

TECHNICAL & SERVICE MANUAL

OUTDOOR UNIT : CMH1972
CMH2472
CMH3172

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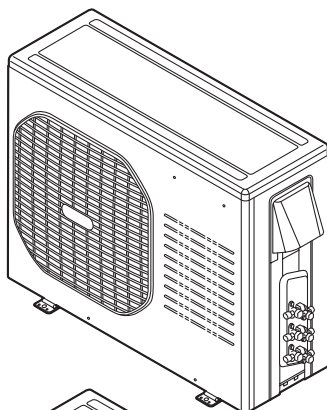
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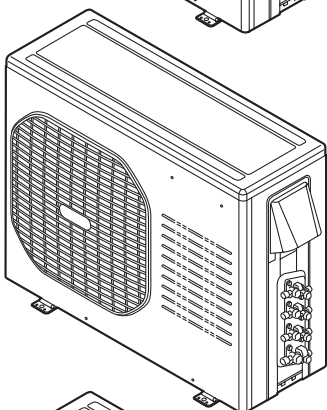
DC INVERTER MULTI-SYSTEM AIR CONDITIONER

Capacity at 230V	Outdoor Model No.	Product Code No.
19,100 BTU/h	CMH1972	1 852 330 30
23,200 BTU/h	CMH2472	1 852 330 31
30,600 BTU/h	CMH3172	1 852 330 32

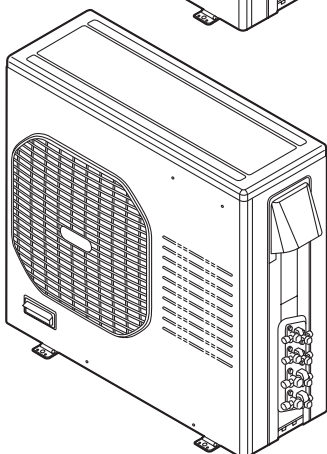
CMH1972



CMH2472



CMH3172



< Applicable Indoor Units >

- Wall mounted type
KMHS0772
KMHS0972
KMHS1272
KMHS1872
KMHS2472

NOTE

For details about the combination, refer to "Unit Combination Table" in the Appendix of this manual.

IMPORTANT

These air conditioners employ new refrigerant R410A.

Pay special attention when servicing the unit.

R410A

Important! Please Read Before Starting

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.



WARNING

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.



CAUTION

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING

When Wiring



ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause accidental injury or death.
- Ground the unit following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.
- Install a protective leakage breaker depending on the installation location (especially a damp or humid location). If a leakage breaker is not installed, electric shock can occur.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing

In a Ceiling or Wall

Make sure the ceiling/wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.

In a Room

Properly insulate any tubing run inside a room to prevent "sweating" that can cause dripping and water damage to walls and floors.

In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

When Servicing

- Turn the power off at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

Others



CAUTION

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm upon completing installation that no refrigerant gas is leaking. If escaped gas comes in contact with a stove, gas water heater, electric room heater or other heat source, it can produce dangerously toxic gas.

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■ APPLICABLE INDOOR UNITS

Indoor Unit Multi-Outdoor Unit		KMHS0772	KMHS0972	KMHS1272	KMHS1872	KMHS2472
3-Room	CMH1972	YES	YES	YES	YES	NO
4-Room	CMH2472	YES	YES	YES	YES	YES
4-Room	CMH3172	YES	YES	YES	YES	YES

NOTE The table lists the wall-mounted type of indoor units as representative models.

1. OPERATING RANGE

	Temperature	Indoor Air Intake Temp.	Outdoor Air Intake Temp.
Cooling	Maximum	95 °F D.B. / 71 °F W.B.	115 °F D.B.
	Minimum	67 °F D.B. / 57 °F W.B.	67 °F D.B.
Heating	Maximum	80 °F D.B. / 67 °F W.B.	75 °F D.B. / 65 °F W.B.
	Minimum	— D.B. / — W.B.	0 °F D.B.

2. SPECIFICATIONS

2-1. Unit Specifications

Outdoor Unit **CMH1972**

Indoor Unit **KMHS0972 × 3**

< 230V >

Type	3-Room Multi Outdoor Unit
Number of Connectable Indoor Units	3
Number of Operatable Indoor Units	3

Voltage Rating	230V Single-Phase 60Hz
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Performance		Cooling	Heating
Total Capacity	BTU/h kW	19,100 (9,800 to 19,100) 5.60 (2.90 to 5.60)	24,800 (11,600 to 24,800) 7.30 (3.40 to 7.30)
Sensible Capacity	BTU/h	16,300	-
Latent Capacity	BTU/h	2,800	-
Air Circulation (High)	ft³/min (m³/h)	1,707 (2,900)	1,707 (2,900)

Electrical Rating		Cooling	Heating
Available Voltage Range	V	187 to 253	
Running Amperes	A	6.7	7.7
Power Input	W	1,500	1,735
Power Factor	%	98	98
SEER	BTU/Wh	13	-
HSPF	BTU/Wh	-	7.7
Compressor Locked Rotor Amperes	A	14.5	
Fuse or Circuit Breaker Capacity	A	20	

Features (Outdoor Unit)			
Control		Microprocessor	
Fan Speeds		Auto (Hi, Me, Lo)	
Compressor		DC Twin Rotary (Inverter)	
Refrigerant / Amount charged at shipment		lb. (g)	R410A / 6.17 (2,800)
Refrigerant Control		Electric Expansion Valve	
Operation Sound (High) Cool/Heat		dB-A	50 / 52
Refrigerant Tubing Connections		Flare Type	
Max. allowable tubing length per unit		ft. (m)	82 (25)
Refrigerant	Narrow tube	inch (mm)	1/4 (6.35) × 3
Tube Diameter	Wide tube	inch (mm)	3/8 (9.52) × 3

Dimensions & Weight (Outdoor Unit)			
Unit Dimensions	inch	29-1/8 × 35-7/16 × 12-19/32	
Height × Width × Depth	(mm)	(740 × 900 × 320)	
Package Dimensions	inch	33-27/32 × 40-5/8 × 16-1/4	
Height × Width × Depth	(mm)	(860 × 1,032 × 413)	
Weight	Net	lb. (kg)	143.3 (65.0)
	Shipping	lb. (kg)	152.1 (69.0)
Shipping Volume	cu.ft (m³)	12.71 (0.36)	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks:

1. The Values shown in performance section and electrical rating section above are based on the following unit combination.

For other combination unit, please refer to the "Unit Combination Tables" in this manual.

Indoor Unit : KMHS0972 3units Outdoor Unit : CMH1972 1unit

2. Rating conditions are: Cooling : Indoor air temp. 80°F D.B./ 67°F W.B Heating : Indoor air temp. 70°F D.B.

Outdoor air temp. 95°F D.B./ 75°F W.B.

Outdoor air temp. 47°F D.B./ 43°F W.B.

Outdoor Unit **CMH1972**
Indoor Unit **KMHS0972 × 3**

< 208V >

Type	3-Room Multi Outdoor Unit
Number of Connectable Indoor Units	3
Number of Operatable Indoor Units	3

Voltage Rating	208V Single-Phase 60Hz
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Performance		Cooling	Heating
Total Capacity	BTU/h kW	19,100 (9,800 to 19,100) 5.60 (2.90 to 5.60)	24,800 (11,600 to 24,800) 7.30 (3.40 to 7.30)
Sensible Capacity	BTU/h	16,300	-
Latent Capacity	BTU/h	2,800	-
Air Circulation (High)	ft³/min (m³/h)	1,707 (2,900)	1,707 (2,900)

Electrical Rating		Cooling	Heating
Available Voltage Range	V	187 to 253	
Running Amperes	A	7.4	8.5
Power Input	W	1,500	1,735
Power Factor	%	98	98
SEER	BTU/Wh	13	-
HSPF	BTU/Wh	-	7.7
Compressor Locked Rotor Amperes	A	14.5	
Fuse or Circuit Breaker Capacity	A	20	

Features (Outdoor Unit)			
Control		Microprocessor	
Fan Speeds		Auto (Hi, Me, Lo)	
Compressor		DC Twin Rotary (Inverter)	
Refrigerant / Amount charged at shipment		lb. (g)	R410A / 6.17 (2,800)
Refrigerant Control		Electric Expansion Valve	
Operation Sound (High) Cool/Heat		dB-A	50 / 52
Refrigerant Tubing Connections		Flare Type	
Max. allowable tubing length per unit		ft. (m)	82 (25)
Refrigerant	Narrow tube	inch (mm)	1/4 (6.35) × 3
Tube Diameter	Wide tube	inch (mm)	3/8 (9.52) × 3

Dimensions & Weight (Outdoor Unit)			
Unit Dimensions	inch	29-1/8 × 35-7/16 × 12-19/32	
Height × Width × Depth	(mm)	(740 × 900 × 320)	
Package Dimensions	inch	33-27/32 × 40-5/8 × 16-1/4	
Height × Width × Depth	(mm)	(860 × 1,032 × 413)	
Weight	Net	lb. (kg)	143.3 (65.0)
	Shipping	lb. (kg)	152.1 (69.0)
Shipping Volume	cu.ft (m³)	12.71 (0.36)	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks:

- The Values shown in performance section and electrical rating section above are based on the following unit combination.
For other combination unit, please refer to the "Unit Combination Tables" in this manual.
Indoor Unit : KMHS0972 3units Outdoor Unit : CMH1972 1unit
- Rating conditions are: Cooling : Indoor air temp. 80°F D.B./ 67°F W.B Heating : Indoor air temp. 70°F D.B.
Outdoor air temp. 95°F D.B./ 75°F W.B. Outdoor air temp. 47°F D.B./ 43°F W.B.

Outdoor Unit **CMH2472**
Indoor Unit **KMHS0972 × 3**

< 230V >

Type	4-Room Multi Outdoor Unit
Number of Connectable Indoor Units	4
Number of Operatable Indoor Units	3

Voltage Rating	230V Single-Phase 60Hz
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Performance		Cooling	Heating
Total Capacity	BTU/h kW	23,200 (9,800 to 23,200) 6.80 (2.90 to 6.80)	29,200 (11,600 to 29,200) 8.60 (3.40 to 8.60)
Sensible Capacity	BTU/h	19,600	-
Latent Capacity	BTU/h	3,600	-
Air Circulation (High)	ft³/min (m³/h)	1,707 (2,900)	1,707 (2,900)

Electrical Rating		Cooling	Heating
Available Voltage Range	V	187 to 253	
Running Amperes	A	9.0	10.1
Power Input	W	2,040	2,270
Power Factor	%	98	98
SEER	BTU/Wh	13	-
HSPF	BTU/Wh	-	7.7
Compressor Locked Rotor Amperes	A	14.5	
Fuse or Circuit Breaker Capacity	A	20	

Features (Outdoor Unit)			
Control		Microprocessor	
Fan Speeds		Auto (Hi, Me, Lo)	
Compressor		DC Twin Rotary (Inverter)	
Refrigerant / Amount charged at shipment		lb. (g)	R410A / 6.17 (2,800)
Refrigerant Control		Electric Expansion Valve	
Operation Sound (High) Cool/Heat		dB-A	50 / 52
Refrigerant Tubing Connections		Flare Type	
Max. allowable tubing length per unit		ft. (m)	82 (25)
Refrigerant	Narrow tube	inch (mm)	1/4 (6.35) × 4
Tube Diameter	Wide tube	inch (mm)	3/8 (9.52) × 3 + 1/2 (12.7) × 1

Dimensions & Weight (Outdoor Unit)			
Unit Dimensions	inch	29-1/8 × 35-7/16 × 12-19/32	
Height × Width × Depth	(mm)	(740 × 900 × 320)	
Package Dimensions	inch	33-27/32 × 40-5/8 × 16-1/4	
Height × Width × Depth	(mm)	(860 × 1,032 × 413)	
Weight	Net	lb. (kg)	143.3 (65.0)
	Shipping	lb. (kg)	152.1 (69.0)
Shipping Volume	cu.ft (m³)	12.71 (0.36)	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks:

- The Values shown in performance section and electrical rating section above are based on the following unit combination.
For other combination unit, please refer to the "Unit Combination Tables" in this manual.
Indoor Unit : KMHS0972 3units Outdoor Unit : CMH2472 1unit
- Rating conditions are: Cooling : Indoor air temp. 80°F D.B./ 67°F W.B Heating : Indoor air temp. 70°F D.B.
Outdoor air temp. 95°F D.B./ 75°F W.B. Outdoor air temp. 47°F D.B./ 43°F W.B.

Outdoor Unit **CMH2472**
Indoor Unit **KMHS0972 × 3**

< 208V >

Type	4-Room Multi Outdoor Unit
Number of Connectable Indoor Units	4
Number of Operatable Indoor Units	3

Voltage Rating	208V Single-Phase 60Hz
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Performance		Cooling	Heating
Total Capacity	BTU/h kW	23,200 (9,800 to 23,200) 6.80 (2.90 to 6.80)	29,200 (11,600 to 29,200) 8.60 (3.40 to 8.60)
Sensible Capacity	BTU/h	19,600	-
Latent Capacity	BTU/h	3,600	-
Air Circulation (High)	ft³/min (m³/h)	1,707 (2,900)	1,707 (2,900)

Electrical Rating		Cooling	Heating
Available Voltage Range	V	187 to 253	
Running Amperes	A	10.0	11.1
Power Input	W	2,040	2,270
Power Factor	%	98	98
SEER	BTU/Wh	13	-
HSPF	BTU/Wh	-	7.7
Compressor Locked Rotor Amperes	A	14.5	
Fuse or Circuit Breaker Capacity	A	20	

Features (Outdoor Unit)			
Control		Microprocessor	
Fan Speeds		Auto (Hi, Me, Lo)	
Compressor		DC Twin Rotary (Inverter)	
Refrigerant / Amount charged at shipment		lb. (g)	R410A / 6.17 (2,800)
Refrigerant Control		Electric Expansion Valve	
Operation Sound (High) Cool/Heat		dB-A	50 / 52
Refrigerant Tubing Connections		Flare Type	
Max. allowable tubing length per unit		ft. (m)	82 (25)
Refrigerant	Narrow tube	inch (mm)	1/4 (6.35) × 4
Tube Diameter	Wide tube	inch (mm)	3/8 (9.52) × 3 + 1/2 (12.7) × 1

Dimensions & Weight (Outdoor Unit)			
Unit Dimensions	inch	29-1/8 × 35-7/16 × 12-19/32	
Height × Width × Depth	(mm)	(740 × 900 × 320)	
Package Dimensions	inch	33-27/32 × 40-5/8 × 16-1/4	
Height × Width × Depth	(mm)	(860 × 1,032 × 413)	
Weight	Net	lb. (kg)	143.3 (65.0)
	Shipping	lb. (kg)	152.1 (69.0)
Shipping Volume	cu.ft (m³)	12.71 (0.36)	

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Remarks:

- The Values shown in performance section and electrical rating section above are based on the following unit combination.
For other combination unit, please refer to the "Unit Combination Tables" in this manual.
Indoor Unit : KMHS0972 3units Outdoor Unit : CMH2472 1unit
- Rating conditions are: Cooling : Indoor air temp. 80°F D.B./ 67°F W.B Heating : Indoor air temp. 70°F D.B.
Outdoor air temp. 95°F D.B./ 75°F W.B. Outdoor air temp. 47°F D.B./ 43°F W.B.

Outdoor Unit **CMH3172**
Indoor Unit **KMHS0972 × 4**

< 230V >

Type	4-Room Multi Outdoor Unit
Number of Connectable Indoor Units	4
Number of Operatable Indoor Units	4

Voltage Rating	230V Single-Phase 60Hz
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Performance		Cooling	Heating
Total Capacity	BTU/h kW	30,600 (9,800 to 30,600) 9.00 (2.90 to 9.00)	32,000 (11,600 to 32,000) 9.40 (3.40 to 9.40)
Sensible Capacity	BTU/h	25,800	-
Latent Capacity	BTU/h	4,800	-
Air Circulation (High)	ft³/min (m³/h)	1,942 (3,300)	1,807 (3,070)

Electrical Rating		Cooling	Heating
Available Voltage Range	V	187 to 253	
Running Amperes	A	12.3	10.3
Power Input	W	2,800	2,350
Power Factor	%	99	99
SEER	BTU/Wh	16	-
HSPF	BTU/Wh	-	7.7
Compressor Locked Rotor Amperes	A	17.0	
Fuse or Circuit Breaker Capacity	A	20	

Features (Outdoor Unit)			
Control		Microprocessor	
Fan Speeds		Auto (Hi, Me, Lo)	
Compressor		DC Twin Rotary (Inverter)	
Refrigerant / Amount charged at shipment		lb. (g)	R410A / 8.38 (3,800)
Refrigerant Control		Electric Expansion Valve	
Operation Sound (High) Cool/Heat		dB-A	53 / 52
Refrigerant Tubing Connections		Flare Type	
Max. allowable tubing length per unit		ft. (m)	100 (30.5)
Refrigerant	Narrow tube	inch (mm)	1/4 (6.35) × 4
Tube Diameter	Wide tube	inch (mm)	3/8 (9.52) × 2 + 1/2 (12.7) × 2

Dimensions & Weight (Outdoor Unit)			
Unit Dimensions	inch	35-1/32 × 35-7/16 × 12-19/32	
Height × Width × Depth	(mm)	(890 × 900 × 320)	
Package Dimensions	inch	39-3/4 × 40-5/8 × 16-1/4	
Height × Width × Depth	(mm)	(1,010 × 1,032 × 413)	
Weight	Net	lb. (kg)	180.8 (82.0)
	Shipping	lb. (kg)	189.6 (86.0)
Shipping Volume	cu.ft (m³)	15.18 (0.43)	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks:

- The Values shown in performance section and electrical rating section above are based on the following unit combination.
For other combination unit, please refer to the "Unit Combination Tables" in this manual.
Indoor Unit : KMHS0972 4units Outdoor Unit : CMH3172 1unit
- Rating conditions are: Cooling : Indoor air temp. 80°F D.B./ 67°F W.B Heating : Indoor air temp. 70°F D.B.
Outdoor air temp. 95°F D.B./ 75°F W.B. Outdoor air temp. 47°F D.B./ 43°F W.B.

Outdoor Unit **CMH3172**
Indoor Unit **KMHS0972 × 4**

< 208V >

Type	4-Room Multi Outdoor Unit
Number of Connectable Indoor Units	4
Number of Operatable Indoor Units	4

Voltage Rating	208V Single-Phase 60Hz
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Performance		Cooling	Heating
Total Capacity	BTU/h kW	28,600 (9,800 to 28,600) 8.40 (2.90 to 8.40)	32,000 (11,600 to 32,000) 9.40 (3.40 to 9.40)
Sensible Capacity	BTU/h	24,200	-
Latent Capacity	BTU/h	4,400	-
Air Circulation (High)	ft³/min (m³/h)	1,942 (3,300)	1,807 (3,070)

Electrical Rating		Cooling	Heating
Available Voltage Range	V	187 to 253	
Running Amperes	A	13.6	11.4
Power Input	W	2,800	2,350
Power Factor	%	99	99
SEER	BTU/Wh	16	-
HSPF	BTU/Wh	-	7.7
Compressor Locked Rotor Amperes	A	17.0	
Fuse or Circuit Breaker Capacity	A	20	

Features (Outdoor Unit)			
Control		Microprocessor	
Fan Speeds		Auto (Hi, Me, Lo)	
Compressor		DC Twin Rotary (Inverter)	
Refrigerant / Amount charged at shipment		lb. (g)	R410A / 8.38 (3,800)
Refrigerant Control		Electric Expansion Valve	
Operation Sound (High) Cool/Heat		dB-A	53 / 52
Refrigerant Tubing Connections		Flare Type	
Max. allowable tubing length per uint		ft. (m)	100 (30.5)
Refrigerant	Narrow tube	inch (mm)	1/4 (6.35) × 4
Tube Diameter	Wide tube	inch (mm)	3/8 (9.52) × 2 + 1/2 (12.7) × 2

Dimensions & Weight (Outdoor Unit)			
Unit Dimensions	inch	35-1/32 × 35-7/16 × 12-19/32	
Height × Width × Depth	(mm)	(890 × 900 × 320)	
Package Dimensions	inch	39-3/4 × 40-5/8 × 16-1/4	
Height × Width × Depth	(mm)	(1,010 × 1,032 × 413)	
Weight	Net	lb. (kg)	180.8 (82.0)
	Shipping	lb. (kg)	189.6 (86.0)
Shipping Volume	cu.ft (m³)	15.18 (0.43)	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks:

- The Values shown in performance section and electrical rating section above are based on the following unit combination.
For other combination unit, please refer to the "Unit Combination Tables" in this manual.
Indoor Unit : KMHS0972 4units Outdoor Unit : CMH3172 1unit
- Rating conditions are: Cooling : Indoor air temp. 80°F D.B./ 67°F W.B Heating : Indoor air temp. 70°F D.B.
Outdoor air temp. 95°F D.B./ 75°F W.B. Outdoor air temp. 47°F D.B./ 43°F W.B.

2-2. Major Component Specifications

2-2-1. Outdoor Unit

Outdoor Unit **CMH1972**

Control PCB		
Part No.		CB-CMH1972
Controls		Microprocessor
Control Circuit Fuse		250V 25A
Compressor		
Type		DC Twin Rotary (Hermetic)
Compressor Model / Nominal Output		5KD240XAB21 / 1,700W
Compressor Oil ... Amount	Pints (cc)	FV50S ... 1.91 (900)
Coil Resistance (Ambient Temp. 68 °F (20 °C))	Ohm	U - V : 0.720 V - W : 0.708 W - U : 0.726
Safety Device		
CT (Peak current cut-off control)		Yes
Compressor Discharge Temp. Control		Yes
Operation cut-off control in abnormal ambient Temp.		Yes
Overload Relay	Model	CS-7LN115
	Operation Temp.	Open : 239 °F (115 °C), Close : 212 °F (100 °C)
Run Capacitor	Micro F	-
	VAC	-
Crankcase Heater		230V 30W
Fan		
Type		Propeller
Q'ty ... Dia.	inch (mm)	1 ... D18-1/8 (D460)
Fan Motor		
Type		DC Motor
Model ... Q'ty		SIC-71FW-D490-1 ... 1
No. of Poles		8
Rough Measure RPM (Cool / Heat)		750 / 750
Nominal Output	W	90
Coil Resistance	Ohm	-
(Ambient Temp. 68 °F (20 °C))		
Safety Device		
Type		Internal Controller
Over-Current Protection		Yes
Over-Heat Protection		Yes
Run Capacitor	Micro F	-
	VAC	-
Heat Exchanger Coil		
Coil		Aluminum Plate Fin / Copper Tube
Rows		2
Fins per inch		18.1
Face Area	ft² (m²)	6.40 (0.595)
External Finish		Acrylic baked-on enamel finish

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Outdoor Unit **CMH2472**

Control PCB	
Part No.	CB-CMH2472
Controls	Microprocessor
Control Circuit Fuse	250V 25A

Compressor	
Type	DC Twin Rotary (Hermetic)
Compressor Model / Nominal Output	5KD240XAB21 / 1,700W
Compressor Oil ... Amount Pints (cc)	FV50S ... 1.91 (900)
Coil Resistance (Ambient Temp. 68 °F (20 °C)) Ohm	U - V : 0.720 V - W : 0.708 W - U : 0.726
Safety Device	
CT (Peak current cut-off control)	Yes
Compressor Discharge Temp. Control	Yes
Operation cut-off control in abnormal ambient Temp.	Yes
Overload Relay Model	CS-7LN115
Operation Temp.	Open : 239 °F (115 °C), Close : 212 °F (100 °C)
Run Capacitor Micro F	-
VAC	-
Crankcase Heater	230V 30W

Fan	
Type	Propeller
Q'ty ... Dia. inch (mm)	1 ... D18-1/8 (D460)

Fan Motor	
Type	DC Motor
Model ... Q'ty	SIC-71FW-D490-1 ... 1
No. of Poles	8
Rough Measure RPM (Cool / Heat)	750 / 750
Nominal Output W	90
Coil Resistance Ohm (Ambient Temp. 68 °F (20 °C))	-
Safety Device	
Type	Internal Controller
Over-Current Protection	Yes
Over-Heat Protection	Yes
Run Capacitor Micro F	-
VAC	-

Heat Exchanger Coil	
Coil	Aluminum Plate Fin / Copper Tube
Rows	2
Fins per inch	18.1
Face Area ft² (m²)	6.40 (0.595)

External Finish	Acrylic baked-on enamel finish
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DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Outdoor Unit **CMH3172**

Control PCB	
Part No.	CB-CMH3172
Controls	Microprocessor
Control Circuit Fuse	250V 25A

Compressor	
Type	DC Twin Rotary (Hermetic)
Compressor Model / Nominal Output	5JD420XAB22 / 3,000W
Compressor Oil ... Amount Pints (cc)	FV50S ... 2.55 (1,200)
Coil Resistance (Ambient Temp. 68 °F (20 °C)) Ohm	U - V : 0.435 V - W : 0.441 W - U : 0.452
Safety Device	
CT (Peak current cut-off control)	Yes
Compressor Discharge Temp. Control	Yes
Operation cut-off control in abnormal ambient Temp.	Yes
Overload Relay Model	CS-7LN115
Operation Temp.	Open : 239 °F (115 °C), Close : 212 °F (100 °C)
Run Capacitor Micro F	-
VAC	-
Crankcase Heater	230V 30W

Fan	
Type	Propeller
Q'ty ... Dia. inch (mm)	1 ... D18-1/8 (D460)

Fan Motor	
Type	DC Motor
Model ... Q'ty	SIC-71FW-D490-1 ... 1
No. of Poles	8
Rough Measure RPM (Cool / Heat)	800 / 750
Nominal Output W	90
Coil Resistance Ohm (Ambient Temp. 68 °F (20 °C))	-
Safety Device	
Type	Internal Controller
Over-Current Protection	Yes
Over-Heat Protection	Yes
Run Capacitor Micro F	-
VAC	-

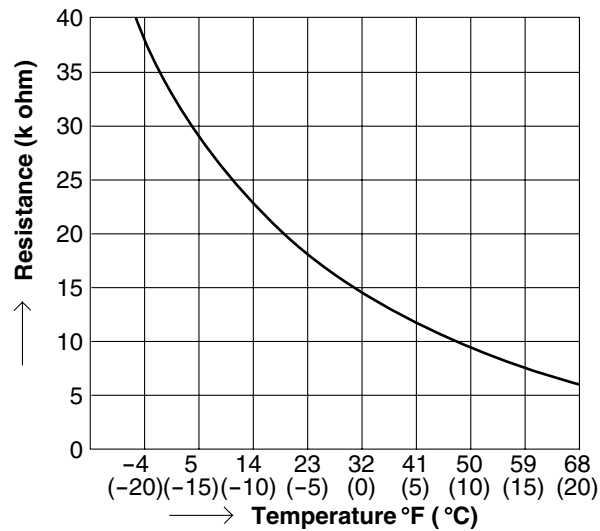
Heat Exchanger Coil	
Coil	Aluminum Plate Fin / Copper Tube
Rows	2
Fins per inch	18.1
Face Area ft² (m²)	7.75 (0.72)

External Finish	Acrylic baked-on enamel finish
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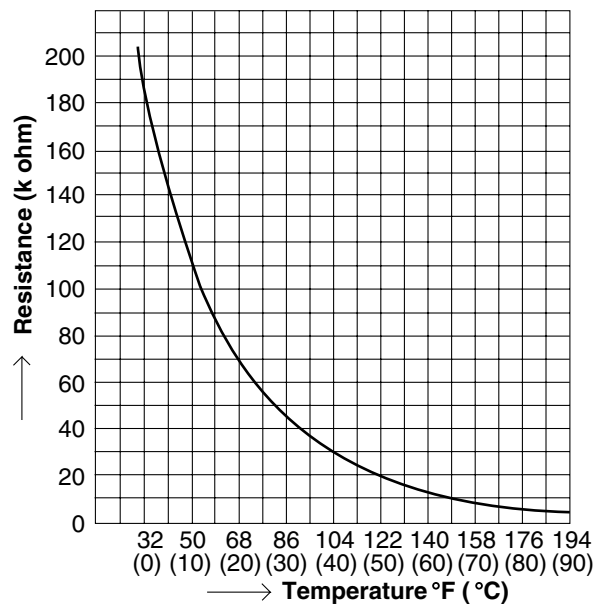
DATA SUBJECT TO CHANGE WITHOUT NOTICE.

2-3. Other Component Specifications

Sensor Name	Model No. of sensor	Quantity of Sensor		
		CMH1972	CMH2472	CMH3172
Outdoor air temp sensor	TKS295B	1	1	1
Outdoor heat exchanger sensor	TKS292B	1	1	1
AW / AN sensor	TKS292B	1 / 1	1 / 1	1 / 1
BW / BN sensor	TKS292B	1 / 1	1 / 1	1 / 1
CW / CN sensor	TKS292B	1 / 1	1 / 1	1 / 1
DW / DN sensor	TKS292B	0	1 / 1	1 / 1

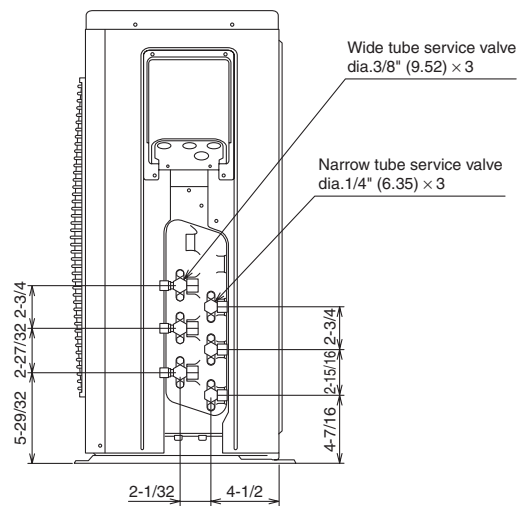
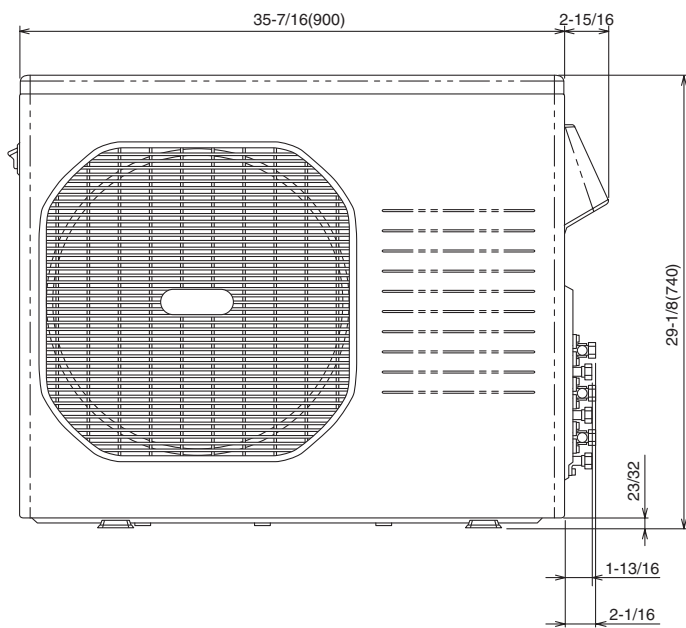
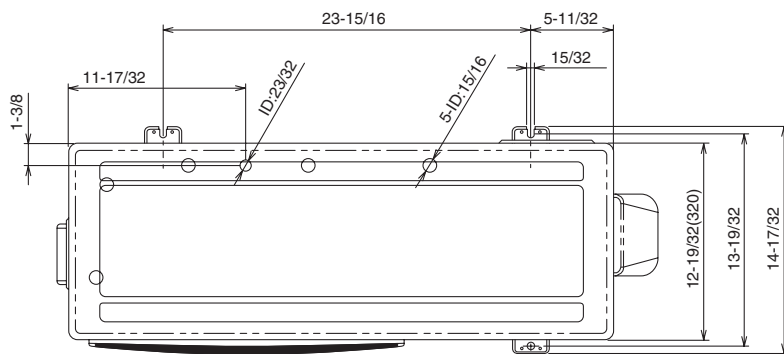


Sensor Name	Model No. of sensor	Quantity of Sensor		
		CMH1972	CMH2472	CMH3172
Compressor temp sensor	TKS293B	1	1	1

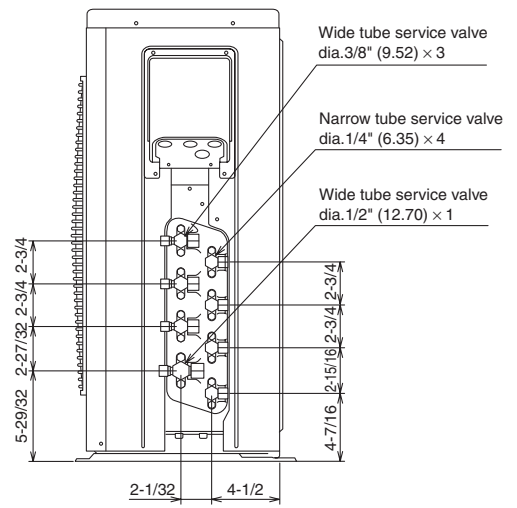
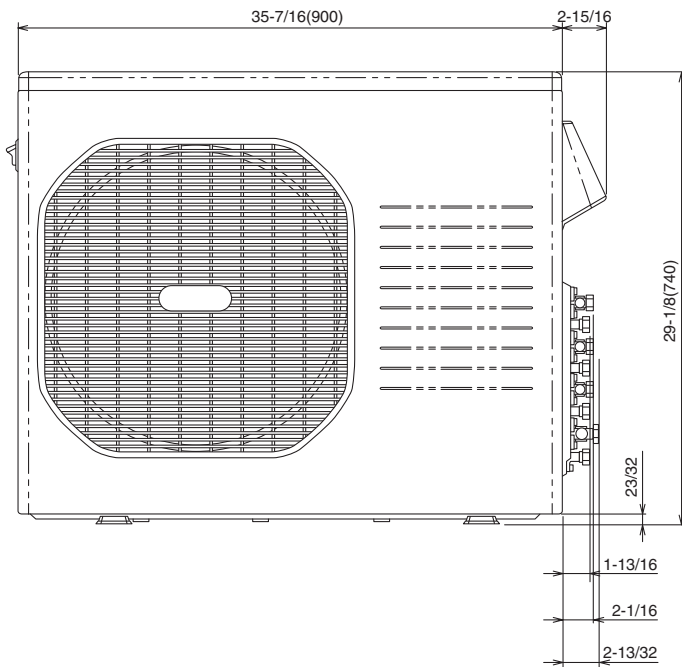
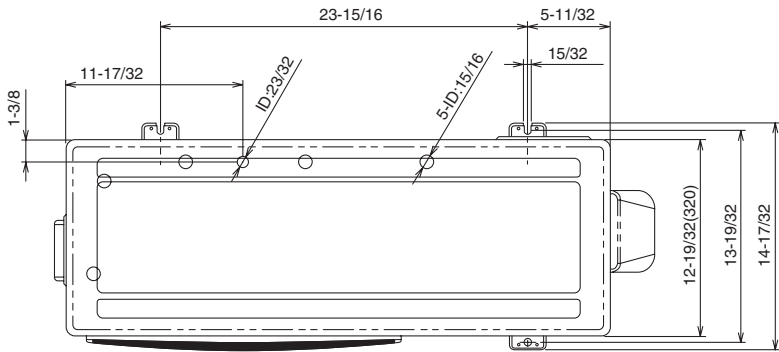


3. DIMENSIONAL DATA

Outdoor Unit CMH1972

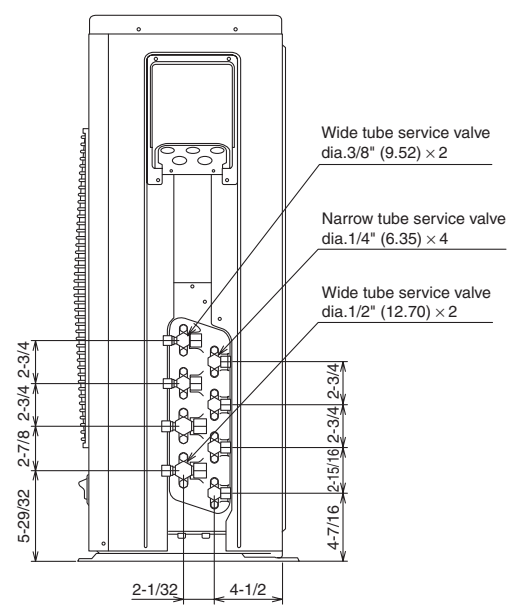
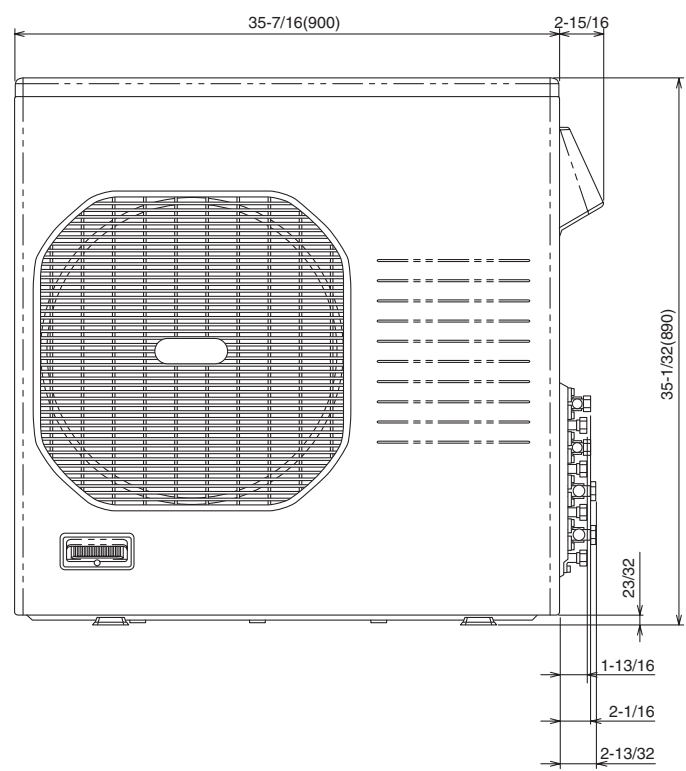
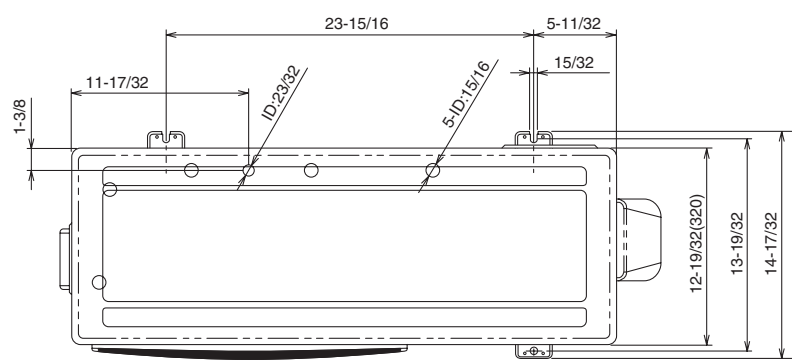


Unit: inch(mm)

Outdoor Unit **CMH2472**

Unit: inch(mm)

