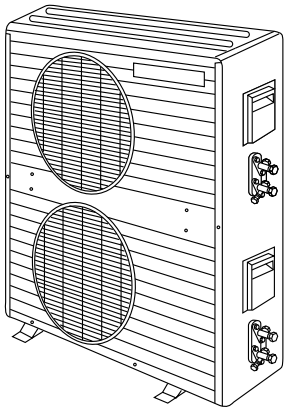
ORDER NO. MAC9611042C2

Service Manual

Multi-Split Air Conditioners

CS-MA90KE / CU-MA180KE
CS-MA120KE / CU-MA240KE
CS-MA70KE / CU-MA190KE
CS-MA120KE



Contents

Panasonic

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

⚠ PRECAUTION OF LOW TEMPERATURE

In order to avoid frostbite, be assured of no refrigerant leakage during the installation or repairing of refrigeration circuit.

Features

- **High Efficiency**
- **Compact Design**
- **Comfort Improvement**
  – Wider range of horizontal discharge air
  – Longer hours of sleep mode operation
- **Auto Restart**
  – Auto restart operation after power failure
- **Removable and Washable Front Panel**
- **Installation Work Improvement**
  – Long piping up to 15 m
- **Quality Improvement**
  – Low voltage protection
  – Gas leakage protection
  – Prevent compressor reverse cycle
  – 2-stage OLP to protect compressor (CS-MA90KE / CS-MA120KE)
- **Service Improvement**
  – Easy fan motor replacement procedure

Functions

Remote Control

OFF / ON

Operation OFF / ON

MODE

Operation Mode Selection

- AUTO Automatic Operation Mode
- HEAT Heating Operation Mode
- COOL Cooling Operation Mode
- DRY Soft Dry Operation Mode

FAN SPEED

Indoor Fan Speed Selection

- Low Speed
- Medium Speed
- High Speed
- AUTOFAN Automatic Fan Speed

SWING / MANUAL

Airflow Direction Control

- SWING Automatic Airflow Direction Control
- MANUAL Airflow Direction Manual Control

TEMP.

Room Temperature Setting

- Temperature Setting (16˚C to 30˚C)
- Automatic Operation
  - ◄ 2˚C lower than standard
  - Standard
  - ► 2˚C higher than standard

ON-TIMER
OFF-TIMER

Timer Operation Selection

- 24-hour, OFF / ON Real Timer Setting.

TIME

Time / Timer Setting

- Hours and minutes setting.

SET
CANCEL

Timer Operation Set / Cancel

- ON Timer and OFF Timer setting and cancellation.

CLOCK
(時計)

Clock Setting

- Current time setting.

SLEEP

Sleep Mode Operation OFF / ON

Functions

Indoor Unit

POWER ⏻

Power Switch OFF / ON

AUTO
OFF / ON

Auto Operation Switch

- Used when the remote control cannot be used.

Remote Control Signal Receiving Sound Control

- It can be controlled by pressing Auto Operation Switch for 10 seconds.

TEST RUN
OFF / ON

Operation Test Running / Pump Down Switch

- Used when test running or servicing.

Operation Indication Lamps (LED)

- POWER (Red)..... Lights up in operation, blinks in Automatic Operation Mode judging and Hot Start operation
- SLEEP (Orange)..... Lights up in Sleep Mode Operation
- TIMER (Orange)..... Lights up in Timer Setting

Operation Mode

- Heating, Cooling, Soft Dry and Automatic Mode.

Time Delay Safety Control

- Restarting is inhibited for appro. 3 or 4 minutes.

7 Minutes Time Save Control

- Cooling Operation only.

Auto Restart Control

- Operation is restarted after power failure at previous setting mode.

Anti-Freezing Control

- Anti-Freezing control for indoor heat exchanger. (Cooling and Soft Dry)

Hot-Start Control

- The indoor fan stops until the indoor heat exchanger temperature over 30°C.
- The indoor fan operates at SLo and Lo⁻ when indoor heat exchanger temperature reaches 30°C ~ 41°C.
- Hot Start is completed when indoor heat exchanger reaches 41°C.

Sleep Mode Auto Control

- The operation starts at SLo speed and stops after 8 hours.

Indoor Fan Speed Control

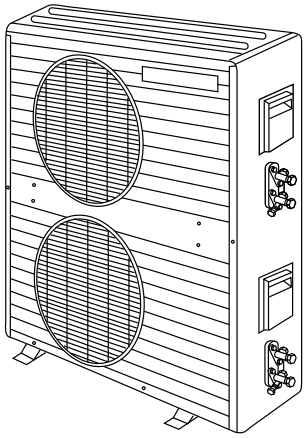
- High, Medium and Low.
- Automatic Fan Speed Mode
  - Heating : Fan speed varies from Me → SLo in accordance with indoor heat exchanger.
  - Cooling : Fan rotates at Hi and Me speed. Deodorizing control is available.
  - Soft Dry : Fan rotates at SLo speed. Deodorizing control is available.

Airflow Direction Control

- Automatic air swing and manual adjusted by remote control for vertical airflow.
- Manually adjusted by hand for horizontal airflow.

Functions

Outdoor Unit



Compressor Reverse Rotation Protection Control

- To protect compressor from reverse rotation when there is a instantaneous power failure.

Overload Protector

- CS-MA90KE and CS-MA120KE
  2-stage OLP to protect the compressor.
  Overload Protector will trip when
  – Temperature of compressor increases to 120°C.
  – High temperature or high current flow to compressor.
  (Refer circuit diagram for OLP characteristic)
- CS-MA70KE
  OLP to protect the compressor.
  – OLP characteristic can be referred to circuit diagram.

60 Secs. Forced Operation Control

- Once the compressor is activated, it does not stop for 60 secs. (Stops immediate with remote control stop signal.)

Deice Control

- To prevent frosting at outdoor heat exchanger. (Only for Heating Operation)
- Outdoor indoor heat exchanger is sensed by TRS (Thermal Reed Switch).

Overload Protection Control

- Outdoor fan stops when indoor heat exchanger temperature rises to 51°C and restarts when the indoor heat exchanger temperature drops to 49°C.
- Compressor stops when indoor heat exchanger temperature reaches 65°C or above.
  (Heating Operation only)

Compressor Protection Control

- If the outdoor fan motor is not running after compressor starts for 50 secs., compressor will stop. (Cooling and Soft Dry Operation only).

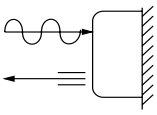
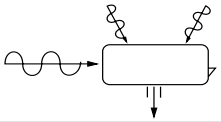
4-Way Valve Control

- When the unit is switched to “OFF” during Heating Operation, 4-way valve stays at Heating position for 5 minutes.

Outdoor Fan Operation Control

- Inner protector.

Product Specifications

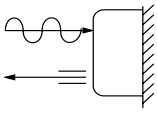
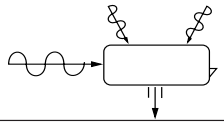
			Unit	CS-MA70KE, CS-MA120KE	CU-MA190KE
Cooling Capacity			kW Btu/h	2.05 - 2.00, 3.50 - 3.45 7,000 - 6,800, 11,900 - 11,800	
Heating Capacity			kW Btu/h	2.15 - 2.10, 4.10 - 4.00 7,300 - 7,200, 14,000 - 13,600	
Moisture Removal			ℓ/h Pint/h	1.3, 2.0 2.7, 4.2	
Power Source			Phase V Cycle	Single 240 - 220 50	
Airflow Method			OUTLET INTAKE	SIDE VIEW 	TOP VIEW 
Air Volume	Indoor Air (Lo)		m^3/min (cfm)	Cooling ; 5.5 (190), 7.5 (260) Heating ; 5.5 (190), 7.8 (280)	–
	Indoor Air (Me)		m^3/min (cfm)	Cooling ; 6.0 (210), 8.4 (300) Heating ; 6.0 (210), 8.7 (310)	–
	Indoor Air (Hi)		m^3/min (cfm)	Cooling ; 6.7 (240), 9.3 (330) Heating ; 6.7 (240), 9.7 (340)	–
	Outdoor Air		m^3/min (cfm)	–	22.4 (790), 22.0 (780)
Noise Level			dB (A)	Cooling ; High 36-35, 42-41, Low 30-29, 38-37 Heating ; High 36-35, 43-42, Low 30-29, 38-37	Cooling ; High 47-45, 49-48 (51-50) Heating ; High 49-47, 49-48 (52-51)
Electrical Data	Input		W	Cooling ; 660 - 600, 1,250 - 1,220 Heating ; 640 - 600, 1,280 - 1,230	
	Running Current		A	Cooling ; 3.2 - 3.0, 5.6 - 5.7 Heating ; 3.1 - 3.0, 5.7 - 5.7	
	COP		W/W	Cooling ; 3.1 - 3.3, 2.8 - 2.8 Heating ; 3.4 - 3.5, 3.2 - 3.3	
	Starting Current		A	13, 25	
Piping Connection Port (Flare piping)			inch inch	G ; Half Union 3/8", 1/2" L ; Half Union 1/4", 1/4"	G ; 3-way valve 3/8", 1/2" L ; 2-way valve 1/4", 1/4"
Pipe Size (Flare piping)			inch inch	G (gas side) ; 3/8", 1/2" L (liquid side) ; 1/4", 1/4"	G (gas side) ; 3/8", 1/2" L (liquid side) ; 1/4", 1/4"
Drain Hose	Inner diameter		mm	12	–
	Length		m	0.7	–
Power Cord Length Number of core-wire			m	2.1 3 (1.0 mm^2)	– –
Dimensions		Height	inch (mm)	11-7/16 (290)	39- 31/32(1015)
		Width	inch (mm)	31-15/32 (799)	30-23/32 (780)
		Depth	inch (mm)	6-29/32 (175)	9-21/32 (245)
Net Weight			lb (kg)	18 (8.0)	159 (72)
Compressor		Type		–	Rotary (1 cylinder) rolling piston type
	Motor	Type		–	Induction (2-poles)
	Rated	Output	W	–	550, 1,100
Air Circulation		Type		Cross-flow Fan	Propeller Fan
		Material		AS + Glass Fiber 30%	AES + Glass Fiber 12%
	Motor	Type		Transistor (4-poles)	Induction (6-poles)
		Input	W	–	58.6 × 2
		Rated Output	W	20	20 × 2
	Fan Speed	Low	rpm	950, 1,210	–
		Medium	rpm	1,030, 1,350	–
		High	rpm	1,150, 1,500	730

Product Specifications

		Unit	CS-MA70KE, CS-MA120KE	CU-MA190KE	
Heat Exchanger	Description		Evaporator	Condenser	
	Tube material		Copper	Copper	
	Fin material		Aluminium	Aluminium	
	Fin Type		Slot Fin	Corrugated Fin	
	Row / Stage		(Plate fin configuration, forced draft) 2 × 12 2 × 12	1 × 18	2 × 19
	FPI		18 21	19	16
	Size (W × H × L)	mm	600 × 252 × 25.4	856 × 457.2 × 22	706.2 × 482.6 × 44 669.9
Refrigerant Control Device			–	Capillary Tube	
Refrigeration Oil		(c.c)	–	SUNISO 4GDID or ATMOS M60 (290, 430)	
Refrigerant (R-22)		g (oz)	–	860, 1,100 (30.4, 38.8)	
Thermostat			Electronic Control	–	
Protection Device			–	Overload Protector	
Capillary Tube	Length Flow Rate Inner Diameter	mm ℓ/min mm	– – –	Cooling ; 920, 720, Heating ; 590, 550 Cooling ; 4.0, 7.5, Heating ; 8.2, 12.5 Cooling ; 1.1, 1.3, Heating ; 1.3, 1.5	
Air Filter	Material Style		P.P. Honeycomb	–	
Capacity Control			Capillary Tube		
Compressor Capacitor		µF, VAC	–	15 µF, 440VAC	30 µF, 370VAC
Fan Motor Capacitor		µF, VAC	–	1.2 µF, 400VAC	1.2 µF, 400VAC

• Specifications are subject to change without notice for further improvement.

Product Specifications

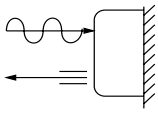
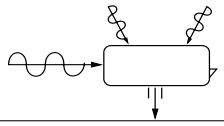
			Unit	CS-MA90KE	CU-MA180KE
Cooling Capacity			kW Btu/h	2.65 × 2 - 2.60 × 2 9,000 × 2 - 8,900 × 2	
Heating Capacity			kW Btu/h	3.15 × 2 - 3.00 × 2 10,700 × 2 - 10,200 × 2	
Moisture Removal			ℓ/h Pint/h	1.6 × 2 3.4 × 2	
Power Source			Phase V Cycle	Single 240 - 220 50	
Airflow Method			OUTLET INTAKE	SIDE VIEW 	TOP VIEW 
Air Volume	Indoor Air (Lo)		m^3/min (cfm)	Cooling ; 6.3 (220) Heating ; 6.4 (230)	–
	Indoor Air (Me)		m^3/min (cfm)	Cooling ; 7.4 (260) Heating ; 7.5 (260)	–
	Indoor Air (Hi)		m^3/min (cfm)	Cooling ; 8.4 (300) Heating ; 8.6 (300)	–
	Outdoor Air		m^3/min (cfm)	–	22.4 (790)
Noise Level			dB (A)	Cooling ; High 38-38, Low 30-30 Heating ; High 39-39, Low 30-30	Cooling ; High 49-48 (52-51) Heating ; High 49-47 (52-50)
Electrical Data	Input		W	Cooling ; 940 × 2 - 890 × 2 Heating ; 950 × 2 - 880 × 2	
	Running Current		A	Cooling ; 4.1 × 2 - 4.1 × 2 Heating ; 4.2 × 2 - 4.1 × 2	
	COP		W/W	Cooling ; 2.8 - 2.9 Heating ; 3.3 - 3.4	
	Starting Current		A	20 × 2	
Piping Connection Port (Flare piping)			inch inch	G ; Half Union 3/8" L ; Half Union 1/4"	G ; 3-way valve 3/8" L ; 2-way valve 1/4"
Pipe Size (Flare piping)			inch inch	G (gas side) ; 3/8" L (liquid side) ; 1/4"	G (gas side) ; 3/8" L (liquid side) ; 1/4"
Drain Hose	Inner diameter		mm	12	–
	Length		m	0.7	–
Power Cord Length Number of core-wire			m	2.1 3 (1.0mm²)	– –
Dimensions		Height	inch (mm)	11-7/16 (290)	38-3/4 (985)
		Width	inch (mm)	31-15/32 (799)	30-23/32 (780)
		Depth	inch (mm)	6-29/32 (175)	9-21/32 (245)
Net Weight			lb (kg)	18 (8.0)	152 (69)
Compressor		Type		–	Rotary (1 cylinder) rolling piston type
	Motor	Type		–	Induction (2-poles)
	Rated	Output	W	–	750 × 2
Air Circulation		Type		Cross-flow Fan	Propeller Fan
		Material		AS + Glass Fiber 30%	AES + Glass Fiber 12%
	Motor	Type		Transistor (4-poles)	Induction (6-poles)
		Input	W	–	58.6 × 2
		Rated Output	W	20	20 × 2
	Fan Speed	Low	rpm	980	–
		Medium	rpm	1,150	–
		High	rpm	1,310	730

Product Specifications

		Unit	CS-MA90KE	CU-MA180KE
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium	Aluminium
	Fin Type		Slot Fin	Corrugated Fin
	Row / Stage		(Plate fin configuration, forced draft) 2 × 12	1 × 18
	FPI		18	19
	Size (W × H × L)	mm	600 × 252 × 25.4	856 × 457.2 × 22
Refrigerant Control Device			–	Capillary Tube
Refrigeration Oil		(c.c)	–	SUNISO 4GDID or ATMOS M60 (350 × 2)
Refrigeration (R-22)		g (oz)	–	850 × 2 (30.0 × 2)
Thermostat			Electronic Control	–
Protection Device			–	Overload Protector
Capillary Tube	Length	mm	–	Cooling ; 1,033, Heating ; 585
	Flow Rate	ℓ/min	–	Cooling ; 4.8, Heating ; 9.9
	Inner Diameter	mm	–	Cooling ; 1.2, Heating ; 1.4
Air Filter	Material		P.P.	–
	Style		Honeycomb	–
Capacity Control			Capillary Tube	
Compressor Capacitor		µF, VAC	–	25 µF, 370VAC
Fan Motor Capacitor		µF, VAC	–	(Upper unit) 1.0 µF, 400VAC (Lower unit) 1.2 µF, 400VAC

• Specifications are subject to change without notice for further improvement.

Product Specifications

			Unit	CS-MA120KE	CU-MA240KE
Cooling Capacity			kW Btu/h	3.50 × 2 - 3.45 × 2 11,900 × 2 - 11,800 × 2	
Heating Capacity			kW Btu/h	4.10 × 2 - 4.00 × 2 14,000 × 2 - 13,600 × 2	
Moisture Removal			ℓ/h Pint/h	2.0 × 2 4.2 × 2	
Power Source			Phase V Cycle	Single 240 - 220 50	
Airflow Method			OUTLET INTAKE	SIDE VIEW 	TOP VIEW 
Air Volume	Indoor Air (Lo)		m^3/min (cfm)	Cooling ; 7.5 (260) Heating ; 7.8 (280)	–
	Indoor Air (Me)		m^3/min (cfm)	Cooling ; 8.4 (300) Heating ; 8.7 (310)	–
	Indoor Air (Hi)		m^3/min (cfm)	Cooling ; 9.3 (330) Heating ; 9.7 (340)	–
	Outdoor Air		m^3/min (cfm)	–	22.0 (780)
Noise Level			dB (A)	Cooling ; High 42-41, Low 38-37 Heating ; High 43-42, Low 38-37	Cooling ; High 49-48 (52-51) Heating ; High 49-48(52-51)
Electrical Data	Input		kW	Cooling ; 1.25 × 2 - 1.22 × 2 Heating ; 1.28 × 2 - 1.23 × 2	
	Running Current		A	Cooling ; 5.6 × 2 - 5.7 × 2 Heating ; 5.7 × 2 - 5.7 × 2	
	COP		W/W	Cooling ; 2.8 - 2.8 Heating ; 3.2 - 3.3	
	Starting Current		A	25 × 2	
Piping Connection Port (Flare piping)			inch inch	G ; Half Union 1/2" L ; Half Union 1/4"	G ; 3-way valve 1/2" L ; 2-way valve 1/4"
Pipe Size (Flare piping)			inch inch	G (gas side) ; 1/2" L (liquid side) ; 1/4"	G (gas side) ; 1/2" L (liquid side) ; 1/4"
Drain Hose	Inner diameter		mm	12	–
	Length		m	0.7	–
Power Cord Length Number of core-wire			m	2.1 3 (1.0mm²)	– –
Dimensions		Height	inch (mm)	11-7/16 (290)	41-5/32 (1045)
		Width	inch (mm)	31-15/32 (799)	30-23/32 (780)
		Depth	inch (mm)	6-29/32 (175)	9-21/32 (245)
Net Weight			lb (kg)	18 (8.0)	183 (83)
Compressor		Type		–	Rotary (1 cylinder) rolling piston type
	Motor	Type		–	Induction (2-poles)
	Rated	Output	W	–	1,100 × 2
Air Circulation		Type		Cross-flow Fan	Propeller Fan
		Material		AS + Glass Fiber 30%	AES + Glass Fiber 12%
	Motor	Type		Induction (4-poles)	Induction (6-poles)
		Input	W	–	58.6 × 2
		Rated Output	W	20	20 × 2
	Fan Speed	Low	rpm	1,210	–
		Medium	rpm	1,350	–
		High	rpm	1,500	730

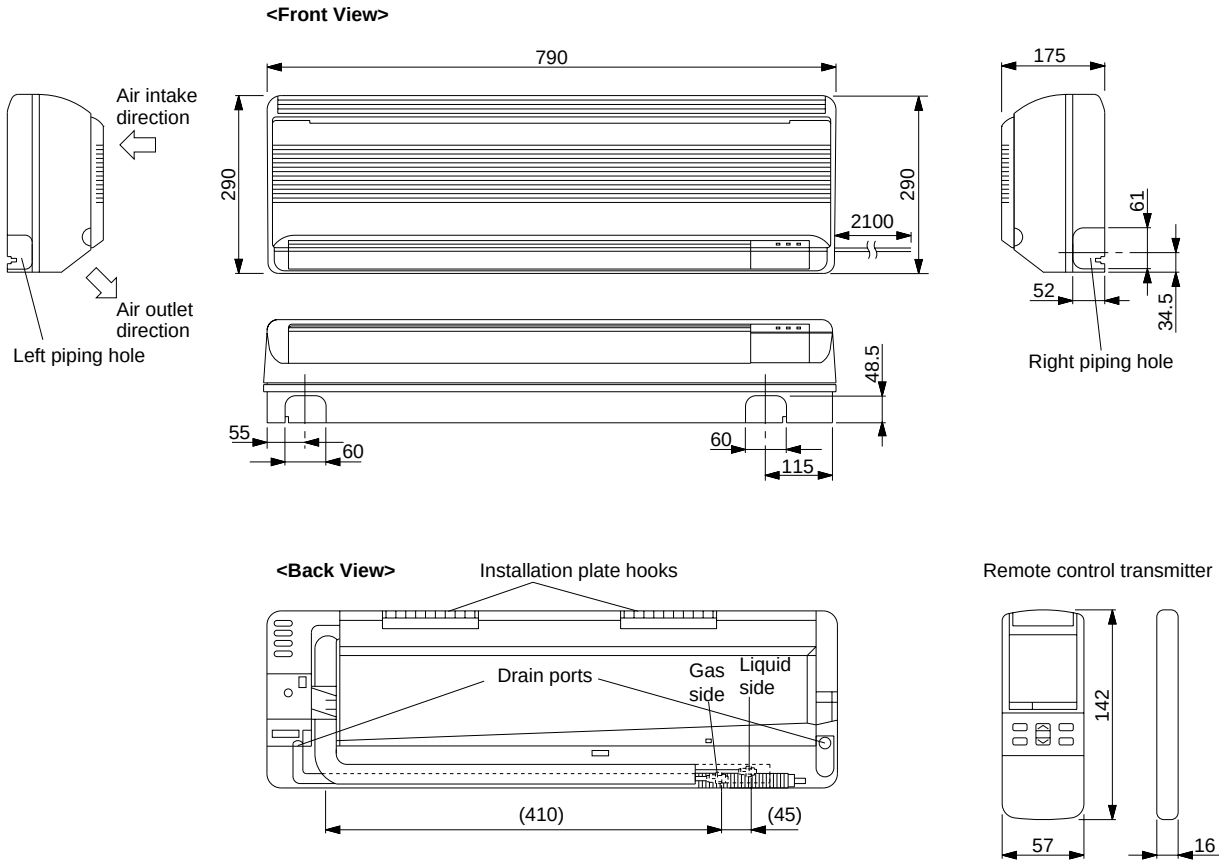
Product Specifications

		Unit	CS-MA120KE	CU-MA240KE
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium	Aluminium
	Fin Type		Slot Fin	Corrugated Fin
	Row / Stage		(Plate fin configuration, forced draft) 2 × 12	2 × 19
	FPI		21	16
	Size (W × H × L)	mm	600 × 252 × 25.4	706.2 × 482.6 × 44 669.9
Refrigerant Control Device			–	Capillary Tube
Refrigeration Oil		(c.c)	–	SUNISO 4GDID or ATMOS M60 (430 × 2)
Refrigeration (R-22)		g (oz)	–	1,100 × 2 (38.8 × 2)
Thermostat			Electronic Control	–
Protection Device			–	Overload Protector
Capillary Tube	Length	mm	–	Cooling ; 720, Heating ; 550
	Flow Rate	ℓ/min	–	Cooling ; 7.5, Heating ; 12.5
	Inner Diameter	mm	–	Cooling ; 1.3, Heating ; 1.5
Air Filter	Material		P.P.	–
	Style		Honeycomb	–
Capacity Control			Capillary Tube	
Compressor Capacitor		µF, VAC	–	30 µF, 370VAC
Fan Motor Capacitor		µF, VAC	–	(Upper unit) 1.0 µF, 400VAC (Lower unit) 1.2 µF, 400VAC

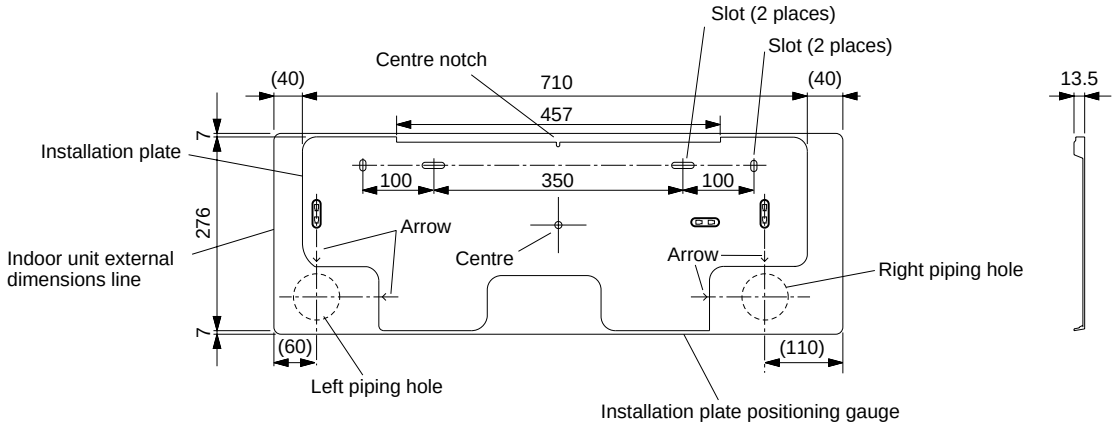
• Specifications are subject to change without notice for further improvement.

