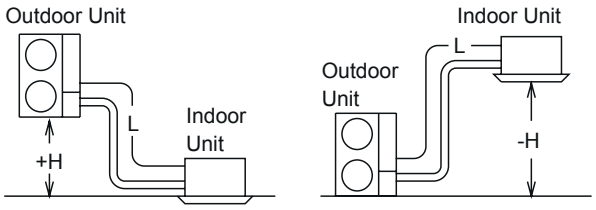
Correction factor for cooling capacity according to piping length.

The heating capacity should be corrected according to the following formula:
HCA=hCxF
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).



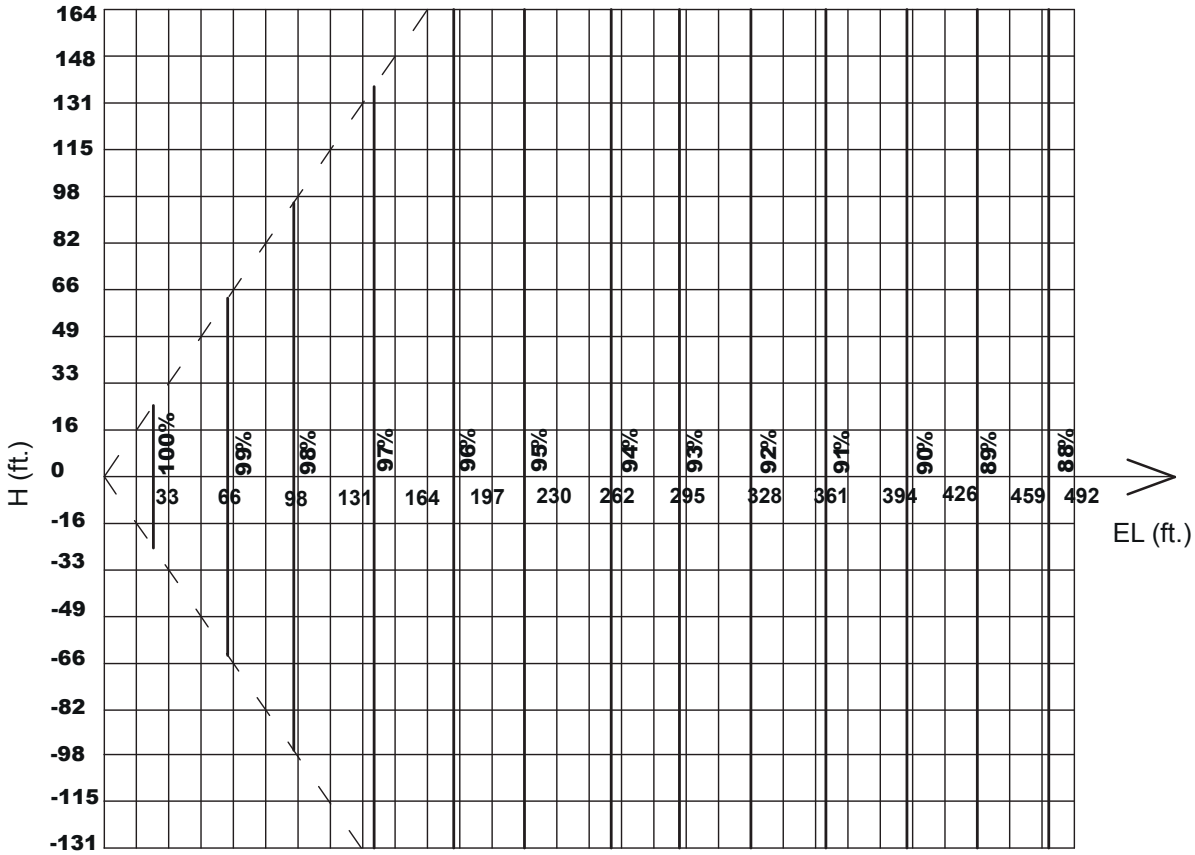
H: Vertical Distance Between Indoor Unit and Outdoor Unit

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

* H and EL please refer to Refrigerant Piping Work

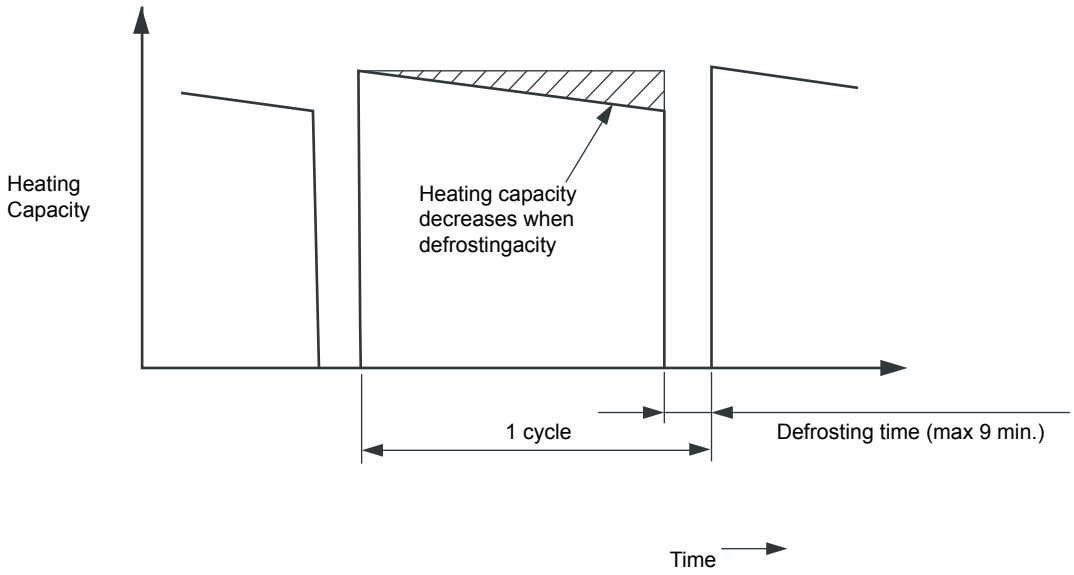


4.3 Correction Factor According to Defrosting Operation

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:

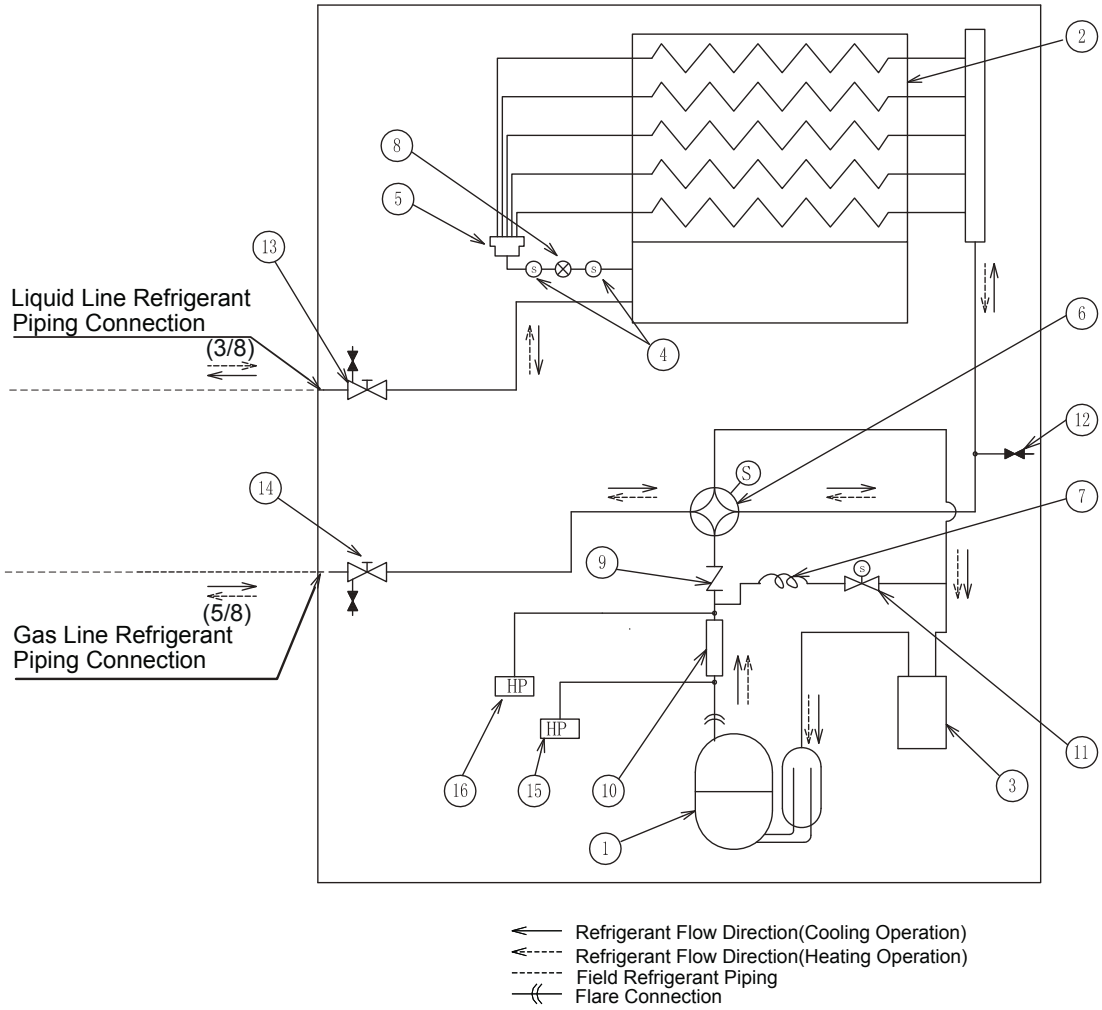
- The correction factor is not available for special conditions like snowfall or operation in a transitional period.
- When the outdoor inlet air temperature is higher than 44 ºF(7 ºC), this correction coefficient is 1.0. And when the outdoor inlet air temperature is lower than 20 ºF(-7 ºC), this correction coefficient is 0.95.
- If the outdoor inlet air temperature is not shown in the above table (for example, 34 ºF(1 ºC)), an interpolation should be carried out using the values before and after (32 ºF(0 ºC) and 38 ºF(3 ºC)) the outdoor inlet air temperature.

5. Control System

5.1 Refrigerant Cycle

Model: CHV6-28URBM

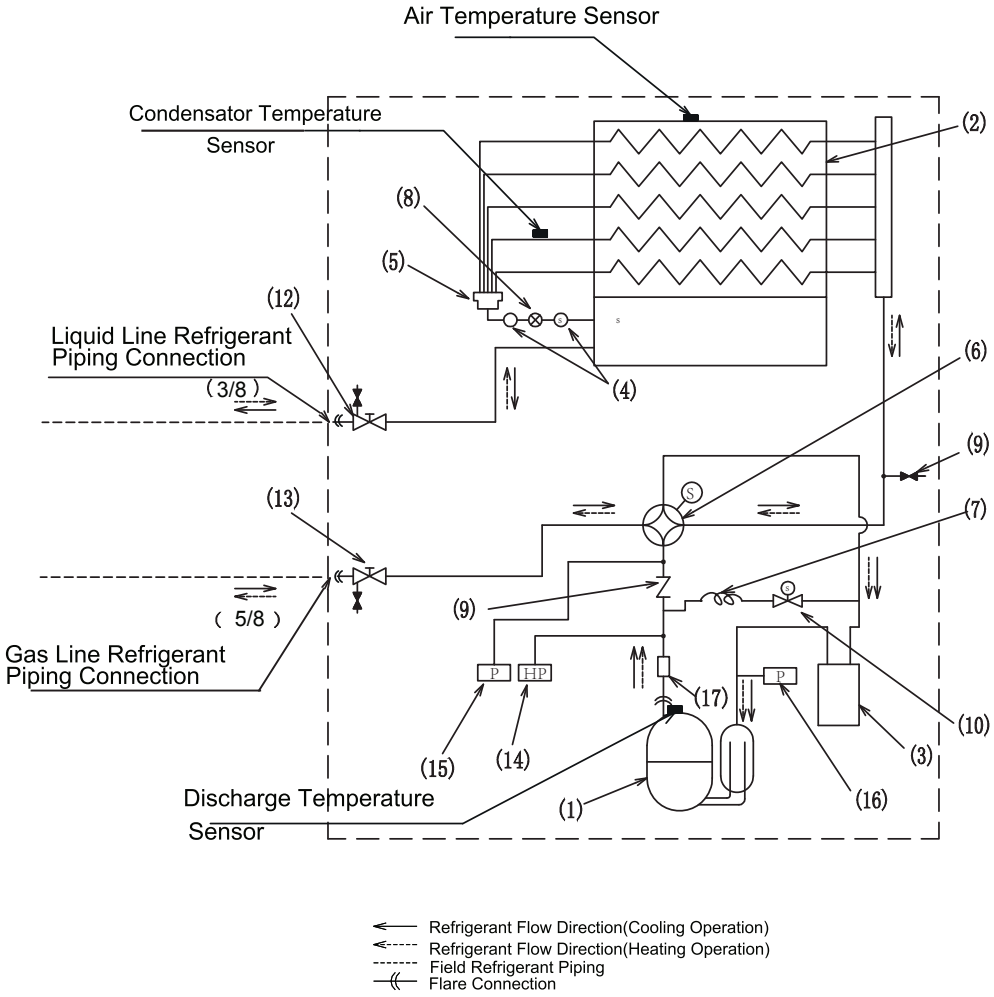
unit: in.