Outdoor Unit **CMH3172**

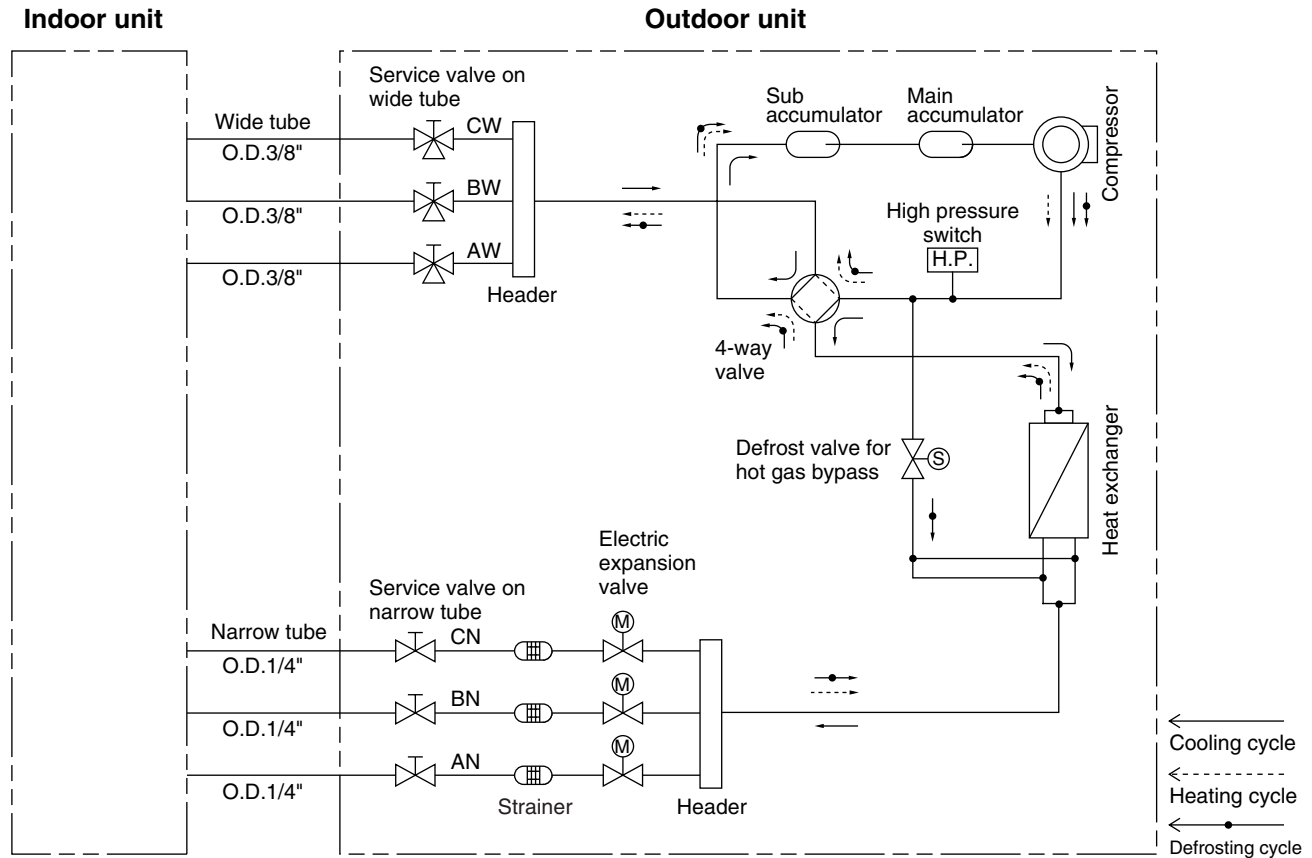


Unit: inch(mm)

4. REFRIGERANT FLOW DIAGRAM

4-1. Refrigerant Flow Diagram

Outdoor Unit CMH1972



Insulation of Refrigerant Tubing

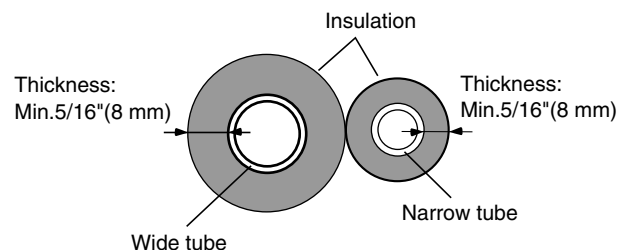
IMPORTANT

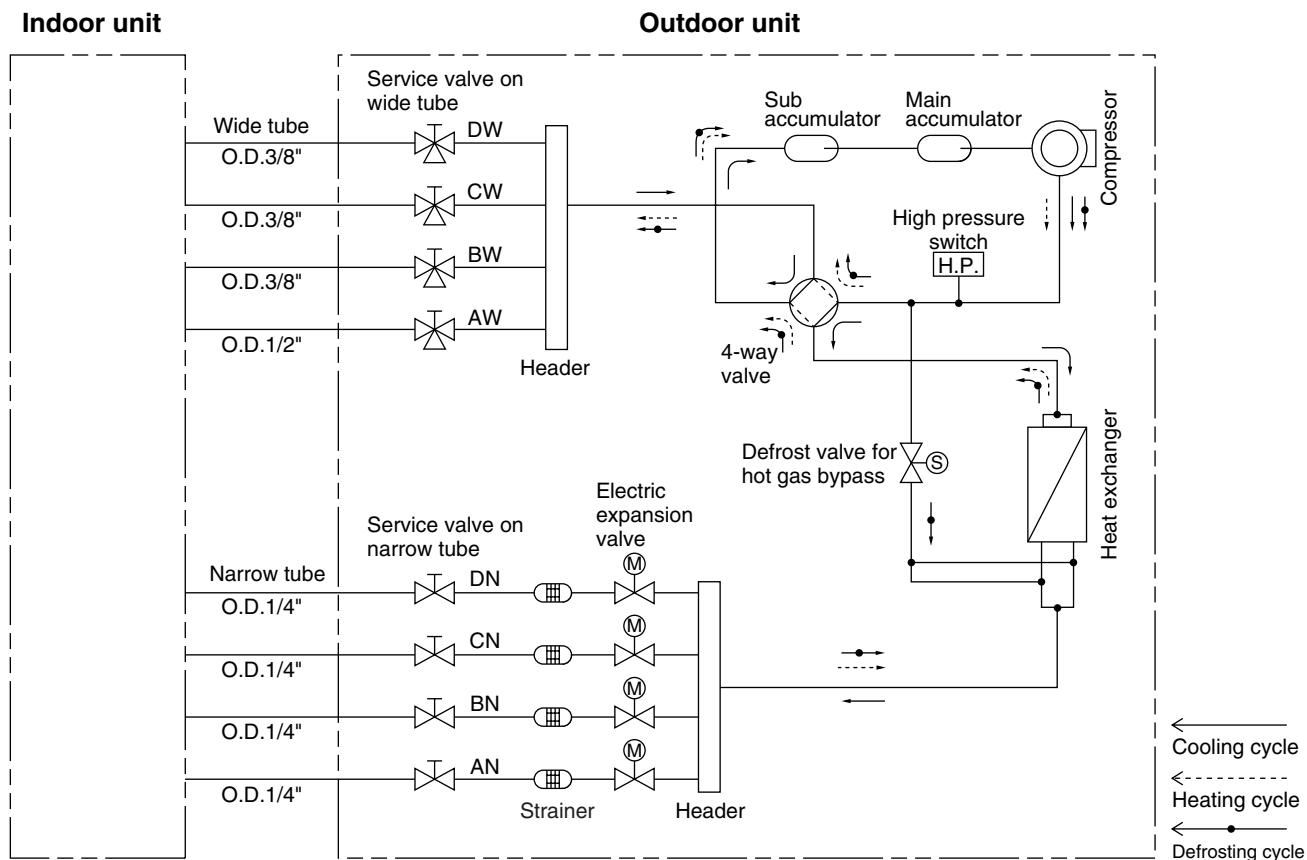
Because capillary tubing is used in the outdoor unit, both the wide and narrow tubes of this air conditioner become cold. To prevent heat loss and wet floors due to dripping of condensation, **both tubes must be well insulated** with a proper insulation material. The thickness of the insulation should be a min. 5/16" (8 mm).



CAUTION

After a tube has been insulated, never try to bend it into a narrow curve because it can cause the tube to break or crack.





Insulation of Refrigerant Tubing

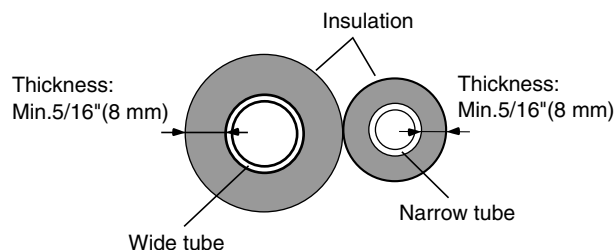
IMPORTANT

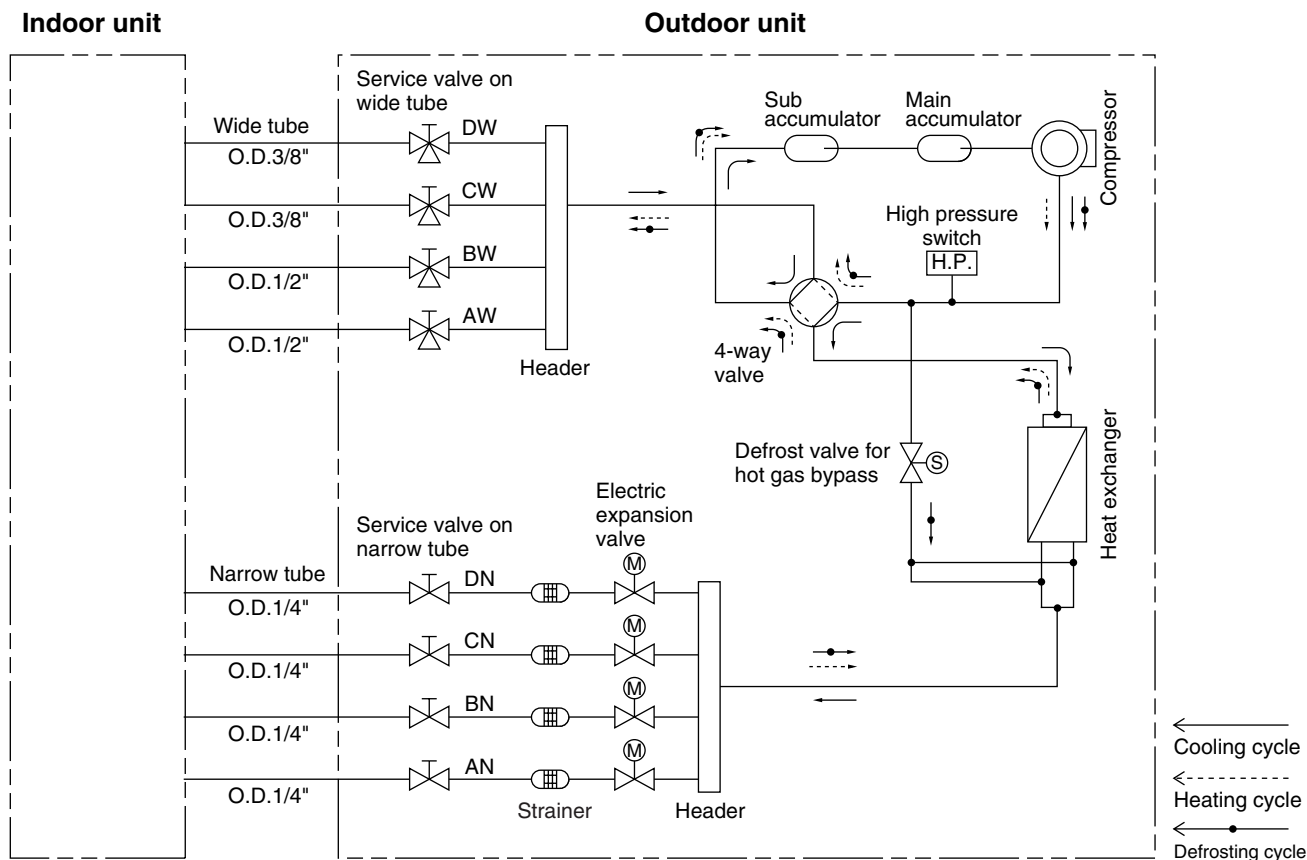
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CAUTION

After a tube has been insulated, never try to bend it into a narrow curve because it can cause the tube to break or crack.





Insulation of Refrigerant Tubing

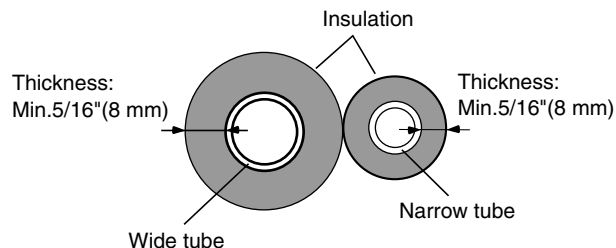
IMPORTANT

Because capillary tubing is used in the outdoor unit, both the wide and narrow tubes of this air conditioner become cold. To prevent heat loss and wet floors due to dripping of condensation, **both tubes must be well insulated** with a proper insulation material. The thickness of the insulation should be a min.5/16"(8 mm).



CAUTION

After a tube has been insulated, never try to bend it into a narrow curve because it can cause the tube to break or crack.



5. PERFORMANCE DATA

5-1. Temperature Charts

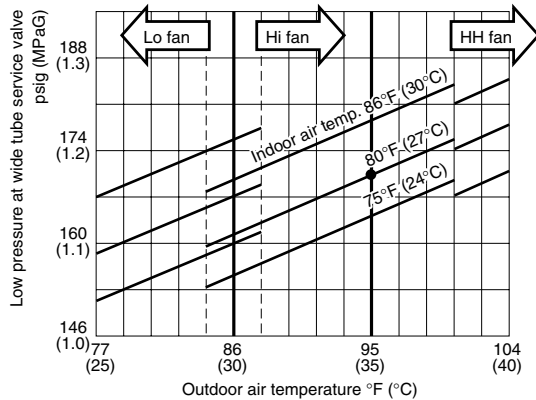
5-1-1. Temperature Charts (CMH1972)

Outdoor Unit **CMH1972** Indoor Unit **KMHS0772** × 1

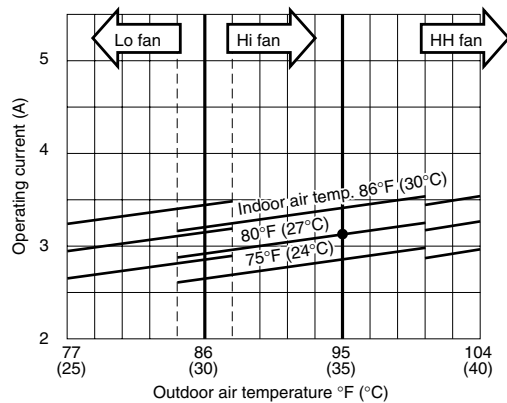
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

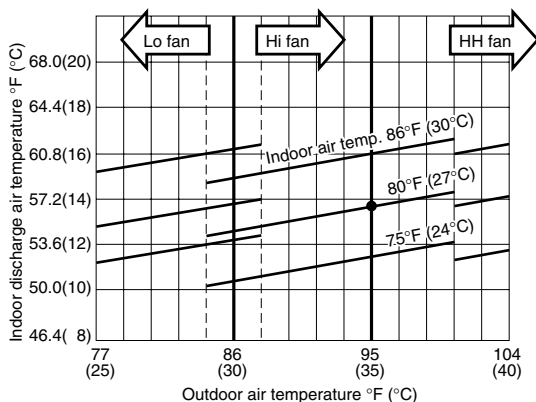
(1) Low pressure performance chart



(2) Operating current performance chart



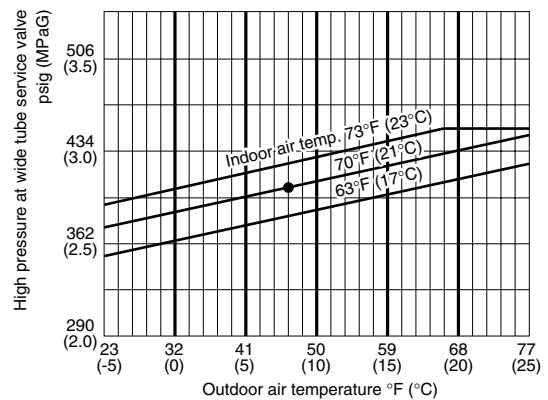
(3) Indoor discharge air performance chart



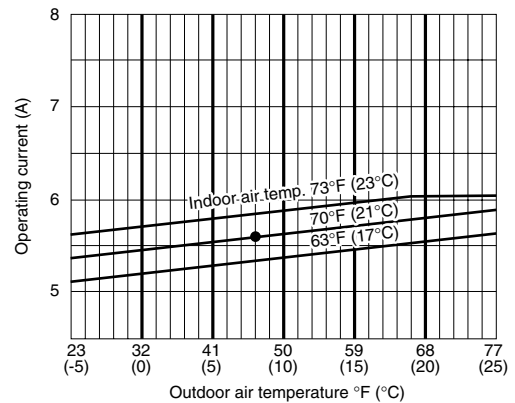
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

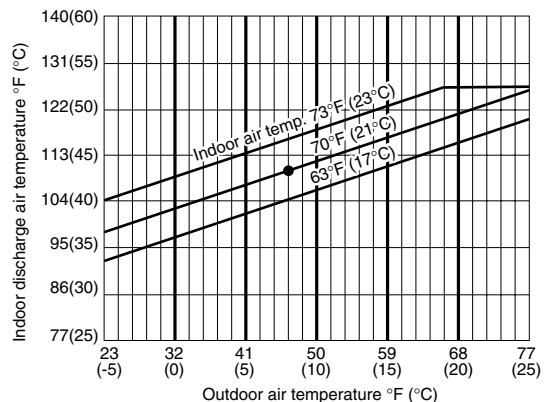
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

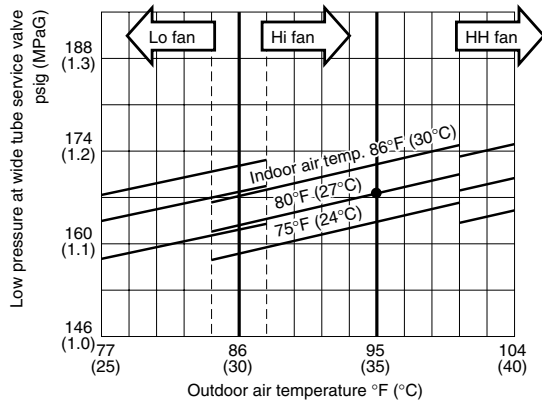
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6t (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH1972** Indoor Unit **KMHS0972** × 1

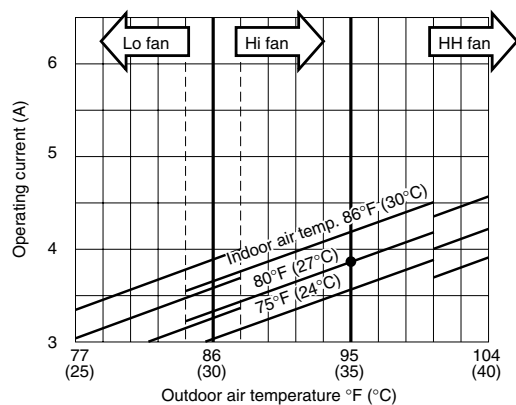
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

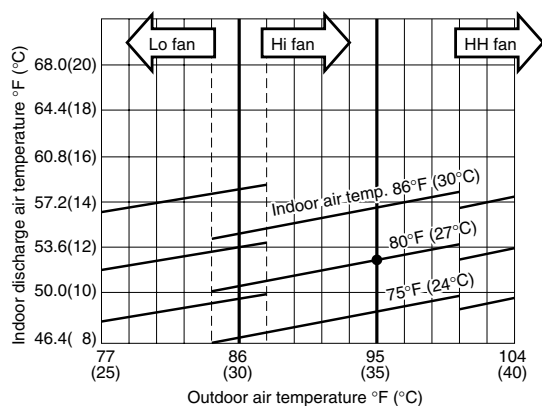
(1) Low pressure performance chart



(2) Operating current performance chart



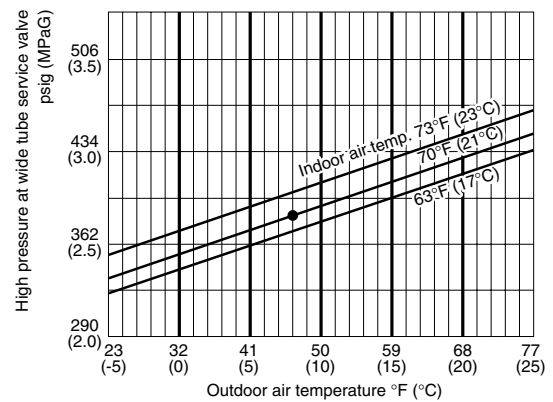
(3) Indoor discharge air performance chart



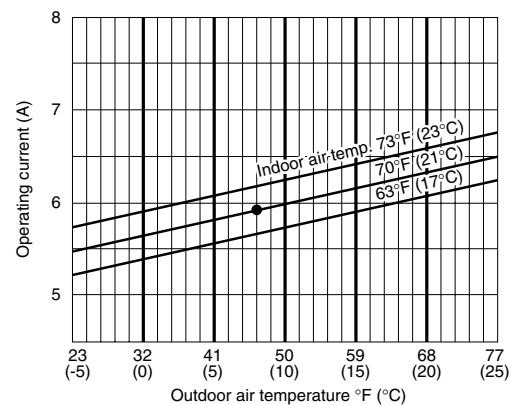
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

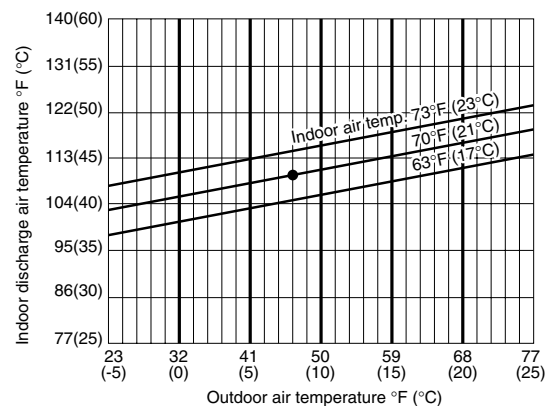
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

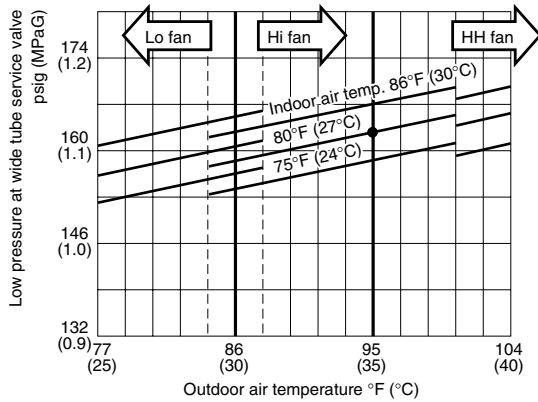
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH1972** Indoor Unit **KMHS1272** × 1

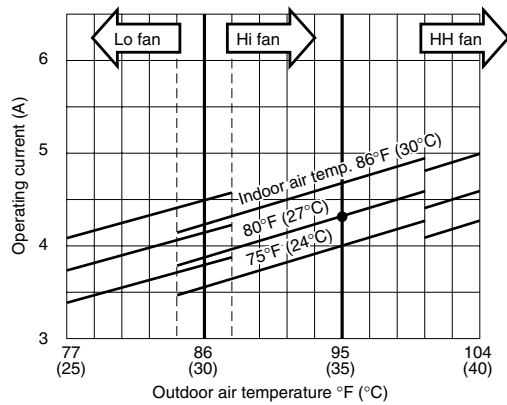
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

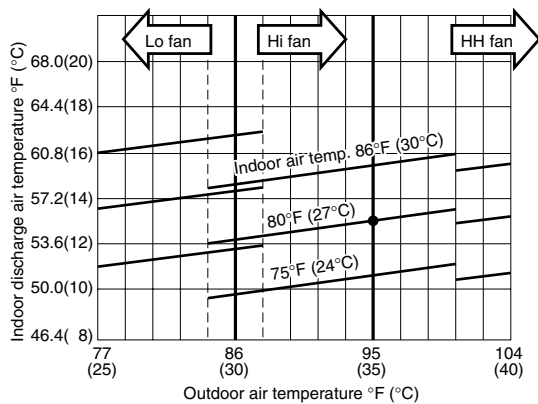
(1) Low pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



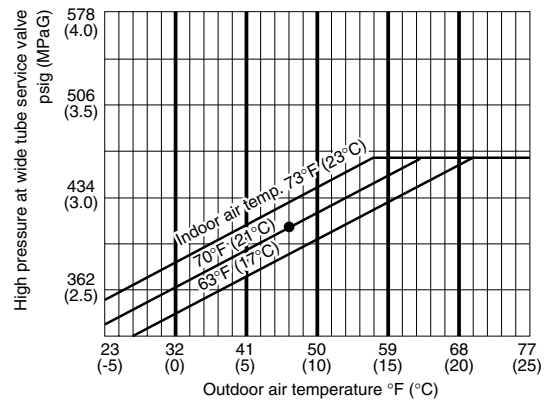
NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

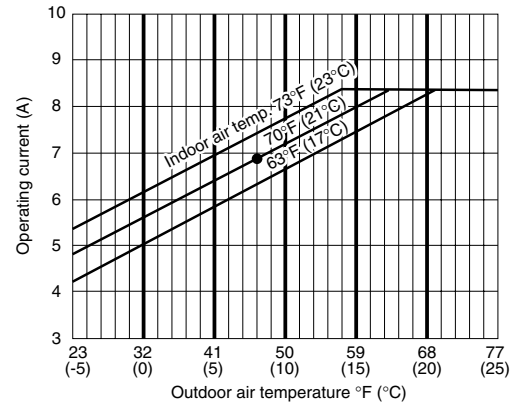
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

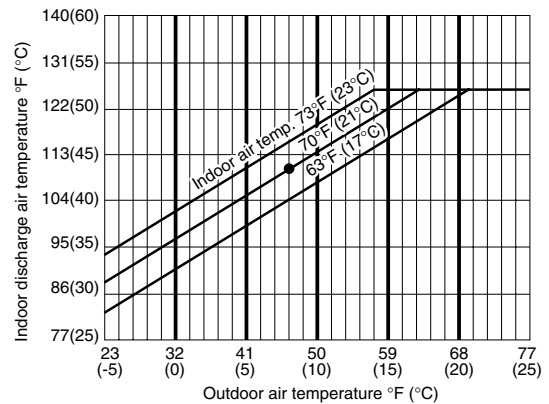
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart

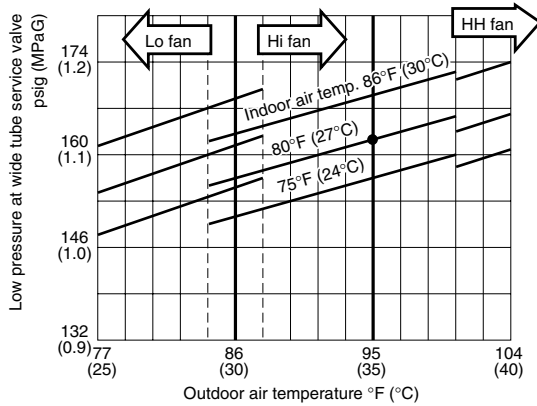


Outdoor Unit **CMH1972** Indoor Unit **KMHS1872** × 1

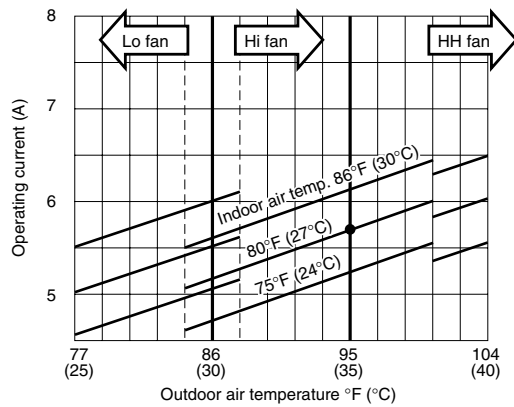
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

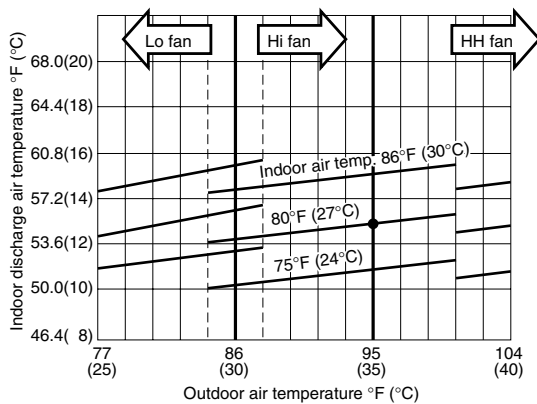
(1) Low pressure performance chart



(2) Operating current performance chart



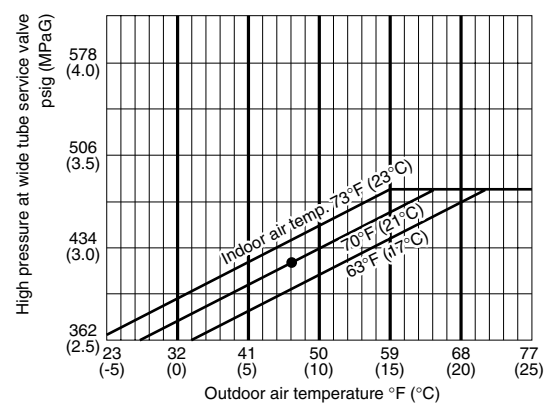
(3) Indoor discharge air performance chart



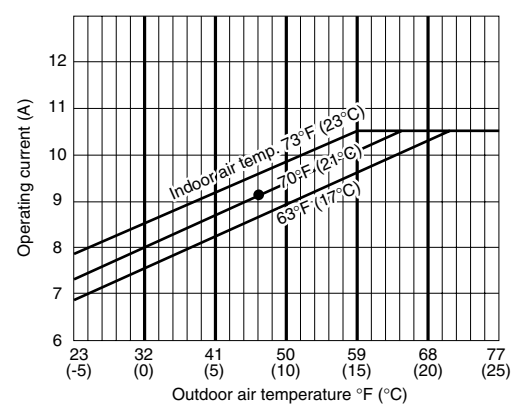
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

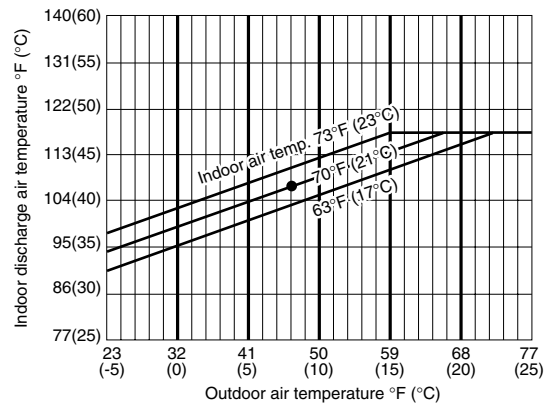
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

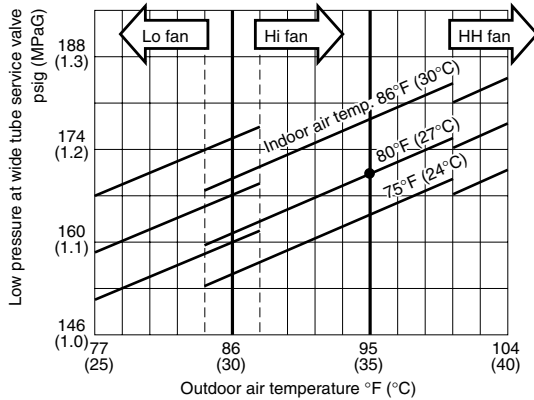
5-1-2. Temperature Charts (CMH2472)

Outdoor Unit **CMH2472** Indoor Unit **KMHS0772** × 1

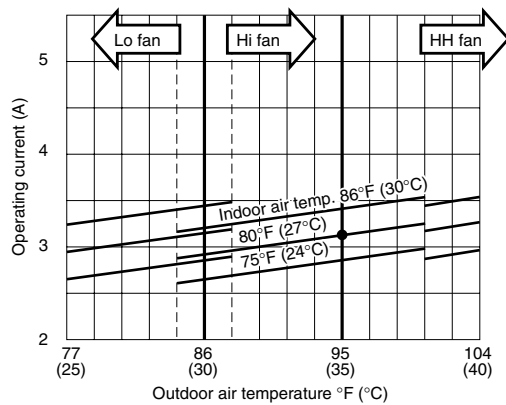
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

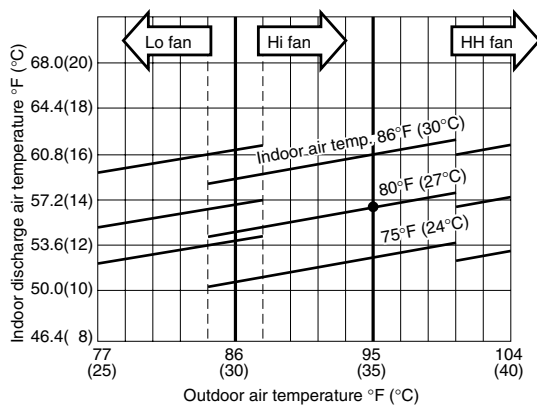
(1) Low pressure performance chart



(2) Operating current performance chart



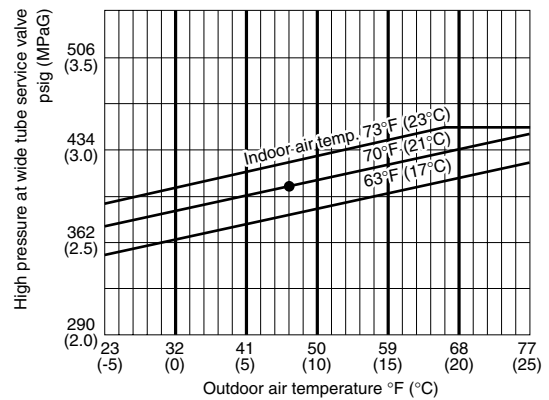
(3) Indoor discharge air performance chart



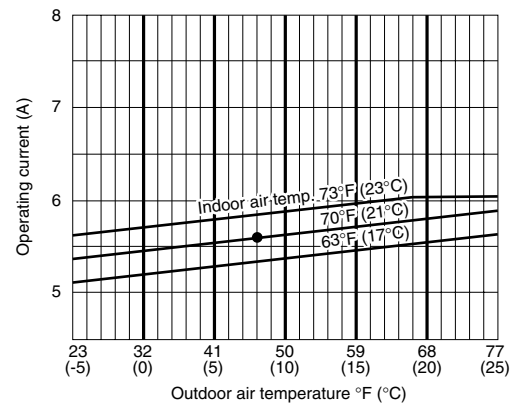
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

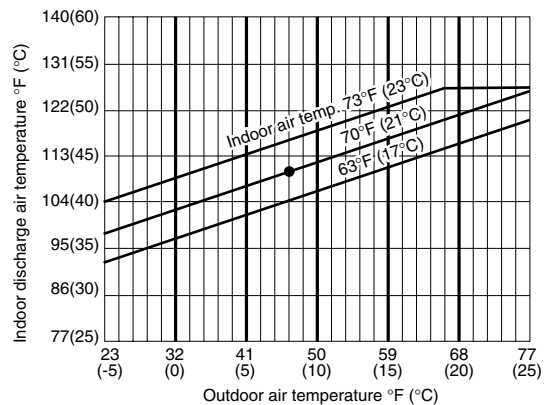
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

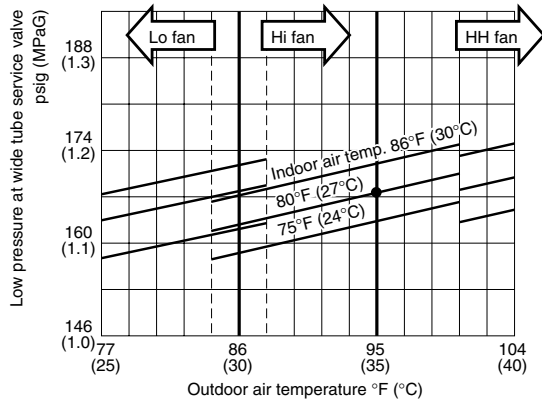
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6t (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH2472** Indoor Unit **KMHS0972** × 1

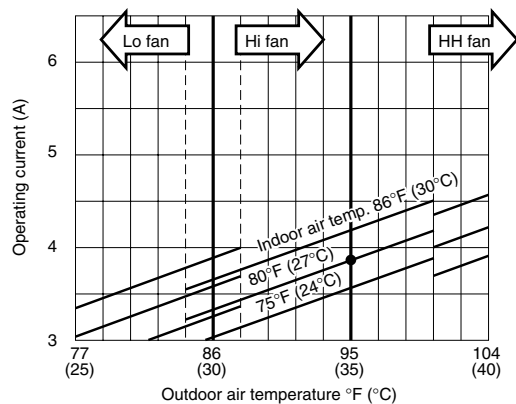
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

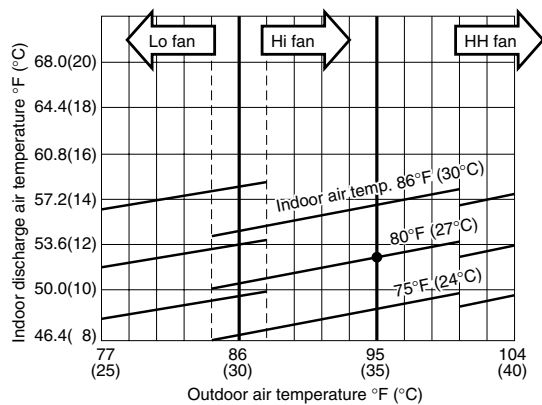
(1) Low pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



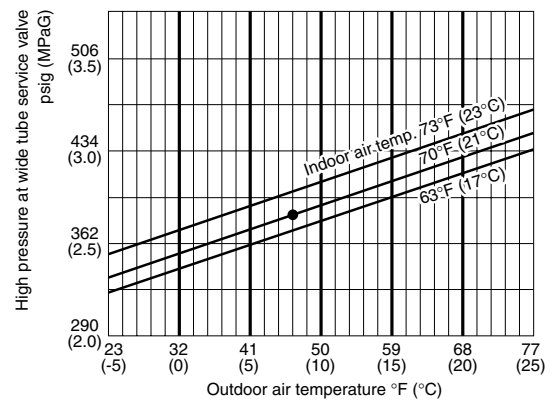
NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

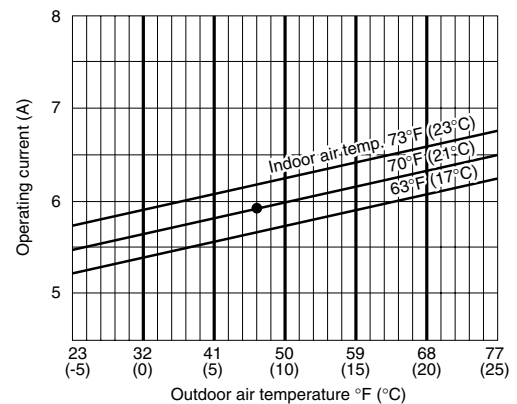
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

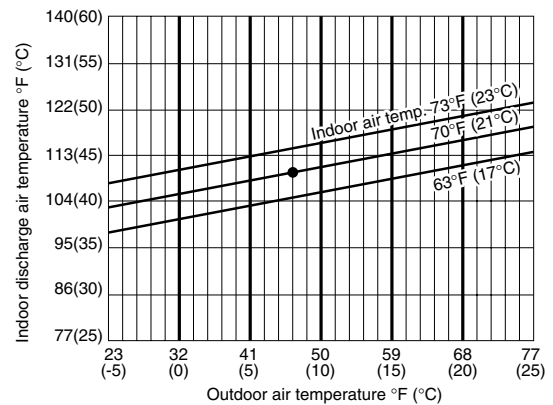
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart

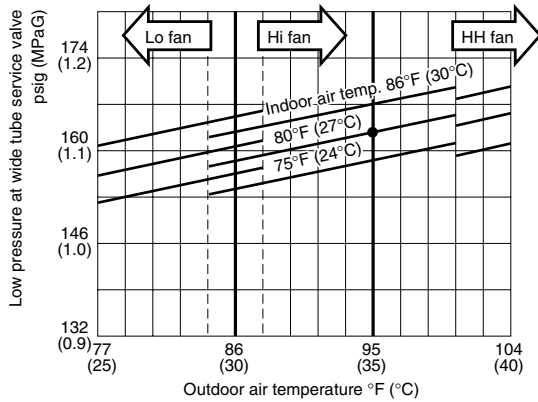


Outdoor Unit **CMH2472** Indoor Unit **KMHS1272** × 1

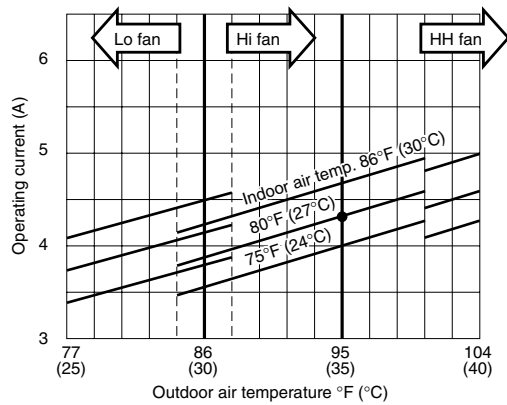
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