Dimensions

CS-MA70KE / CS-MA90KE / CS-MA120KE



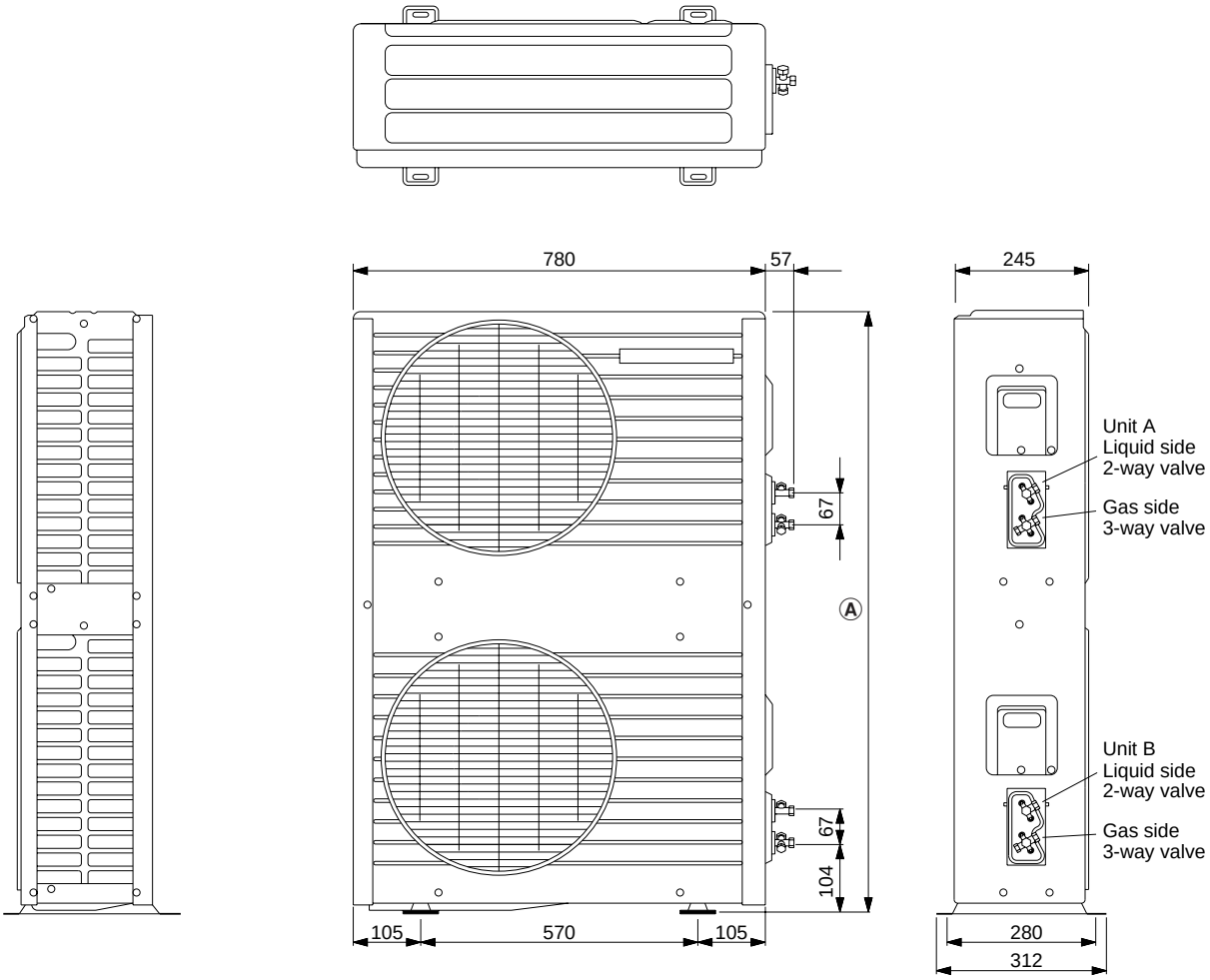
Relative position between the indoor unit and the installation plate <Front View>



Dimensions

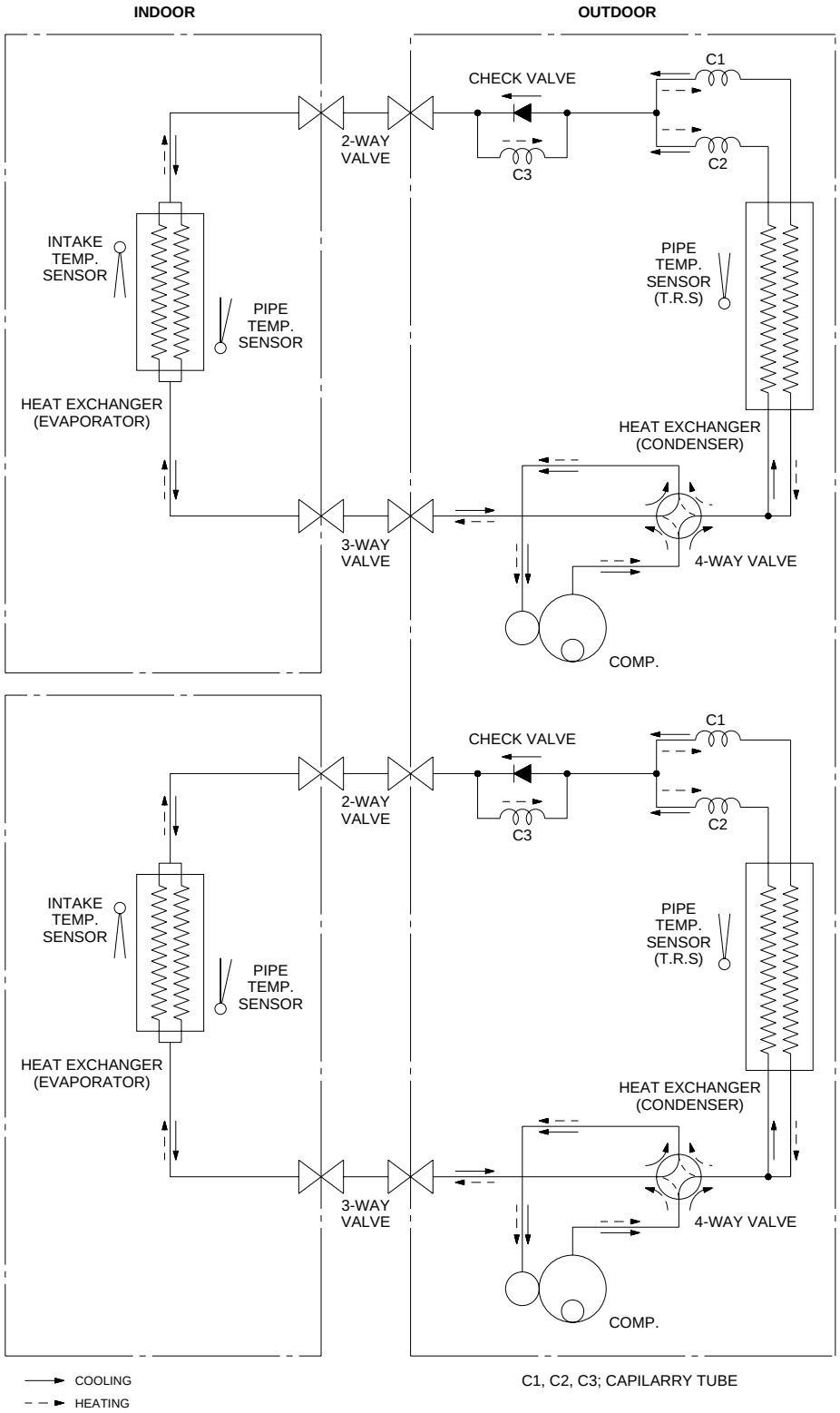
CU-MA180KE, CU-MA190KE, CU-MA240KE

	CU-MA180K	CU-MA190K	CU-MA240K
Ⓐ	985	1015	1045



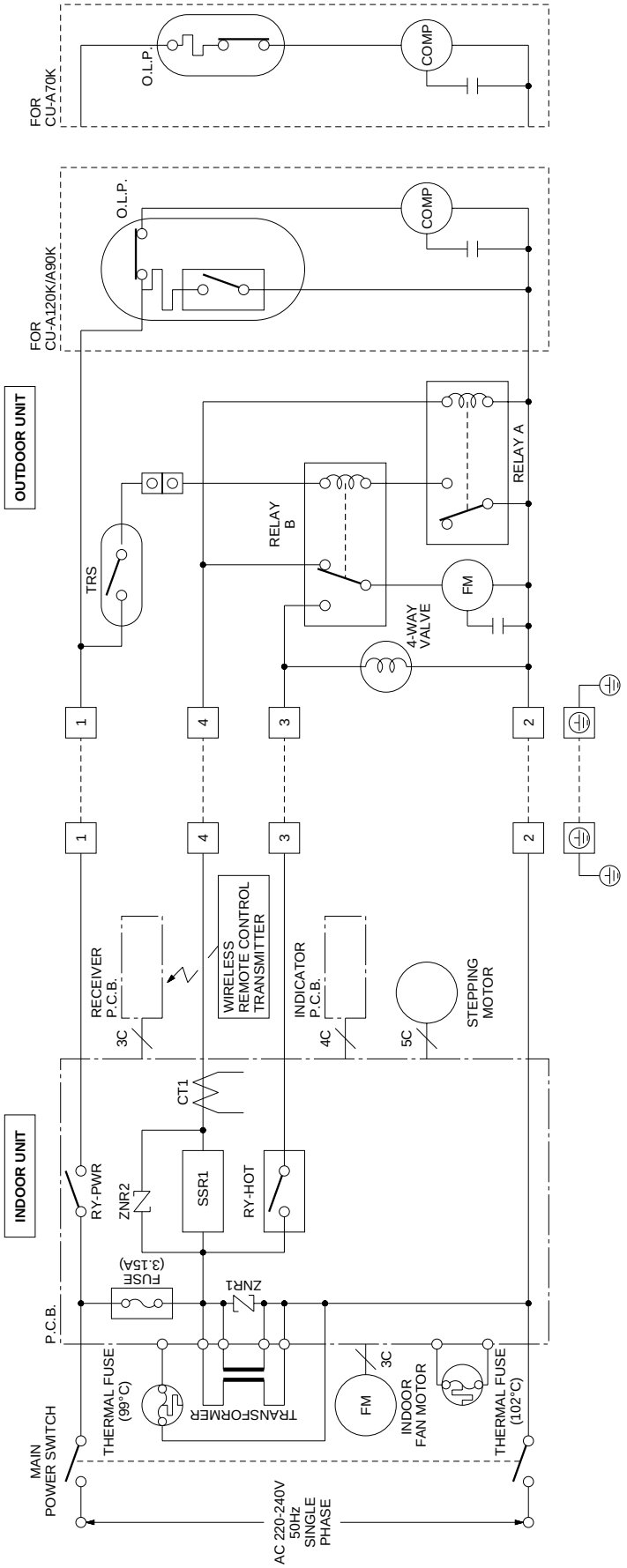
Refrigeration Cycle Diagram

CS-MA90KE / CU-MA180KE
CS-MA120KE / CU-MA240KE
CS-MA70KE / CU-MA190KE
CS-MA120KE



Block Diagram

CS-MA90KE / CU-MA180KE
CS-MA120KE / CU-MA240KE
CS-MA70KE / CU-MA190KE
CS-MA120KE

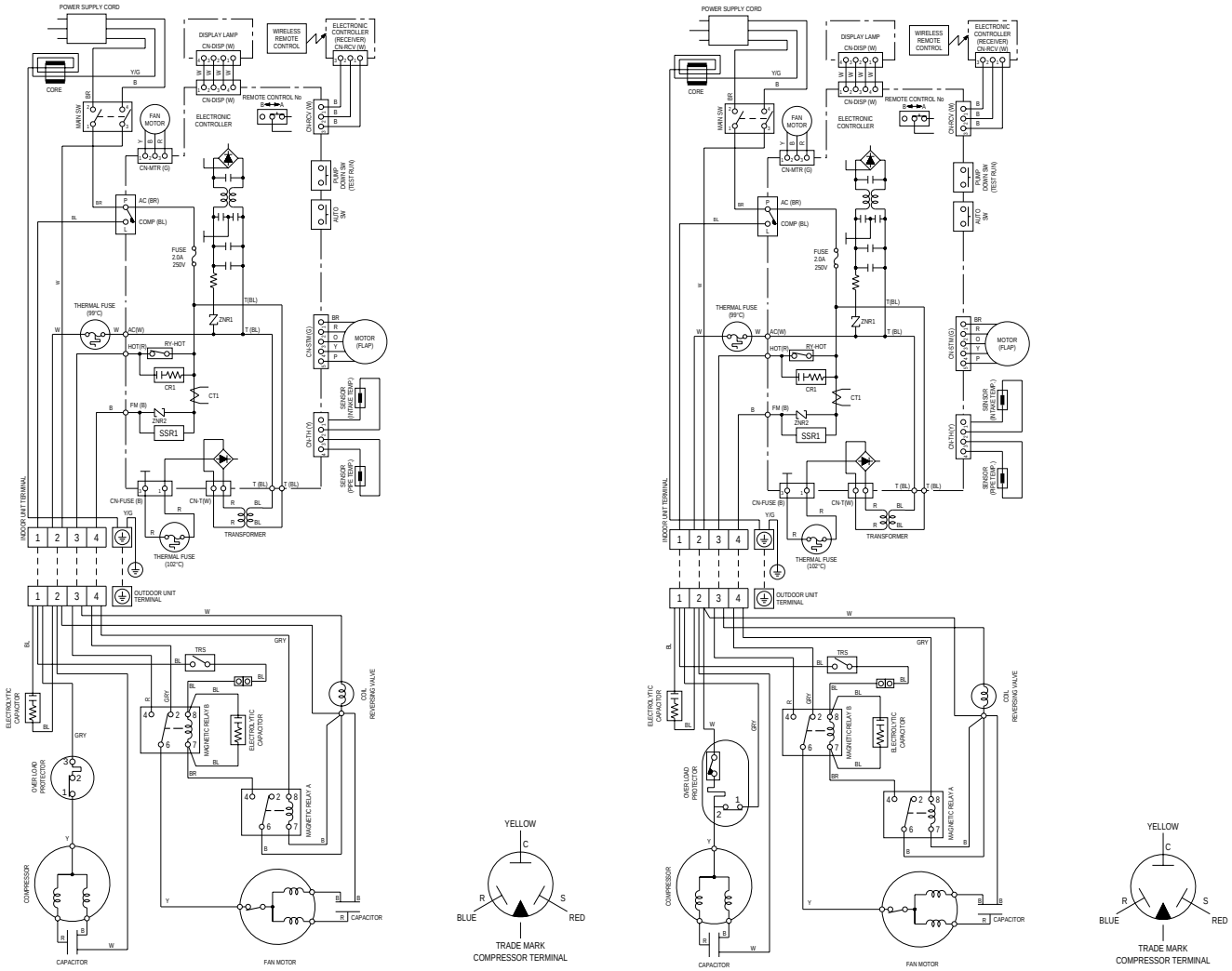


: Indicates the electronic control unit.

"C" : Indicates the number of core wires. (Example:5C=5 core wires).

Wiring Diagram

CS-MA70KE / CU-MA190KE
CS-MA120KE



REMARKS:

B	:	BLUE
BR	:	BROWN
BL	:	BLACK
W	:	WHITE
R	:	RED
O	:	ORANGE
P	:	PINK
Y/G	:	YELLOW/ GREEN
GRY	:	GRAY

Resistance of Outdoor Fan Motor Windings

CONNECTION	CWA95245 (Ω)
BLUE - YELLOW	312.9
YELLOW - RED	419.7

Resistance of Compressor Windings

CS-MA70KE / CU-MA190KE

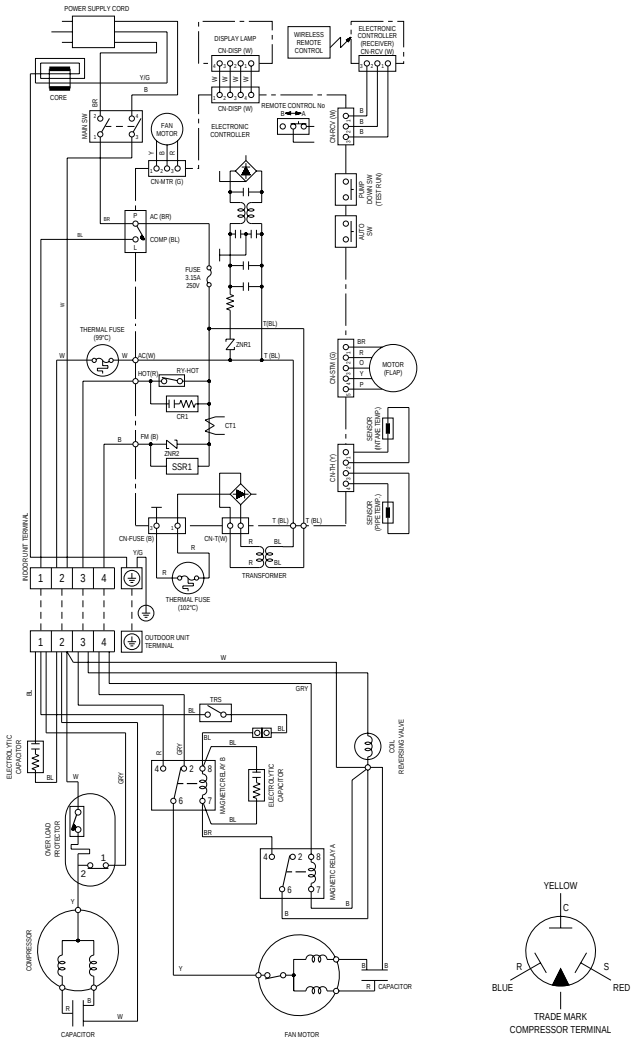
CONNECTION	2RS122D5AB02 (Ω)
C-R	5.63
C-S	12.17

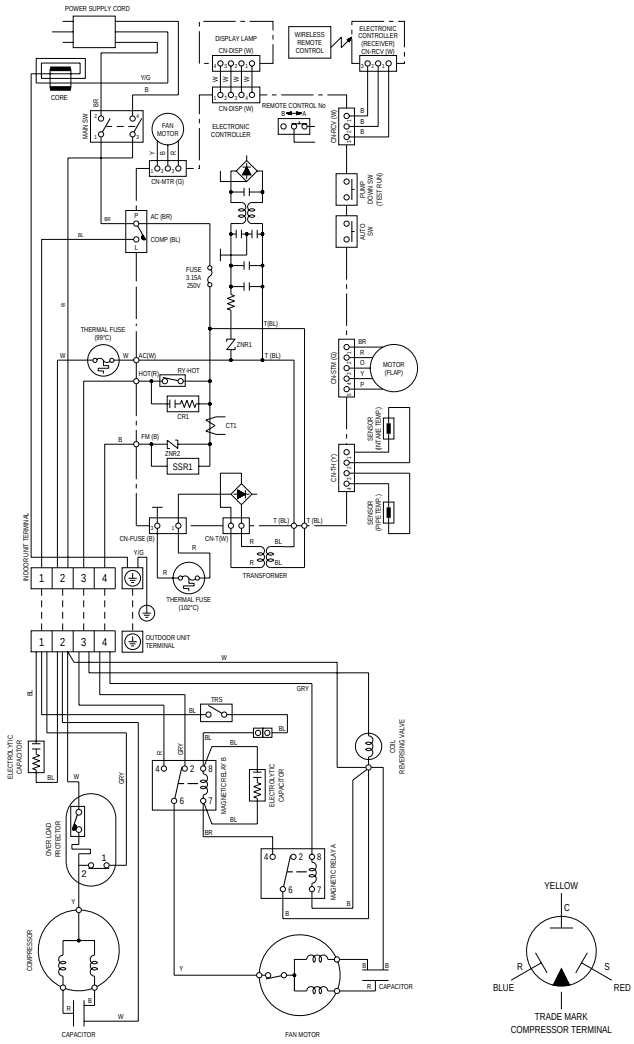
CS-MA120KE / CU-MA190KE

CONNECTION	2KS224D5AC02 (Ω)
C-R	2.45
C-S	3.86

Wiring Diagram

CS-MA90KE / CU-MA180KE
CS-MA120KE / CU-MA240KE





REMARKS:

B	:	BLUE
BR	:	BROWN
BL	:	BLACK
W	:	WHITE
R	:	RED
O	:	ORANGE
P	:	PINK
Y/G	:	YELLOW/ GREEN
GRY	:	GRAY

Resistance of Outdoor Fan Motor Windings

CONNECTION	CWA95245 (Ω)
BLUE - YELLOW	312.9
YELLOW - RED	419.7

Resistance of Compressor Windings

CS-MA90KE / CU-MA180KE

CONNECTION	2PS164D3AD02 (Ω)
C-R	3.43
C-S	4.76

CS-MA120KE / CU-MA240KE

CONNECTION	2KS224D5AC02 (Ω)
C-R	2.45
C-S	3.86

Operation Details

1) Cooling Mode Operation

Cooling in operation according to Remote Control setting.