No.	Part Name	Remark
1	Compressor	
2	Heat Exchanger	
3	Accumulator	
4	Strainer	
5	Distributor	
6	Reversing Valve (RVR)	
7	Capillary Tube	
8	Electronic Expansion Valve (EVO)	
9	Check Valve	
10	Silencer Pressure Switch	
11	Solenoid Valvet	
12	Check Joint	
13	Stop Valve for Liquid Line	
14	Stop Valve for Gas Line	
15	Pressure Switch	Pressure Protect
16	Pressure Switch	Controlling

Model: CHV6-36/48/60URBM

unit: in.



No.	Part Name	Remark
1	Compressor	
2	Heat Exchanger	
3	Accumulator	
4	Strainer	
5	Distributor	
6	Reversing Valve (RVR)	
7	Capillary Tube	Bypass
8	Electronic Expansion Valve (EVO)	
9	Check Valve	
10	Solenoid Valve	Bypass
11	Check Joint	
12	Stop Valve for Liquid Line	
13	Stop Valve for Gas Line	
14	Pressure Switch	High Pressure Protection
15	Pressure Sensor	High
16	Pressure Sensor	Low
17	Silencer	

5.2 Control Logic

No.	Item		Details
1	Cooling Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a),(b) and (c).
		I.U. Electronic Exp. Valve Control	● Quasi PI Control: To determine the I.U. electronic expansion valve opening so as to keep (d) at an optimum value. To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To control the fan steps so that High Pressure is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during Operation Stop)
2	Heating Operation	Comp. Frequency Control	● PI Control: To determine the compressor frequency so as to keep High Pressure. To determine the compressor frequency from (a) and(c) when heating operation is started or the number of operating indoor units is changed.
		I.U. Electronic Exp. Valve(EVI) Control	● To determine the I.U. electronic expansion valve opening so that the indoor liquid pipe temperature (trl) is at an optimum level. To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Exp. Valve(EVO) Control	● Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the temperature at the top of the compressor at an optimum level. When Operating Indoor Unit Number Changed: To determine the O.U. electronic expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.
		Outdoor Fan Control	The fan steps are dependent on Ta in the beginning. After that to control the fan steps so that Pd is within a stable pressure range.
		Reversing Valve Control	Reversing Valve: ON
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during operation stop)
3	Defrost Operation	Comp. Frequency Control	Fixed Compressor Frequency
		I.U. Electronic Exp. Valve Control	To determine the I.U. electronic expansion valve opening depending on the discharge temperature of the compressor (Td).
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To stop the outdoor fan.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	at Start-up: ON
4	Comp. Preheating Control		Crankcase Heater Control

a . Difference between Indoor Inlet Air Temperature and Setting Temperature

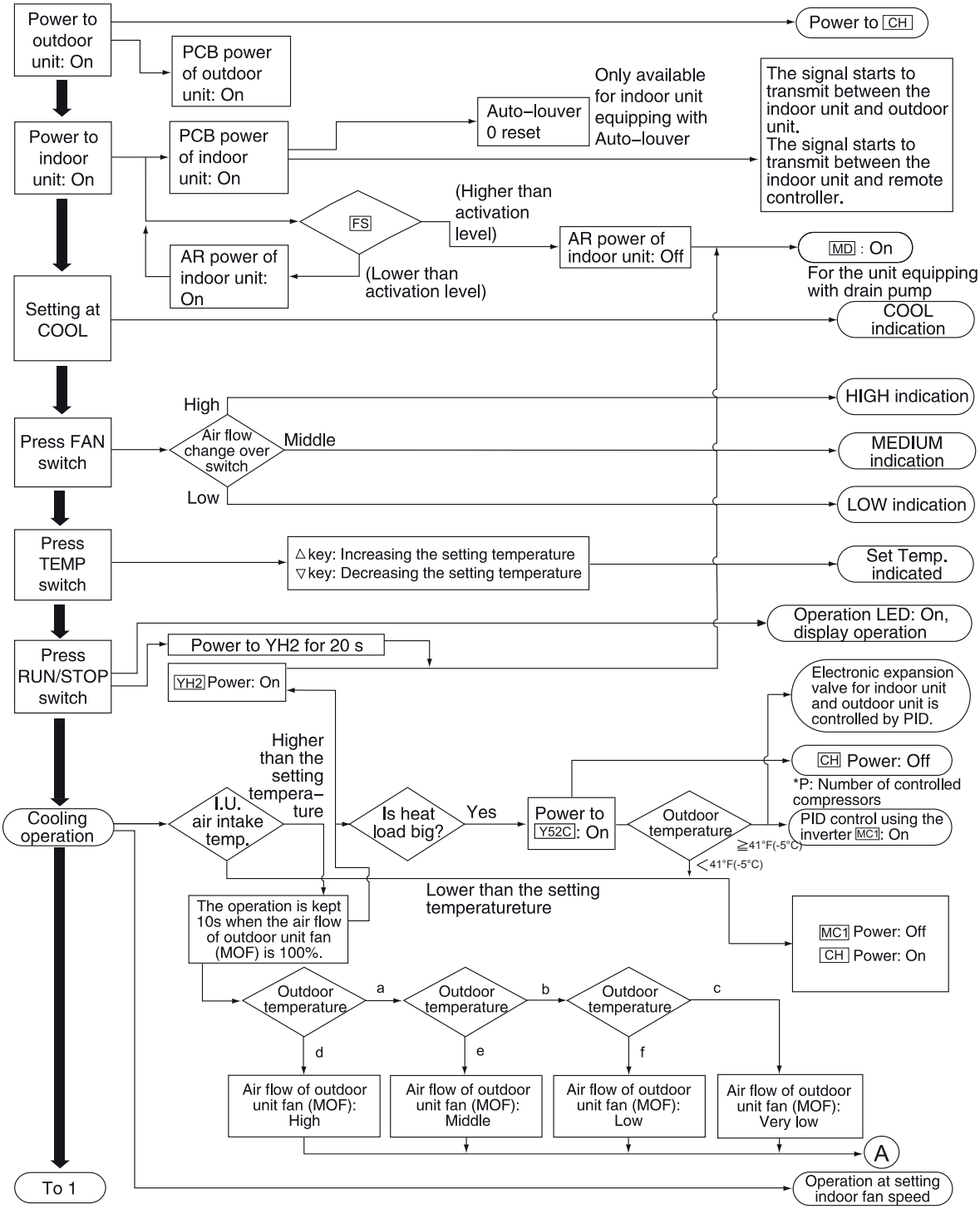
b . Amount of Temperature Difference Change