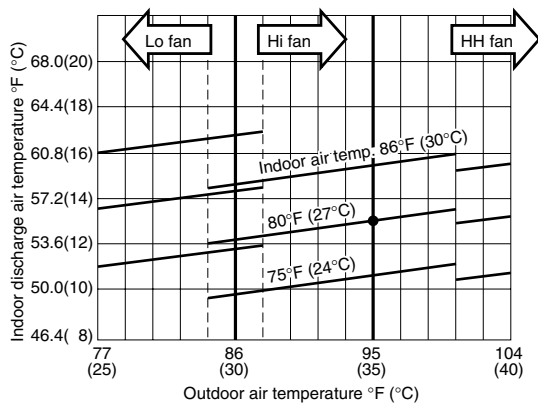
(1) Low pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



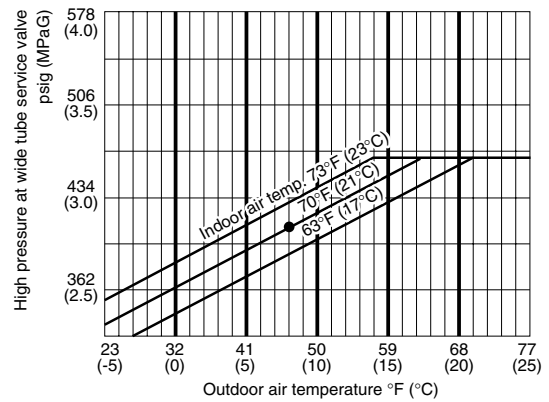
NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

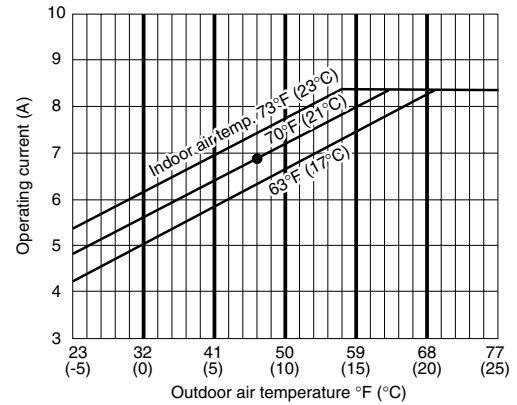
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

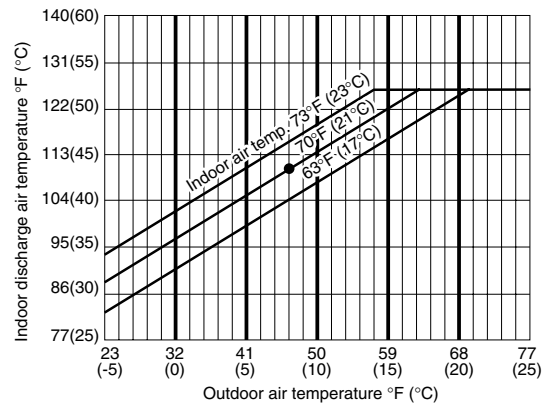
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart

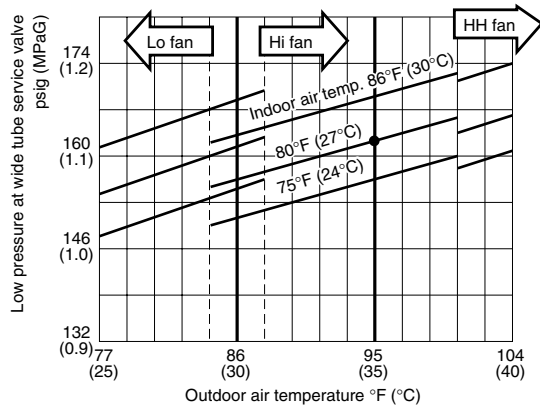


Outdoor Unit **CMH2472** Indoor Unit **KMHS1872 × 1**

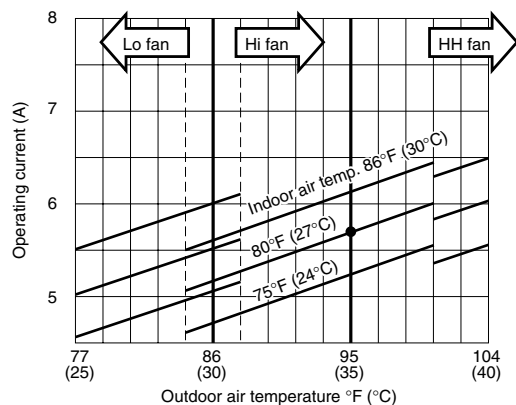
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

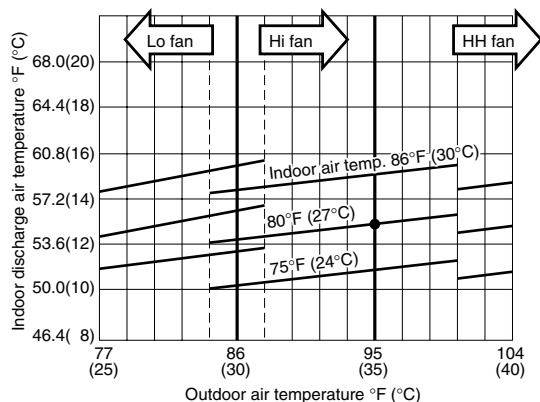
(1) Low pressure performance chart



(2) Operating current performance chart



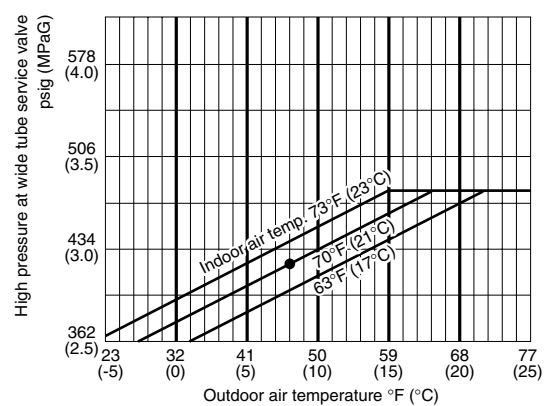
(3) Indoor discharge air performance chart



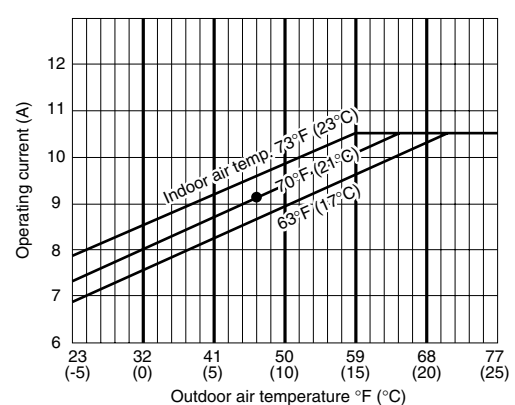
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

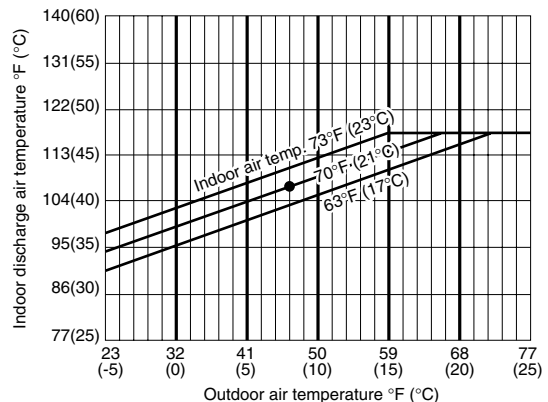
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

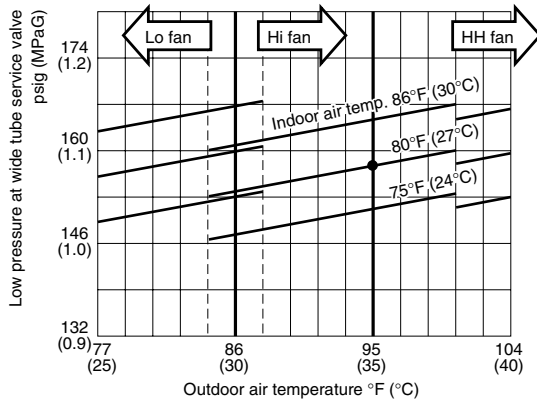
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH2472** Indoor Unit **KMHS2472 × 1**

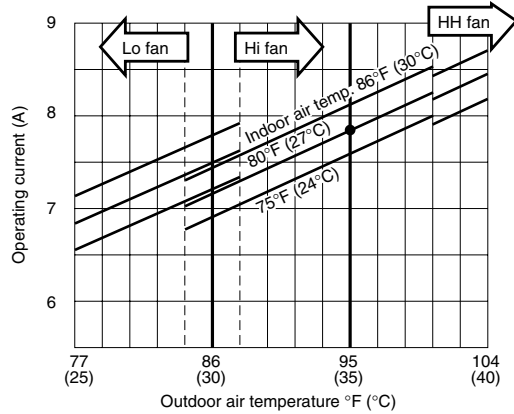
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

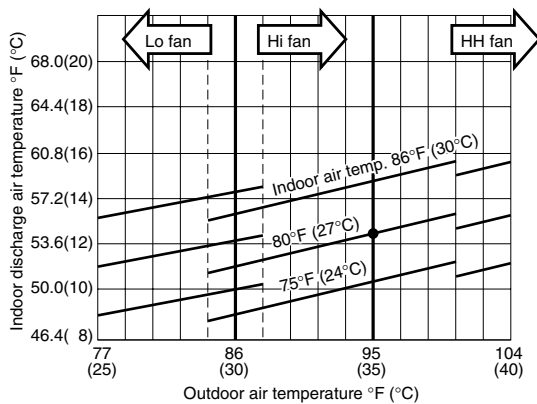
(1) Low pressure performance chart



(2) Operating current performance chart



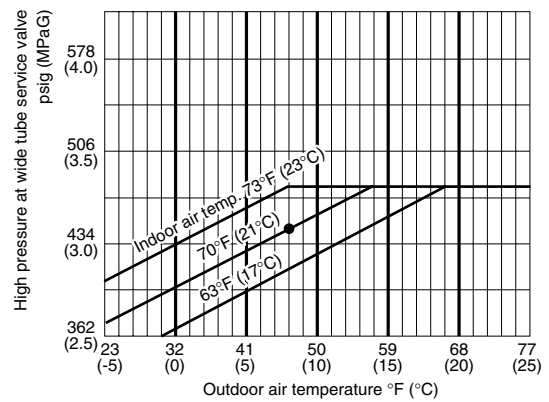
(3) Indoor discharge air performance chart



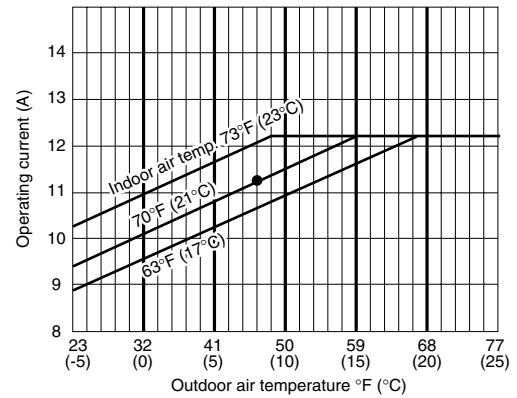
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

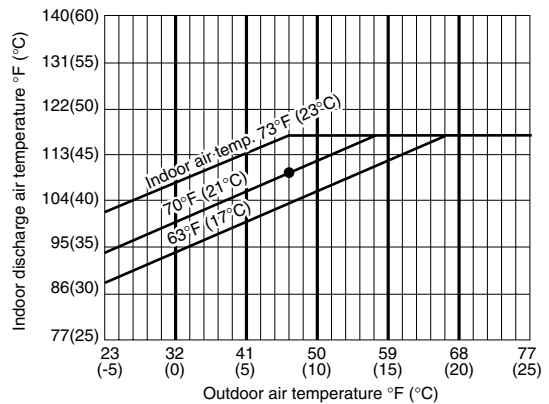
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

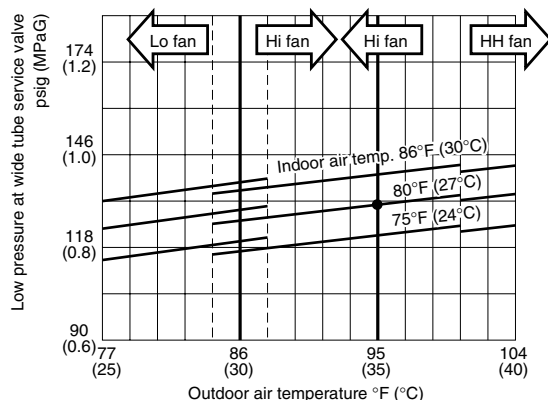
5-1-3. Temperature Charts (CMH3172)

Outdoor Unit **CMH3172** Indoor Unit **KMHS0772** × 1

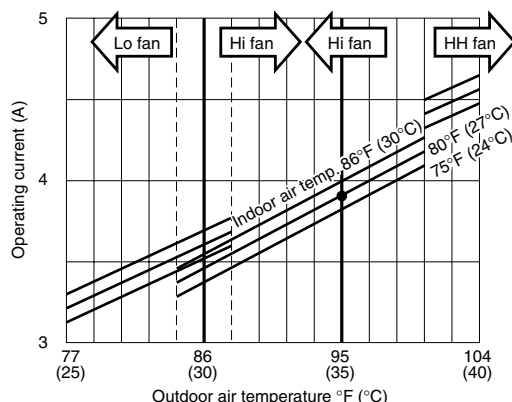
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

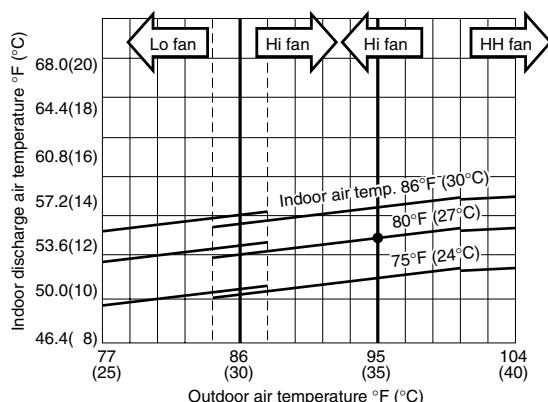
(1) Low pressure performance chart



(2) Operating current performance chart



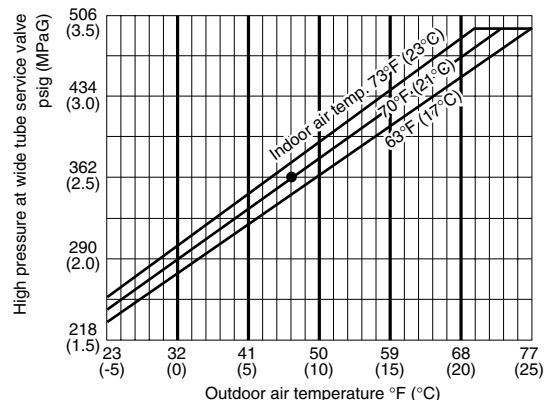
(3) Indoor discharge air performance chart



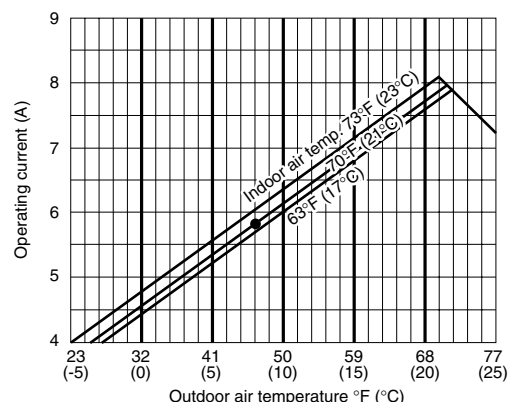
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

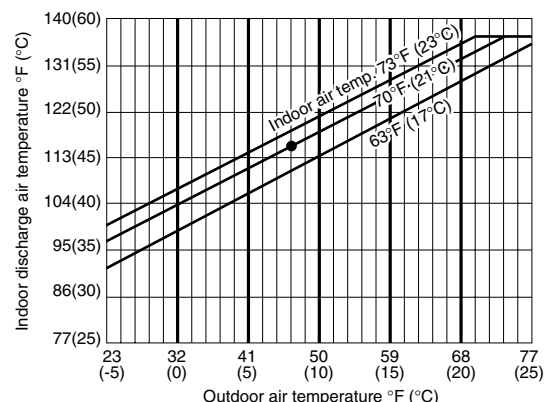
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

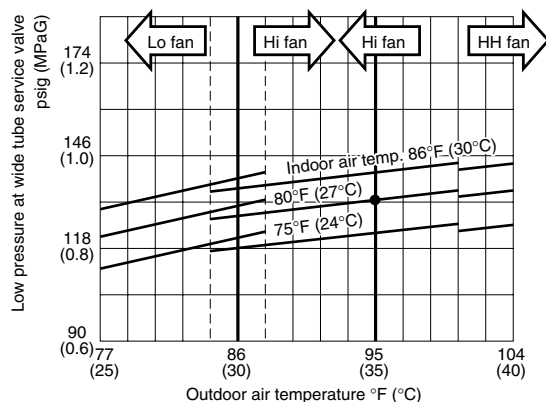
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH3172** Indoor Unit **KMHS0972** × 1

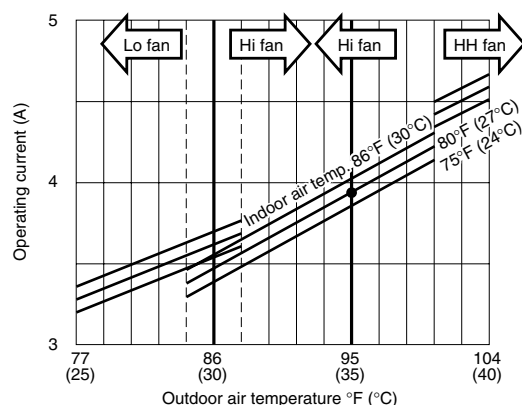
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

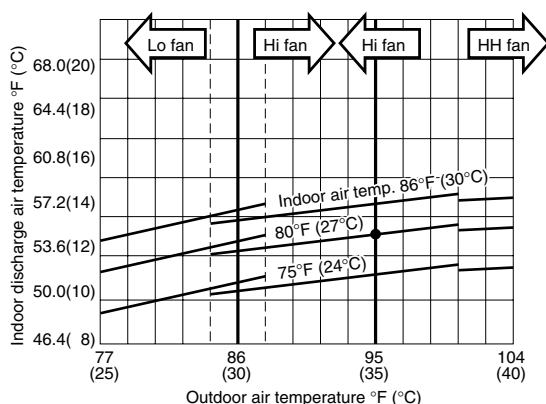
(1) Low pressure performance chart



(2) Operating current performance chart



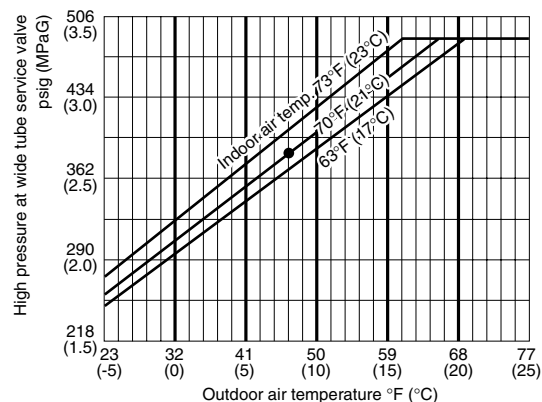
(3) Indoor discharge air performance chart



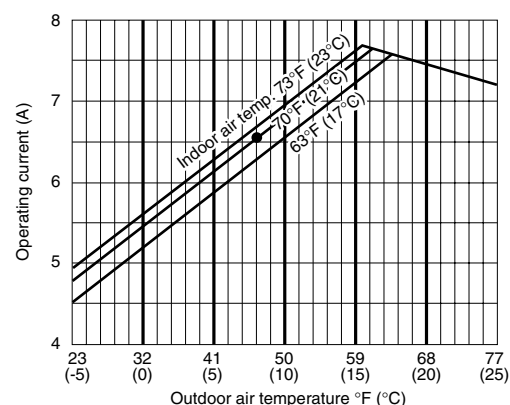
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

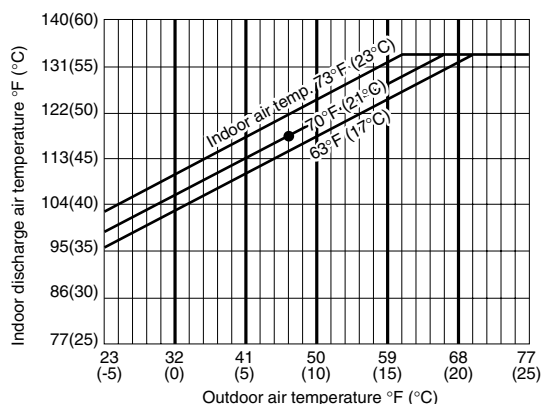
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

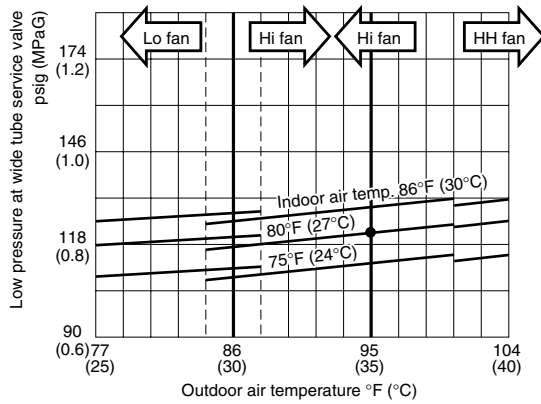
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH3172** Indoor Unit **KMHS1272** × 1

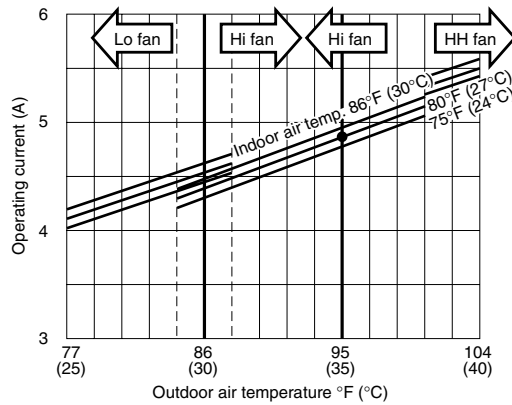
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

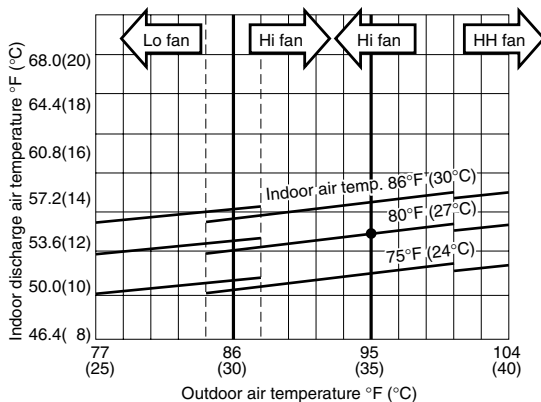
(1) Low pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



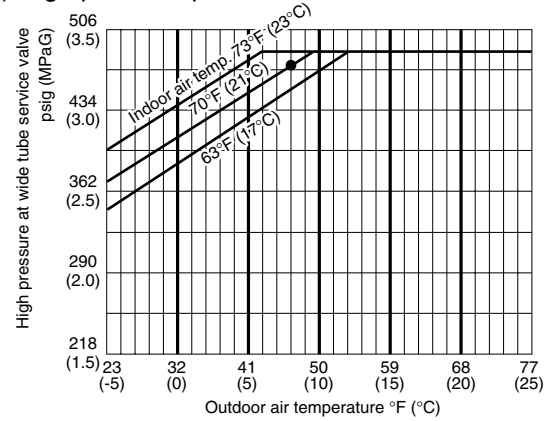
NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

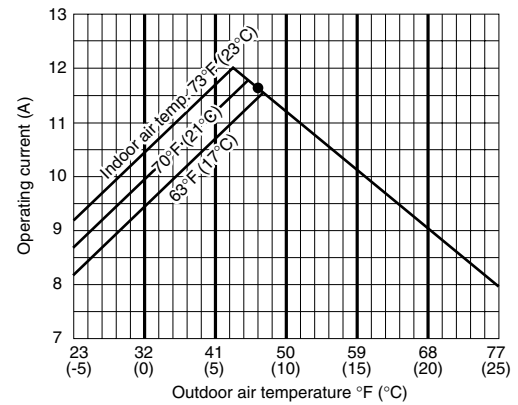
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

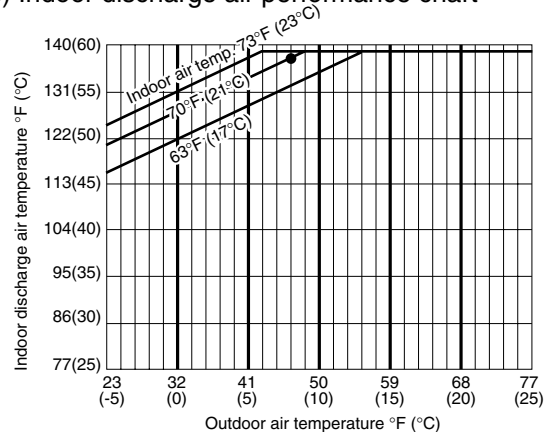
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart

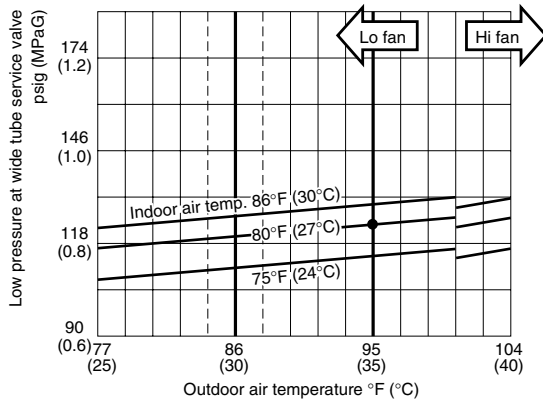


Outdoor Unit **CMH3172** Indoor Unit **KMHS1872** × 1

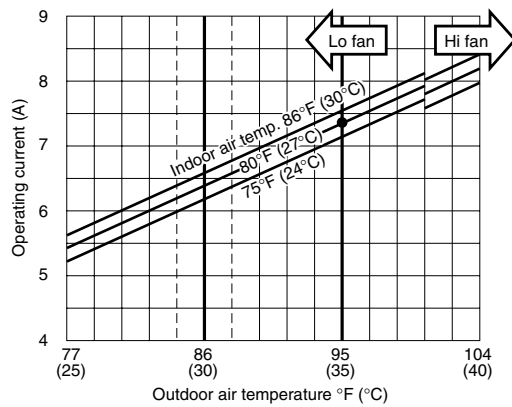
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

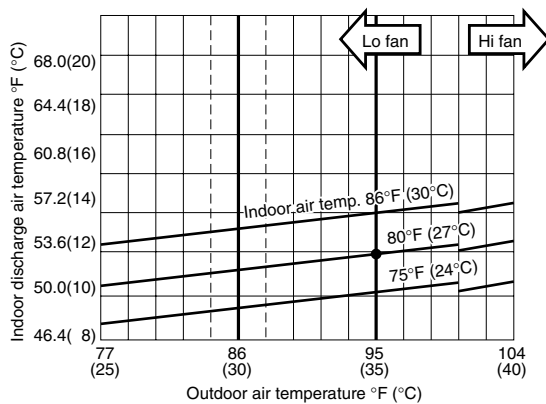
(1) Low pressure performance chart



(2) Operating current performance chart



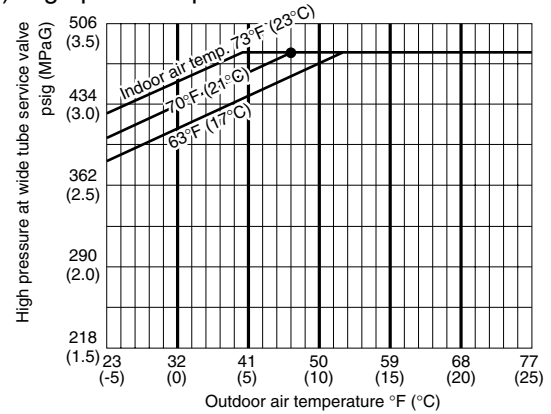
(3) Indoor discharge air performance chart



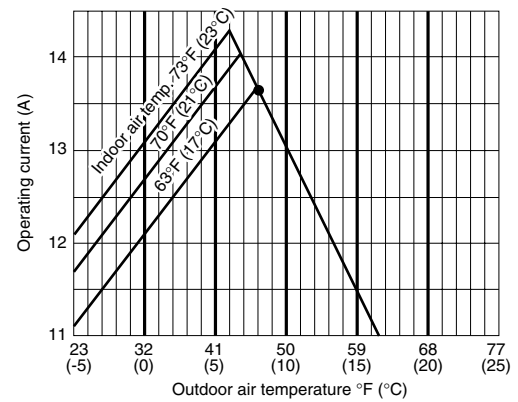
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

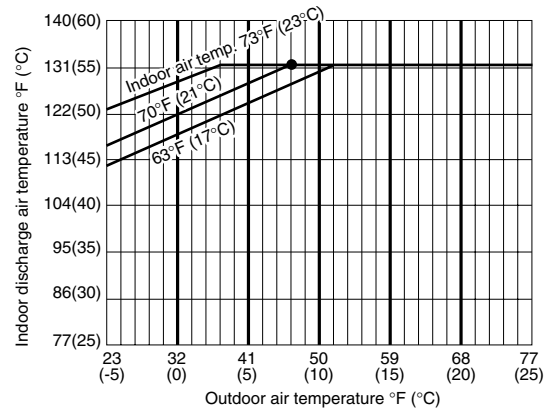
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



NOTE

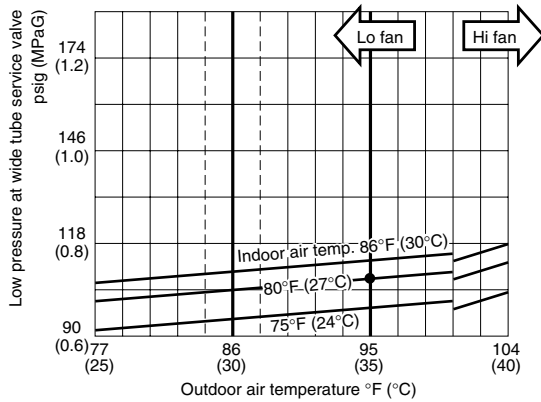
- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

Outdoor Unit **CMH3172** Indoor Unit **KMHS2472** × 1

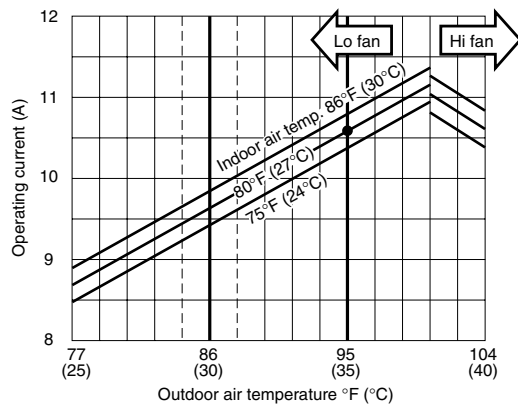
■ Cooling Characteristics

(RH : 46%, Indoor fan speed : High fan)
(230V, 60Hz)

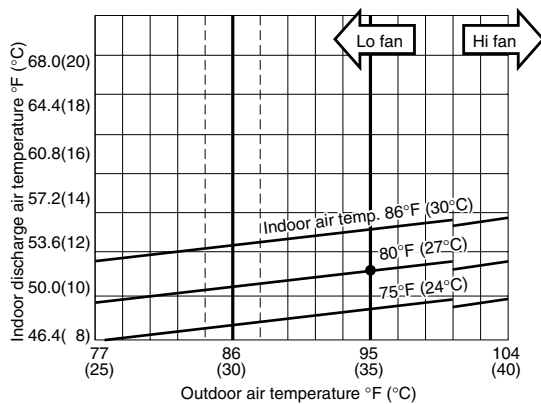
(1) Low pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



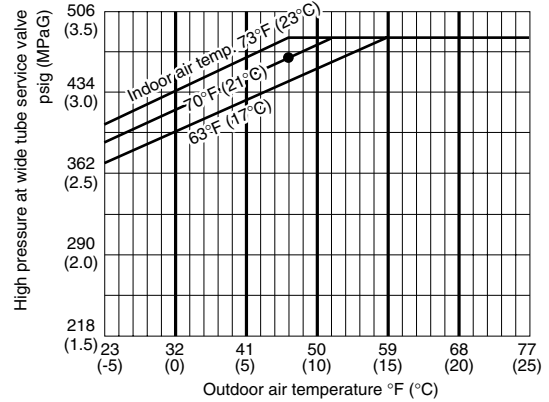
NOTE

- This performance chart shows operation of a single wall-mounted indoor unit. The performance chart will vary depending on the indoor unit type.
- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value. (In this case, be sure to stop all the indoor units where performance is not being checked.)
- The performance is for a tubing length of 24.6ft (7.5m). If the tubing length is different, the performance chart will vary.

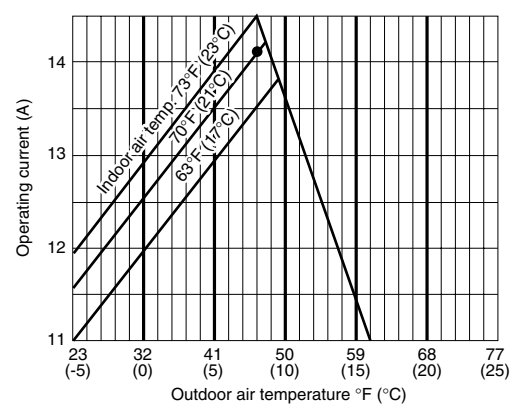
■ Heating Characteristics

(RH : 85%, Indoor fan speed : High fan)
(230V, 60Hz)

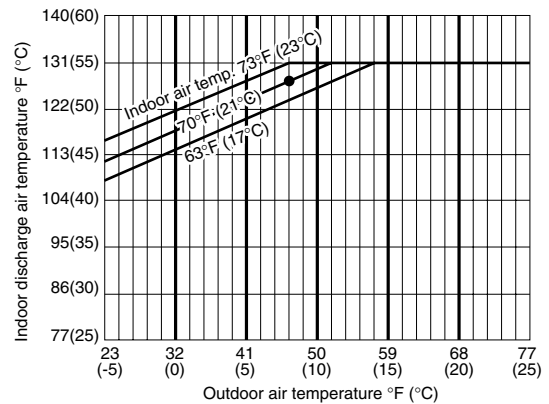
(1) High pressure performance chart



(2) Operating current performance chart



(3) Indoor discharge air performance chart



5-2. Cooling Capacity

Outdoor Unit : **CMH1972**

Indoor Unit : **KMHS0972 × 3**

Power Supply : 230V Single Phase 60Hz

< Cooling Capacity >

RATING CAPACITY:			AIR FLOW RATE:					
INDOOR			OUTDOOR					
ENT. TEMP. °F (°C)			AMBIENT TEMP. °F (°C)					
W.B.	D.B.		65 (18.3)	75 (23.9)	85 (29.4)	95 (35.0)	105 (40.6)	115 (46.1)
59 (15.0)		TC	19,180	18,500	17,770	17,210	16,350	15,440
	72 (22.2)	SHC	17,130	16,960	16,610	16,270	15,930	15,440
	76 (24.4)	SHC	19,180	18,500	17,770	17,210	16,350	15,440
	80 (26.7)	SHC	19,180	18,500	17,770	17,210	16,350	15,440
	84 (28.9)	SHC	19,180	18,500	17,770	17,210	16,350	15,440
	88 (31.1)	SHC	19,180	18,500	17,770	17,210	16,350	15,440
63 (17.2)		TC	20,150	19,450	18,700	18,140	17,250	16,290
	72 (22.2)	SHC	14,040	13,700	13,360	13,190	12,840	12,330
	76 (24.4)	SHC	16,960	16,610	16,270	16,100	15,760	15,410
	80 (26.7)	SHC	20,040	19,450	18,700	18,140	17,250	16,290
	84 (28.9)	SHC	20,150	19,450	18,700	18,140	17,250	16,290
	88 (31.1)	SHC	20,150	19,450	18,700	18,140	17,250	16,290
67 (19.4)		TC	21,140	20,420	19,640	# 19,100	18,180	17,180
	72 (22.2)	SHC	10,610	10,440	10,100	9,930	9,590	9,240
	76 (24.4)	SHC	13,700	13,360	13,010	12,840	12,500	12,160
	80 (26.7)	SHC	16,790	16,440	16,270	15,930	15,760	15,240
	84 (28.9)	SHC	19,700	19,530	19,190	19,010	18,180	17,180
	88 (31.1)	SHC	21,140	20,420	19,640	19,100	18,180	17,180
71 (21.7)		TC	22,130	21,400	20,600	20,080	19,130	18,100
	72 (22.2)	SHC	7,190	7,010	6,670	6,500	6,160	5,810
	76 (24.4)	SHC	10,100	9,930	9,590	9,410	9,240	8,900
	80 (26.7)	SHC	13,360	13,010	12,840	12,670	12,330	11,990
	84 (28.9)	SHC	16,270	16,100	15,760	15,590	15,240	14,900
	88 (31.1)	SHC	19,190	19,010	18,670	18,500	18,330	17,990
75 (23.9)		TC	23,020	22,270	21,450	20,980	20,000	18,930
	76 (24.4)	SHC	6,840	6,670	6,330	6,160	5,980	5,640
	80 (26.7)	SHC	9,930	9,760	9,410	9,240	9,070	8,730
	84 (28.9)	SHC	12,840	12,670	12,500	12,330	11,990	11,640
	88 (31.1)	SHC	15,930	15,590	15,410	15,240	14,900	14,730

TC : Total Cooling Capacity (BTU/h) SHC : Sensible Heat Capacity (BTU/h)

NOTE

- Rating conditions (#) : Indoor Unit Entering Air Temp. 80 °F (26.7 °C) D.B. / 67 °F (19.4 °C) W.B.
: Outdoor Ambient Temp. 95 °F (35 °C) D.B.
- Above data does not take Freeze Prevention Protection during cooling operation into account.
For this reason, the value may vary from the actual cooling characteristics.
- Above data represents the value when the operation frequency of a compressor is fixed.