Time Delay Safety Control (3 minutes)

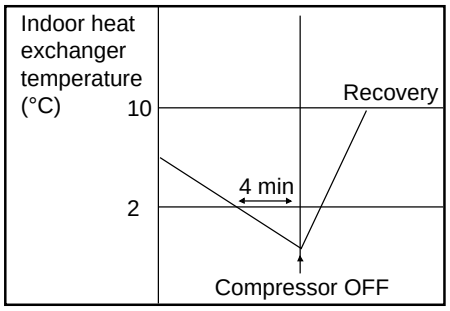
- When the compressor is stopped by Power Switch, Remote Control or there is a power failure, it restarts after 3 minutes when the Power Switch, Remote Control is turned ON or the power supply is resumed.
- When the setting temperature is reached during cooling operation, the compressor stops and it will not start for 3 minutes.

7 minutes Time Saved Control

- The compressor will start automatically if it has stopped for 7 minutes even if the room temperature is below the compressor ON temperature.

Anti-Freezing Control

- If the temperature of the indoor heat exchanger falls continously below 2°C for 4 minutes, the compressor turns off to protect the indoor heat exchanger from freezing. The fan speed setting remains the same.
- Compressor recommences when the indoor heat exchanger temperature rises to 10°C (Recovery).
  ※ 3 minutes waiting of Time Delay Safety Control is valid for Cooling Operation.



Compressor Protection Control

- After the compressor starts for 50 seconds but the outdoor fan motor is still OFF, the compressor will stop and restart automatically. (Time Delay Safety Control is valid).

Comp. operates for 50 secs. and Fan Motor OFF → Compressor OFF → Compressor restarts (3 minutes waiting)

- If the above phenomenon is repeated for 3 times, the compressor will stops.
- The above phenomenon is reset when there is a change to heating mode or stopped by Remote Control Switch.

Compressor Reverse Rotation Protection Control

- If the compressor is operating continually for 5 minutes or longer and the temperature difference between intake air and indoor heat exchanger is 2.5°C or less for 2 minutes, compressor will stop and restart automatically. (Time Delay Safety Control is valid).

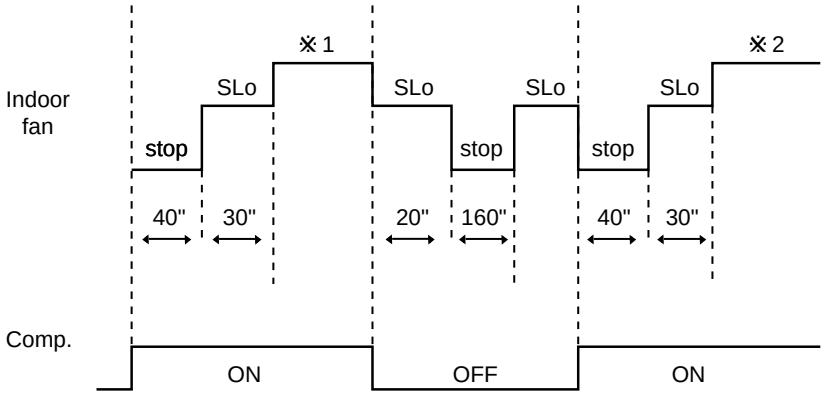
• Compressor starts for > 5 minutes
• $\Delta T \leq 2.5$°C for 2 minutes → Compressor OFF → Compressor restarts (3 minutes waiting)

ΔT = intake air temperature – indoor heat exchanger temperature
This is to protect reverse rotation of the compressor when there is a instantaneous power failure.

Operation Details

Automatic Fan Speed Mode

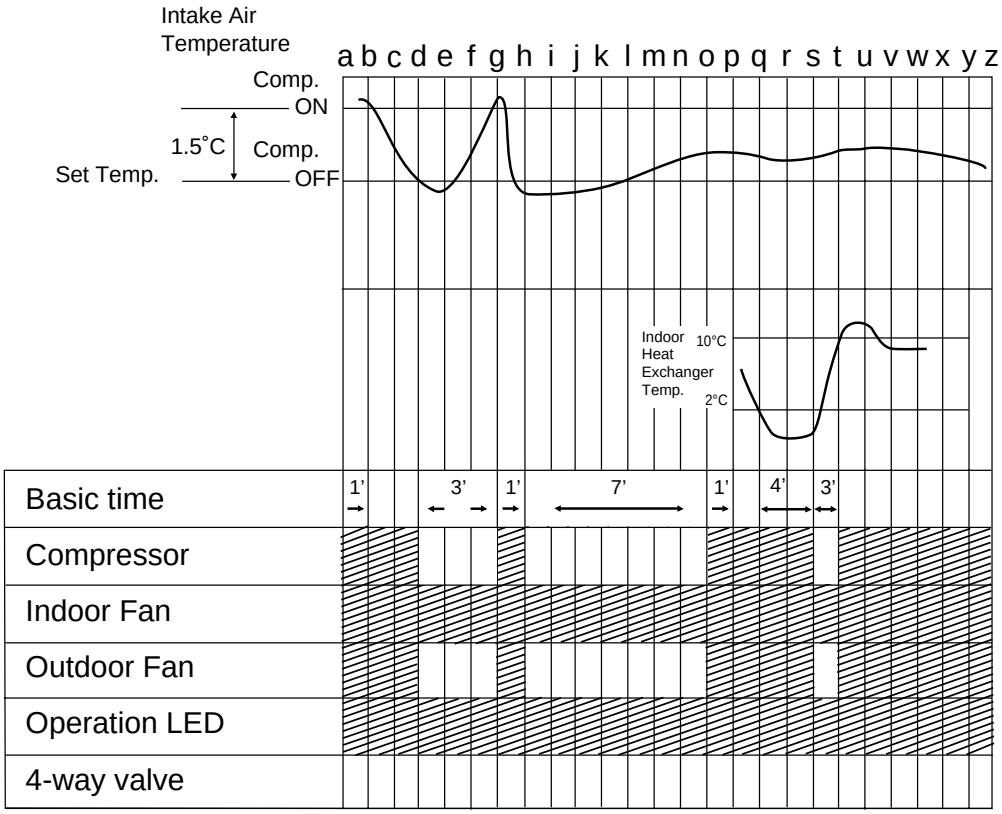
When Automatic Fan Speed is selected at Remote Control during cooling operation.
- Fan speed rotates in the range of Hi to Me.
- Deodorizing Control.



※1 Fan Speed is Hi until the compressor stops (when the set temperature is reached).

※2 Fan Speed is Me after the compressor restarts.

Cooling Operation Time Diagram



<Description of operation>

d – g	:	Time Delay Safety Control (waiting for 3 minutes)
g – h	:	60 sec. Forced Operation
h – o	:	7 min. Time Saved Control
q – t	:	Anti Freezing Control

Operation

Stop

Operation Details

2) Soft Dry Mode Operation

- The unit starts cooling operation until the room temperature reaches the setting temperature set on the Remote Control, and then Soft Dry operation will start.
  (During Soft Dry operation, the indoor fan operates with SLo speed.)
- Once room temperature reaches below Soft Dry OFF temperature, Indoor Fan, Compressor and Outdoor Fan stop for 6 minutes.

Time Delay Safety Control

- Once the compressor stops, it will not start for 3 minutes during Cooling operation.

Anti-Freezing Control

- Same as Anti-Freezing Control for Cooling Mode operation. (For Soft Dry region, 6 minutes waiting is valid during compressor stops.)

Compressor Protection Control

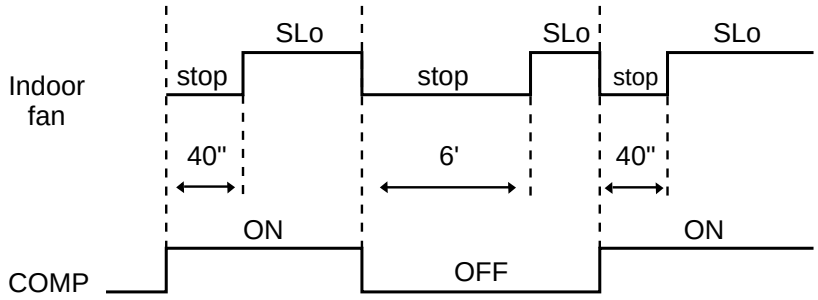
- Same as Compressor Protection Control for Cooling Mode Operation. (Refer page 17)

Compressor Reverse Rotation Protection

- Same as Compressor Reverse Rotation Protection Control for Cooling Mode Operation. (Refer page 17)

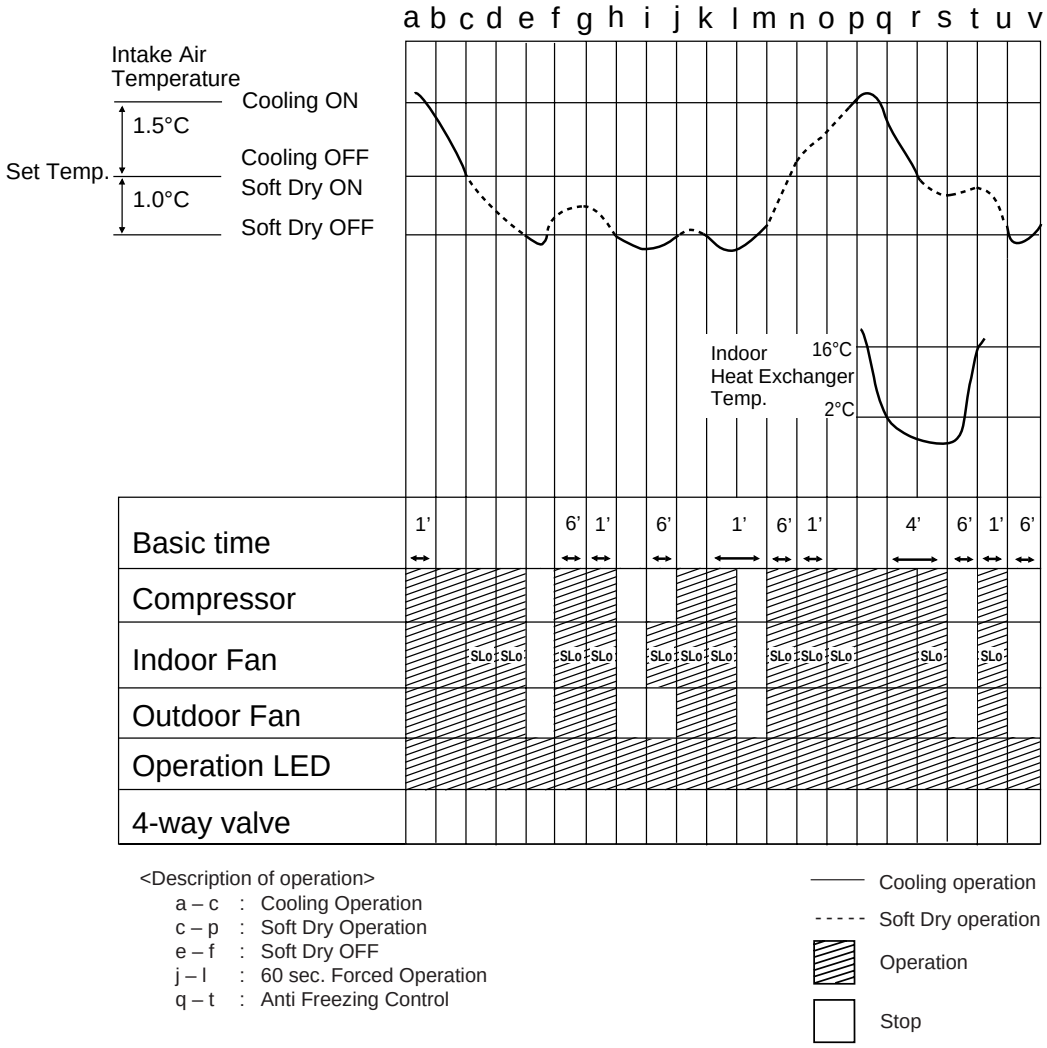
Automatic Fan Speed Mode

When Automatic Fan Speed is selected at Remote Control during Soft Dry Operation.
- Fan speed rotates at SLo.
- Deodorizing Control.



Operation Details

Soft Dry Operation Time Diagram



<Description of operation>

a – c : Cooling Operation
c – p : Soft Dry Operation
e – f : Soft Dry OFF
j – l : 60 sec. Forced Operation
q – t : Anti Freezing Control

Cooling operation
Soft Dry operation
Operation
Stop

Operation Details

3) Heating Mode Operation

Heating in operation according to Remote Control setting.

Time Delay Safety Control

- When the compressor is stopped by Power Switch, Remote Control or there is a power failure, it restarts after 3 minutes when the Power Switch, Remote Control is turned ON or the power supply is resumed.
- When the setting temperature is reached during heating operation, the compressor stops and it will not start for 4 minutes.
- Indoor Fan stops for 1 minute after 3 minutes compressor stops. Then, it will operate with SLo fan speed.

Overload Protection Control

- If the temperature of the indoor heat exchanger rises to 51°C, Outdoor Fan stops.
  The Outdoor Fan restarts when the indoor heat exchanger temperature falls to 49°C.
- If the indoor heat exchanger becomes 65°C or more, the compressor will stop and restart automatically.
  (Time Delay Safety Control – 4 minutes waiting)

Indoor heat exchanger temperature ≤ 65°C → Compressor OFF → Compressor restarts (4 minutes waiting)

Compressor Reverse Rotation Protection Control

- If the compressor is operating continually for 5 minutes or longer and temperature difference between intake air and indoor heat exchanger is 5°C or less for 2 minutes, compressor will stop and restart automatically.
  (Time Delay Safety Control is valid).

• Compressor starts for 5 minutes
• Δ T ≤ 5°C for 2 minutes → Compressor OFF → Compressor restarts (4 minutes waiting)

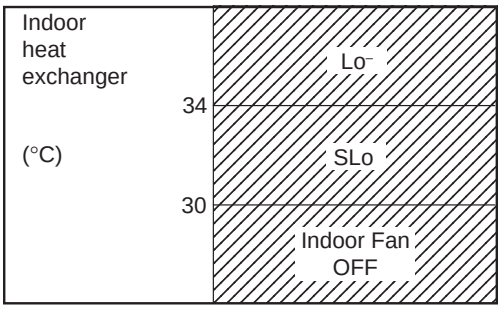
Δ T = Indoor heat exchanger temperature – intake air temperature
This is to protect reverse rotation of the compressor when there is a instantaneous power failure.

4-way Valve Control

- 4-way valve always ON during Heating operation.
- When the unit is switched to "OFF" during Heating operation, 4-way valve stays at Heating position for 5 minutes.

Hot Start Control

When Heating operation starts, Indoor Fan will not start until the indoor heat exchanger reaches 30°C as diagram shown.



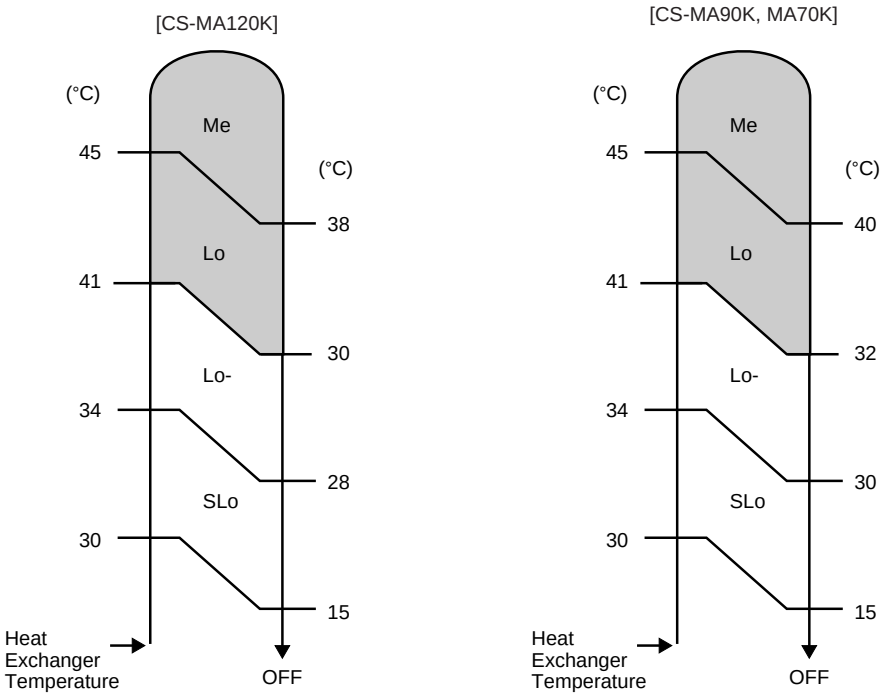
Hot Start is completed when indoor heat exchanger reaches 41°C.

Operation Details

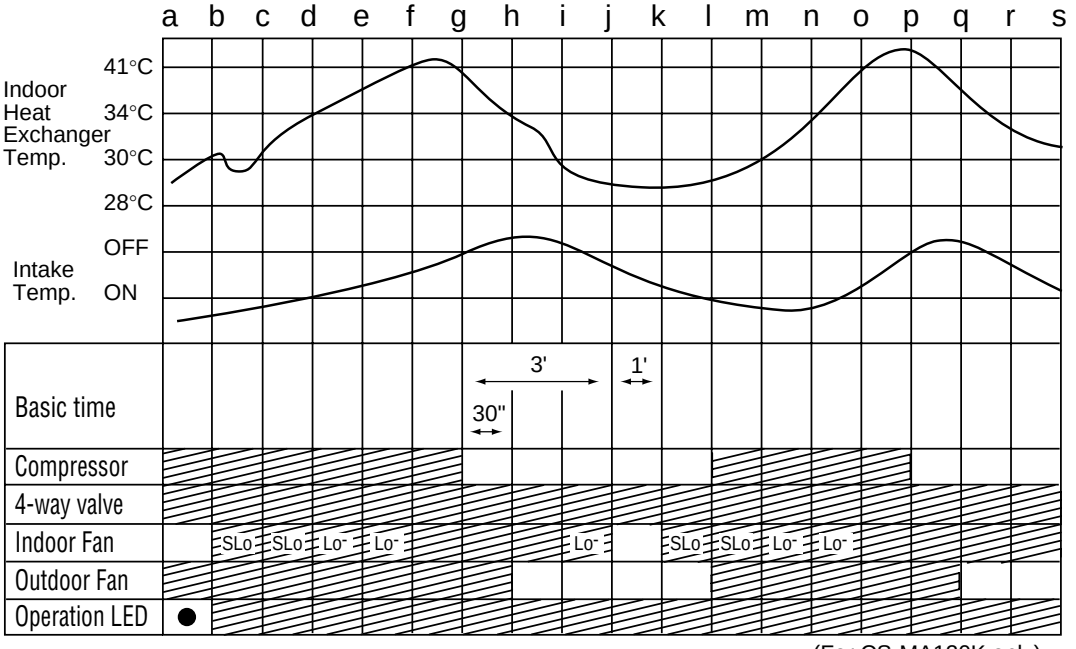
Automatic Fan Speed Mode

When Automatic Fan Speed is selected at Remote Control during heating operation.

- Fan speed rotates in the range of Me ➔ SLo according to the heat exchanger temperature.



Heating Operating Time Diagram



(For CS-MA120K only)

<Description of operation>

a – b : Hot start (Indoor fan = OFF)
b – d : Hot start (Indoor fan = SLo)
g – l : Indoor fan control (controlled during thermostat OFF)
g – h : Outdoor fan control (30 sec. Forced Operation) after compressor stops.

● : Blinking
Operation
Stop

Operation Details

Deicing Control

Deice starts to prevent frosting at outdoor heat exchanger.

- Normal Deicing
  Deice operation detection commences after 30 minutes of Heating operation starts or 60 minutes after previous deice operation. If the TRS (Thermal Reed Switch) senses the outdoor piping temperature drops to –3°C (TRS CLOSE) or less for 50 sec. continuosly during compressor is in operation, deice will start.
  (There is no detection during Outdoor Fan stops.)

- Overload Deicing
  During heating operation, if the outdoor Fan OFF duration (due to overload control) is accumulated up to 60 minutes and after compressor starts for 1 minute, deicing starts.

- Deicing ends when
  (a) 12 minutes after deicing operation starts;
  (b) TRS senses the outdoor piping temperature rises to 4°C (TRS OPEN).
  (c) Deicing will not end immediately as time delay (Td) is valid as shown below.

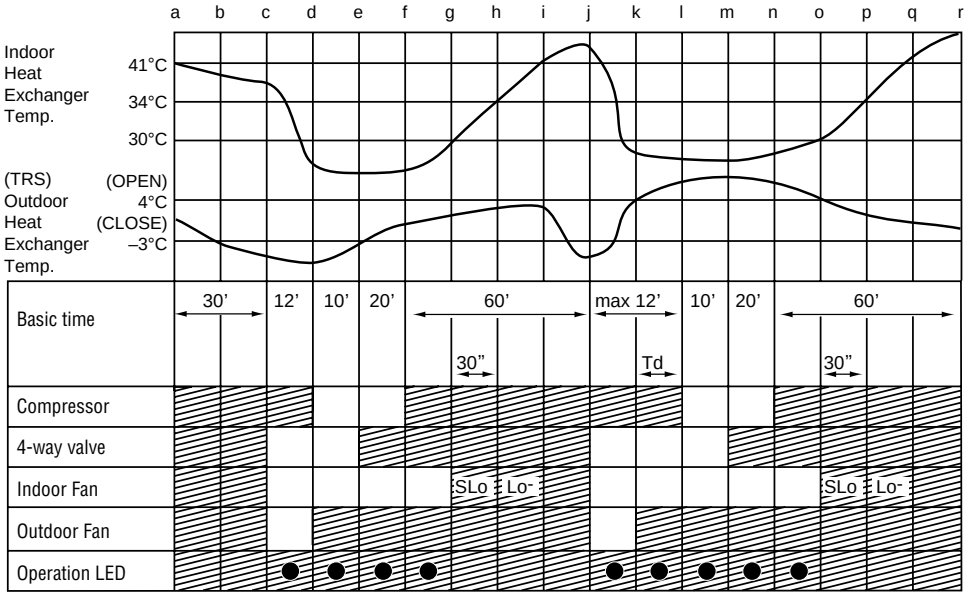
Time taken from deicing starts to TRS OPEN (T)	Td (seconds)
T , 3 minutes	0
3 minutes < T , 6 minutes	60
6 minutes < T , 9 minutes	120
T > 9 minutes	180

- Once deicing operation starts, it will not end for 60 seconds.