c . Capacity Ratio between Operating Indoor Unit and Outdoor Unit

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

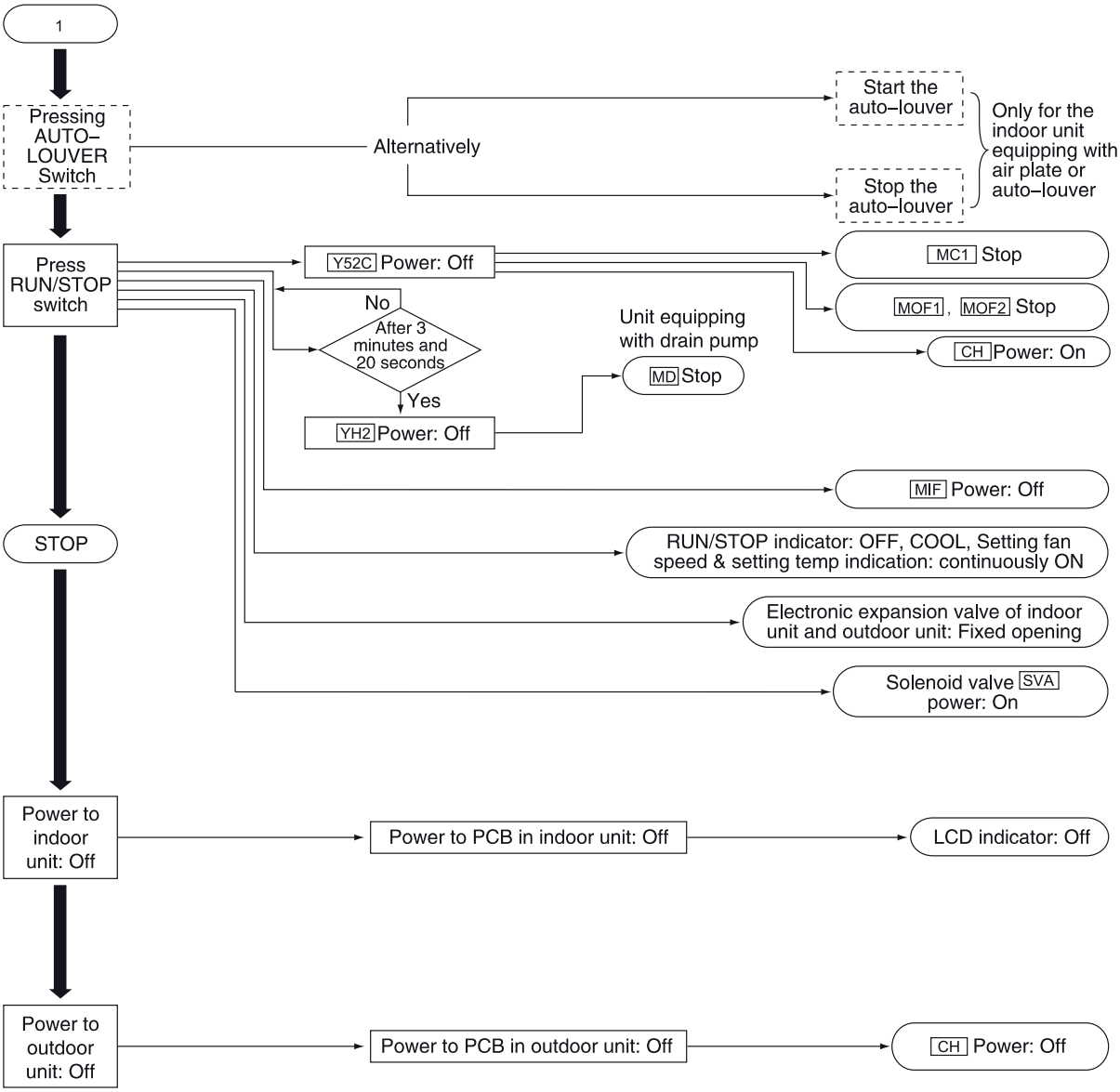
5.3 Standard Operation Procedure Chart

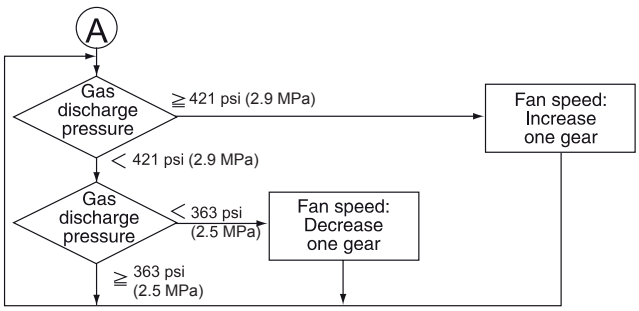
Cooling Operation



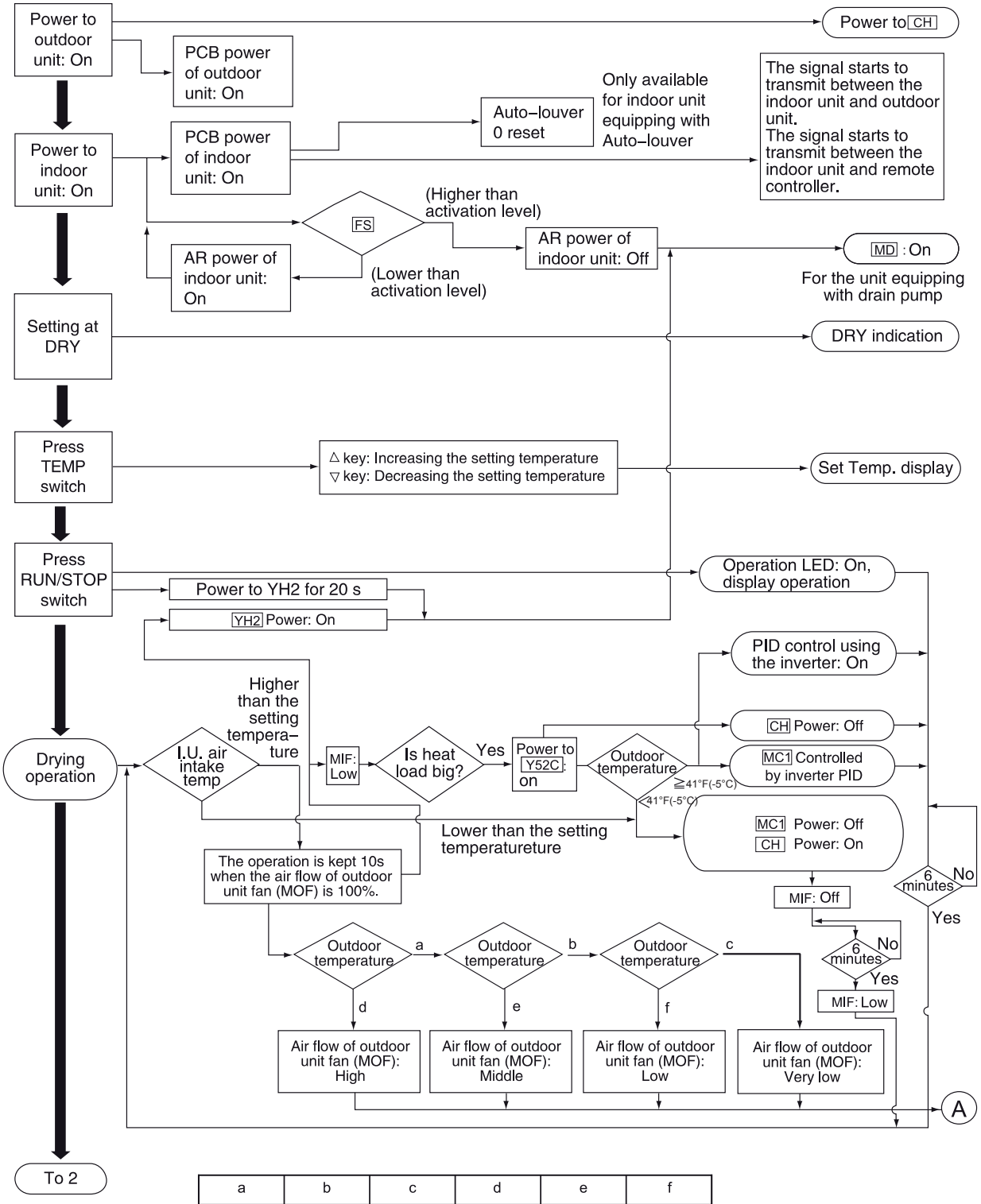
a	b	c	d	e	f
Lower than 77°F(25°C)	Lower than 64°F(18°C)	Lower than 52°F(11°C)	Higher than 77°F(25°C)	Higher than 64°F(18°C)	Higher than 52°F(11°C)