Outdoor Unit : **CMH2472**

Indoor Unit : **KMHS0972 × 3**

Power Supply : 230V Single Phase 60Hz

< Cooling Capacity >

RATING CAPACITY: 23,200 BTU/h			AIR FLOW RATE: 883 CFM					
INDOOR		OUTDOOR						
ENT. TEMP. °F (°C)		AMBIENT TEMP. °F (°C)						
W.B.	D.B.		65 (18.3)	75 (23.9)	85 (29.4)	95 (35.0)	105 (40.6)	115 (46.1)
59 (15.0)		TC	23,420	22,600	21,710	21,090	20,040	15,560
	72 (22.2)	SHC	19,190	18,840	18,330	18,160	17,640	15,560
	76 (24.4)	SHC	22,100	21,760	21,410	21,070	20,040	15,560
	80 (26.7)	SHC	23,420	22,600	21,710	21,090	20,040	15,560
	84 (28.9)	SHC	23,420	22,600	21,710	21,090	20,040	15,560
	88 (31.1)	SHC	23,420	22,600	21,710	21,090	20,040	15,560
63 (17.2)		TC	24,490	23,650	22,730	22,140	21,050	15,980
	72 (22.2)	SHC	15,760	15,410	15,070	14,730	14,390	12,330
	76 (24.4)	SHC	18,840	18,330	17,990	17,810	17,300	15,240
	80 (26.7)	SHC	21,930	21,590	21,070	20,900	20,390	15,980
	84 (28.9)	SHC	24,490	23,650	22,730	22,140	21,050	15,980
	88 (31.1)	SHC	24,490	23,650	22,730	22,140	21,050	15,980
67 (19.4)		TC	25,560	24,700	23,760	# 23,200	22,080	16,380
	72 (22.2)	SHC	12,330	11,990	11,640	11,470	10,960	8,900
	76 (24.4)	SHC	15,410	15,070	14,730	14,390	14,040	11,990
	80 (26.7)	SHC	18,500	18,160	17,810	17,470	17,130	15,070
	84 (28.9)	SHC	21,410	21,070	20,730	20,560	20,040	16,380
	88 (31.1)	SHC	24,500	24,160	23,640	23,200	22,080	16,380
71 (21.7)		TC	26,610	25,730	24,770	24,270	22,840	16,730
	72 (22.2)	SHC	8,730	8,390	8,040	7,870	7,360	5,470
	76 (24.4)	SHC	11,810	11,470	11,130	10,960	10,440	8,390
	80 (26.7)	SHC	14,900	14,560	14,210	14,040	13,530	11,470
	84 (28.9)	SHC	17,810	17,470	17,130	16,960	16,440	14,560
	88 (31.1)	SHC	20,900	20,560	20,210	20,040	19,530	16,730
75 (23.9)		TC	27,510	26,620	25,640	25,210	23,240	17,000
	76 (24.4)	SHC	8,210	7,870	7,700	7,530	6,840	4,960
	80 (26.7)	SHC	11,300	11,130	10,790	10,610	9,930	8,210
	84 (28.9)	SHC	14,390	14,040	13,700	13,530	13,010	11,130
	88 (31.1)	SHC	17,300	16,960	16,790	16,610	15,930	14,040

TC : Total Cooling Capacity (BTU/h) SHC : Sensible Heat Capacity (BTU/h)

NOTE

- Rating conditions (#) : Indoor Unit Entering Air Temp. 80 °F (26.7 °C) D.B. / 67 °F (19.4 °C) W.B.
: Outdoor Ambient Temp. 95 °F (35 °C) D.B.
- Above data does not take Freeze Prevention Protection during cooling operation into account.
For this reason, the value may vary from the actual cooling characteristics.
- Above data represents the value when the operation frequency of a compressor is fixed.

Outdoor Unit : **CMH3172**

Indoor Unit : **KMHS0972 × 4**

Power Supply : 230V Single Phase 60Hz

< Cooling Capacity >

RATING CAPACITY:			30,600 BTU/h		AIR FLOW RATE:		1,177 CFM	
INDOOR		OUTDOOR						
ENT. TEMP. °F (°C)		AMBIENT TEMP. °F (°C)						
W.B.	D.B.		65 (18.3)	75 (23.9)	85 (29.4)	95 (35.0)	105 (40.6)	115 (46.1)
59 (15.0)		TC	31,170	30,000	28,730	28,010	22,960	16,690
	72 (22.2)	SHC	25,580	24,900	24,440	23,980	21,700	16,690
	76 (24.4)	SHC	29,470	29,010	28,320	28,010	22,960	16,690
	80 (26.7)	SHC	31,170	30,000	28,730	28,010	22,960	16,690
	84 (28.9)	SHC	31,170	30,000	28,730	28,010	22,960	16,690
	88 (31.1)	SHC	31,170	30,000	28,730	28,010	22,960	16,690
63 (17.2)		TC	32,490	31,280	29,960	29,310	23,400	16,970
	72 (22.2)	SHC	21,010	20,550	19,870	19,640	17,120	14,610
	76 (24.4)	SHC	24,900	24,440	23,980	23,520	21,240	16,970
	80 (26.7)	SHC	29,010	28,550	28,100	27,640	23,400	16,970
	84 (28.9)	SHC	32,490	31,280	29,960	29,310	23,400	16,970
	88 (31.1)	SHC	32,490	31,280	29,960	29,310	23,400	16,970
67 (19.4)		TC	33,790	32,540	31,170	# 30,600	23,770	17,200
	72 (22.2)	SHC	16,440	15,980	15,290	15,070	12,550	10,270
	76 (24.4)	SHC	20,320	19,870	19,410	19,180	16,670	14,150
	80 (26.7)	SHC	24,440	23,980	23,520	23,300	20,780	17,200
	84 (28.9)	SHC	28,550	28,100	27,410	27,180	23,770	17,200
	88 (31.1)	SHC	32,440	31,980	31,170	30,600	23,770	17,200
71 (21.7)		TC	35,020	33,730	32,320	31,860	24,020	17,350
	72 (22.2)	SHC	11,410	10,950	10,490	10,490	7,750	5,690
	76 (24.4)	SHC	15,520	15,070	14,610	14,380	11,640	9,580
	80 (26.7)	SHC	19,640	19,180	18,720	18,500	15,980	13,690
	84 (28.9)	SHC	23,520	23,070	22,610	22,610	19,870	17,350
	88 (31.1)	SHC	27,640	27,180	26,720	26,500	23,750	17,350
75 (23.9)		TC	36,040	34,730	33,270	32,940	24,130	17,390
	76 (24.4)	SHC	10,720	10,270	9,810	9,810	7,070	5,240
	80 (26.7)	SHC	14,840	14,610	14,150	13,920	11,180	9,350
	84 (28.9)	SHC	18,950	18,500	18,040	17,810	15,290	13,240
	88 (31.1)	SHC	22,840	22,380	21,920	21,920	19,180	17,350

TC : Total Cooling Capacity (BTU/h) SHC : Sensible Heat Capacity (BTU/h)

NOTE

- Rating conditions (#) : Indoor Unit Entering Air Temp. 80 °F (26.7 °C) D.B. / 67 °F (19.4 °C) W.B.
: Outdoor Ambient Temp. 95 °F (35 °C) D.B.
- Above data does not take Freeze Prevention Protection during cooling operation into account.
For this reason, the value may vary from the actual cooling characteristics.
- Above data represents the value when the operation frequency of a compressor is fixed.

5-3. Heating Capacity

Outdoor Unit : **CMH1972**

Indoor Unit : **KMHS0972 × 3**

Power Supply : 230V Single Phase 60Hz

< Heating Capacity >

RATING CAPACITY: 24,800 BTU/h		AIR FLOW RATE: 847 CFM				
OUTDOOR		INDOOR				
ENT. TEMP. °F (°C)		AMBIENT TEMP. °F (°C)				
W.B.		60 (15.6)	65 (18.3)	70 (21.1)	75 (23.9)	80 (26.7)
0 (-17.8)	TH	13,820	13,790	13,750	13,710	13,660
3 (-16.1)	TH	14,280	14,250	14,220	14,170	14,120
8 (-13.3)	TH	15,390	15,360	15,320	15,280	15,220
13 (-10.6)	TH	16,540	16,510	16,470	16,420	16,360
18 (-7.8)	TH	17,810	17,780	17,740	17,680	17,620
23 (-5.0)	TH	19,150	19,110	19,070	19,010	18,930
28 (-2.2)	TH	20,540	20,500	20,450	20,380	20,310
33 (0.6)	TH	21,980	21,940	21,880	21,810	21,730
38 (3.3)	TH	23,400	23,360	23,300	23,220	23,130
43 (6.1)	TH	24,920	24,870	# 24,800	24,720	24,620
48 (8.9)	TH	26,450	26,400	26,330	26,240	26,130
53 (11.7)	TH	28,000	27,940	27,870	27,770	27,660
58 (14.4)	TH	29,500	29,440	29,360	29,250	29,130
63 (17.2)	TH	31,050	30,980	30,890	30,780	30,660
65 (18.3)	TH	31,650	31,580	31,490	31,380	31,250

TH : Total Heating Capacity (BTU/h)

NOTE

- Rating conditions (#) : Indoor Unit Entering Air Temp. 70 °F (21.1 °C) D.B.
: Outdoor Ambient Temp. 47 °F (8.3 °C) D.B. / 43 °F (6.1 °C) W.B.
- Above data does not take Defrost Operation, Overload Prevention Protection, and/or Cold Air Prevention Protection during heating operation into account. For this reason, the value may vary from the actual heating characteristics.
- Above data represents the value when the operation frequency of a compressor is fixed.

Outdoor Unit : **CMH2472**

Indoor Unit : **KMHS0972 × 3**

Power Supply : 230V Single Phase 60Hz

< Heating Capacity >

RATING CAPACITY:		29,200 BTU/h		AIR FLOW RATE:		847 CFM	
OUTDOOR		INDOOR					
ENT. TEMP. °F (°C)		AMBIENT TEMP. °F (°C)					
W.B.			60 (15.6)	65 (18.3)	70 (21.1)	75 (23.9)	80 (26.7)
0 (-17.8)		TH	16,550	16,540	16,510	16,470	16,420
3 (-16.1)		TH	17,100	17,080	17,050	17,010	16,960
8 (-13.3)		TH	18,390	18,370	18,340	18,300	18,250
13 (-10.6)		TH	19,730	19,710	19,680	19,640	19,580
18 (-7.8)		TH	21,200	21,180	21,150	21,100	21,040
23 (-5.0)		TH	22,740	22,720	22,680	22,630	22,570
28 (-2.2)		TH	24,330	24,310	24,270	24,220	24,150
33 (0.6)		TH	25,970	25,950	25,900	25,850	25,770
38 (3.3)		TH	27,580	27,560	27,510	27,450	27,100
43 (6.1)		TH	29,280	29,250	# 29,200	29,130	27,660
48 (8.9)		TH	30,990	30,950	30,900	30,830	28,150
53 (11.7)		TH	32,690	32,650	32,600	31,800	28,540
58 (14.4)		TH	34,320	34,280	34,220	32,140	28,820
63 (17.2)		TH	35,970	35,930	35,860	32,330	28,990
65 (18.3)		TH	36,600	36,560	36,110	32,370	29,010

TH : Total Heating Capacity (BTU/h)

NOTE

- Rating conditions (#) : Indoor Unit Entering Air Temp. 70 °F (21.1 °C) D.B.
: Outdoor Ambient Temp. 47 °F (8.3 °C) D.B. / 43 °F (6.1 °C) W.B.
- Above data does not take Defrost Operation, Overload Prevention Protection, and/or Cold Air Prevention Protection during heating operation into account. For this reason, the value may vary from the actual heating characteristics.
- Above data represents the value when the operation frequency of a compressor is fixed.

Outdoor Unit : **CMH3172**

Indoor Unit : **KMHS0972 × 4**

Power Supply : 230V Single Phase 60Hz

< Heating Capacity >

RATING CAPACITY:		32,000 BTU/h		AIR FLOW RATE:		1,130 CFM	
OUTDOOR		INDOOR					
ENT. TEMP. °F (°C)		AMBIENT TEMP. °F (°C)					
W.B.			60 (15.6)	65 (18.3)	70 (21.1)	75 (23.9)	80 (26.7)
0 (-17.8)		TH	18,270	18,260	18,230	18,200	18,150
3 (-16.1)		TH	18,860	18,850	18,820	18,790	18,740
8 (-13.3)		TH	20,260	20,250	20,230	20,200	20,150
13 (-10.6)		TH	21,720	21,710	21,680	21,650	21,600
18 (-7.8)		TH	23,310	23,300	23,280	23,240	23,190
23 (-5.0)		TH	24,970	24,960	24,940	24,910	24,850
28 (-2.2)		TH	26,690	26,690	26,660	26,630	26,570
33 (0.6)		TH	28,460	28,450	28,430	28,400	28,340
38 (3.3)		TH	30,190	30,190	30,170	30,140	30,080
43 (6.1)		TH	32,020	32,020	# 32,000	31,960	31,900
48 (8.9)		TH	33,850	33,850	33,840	33,800	33,740
53 (11.7)		TH	35,680	35,680	35,670	35,630	35,570
58 (14.4)		TH	37,420	37,430	37,420	37,380	37,320
63 (17.2)		TH	39,190	39,200	39,190	39,160	39,100
65 (18.3)		TH	39,870	39,880	39,880	39,850	39,790

TH : Total Heating Capacity (BTU/h)

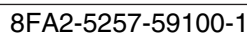
NOTE

- Rating conditions (#) : Indoor Unit Entering Air Temp. 70 °F (21.1 °C) D.B.
: Outdoor Ambient Temp. 47 °F (8.3 °C) D.B. / 43 °F (6.1 °C) W.B.
- Above data does not take Defrost Operation, Overload Prevention Protection, and/or Cold Air Prevention Protection during heating operation into account. For this reason, the value may vary from the actual heating characteristics.
- Above data represents the value when the operation frequency of a compressor is fixed.

6-1. Electric Wiring Diagrams



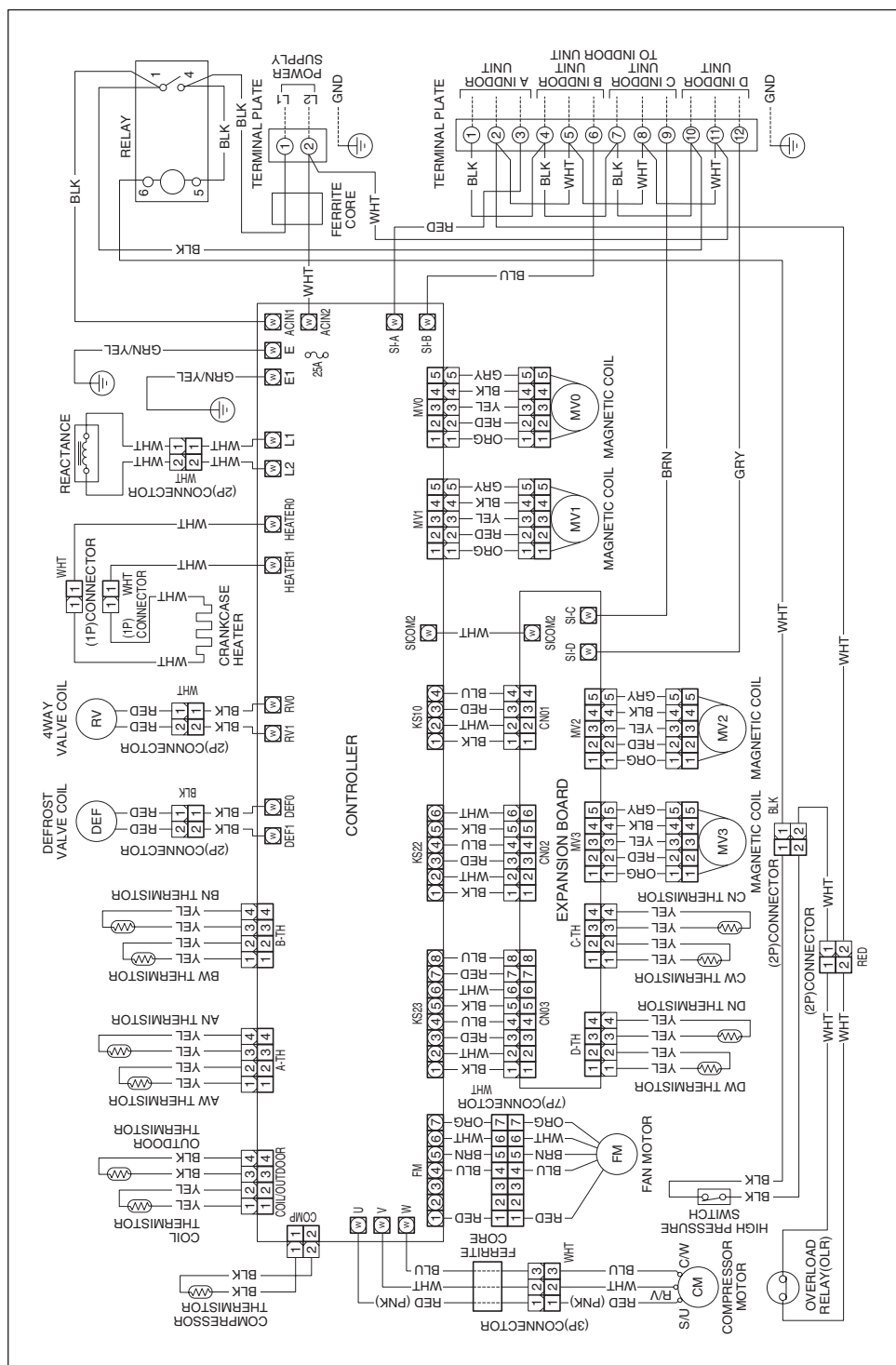
To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.





WARNING

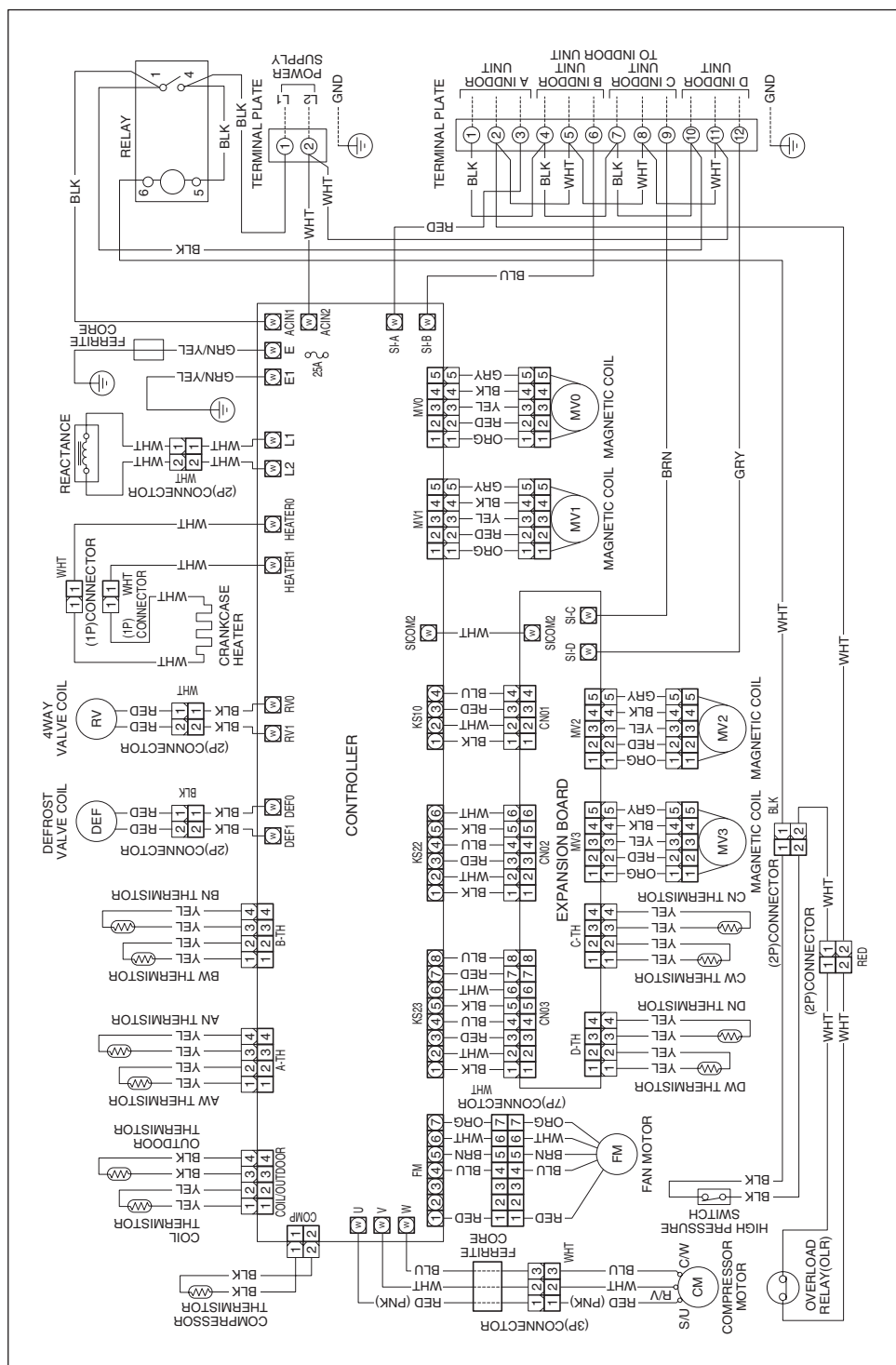
To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.



8FA2-5257-59300-1

**WARNING**

To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.



8FA2-5257-89400-1

7. FUNCTIONS

7-1. Explanation of Functions

NOTE The numerical values such as temperature, frequency, time and current in parentheses are an example of CMH3172 and the values are different from the other models.

	Control/conditions	Unit operation	Explanation
INITIAL	Breaker is ON.	_____	Power is supplied to the indoor and outdoor unit control circuits, however the unit remains stopped. Positioning of the outdoor unit electric expansion valve is performed.
	The ON/OFF operation button on the remote controller is pressed.	If automatic operation mode has been selected with the remote controller, operation begins in HEAT, SENSOR DRY, or COOL mode depending on the room temperature and outdoor temperature at the time operation starts.	This applies in the case of automatic HEAT/COOL operation.
		 Depending on the operational mode, refer to the HEAT, SENSOR DRY, or COOL item.	
HEAT	The ON/OFF operation button on the remote controller is pressed.	- Operation lamp illuminates. - Indoor fan is stopped to prevent cold air from being emitted. - Outdoor unit begins operating after forced-stop is canceled.	The unit is forced to stop for 3 minutes after the power is turned ON, or 3 minutes after the compressor stops, in order to protect the compressor. The frequency is increased at the rate of 1 Hz every 0.5 seconds.
		- When the indoor coil temperature rises, - the compressor starts, - the outdoor fan starts, - and the indoor fan changes from "LL" to the set fan speed.	Depending on the relationship between the remote controller temperature setting and the room temperature, the compressor may stop temporarily (in other words, the thermostat may turn OFF).
		When the frequency reaches α Hz, frequency increases are stopped for a period of β seconds. (Refer to Table 2 "Frequency control".)	This is in order to stabilize the return of oil to the compressor.
		The frequency then increases.	If the indoor and outdoor temperatures are high, the current peak cut-off activates, stopping any increases in frequency.
	The room temperature has reached the desired temperature.	The indoor temperature and the remote controller temperature setting are approximately equal.	Operating frequency is stabilized in order to maintain a comfortable environment.
	The thermostat turns OFF.	The indoor fan is stopped.	- The outdoor unit stops. (It does not stop if the thermostat for another indoor unit is ON.) - Approximately 30 seconds after the thermostat turns OFF, the indoor fan is stopped.
	The indoor and outdoor temperatures are high.	In order to protect the compressor, the outdoor unit will not operate for 3 minutes after the thermostat turns OFF, even if the room temperature drops below the desired temperature.	- The outdoor unit starts automatically after 3 minutes. - During these 3 minutes, a low-pressure pressure balance is achieved, allowing the compressor to start more easily.
		The frequency is not increased, even if there is a difference between the room temperature and the desired temperature. In some cases, the frequency may be decreased.	The amount of heat pump exceeds the amount of heat radiation from the room. Therefore, there is no need to further increase the compressor capacity, and the frequency is stabilized or lowered.

	Control/conditions	Unit operation	Explanation
HEAT	The thermostat turns ON.	The indoor unit is stopped.	The unit operated before, and the temperature of the indoor heat exchanger is relatively warm. Therefore, the fan speed may start at the set fan speed at the same time that the thermostat turns ON.
	When defrost operation begins, frost has formed on the outdoor unit (when the ambient air temperature is low).	Non-stop defrost - Indoor fan : Stopped - Outdoor fan : Stopped - Compressor : 80 Hz - Solenoid valve (for hot gas bypass): ON 4-way valve : Remains ON - Operation lamp : Red and orange ON alternately	Defrost operation begins based on outdoor heat exchanger temperature and outdoor air temperature conditions. Non-stop defrost (Refer to Fig. 1) 1. After HEAT operation begins, the temperature of the outdoor heat exchanger is at or below the L1 line for 35 minutes. (If outdoor air temperature is less than 26.6 °F, the time is 48 minutes) 2. After HEAT operation begins, the temperature of the outdoor heat exchanger is at or below the L2 line for 120 minutes.
			The 4-way valve remains ON during defrost.
			The outdoor fan stops and the solenoid valve turns ON, allowing the refrigerant to bypass the indoor unit.
			The operating frequency during defrost is 80 Hz. (Frequency is lowered if the current peak cut-off function is activated.)
			- The maximum length of a single defrost operation is 12 minutes. - For the outdoor heat exchanger temperature conditions for ending defrost, refer to Table 1.
	Defrost release	- Indoor fan turns ON. - After 10 seconds, the solenoid valve (for hot gas bypass) turns OFF. ↓ - When the cold air feel has disappeared, the indoor fan starts and gradually increases speed until it reaches the set speed.	_____
	STOP [Clean defrost] Defrost is performed when the outdoor unit is stopped, and the temperature of the outdoor unit coil is at or below the L1 line. (Refer to Fig. 1.)	All indicator lamps turn OFF. The indoor and outdoor units stop.	_____
	Operation is restarted within 4 hours (only when AUTO mode is selected with the remote controller).	Starts operating in the same operating mode (HEAT) and with the same temperature settings as before operation was stopped.	Within 4 hours after operation was stopped, it is assumed that there has been no significant change in the indoor and outdoor temperatures, and the previous conditions (HEAT) are stored.
	Operation starts after 4 hours or more have passed.	New operation begins based on the temperature conditions at the time the ON/OFF button is pressed.	_____

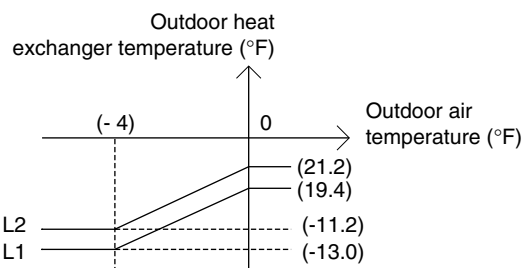


Fig. 1

Temperature of releasing

Defrost operation time	Less than 2 minutes	2 minutes or more
Heat exchanger temperature for releasing defrosting	No releasing	57.2 °F or higher (*1)

*1 The temperature for releasing of defrosting is (68 °F) or higher when the outdoor air temperature is less than 32 °F.

Table 1

	Control/conditions	Unit operation	Explanation
COOL	The ON/OFF operation button on the remote controller is pressed.	- The operation lamp illuminates. - The indoor fan operates at the set fan speed. - The outdoor unit stops.	The outdoor unit does not operate for 3 minutes even after the breaker is turned ON.
		The outdoor unit starts.	The frequency is increased at the rate of 0.5 Hz every 1 seconds.
		(Compressor and the outdoor fan start.)	
		When the frequency reaches α Hz, frequency increases are stopped for a period of β seconds. (Refer to Table 2.)	This is in order to stabilize the return of oil to the compressor.
		The frequency then increases.	If the indoor and outdoor temperatures are high, the current peak cut-off activates, stopping any increases in frequency.
	The room temperature has reached the desired temperature.	The indoor temperature and the desired temperature are approximately equal.	Operating frequency is stabilized in order to maintain a comfortable environment.
	The thermostat turns OFF.	_____	The outdoor unit stops. (It does not stop if the thermostat for another indoor unit is ON.)
	The thermostat turns ON again.	After the thermostat turns ON again, the outdoor unit will not operate for 3 minutes, even if the room temperature increases above the desired temperature.	After 3 minutes, the outdoor unit begins operating automatically. During these 3 minutes, a pressure balance is achieved, allowing the compressor to start more easily.
	Freeze prevention	- When the temperature of the indoor heat exchanger drops to approximately 35.6 °F or below, the compressor turns OFF, the outdoor fan turns OFF, and the indoor fan continues operating with no changes. ↓ - Approximately 3 minutes later, if the temperature of the indoor heat exchanger is above 46.4 °F, the system returns to its original conditions.	In order to protect against freezing, the compressor stops temporarily, until the temperature of the indoor heat exchanger has risen.
	Stop	All indicator lamps turn OFF. The indoor and outdoor units stop.	_____
	Operation is restarted within 4 hours (only when AUTO mode is selected with the remote controller).	Starts operating in the same operating mode (COOL) and with the same temperature settings as before operation was stopped.	Within 4 hours after operation was stopped, it is assumed that there has been no significant change in the indoor and outdoor temperatures, and the previous conditions (COOL) are stored.
	Operation starts after 4 hours or more have passed.	New operating mode is determined based on the temperature conditions at the time the ON/OFF operation button is pressed.	_____

Frequency control

α (Hz)	β (seconds)	
	Outdoor air temperature is below 32 °F.	Outdoor air temperature is 32 °F or higher.
(25) Hz	(120) seconds	(60) seconds
(35) Hz	(60) seconds	(30) seconds
(45) Hz	(60) seconds	(30) seconds
(55) Hz	(180) seconds	(90) seconds

Table 2

(1/f fluctuation fan)

	Control/conditions	Unit operation	Explanation
SENSOR DRY	The ON/OFF operation button on the remote controller is pressed.	- The operation lamp illuminates. - The indoor fan operates at the set fan speed. - The outdoor unit stops.	The outdoor unit does not operate for 3 minutes even after the breaker is turned ON.
		The outdoor unit starts. (Compressor and the outdoor fan start.)	The frequency is increased at the rate of 0.5 Hz every 1 seconds.
		When the frequency reaches α Hz, frequency increases are stopped for a period of β seconds. (Refer to Table 2.)	This is in order to stabilize the return of oil to the compressor.
		The frequency then increases.	If the indoor and outdoor temperatures are high, the current peak cut-off activates, stopping any increases in frequency.
	The room temperature reaches the desired temperature, and there is no need for further cooling.	- DRY operation starts DRY A operation - The indoor fan changes between "Low" and "LL" (very low) over a 6-minute cycle. This is 1/f fluctuation fan operation. (Refer to Fig. 2.)	Operating frequency is stabilized in order to maintain a comfortable environment. - Operates to effectively dehumidify the air while not excessively reducing the indoor temperature. - The indoor unit operates at 1/f fluctuation fan operation, at a fan speed that does not cause a chilly feeling.
	The room temperature is 59 °F or higher, and is slightly too cold.	DRY B operation (1) The indoor fan changes between "Low" and "LL" (very low) over a 6-minute cycle. This is 1/f fluctuation fan operation. ↓ (2) After approximately 3 minutes, the compressor turns OFF, the outdoor fan turns OFF, and the indoor fan turns OFF. ↓ (3) After approximately 6 minutes, the conditions return to (1).	The compressor operates on a 3-minutes ON, 6-minutes OFF cycle, to prevent the room temperature from dropping too much.
	The room temperature is below 59 °F.	Monitoring operation begins.	When monitoring operation begins, the compressor stops, and the indoor fan operates at "LL" (very low) speed.

● 1/f fluctuation fan

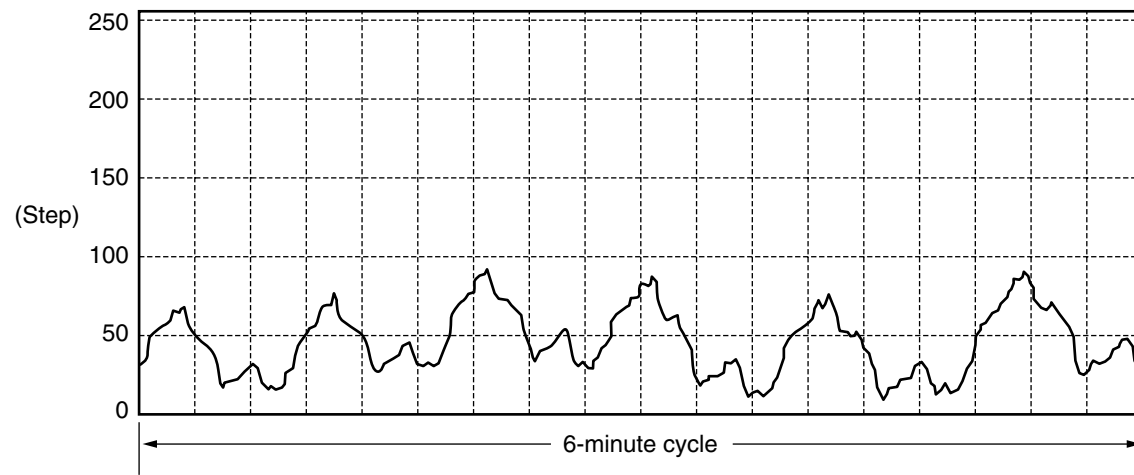


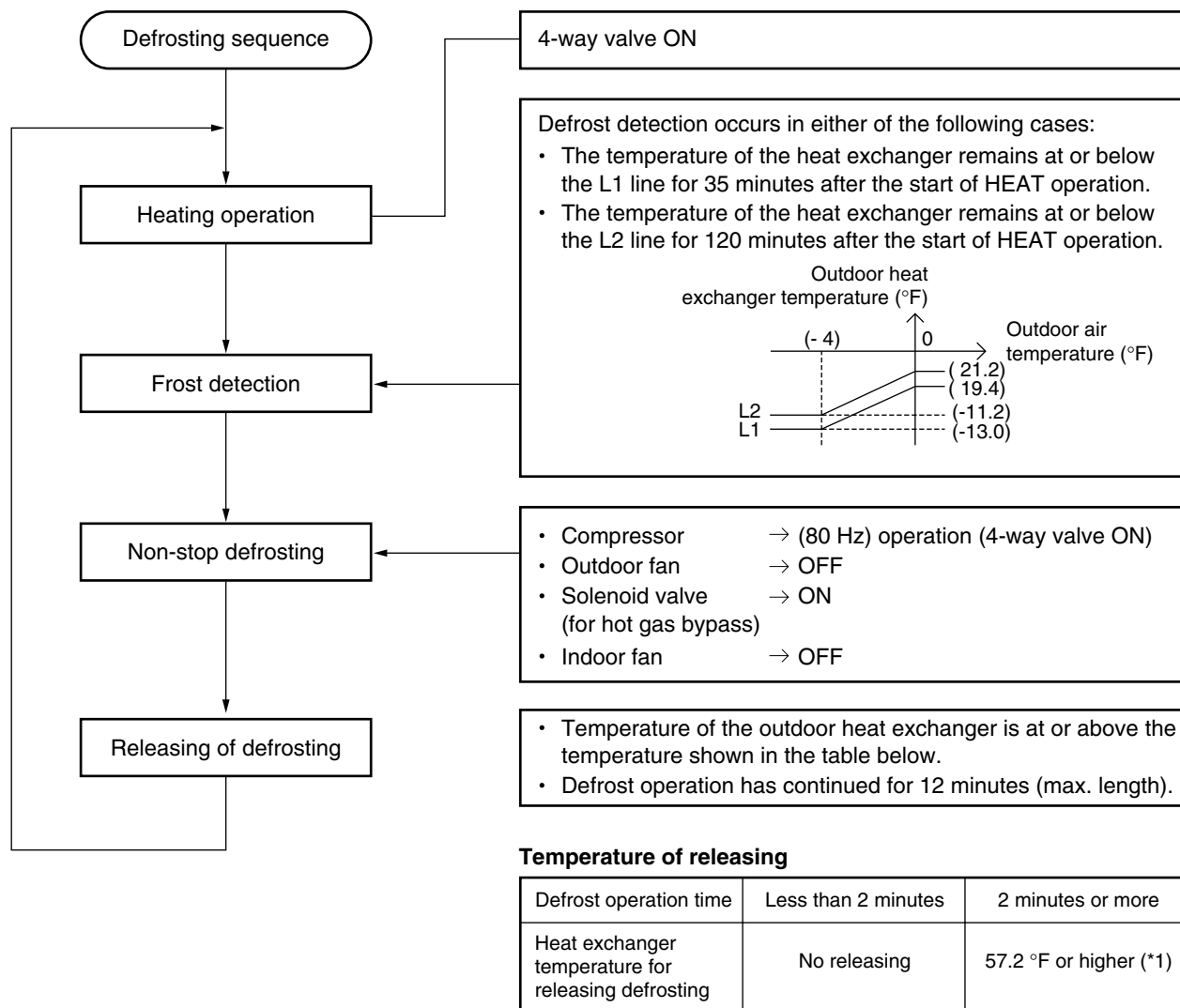
Fig. 2

7-2. Protective Functions

NOTE The numerical values such as temperature, frequency, time and current in parentheses are an example of CMH3172 and the values are different from the other models.

7-2-1. Defrost Detection and Release

(1) Non-stop defrosting



*1 The temperature for releasing of defrosting is (68 °F) or higher when the outdoor air temperature is less than 32 °F.

NOTE Defrost does not occur during HIGH POWER operation.

If other stopped indoor units are started during defrost operation, they begin operating in defrost mode.

(2) Clean defrost

If all indoor units are stopped during HEAT operation, and frost is detected at the L1 line, and the conditions for defrost are met, then defrost operation occurs, and the unit stops after defrost is completed.

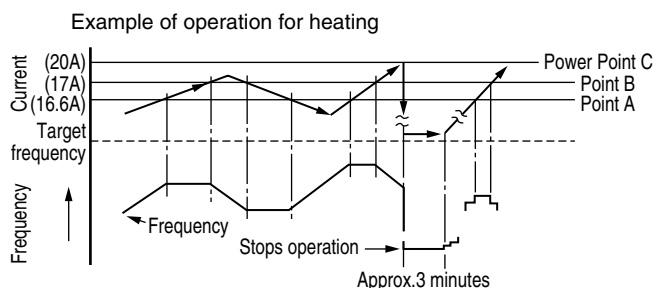
7-2-2. Current Control

- The operating current may rise as a result of causes including increasing heating or cooling loads or decreases in power voltage. In these cases, the operating frequency is automatically reduced, or operation is stopped, in order to control the operating current so that it is (20 A) or less.

As a result: 

- Power breakers and fuses will not be tripped.
- Operation can continue during this period with somewhat reduced heating or cooling capacity.
- Operation at normal capacity is restored when the cause of the current rise is eliminated.

Description of function



- Operates at the target frequency at Point A and below.
- Stops increases to the frequency between Points A and B.
- Reduces the frequency by 1 Hz per 0.5 seconds when Point B is exceeded.
- Stops operation, and restarts it approximately 3 minutes later, if Point C is exceeded.
(May operate when sudden voltage fluctuations occur. → Indicates trouble.)

(1) Automatic frequency control

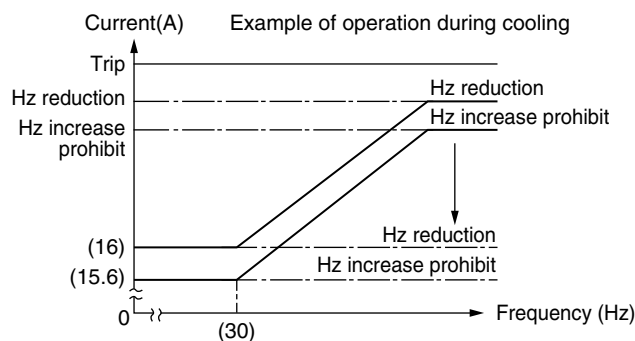
The operating frequency is reduced automatically, or operation is stopped, in order to control the operating current so that it is at or below the values shown in the table below.

	(20A)	
	HEAT	COOL
Point C (peak cut trip)	(20.0)	(20.0)
Point B (Hz reduction)	(17.0)	(17.0)
Point A (Hz increase prohibit)	(16.6)	(16.6)

NOTE During defrost operation, the COOL current setting value is used.

(2) Current control

The operating frequency upper limits shown in the figure below are established for frequency reduction and increase-prohibit.

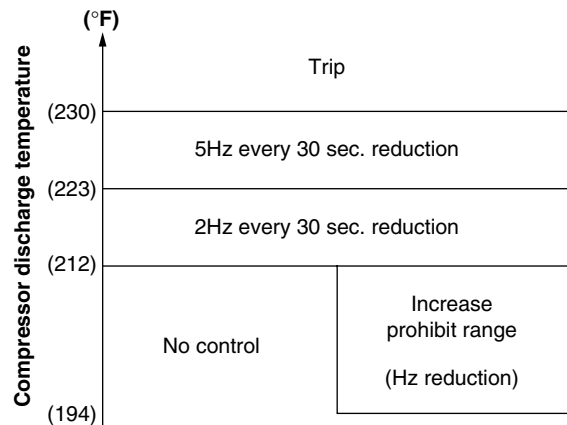


7-2-3. Low Start Current

Operation starts at (8 Hz), and the start current is less than the normal operating current. This prevents the flickering of fluorescent lights or television screens that occurs when ordinary A/C units start.