- After deicing operation, compressor stops for 30 seconds and 4-way valve stays at cooling position for 10 seconds.

Operation Details

Normal Deicing Time Diagram

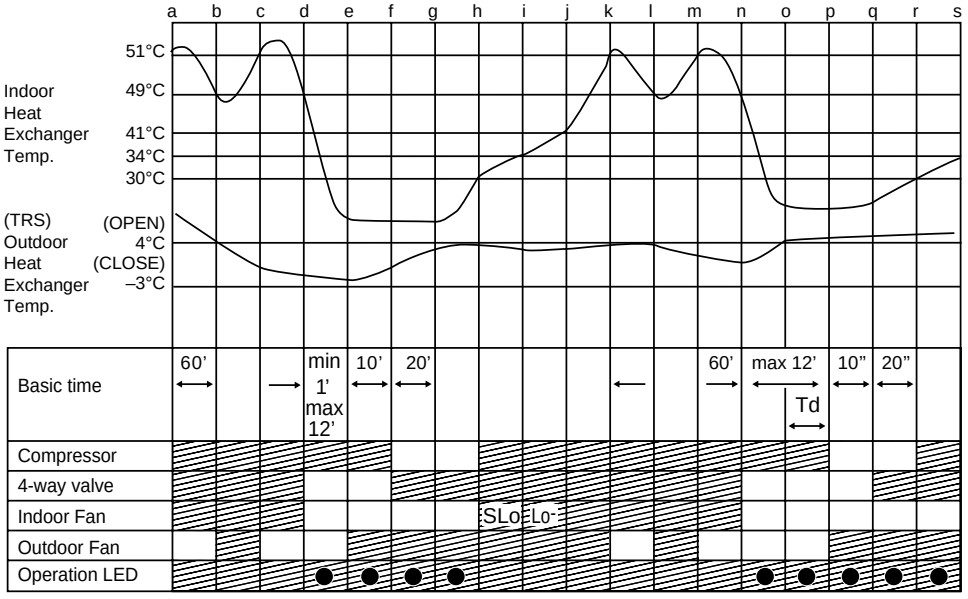


<Description of operation>

a – c	:	Deicing operation judging condition established
c – d	:	Deicing operation (timer detected)
d – e, l – m	:	Time delay for 4-way valve
e – f, m – n	:	Time delay for Compressor
f – g, n – o	:	Hot start (no thermo OFF)
g – h, o – p	:	No thermo OFF (after finished hot start)
j – l	:	Deicing operation (TRS detected)

● : Blinking
Operation
Stop

Overload Deicing Time Diagram



<Description of operation>

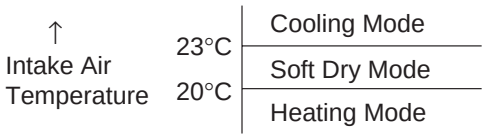
a – d, k – h	:	Overload Control
d – g	:	Overload Deicing (timer detected)
g – h	:	Hot Start (indoor fan OFF)
h – i	:	Hot Start (indoor fan SLo)
n – p	:	Overload Control (TRS detected)

● : Blinking
Operation
Stop

Operation Details

4) Automatic Mode Operation

Standard for Determining Operation Mode



	Setting Temperature (Standard)
Cooling Mode	25°C
Soft Dry Mode	22°C
Heating Mode	21°C

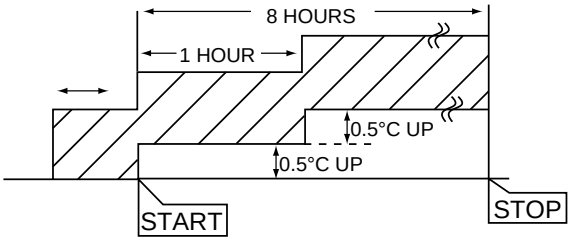
(a) Indoor fan operates at SLo fan speed for 20 seconds.
(b) After judging indoor air temperature, the operation mode is determined and operation continued at the mode determined.
(c) If indoor intake air is less than 16°C, Heating mode will immediate operate.
(d) After the operation mode has been determined, the mode does not change. However, Soft Dry mode operation includes Cooling mode operation.
(e) If Automatic Mode operation is started while the air conditioner is operating, operation will continue. If current operation is in Cooling mode (including the operation which is a part of Soft Dry mode operation), it will be maintained, for 20 seconds at SLo fan speed. Then, the selected operation mode will continue.
(f) Room temperature adjustment.
The following are added to the setting temperature specified as above.

Higher	→	+2°C
Standard	→	±0°C
Lower	→	–2°C

5) Sleep Mode Auto Operation

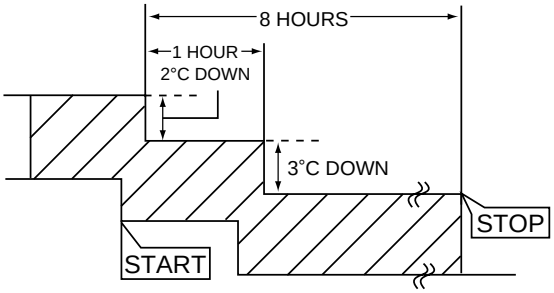
Cooling or Soft Dry operation

When you press the SLEEP Mode, the following movement will start to avoid overcooling.
- The fan speed is automatically set to Low.
- The setting temperature will be risen by **0.5**°C at the start of operation and by **0.5**°C one hour later.
- The operation will stop after **8** hours.



Heating operation

When you press the SLEEP Mode, the following movement will start to avoid overheating.
- The fan speed is automatically set to Low or Super Low.
- The setting temperature will be dropped by **2**°C at the start of operation and by **3**°C one hour later.
- The operation will stop after **8** hours.



Operation Details

6) Auto Restart Control

- If there is a power failure, operation will be automatically restarted when the power is resumed. It will start with previous operation mode and airflow direction. (Time Delay Safety Control is valid)
- Auto Restart Control is not available when Timer or Sleep Mode is set.
- This control can be omitted by cutting the jumper wire J2. (Refer Circuit Diagram)

7) Indoor Fan Motor Control

- Auto Fan Speed Control
  When set to Auto Fan Speed, the fan speed is adjusted between maximum and minimum setting as shown in the table.
- Manual Fan Speed Control
  Basic fan speed adjustment (3 settings, from Lo to Hi) can be carried out by using the Fan Speed selection button.

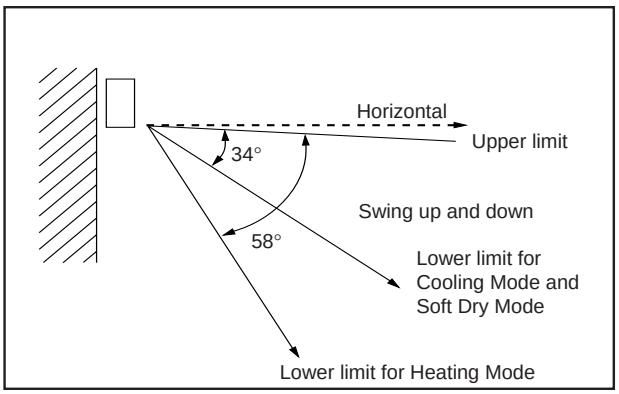
Fan Speed		High Speed ↔ Low Speed								
No.		8	7	6	5	4	3	2	1	0
Cooling	Manual		○	○	○					
	Auto		○	○						
	Sleep					○				
Soft Dry							○			○
Heating	Manual	○		○	○	○	○			○
	Auto			○	○	○	○			○
	Sleep					○	○			○
Voltage to Fan Motor Drive Transistor (V)	CS-MA70K	21.0	21.0	18.6	17.0	15.8	11.0	11.0	7.2	0
	CS-MA90K	26.7	25.9	21.5	18.1	15.8	11.0	11.0	7.2	0
	CS-MA120K	32.0	31.0	26.0	22.5	21.5	16.5	11.0	7.2	0
		SHi	Hi	Me	Lo	Lo⁻	SLo	MID START	START	STOP

Operation Details

8) Airflow Direction Control

Airflow Direction Auto-Control

- When set a Airflow Direction Auto-Control with remote control, the louver swings up and down as shown in the diagram.
- The louver does not swing when the Indoor Fan stops during operation.
- When stopped with remote control, the discharge vent is closed with the louver.

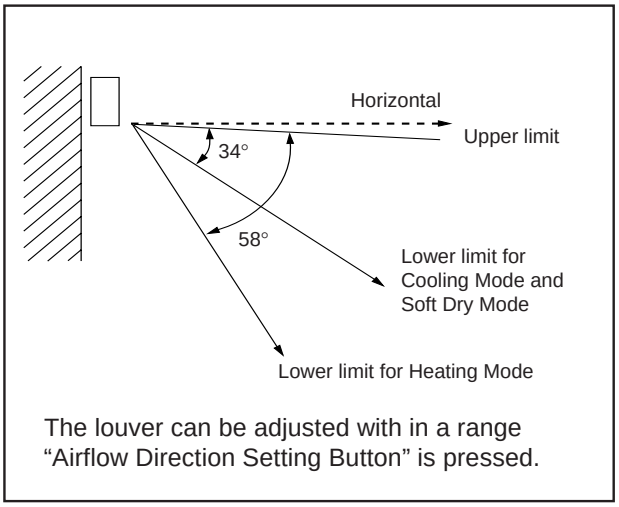


※ The left and right airflow direction louvers can be adjusted manually.

※ 1 There is no swinging while indoor fan is stopped during Cooling and Soft Dry operation.
※ 2 In Heating operation, when the indoor heat exchanger temperature rises to 38°C, the airflow direction is changed from upper limit to lower limit. When the indoor heat exchanger temperature falls to 35°C, the airflow direction is changed from lower limit to upper limit.

Airflow Direction Manual Control

- When the airflow direction set button is pressed, the automatic airflow is released and the airflow direction louver move up and down in the range shown in the diagram.
  The louver can be stopped by releasing the button at the desired louver position.
- When the remote control is used to stop the operation, the discharge vent is closed with airflow direction louver.



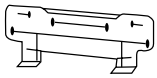
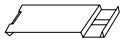
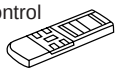
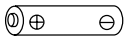
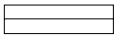
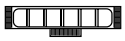
※ The left and right airflow direction louvers can be adjusted manually.

9) Delay ON Timer Control

- When the Delayed ON Timer is set by using the remote control, the unit will start operate slightly before the set time, so that the room will reach nearly to the set temperature by the desired time.
- For Cooling and Soft Dry mode, the operation will start 15 minutes before the set time.
- For Heating mode, the operation will start 30 minutes before the set time.
- For Automatic mode, the indoor fan will operate at SLo speed for 20 seconds 30 minutes before the set time to detect the intake air temperature to determine the operation mode. The operation indication lamp will blink at this time.

Installation Information

Attached accessories

No.	Accessories part	Qty.	No.	Accessories part	Qty.
1	Installation plate 	1	6	Drain elbow 	1
2	Installation plate fixing screw 	6	7	Clamping cover of piping 	1
3	Remote control 	1	8	Vinyl tape 	3
4	Battery 	2	9	Vinyl tape 	1
5	Air purifying filter 	2			

Accessories: Flaring piping kit
CZ-4F5, 7, 10 AN

SELECT THE BEST LOCATION

INDOOR UNIT

- There should not be any heat source or steam near the unit.
- There should not be any obstacles blocking the air circulation.
- A place where air circulation in the room is good.
- A place where drainage can be easily done.
- A place where noise prevention is taken into consideration.
- Do not install the unit near the door way.
- Ensure the spaces indicated by arrows from the wall, ceiling, fence or other obstacles.
- Indoor unit of this room air conditioner shall be installed on the wall in a height of at least 2.3 m.

OUTDOOR UNIT

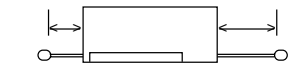
- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- There should not be any animal or plant which could be affected by hot air discharged.
- Keep the spaces indicated by arrows from wall, ceiling, fence or other obstacles.
- Do not place any obstacles which may cause a short circuit of the discharged air.
- If piping length is over the rated length, additional refrigerant should be added as shown in the table.

MODEL	Piping size		Rated Length	Max. Elevation (m)	Max. Piping Length (m)	Additional Refrigerant (g/m)
	Gas	Liquid				
MA70KE	3/8"	1/4"	7	5	15	15
MA90KE	3/8"	1/4"	7	5	15	30
MA120KE	1/2"	1/4"	7	5	15	30

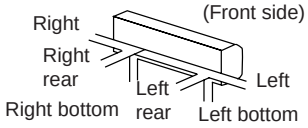
Installation Information

Indoor / Outdoor unit installation diagram

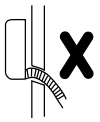
Length of power supply cord



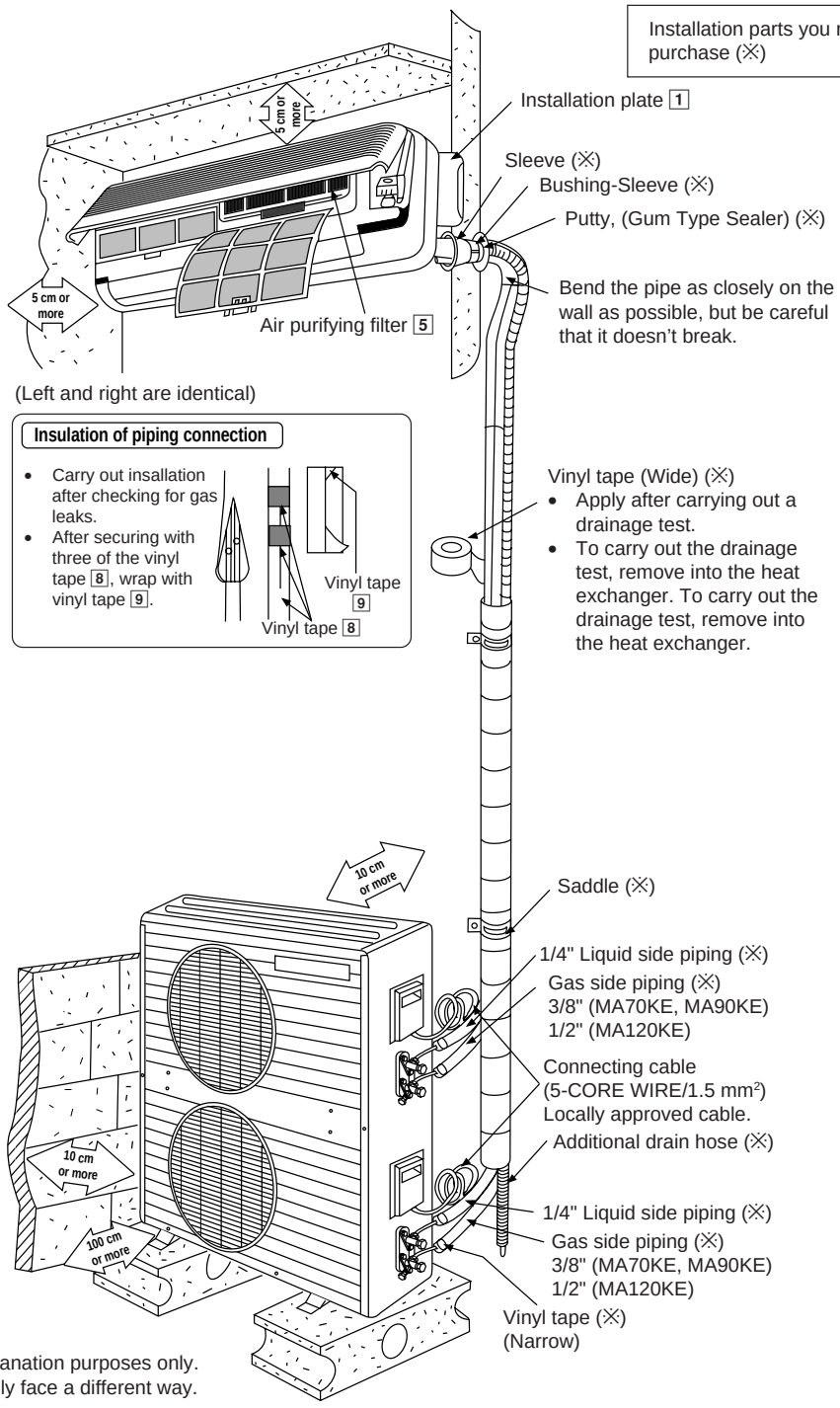
Piping direction



Attention not to bend up drain hose

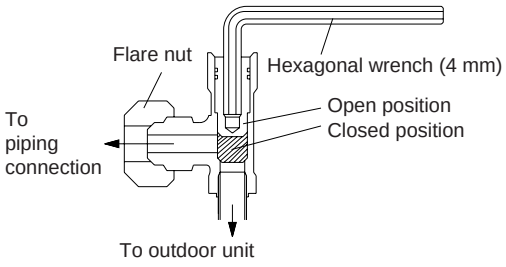
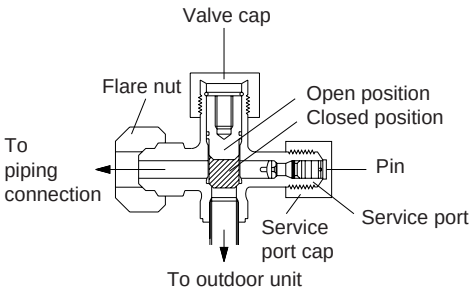


Installation parts you must purchase (※)



- This illustration is for explanation purposes only. The indoor unit will actually face a different way.

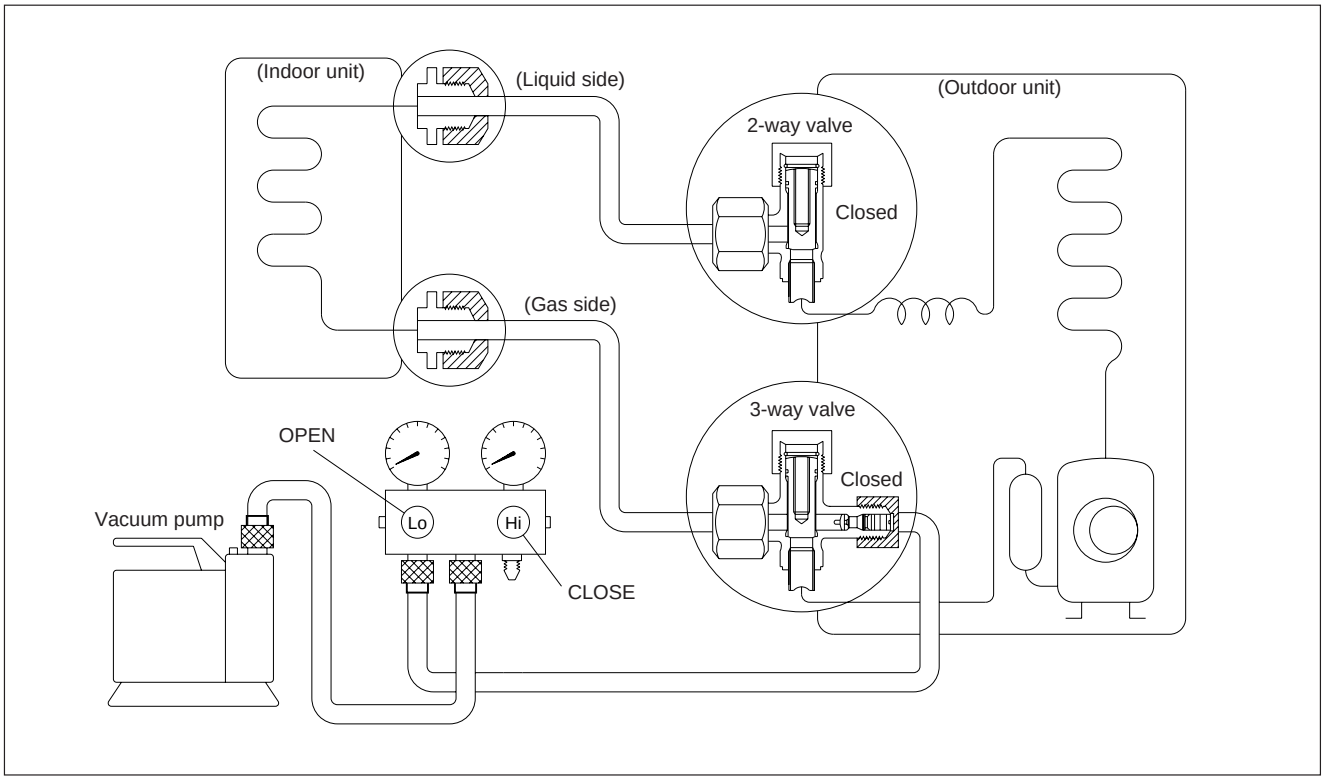
2-way • 3-way Valve

	2-way Valve (Liquid Side)	3-way Valve (Gas Side)	
			
Works	Shaft Position	Shaft Position	Service Port
Shipping	Close (With valve cap)	Closed (With valve cap)	Closed (With cap)
Evacuation (Installation and Re-installation)	Closed (Counter-Clockwise)	Closed (Clockwise)	Open (Push-pin)
Operation	Open (With valve cap)	Open (With valve cap)	Closed (With cap)
Pumping down (Transferring)	Closed (Clockwise)	Open (Counter-clockwise)	Open (Connected manifold gauge)
Evacuation (Servicing)	Open	Open	Open With vacuum pump
Gas charging (Servicing)	Open	Open	Open (With charging cylinder)
Pressure check (Servicing)	Open	Open	Open (Connected manifold gauge)
Gas releasing (Servicing)	Open	Open	Open (Connected manifold gauge)

1 Evacuation of Installation

WHEN INSTALLING AN AIR CONDITIONER, BE SURE TO EVACUATE THE AIR INSIDE THE INDOOR UNIT AND PIPES in the following procedure.

If air remain in the indoor unit and refrigeration pipes, it will affect the compressor, reduce to cooling capacity, and could lead to a malfunction.



Procedure:

(1) Connect a charging hose with a push pin to the Low side of a charging set and the service port of a 3-way valve.
- Be sure to connect the end of the charging hose with the push pin to the service port.

(2) Connect the centre hose of the charging set to a vacuum pump.

(3) Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 MPa (0 cmHg) to –0.1 MPa (–76 cmHg). Then evacuate the air for approximately ten minutes.