Cooling Operation



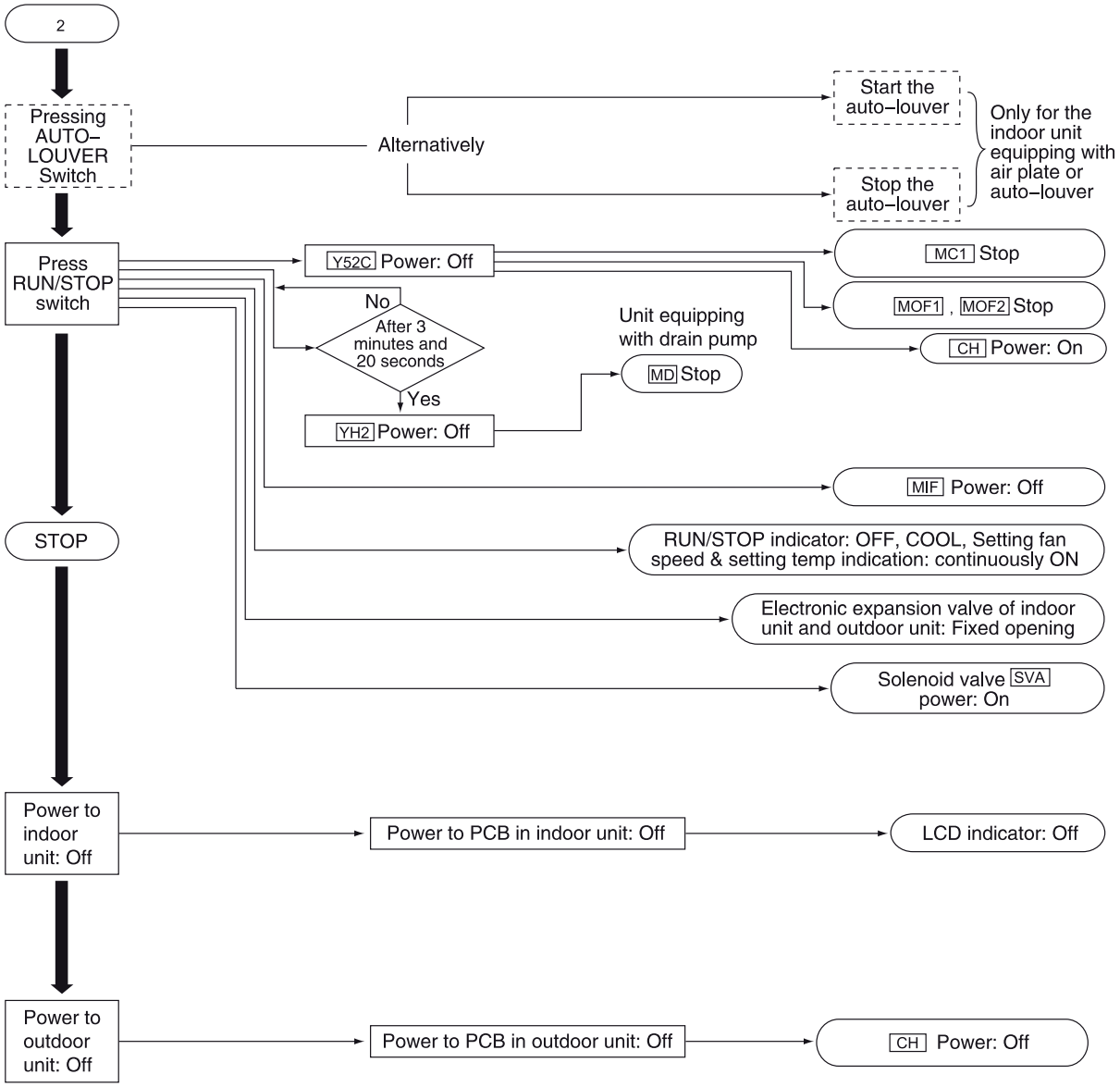


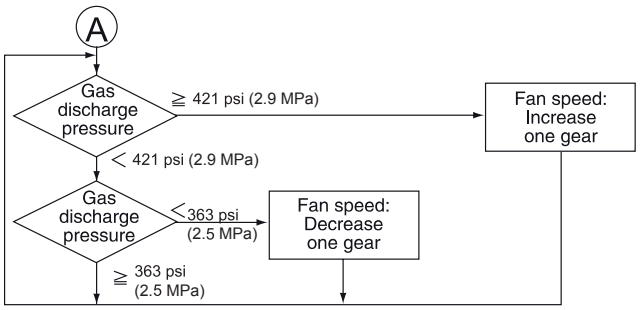
Dry Operation



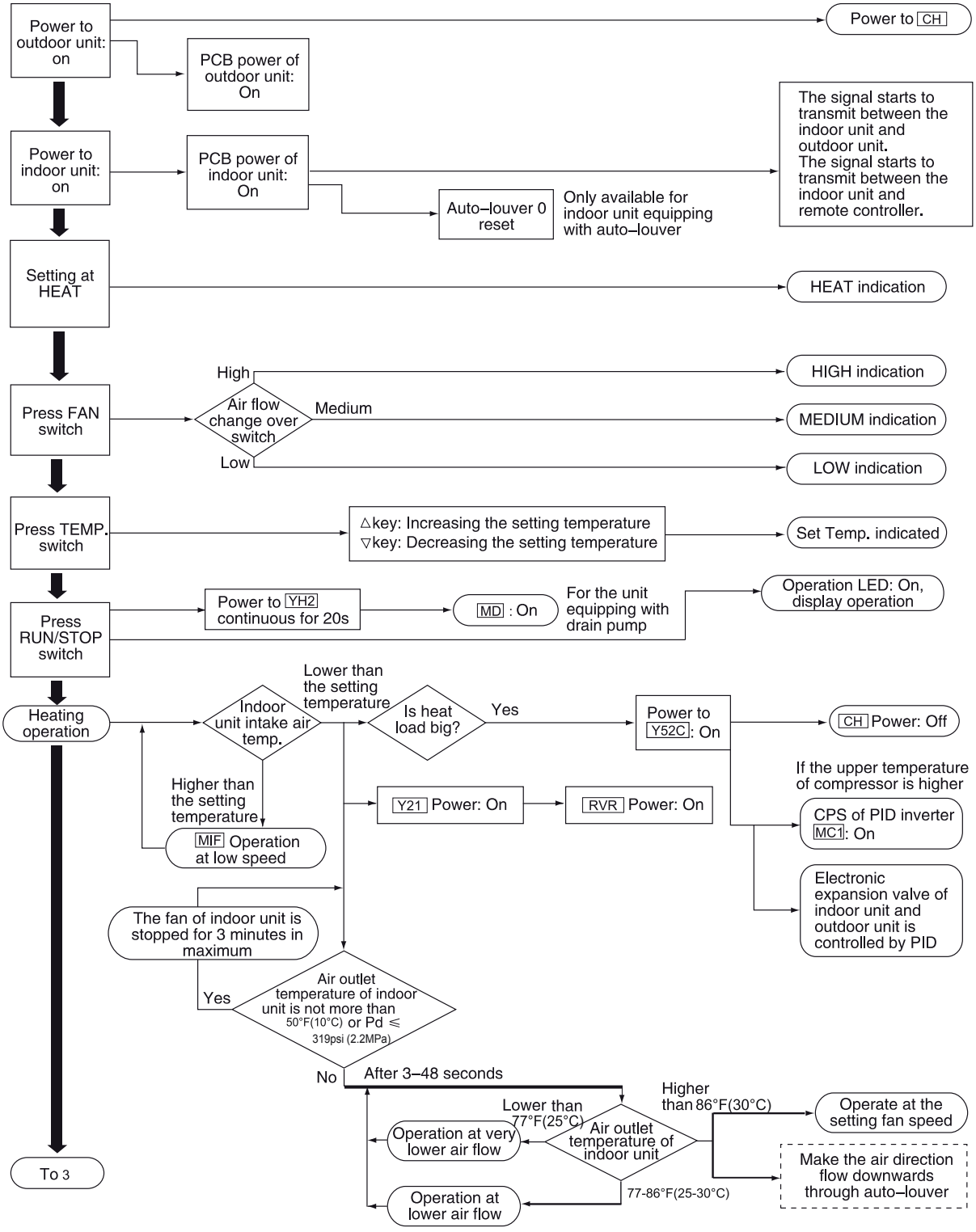
a	b	c	d	e	f
Lower than 77°F (25°C)	Lower than 64°F (18°C)	Lower than 52°F (11°C)	Higher than 77°F (25°C)	Higher than 64°F (18°C)	Higher than 52°F (11°C)

