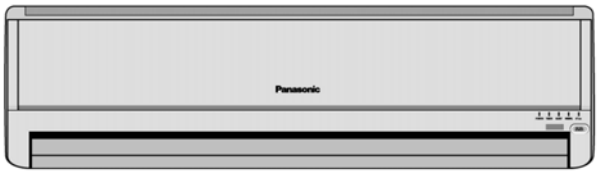
Order No. MAC0712071C3

Service Manual

Air Conditioner

Indoor Unit Outdoor Unit
CS-C28HKF CU-C28HKF



⚠ 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.

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Panasonic®

1 Safety Precautions

- Read the following “SAFETY PRECAUTIONS” carefully before perform any servicing.
- Electrical work must be installed or serviced by a licensed electrician. Be sure to use the correct rating of the power plug and main circuit for the model installed.
- The caution items stated here must be followed because these important contents are related to safety. The meaning of each indication used is as below. Incorrect installation or servicing due to ignoring of the instruction will cause harm or damage, and the seriousness is classified by the following indications.

⚠ WARNING	This indication shows the possibility of causing death or serious injury.
⚠ CAUTION	This indication shows the possibility of causing injury or damage to properties.

- The items to be followed are classified by the symbols:

⃠	This symbol denotes item that is PROHIBITED from doing.

- Carry out test run to confirm that no abnormality occurs after the servicing. Then, explain to user the operation, care and maintenance as stated in instructions. Please remind the customer to keep the operating instructions for future reference.

⚠ WARNING	
1. Engage dealer or specialist for installation and servicing. If installation of servicing done by the user is defective, it will cause water leakage, electrical shock or fire.	
2. Install according to this installation instructions strictly. If installation is defective, it will cause water leakage, electric shock or fire.	
3. Use the attached accessories parts and specified parts for installation and servicing. Otherwise, it will cause the set to fall, water leakage, fire or electrical shock.	
4. Install at a strong and firm location which is able to withstand the set’s weight. If the strength is not enough or installation is not properly done, the set will drop and cause injury.	
5. For electrical work, follow the local national wiring standard, regulation and the installation instruction. An independent circuit and single outlet must be used. If electrical circuit capacity is not enough or defect found in electrical work, it will cause electrical shock or fire.	
6. This equipment is strongly recommended to install with Earth Leakage Circuit Breaker (ELCB) or Residual Current Device (RCD). Otherwise, it may cause electrical shock and fire in case equipment breakdown or insulation breakdown.	
7. Use the specified cable and connect tightly for indoor/outdoor connection. Connect tightly and clamp the cable so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat-up or fire at the connection.	
8. Wire routing must be properly arranged so that control board cover is fixed properly. If control board cover is not fixed perfectly, it will cause heat-up or fire at the connection point of terminal, fire or electrical shock.	
9. When carrying out piping connection, take care not to let air substances other than the specified refrigerant go into refrigeration cycle. Otherwise, it will cause lower capacity, abnormal high pressure in the refrigeration cycle, explosive and injury.	
10. Do not install outdoor unit near handrail of veranda. When installing air-conditioner unit at veranda of high rise building, child may climb up to outdoor unit and cross over the handrail and causing accident.	
11. This equipment must be properly earthed. Earth line must not be connected to gas pipe, water pipe, earth of lightning rod and telephone. Otherwise, it may cause electric shock in case equipment breakdown or insulation breakdown.	⃠
12. When connecting the piping, do not allow air or any substances other than the specified refrigerant to enter the refrigeration cycle. Otherwise, this may lower the capacity, cause abnormally high pressure in the refrigeration cycle, and possibly result in explosion and injury.	⃠
13. Do not damage or use unspecified power supply cord. Otherwise it will cause fire or electric shock.	⃠
14. Do not modify the length of the power supply cord or use of the extension cord, and do not share the single outlet with other electrical appliances. Otherwise, it will cause fire or electrical shock.	⃠
15. It is desirable that the amount of residual oil is less than 40 mg/10m.	⃠
16. During installation, before run the compressor, confirm the refrigerant pipes are fixed. Operation of compressor without fixing the piping, setting the valves at open condition, a burst may occur and cause injury.	
17. After completion of the installation servicing confirm there is no leakage of refrigerant gas. It may generate toxic gas when the refrigerant contacts with fire.	
18. Ventilate if there is refrigerant gas leakage during operation. It may cause toxic gas when the refrigerant contacts with fire.	

⚠ CAUTION

1. Do not install the unit at place where leakage of flammable gas may occur. In case gas leaks and accumulates at surrounding of the unit, it may cause fire.

2. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.
3. Tighten the flare nut with torque wrench according to specified method. If the flare nut is over-tightened, after a long period, the flare may break and cause refrigerant gas leakage.
4. Do not touch outdoor unit air inlet and aluminium fin. It may cause injury.

5. Select an installation location which is easy for maintenance.
6. Pb free solder has a higher melting point than standard solder; typically the melting point is 50°F - 70°F (30°C - 40°C) higher. Please use a high temperature solder iron. In case of the soldering iron with temperature control, please set it to 700 ± 20°F (370 ± 10°C). Pb free solder will tend to splash when heated too high (about 1100°F / 600°C).
7. Power supply connection to the conditioner. Connect the power supply cord of the air conditioner to the mains using one of the following methods.
   Power supply point shall be the place where there is ease for access for the power disconnection in case of emergency. In some countries, permanent connection of this room air conditioner to the power supply is prohibited.
   1. Power supply connection to the receptacle using a power plug. Use an approved power plug with earth pin for the connection to the socket.
   2. Power supply connection to a circuit breaker for the permanent component. Use an approved circuit breaker for the permanent connection. It must be a double pole switch with a minimum 3.5 mm contact gap.
8. Do not release refrigerant during piping work for installation, servicing, reinstallation and during repairing a refrigeration parts. Take care of the liquid refrigerant, it may cause frostbite.

9. Installation work. It may need two people to carry out the installation work.
10. Do not install this appliance in a laundry room or other location where water may drip from the ceiling, etc.

2 Specifications

2.1. CS-C28HKF CU-C28HKF

Item			Unit	Indoor unit	Outdoor unit
Performance Test Condition				NEW JIS	
Capacity			kW	8.20 - 8.20	
			BTU/h	28000 - 28000	
			*kJ/h	29520 - 29520	
EER			W/W	2.97 - 2.81	
			BTU/hW	10.14 - 9.59	
Noise Level			dB (A)	High: 49; Low: 44	High: 56 / 57
			Power level dB	—	—
Moisture Removal			l/h	4.8	
			(pt/h)	10.1	
Air Volume	Lo		m^3/m (ft^3/m)	15.5 (548) - 15.5 (548)	—
	Me		m^3/m (ft^3/m)	17.4 (615) - 17.4 (615)	—
	Hi		m^3/m (ft^3/m)	18.4 - (650) - 18.4 (650)	48.5 (1710) - 50.5 (1780)
	SHi		m^3/m (ft^3/m)	19.0 (670) - 19.0 (670)	—
Refrigerant Control Device				—	Capillary Tube
Refrigerant Oil (Charged)			cm^3	—	ATMOS M6O or SUNISO 4 GDID (900cm^3)
Refrigerant (Charged) R22			kg (oz)	—	2.28 (80.5)
Dimension	Height		mm (inch)	275 (10 - 27/32)	750 (29 - 17/32)
	Width		mm (inch)	998 (39 - 5/16)	875 (34 - 15/32)
	Depth		mm (inch)	230 (9 - 1/16)	345 (13 - 19/32)
Net Weight			kg (lbs)	11 (24)	68 (150)
Pipe Diameter	Gas		mm (inch)	15.88 (5/8")	
	Liquid		mm (inch)	6.35 (1/4")	
Height Difference			m (ft)	20 (65.6)	
Pipe Length Range			m (ft)	3 (9.8) - 25 (98.4)	
Additional Gas Amount			g/m (oz/ft)	30 (0.3)	
Refrigeration Charge Less			m (ft)	7.5 (24.6)	
Drain Hose	Inner diameter		mm	16	—
	Length		mm	650	—
Compressor	Type			—	Hermetic motor
	Motor Type			—	Induction (2-poles)
	Rated Output		W	—	2.4 k
Fan	Type			Cross-flow Fan	Propeller Fan
	Material			ASHT18	PP Resin
	Motor Type			Transistor (8-poles)	Induction (6-poles)
	Input power		W	85.0	183.0
	Output power		W	30	80
	Fan Speed	Lo (Cool)	rpm	1410 - 1410	440 - 500
		Me (Cool)	rpm	1580 - 1580	—
		Hi (Cool)	rpm	1670 - 1670	860 - 890
		SHi (Cool)	rpm	1720 - 1720	—
Heat Exchanger	Fin material			Aluminium (Pre Coat)	Aluminium (Blue Coat)
	Fin Type			Slit Fin	Corrugate Fin
	Row × Stage × FPI			2 × 15 × 21	2 × 28 × 17
	Size (W × H × L)		mm	810 × 315 × 25.4	44 × 711.2 × 811.0:845.5
Air Filter Type	Material			Polypropelene	—
	Style			One-touch	—

1. Cooling capacities are based on indoor temperature of 27°C D.B. (80.6°F D.B.), 19.0°C W.B. (66.2°F W.B.) and outdoor air temperature of 35°C D.B. (95°F D.B.), 24°C W.B. (75.2°F W.B.)