(4) Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
BE SURE TO TAKE THIS PROCEDURE IN ORDER TO AVOID GAS LEAKAGE.

(5) Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.

(6) Tighten the service port cap at a torque of 18 N•m with a torque wrench.

(7) Remove the valve caps of the 2-way valve and the 3-way valve. Position both of the valves to "open" using a hexagonal wrench (4 mm).

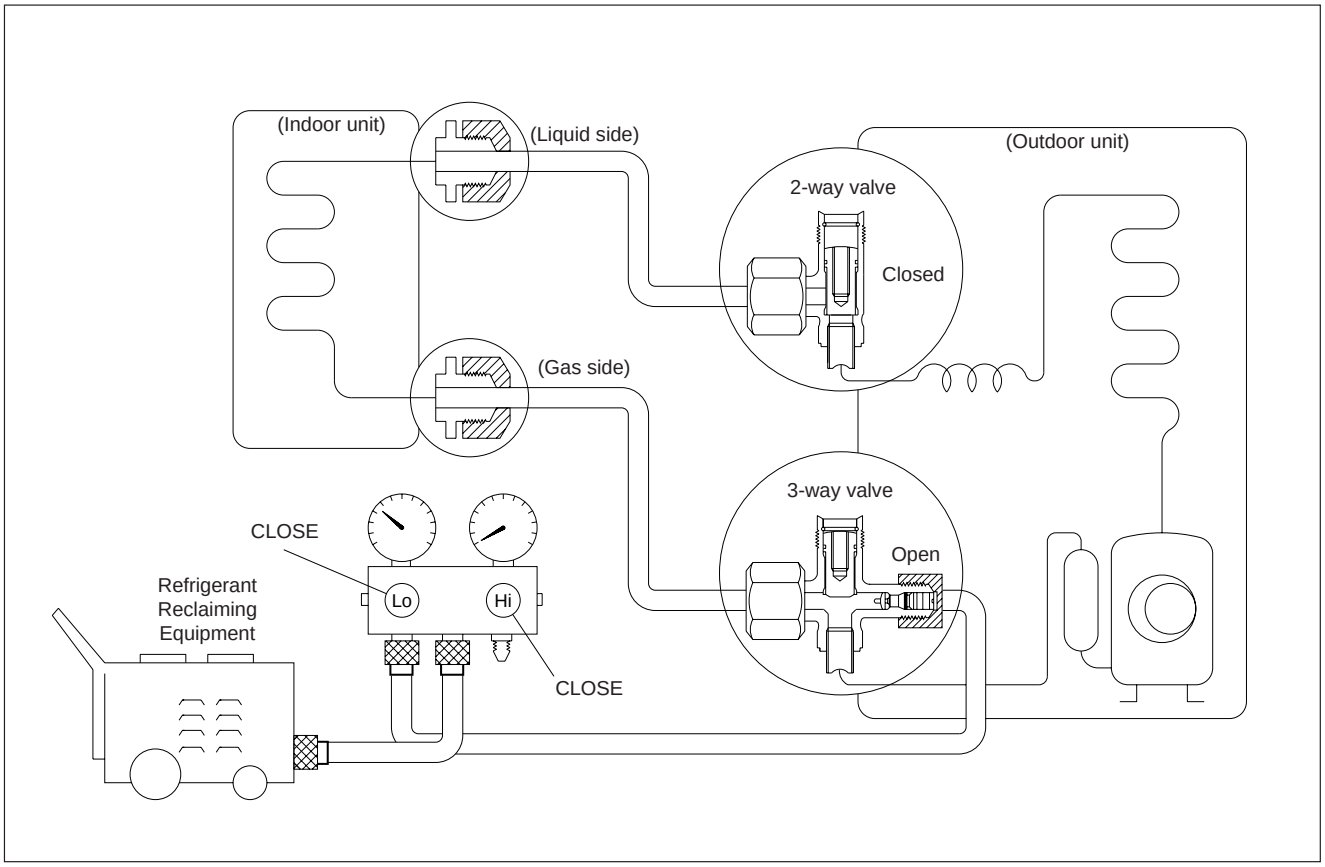
(8) Mount the valve caps onto the 2-way and 3-way valves.
- Be sure to check for gas leakage.

Caution

If gauge needle does not move from 0 cmHg to –76 cmHg in step (3) above, take the following measures:

If the leaks stop when the piping connections are tightened further, continue working from step (3).
If the leaks do not stop when the connections are retightened, repair the location of the leak.

2 Pumping down



Procedure:

(1) Confirm that both the 2-way and 3-way valves are set to the opened position.
- Remove the valve stem caps and confirm that the valve stems are in the opened position.
- Be sure to use a hexagonal wrench to operate the valve stems.

(2) Operate the unit for 10 to 15 minutes.

(3) Stop operation and wait for 3 minutes, then connect the charge set to the service port of the 3-way valve.
- Connect the charge hose with the push pin to the Gas service port.

(4) Air purging of the charge hose.
- Open the low-pressure valve on the charge set slightly to purge air from the charge hose.

(5) Set the 2-way valve to the closed position.

(6) Operate the air conditioner at the cooling cycle and stop it when the gauge indicates 0 MPa (0 kg/cm²G).

If the unit cannot be operated at the cooling condition (weather is rather cool), short the Pumping Down pins on the Main Control P.C.B.

(Simply press the pumping down button if it is equipped.)

So that the unit can be operated.

(7) Immediately set the 3-way valve to the closed position.
- Do this quickly so that the gauge ends up indicating 0.1 MPa (1 kg/cm²G) to 0.3 MPa (3 kg/cm²G)

(8) Use refrigerant reclaiming equipment to collect refrigerant from indoor unit and pipes.

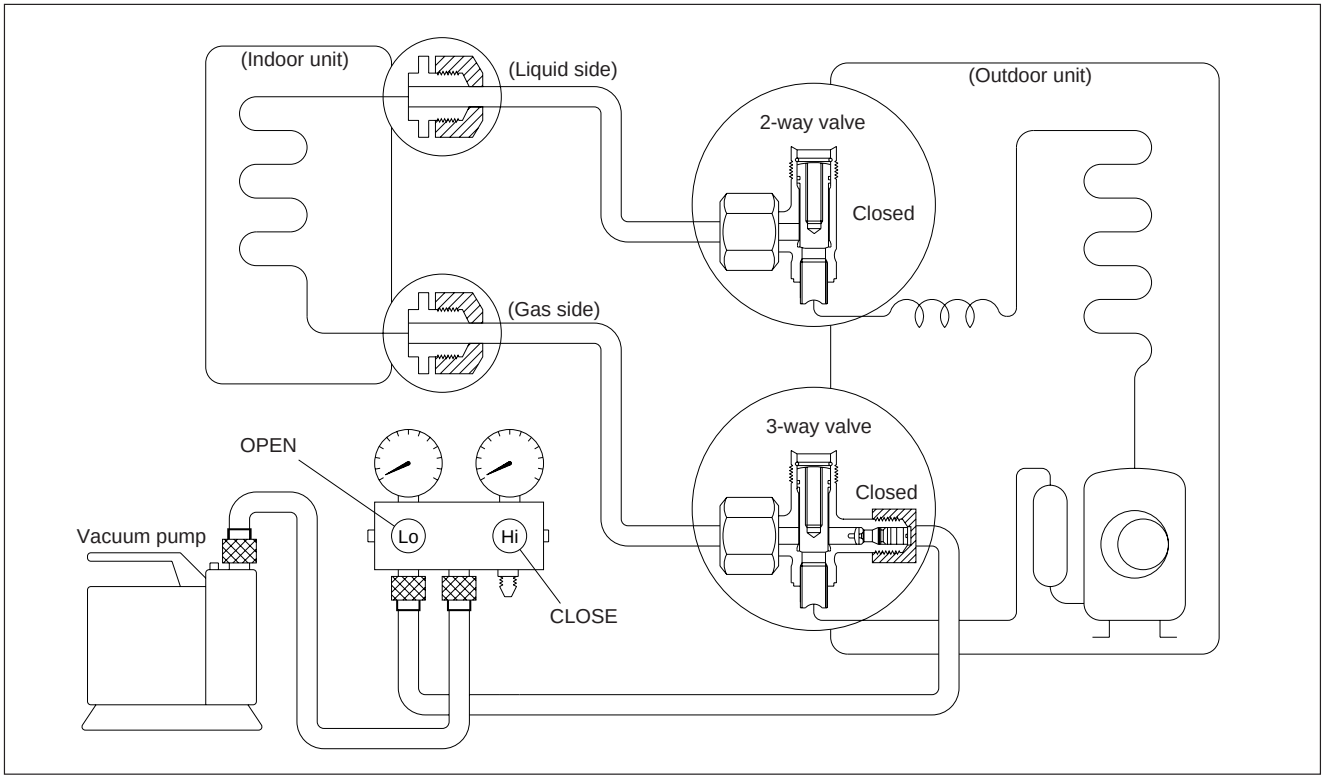
(9) Disconnect the charge set, and mount the 2-way and 3-way valve's stem caps and the service port caps.
- Use a torque wrench to tighten the service port cap to a torque of 18 N•m.
- Be sure to check for gas leakage.

(10) Disconnect pipes from indoor unit and outdoor unit.

3 Evacuation of Re-installation

WHEN RE-INSTALLING AN AIR CONDITIONER, BE SURE TO EVACUATE THE AIR INSIDE THE INDOOR UNIT AND PIPES in the following procedure.

If air remain in the indoor unit and refrigeration pipes, it will affect the compressor, reduce to cooling capacity, and could lead to a malfunction.



Procedure:

(1) Connect a charging hose with a push pin to the Low side of a charging set and the service port of the 3-way valve.
- Be sure to connect the end of the charging hose with the push pin to the service port.

(2) Connect the center hose of the charging set to a vacuum pump.

(3) Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 MPa (0 cmHg) to –0.1 MPa (–76 cmHg). Then evacuate the air for approximately ten minutes.

(4) Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
BE SURE TO TAKE THIS PROCEDURE IN ORDER TO AVOID GAS LEAKAGE.

(5) Disconnect the charging hose from the vacuum pump .

(6) Charge the pipes and indoor unit with gas refrigerant from 3-way valve service port, and then discharge the refrigerant until low side (gas side) gauge needle indicates 0.3 MPa (3 kg/cm^2)

(7) Tighten the service port cap at a torque of 18N·m with a torque wrench.

(8) Remove the valve caps of the 2-way valve and the 3-way valve. Position both of the valves to "open" using a hexagonal wrench (4 mm).

(9) Mount valve caps onto the 2-way and 3-way valves.
- **BE SURE TO USE REFRIGERANT RECLAIMING EQUIPMENT WHILE DISCHARGING THE REFRIGERANT.**
- Purge the air from charge set's centre hose.
- Be sure to check for gas leakage.

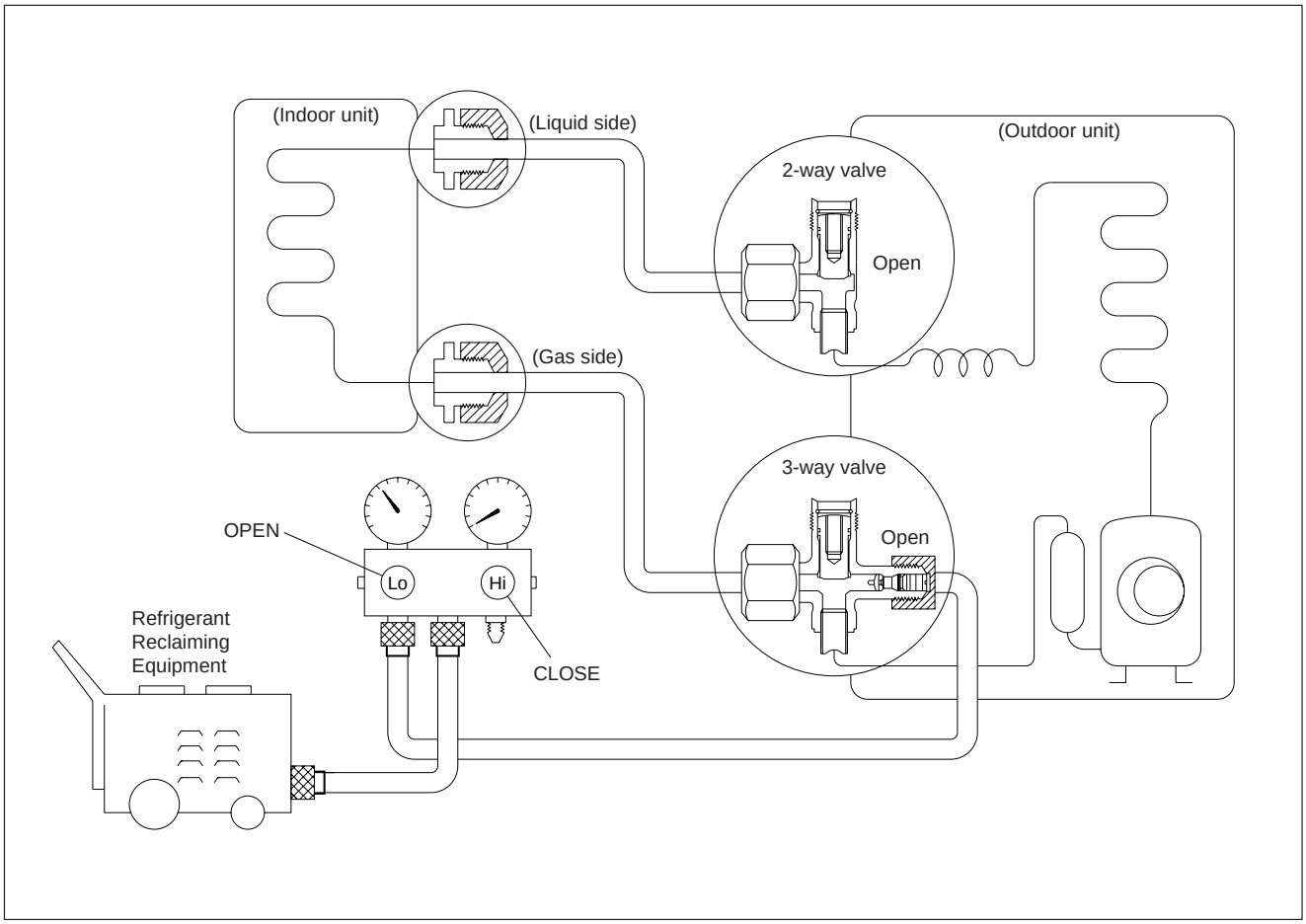
Caution

If gauge needle does not move from 0 MPa (0 cmHg) to –0.1 MPa (–76 cmHg) in step (3) above, take the following measures:

If the leaks stop when the piping connections are tightened further, continue working from step (3).
If the leaks do not stop when the connections are retightened, repair the location of the leak.

4 Balance refrigerant of the 2-way, 3-way valve

(Lack of refrigerant in the refrigeration cycle)



Procedure:

(1) Confirm that both the 2-way and 3-way valves are set to the open position.

(2) Connect the charge set to the 3-way valve's service port.

- Leave the valve on the charge set closed.
- Connect the charge hose with the push-pin to the service port.

(3) Connect the charge set's centre hose to refrigerant reclaiming equipment.

- Purge the air from charge hose.

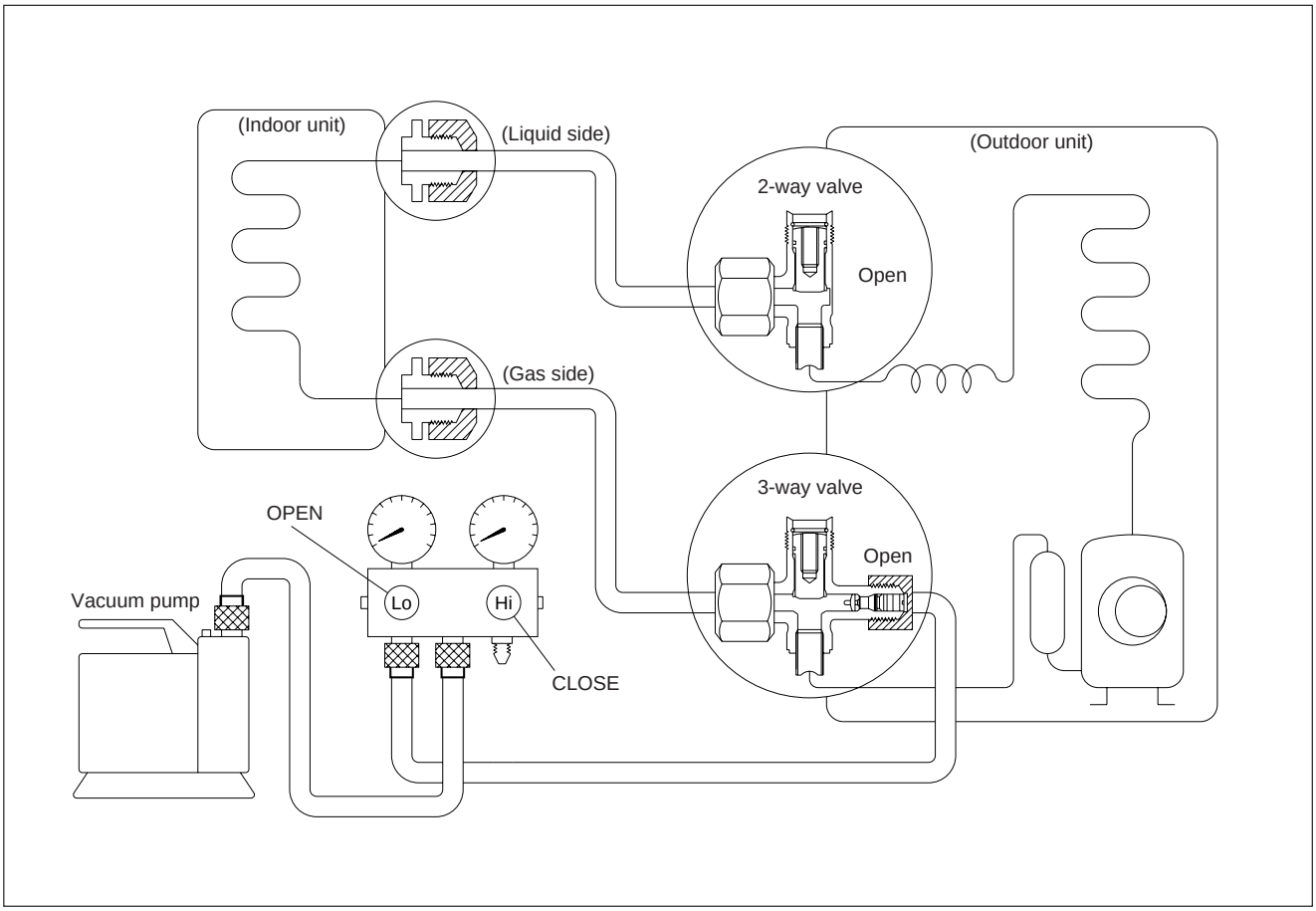
(4) Open the valve (Low side) on the charge set and discharge the refrigerant until the gauge indicates 0.05 MPa (0.5 kg/cm²G) to 0.1 MPa (1 kg/cm²G).

- If there is no air in the refrigeration cycle (the pressure when the air conditioner is not running is higher than 0.1 MPa (1 kg/cm²G), discharge the refrigerant until the gauge indicates 0.05 MPa (0.5 kg/cm²G) to 0.1 MPa (1 kg/cm²G). If this is the case, it will not be necessary to apply a evacuation.
- Discharge the refrigerant gradually; if it is discharged too suddenly, the refrigeration oil will also be discharged.

(5) Turn on refrigerant reclaiming equipment .

5 Evacuation

(No refrigerant in the refrigeration cycle)



Procedure:

(1) Connect the vacuum pump to the charge set's centre hose.

(2) Evacuation for approximately one hour.

- Confirm that the gauge needle has moved toward –0.1 MPa (–76 cmHg) [vacuum of 4 mmHg or less.]

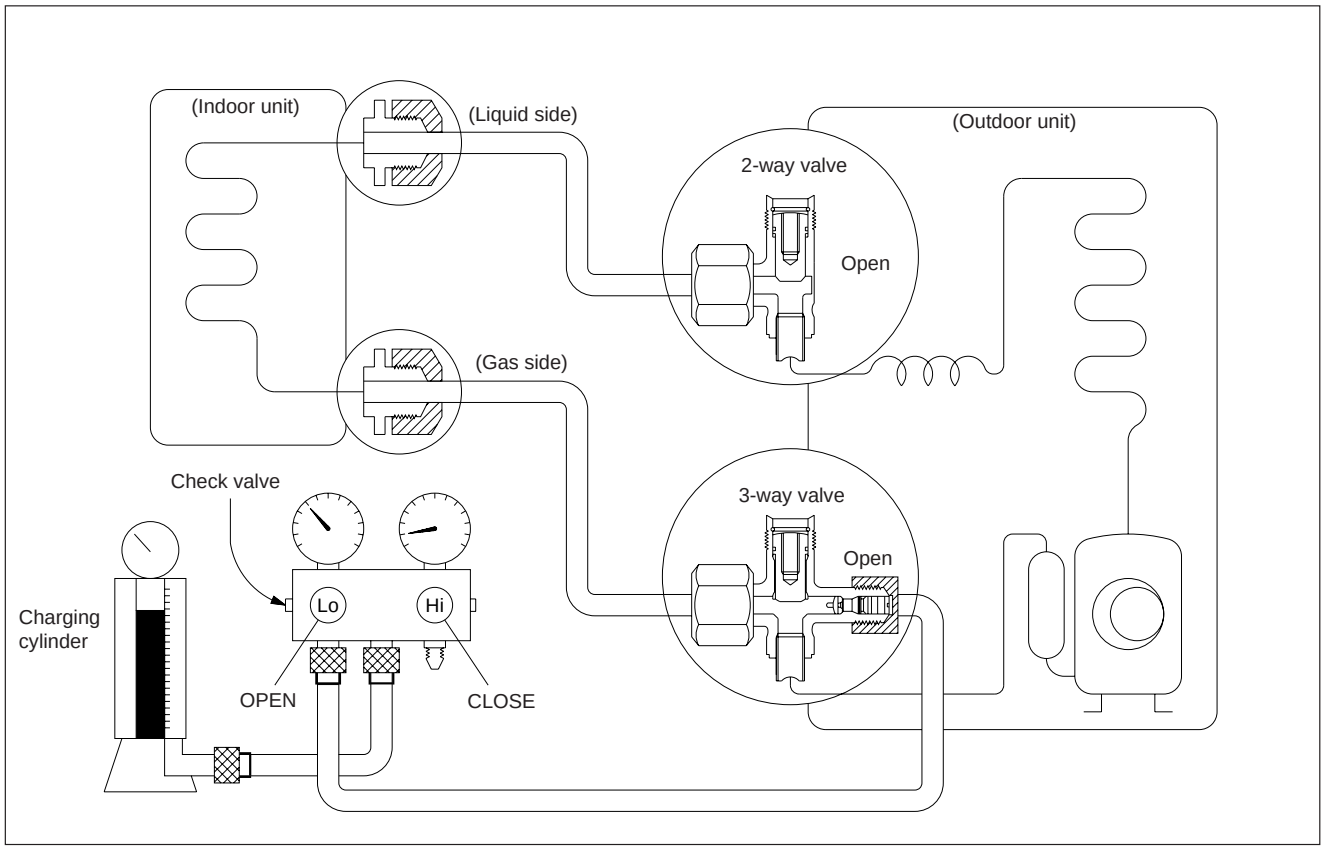
(3) Close the valve (Low side) on the charge set, turn off the vacuum pump, and confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).