Dry Operation

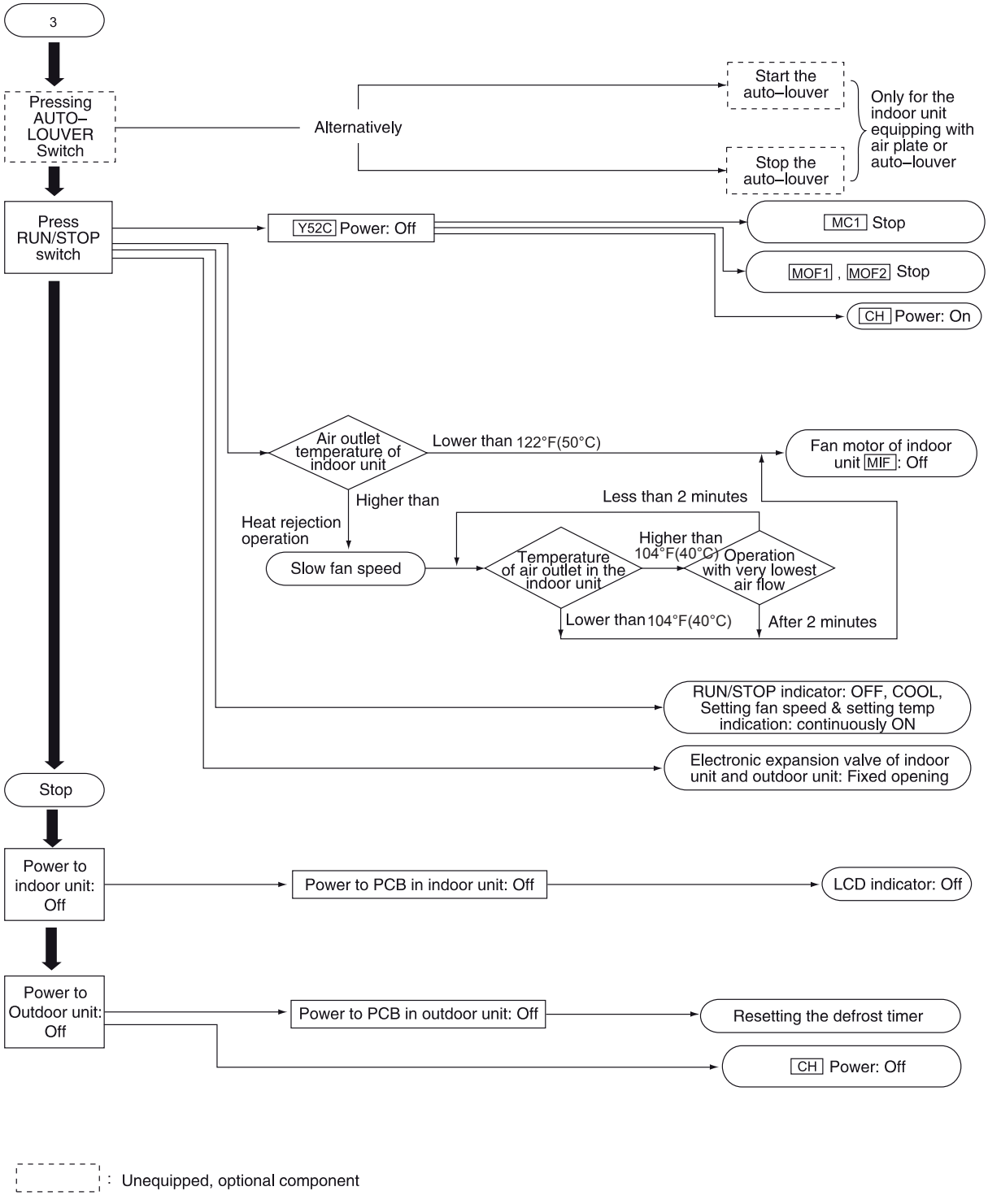




Heating Operation

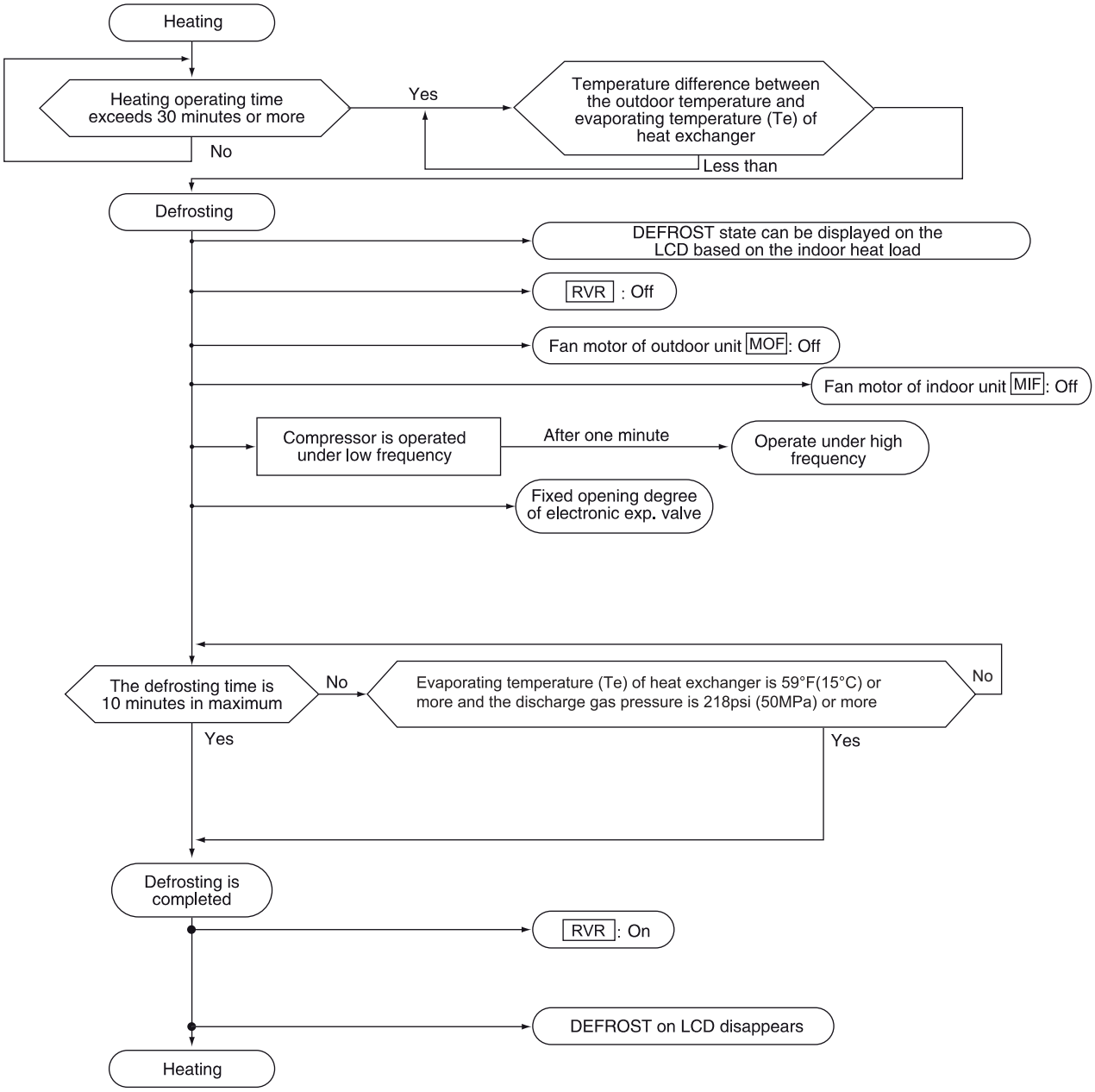


Heating Operation



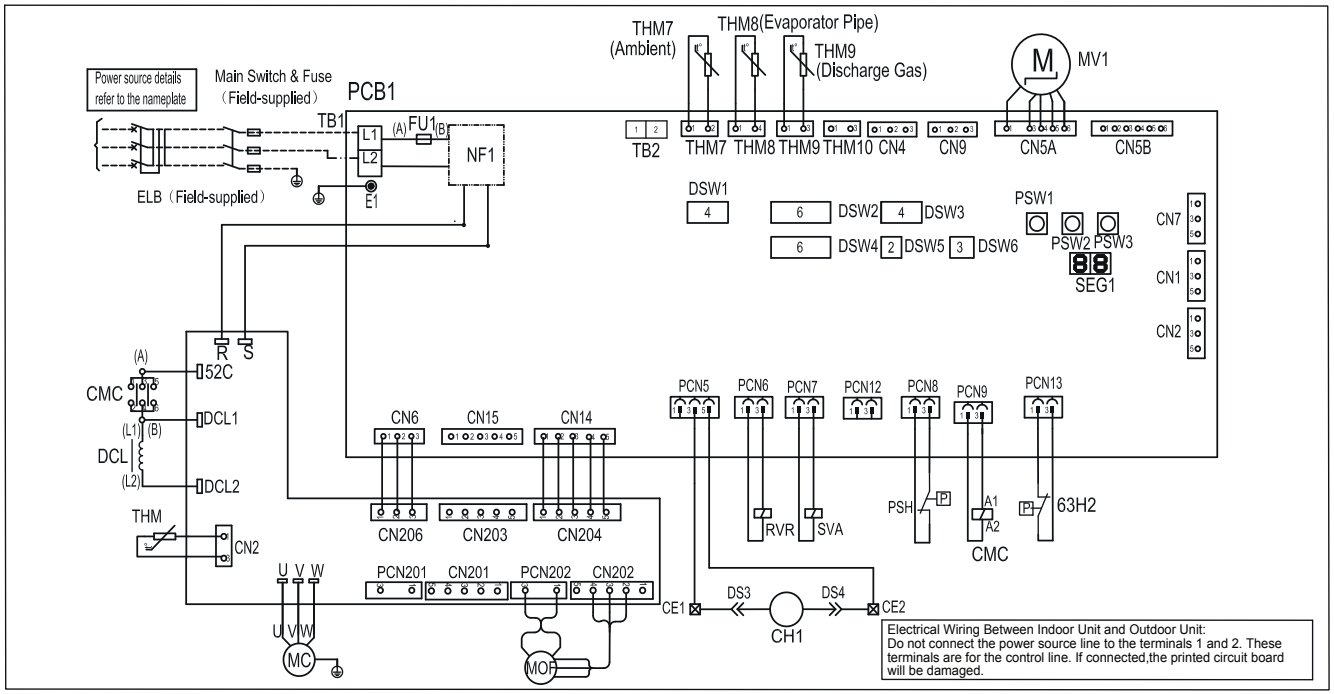
: Unequipped, optional component

Defrost Operation



5.4 Electrical Wiring Diagram

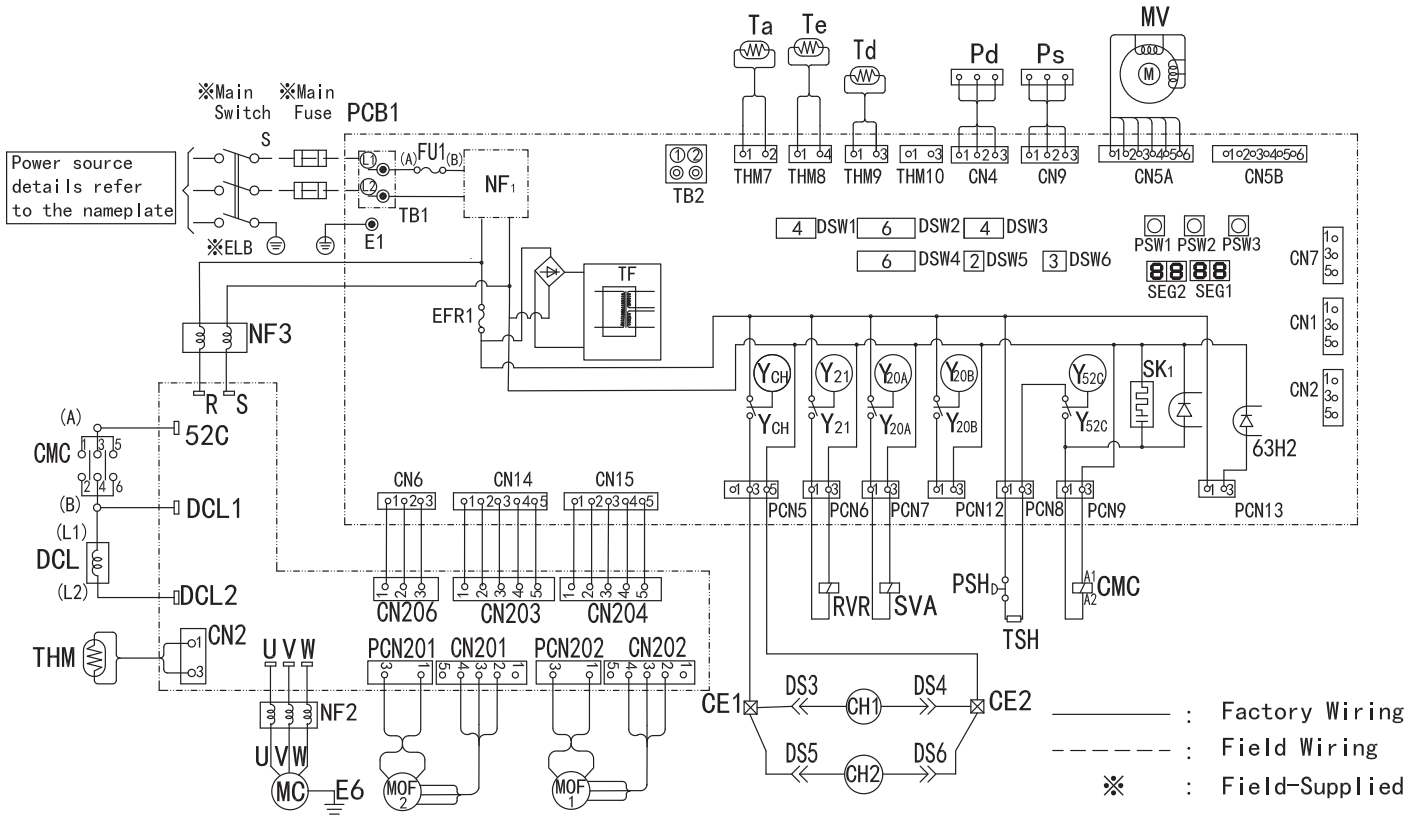
CHV6-28URBM



MARK	NAME
MC	Motor for Compressor
MOF	Motor for Out Fan
FU	Fuse
CMC	Contactor for Compressor Motor
RVR	Reversing Valve Relay
MV	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
PSH	Pressure Switch High