7-2-4. Compressor Temperature Control

To protect the compressor coil from overheating, the operating frequency is controlled based on the compressor discharge temperature.



* Within the increase-prohibit range, the range changes to the Hz reduction range (2 Hz every 30 seconds) if the compressor temperature rises by 4 °F.

7-2-5. Control at HEAT Start-up

If HEAT operation is started when the outdoor air temperature is 59 °F or below, the unit operates at the HEAT start-up frequency (70 Hz or above).

Reset conditions

- (1) The compressor frequency exceeds the start-up frequency of (70 Hz).
- (2) The compressor thermostat is OFF.
- (3) Frequency reduction for indoor high-load control has occurred.
- (4) The outdoor air temperature is above 59 °F.
- (5) The main-unit switch on one or more indoor units is set to TEST run.

8. TROUBLESHOOTING

8-1. Precautions before Performing Inspection or Repair

■ **Both the indoor unit and outdoor unit include electronic control circuits.**

Be sure to pay attention to the following before inspecting or repairing the outdoor-side electronic circuits.

- High-capacity electrolytic capacitors are used inside the outdoor unit controller (inverter). They retain an electrical charge (charging voltage DC 311 V) even after the power is turned OFF, and some time is required for the charge to dissipate.

Be careful not to touch any electrified parts before the control circuit board Power Lamp (red) turns OFF.

If the outdoor control circuit board is normal, approximately 180 seconds will be required for the charge to dissipate. However, allow at least 30 minutes for the charge to dissipate if it is thought there might be trouble with the outdoor control circuit board.

For example, if the outdoor control circuit board fuse has blown, approximately 30 minutes will be required to discharge the high-capacity electrolytic capacitors.

8-2. Trouble Diagnosis by Error Monitor Lamps



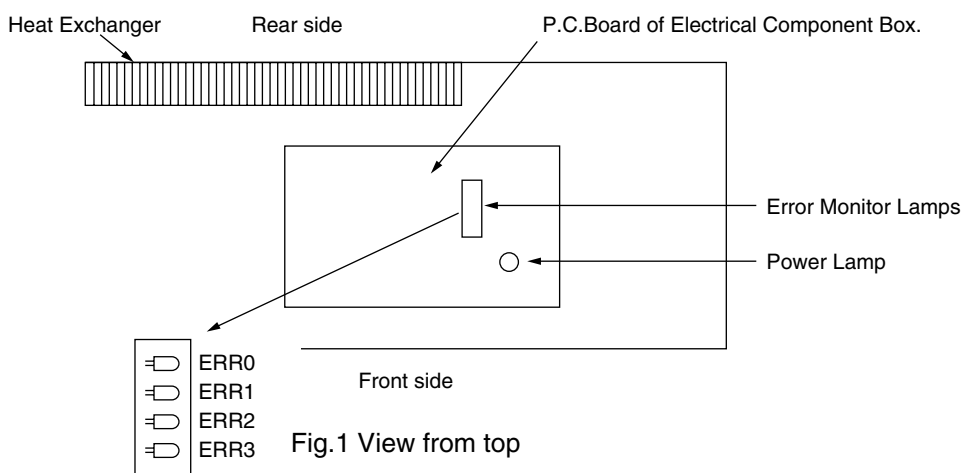
WARNING

To prevent electric shock, do not inspect or repair until the Power Lamp on the P.C.Board is turned off.

8-2-1. Location of the Error Monitor Lamps

Remove the top plate of outdoor unit and the cover of Electrical Component Box.

The Power Lamp and Error Monitor Lamps are located on the P.C.Board of Electrical Component Box. (Fig.1)



8-2-2. Display of the Error Monitor Lamps

If a protective device has activated or there is a sensor failure in the outdoor unit, the 4 error monitor lamps on the outdoor control circuit board will indicate the nature of the trouble.

○ : ON × : OFF

Error Monitor Lamp				Error Contents
ERR0	ERR1	ERR2	ERR3	
○	×	×	○	Sensor for compressor discharge temp
×	○	×	○	Sensor for heat exchange temp
○	×	×	×	Sensor for branch pipe A (Narrow tube)
×	○	×	×	Sensor for branch pipe B (Narrow tube)
○	○	×	×	Sensor for branch pipe C (Narrow tube)
×	×	○	×	Sensor for branch pipe D (Narrow tube)
○	○	×	○	Outdoor temp sensor
○	×	○	×	Sensor for branch pipe A (Wide tube)
×	○	○	×	Sensor for branch pipe B (Wide tube)
○	○	○	×	Sensor for branch pipe C (Wide tube)
×	×	×	○	Sensor for branch pipe D (Wide tube)
×	×	○	○	HIC circuit trouble (current, temp)
×	○	○	○	Actuation of comp over load relay
○	×	○	○	Actuation of freeze protection function
○	○	○	○	Outdoor unit error. Detail of error message indicate on indoor LED

8-3. Checking the Outdoor System

8-3-1. Checking the outdoor unit

No.	Work procedure	Check items (unit operation)
1	Apply 220 V AC between terminals L1 and L2 on the outdoor unit terminal plate.	The LED (red) on the control board must illuminate.
2	Short-circuit the T-RUN terminal to the COM terminal of TEST/T-RUN terminals.	The compressor, fan motor, 4-way valve, and solenoid valve (for the hot gas bypass) must turn ON. (They turn ON about (70) seconds later after the power is turned ON.)

NOTE If the above check items are okay, but the outdoor unit does not operate, there may be a faulty connection between the indoor unit and the outdoor unit.

8-3-2. Checking the defrost operation

- Using forced defrost operation to check this function.

No.	Work procedure	Check items (unit operation)
1	Connect a dummy resistor of 39 k ohm to the outdoor coil temperature sensor connector.	■ Non-stop defrost Indoor fan: Setting, LL (30 sec.), Stop, Setting CM: (80 Hz), ON Solenoid valve (for hot gas bypass): OFF, ON (5 sec.), OFF (10 sec.) Outdoor fan: ON, OFF, ON Defrost start, Release - The maximum length of defrost operation is 12 minutes. - Defrost can also be released based on the below conditions for the outdoor heat exchanger sensor. - Less than 2 minutes → Not released 2 minutes or more → 57.2 °F or higher (*1) *1 However, the condition is (68 °F) or higher when the outdoor air temperature is below 32 °F.

8-4. Trouble Diagnosis of Each Part

8-4-1. Problems of Each Part and Inspection Points

- For details about the inspection points, refer to the Inspection Points for Each Part.

Problems Inspection points		Indoor unit				Outdoor unit										Others	No. of Inspection Points for Each part
		Indoor unit does not operate.	Operation lamp blinking.	Operation lamp does not illuminate.	Indoor fan dose not turn.	Outdoor unit does not operate.	Outdoor fan dose not turn.	4-way valve does not operate.	The compressor (only) does not operate.	The compressor stops on occasion.	The compressor speed does not increase.	The outdoor air temperature is high, however defrost operation occurs.	Defrost operation does not occur.	The electric expansion valve does not operate.	Does not cool or cooling performance is inadequate.	Does not heat or heating performance is inadequate.	
Self-Diagnostics check			○		○	○	○		○								
Indoor unit	Indoor controller (control unit)	○	○	○	○	○											
	Indoor fan motor		○		○												
	Room temperature sensor		○														
	Heat exchanger temperature sensor		○		○												
	Inter-unit cable		○			○	○	○	○	○	○						
	Switch circuit board	○		○													
Outdoor unit	Outdoor control circuit board		○			○	○	○	○	○	○						(1)
	Diode module		○			○											
	HIC		○			○											
	Electrolytic capacitor		○			○											
	Fuse		○			○											(2)
	Compressor		○			○	○	○	○	○	○						(3)
	Compressor protective sensor		○			○			○	○							(4)
	Outdoor fan motor		○			○	○			○		○					
	4-way valve							○									(5)
	Coil thermistor		○			○						○	○				(6)
	Electric expansion valve													○	○	○	(7)
	Branch tubing temperature sensor		○														(8)

Problems Inspection points		Indoor unit				Outdoor unit								Others		No. of Inspection Points for Each part	
		Indoor unit does not operate.	Operation lamp blinking.	Operation lamp does not illuminate.	Indoor fan dose not turn.	Outdoor unit does not operate.	Outdoor fan dose not turn.	4-way valve does not operate.	The compressor (only) does not operate.	The compressor stops on occasion.	The compressor speed does not increase.	The outdoor air temperature is high, however defrost operation occurs.	Defrost operation does not occur.	The electric expansion valve does not operate.	Does not cool or cooling performance is inadequate.		Does not heat or heating performance is inadequate.
Others	Breaker	○				○											(9)
	Refrigerant gas pressure								○						○	○	(10)

8-4-2. Inspection Points for Each Part

(1) Outdoor control circuit board

Refer to "8-3-1. Checking the outdoor unit".

NOTE Do not remove or insert the outdoor control circuit board connector when power is being supplied to it.
(The controller will be damaged.)

(2) Fuse

Check it visually or the continuity with a tester.

(3) Compressor

Check for an open circuit in the compressor coil winding.

(4) Compressor protective sensor (compressor discharge temperature thermistor)

Check that the sensor is securely contained in the thermostart holder.

(5) 4-way valve

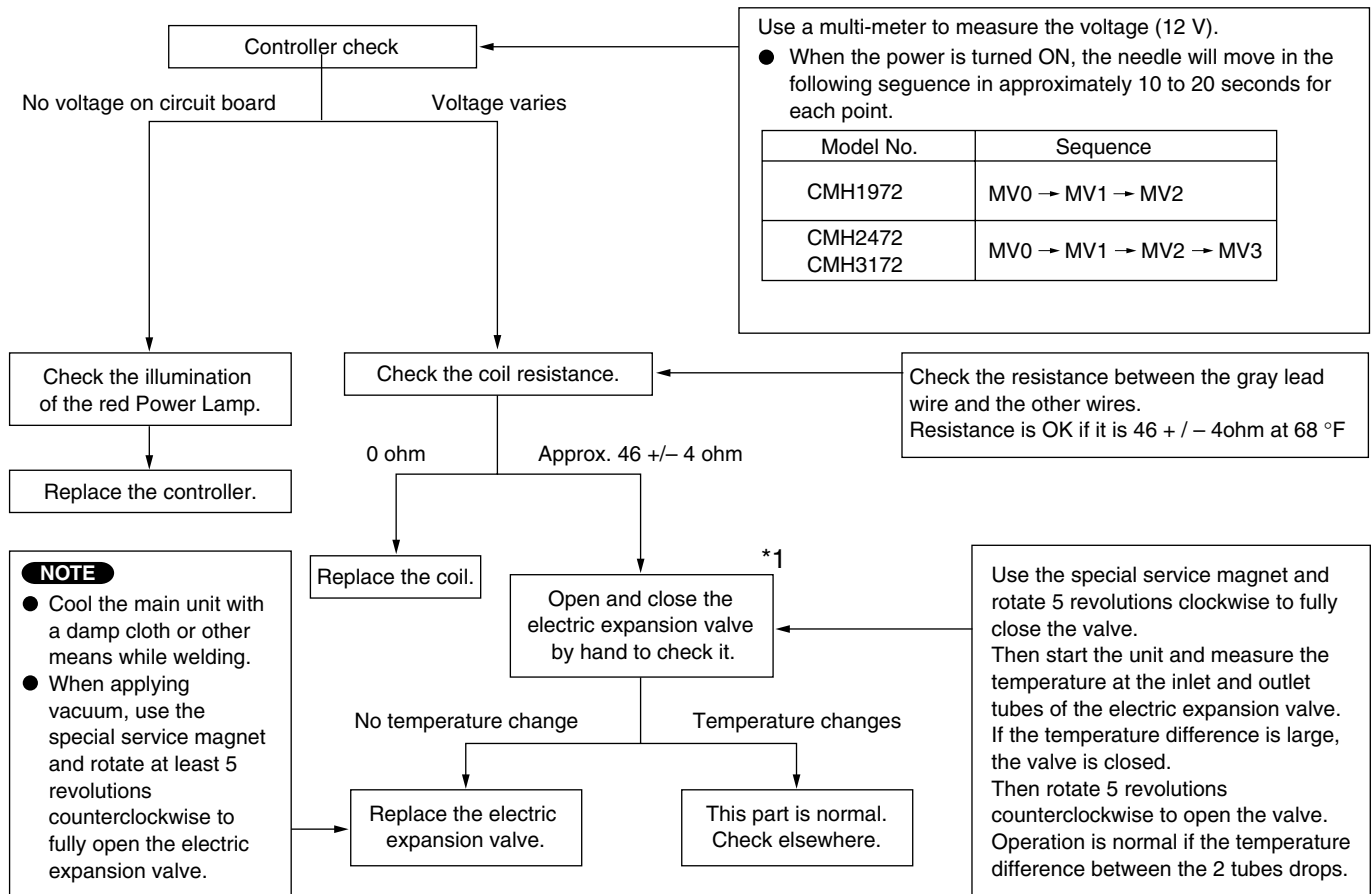
Short-circuit the T-RUN terminal to the COM terminal of TEST/T-RUN terminals. Perform a test run of the unit alone, and check whether the 4-way valve inside the outdoor unit produces a click sound.

(6) Coil thermistor

Check that the sensor is securely contained in the thermostat holder.

(7) Electric expansion valve

- When replacing the electric expansion valve and coil, be sure to attach the connectors in the correct positions. Labels are applied to the valve body and coil, corresponding to the connector colors, to identify them.



*1 If you have manually checked the electric expansion valve, be sure to reapply the outdoor power after you have replaced the wiring. (The position of the electric expansion valve will change.)

(8) Branch tubing temperature sensor

Check that the sensor is securely contained in the thermostat holder.

(9) Breaker

Check whether or not the breaker has been tripped.

- Check that the breakers and fuses used are of the specified capacity.
- Check that the breaker and its line are exclusive for A/C use.

(10) Refrigerant gas pressure

Start a COOL test run, and measure the temperatures of the A/C intake air and discharge air. Compare the values with the performance charts.

- If the values are higher than the performance charts:

Check for refrigerant shortage or blockage of the refrigerant circuit.

< Assessment of refrigerant shortage >

1. The pressure in the low-pressure section is 5 MPa or more below the value in the performance charts.
2. There is little condensation on the indoor heat exchanger, which overall appears dry.

< Distinguishing between refrigerant shortage and refrigerant circuit blockage >

If the pressure in the low-pressure section does not change when the circuit is charged 2 to 3 times with refrigerant gas (0.44 lbs each time), or if the change is small, then the problem may not be refrigerant shortage.

The problem may be a blockage of the refrigerant circuit.

1. Check that there is no internal leakage inside the 4-way valve:

At the low-pressure side tubing, check that there is no temperature difference between the intake and discharge of the 4-way valve.

2. Check that the electric expansion valve is not blocked. Check as described on the preceding page.

8-5. Trouble Diagnosis of Fan Motor

- This outdoor DC fan motor contains an internal control PCB. Therefore, it is not possible to measure the coil resistance, and the following procedure should be used to check the motor.
- Perform the trouble diagnosis by Test Run mode described on Installation Instructions of indoor unit.

Important: (A) Turn OFF the power before connecting or disconnecting the motor connectors.

(B) When performing voltage measurement at the outdoor controller connector for (3) in the table below, the DC motor will trip and voltage output will stop approximately 10 seconds after operation is started. For this reason, to measure the voltage again, first turn OFF the outdoor unit power, then, measure the voltage in Test Run mode.

[Trouble symptom 1] The fan does not stop when the outdoor unit stops. →Outdoor unit controller trouble

[Trouble symptom 2] The fan motor does not rotate when the outdoor unit is operating.

(Diagnostic procedure)

* Disconnect the motor connectors and measure the voltage at the DC motor connectors on the outdoor unit controller (3 locations).

Measurement location	Normal value
(1) Vm-Gnd: Between pin 1 and pin 4	DC 230V or more
(2) Vcc-Gnd: Between pin 5 and pin 4	DC 14V or more
(3) Vsp-Gnd: Between pin 7 and pin 4	After fluctuating 4 times between DC 1.7 to 6.1V (1 sec. ON) and DC 0 V (1 sec. OFF), the DC motor trips.

(Diagnostic results)

All of the above measured values are normal. → Fan motor trouble (Replace the motor.)

Any one of the above measured values is not normal. → Outdoor unit controller trouble
(Replace the controller .)

(Reference) DC motor connector pin arrangement

Pin 1: Vm (red)
Pin 2: Not used
Pin 3: Not used
Pin 4: Gnd (blue)
Pin 5: Vcc (brown)
Pin 6: PG (white)
Pin 7: Vsp (orange)

[Trouble symptom 3] Motor rotates for some time (several seconds), but then quickly stops, when the outdoor unit operates.

(There is trouble in the system that provides feedback of motor rotation speed from the motor to the outdoor unit controller.)

[Trouble symptom 4] Fan motor rotation speed does not change during outdoor unit operation.

[Trouble symptom 5] Fan motor rotation speed varies excessively during outdoor unit operation.

(Remedy for symptom 3 to 5)

It is not possible to identify whether the trouble is outdoor unit controller trouble or motor trouble. Therefore, first replace the outdoor unit controller, then (if necessary) replace the DC motor.

9. REFRIGERANT R410A: SPECIAL PRECAUTIONS WHEN SERVICING UNIT

9-1. Characteristics of New Refrigerant R410A

9-1-1. What is New Refrigerant R410A?

R410A is a new refrigerant that contains two types of pseudo-non-azeotropic refrigerant mixture. Its refrigeration capacity and energy efficiency are about the same level as the conventional refrigerant, R22.

9-1-2. Components (mixing proportions)

HFC32 (50%) / HFC125 (50%)

9-1-3. Characteristics

- Less toxic, more chemically stable refrigerant
- The composition of refrigerant R410A changes whether it is in a gaseous phase or liquid phase. Thus, when there is a refrigerant leak the basic performance of the air conditioner may be degraded because of a change in composition of the remaining refrigerant. ***Therefore, do not add new refrigerant.*** Instead, recover the remaining refrigerant with the refrigerant recovery unit. Then, after evacuation, totally recharge the specified amount of refrigerant with the new refrigerant at its normal mixed composition state (in liquid phase).
- When refrigerant R410A is used, the composition will differ depending on whether it is in gaseous or liquid phase, and the basic performance of the air conditioner will be degraded if it is charged while the refrigerant is in gaseous state. ***Thus, always charge the refrigerant while it is in liquid phase.***



CAUTION

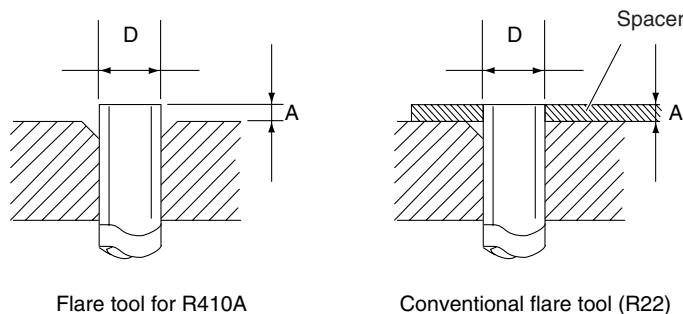
Ether-type oil is used for compressor oil for R410A-type units, which is different from the mineral oil used for R22. Thus more attention to moisture prevention and faster replacement work compared with conventional models are required.

9-2. Checklist before Servicing

Use a clutch-type flare tool for R410A or the conventional flare tool. Note that sizes of the resultant flares differ between these two tools. Where a conventional flare tool is used, make sure to observe A Specification (amount of extrusion) by using the flare spacer.

Diameter of tube D	Specification A	
	Flare tool for R410A	Conventional flare tool (for R22)
Dia. 1/4" (6.35 mm)	0 to 0.0196" (0 to 0.5 mm)	0.0472" (1.2 mm)
Dia. 3/8" (9.52 mm)		
Dia. 1/2" (12.7 mm)		
Dia. 5/8" (15.88 mm)		

● Size of flare



● Tubing precautions

- Refrigerant R410A is more easily affected by dust or moisture compared with R22, thus be sure to temporarily cover the ends of the tubing with caps or tape prior to installation.

Never use 0.0276" (0.7 mm)-thick copper tubing or tubing which is less than 0.0315" (0.8 mm) in thickness, since air conditioners with R410A are subject to higher pressure than those using R22 and R407C.

● No addition of compressor oil for R410A

No additional charge of compressor oil is permitted.

● No use of refrigerant other than R410A

Never use a refrigerant other than R410A.

● If refrigerant R410A is exposed to fire

Through welding, etc., toxic gas may be released when R410A refrigerant is exposed to fire. Therefore, be sure to provide ample ventilation during installation work.

● Caution in case of R410A leak

Check for possible leak points with the special leak detector for R410A. If a leak occurs inside the room, immediately provide thorough ventilation.

9-3. Tools Specifically for R410A

- For servicing, use the following tools for R410A

Tool Distinction	Tool Name
Tools specifically for R410A	● Gauge manifold ● Charging hose ● Gas leak detector ● Refrigerant cylinder ● Charging cylinder ● Refrigerant recovery unit ● Vacuum pump with anti-reverse flow (*1) (Solenoid valve-installed type, which prevents oil from flowing back into the unit when the power is off, is recommended.) ● Vacuum pump (*2)...can be used if the following adapter is attached. ● Vacuum pump adapter (reverse-flow prevention adapter) (*3). (Solenoid valve-installed adapter attached to a conventional vacuum pump.) ● Electronic scale for charging refrigerant ● Flare tool
Tools which can be commonly used for R22, R407C, and R410A	● Bender ● Torque wrench ● Cutter, reamer ● Welding tool, nitrogen gas cylinder



CAUTION

- The above tools specifically for R410A must not be used for R22 and R407C. Doing so will cause malfunction of the unit.
- For the above vacuum pump (*1, *2) and vacuum pump adapter (*3), those for R22-type units can be used for R410A-type. However, they must be used exclusively for R410A and never alternately with R22 and R407C.
- To prevent other refrigerants (R22, R407C) from being mistakenly charged to this unit, shape and external diameter of the service port screw has been altered.
<External diameter of service port> R410A : 5/16"
R22, R407C : 1/4"

9-4. Tubing Installation Procedures

When the tubes are connected, ***always apply HAB oil on the flare portions to improve the sealing of tubing.***

The following is the **HAB oil** generally used:

Esso: ZERICE S32

NOTE

For details on tubing installation procedures, refer to the installation manuals attached to the indoor unit and outdoor unit.

9-5. In Case of Compressor Malfunction



CAUTION

- Should the compressor malfunction, be sure to make the switch to a replacement compressor as quickly as possible.
- Use only the tools indicated exclusively for R410A. → See "9-3. Tools Specifically for R410A."

9-5-1. Procedure for Replacing Compressor

(1) Recovering refrigerant

- Any remaining refrigerant inside the unit should not be released to the atmosphere, but recovered using the refrigerant recovery unit for R410A.
- Do not reuse the recovered refrigerant, since it will contain impurities.

(2) Replacing Compressor

- Soon after removing seals of both discharge and suction tubes of the new compressor, replace it quickly.

(3) Checking for sealing

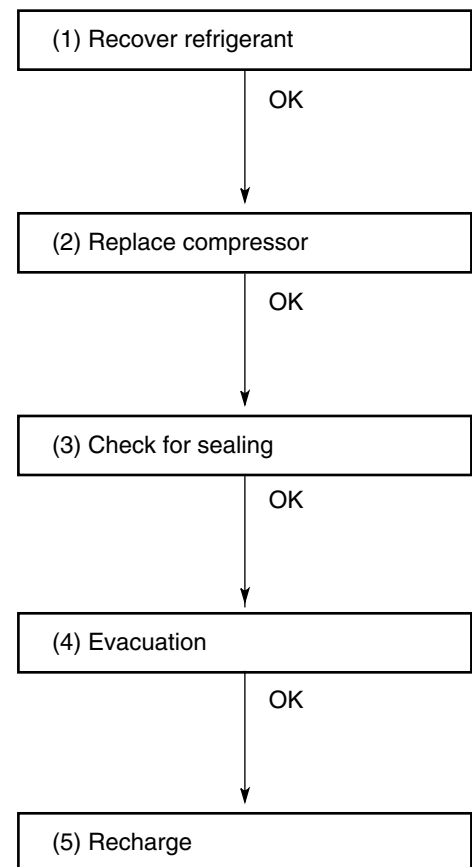
- Use nitrogen gas for the pressurized gas, and never use a refrigerant other than R410A. Also do not use oxygen or any flammable gas.

(4) Evacuation

- **Use a solenoid valve-installed vacuum pump** so that even if power is cut off in the middle of evacuation of air due to a power interruption, the valve will prevent the pump oil from flowing back.
- The equipment may be damaged if moisture remains in the tubing, thus carry out the evacuation thoroughly.
- When using a vacuum pump with exhaust air volume more than 0.883 cu.ft./min. and ultimate vacuum pressure rate of 50 micron Hg.

Standard time for evacuation

Length of tubing	Less than 33 ft. (10 m)	More than 33 ft. (10 m)
Evacuation time	More than 10 minutes	More than 15 minutes



(5) Recharging

- **Be sure to charge the specified amount of refrigerant in liquid state** using the service port of the wide tube service valve. The proper amount is listed on the unit's nameplate.

When the entire amount cannot be charged all at once, charge gradually while operating the unit in Cooling Operation.



CAUTION

Never charge a large amount of liquid refrigerant at once to the unit. This may cause damage to the compressor.

- When charging with a refrigerant cylinder, use an electronic scale for charging refrigerant. In this case, if the volume of refrigerant in the cylinder becomes less than 20% of the fully-charged amount, the composition of the refrigerant starts to change. Thus, **do not use the refrigerant if the amount in the charging cylinder is less than 20%.**

Also, charge the minimum necessary amount to the charging cylinder before using it to charge the air conditioning unit.

Example:

In case of charging refrigerant to a unit requiring 1.68 lb. (0.76 Kg) using a capacity of a 22 lb. (10 Kg) cylinder, the minimum necessary amount for the cylinder is:

$$1.68 + 22 \times 0.20 = 6.08 \text{ lb.}$$

$$(0.76 + 10 \times 0.20 = 2.76 \text{ Kg})$$

- **For the remaining refrigerant, refer to the instructions of the refrigerant manufacturer.**

If using a charging cylinder, transfer the specified amount of liquid refrigerant from the refrigerant cylinder to the charging cylinder.

Prepare an evacuated charging cylinder beforehand.

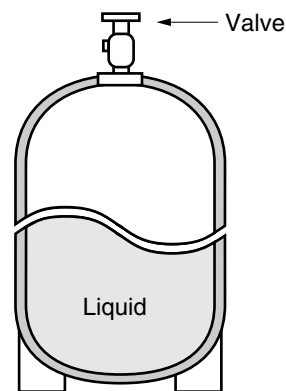


CAUTION

- **To prevent the composition of R410A from changing, never bleed the refrigerant gas into the atmosphere while transferring the refrigerant. (Fig. 3)**

Do not use the refrigerant if the amount in the charging cylinder is less than 20%.

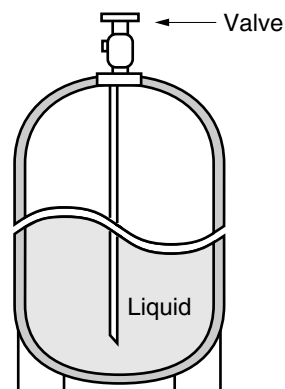
Configuration and characteristics of cylinders



Single valve

Charge liquid refrigerant with cylinder in up-side-down position.

Fig. 1



Single valve (with siphon tube)

Charge with cylinder in normal position.

Fig. 2

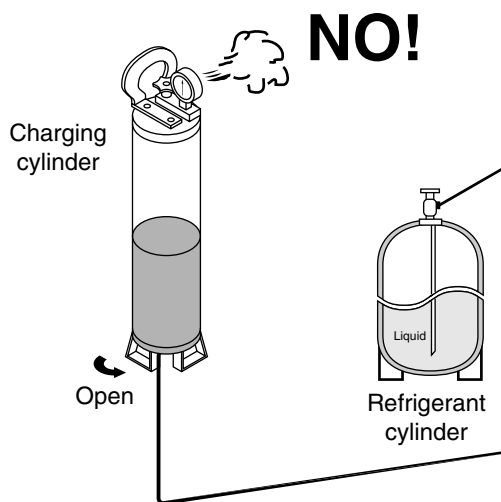


Fig. 3

9-6. In Case Refrigerant is Leaking



CAUTION

Never attempt to charge additional refrigerant when refrigerant has been leaking from the unit. Follow the procedure described below to locate points of leaks and carry out repairs, then recharge the refrigerant.

(1) Detecting Leaks

- Use the detector for R410A to locate refrigerant leak points.

(2) Recovering refrigerant

- Never release the gas to the atmosphere; recover residual refrigerant using the refrigerant recovery unit for R410A, instead.
- Do not reuse the recovered refrigerant because its composition will have been altered.

(3) Welding leaking points

- Confirm again that no residual refrigerant exists in the unit before starting welding.
- Weld securely using flux and wax for R410A.
- Prevent oxide film from forming inside the tubes utilizing substitution with nitrogen (N₂) in the refrigerant circuit of the unit. Leave ends of tubes open during welding.

(4) Checking for sealing

- Use nitrogen gas for the pressurized gas, and never use a refrigerant other than R410A. Also do not use oxygen or any flammable gas.

(5) Evacuation

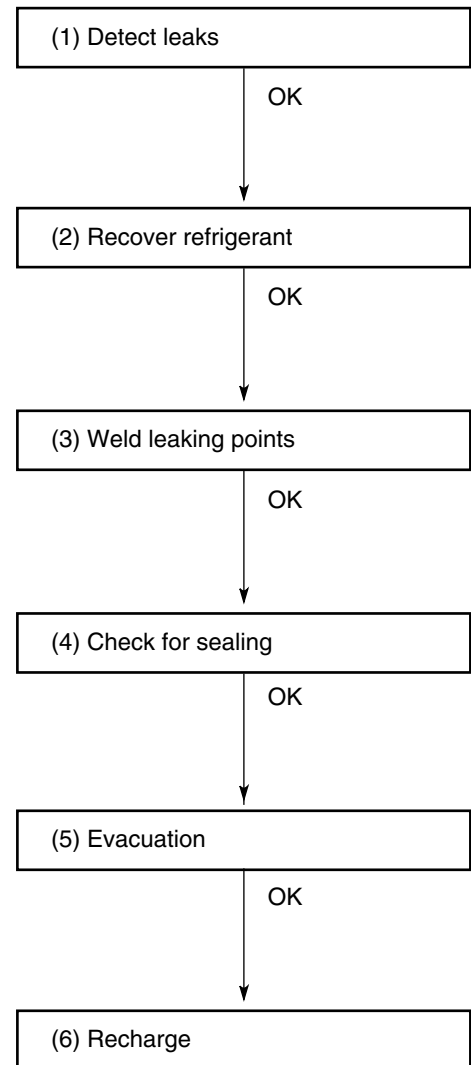
- **Use a solenoid valve-installed vacuum pump** so that even if power is cut off in the middle of evacuation of air due to a power interruption, the valve will prevent the pump oil from flowing back.
- The equipment may be damaged if moisture remains in the tubing, thus carry out the evacuation thoroughly.
- When using a vacuum pump with exhaust air volume more than 0.883 cu.ft./min. and ultimate vacuum pressure rate of 50 micron Hg.

Standard time for evacuation

Length of tubing	Less than 33 ft. (10 m)	More than 33 ft. (10 m)
Evacuation time	More than 10 minutes	More than 15 minutes

(6) Recharging

- Recharge unit in the same manner explained on the previous page "(5) Recharging."



9-7. Charging Additional Refrigerant

9-7-1. When Tubes are Extended

- Observe the proper amount of refrigerant as stated in this service manual or the installation manual that came with the indoor unit. ***Charge additional refrigerant in liquid state only.***



CAUTION

Never charge additional refrigerant if refrigerant is leaking from the unit. Follow instructions given in "9-6. In Case Refrigerant is Leaking" and completely carry out repairs. Only then should you recharge the refrigerant.

9-8. Retro-Fitting Existing Systems

9-8-1. Use of Existing Units

- ***Never use new refrigerant R410A for existing units which use R22.*** This will cause the air conditioner to operate improperly and may result in a hazardous condition.

9-8-2. Use of Existing Tubing

- If replacing an older unit that used refrigerant R22 with a R410A unit, ***do not use its existing tubing.*** Instead, completely new tubing must be used.

APPENDIX A INSTALLATION INSTRUCTIONS

CMH1972

CMH2472

CMH3172

(II-852-6-4189-993-00-2)

– Inverter Multi Split System Air Conditioner – **COOL/DRY/HEAT Model**

This air conditioner uses the new refrigerant R410A.

NOTE Refrigerant service valve size = 5/16"

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Combine indoor and outdoor units only as listed below.

Indoor Unit

KMHS0772
KMHS0972
KMHS1272
KMHS1872
KMHS2472

Outdoor Unit

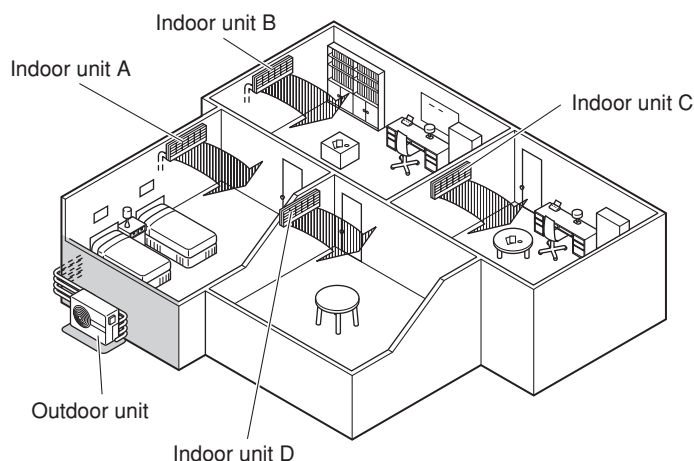
CMH1972
CMH2472
CMH3172

Combine indoor and outdoor units only as listed in the combination tables for 3-room or 4-room outdoor unit as shown in its respective manual.

Power Source:

60 Hz, single-phase, 230 / 208 VAC

Be sure to read the yellow instruction sheet attached to the outdoor unit for models using the new refrigerant R410A.

Combination example**NOTE**

The illustrations are based on the typical appearance of a standard model. Consequently, the shape may differ from that of the air conditioner that you are installing.

SANYO Commercial Solutions

A Division of SANYO North America Corporation
Cornerstone Business Park,
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Bensenville, IL 60106, U.S.A.

In Canada

SANYO Canada Inc.

1-300 Applewood Crescent, Concord
Ontario, L4K 5C7, Canada

IMPORTANT!

Please Read Before Starting

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.



WARNING

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.



CAUTION

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING When Wiring



ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause **accidental injury or death**.
- **Ground the unit** following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing...

...In a Ceiling or Wall

Make sure the ceiling/wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.

...In a Room

Properly insulate any tubing run inside a room to prevent "sweating" that can cause dripping and water damage to walls and floors.

...In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

...In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

...In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

When Servicing

- Turn the power OFF at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

Others



CAUTION

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm upon completing installation that no refrigerant gas is leaking. If escaped gas comes in contact with a stove, gas water heater, electric room heater or other heat source, it can produce dangerously toxic gas.
- Do not install only a single indoor unit.

1. General

This booklet briefly outlines where and how to install the air conditioning system. Please read over the entire set of instructions for the indoor and outdoor units and make sure all accessory parts listed are with the system before beginning. If the electric wiring diagram does not appear in this manual, please check for the diagram on the indoor unit.

1-1. Tools Required for Installation (not supplied)

1. Standard screwdriver
2. Phillips head screwdriver
3. Knife or wire stripper
4. Tape measure
5. Carpenter's level
6. Sabre saw or key hole saw
7. Hacksaw
8. Core bits
9. Hammer
10. Drill
11. Tube cutter
12. Tube flaring tool
13. Torque wrench
14. Adjustable wrench
15. Reamer (for deburring)
16. Vacuum pump (For R410A)
17. Manifold valve

1-2. Accessories Supplied with Unit

Table 1

Parts	Figure	Q'ty	Parts	Figure	Q'ty	Parts	Figure	Q'ty
Hex wrench		1	Cushion rubber		4	Reducer (1/2" × 3/8")		CMH2472 1 CMH3172 2
Labels for inter-unit cable and tube		4 each	Reducer (3/8" × 1/2")		CMH1972 1	Packed in the outdoor unit.		

1-3. Optional Copper Tubing Kit

Copper tubing for connecting the outdoor unit to the indoor unit is available in kits which contain the narrow and wide tubing, fittings and insulation. Consult your nearest sales outlet or A/C workshop.

1-4. Type of Copper Tube and Insulation Material

If you wish to purchase these materials separately from a local source, you will need:

1. Deoxidized annealed copper tube for refrigerant tubing as detailed in Table 2.
Cut each tube to the appropriate lengths 1' to 1'4" (30 cm to 40 cm) to dampen vibration between units.

2. Foamed polyethylene insulation for the specified copper tubes as required to precise length of tubing. Wall thickness of the insulation should be not less than 5/16" (8 mm).
3. Use insulated copper wire for field wiring. Wire size varies with the total length of wiring. Refer to 5. Wiring Instructions for details.



CAUTION

Check local electrical codes and regulations before obtaining wire. Also, check any specified instructions or limitations.

Table 2

Model	Narrow Tube		Wide Tube	
	Outer Dia.	Thickness	Outer Dia.	Thickness
KMHS0772	1/4" (6.35 mm)	0.0314" (0.8 mm)	3/8" (9.52 mm)	0.0314" (0.8 mm)
KMHS0972	1/4" (6.35 mm)	0.0314" (0.8 mm)	3/8" (9.52 mm)	0.0314" (0.8 mm)
KMHS1272	1/4" (6.35 mm)	0.0314" (0.8 mm)	3/8" (9.52 mm)	0.0314" (0.8 mm)
KMHS1872	1/4" (6.35 mm)	0.0314" (0.8 mm)	1/2" (12.70 mm)	0.0314" (0.8 mm)
KMHS2472	1/4" (6.35 mm)	0.0314" (0.8 mm)	5/8" (15.88 mm)	0.0393" (1.0 mm)

1-5. Additional Materials Required for Installation

1. Refrigeration (armored) tape
2. Insulated staples or clamps for connecting wire
(See local codes)
3. Putty
4. Refrigeration lubricant
5. Clamps or saddles to secure refrigerant tubing

2. Installation Site Selection

2-1. Indoor Unit



WARNING

To prevent abnormal heat generation and the possibility of fire, do not place obstacles, enclosures and grilles in front of or surrounding the air conditioner in a way that may block air flow.

AVOID:

- direct sunlight.
- nearby heat sources that may affect performance of the unit.
- areas where leakage of flammable gas may be expected.
- placing or allowing any obstructions near the A/C inlet or outlet.
- installing in rooms that contain instant-on (rapid-start) fluorescent lamps. (These may prevent the A/C from receiving signals.)
- places where large amounts of oil mist exist.
- installing in locations where there are devices that generate high-frequency emissions.

DO:

- select an appropriate position from which every corner of the room can be uniformly cooled. (High on a wall is best.)
- select a location that will hold the weight of the unit.
- select a location where tubing and drain hose have the shortest run to the outside. (Fig. 1)
- allow room for operation and maintenance as well as unrestricted air flow around the unit. (Fig. 2)
- install the unit within the maximum elevation difference (H1, H2, H3, H4) above or below the outdoor unit and within a total tubing length (L1+L2+L3, L1+L2+L3+L4) from the outdoor unit as detailed in Table 3 and Fig. 3a.