(4) Disconnect the charge hose from the vacuum pump.

- Vacuum pump oil
  If the vacuum pump oil becomes dirty or depleted, replenish as needed.

6 Gas charging

(After Evacuation)



Procedure:

(1) Connect the charge hose to the charging cylinder.

- Connect the charge hose which you disconnected from the vacuum pump to the valve at the bottom of the cylinder.

(2) Purge the air from the charge hose.

- Open the valve at the bottom of the cylinder and press the check valve on the charge set to purge the air (be careful of the liquid refrigerant).

(3) Open the valve (Low side) on the charge set and charge the system with liquid refrigerant.

- If the system cannot be charged with the specified amount of refrigerant, it can be charged with a little at a time (approximately 150 g each time) while operating the air conditioner in the cooling cycle; however, one time is not sufficient, wait approximately 1 minute and then repeat the procedure. (pumping down-pin)

This is different from previous procedures. Because you are charging with liquid refrigerant from the gas side, absolutely do not attempt to charge with large amount of liquid refrigerant while operating the air conditioner.

(4) Immediately disconnect the charge hose from the 3-way valve's service port.

- Stopping partway will allow the refrigerant to be discharged.
- If the system has been charged with liquid refrigerant while operating the air conditioner, turn off the air conditioner before disconnecting the hose.

(5) Mount the valve stem caps and the service port cap.

- Use torque wrench to tighten the service port cap to a torque of 18 N•m.
- Be sure to check for gas leakage.

Servicing Information

- **Inspection points for the Indoor Electronic Controller**

1. The Electronic Controller, a signal Receiver and an Indicator can be seen by removing the Front Grille and Control Board Cover, as shown in the Fig. 1.

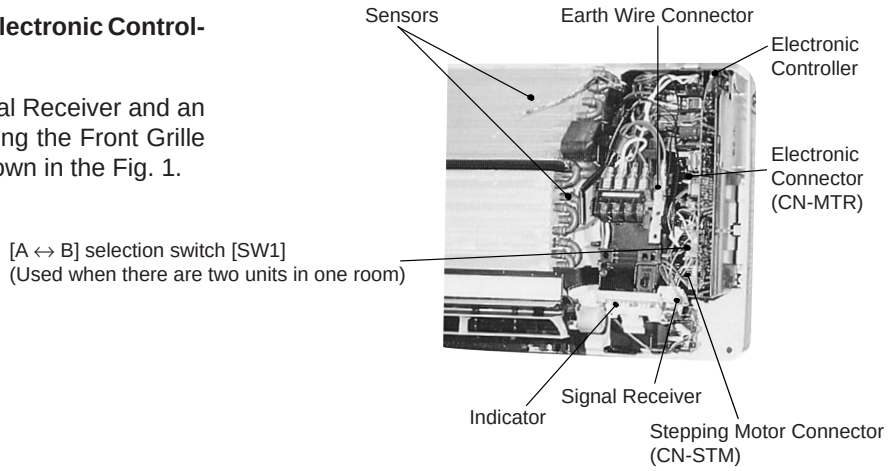


Fig. 1

- **Indoor Fan Motor removal procedure**

1. Remove the connector CN-MTR (GREEN) of Fan Motor and connector CN-STM (GREEN) of stepping motor from the electronic controller. Release the earth wire (YELLOW-GREEN) from the control board and sensors from its holders. (Refer Fig. 1)

2. Remove the Control Board
   The Control Board can be removed by releasing the top, left and right tabs shown in Fig. 2, 3, 4.

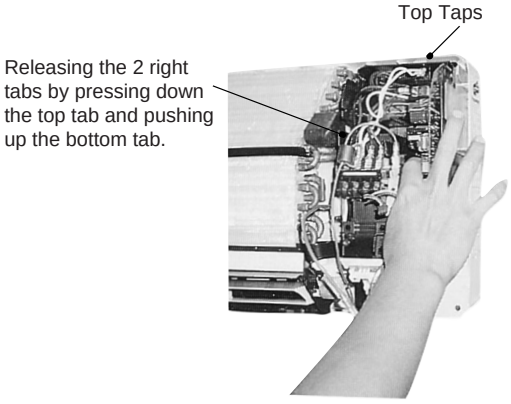


Fig. 2

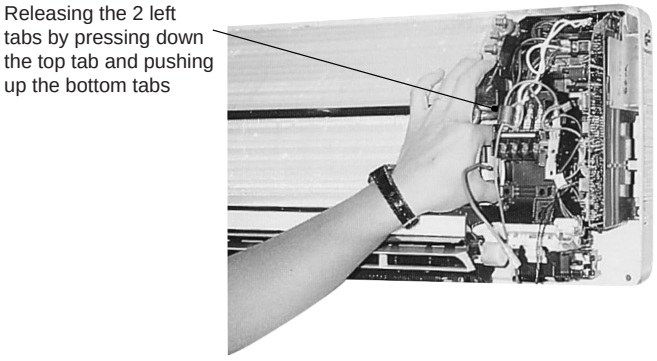


Fig. 3

Fig. 4

Servicing Information

3. Remove the Fan Motor
   Loosen the Fan Motor securing screw at the junction with Cross Flow Fan. (Fig. 5)

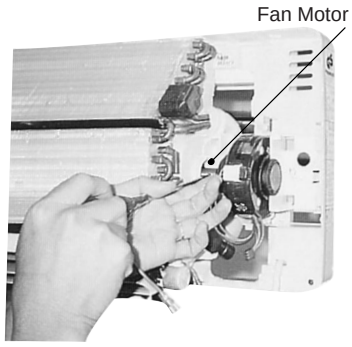


Fig. 5

Remove the particular piece and the Fan Motor can be taken off as shown in Fig. 6 and 7.

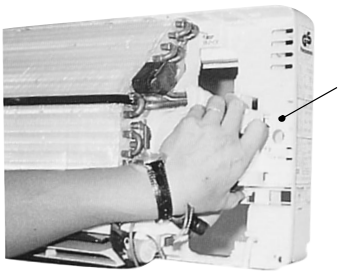


Fig. 6

Fig. 7

4. To fix the Indoor Fan Motor, ensure that the Fan Motor securing screw is positioned at the rear end and the Fan Motor lead wire is positioned parallel to the Fan Motor. (Fig. 8)

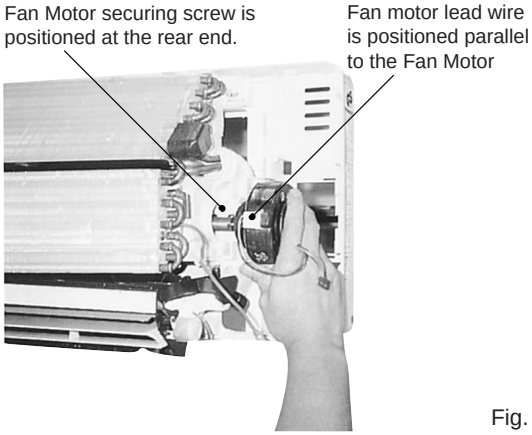


Fig. 8

Servicing Information

- **Cross Flow Fan Removal Procedure**

1. Remove the Indoor Fan Motor.
   (Refer to the removal procedure of the Indoor Fan Motor.) (Fig. 9)

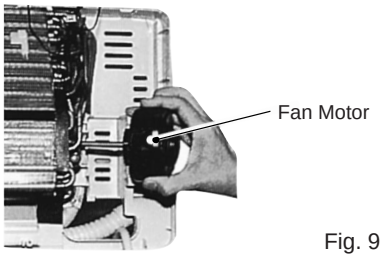


Fig. 9

2. Remove the Air Discharge Grille by taking off the screws that hold the Air Discharge Grille and then pull the Air Discharge Grille in a down and forward direction. (Fig. 10)

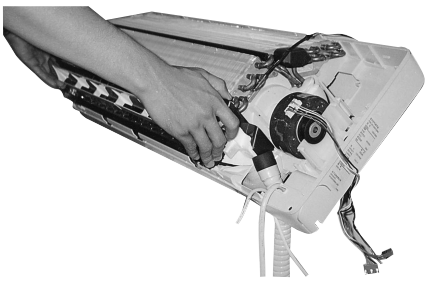


Fig. 10

3. Pull off the Bearing at the left of the Cross Flow Fan. (Fig. 11)

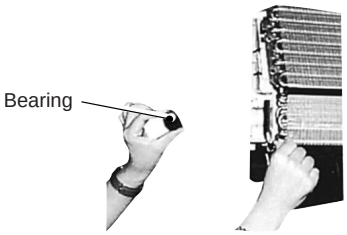


Fig. 11

4. Take off the mounting tab on the left side of the Heat Exchanger, pull the Heat Exchanger forward (left side) and remove the Cross Flow Fan.
   (Fig. 12)

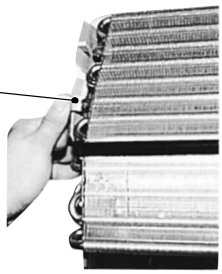
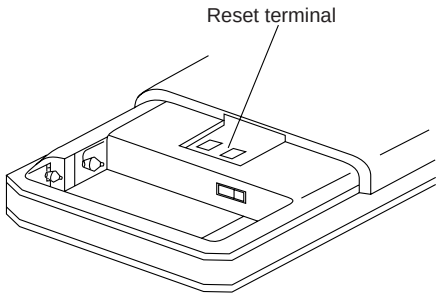


Fig. 12

Servicing Information

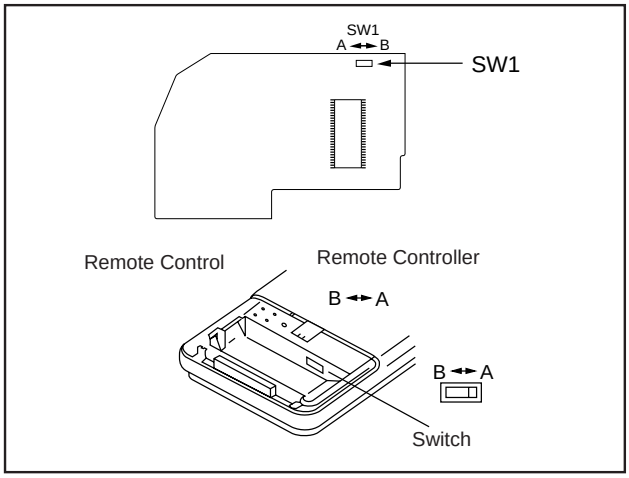
- **Remote Control Reset**

  When the batteries are inserted for the first time, or the batteries are replaced, all the indications will blink and the remote control might not work.
  If this happens, remove the back cover of the remote control and you will find a resetting terminal, and by shorting it with a minus screwdriver, it will return to normal.



- **Changing the wireless remote control transmission code**

  When two indoor units are installed in the same room, in order to prevent operating errors caused by using two remote controls, set up the remote control [B ↔ A] switch (SW1).
  The unit is set to A when it is shipped.



- **By adding a jumper wire to the remote control side and a carbon resistor (1/4 W, 10 kΩ) to the indoor printed circuit board, it is possible to select 4 types of transmission codes including one at time of delivery condition (1).**

	Remote control		Indoor printed circuit board		Note
	Switch SW B ↔ A	J – B	Switch SW1	RX	
1	A	———	A	———	At product delivery
2	B	———	B	———	
3	A	Jumper wire	A	10kΩ	
4	B	Jumper wire	B	10kΩ	

Troubleshooting Guide

Refrigeration cycle system

In order to diagnose malfunctions, make sure that there are no electrical problems before inspecting the refrigeration cycle. Such problems include insufficient insulation, problem with the power source, malfunction of a compressor or a fan.
The normal outlet air temperature and pressure of the refrigeration cycle depends on various conditions; the standard values for them are shown in the table on the right.

Normal Pressure and Outlet Air Temperature (Standard)

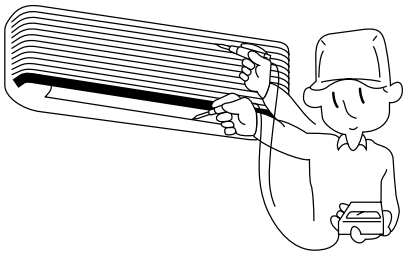
	Gas pressure MPa (kg/cm^2G)	Outlet air temperature (°C)
Cooling mode	0.4 ~ 0.6 (4 ~ 6)	12 ~ 16
Heating Mode	1.5 ~ 2.1 (15 ~ 21)	36 ~ 45

★ Condition: Indoor fan speed; High
Outdoor temperature 35°C at cooling mode and 7°C at heating mode

Difference in the intake and outlet air temperatures

- Above 8°C (15 minutes after an operation is started.) at cooling mode
  Above 14°C (15 minutes after an operation is started.) at heating mode → **Normal**
- Less than 8°C at cooling mode
  Less than 14°C at heating mode

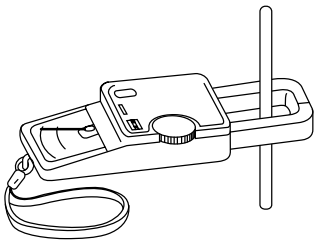
• **Measure the air temperature difference**



Value of electric current during operation

- Higher than specified → Dusty condenser preventing heat radiation
- Higher than specified → Excessive amount of refrigerant
- Lower than specified

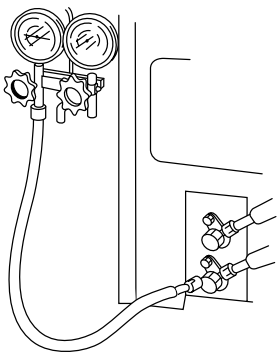
• **Measure the electric current during operation**



Gas side pressure

- Cooling Mode — High → Inefficient compressor
- Cooling Mode — Low → Insufficient refrigerant
- Cooling Mode — Low → Clogged strainer or capillary tube
- Heating Mode — Low → Inefficient compressor
- Heating Mode — Low → Insufficient refrigerant
- Heating Mode — Low → Clogged strainer or capillary tube

• **Measure the gas side pressure**



Troubleshooting Guide

1. Relationship between the condition of the air conditioner and pressure and electric current

Condition of the air conditioner	Cooling Mode			Heating Mode		
	Low Pressure	High Pressure	Electric current during operation	Low Pressure	High Pressure	Electric current during operation
Insufficient refrigerant (gas leakage)	↘	↘	↘	↘	↘	↘
Clogged capillary tube or Strainer	↘	↘	↘	↘	↘	↘
Short circuit in the indoor unit	↘	↘	↘	↗	↗	↗
Heat radiation deficiency of the outdoor unit	↗	↗	↗	↘	↘	↘
Inefficient compression	↗	↘	↘	↗	↘	↘

- Carry out the measurements of pressure, electric current, and temperature fifteen minutes after an operation is started.

2. Diagnosis methods of a malfunction of a compressor and a 4-way valve

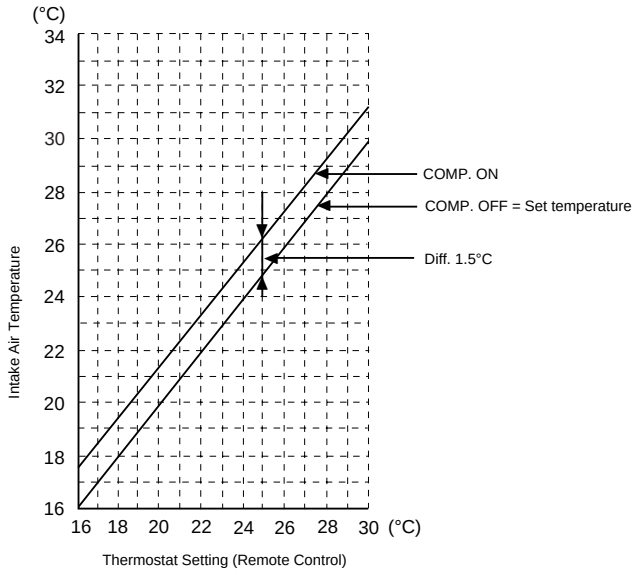
Nature of fault	Symptom
Insufficient compressing of a compressor	• Electric current during operation becomes approximately 20% lower than the normal value. • The discharge tube of the compressor becomes abnormally hot (normally 70 to 90°C). • The difference between high pressure and low pressure becomes almost zero.
Locked compressor	• Electric current reaches a high level abnormally, and the value exceeds the limit of an ammeter. In some cases, a breaker turns off. • The compressor is a humming sound.
Inefficient switches of the 4-way valve	• Electric current during operation becomes approximately 80% lower than the normal value. • The temperature difference between from the discharge tube to the 4-way valve and from suction tube to the 4-way valve becomes almost zero.

Technical Data

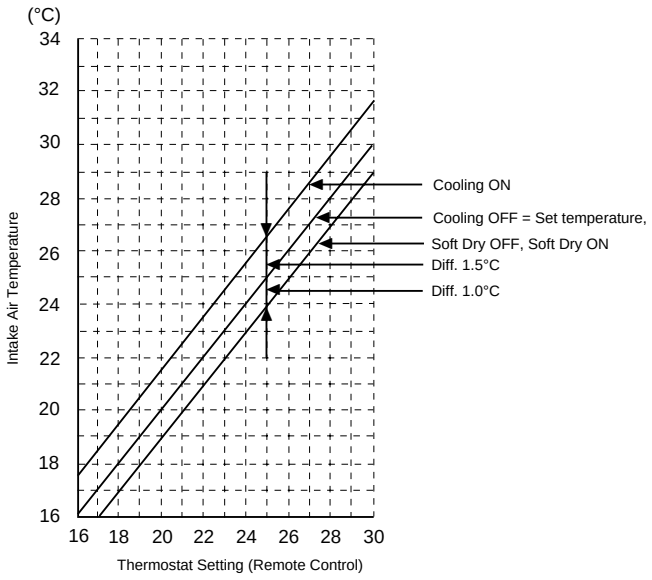
■ Thermostat characteristics

CS-MA70KE / CS-MA90KE / CS-MA120KE

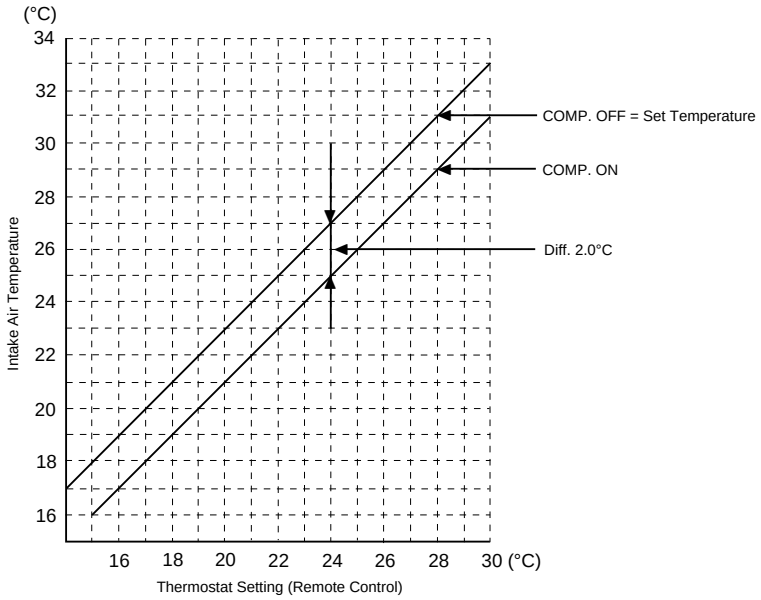
- **Cooling**



- **Soft Dry**



- **Heating**

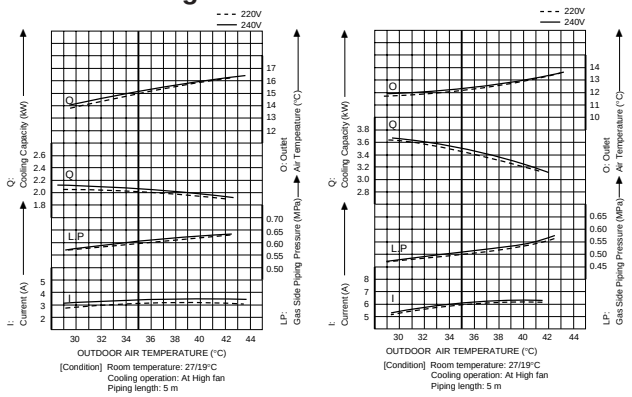


Technical Data

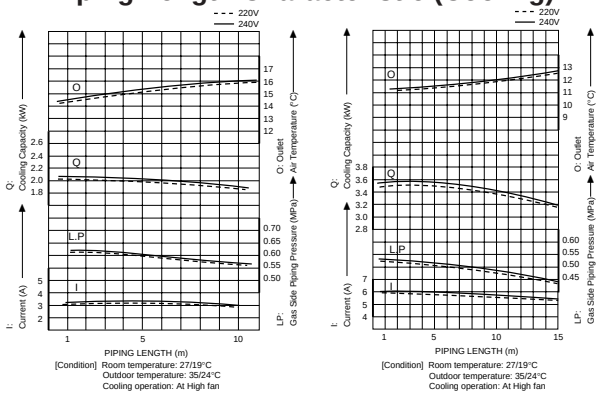
■ Operation characteristics

CS-MA70KE, CS-MA120KE / CU-MA190KE

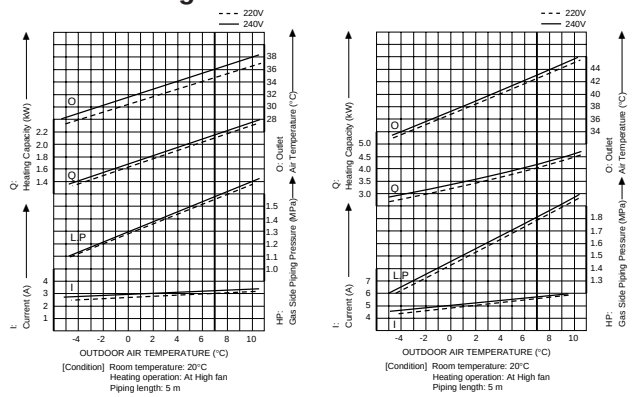
- **Cooling Characteristic**



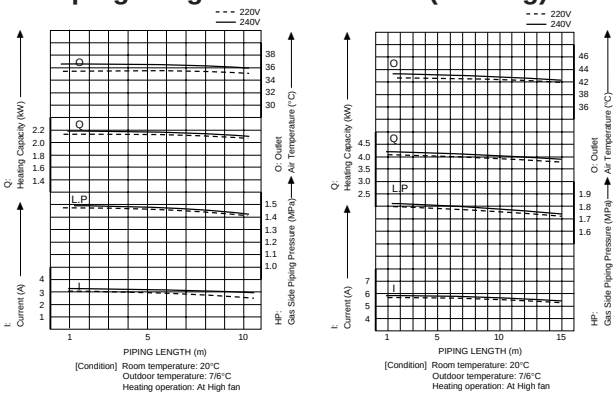
- **Piping Length Characteristic (Cooling)**