Item		Unit		
Power Source (Phase, Voltage, Cycle)		ø	Single	Single
		V	220	240
		Hz	50	50
Input power		W	2.76k	2.92k
Starting Current		A	83.0	83.0
Maximum Current		A	20.5	20.5
Running Current	Cooling	A	13.1	13.8
Power Factor	Cooling	%	96	88
Power factor means total figure of compressor, indoor fan motor and outdoor fan motor.				
Power Cord	Number of core			
	Length	m (ft)		
Thermostat			Mechanical	
Protection Device			—	

Note

- Specification are subjected to change without prior notice for further improvement.

3 Features

- **E-ion Air Purifying System with Patrol Sensor**
  - Active e-ions are released to catch dust particles and bring them back the large positively charged filter
  - Patrol Sensor color changes to indicate the dirt level in the air

- **Long Installation Piping**
  - CS/CU-C28HK, long piping up to 25 meter

- **Easy to use remote control**

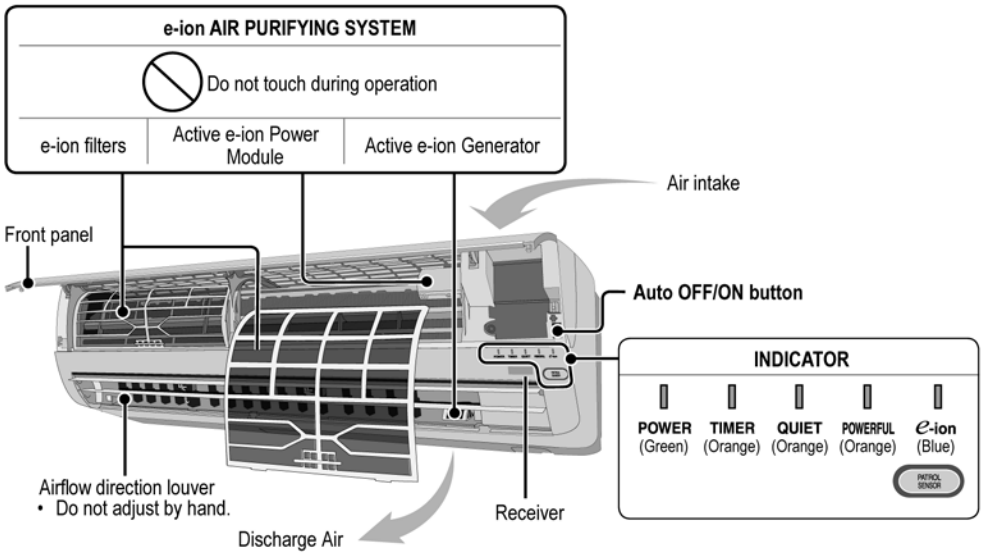
- **Quality Improvement**
  - Random auto restart after power failure for safety restart operation
  - Gas leakage protection
  - Prevent compressor reverse cycle
  - Inner protector to protect Compressor
  - Noise prevention during soft dry operation
  - Blue coated condenser for high resistance to corrosion

- **Operation Improvement**
  - Quiet mode to reduce the indoor unit operating sound
  - Powerful mode to reach the desired room temperature quickly
  - 24-hour timer setting