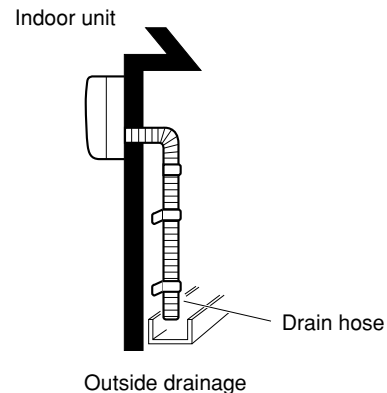
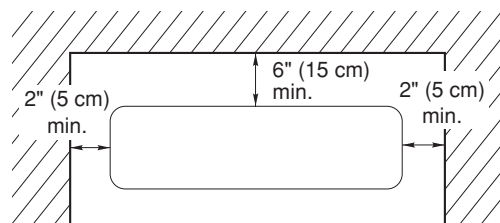


Fig. 1



Front View

Fig. 2

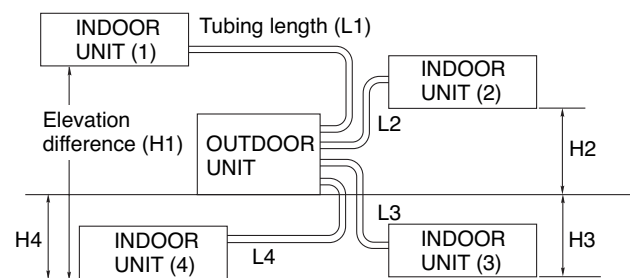


Fig. 3a



CAUTION

For stable operation of the air conditioner, do not install wall-mounted type indoor units less than 5' (1.5 m) from floor level.

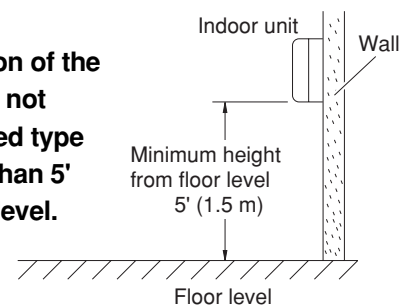


Fig. 3b

- Install the indoor unit more than 3.3' (1 m) away from any antenna or power lines or connecting wires used for television, radio, telephone, security system, or intercom. Electrical noise from any of these sources may affect operation.
- install in a sturdy manner to avoid increased operating noise.

Table 3

Model	Max. Allowable Tubing Length per unit (ft.)	Max. Allowable Total Tubing Length at shipment (L1+L2+L3) or (L1+L2+L3+L4) (ft.)	Limit of Total Tubing Length (L1+L2+L3) or (L1+L2+L3+L4) (ft.)	Limit of Elevation Difference (H1, H2, H3, H4) (ft.)	Required Amount of Additional Refrigerant (oz./ft.)*
CMH1972	82	150 (L1+L2+L3)	150 (L1+L2+L3)	50	—
CMH2472	82	150 (L1+L2+L3+L4)	200 (L1+L2+L3+L4)	50	0.22
CMH3172	100	150 (L1+L2+L3+L4)	230 (L1+L2+L3+L4)	50	0.22

* If total tubing length becomes 150 to 200 ft. (Max.) or 150 to 230 ft. (Max.), charge additional refrigerant (R410A) by 0.22 oz./ft. No additional charge of compressor oil is necessary. For more detailed charging information, refer to the Technical & Service Manual.

2-2. Connecting Indoor Units

(1) Connecting indoor unit for CMH1972

(A)

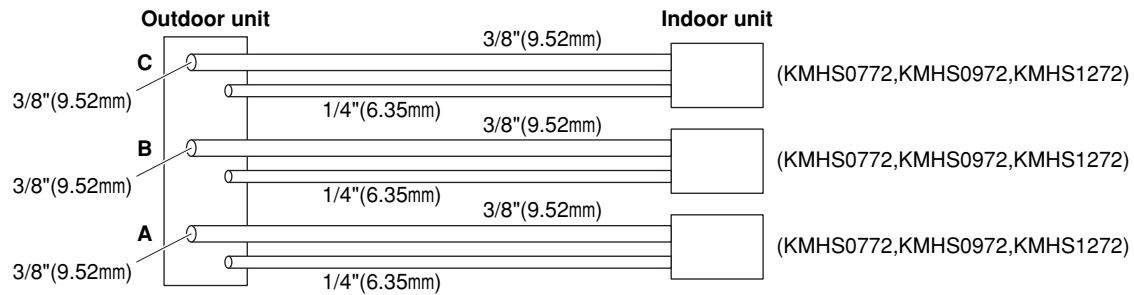


Fig. 4a

(B)

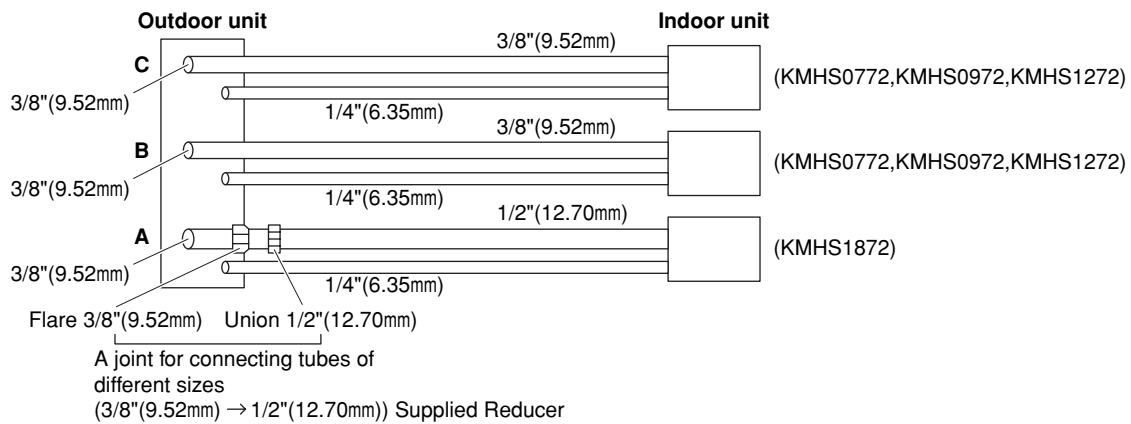


Fig. 4b

(2) Connecting indoor unit for CMH2472

(A)

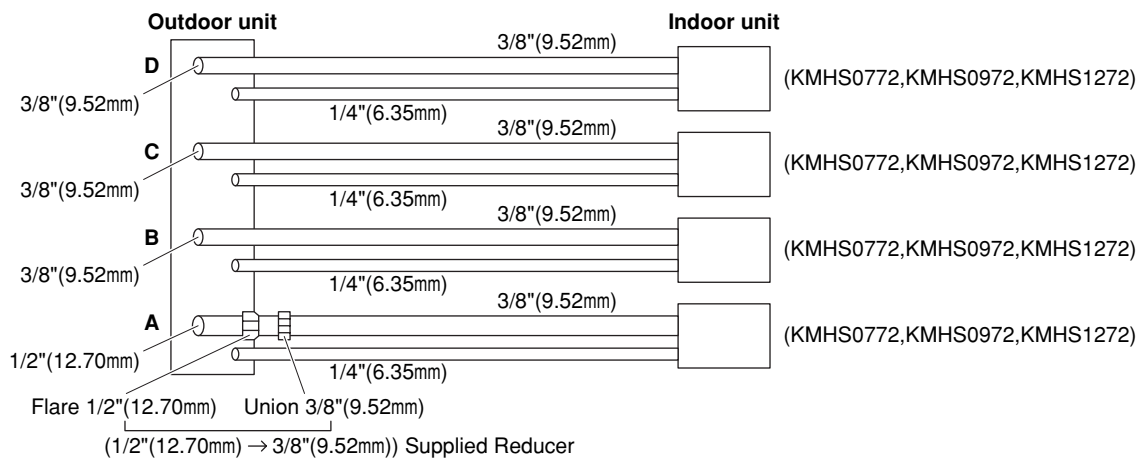


Fig. 4c

(B)

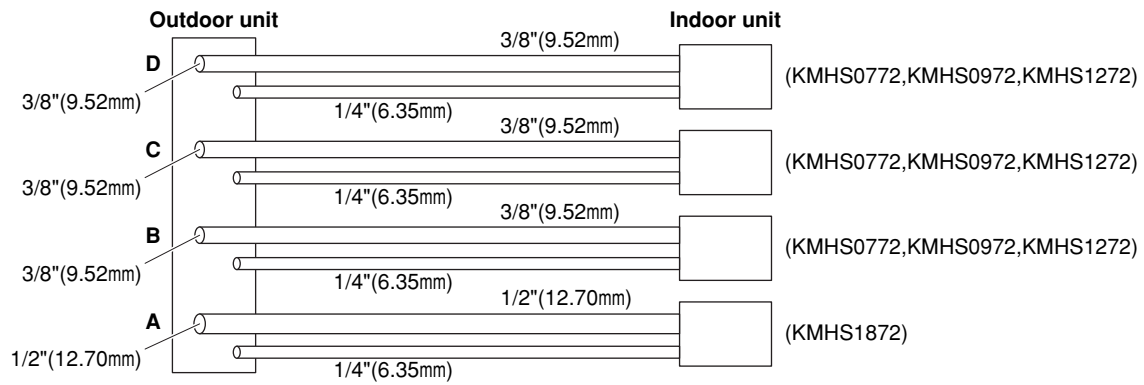


Fig. 4d

(C)

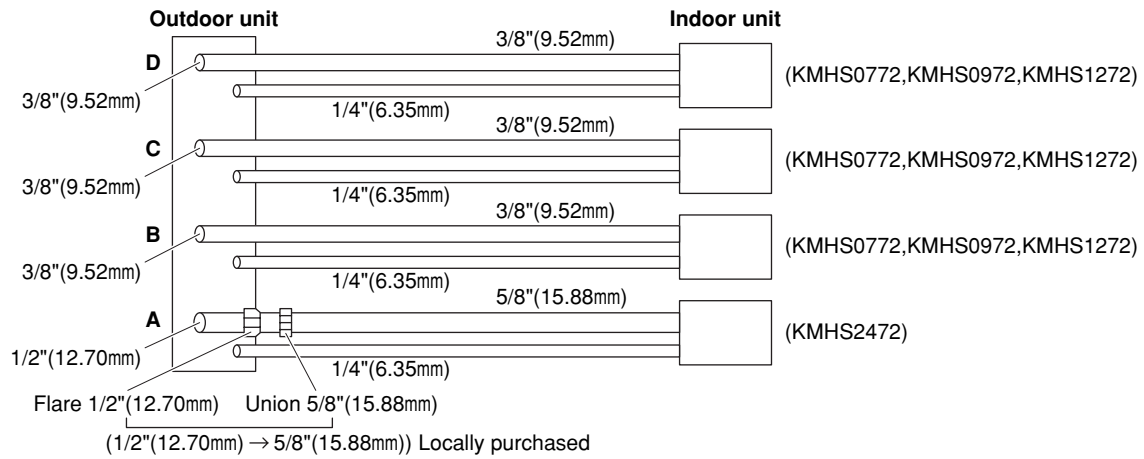


Fig. 4e

(D)

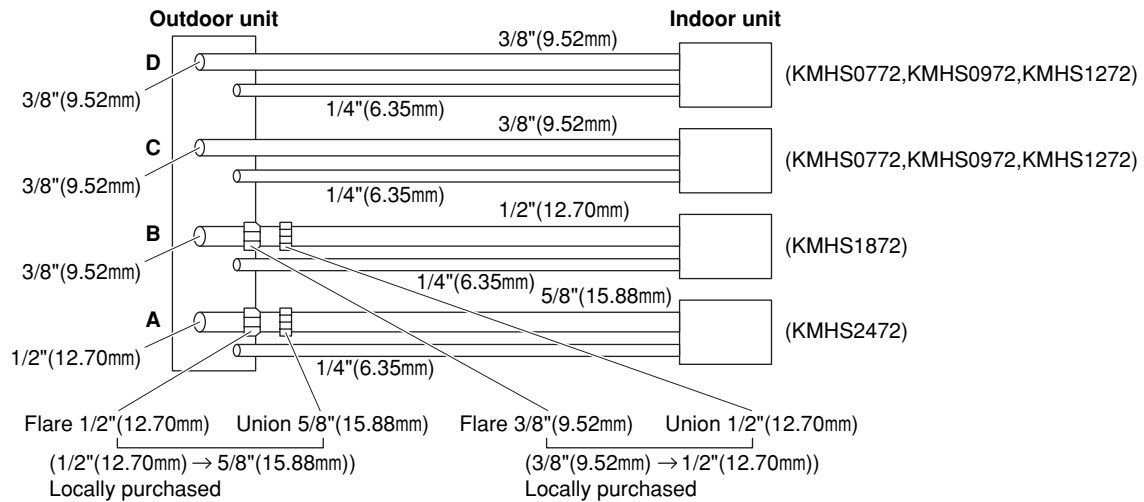


Fig. 4f

(3) Connecting indoor unit for CMH3172

(A)

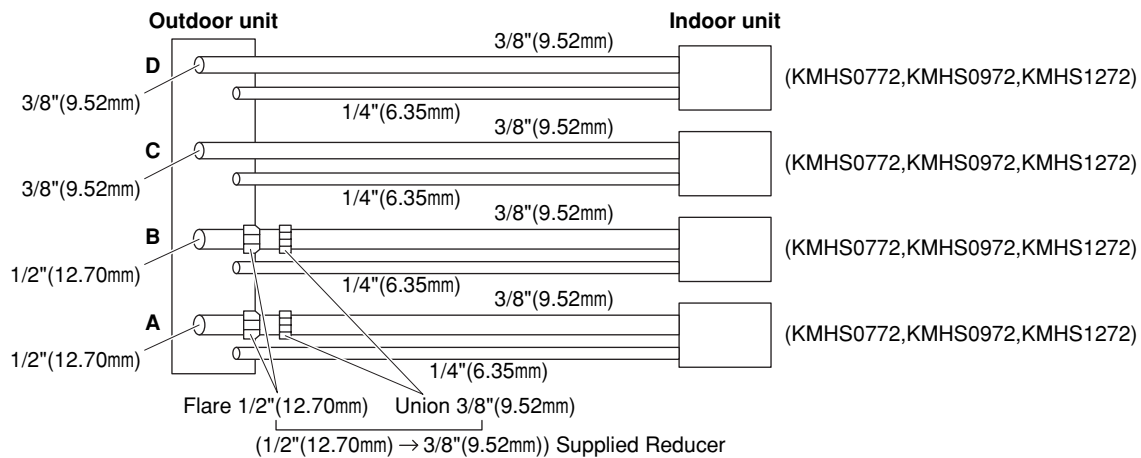


Fig. 4g

(B)

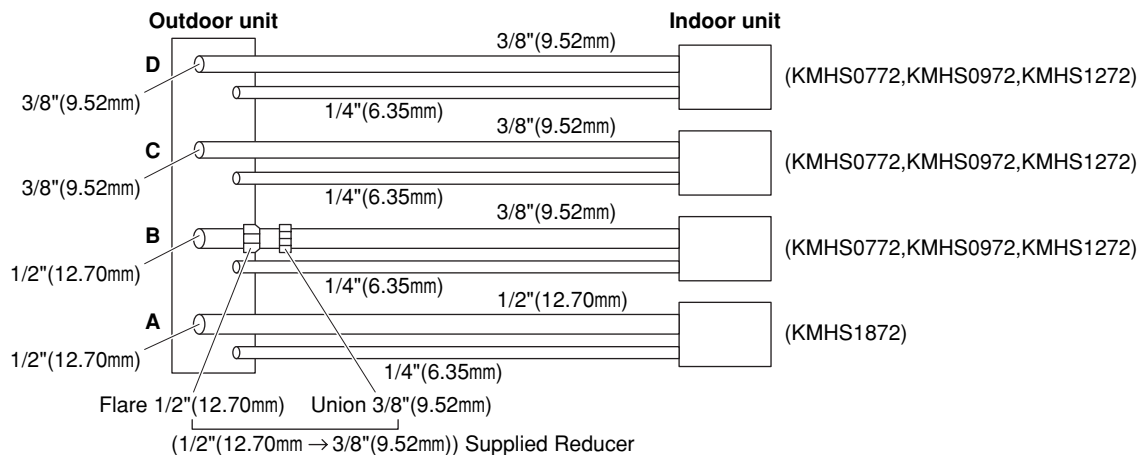


Fig. 4h

(C)

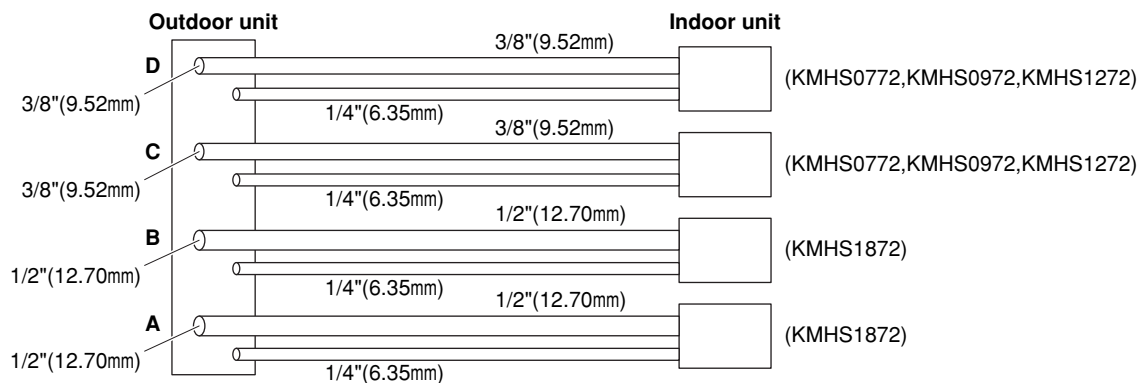


Fig. 4i

(D)

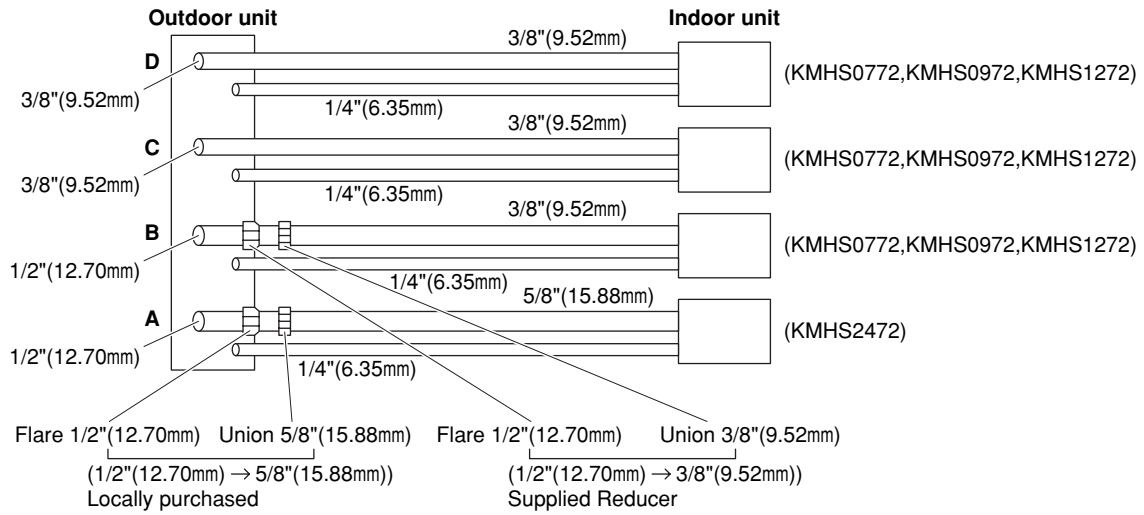


Fig. 4j

(E)

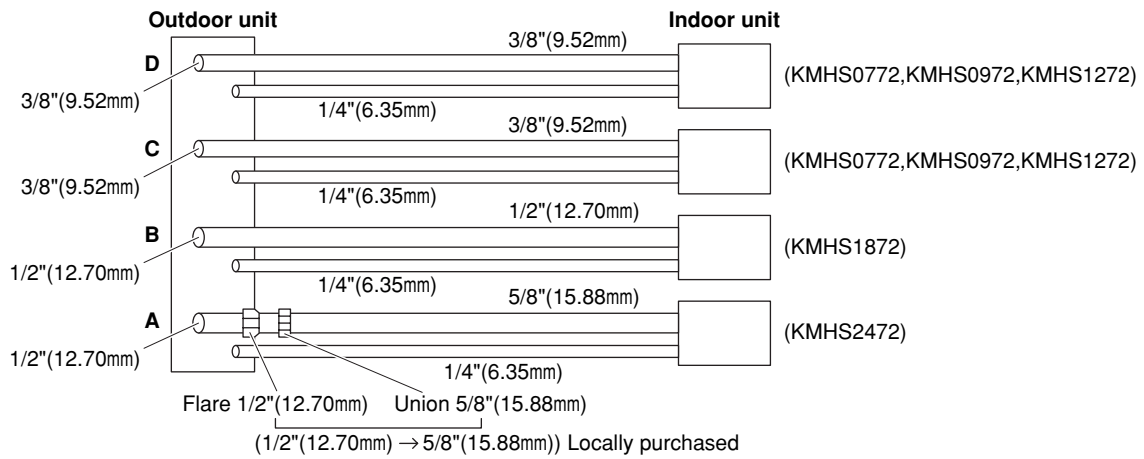


Fig. 4k

2-3. Outdoor Unit

AVOID:

- heat sources, exhaust fans, etc. (Fig. 5a)
- damp, humid or uneven locations.

DO:

- choose a place as cool as possible.
- choose a place that is well ventilated.
- allow enough room around the unit for air intake/exhaust and possible maintenance. (Fig. 5b)
- provide a solid base (level concrete pad, concrete block, 6" × 1'4" (15 × 40 cm) beams or equal), a minimum of 6" (15 cm) above ground level to reduce humidity and protect the unit against possible water damage and decreased service life. (Figs. 5c and 5d)



CAUTION

A solid base must not cover the hole of the bottom plate.

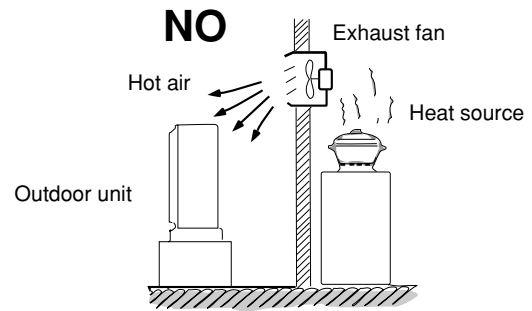


Fig. 5a

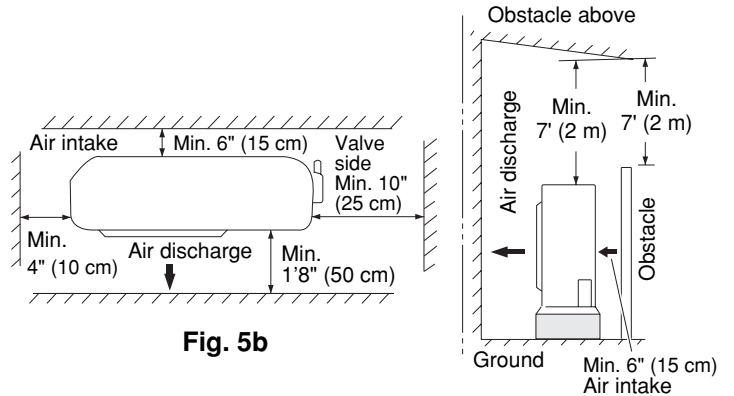


Fig. 5b

- Install cushion rubber under unit's feet to reduce vibration and noise. (Fig. 5e)
- use lug bolts or equal to bolt down unit, reducing vibration and noise.
- Install in a location where no antenna of a television or radio exists within 10' (3 m).

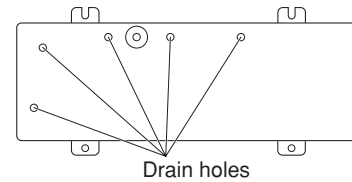


Fig. 5c

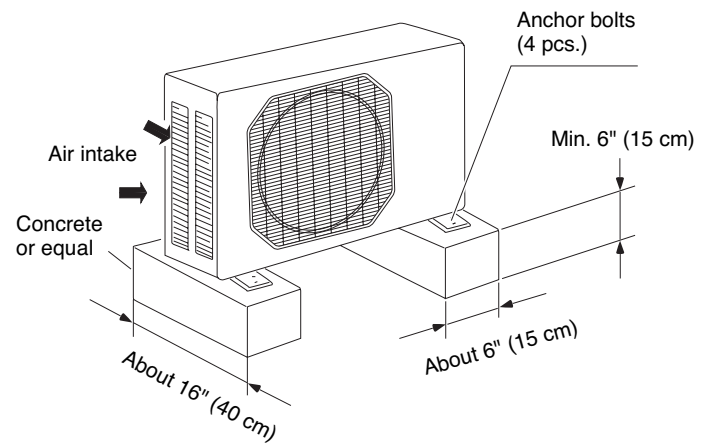


Fig. 5d

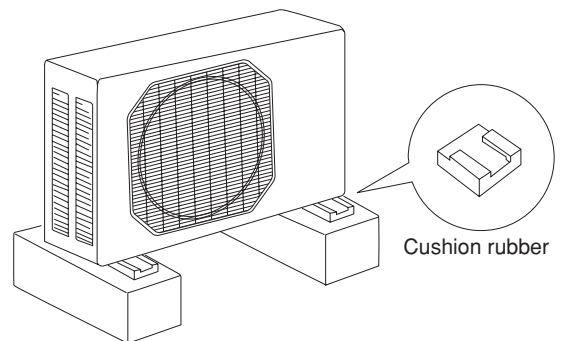


Fig. 5e

2-4. Outer Dimensions of Outdoor Unit

(1) CMH1972

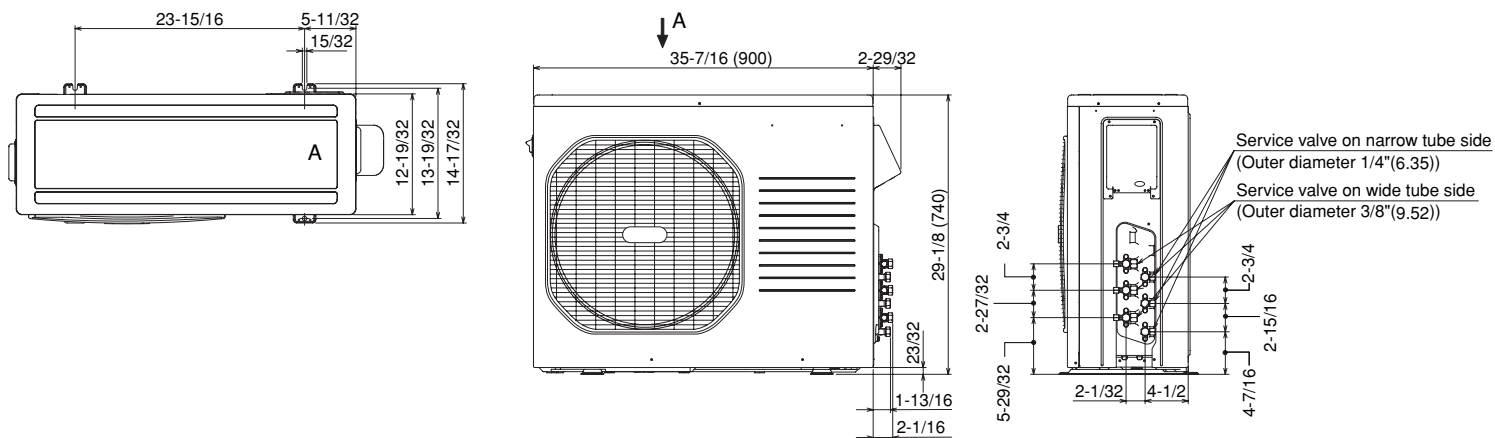


Fig. 6a

(2) CMH2472

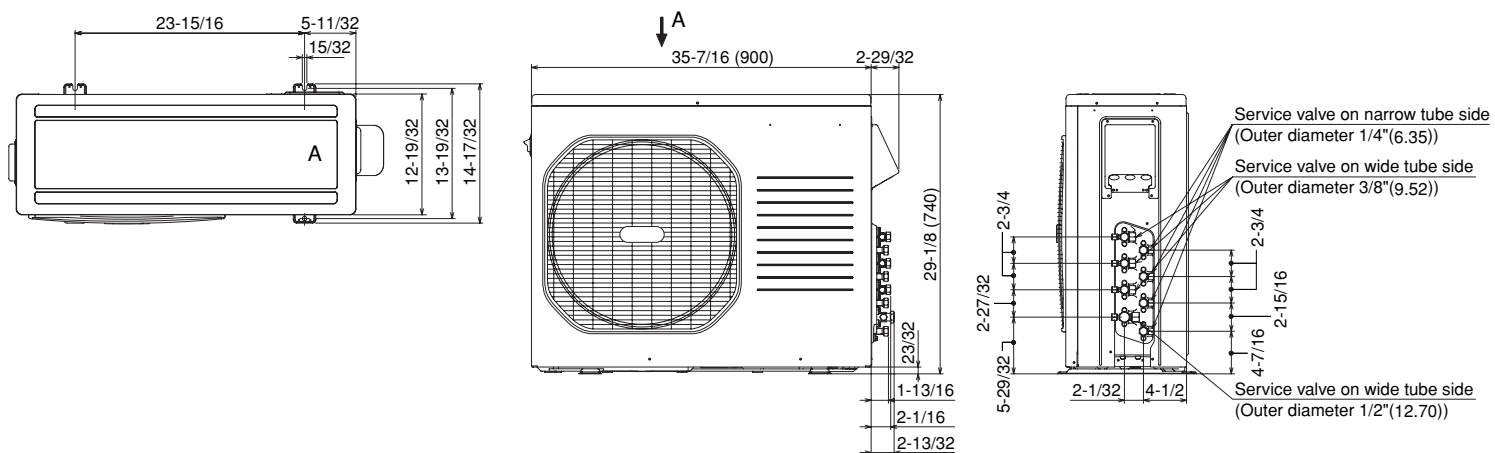


Fig. 6b

(3) CMH3172

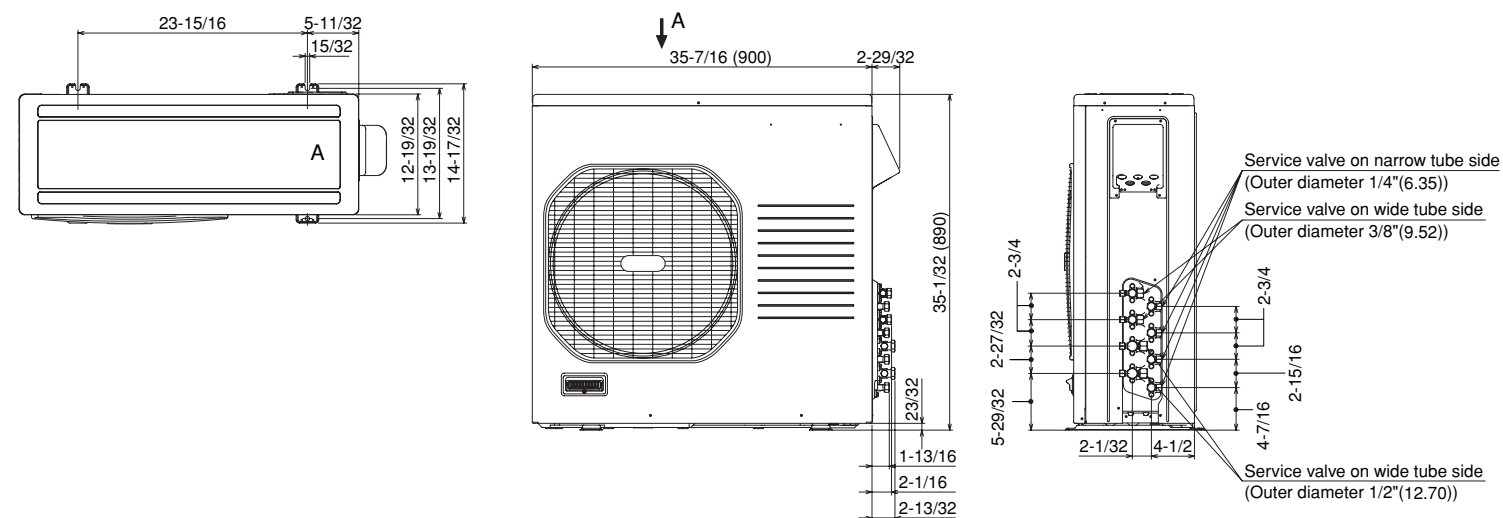


Fig. 6c

unit: inch (mm)

2-5. Diagram of Outdoor Unit Installation

Never install only a single indoor unit.

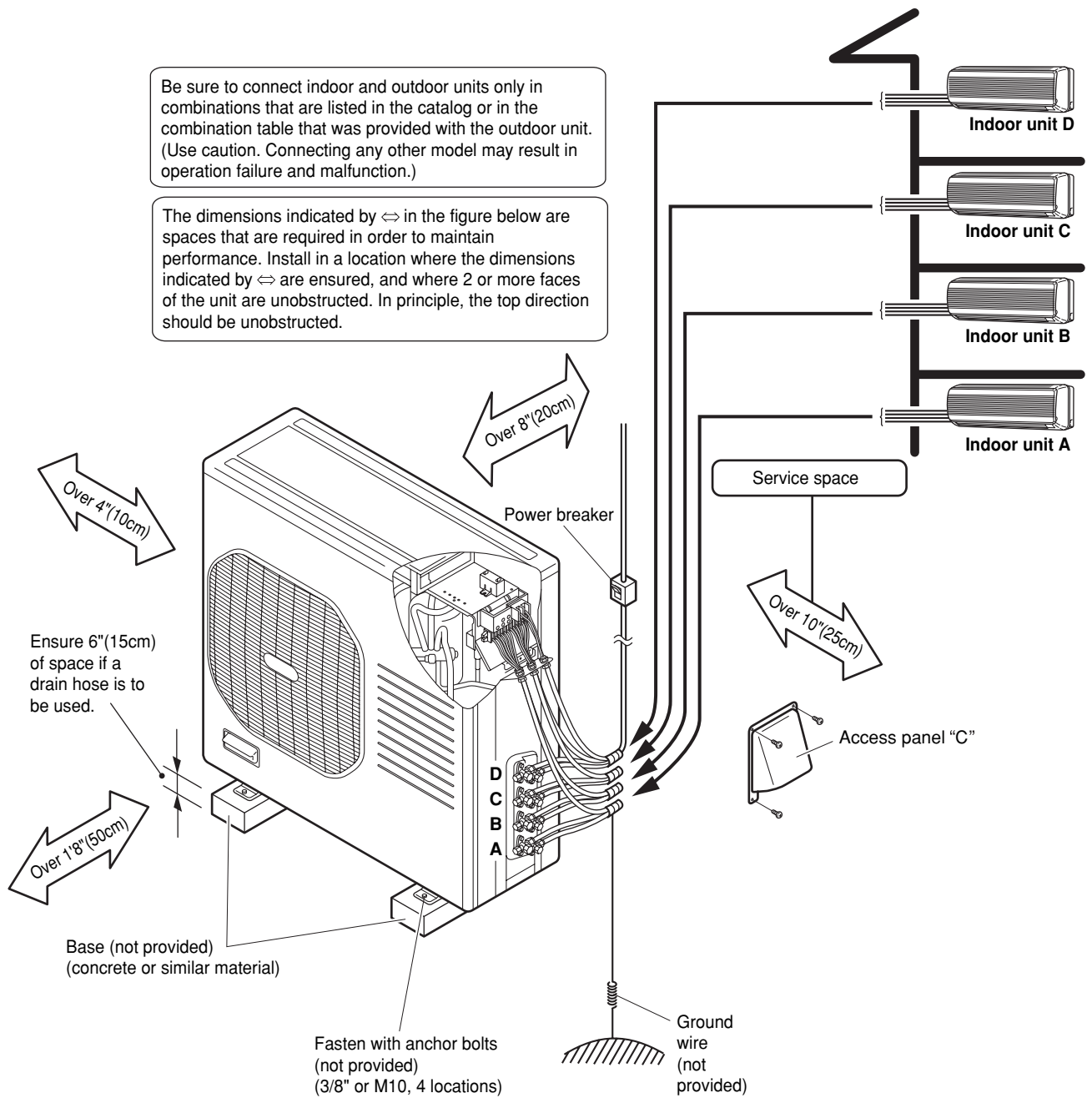


Fig. 7

3. Installation Process

3-1. Embedding the Tubing and Wiring

- Do not connect tubes to locations that are embedded.
- Be sure to bind refrigerant tubing and inter-unit cables together with vinyl tape.
- The power cable must be obtained on-site.
(#12: Less than 85 ft.)
... AWG (American Wire Gauge)
- Be sure to apply the provided labels to both ends of the inter-unit cables to prevent miswiring.
- Securely seal the end of embedded tubing with vinyl tape in order to prevent dirt or moisture entry.
- In order to prevent insulation breakdown and ground faults, do not allow the wire ends to contact rainwater, or be subject to dew condensation.

3-2. Use of the Flaring Method

Many of the conventional split system air conditioners employ the flaring method to connect refrigerant tubes which run between indoor and outdoor units. In this method, the copper tubes are flared at each end and connected with flare nuts.

3-3. Flaring Procedure with a Flare Tool

- (1) Cut the copper tube to the required length with a tube cutter. It is recommended to cut approx. 12" to 20" (30 to 50 cm) longer than the tubing length you estimate.
- (2) Remove burrs at the end of the copper tube with a tube reamer or file. This process is important and should be done carefully to make a good flare. (Fig. 8)

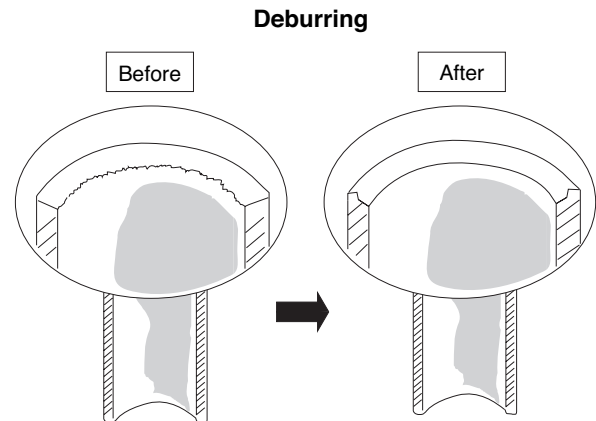


Fig. 8

NOTE

When reaming, hold the tube end downward and be sure that no copper scraps fall into the tube. (Fig. 9)

(3) Remove the flare nut from the unit and be sure to mount it on the copper tube.

(4) Make a flare at the end of copper tube with a flare tool.* (Figs. 10 and 11)

(*Use "RIGID" or equivalent.)

NOTE

A good flare should have the following characteristics:

- inside surface is glossy and smooth.
- edge is smooth.
- tapered sides are of uniform length.

3-4. Caution before Connecting Tubes Tightly

- Be sure to apply a sealing cap or water-proof tape to prevent dust or water from getting into the tubes before they are used.
- Be sure to apply refrigerant lubricant to the matching surfaces of the flare and union before connecting them together. This is effective for reducing gas leaks. (Fig. 12)
- For proper connection, align the union tube and flare tube straight with each other, then screw in the flare nut lightly at first to obtain a smooth match. (Fig. 13)

3-5. Tubing Connections

- Temporary connection:
Screw in 3 – 5 rotations by hand. (Fig.14)
- To fasten the flare nuts, apply specified torque as:

Table 4

Tube Dia.	Tightening Torque
1/4" (6.35 mm)	Approx. 120 – 160 lbs·in (140 – 180 kgf·cm)
3/8" (9.52 mm)	Approx. 300 – 360 lbs·in (340 – 420 kgf·cm)
1/2" (12.70 mm)	Approx. 430 – 540 lbs·in (490 – 610 kgf·cm)
5/8" (15.88 mm)	Approx. 590 – 710 lbs·in (680 – 820 kgf·cm)

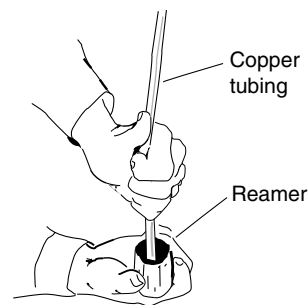
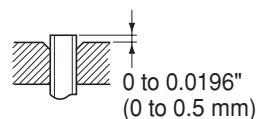
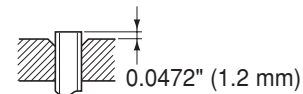


Fig. 9

If the special R410A flare tool is used:



If the previous flare tool (clutch-type) is used:



Adjust so that the amount of tube protrusion is as shown in the figure.