- **Heating Characteristic**



- **Piping Length Characteristic (Heating)**



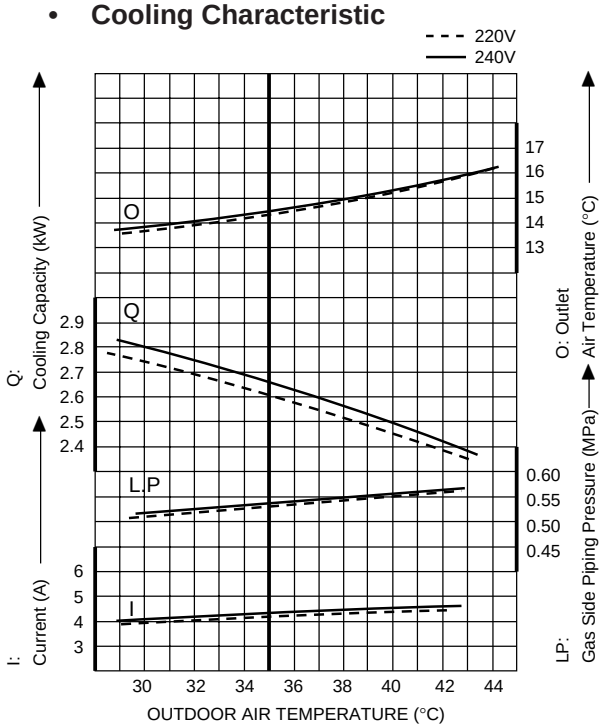
Technical Data

■ Operation characteristics

CS-MA90KE / CU-MA180KE

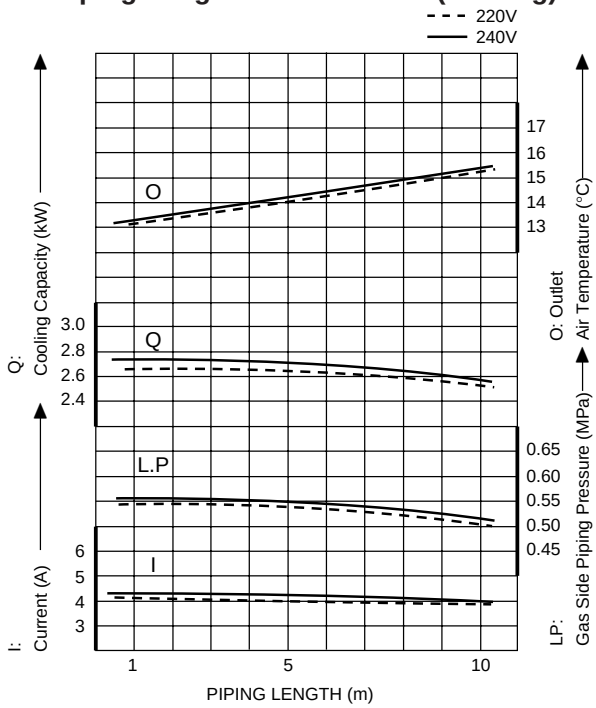
The capability value shown is the value for one unit. For a total for two units, multiply by 2.

- **Cooling Characteristic**



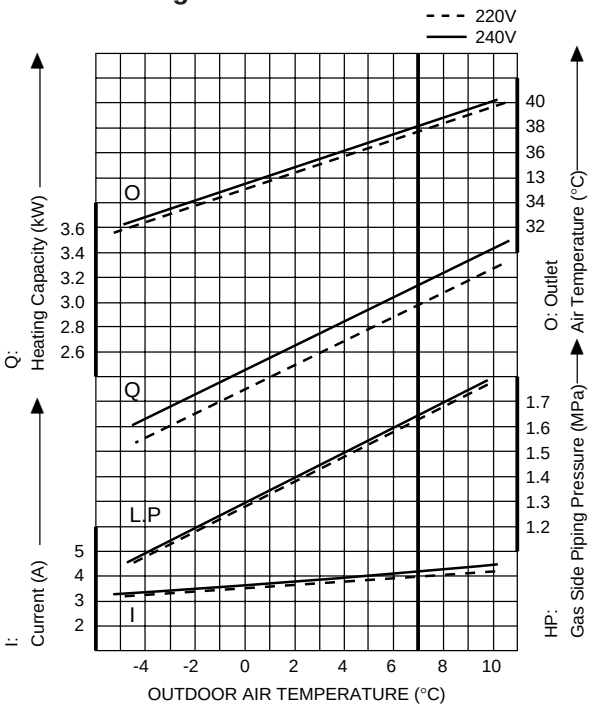
[Condition] Room temperature: 27/19°C
Cooling operation: At High fan
Piping length: 5 m

- **Piping Length Characteristic (Cooling)**



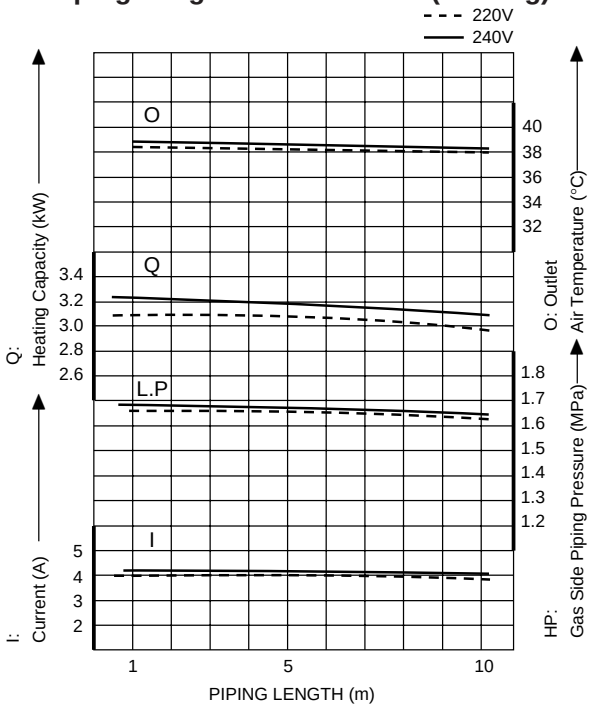
[Condition] Room temperature: 27/19°C
Outdoor temperature: 35/24°C
Cooling operation: At High fan

- **Heating Characteristic**



[Condition] Room temperature: 20°C
Heating operation: At High fan
Piping length: 5 m

- **Piping Length Characteristic (Heating)**



[Condition] Room temperature: 20°C
Outdoor temperature: 7/6°C
Heating operation: At High fan

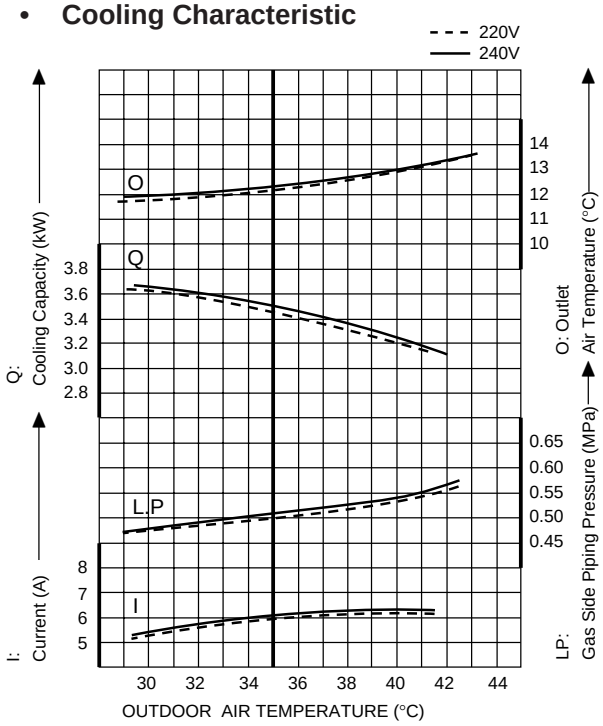
Technical Data

■ Operation characteristics

CS-MA120KE / CU-MA240KE

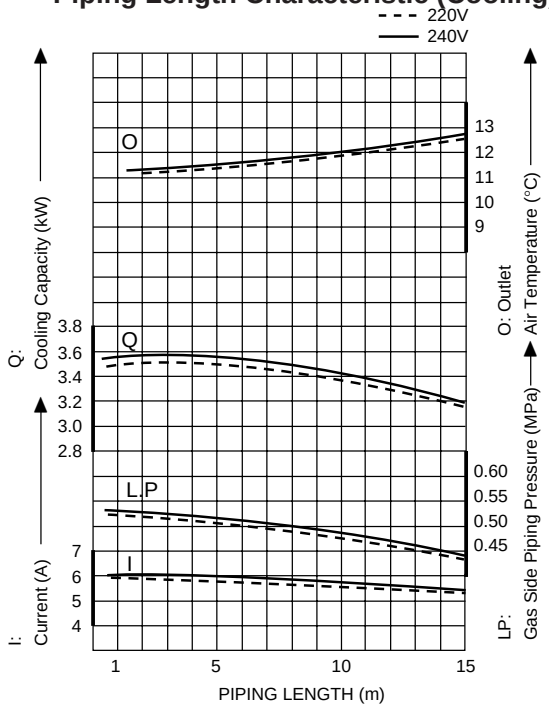
The capability value shown is the value for one unit. For a total for two unit, multiply by 2.

- **Cooling Characteristic**



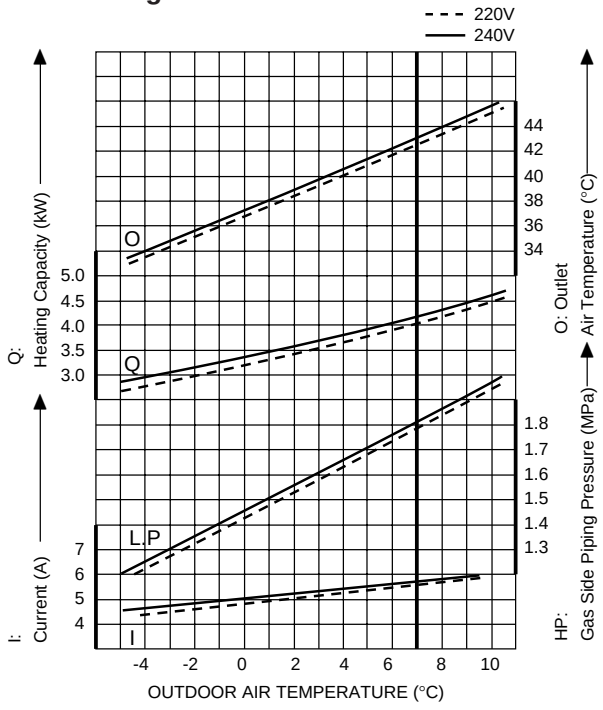
[Condition] Room temperature: 27/19°C
Cooling operation: At High fan
Piping length: 5 m

- **Piping Length Characteristic (Cooling)**



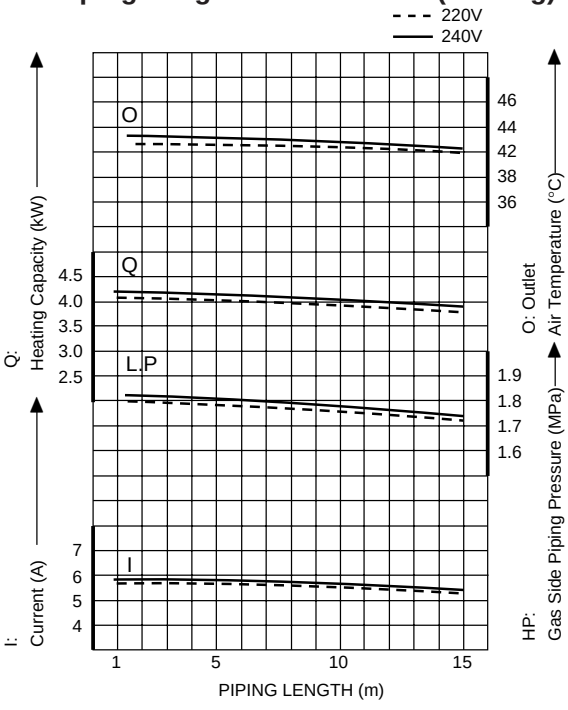
[Condition] Room temperature: 27/19°C
Outdoor temperature: 35/24°C
Cooling operation: At High fan

- **Heating Characteristic**



[Condition] Room temperature: 20°C
Heating operation: At High fan
Piping length: 5 m

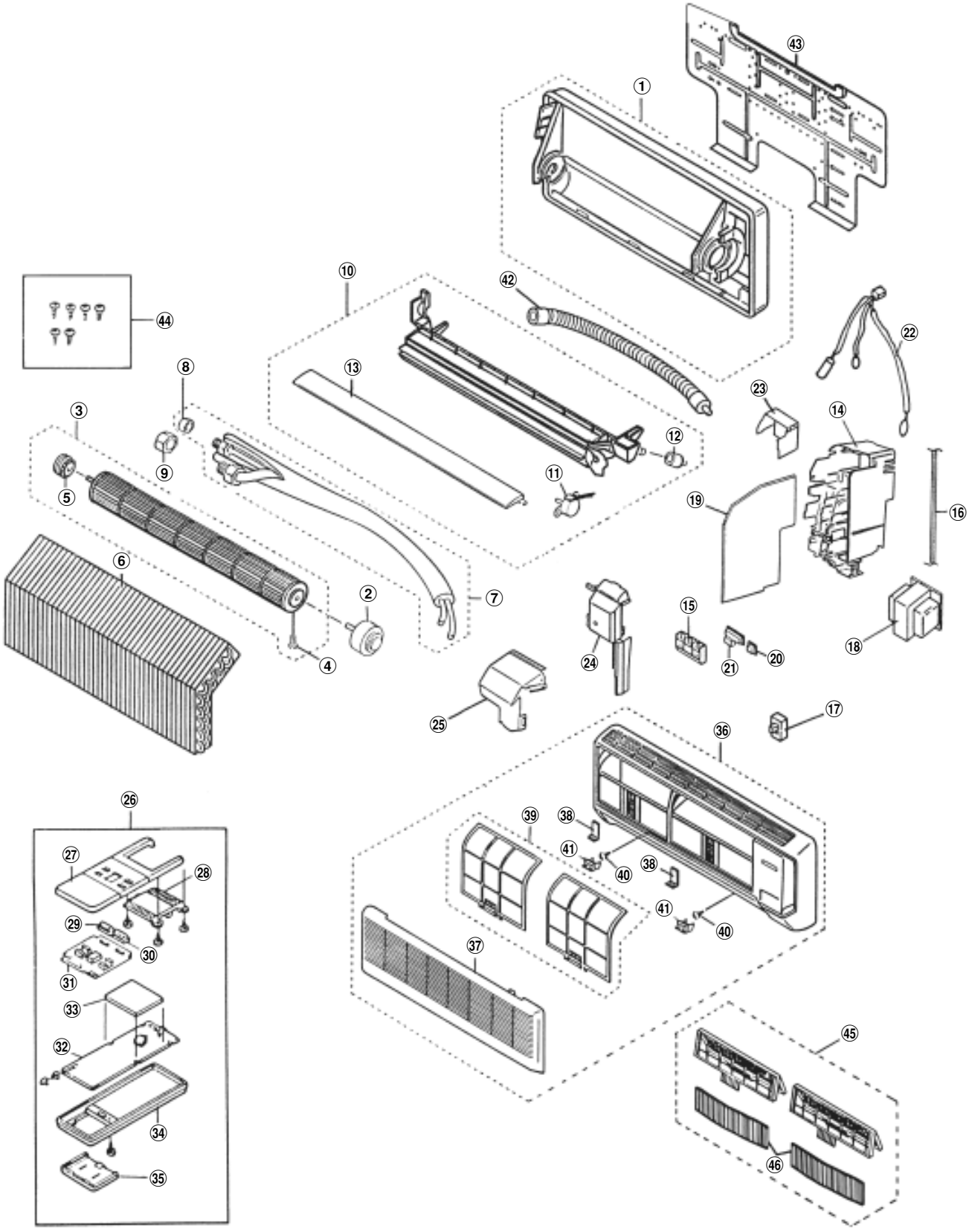
- **Piping Length Characteristic (Heating)**



[Condition] Room temperature: 20°C
Outdoor temperature: 7/6°C
Heating operation: At High fan

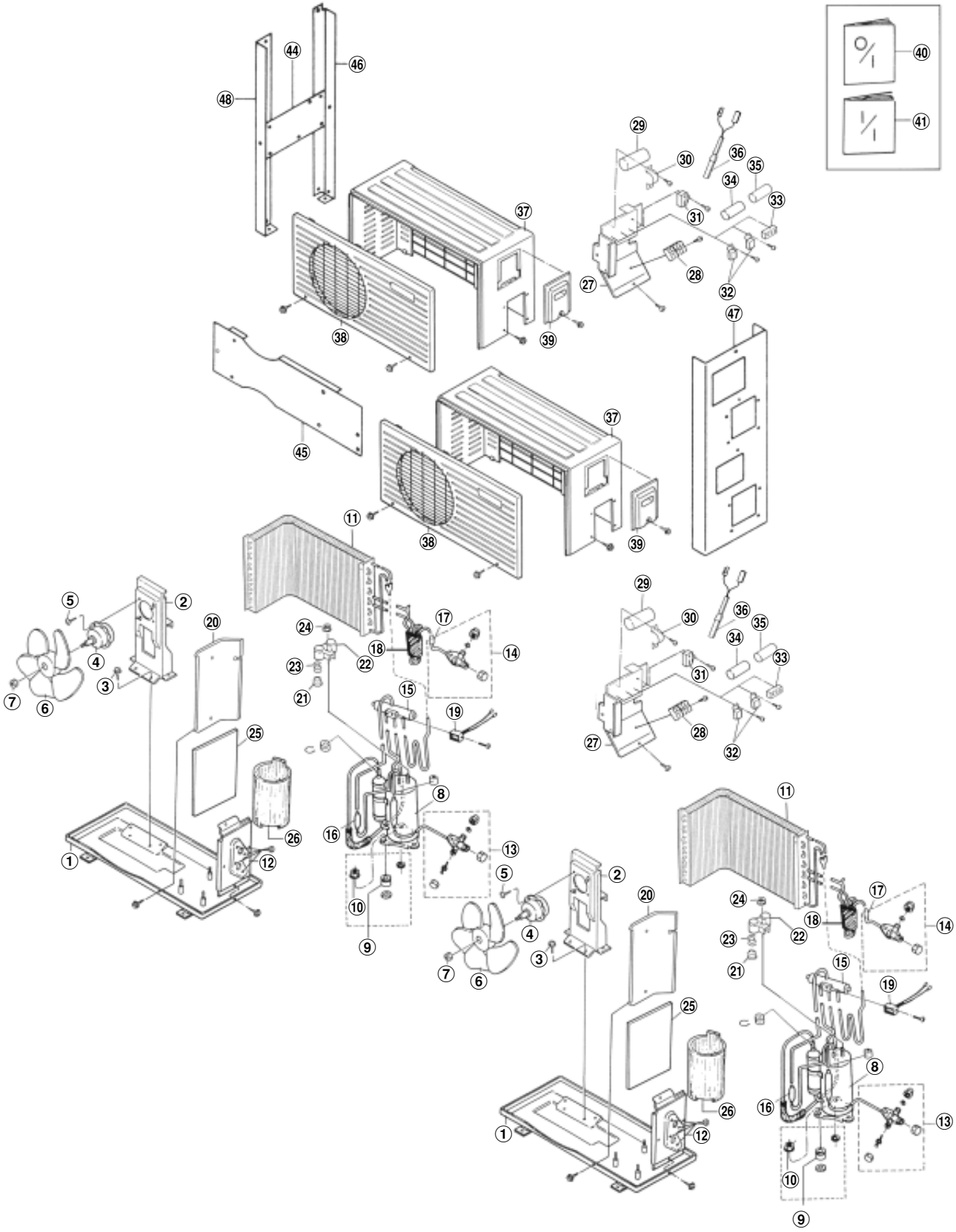
Exploded View (CS-MA70KE, CS-MA120KE / CU-MA190KE)

CS-MA70KE / CS-MA120KE



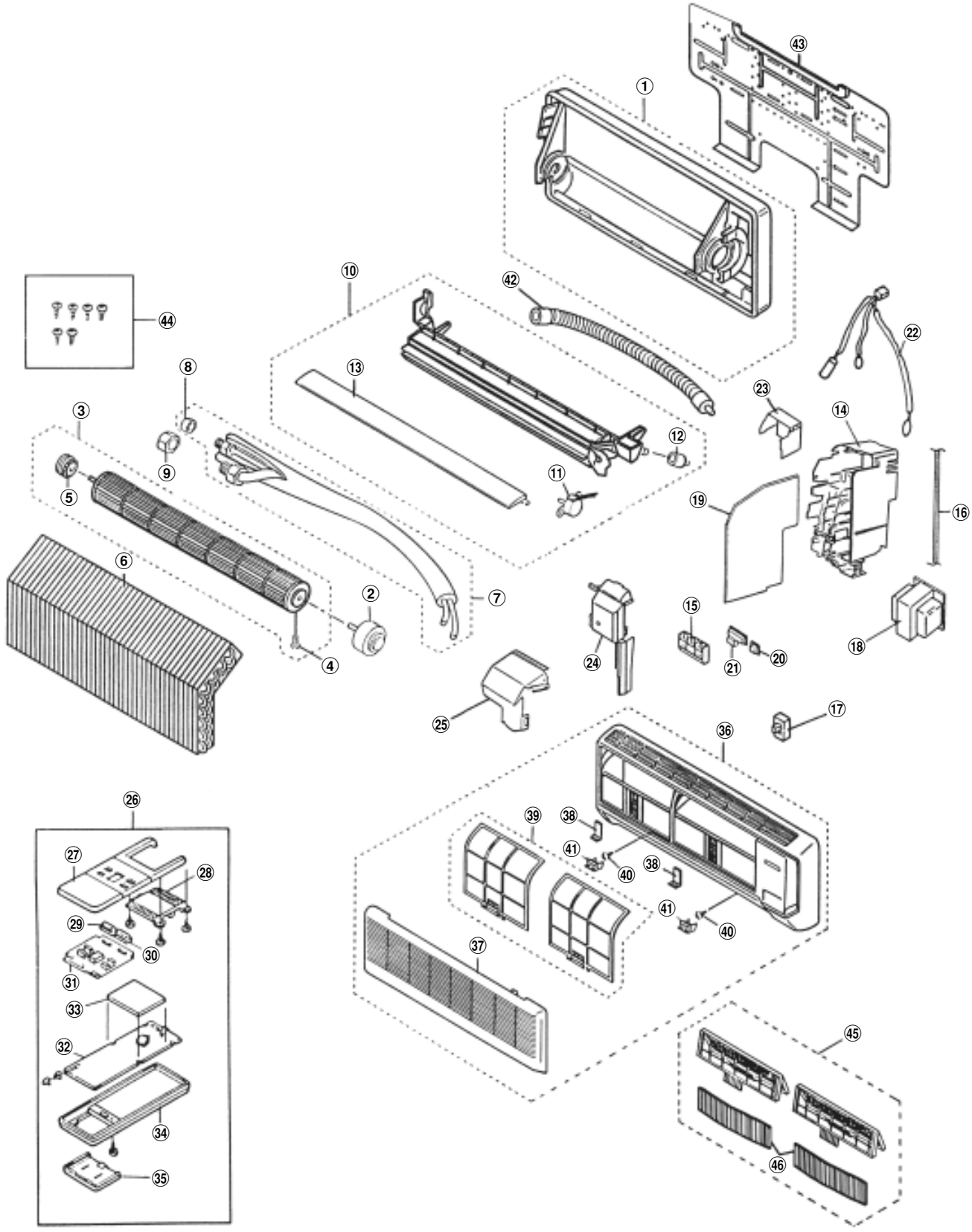
Exploded View (CS-MA70KE, CS-MA120KE / CU-MA190KE)