63H2	High Pressure Switch For Control
TB	Terminal Board
PCB	Printed Circuit Board
THM	Thermistor
DCL	Reactor
NF	Noise Filter
PSW	Push Switch on PCB1
DSW	Dip Switch on PCB1
CH	Crankcase Heater
⏚	Ground wire

CHV6-36/48/60URBM

Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.



MARK	NAME
MC	Motor for Compressor
MO1F	Motor for Out Fan
MO2F	Motor for Out Fan
FU1	Fuse
CMC	Contactor for Compressor Motor
RVR	Reversing Valve Relay
MV	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch for Protection
Pd	Sensor for Refrigerant Pressure
Ps	Sensor for Refrigerant Pressure
TB1,2	Terminal Board
TF	Transformer
PCB1	Printed Circuit Board
EFR	Fuse
Y52C	Relay(CMC)
Y21	Relay(RVR)
YCH	Relay(CH)
Y20A	Relay(SVA)
Y20B	Relay(SVF)
THM7	Thermistor
THM8	Thermistor
THM9	Thermistor
THM81	Thermistor
DCL	Reactor
IPM	Inverter System Power Podule
NF1~4	Noise Filter
PSW1	Push Switch on PCB1
PSW2	Push Switch on PCB1
PSW3	Push Switch on PCB1
DSW1	Dip Switch on PCB1
DSW2	Dip Switch on PCB1
DSW3	Dip Switch on PCB1
DSW4	Dip Switch on PCB1
DSW5	Dip Switch on PCB1
DSW6	Dip Switch on PCB1
CH1~2	Crankcase Heater
E1~6	Ground Wire