Fig. 10

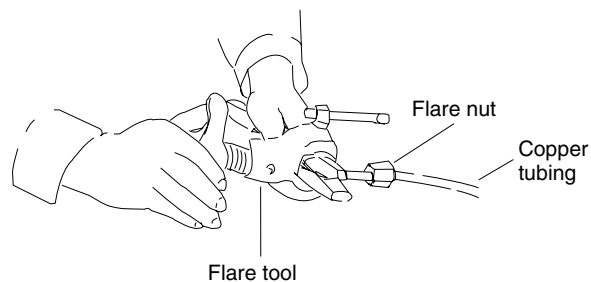


Fig. 11

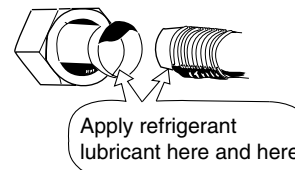


Fig. 12

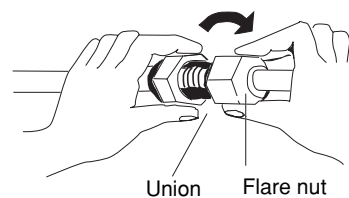


Fig. 13

Service valve on narrow tube side

Service valve on wide tube side

Apply the provided labels to the indoor and outdoor unit tubing connectors to prevent errors in connections.

Fig. 14



CAUTION

Be sure to match refrigerant tubing and electric wiring between indoor and outdoor units. For more details, refer to “Tubing Check Control” in the Technical & Service Manual.

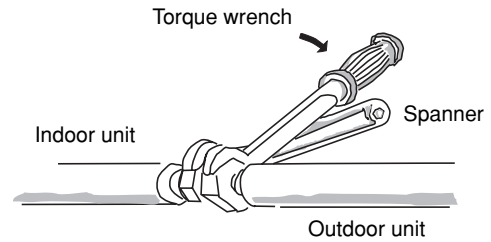


Fig. 15

3-6. Insulation of Refrigerant Tubing

IMPORTANT

To prevent heat loss and wet floors due to dripping of condensation, **both tubes must be well insulated with a proper insulation material.**

The thickness of the insulation should be a minimum 5/16" (8 mm). (Fig. 17)

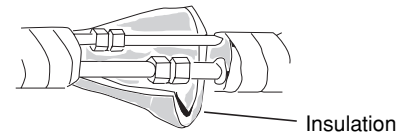


Fig. 16

3-7. Taping the Tubes



CAUTION

After a tube has been insulated, never try to bend it into a narrow curve, as this may cause the tube to break or crack.

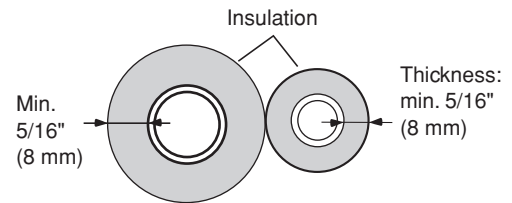


Fig. 17

- (1) At this time, the 2 refrigerant tubes (and electrical wire if local codes permit) should be taped together with armoring tape. The drain hose may also be included and taped together as 1 bundle with the tubing.
- (2) Wrap the armoring tape from the bottom of the outdoor unit to the top of the tubing where it enters the wall. As you wrap the tubing, overlap half of each previous tape turn. (Fig. 18)
- (3) Clamp the tubing bundle to wall, using 1 clamp approx. every 47" (120 cm).

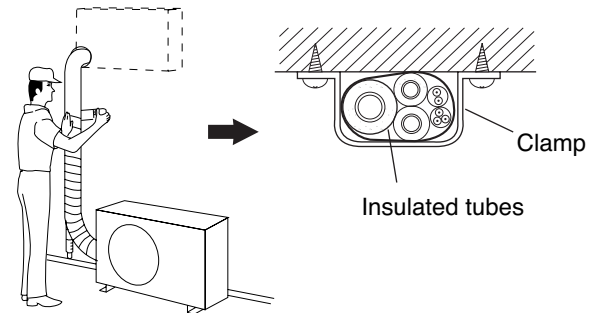


Fig. 18

NOTE

Do not wind the armoring tape too tightly, since this will decrease the heat insulation effect. Also, be sure the condensation drain hose splits away from the bundle and drips clear of the unit and the tubing.

3-8. Finishing the Installation

After finishing insulating and taping over the tubing, use sealing putty to seal off the hole in the wall to prevent rain and draft from entering. (Fig. 19)

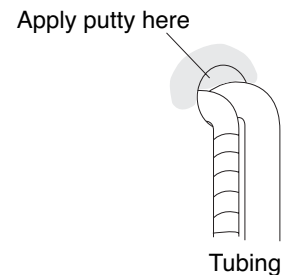


Fig. 19

4. Air Purging

Air and moisture remaining in the refrigerant system have undesirable effects as indicated below. Therefore, they must be purged completely.

- pressure in the system rises
- operating current rises
- cooling efficiency drops
- moisture in the air may freeze and block capillary tubing
- water may lead to corrosion of parts in the refrigerant system

■ Air Purging with a Vacuum Pump (for Test Run)

- In order to protect the earth's environment, be sure to use a vacuum pump to perform the air purge.
(Never perform an air purge by using the refrigerant gas cylinder or other external gas, or by using the gas inside the outdoor unit.)



CAUTION

In order to prevent charging errors with A/C that uses R410A, the screw diameter at the service valve charging port has been changed. When recharging or performing other servicing, use the special charging hose and manifold gauge.

Perform the air purge for tubes A, B, C, and D. Use the same procedures for all tubes.

- (1) Check that each tube (both narrow and wide tubes) between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Note that both narrow and wide tube service valves on the outdoor unit are kept closed at this stage.
- (2) Using an adjustable wrench or box wrench, remove the valve caps from the service valve on both narrow and wide tubes.
- (3) Connect a vacuum pump and a manifold valve (with pressure gauges) to the service port on the wide tube service valve. (Fig. 20).



CAUTION

Before using the vacuum pump adapter, read the vacuum pump adapter manual, and use the adapter correctly.



CAUTION

Be sure to use a manifold valve for air purging. If it is not available, use a stop valve for this purpose. The "Hi" knob of the manifold valve must always be kept closed.

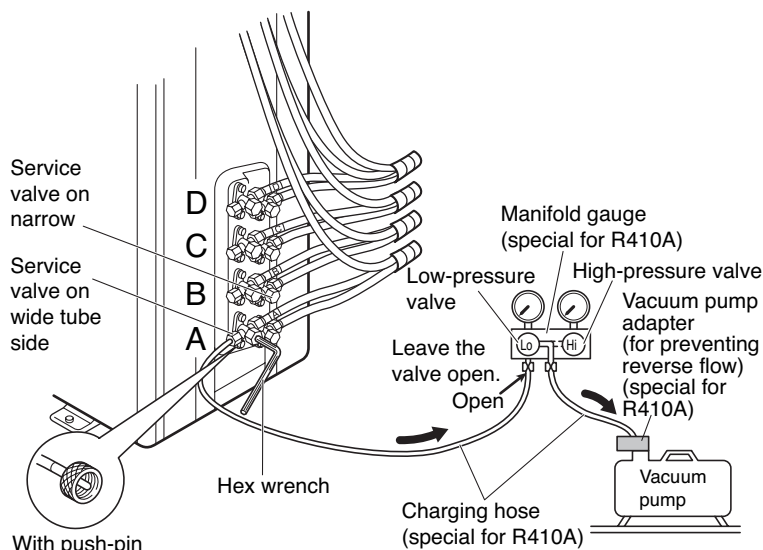
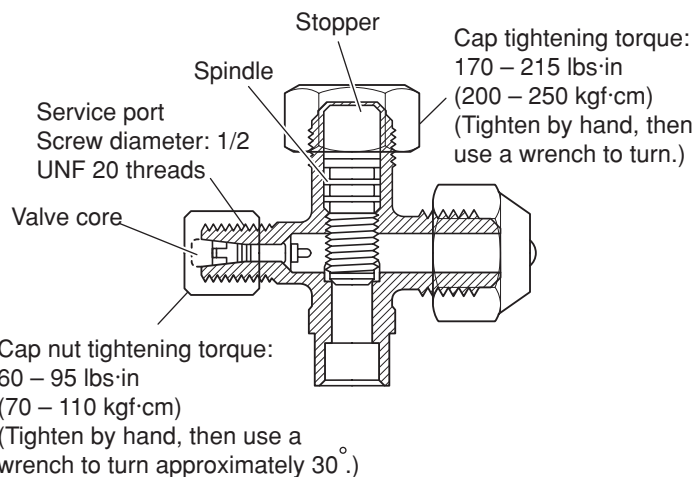


Fig. 20



<Structure of service valve on wide tube side>

NOTE

External diameter of service port
R410A: 5/16"

Fig. 21

- When using a hex wrench to open the spindle, an extremely small amount of refrigerant may leak. This does not indicate a problem.
- Use a hex wrench of a type to which force can be easily applied.

- (4) With the “Lo” knob of the manifold valve open and high-pressure valve (“Hi”) closed completely, run the vacuum pump. Run the pump until the pressure is -101 kPa (-76 cmHg). The operation time for the vacuum pump varies with tubing length and the capacity of the pump. The following table shows the amount of time required for evacuation:

Table 5

Required time for evacuation when capacity of 100 liter/h vacuum pump is used
20 min. or more

NOTE

The required time in the above table is calculated based on the assumption that the ideal (or target) vacuum condition is around 10 mmHg abs.

- (5) With the vacuum pump still running, close the “Lo” knob of the manifold valve. Then stop the vacuum pump. Fully close the low-pressure valve and stop the vacuum pump. (Wait 1 – 2 minutes and check that the manifold gauge pointer does not return. If it does return, find and repair the leak, then apply the vacuum again.)
- (6) With a hex wrench, turn the valve stem on the narrow tube service valve counter-clockwise by 90 degrees ($1/4$ turn) for 10 seconds, and then turn the stem clockwise to close it again.



CAUTION

Be sure to completely insert the hex wrench before attempting to turn the valve.

- (7) With a standard screwdriver, turn the wide tube service valve stem counterclockwise to fully open the valve.
- (8) Turn the narrow tube service valve stem counterclockwise to fully open the valve.
- (9) Loosen the vacuum hose connected to the wide tube service port slightly to release the pressure. Then, remove the hose.
- (10) Leak test all joints at the tubing (both indoor and outdoors) with liquid soap. Bubbles indicate a leak. Be sure to wipe off the soap with a clean cloth.



CAUTION

If a CFC gas detector is used, use a special detector for HFC refrigerant (such as R410 and R134a).

- (11) Replace the flare nut on the wide tube service port and fasten the flare nut securely with an adjustable wrench or box wrench. Next, mount the valve cap and tighten it with a torque wrench (the cap needs to be tightened with the torque of 180 lbs-in (200 kgf-cm)). This process is very important to prevent gas from leaking from the system.
- (12) Test run the air conditioner. (See page 23.)
- (13) While the air conditioner is running, apply liquid soap to check for any gas leaks around the service valves or caps.
- (14) If there is no leakage, stop the air conditioner.
- (15) Wipe off the soap on the tubing.

This completes air purging with a vacuum pump and the air conditioner is ready for actual operation.

■ Pump Down

In order to protect the earth's environment, be sure to perform pump-down to recover refrigerant gas without releasing it into the atmosphere.

- When relocating or disposing of the A/C, request this service from the dealer where the unit was purchased, or from an appropriate agent. Perform pump-down as described below.

What is pump-down?

- Pump-down refers to recovering the refrigerant gas from the refrigerant cycle at the outdoor unit. This work must be performed during cooling operation. The refrigerant gas cannot be recovered during heating operation.
- During winter, or if the temperature sensor prevents cooling operation, perform "forced cooling operation."

Pump-down procedure

- (1) Fully close the spindles at the valves on the narrow tube side of tubes A, B, C and D. (Refer to Fig. 22.)
- (2) Connect the manifold gauge to the charging port at the valve on the wide tube side of tube D. Purge the air from the charging hose. (Refer to Fig. 23.)

- (3) Perform cooling operation or forced cooling operation.

When the pressure at the low-pressure side is 0.15 – 0.2 MPa (0.5 – 1 kg/cm²G), fully close the spindles at the valves on the wide tube side of tubes A, B, C, and D, and immediately stop operation. (Refer to Fig. 23.)

In the winter, the outdoor unit may stop after 5 - 10 minutes of operation. This is in order to protect the indoor unit heat exchanger from freezing and does not indicate a problem.

- (4) Disconnect the manifold gauge and the inter-unit tubes, and attach the caps and flare nuts. At this point, pump-down is completed. (If the caps and flare nuts are not reattached, there is the danger of gas leakage.) (Refer to Fig. 24.)

If pump-down is not possible

If the A/C cannot be operated because of a malfunction or other cause, use a refrigerant recovery device to recover the refrigerant.

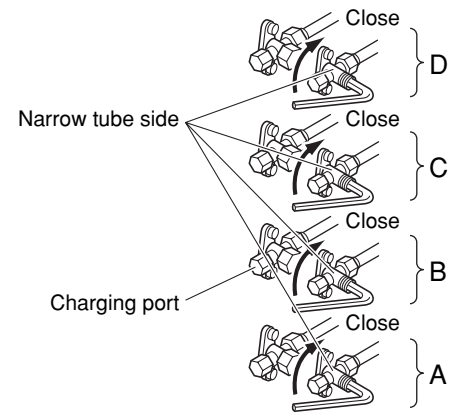


Fig. 22

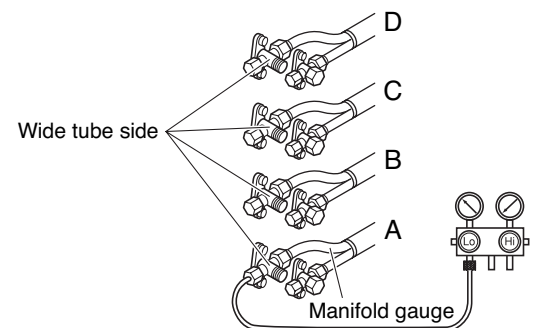


Fig. 23

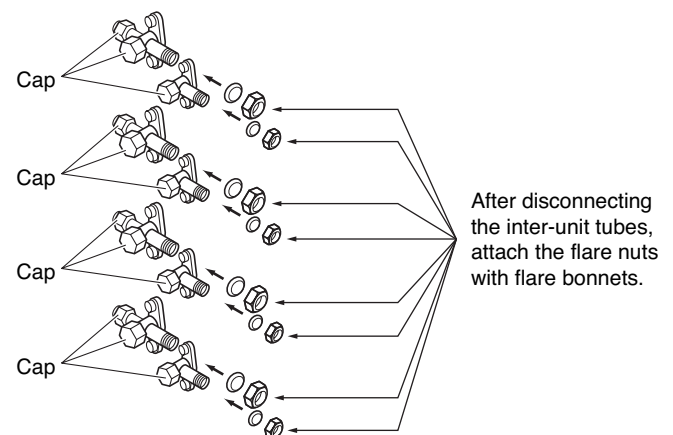


Fig. 24

5. Wiring Instructions

5-1. General Precautions on Wiring

- (1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.
- (2) Provide a power outlet to be used exclusively for each unit, with a power supply disconnect and circuit breaker for overcurrent protection provided in the exclusive line.
- (3) To prevent possible hazard due to insulation failure, the unit must be grounded.
- (4) Each wiring connection must be done tightly and in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.
- (5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.
- (6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.

5-2. Recommended Wire Length and Diameter

Regulations on wiring diameter differ from locality to locality. For field wiring requirements, please refer to your local electrical codes. Carefully observe these regulations when carrying out the installation.

Table 6 shows maximum wire lengths for control line and power line and fuse or circuit capacity.

NOTE

Refer to the wiring system diagram (Fig. 25a or 25b) for the meaning of (A), (B), and (C) in Table 6.

Refer to your local codes or in the absence of local codes see the National Electric Code: ANSI/NFPA70.

Table 6

Model \ AWG	Max. Power Line Length (ft.) (A)	Max. Control Line Length (ft.) (B) (C)	Fuse or Circuit Capacity
	(#12)	(#14)	
CMH1972	85 (Max.)	82 (Max.)	20 A
CMH2472	85 (Max.)	82 (Max.)	20 A
CMH3172	85 (Max.)	100 (Max.)	20 A

... AWG (American Wire Gauge)



WARNING

- Be sure to comply with local codes on running the wire from the indoor unit to the outdoor unit (size of wire and wiring method, etc.).
- Each wire must be firmly connected.
- No wire should be allowed to touch refrigerant tubing, the compressor, or any moving part.
- Be sure to connect power wires correctly matching up numbers on terminals of the outdoor unit and respective indoor units A – D.



CAUTION

- Be sure to connect the power supply line to the outdoor unit as shown in the wiring diagram. The indoor unit draws its power from the outdoor unit.
- Do not run wiring for antenna, signal, or power lines of television, radio, stereo, telephone, security system, or intercom any closer than 3'4" (1 m) from the power cable and wires between the indoor and outdoor units. Electrical noise may affect the operation.



WARNING

- To avoid the risk of electric shock, each air conditioner unit must be grounded.
- For the installation of a grounding device, please observe local electrical codes.
- Grounding is necessary, especially for units using inverter circuits, in order to release charged electricity and electrical noise caused by high tension. Otherwise, electrical shock may occur.
- Place a dedicated ground more than 7' (2 m) away from other grounds and do not have it shared with other electric appliances.

* NOTE

Disconnect switch may be required by national or local codes.



CAUTION

Always comply with national and local code requirements.

5-3. Wiring System Diagram

3 indoor units with CMH1972

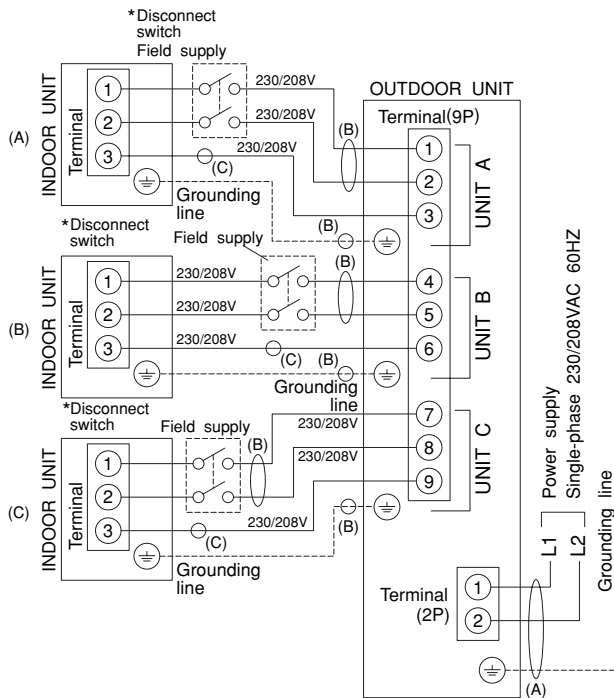


Fig. 25a

4 indoor units with CMH2472, CMH3172

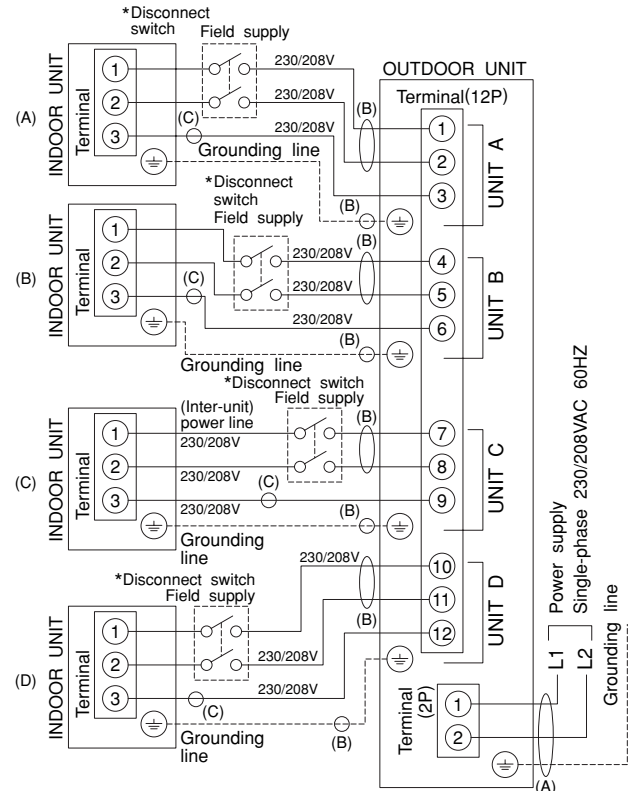


Fig. 25b

5-4. How to Connect Wiring to the Terminal



WARNING

Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, be sure all wiring is tightly connected.

When connecting each power wire to the corresponding terminal, follow the instructions “How to connect wiring to the terminal” and fasten the wire securely tight with the fixing screw of the terminal plate.

How to connect wiring to the terminal

a) For Indoor Unit

- (1) Cut the wire end with a cutting pliers, then strip the insulation to expose the wire about 9/32" (7 mm). See the label (Fig. 26) near the terminal plate.
- (2) Using a screwdriver, loosen the terminal screw on the terminal plate.
- (3) Insert the wire and tighten the terminal screw completely using a screwdriver.

b) For Outdoor Unit

■ For solid core wiring (or F-cable)

- (1) Cut the wire end with a cutting pliers, then strip the insulation to expose the solid wire about 15/16" (25 mm). (Fig. 27)
- (2) Using a screwdriver, remove the terminal screw(s) on the terminal plate.
- (3) Using the pliers, bend the solid wire to form a loop suitable for the terminal screw.
- (4) Shape the loop wire properly, place it on the terminal plate and fix it securely with the removed terminal screw using a screwdriver.

■ For stranded wiring

- (1) Cut the wire end with a cutting pliers, then strip the insulation to expose the stranded wiring about 3/8" (10 mm) and tightly twist the wire ends. (Figs. 28 and 29)
- (2) Using a screwdriver, remove the terminal screw(s) on the terminal plate.
- (3) Using a ring connector fastener or pliers, securely clamp each stripped wire end with a ring connector. (Fig. 28)
- (4) Place the ring connector wire, and replace and tighten the removed terminal screw using a screwdriver. (Fig. 30)

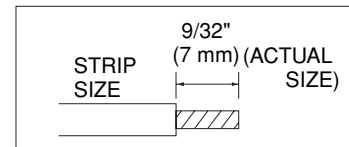


Fig. 26

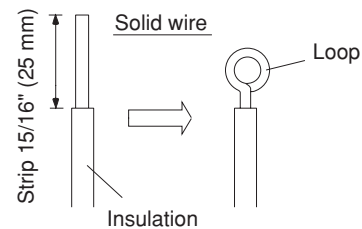


Fig. 27

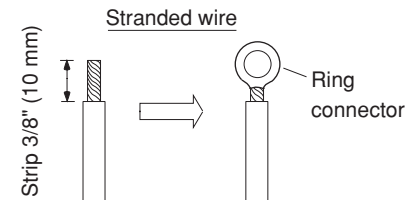


Fig. 28

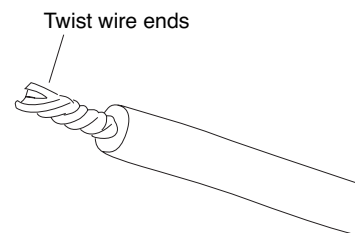


Fig. 29

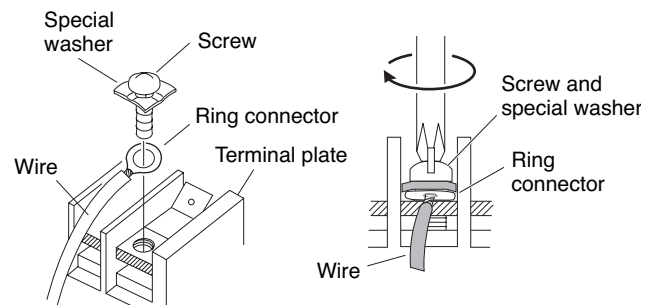


Fig. 30

5-5. Wiring Instructions for the Outdoor Unit



CAUTION

- Be sure to correctly align inter-unit cables A, B, C and D.

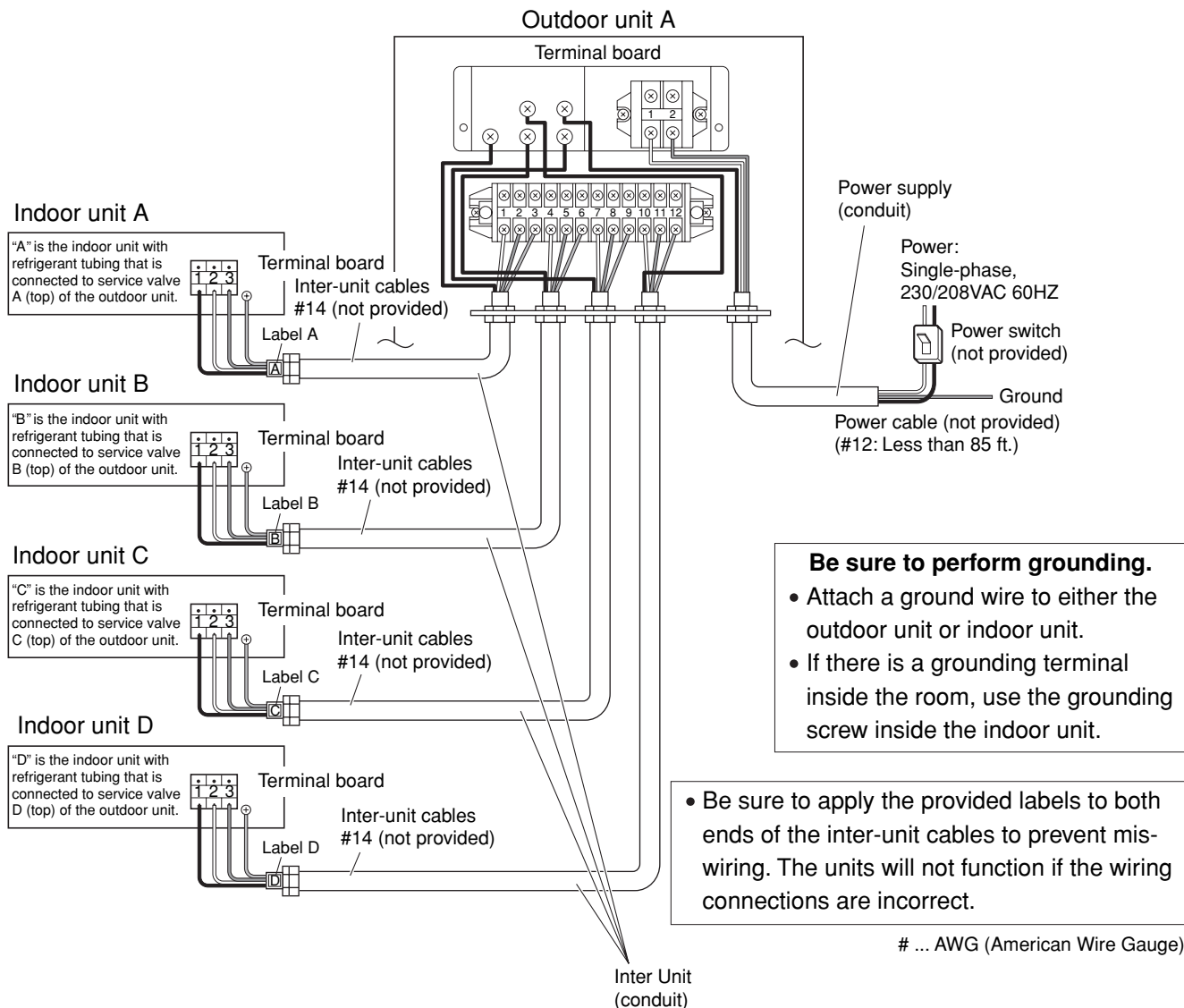


Fig. 31

- Use a dedicated A/C circuit for power.
- To make connections to the outdoor unit, remove the inspection panel and tubing panel.
- Do not bring the inter-unit cables or power cable into contact with tubing or service valves.
- Use outdoor unit cable fasteners and fasten the inter-unit cables at the location where the cables are double-sheathed.
- Arrange the wiring so that the inter-unit cables are contained in the inspection panel and tubing panel, as shown in Fig. 31.

Regulations on wire size differ from locality to locality. For field wiring requirements, please refer to your local electrical codes. Make sure that the installation fully complies with all local and national regulations.

- (1) Remove access panel "C". (Fig. 32)
- (2) Connect the inter-unit and power supply line according to the drawing on the panel side.
- (3) Be sure to size each wire allowing approx. 4" (10 cm) longer than the required length for wiring. Store excess wiring inside the cabinet.
- (4) When connections are completed, check that all connections are correct as shown in the wiring system diagram on panel side.
- (5) Be sure to ground the unit according to your local codes.

6. Test Run

Performing a test run

- Refer to the test run procedures in the indoor unit installation manual.
- Perform the test run separately for each connected indoor unit. If 2 units are operated simultaneously, it is not possible to correctly check for errors in tubing and wiring.
- If the room temperature is 59°F (15°C) or below, it may not be possible to check for tubing errors with cooling operation. If this occurs, perform heating operation for each unit individually, and check that warm air is discharged from each unit. If there is cold air mixed in with the warm air, check the tubing connections again.

Checking tubing and wiring

Perform the test run and check that operation is normal. If there is an error in tubing or wiring, the refrigerant may flow to indoor unit B when indoor unit A is operated (for example).



- Stop operation immediately if there is an error in tubing or wiring. Turn the power (breaker) to OFF, and check whether the inter-unit cables are connected incorrectly, or whether the narrow tubes A and B are connected in reverse. Correct the connections.
- If there is an error in tubing, pump-down must be performed. Be sure to perform pump-down. After making corrections, again purge the air from the tubes.

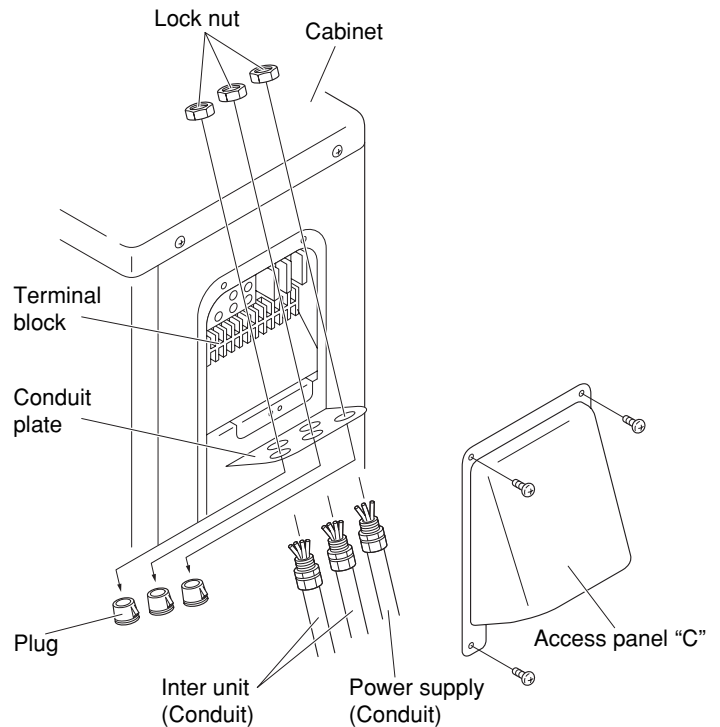


Fig. 32

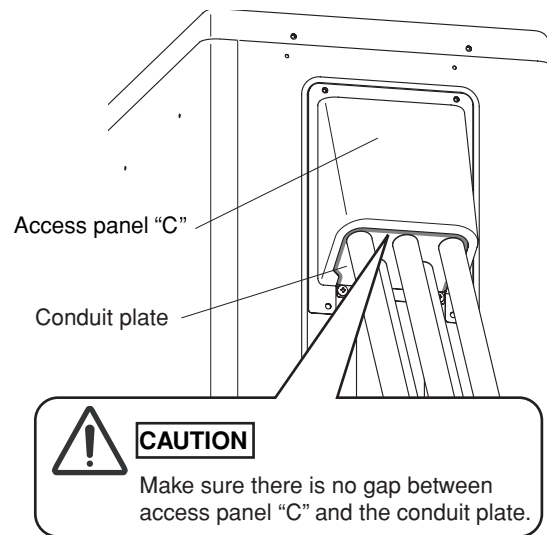


Fig. 33

7. Connecting a Home Automation Device

The HA (white) 4P terminal is located on the indoor unit PCB. If a HA device will be used, connect it to this terminal.

8. Installation Check Sheet

- ☐ The strength of the installation location is sufficient to support the A/C weight.
- ☐ The indoor and outdoor units are installed level and vertically.
- ☐ The power and voltage are as specified.
- ☐ Inter-unit cables are securely fastened to the terminal board.
- ☐ Inter-unit cables are securely fixed.
- ☐ The power cord and inter-unit cables are not connected anywhere along their paths.
- ☐ The ground wire is securely connected.
- ☐ An air purge of the refrigerant circuit has been conducted.
- ☐ A leak test of the tubing connections has been performed.
- ☐ Thermal insulation has been applied to the tubing connections.
- ☐ Drain connections are secure and water drains properly.
- ☐ Putty has been used to close the hole in the wall.
- ☐ All service valves are fully open.
- ☐ Remote controller signals are being positively received.

APPENDIX B UNIT COMBINATION TABLES

< List of Combination Tables >

Name of Combination Table	Model No. of Outdoor Unit	Remarks
3-Room Outdoor Unit Combination Table	CMH1972	OI-852-6-4180-821-00-4
4-Room Outdoor Unit Combination Table	CMH2472	OI-852-6-4180-822-00-5
4-Room Outdoor Unit Combination Table	CMH3172	OI-852-6-4180-805-00-4

NOTE

Be sure to operate the air conditioning system only when 2 or more indoor units have been installed. If operated with only a single unit installed, the returning fluid to the compressor may cause a malfunction.

Save this Combination Table!

Please be sure to hand over this sheet to the user.



3-Room Outdoor Unit Combination Table

CMH1972

<Combinations of Connectable Indoor Units>

The combinations of the indoor units listed in Table 1 and Table 2 are combinations solely of those units which can be operated concurrently. In addition to the combinations listed in the table, other combinations of indoor units are possible provided that the following conditions are satisfied.

Conditions:

1. At least two or more indoor units must be connected to the multi outdoor unit. It is not acceptable for only one indoor unit to be connected.
2. The total rated cooling capacity of the indoor units to be connected must be no more than 200% of the rated cooling capacity of the outdoor unit.



CAUTION

In this case, all the indoor units installed must not be operated concurrently under any circumstances. Otherwise, the air conditioner may not run properly and trouble may occur.

Example: When 3 indoor units are connected

at 230V

If the following holds true

- Rated cooling capacity of CMH1972 outdoor unit: C=19100 (BTU/h)
- Rated cooling capacity of indoor units: K1, K2, ... (BTU/h)

Then:

$$C \times 2 (200\%) \geq K1 + K2 + \dots$$

$$19100 \times 2 \geq 7500 + 11900 + 17500$$

$$38200 \geq 36900$$

It is therefore possible to connect 3 units with respective capacities of 7500 + 11900 + 17500.

However, since this combination is not found in the 3-room operation column of Table 1, operating all these units concurrently may result in trouble. At a time like this, shut down at least one of the 3 indoor units to match one of the combinations found in the 2-room operation column of Table 1.

at 208V

If the following holds true

- Rated cooling capacity of CMH1972 outdoor unit: C=19100 (BTU/h)
- Rated cooling capacity of indoor units: K1, K2, ... (BTU/h)

Then:

$$C \times 2 (200\%) \geq K1 + K2 + \dots$$

$$19100 \times 2 \geq 7500 + 11900 + 17500$$

$$38200 \geq 36900$$

It is therefore possible to connect 3 units with respective capacities of 7500 + 11900 + 17500.

However, since this combination is not found in the 3-room operation column of Table 2, operating all these units concurrently may result in trouble. At a time like this, shut down at least one of the 3 indoor units to match one of the combinations found in the 2-room operation column of Table 2.

NOTE

Be sure to operate the air conditioning system only when 2 or more indoor units have been installed.
If operated with only a single unit installed, the returning fluid to the compressor may cause a malfunction.

< Combinations of operatable indoor units >

Voltage Rating : 230V 60Hz

CMH1972

(Rated cooling capacity at 230V: 19100 BTU/h)

NOTE

7500 : KMHS0772
9000 : KMHS0972
11900 : KMHS1272
17500 : KMHS1872

Table 1

	Indoor Unit Combination			Indoor Unit Capacity (BTU/h)																	
				COOLING					HEATING												
				Room A	Room B	Room C	Total Performance				Room A	Room B	Room C	Total Performance							
							Capacity	(	Min.	-				Max.	)	Capacity	(	Min.	-	Max.	)
Single-room Operation	7500	=	7500	7500			7500	(	4700	-	8800	)	8500			8500	(	6100	-	14600	)
	9000	=	9000	9000			9000	(	4700	-	10900	)	12200			12200	(	6100	-	16000	)
	11900	=	11900	11900			11900	(	5100	-	12200	)	14300			14300	(	6400	-	16700	)
	17500	=	17500	17500			17500	(	5400	-	19100	)	20400			20400	(	6800	-	24800	)
2-room Operation	7500 + 7500	=	15000	7500	7500		15000	(	6800	-	17400	)	8500	8500		17000	(	6800	-	21800	)
	7500 + 9000	=	16500	7485	9015		16500	(	6800	-	19100	)	8525	12275		20800	(	7100	-	24800	)
	7500 + 11900	=	19400	6716	10684		17400	(	6800	-	19100	)	8358	14042		22400	(	7100	-	24800	)
	7500 + 17500	=	25000	5507	12893		18400	(	7100	-	19100	)	7000	16800		23800	(	8100	-	24800	)
	9000 + 9000	=	18000	8500	8500		17000	(	6800	-	19100	)	11600	11600		23200	(	7800	-	24800	)
	9000 + 11900	=	20900	7627	10073		17700	(	7100	-	19100	)	10800	12600		23400	(	7800	-	24800	)
	9000 + 17500	=	26500	6353	12347		18700	(	7100	-	19100	)	9075	15125		24200	(	8100	-	24800	)
	11900 + 11900	=	23800	9200	9200		18400	(	6800	-	19100	)	11900	11900		23800	(	7800	-	24800	)
	11900 + 17500	=	29400	7728	11372		19100	(	7100	-	19100	)	10129	14471		24600	(	8100	-	24800	)
3-room Operation	7500 + 7500 + 7500	=	22500	6000	6000	6000	18000	(	8500	-	19100	)	7800	7800	7800	23400	(	9200	-	24800	)
	7500 + 7500 + 9000	=	24000	5742	5742	6916	18400	(	9800	-	19100	)	6919	6919	9963	23800	(	10200	-	24800	)
	7500 + 7500 + 11900	=	26900	5263	5263	8373	18900	(	9800	-	19100	)	6576	6578	11048	24200	(	10900	-	24800	)
	7500 + 7500 + 17500	=	32500	4400	4400	10300	19100	(	9800	-	19100	)	5636	5636	13527	24800	(	11600	-	24800	)
	7500 + 9000 + 9000	=	25500	5603	6749	6749	19100	(	9800	-	19100	)	6237	8981	8981	24200	(	11600	-	24800	)
	7500 + 9000 + 11900	=	28400	5032	6062	8006	19100	(	9800	-	19100	)	5971	8598	10031	24600	(	11600	-	24800	)
	7500 + 9000 + 17500	=	34000	4202	5062	9837	19100	(	9800	-	19100	)	5124	7379	12298	24800	(	11600	-	24800	)
	7500 + 11900 + 11900	=	31300	4567	7266	7266	19100	(	9800	-	19100	)	5688	9556	9556	24800	(	11600	-	24800	)
	9000 + 9000 + 9000	=	27000	6367	6367	6367	19100	(	9800	-	19100	)	8267	8267	8267	24800	(	11600	-	24800	)
	9000 + 9000 + 11900	=	29900	5752	5752	7597	19100	(	9800	-	19100	)	7832	7832	9137	24800	(	11600	-	24800	)
	9000 + 11900 + 11900	=	32800	5245	6927	6927	19100	(	9800	-	19100	)	7440	8680	8680	24800	(	11600	-	24800	)
	11900 + 11900 + 11900	=	35700	6367	6367	6367	19100	(	9800	-	19100	)	8267	8267	8267	24800	(	11600	-	24800	)

- The table lists the wall-mounted type of indoor units as representative models.