CU-MA190KE



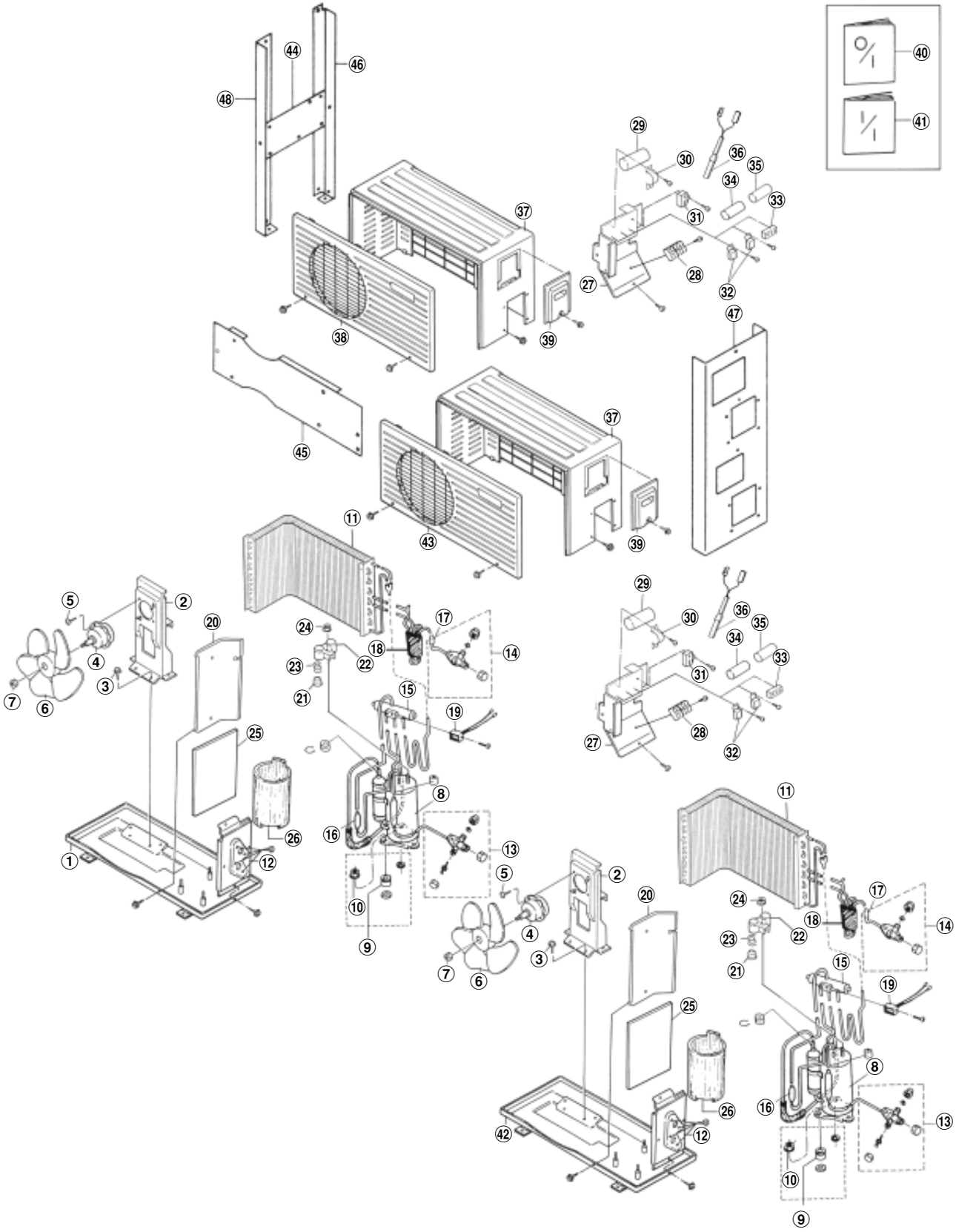
Exploded View (CS-MA90KE / CU-MA180KE, CS-MA120KE / CU-MA240KE)

CS-MA90KE / CS-MA120KE



Exploded View (CS-MA90KE / CU-MA180KE, CS-MA120KE / CU-MA240KE)

CU-MA180KE / CU-MA240KE



Replacement Parts List

<Model: CS-MA70KE, CS-MA120KE>

NO.	DESCRIPTION & NAME	QTY	CS-MA70KE	CS-MA120KE	REMARKS
1	CHASSY COMPLETE	1	CWD50C202	←	
2	FAN MOTOR	1	CWA98244	←	○
3	CROSS FLOW FAN COMPLETE	1	CWH02C053	←	
4	SCREW – CROSS FLOW FAN	1	CWH4580304	←	
5	BEARING ASS'Y	1	CWH64K007	←	
6	EVAPORATOR	1	CWB30C145	CWB30C146	
7	TUBE ASS'Y COMPLETE	1	CWT01C237	CWT01C238	
8	FLARE NUT (1/4")	1	CWH6002140	←	
9	FLARE NUT (1/2") OR (3/8")	1	CWT25005 (3/8")	CWT25007 (1/2")	
10	DISCHARGE GRILLE COMPLETE	1	CWE20C480	CWE20C481	
11	MOTOR – AIR SWING	1	CWA98245	←	○
12	TAP – DRAIN TRAY	1	CWH52C003	←	
13	VANE	1	CWE24394	←	
14	CONTROL BOARD	1	CWH10887	←	
15	TERMINAL BOARD COMPLETE	1	CWA28C469	CWA28C470	○
16	POWER SUPPLY CORD	1	CWA20C656	CWA20C620	
17	SLIDE SWITCH	1	CWA04088	←	○
18	TRANSFORMER COMPLETE	1	CWA40C246	←	○
19	ELETRONIC CONTROLLER	1	CWA74900	CWA74804	○
20	RECEIVER	1	CWA74321	←	○
21	INDICATOR COMPLETE	1	CWE39C271	←	○
22	SENSOR COMPLETE	1	CWA50C521	←	○
23	CONTROL BOARD TOP COVER	1	CWH13383	←	
24	CONTROL BOARD FRONT COVER	1	CWH13C256	←	
25	CONTROL BOARD COVER PIECE	1	CWH13385	←	
26	REMOTE CONTROL COMPLETE	1	CWA75C556	←	○
27	REMOTE CONTROL CASE CO.	1	CWE15C241	←	
28	CONTROL PANEL	1	CWE311064	←	
29	KNOB	1	CWE17196A	←	
30	KNOB	1	CWE17197A	←	
31	CONTACTOR	1	CWA65036C	←	
32	PCB – REMOTE CONTROL	1	CWA74224	←	
33	INDICATOR	1	CWE39199	←	
34	REMOTE CONTROL CASE	1	CWE15128A	←	
35	COVER	1	CWB80040A	←	
36	FRONT GRILLE COMPLETE	1	CWE11C590	←	
37	INTAKE GRILLE COMPLETE	1	CWE22C287	←	
38	PARTICULAR PIECE	2	CWD93C070	←	
39	AIR FILTER	2	CWD00215	←	
40	SCREW – FRONT GRILLE	2	XTN4+16C	←	
41	CAP – FRONT GRILLE	2	CWH52230	←	
42	DRAIN HOSE	1	CWH5880580	←	
43	INSTALLATION PLATE	1	CWH36122	←	
44	BAG COMPLETE – INSTALLATION SCREW	1	CWH82C194	←	
45	AIR PURIFYING FILTER COMPLETE	1	CWD00C111	←	
46	AIR PURIFYING FILTER	2	CWD00220	←	○

(Note)
- All parts are supplied from MAICO, Malaysia (Vendor Code: 061).
- The above parts are kept for seven years in accordance with MEI service policy. However, longer lead time will be taken in supplying the non-numbered parts.
- ○ marked parts are recommended to be kept in stock.

Replacement Parts List

<Model: CU-MA190KE>

NO.	DESCRIPTION & NAME	QTY	CU-MA190KE		REMARKS
			(Upper)	(Lower)	
1	CHASSY ASS'Y	1	CWD50K627A	CWD50K612A	
2	FAN MOTOR BRACKET	1	CWD54113	CWD54155	
3	SCREW – FAN MOTOR BRACKET	8	CWH4580399		
4	FAN MOTOR	2	CWA95245		○
5	SCREW – FAN MOTOR MOUNT	6	CWH55027		
6	PROPELLER FAN	2	CWH00K052		
7	NUT – PROPELLER FAN	2	CWH56032		
8	COMPRESSOR	1	2RS122D5AB02	2KS224D5AC02	○
9	ANTI – VIBRATION BUSHING	3	CWH50077	CWH50055	
10	NUT – COMPRESSOR MOUNT	3	CWH56000	CWH4582065	
11	CONDENSER	1	CWB32C043	CWB32C225	
12	HOLDER COUPLING ASS'Y	1	CWH35K017A	CWH35K019A	
13	3-WAY VALVE	1	CWB01343	CWB01379	○
14	2-WAY VALVE	1	CWB02224	CWB02269	○
15	4-WAY VALVE	1	CWB00002	CWB00003	○
16	TUBE ASS'Y (RECEIVER)	1	CWT01537	CWT01C240	
17	STRAINER	2	CWB11025		
18	TUBE ASS'Y (CHECK VALVE, CAPILLARY)	1	CWT01C260	CWT01C241	
19	V – COIL COMPLETE	1	CWA43C424	CWA43C439	○
20	SOUND PROOF BOARD	1	CWH15C081	CWH15264	
21	OVERLOAD PROTECTOR	1	CWA67C1349	CWA67C1212	○
22	TERMINAL COVER	1	CWH17006	CWH17038	
23	HOLDER – O.L.P.	1	—	CWH34033	
24	NUT – TERMINAL COVER	2	CWH7080300		
25	SOUND PROOF MATERIAL	1	—	CWG30779	
26	SOUND PROOF MATERIAL	1	CWG30786	—	
27	CONTROL BOARD	1	CWH10881	CWH10878	
28	TERMINAL BOARD ASS'Y	1	CWA28C500	CWA28C502	
29	CAPACITOR – COMPRESSOR	1	CWA31653	CWA31647	○
30	HOLDER CAPACITOR	2	CWH30057		
31	CAPACITOR – FAN MOTOR (1.2 μF, 400 V)	2	CWA31342		○
32	ELECTRO MAGNETIC SWITCH	4	CWA00059		○
33	TERMINAL BOARD ASS'Y	2	CWA4711012		
34	ELECTROLYTIC CAPACITOR	2	CWA32C045		○
35	ELECTROLYTIC CAPACITOR	2	CWA32C067		○
36	TEMPERATURE RELAY	2	CWA14C000		○
37	CABINET ASS'Y	1	CWE00K268A	CWE00K251A	
38	CABINET FRONT PLATE	1	CWE06C046E	CWE06C108A	
39	CONTROL BOARD COVER	2	CWH13C286		
40	OPERATING INSTRUCTIONS	1	CWF561247		
41	INSTALLATION INSTRUCTIONS	1	CWF61482		
44	FLAT PLATE	1	CWD64188A		
45	FLAT PLATE	1	CWD91184A		
46	FLAT PLATE	1	CWD91179A		
47	FLAT PLATE	1	CWD91180A		
48	FLAT PLATE	1	CWD91181A		

(Note)
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- ○ marked parts are recommended to be kept in stock.

Replacement Parts List

<Model: CS-MA90KE, CS-MA120KE>

NO.	DESCRIPTION & NAME	QTY	CS-MA90KE	CS-MA120KE	REMARKS
1	CHASSY COMPLETE	1	CWD50C202	←	
2	FAN MOTOR	1	CWA98244	←	○
3	CROSS FLOW FAN COMPLETE	1	CWH02C053	←	
4	SCREW – CROSS FLOW FAN	1	CWH4580304	←	
5	BEARING ASS'Y	1	CWH64K007	←	
6	EVAPORATOR	1	CWB30C145	CWB30C146	
7	TUBE ASS'Y COMPLETE	1	CWT01C237	CWT01C238	
8	FLARE NUT (1/4")	1	CWH6002140	←	
9	FLARE NUT (1/2") OR (3/8")	1	CWT25005 (3/8")	CWT25007 (1/2")	
10	DISCHARGE GRILLE COMPLETE	1	CWE20C480	CWE20C481	
11	MOTOR – AIR SWING	1	CWA98245	←	○
12	TAP – DRAIN TRAY	1	CWH52C003	←	
13	VANE	1	CWE24394	←	
14	CONTROL BOARD	1	CWH10887	←	
15	TERMINAL BOARD COMPLETE	1	CWA28C469	CWA28C470	○
16	POWER SUPPLY CORD	1	CWA20C620	←	
17	SLIDE SWITCH	1	CWA04088	←	○
18	TRANSFORMER COMPLETE	1	CWA40C246	←	○
19	ELETRONIC CONTROLLER	1	CWA74899	CWA74804	○
20	RECEIVER	1	CWA74321	←	○
21	INDICATOR COMPLETE	1	CWE39C271	←	○
22	SENSOR COMPLETE	1	CWA50C521	←	○
23	CONTROL BOARD TOP COVER	1	CWH13383	←	
24	CONTROL BOARD FRONT COVER	1	CWH13C256	←	
25	CONTROL BOARD COVER PIECE	1	CWH13385	←	
26	REMOTE CONTROL COMPLETE	1	CWA75C556	←	○
27	REMOTE CONTROL CASE CO.	1	CWE15C241	←	
28	CONTROL PANEL	1	CWE311064	←	
29	KNOB	1	CWE17196A	←	
30	KNOB	1	CWE17197A	←	
31	CONTACTOR	1	CWA65036C	←	
32	PCB – REMOTE CONTROL	1	CWA74224	←	
33	INDICATOR	1	CWE39199	←	
34	REMOTE CONTROL CASE	1	CWE15128A	←	
35	COVER	1	CWB80040A	←	
36	FRONT GRILLE COMPLETE	1	CWE11C590	←	
37	INTAKE GRILLE COMPLETE	1	CWE22C287	←	
38	PARTICULAR PIECE	2	CWD93C070	←	
39	AIR FILTER	2	CWD00215	←	
40	SCREW – FRONT GRILLE	2	XTN4+16C	←	
41	CAP – FRONT GRILLE	2	CWH52230	←	
42	DRAIN HOSE	1	CWH5880580	←	
43	INSTALLATION PLATE	1	CWH36122	←	
44	BAG COMPLETE – INSTALLATION SCREW	1	CWH82C194	←	
45	AIR PURIFYING FILTER COMPLETE	1	CWD00C111	←	
46	AIR PURIFYING FILTER	2	CWD00220	←	○

(Note)
- All parts are supplied from MAICO, Malaysia (Vendor Code: 061).
- The above parts are kept for seven years in accordance with MEI service policy. However, longer lead time will be taken in supplying the non-numbered parts.
- ○ marked parts are recommended to be kept in stock.

Replacement Parts List

<Model: CU-MA180KE / CU-MA240KE>

NO.	DESCRIPTION & NAME	QTY	CU-MA180KE	CU-MA240KE	REMARKS
1	CHASSY ASS'Y	1	CWD50K562A	CWD50K626A	
2	FAN MOTOR BRACKET	2	CWD54113	CWD54155	
3	SCREW – FAN MOTOR BRACKET	8	CWH4580399	←	
4	FAN MOTOR	2	CWA95245	←	○
5	SCREW – FAN MOTOR MOUNT	6	CWH55027	←	
6	PROPELLER FAN	2	CWH00K052	←	
7	NUT – PROPELLER FAN	2	CWH56032	←	
8	COMPRESSOR	2	2PS164D3AD02	2KS224D5AC02	○
9	ANTI – VIBRATION BUSHING	6	CWH50077	CWH50055	
10	NUT – COMPRESSOR MOUNT	6	CWH56000	CWH4582065	
11	CONDENSER	2	CWB32C043	CWB32C225	
12	HOLDER COUPLING ASS'Y	2	CWH35K017A	CWH35K019A	
13	3-WAY VALVE	2	CWB01343	CWB01379	○
14	2-WAY VALVE	2	CWB02224	CWB02269	○
15	4-WAY VALVE	2	CWB00002	CWB00003	○
16	TUBE ASS'Y (RECEIVER)	2	CWT01537	CWT01C240	
17	STRAINER	2	CWB11025	←	
18	TUBE ASS'Y (CHECK VALVE, CAPILLARY)	2	CWT01C257	CWT01C241	
19	V – COIL COMPLETE	2	CWA43C424	CWA43C439	○
20	SOUND PROOF BOARD	2	CWH15C081	CWH15264	
21	OVERLOAD PROTECTOR	2	CWA67C1210	CWA67C1212	○
22	TERMINAL COVER	2	CWH17038	←	
23	HOLDER – O.L.P.	2	CWH34033	←	
24	NUT – TERMINAL COVER	2	CWH7080300	←	
25	SOUND PROOF MATERIAL	2	—	CWG30779	
26	SOUND PROOF MATERIAL	2	CWG30786	—	
27	CONTROL BOARD	2	CWH10881	CWH10878	
28	TERMINAL BOARD ASS'Y	2	CWA28C501	CWA28C502	
29	CAPACITOR – COMPRESSOR	2	CWA31646	CWA31647	○
30	HOLDER CAPACITOR	2	CWH30057	←	
31	CAPACITOR – FAN MOTOR (1.2 μF, 400 V)	1, 1	CWA31341, CWA31342	CWA31341, CWA31342	○
32	ELECTRO MAGNETIC SWITCH	4	CWA00059	←	○
33	TERMINAL BOARD ASS'Y	2	CWA4711012	←	
34	ELECTROLYTIC CAPACITOR	2	CWA32C045	←	○
35	ELECTROLYTIC CAPACITOR	2	CWA32C067	←	○
36	TEMPERATURE RELAY	2	CWA14C000	←	○
37	CABINET ASS'Y	2	CWE00K268A	CWE00K251A	
38	CABINET FRONT PLATE	1	CWE06C046E	CWE06C104A	
39	CONTROL BOARD COVER	2	CWH13302	CWH13C286	
40	OPERATING INSTRUCTIONS	1	CWF561247	←	
41	INSTALLATION INSTRUCTIONS	1	CWF61481	←	
42	CHASSY ASSY'Y (LOWER)	1	CWD50K456D	CWD50K612A	
43	CABINET FRONT PLATE	1	CWE06C066A	CWE06C108A	
44	FLAT PLATE	1	CWD64188A	CWD64189A	
45	FLAT PLATE	1	CWD90964A	CWD90955A	
46	FLAT PLATE	1	CWD90962A	CWD90960A	
47	FLAT PLATE	1	CWD90973A	CWD90977A	
48	FLAT PLATE	1	CWD90961A	CWD90959A	

(Note)
- All parts are supplied from MAICO, Malaysia (Vendor Code: 061).
- The above parts are kept for seven years in accordance with MEI service policy. However, longer lead time will be taken in supplying the non-numbered parts.
- ○ marked parts are recommended to be kept in stock.

Electronic Parts List

<Model: CWA74900 / CWA74899 / CWA74804>

SYMBOL	DESCRIPTION & NAME	PART NO.
BZ	SOUND GENERATOR	A48004
CT1	TRANSFORMER	A40322
D1	DIODE	A54RB44–08V
D2	DIODE	A54C197
D3	DIODE	A541SS131T
D6	DIODE	A54RA15-01KB
D24	DIODE	A54MA723TA
D7 ~ D13, D15 ~ D23	DIODE	A54MA165TA5
DB1	DIODE	A54D3SBA60F1
DB2	DIODE	A54CS1VB20E
FUSE	FUSE	XBA2C20TR0
IC1	INTEGRATED CIRCUIT	A52D011W164
IC2	INTEGRATED CIRCUIT	A52C096
IC3	INTEGRATED CIRCUIT	A52C040
IC4	INTEGRATED CIRCUIT	A52MPA2003C
IC5	INTEGRATED CIRCUIT	A52BR9011B
IC6	INTEGRATED CIRCUIT	A52MPC393C
IC7	INTEGRATED CIRCUIT	A52BX7809
L1	V–COIL	A43101T
L2 ~ L6	V–COIL	A43036
LF1	NOISE FILTER	A49221
Q1	TRANSISTOR	A55C081
Q10 ~ Q12	TRANSISTOR	A55DTA143XST
Q16	TRANSISTOR	A52STA302A
Q17	TRANSISTOR	A52STA303A
Q2	TRANSISTOR	A55D2220QTA
Q3, Q5, Q7 ~ Q9, Q13 ~ Q15, Q18	TRANSISTOR	A55DTC114EST
Q4	TRANSISTOR	A55C1740STPQ
Q6	TRANSISTOR	A55C1741ASTR
RY–HOT	ELECTRO MAGNETIC RELAY	A00161
RY–PWR	ELECTRO MAGNETIC RELAY	A00106
SSR1	TYRISTOR	A56W2DEH1–5
SW1	SLIDE SWITCH	A04042
SW2, SW3	PUSH SWITCH	A01059
T1	TRANSFORMER	A40235
T2	TRANSFORMER	A40263
VR1	VARIABLE RESISTOR	A44VG67TP152
X1	RESONATOR	A45ST8.0MTWT
ZD1	DIODE	A54D8.2EL2TB
ZNR1	DIODE	A54C036

(Note) • All parts are supplied from MACC, Malaysia (Vendor Code: 086).

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