Voltage Rating : 208V 60Hz

CMH1972

(Rated cooling capacity at 208V: 19100 BTU/h)

NOTE

7500 : KMHS0772
9000 : KMHS0972
11900 : KMHS1272
17500 : KMHS1872

Table 2

	Indoor Unit Combination			Indoor Unit Capacity (BTU/h)											
				COOLING					HEATING						
				Room A	Room B	Room C	Total Performance			Room A	Room B	Room C	Total Performance		
							Capacity	Min.	- Max.				Capacity	Min.	- Max.
Single-room Operation	7500	=	7500	7500			7500	(4700 - 8800)	8500			8500	(6100 - 14600)		
	9000	=	9000	9000			9000	(4700 - 10900)	12200			12200	(6100 - 16000)		
	11900	=	11900	11900			11900	(5100 - 12200)	14300			14300	(6400 - 16700)		
	17500	=	17500	17500			17500	(5400 - 19100)	20400			20400	(6800 - 24400)		
2-room Operation	7500 + 7500	=	15000	7500	7500		15000	(6800 - 17400)	8500	8500		17000	(6800 - 21800)		
	7500 + 9000	=	16500	7485	9015		16500	(6800 - 19100)	8525	12275		20800	(7100 - 24800)		
	7500 + 11900	=	19400	6716	10684		17400	(6800 - 19100)	8358	14042		22400	(7100 - 24800)		
	7500 + 17500	=	25000	5507	12893		18400	(7100 - 19100)	7000	16800		23800	(8100 - 24800)		
	9000 + 9000	=	18000	8500	8500		17000	(6800 - 19100)	11600	11600		23200	(7800 - 24800)		
	9000 + 11900	=	20900	7627	10073		17700	(7100 - 19100)	10800	12600		23400	(7800 - 24800)		
	9000 + 17500	=	26500	6353	12347		18700	(7100 - 19100)	9075	15125		24200	(8100 - 24800)		
	11900 + 11900	=	23800	9200	9200		18400	(6800 - 19100)	11900	11900		23800	(7800 - 24800)		
	11900 + 17500	=	29400	7728	11372		19100	(7100 - 19100)	10129	14471		24600	(8100 - 24800)		
3-room Operation	7500 + 7500 + 7500	=	22500	6000	6000	6000	18000	(8500 - 19100)	7800	7800	7800	23400	(9200 - 24800)		
	7500 + 7500 + 9000	=	24000	5742	5742	6916	18400	(9800 - 19100)	6919	6919	9963	23800	(10200 - 24800)		
	7500 + 7500 + 11900	=	26900	5263	5263	8373	18900	(9800 - 19100)	6576	6576	11048	24200	(10900 - 24800)		
	7500 + 7500 + 17500	=	32500	4400	4400	10300	19100	(9800 - 19100)	5636	5636	13527	24800	(11600 - 24800)		
	7500 + 9000 + 9000	=	25500	5603	6749	6749	19100	(9800 - 19100)	6237	8981	8981	24200	(11600 - 24800)		
	7500 + 9000 + 11900	=	28400	5032	6062	8006	19100	(9800 - 19100)	5971	8598	10031	24600	(11600 - 24800)		
	7500 + 9000 + 17500	=	34000	4202	5062	9837	19100	(9800 - 19100)	5124	7379	12298	24800	(11600 - 24800)		
	7500 + 11900 + 11900	=	31300	4567	7266	7266	19100	(9800 - 19100)	5688	9556	9556	24800	(11600 - 24800)		
	9000 + 9000 + 9000	=	27000	6367	6367	6367	19100	(9800 - 19100)	8267	8267	8267	24800	(11600 - 24800)		
	9000 + 9000 + 11900	=	29900	5752	5752	7597	19100	(9800 - 19100)	7832	7832	9137	24800	(11600 - 24800)		
	9000 + 11900 + 11900	=	32800	5245	6927	6927	19100	(9800 - 19100)	7440	8680	8680	24800	(11600 - 24800)		
	11900 + 11900 + 11900	=	35700	6367	6367	6367	19100	(9800 - 19100)	8267	8267	8267	24800	(11600 - 24800)		

- The table lists the wall-mounted type of indoor units as representative models.

Save this Combination Table!

Please be sure to hand over this sheet to the user.



4-Room Outdoor Unit Combination Table

CMH2472

<Combinations of Connectable Indoor Units>

The combinations of the indoor units listed in Table 1 and Table 2 are combinations solely of those units which can be operated concurrently. In addition to the combinations listed in the table, other combinations of indoor units are possible provided that the following conditions are satisfied.

Conditions:

1. At least two or more indoor units must be connected to the multi outdoor unit. It is not acceptable for only one indoor unit to be connected.
2. The total rated cooling capacity of the indoor units to be connected must be no more than 200% of the rated cooling capacity of the outdoor unit.



CAUTION

In this case, all the indoor units installed must not be operated concurrently under any circumstances. Otherwise, the air conditioner may not run properly and trouble may occur.

Example: When 4 indoor units are connected

at 230V

If the following holds true

- Rated cooling capacity of CMH2472 outdoor unit: C=23200 (BTU/h)
- Rated cooling capacity of indoor units: K1, K2, ... (BTU/h)

Then:

$$C \times 2 (200\%) \geq K1 + K2 + \dots$$

$$23200 \times 2 \geq 7500 + 7500 + 7500 + 17500$$

$$46400 \geq 40000$$

It is therefore possible to connect 4 units with respective capacities of 7500 + 7500 + 7500 + 17500.

However, since this combination is not found in the 4-room operation column of Table 1, operating all these units concurrently may result in trouble. At a time like this, shut down at least one of the 4 indoor units to match one of the combinations found in the 3-room operation column of Table 1.

at 208V

If the following holds true

- Rated cooling capacity of CMH2472 outdoor unit: C=23200 (BTU/h)
- Rated cooling capacity of indoor units: K1, K2, ... (BTU/h)

Then:

$$C \times 2 (200\%) \geq K1 + K2 + \dots$$

$$23200 \times 2 \geq 7500 + 7500 + 7500 + 17500$$

$$46400 \geq 40000$$

It is therefore possible to connect 4 units with respective capacities of 7500 + 7500 + 7500 + 17500.

However, since this combination is not found in the 4-room operation column of Table 2, operating all these units concurrently may result in trouble. At a time like this, shut down at least one of the 4 indoor units to match one of the combinations found in the 3-room operation column of Table 2.

NOTE

Be sure to operate the air conditioning system only when 2 or more indoor units have been installed.

If operated with only a single unit installed, the returning fluid to the compressor may cause a malfunction.

< Combinations of operatable indoor units >

Voltage Rating : 230V 60Hz

CMH2472

(Rated cooling capacity at 230V: 23200 BTU/h)

NOTE

7500 : KMHS0772
9000 : KMHS0972
11900 : KMHS1272
17500 : KMHS1872
24200 : KMHS2472

Table 1

	Indoor Unit Combination	Indoor Unit Capacity (BTU/h)											
		COOLING						HEATING					
		Room A	Room B	Room C	Room D	Total Performance			Room A	Room B	Room C	Room D	Total Performance
						Capacity	(Min. - Max.)						Capacity (Min. - Max.)
Single-room Operation	7500	= 7500	7500			7500	(4700 - 8800)	8500					8500 (6100 - 14600)
	9000	= 9000	9000			9000	(4700 - 10900)	12200					12200 (6100 - 16000)
	11900	= 11900	11900			11900	(5100 - 12200)	14300					14300 (6400 - 16700)
	17500	= 17500	17500			17500	(5400 - 19700)	20400					20400 (6800 - 26200)
	24200	= 24200	23200			23200	(5400 - 23200)	27200					27200 (6800 - 27200)
2-room Operation	7500 + 7500	= 15000	7500	7500		15000	(6800 - 17400)	8500	8500				17000 (6800 - 21800)
	7500 + 9000	= 16500	7485	9015		16500	(6800 - 19700)	8525	12275				20800 (7100 - 25400)
	7500 + 11900	= 19400	7488	11912		19400	(6800 - 22800)	8507	14293				22800 (7100 - 28200)
	7500 + 17500	= 25000	6705	15695		22400	(7100 - 23200)	8294	19906				28200 (8100 - 29200)
	7500 + 24200	= 31700	5488	17712		23200	(7100 - 23200)	6636	22564				29200 (8100 - 29200)
	9000 + 9000	= 18000	9000	9000		18000	(6800 - 21400)	12200	12200				24400 (7800 - 29000)
	9000 + 11900	= 20900	8618	11382		20000	(6800 - 23200)	11908	13892				25800 (7800 - 29000)
	9000 + 17500	= 26500	7746	15054		22800	(7100 - 23200)	10725	17875				28600 (8100 - 29200)
	9000 + 24200	= 33200	6306	16894		23200	(7100 - 23200)	8688	20512				29200 (8100 - 29200)
	11900 + 11900	= 23800	11200	11200		22400	(6800 - 23200)	13600	13600				27200 (7800 - 29000)
	11900 + 17500	= 29400	9387	13813		23200	(7100 - 23200)	11941	17059				29000 (8100 - 29200)
	11900 + 24200	= 36100	7660	15540		23200	(7100 - 23200)	9657	19543				29200 (8100 - 29200)
3-room Operation	17500 + 17500	= 35000	11600	11600		23200	(7100 - 23200)	14600	14600				29200 (8100 - 29200)
	7500 + 7500 + 7500	= 22500	7333	7333	7333	22000	(8500 - 23200)	8467	8467	8467			25400 (9200 - 29000)
	7500 + 7500 + 9000	= 24000	6990	6990	8420	22400	(9800 - 23200)	7907	7907	11386			27200 (10200 - 29200)
	7500 + 7500 + 11900	= 26900	6405	6405	10190	23000	(9800 - 23200)	7663	7663	12874			28200 (10900 - 29200)
	7500 + 7500 + 17500	= 32500	5345	5345	12511	23200	(9800 - 23200)	6636	6636	15927			29200 (11600 - 29200)
	7500 + 9000 + 9000	= 25500	6688	8056	8056	22800	(9800 - 23200)	7371	10614	10614			28600 (11600 - 29200)
	7500 + 9000 + 11900	= 28400	6113	7363	9725	23200	(9800 - 23200)	7039	10136	11825			29000 (11600 - 29200)
	7500 + 9000 + 17500	= 34000	5104	6148	11948	23200	(9800 - 23200)	6033	8688	14479			29200 (11600 - 29200)
	7500 + 11900 + 11900	= 31300	5548	8826	8826	23200	(9800 - 23200)	6697	11251	11251			29200 (11600 - 29200)
	7500 + 11900 + 17500	= 36900	4704	7484	11012	23200	(9800 - 23200)	5748	9657	13795			29200 (11600 - 29200)
	9000 + 9000 + 9000	= 27000	7733	7733	7733	23200	(9800 - 23200)	9733	9733	9733			29200 (11600 - 29200)
	9000 + 9000 + 11900	= 29900	6986	6986	9227	23200	(9800 - 23200)	9221	9221	10758			29200 (11600 - 29200)
	9000 + 9000 + 17500	= 35500	5883	5883	11433	23200	(9800 - 23200)	7964	7964	13273			29200 (11600 - 29200)
	9000 + 11900 + 11900	= 32800	6371	8415	8415	23200	(9800 - 23200)	8760	10220	10220			29200 (11600 - 29200)
	9000 + 11900 + 17500	= 38400	5441	7186	10573	23200	(9800 - 23200)	7617	8887	12696			29200 (11600 - 29200)
4-room Operation	11900 + 11900 + 11900	= 35700	7733	7733	7733	23200	(9800 - 23200)	9733	9733	9733			29200 (11600 - 29200)
	11900 + 11900 + 17500	= 41300	6683	6683	9834	23200	(9800 - 23200)	8517	8517	12167			29200 (11600 - 29200)

IMPORTANT!

(Concurrent operation of 4 indoor units prohibited)

This multi outdoor unit allows up to four indoor units to be connected. However, all four indoor units must not be operated concurrently. Otherwise, the air conditioner may not run properly. Up to three indoor units may be operated concurrently.

- The table lists the wall-mounted type of indoor units as representative models.

Voltage Rating : 208V 60Hz

CMH2472

(Rated cooling capacity at 208V: 23200 BTU/h)

NOTE

7500 : KMHS0772
9000 : KMHS0972
11900 : KMHS1272
17500 : KMHS1872
24200 : KMHS2472

Table 2

	Indoor Unit Combination			Indoor Unit Capacity (BTU/h)													
				COOLING						HEATING							
				Room A	Room B	Room C	Room D	Total Performance			Room A	Room B	Room C	Room D	Total Performance		
								Capacity	(Min. - Max.)							Capacity	(Min. - Max.)
Single-room Operation	7500	= 7500	7500					7500	(4700 - 8800)		8500					8500	(6100 - 14600)
	9000	= 9000	9000					9000	(4700 - 10900)		12200					12200	(6100 - 16000)
	11900	= 11900	11900					11900	(5100 - 12200)		14300					14300	(6400 - 16700)
	17500	= 17500	17500					17500	(5400 - 19700)		20400					20400	(6800 - 24400)
	24200	= 24200	22400					22400	(5400 - 22400)		25800					25800	(6800 - 25800)
2-room Operation	7500 + 7500	= 15000	7500	7500				15000	(6800 - 17400)		8500	8500				17000	(6800 - 21800)
	7500 + 9000	= 16500	7485	9015				16500	(6800 - 19700)		8525	12275				20800	(7100 - 25400)
	7500 + 11900	= 19400	7488	11912				19400	(6800 - 22800)		8507	14293				22800	(7100 - 28200)
	7500 + 17500	= 25000	6705	15695				22400	(7100 - 23200)		8294	19906				28200	(8100 - 29200)
	7500 + 24200	= 31700	5488	17712				23200	(7100 - 23200)		6636	22564				29200	(8100 - 29200)
	9000 + 9000	= 18000	9000	9000				18000	(6800 - 21400)		12200	12200				24400	(7800 - 28200)
	9000 + 11900	= 20900	8618	11382				20000	(6800 - 23200)		11908	13892				25800	(7800 - 29000)
	9000 + 17500	= 26500	7746	15054				22800	(7100 - 23200)		10725	17875				28600	(8100 - 29200)
	9000 + 24200	= 33200	6306	16894				23200	(7100 - 23200)		8688	20512				29200	(8100 - 29200)
	11900 + 11900	= 23800	11200	11200				22400	(6800 - 23200)		13600	13600				27200	(7800 - 28600)
	11900 + 17500	= 29400	9387	13813				23200	(7100 - 23200)		11941	17059				29000	(8100 - 29200)
	11900 + 24200	= 36100	7660	15540				23200	(7100 - 23200)		9657	19543				29200	(8100 - 29200)
17500 + 17500	= 35000	11600	11600				23200	(7100 - 23200)		14600	14600				29200	(8100 - 29200)	
3-room Operation	7500 + 7500 + 7500	= 22500	7333	7333	7333			22000	(8500 - 23200)		8467	8467	8467			25400	(9200 - 29000)
	7500 + 7500 + 9000	= 24000	6990	6990	8420			22400	(9800 - 23200)		7907	7907	11386			27200	(10200 - 29200)
	7500 + 7500 + 11900	= 26900	6405	6405	10190			23000	(9800 - 23200)		7663	7663	12874			28200	(10900 - 29200)
	7500 + 7500 + 17500	= 32500	5345	5345	12511			23200	(9800 - 23200)		6636	6636	15927			29200	(11600 - 29200)
	7500 + 9000 + 9000	= 25500	6688	8056	8056			22800	(9800 - 23200)		7371	10614	10614			28600	(11600 - 29200)
	7500 + 9000 + 11900	= 28400	6113	7363	9725			23200	(9800 - 23200)		7039	10136	11825			29000	(11600 - 29200)
	7500 + 9000 + 17500	= 34000	5104	6148	11948			23200	(9800 - 23200)		6033	8688	14479			29200	(11600 - 29200)
	7500 + 11900 + 11900	= 31300	5548	8826	8826			23200	(9800 - 23200)		6697	11251	11251			29200	(11600 - 29200)
	7500 + 11900 + 17500	= 36900	4704	7484	11012			23200	(9800 - 23200)		5748	9657	13795			29200	(11600 - 29200)
	9000 + 9000 + 9000	= 27000	7733	7733	7733			23200	(9800 - 23200)		9733	9733	9733			29200	(11600 - 29200)
	9000 + 9000 + 11900	= 29900	6986	6986	9227			23200	(9800 - 23200)		9221	9221	10758			29200	(11600 - 29200)
	9000 + 9000 + 17500	= 35500	5883	5883	11433			23200	(9800 - 23200)		7964	7964	13273			29200	(11600 - 29200)
	9000 + 11900 + 11900	= 32800	6371	8415	8415			23200	(9800 - 23200)		8760	10220	10220			29200	(11600 - 29200)
	9000 + 11900 + 17500	= 38400	5441	7186	10573			23200	(9800 - 23200)		7617	8887	12696			29200	(11600 - 29200)
	11900 + 11900 + 11900	= 35700	7733	7733	7733			23200	(9800 - 23200)		9733	9733	9733			29200	(11600 - 29200)
	11900 + 11900 + 17500	= 41300	6683	6683	9834			23200	(9800 - 23200)		8517	8517	12167			29200	(11600 - 29200)
	4-room Operation																
IMPORTANT! (Concurrent operation of 4 indoor units prohibited) This multi outdoor unit allows up to four indoor units to be connected. However, all four indoor units must not be operated concurrently. Otherwise, the air conditioner may not run properly. Up to three indoor units may be operated concurrently.																	

IMPORTANT! (Concurrent operation of 4 indoor units prohibited)
This multi outdoor unit allows up to four indoor units to be connected.
However, all four indoor units must not be operated concurrently.
Otherwise, the air conditioner may not run properly.
Up to three indoor units may be operated concurrently.

- The table lists the wall-mounted type of indoor units as representative models.

Save this Combination Table!

Please be sure to hand over this sheet to the user.



4-Room Outdoor Unit Combination Table

CMH3172

<Combinations of Connectable Indoor Units>

The combinations of the indoor units listed in Table 1 and Table 2 are combinations solely of those units which can be operated concurrently. In addition to the combinations listed in the table, other combinations of indoor units are possible provided that the following conditions are satisfied.

Conditions:

1. At least two or more indoor units must be connected to the multi outdoor unit. It is not acceptable for only one indoor unit to be connected.
2. The total rated cooling capacity of the indoor units to be connected must be no more than 200% of the rated cooling capacity of the outdoor unit.



CAUTION

In this case, all the indoor units installed must not be operated concurrently under any circumstances. Otherwise, the air conditioner may not run properly and trouble may occur.

Example: When 4 indoor units are connected

at 230V

If the following holds true

- Rated cooling capacity of CMH3172 outdoor unit: C=30600 (BTU/h)
- Rated cooling capacity of indoor units: K1, K2, ... (BTU/h)

Then:

$$C \times 2 (200\%) \geq K1 + K2 + \dots$$

$$30600 \times 2 \geq 7500 + 7500 + 11900 + 24200$$

$$61200 \geq 51100$$

It is therefore possible to connect 4 units with respective capacities of 7500 + 7500 + 11900 + 24200.

However, since this combination is not found in the 4-room operation column of Table 1, operating all these units concurrently may result in trouble. At a time like this, shut down at least one of the 4 indoor units to match one of the combinations found in the 3-room operation column of Table 1.

at 208V

If the following holds true

- Rated cooling capacity of CMH3172 outdoor unit: C=28600 (BTU/h)
- Rated cooling capacity of indoor units: K1, K2, ... (BTU/h)

Then:

$$C \times 2 (200\%) \geq K1 + K2 + \dots$$

$$28600 \times 2 \geq 7500 + 7500 + 11900 + 24200$$

$$57200 \geq 51100$$

It is therefore possible to connect 4 units with respective capacities of 7500 + 7500 + 11900 + 24200.

However, since this combination is not found in the 4-room operation column of Table 2, operating all these units concurrently may result in trouble. At a time like this, shut down at least one of the 4 indoor units to match one of the combinations found in the 3-room operation column of Table 2.

NOTE

Be sure to operate the air conditioning system only when 2 or more indoor units have been installed.

If operated with only a single unit installed, the returning fluid to the compressor may cause a malfunction.

< Combinations of operatable indoor units >

Voltage Rating : 230V 60Hz

CMH3172

(Rated cooling capacity at 230V: 30600 BTU/h)

NOTE

7500 : KMHS0772
9000 : KMHS0972
11900 : KMHS1272
17500 : KMHS1872
24200 : KMHS2472

Table 1

	Indoor Unit Combination	Indoor Unit Capacity (BTU/h)																
		COOLING						HEATING										
		Room A	Room B	Room C	Room D	Total Performance				Room A	Room B	Room C	Room D	Total Performance				
						Capacity	Min.	-	Max.						Capacity	Min.	-	Max.
Single-room Operation	7500	= 7500	7500			7500	4000	-	8800	8500					8500	6100	-	14600
	9000	= 9000	9000			9000	4400	-	10900	12200					12200	6100	-	16000
	11900	= 11900	11900			11900	4700	-	12200	14300					14300	6400	-	17400
	17500	= 17500	17500			17500	5100	-	19700	20400					20400	6800	-	26600
	24200	= 24200	24200			24200	5400	-	25200	29000					29000	6800	-	30000
2-room Operation	7500 + 7500	= 15000	7500	7500		15000	4400	-	17400	8500	8500				17000	6800	-	21800
	7500 + 9000	= 16500	7500	9000		16500	5100	-	19700	8541	12259				20800	7100	-	25400
	7500 + 11900	= 19400	7500	11900		19400	5800	-	22800	8500	14300				22800	7800	-	28200
	7500 + 17500	= 25000	7320	17080		24400	7500	-	26200	8529	20471				29000	10200	-	32000
	7500 + 24200	= 31700	6625	21375		28000	7800	-	30000	6800	23200				30000	10200	-	32000
	9000 + 9000	= 18000	9000	9000		18000	5800	-	22000	12200	12200				24400	8100	-	29000
	9000 + 11900	= 20900	8957	11843		20800	6400	-	25200	11878	13922				25800	8800	-	29000
	9000 + 17500	= 26500	8626	16774		25400	7800	-	29000	11002	18398				29400	11200	-	32000
	9000 + 24200	= 33200	7861	21139		29000	7800	-	30000	9061	21539				30600	11200	-	32000
	11900 + 11900	= 23800	11900	11900		23800	7500	-	28600	13600	13600				27200	9800	-	29000
	11900 + 17500	= 29400	10848	15952		26800	8800	-	30000	12281	17519				29800	11600	-	32000
	11900 + 24200	= 36100	9625	19575		29200	8800	-	30000	10238	20762				31000	11600	-	32000
	17500 + 17500	= 35000	14500	14500		29000	8800	-	30000	15300	15300				30600	11600	-	32000
	17500 + 24200	= 41700	12296	17004		29300	9200	-	30000	13215	18785				32000	11600	-	32000
3-room Operation	7500 + 7500 + 7500	= 22500	7467	7467	7467	22400	6800	-	26200	8467	8467	8467		25400	9200	-	30600	
	7500 + 7500 + 9000	= 24000	7500	7500	9000	24000	7500	-	26600	8442	8442	12116		29000	10200	-	31200	
	7500 + 7500 + 11900	= 26900	7082	7082	11236	25400	8100	-	26800	7930	7930	13341		29200	10900	-	32000	
	7500 + 7500 + 17500	= 32500	6600	6600	15400	28600	9200	-	30600	6818	6818	16364		30000	11600	-	32000	
	7500 + 7500 + 24200	= 39200	5587	5587	18027	29200	9800	-	30600	5802	5802	19796		31400	11600	-	32000	
	7500 + 9000 + 9000	= 25500	7294	8753	8753	24800	7800	-	27200	7596	10902	10902		29400	11200	-	31600	
	7500 + 9000 + 11900	= 28400	6972	8366	11062	26400	8800	-	27600	7237	10387	12175		29800	11600	-	32000	
	7500 + 9000 + 17500	= 34000	6309	7571	14721	28600	9800	-	30600	6328	9083	15188		30600	11600	-	32000	
	7500 + 9000 + 24200	= 40700	5381	6457	17362	29200	9800	-	30600	5473	7855	18672		32000	11600	-	32000	
	7500 + 11900 + 11900	= 31300	6613	10493	10493	27600	9200	-	28600	6873	11563	11563		30000	11600	-	32000	
	7500 + 11900 + 17500	= 36900	5935	9417	13848	29200	9800	-	30600	6100	10262	14639		31000	11600	-	32000	
	7500 + 11900 + 24200	= 43600	5023	7970	16207	29200	9800	-	30600	5251	8834	17915		32000	11600	-	32000	
	7500 + 17500 + 17500	= 42500	5153	12024	12024	29200	9800	-	30600	5517	13241	13241		32000	11600	-	32000	
	7500 + 17500 + 24200	= 49200	4451	10386	14363	29200	9800	-	30600	4698	11275	16028		32000	11600	-	32000	
	9000 + 9000 + 9000	= 27000	8533	8533	8533	25600	8500	-	27200	10000	10000	10000		30000	11600	-	32000	
	9000 + 9000 + 11900	= 29900	8187	8187	10825	27200	9200	-	28200	9520	9520	11159		30200	11600	-	32000	
	9000 + 9000 + 17500	= 35500	7352	7352	14296	29000	9800	-	30600	8496	8496	14207		31200	11600	-	32000	
	9000 + 9000 + 24200	= 42200	6185	6185	16630	29000	9800	-	30600	7311	7311	17378		32000	11600	-	32000	
	9000 + 11900 + 11900	= 32800	7848	10376	10376	28600	9200	-	29200	9150	10725	10725		30600	11600	-	32000	
	9000 + 11900 + 17500	= 38400	6844	9049	13307	29200	9800	-	30600	8220	9635	13745		31600	11600	-	32000	
	9000 + 11900 + 24200	= 45100	5827	7705	15668	29200	9800	-	30600	7034	8245	16721		32000	11600	-	32000	
	9000 + 17500 + 17500	= 44000	5973	11614	11614	29200	9800	-	30600	7366	12317	12317		32000	11600	-	32000	
	11900 + 11900 + 11900	= 35700	9267	9267	9267	27800	9800	-	29000	10333	10333	10333		31000	11600	-	32000	
	11900 + 11900 + 17500	= 41300	8414	8414	12373	29200	9800	-	30600	9280	9280	13239		31800	11600	-	32000	
	11900 + 11900 + 24200	= 48000	7239	7239	14722	29200	9800	-	30600	7944	7944	16111		32000	11600	-	32000	
	11900 + 17500 + 17500	= 46900	7409	10896	10896	29200	9800	-	30600	8305	11848	11848		32000	11600	-	32000	
4-room Operation	7500 + 7500 + 7500 + 7500	= 30000	6800	6800	6800	6800	27200	9800	-	28200	7400	7400	7400	7400	29600	11600	-	32000
	7500 + 7500 + 7500 + 9000	= 31500	6667	6667	6667	8000	28000	9800	-	28200	6764	6764	6764	9708	30000	11600	-	32000
	7500 + 7500 + 7500 + 11900	= 34400	6235	6235	6235	8984	28600	9800	-	28600	6492	6492	6492	10923	30400	11600	-	32000
	7500 + 7500 + 7500 + 17500	= 40000	5738	5738	5738	13388	30600	9800	-	30600	5815	5815	5815	13956	31400	11600	-	32000
	7500 + 7500 + 7500 + 24200	= 46700	4914	4914	4914	15857	30600	9800	-	30600	4991	4991	4991	17028	32000	11600	-	32000
	7500 + 7500 + 9000 + 9000	= 33000	6409	6409	7691	7691	28200	9800	-	28200	6324	6324	9076	9076	30800	11600	-	32000
	7500 + 7500 + 9000 + 11900	= 35900	6058	6058	7270	9613	29000	9800	-	29000	6097	6097	8750	10257	31200	11600	-	32000
	7500 + 7500 + 9000 + 17500	= 41500	5530	5530	6636	12904	30600	9800	-	30600	5484	5484	7871	13161	32000	11600	-	32000
	7500 + 7500 + 9000 + 24200	= 48200	4761	4761	5714	15363	30600	9800	-	30600	4674	4674	6708	15945	32000	11600	-	32000
	7500 + 7500 + 11900 + 11900	= 38800	5915	5915	9385	9385	30600	9800	-	30600	5816	5816	9784	9784	31200	11600	-	32000
	7500 + 7500 + 11900 + 17500	= 44400	5169	5169	8201	12061	30600	9800	-	30600	5261	5261	8851	12627	32000	11600	-	32000
	7500 + 7500 + 17500 + 17500	= 50000	4590	4590	10710	10710	30600	9800	-	30600	4706	4706	11294	11294	32000	11600	-	32000
	7500 + 9000 + 9000 + 9000	= 34500	6217	7461	7461	7461	28600	9800	-	28600	5880	8440	8440	8440	31200	11600	-	32000
	7500 + 9000 + 9000 + 11900	= 37400	6136	7364	7364	9736	30600	9800	-	30600	5691	8168	8168	9574	31600	11600	-	32000
	7500 + 9000 + 9000 + 17500	= 43000	5337	6405	6405	12453	30600	9800	-	30600	5103	7325	7325	12248	32000	11600	-	32000
	7500 + 9000 + 11900 + 11900	= 40300	5695	6834	9036	9036	30600	9800	-	30600	5517	7919	9282	9282	32000	11600	-	32000
	7500 + 9000 + 11900 + 17500	= 45900	5000	6000	7933	11667	30600	9800	-	30600	4910	7047	8260	11783	32000	11600	-	32000
	7500 + 11900 + 11900 + 11900	= 43200	5313	8429	8429	8429	30600	9800	-	30600	5292	8903	8903	8903	32000	11600	-	32000
	7500 + 11900 + 11900 + 17500	= 48800	4703	7462	7462	10973	30600	9800	-	30600	4730	7958	7958	11353	32000	11600	-	32000
	9000 + 9000 + 9000 + 9000	= 36000	7650	7650	7650	7650	30600	9800	-	30600	8000	8000	8000	8000	32000	11600	-	32000
	9000 + 9000 + 9000 + 11900	= 38900	7080	7080	7080	9361	30600	9800	-	30600	7670	7670	7670	8990	32000	11600	-	32000
	9000 + 9000 + 9000 + 17500	= 44500	6189	6189	6189	10818	30600	9800	-	30600	6849	6849	6849	11453	32000	11600	-	32000
	9000 + 9000 + 11900 + 11900	= 41800	65															

Voltage Rating : 208V 60Hz

CMH3172

(Rated cooling capacity at 208V: 28600 BTU/h)

NOTE

7500 : KMHS0772
9000 : KMHS0972
11900 : KMHS1272
17500 : KMHS1872
24200 : KMHS2472

Table 2

	Indoor Unit Combination		Indoor Unit Capacity (BTU/h)														
			COOLING						HEATING								
			Room A	Room B	Room C	Room D	Total Performance			Room A	Room B	Room C	Room D	Total Performance			
						Capacity	Min.	Max.						Capacity	Min.	Max.	
Single-room Operation	7500	= 7500	7500				7500	4000	8800	8500					8500	6100	14600
	9000	= 9000	9000				9000	4400	10900	12200					12200	6100	16000
	11900	= 11900	11900				11900	4700	12200	14300					14300	6400	17400
	17500	= 17500	17500				17500	5100	19700	20400					20400	6800	26600
	24200	= 24200	24200				24200	5400	24800	29000					29000	6800	30000
2-room Operation	7500 + 7500	= 15000	7500	7500			15000	4400	17400	8500	8500				17000	6800	21800
	7500 + 9000	= 16500	7500	9000			16500	5100	19700	8541	12259				20800	7100	25400
	7500 + 11900	= 19400	7500	11900			19400	5800	22800	8500	14300				22800	7800	28200
	7500 + 17500	= 25000	7320	17080			24400	7500	26200	8529	20471				29000	10200	32000
	7500 + 24200	= 31700	6625	21375			28000	7800	27600	6800	23200				30000	10200	32000
	9000 + 9000	= 18000	9000	9000			18000	5800	22000	12200	12200				24400	8100	29000
	9000 + 11900	= 20900	8957	11843			20800	6400	25200	11878	13922				25800	8800	29000
	9000 + 17500	= 26500	8626	16774			25400	7800	27600	11002	18398				29400	11200	32000
	9000 + 24200	= 33200	7373	19827			27200	7800	27600	9061	21539				30600	11200	32000
	11900 + 11900	= 23800	11900	11900			23800	7500	27600	13600	13600				27200	9800	29000
	11900 + 17500	= 29400	10848	15952			26800	8800	27600	12281	17519				29800	11600	32000
	11900 + 24200	= 36100	9098	18502			27600	8800	27600	10238	20762				31000	11600	32000
	17500 + 17500	= 35000	13600	13600			27200	8800	27600	15300	15300				30600	11600	32000
	17500 + 24200	= 41700	11583	16017			27600	9200	27600	13215	18785				32000	11600	32000
3-room Operation	7500 + 7500 + 7500	= 22500	7467	7467	7467		22400	6800	24800	8467	8467	8467		25400	9200	30600	
	7500 + 7500 + 9000	= 24000	7500	7500	9000		24000	7500	25200	8442	8442	12116		29000	10200	31200	
	7500 + 7500 + 11900	= 26900	6747	6747	10706		24200	8100	25400	7930	7930	13341		29200	10900	32000	
	7500 + 7500 + 17500	= 32500	6185	6185	14431		26800	9200	27600	6818	6818	16364		30000	11600	32000	
	7500 + 7500 + 24200	= 39200	5281	5281	17039		27600	9800	27600	5802	5802	19796		31400	11600	32000	
	7500 + 9000 + 9000	= 25500	7118	8541	8541		24200	7800	25400	7596	10902	10902		29400	11200	31600	
	7500 + 9000 + 11900	= 28400	6444	7732	10224		24400	8800	25800	7237	10387	12175		29800	11600	32000	
	7500 + 9000 + 17500	= 34000	5912	7094	13794		26800	9800	27600	6328	9083	15188		30600	11600	32000	
	7500 + 9000 + 24200	= 40700	5086	6103	16411		27600	9800	27600	5473	7855	18672		32000	11600	32000	
	7500 + 11900 + 11900	= 31300	5799	9201	9201		24200	9200	27600	6873	11563	11563		30000	11600	32000	
	7500 + 11900 + 17500	= 36900	5610	8901	13089		27600	9800	27600	6100	10262	14639		31000	11600	32000	
	7500 + 11900 + 24200	= 43600	4748	7533	15319		27600	9800	27600	5251	8834	17915		32000	11600	32000	
	7500 + 17500 + 17500	= 42500	4871	11365	11365		27600	9800	27600	5517	13241	13241		32000	11600	32000	
	7500 + 17500 + 24200	= 49200	4207	9817	13576		27600	9800	27600	4698	11275	16028		32000	11600	32000	
	9000 + 9000 + 9000	= 27000	8267	8267	8267		24800	8500	26200	10000	10000	10000		30000	11600	32000	
	9000 + 9000 + 11900	= 29900	7284	7284	9631		24200	9200	25400	9520	9520	11159		30200	11600	32000	
	9000 + 9000 + 17500	= 35500	6439	6439	12521		25400	9800	27600	8496	8496	14207		31200	11600	32000	
	9000 + 9000 + 24200	= 42200	5886	5886	15827		27600	9800	27600	7311	7311	17378		32000	11600	32000	
	9000 + 11900 + 11900	= 32800	6805	8998	8998		24800	9200	26200	9150	10725	10725		30600	11600	32000	
	9000 + 11900 + 17500	= 38400	6469	8553	12578		27600	9800	27600	8220	9635	13745		31600	11600	32000	
	9000 + 11900 + 24200	= 45100	5508	7282	14810		27600	9800	27600	7034	8245	16721		32000	11600	32000	
	9000 + 17500 + 17500	= 44000	5645	10977	10977		27600	9800	27600	7366	12317	12317		32000	11600	32000	
	11900 + 11900 + 11900	= 35700	8467	8467	8467		25400	9800	27600	10333	10333	10333		31000	11600	32000	
	11900 + 11900 + 17500	= 41300	7953	7953	11695		27600	9800	27600	9280	9280	13239		31800	11600	32000	
	11900 + 11900 + 24200	= 48000	6843	6843	13915		27600	9800	27600	7944	7944	16111		32000	11600	32000	
	11900 + 17500 + 17500	= 46900	7003	10299	10299		27600	9800	27600	8305	11848	11848		32000	11600	32000	
4-room Operation	7500 + 7500 + 7500 + 7500	= 30000	6300	6300	6300	6300	25200	9800	25200	7400	7400	7400	7400	29600	11600	32000	
	7500 + 7500 + 7500 + 9000	= 31500	6048	6048	6048	7257	25400	9800	25400	6764	6764	6764	9708	30000	11600	32000	
	7500 + 7500 + 7500 + 11900	= 34400	5625	5625	5625	8925	25800	9800	25800	6492	6492	6492	10923	30400	11600	32000	
	7500 + 7500 + 7500 + 17500	= 40000	5363	5363	5363	12513	28600	9800	28600	5815	5815	5815	13956	31400	11600	32000	
	7500 + 7500 + 7500 + 24200	= 46700	4593	4593	4593	14821	28600	9800	28600	4991	4991	4991	17028	32000	11600	32000	
	7500 + 7500 + 9000 + 9000	= 33000	5864	5864	7036	7036	25800	9800	25800	6324	6324	9076	9076	30800	11600	32000	
	7500 + 7500 + 9000 + 11900	= 35900	5557	5557	6669	8817	26600	9800	26600	6097	6097	8750	10257	31200	11600	32000	
	7500 + 7500 + 9000 + 17500	= 41500	5169	5169	6202	12060	28600	9800	28600	5484	5484	7871	13161	32000	11600	32000	
	7500 + 7500 + 9000 + 24200	= 48200	4450	4450	5340	14359	28600	9800	28600	4674	4674	6708	15945	32000	11600	32000	
	7500 + 7500 + 11900 + 11900	= 38800	5528	5528	8772	8772	28600	9800	28600	5816	5816	9784	9784	31200	11600	32000	
	7500 + 7500 + 11900 + 17500	= 44400	4831	4831	7665	11273	28600	9800	28600	5261	5261	8851	12627	32000	11600	32000	
	7500 + 7500 + 17500 + 17500	= 50000	4290	4290	10010	10010	28600	9800	28600	4706	4706	11294	11294	32000	11600	32000	
	7500 + 9000 + 9000 + 9000	= 34500	5696	5696	6835	6835	26200	9800	26200	5880	8440	8440	8440	31200	11600	32000	
	7500 + 9000 + 9000 + 11900	= 37400	5735	5735	6882	6882	9100	28600	9800	5691	8168	8168	9574	31600	11600	32000	
	7500 + 9000 + 9000 + 17500	= 43000	4988	4988	5986	11640	28600	9800	28600	5103	7325	7325	12248	32000	11600	32000	
	7500 + 9000 + 11900 + 11900	= 40300	5323	5323	6387	8445	28600	9800	28600	5517	7919	9282	9282	32000	11600	32000	
	7500 + 9000 + 11900 + 17500	= 45900	4673	4673	5608	7415	10904	28600	9800	4910	7047	8260	11783	32000	11600	32000	
	7500 + 11900 + 11900 + 11900	= 43200	4965	4965	7878	7878	28600	9800	28600	5292	8903	8903	8903	32000	11600	32000	
	7500 + 11900 + 11900 + 17500	= 48800	4395	4395	6974	6974	10256	28600	9800	4730	7958	7958	11353	32000	11600	32000	
	9000 + 9000 + 9000 + 9000	= 36000	7150	7150	7150	7150	25800	9800	25800	8000	8000	8000	8000	32000	11600	32000	
	9000 + 9000 + 9000 + 11900	= 38900	6617	6617	6617	8749	28600	9800	28600	7670	7670	7670	8990	32000	11600	32000	
	9000 + 9000 + 9000 + 17500	= 44500	5784	5784	5784	8142	28600	9800	28600	6849	6849	6849	11453	32000	11600	32000	
	9000 + 9000 + 11900 + 11900	= 41800	6158	6158	8142	8142	28600	9800	28600	7366	7366	8634	8634	32000	11600	32000	
9000 + 9000 + 11900 + 17500	= 47400	5430	5430	7180	10559	28600	9800	28600	6606	6606	7743	11046	32000	11600	32000		
9000 + 11900 + 11900 + 11900	= 44700	5758	7614	7614	7614	28600	9800	28600	7085	8305	8305	8305	32000	11600	32000		
11900 + 11900 + 11900 + 11900	= 4																

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Jan. / 2008 (T)