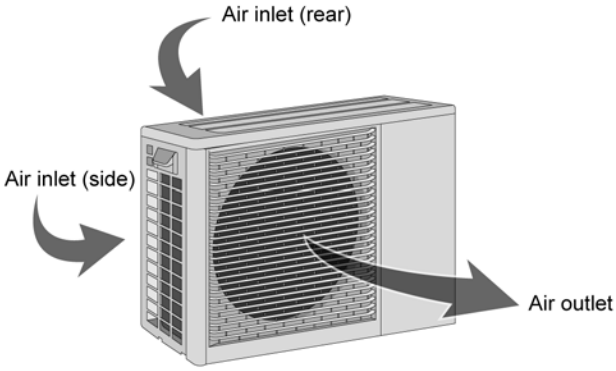
4 Location of Controls and Components

4.1. Product Overview

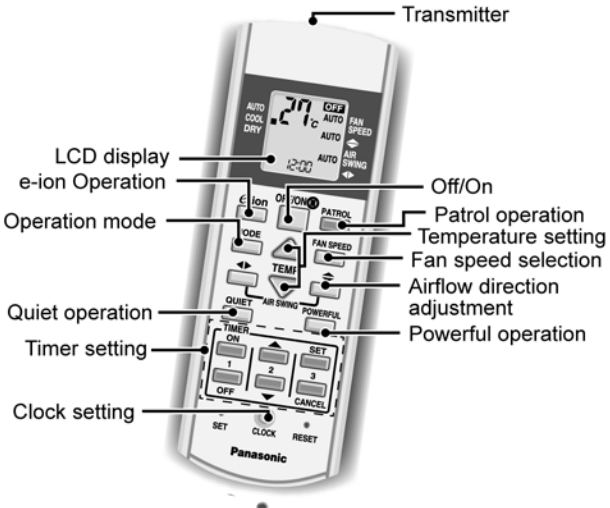
4.1.1. Indoor Unit



4.1.2. Outdoor Unit



4.1.3. Remote Control

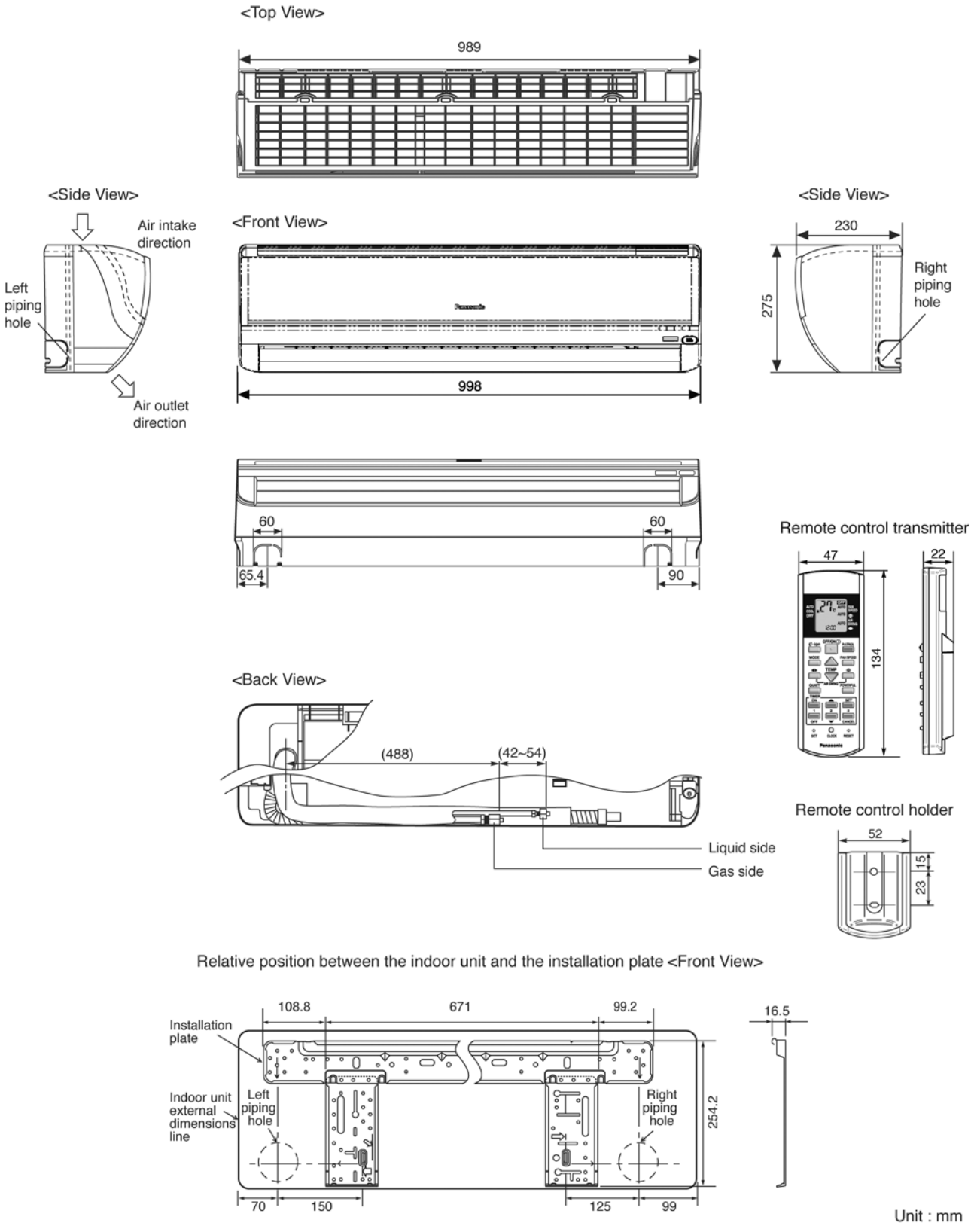


* For normal operation, the SET button is not in use.
* Press RESET button to restore the remote control's default setting.

5 Dimensions

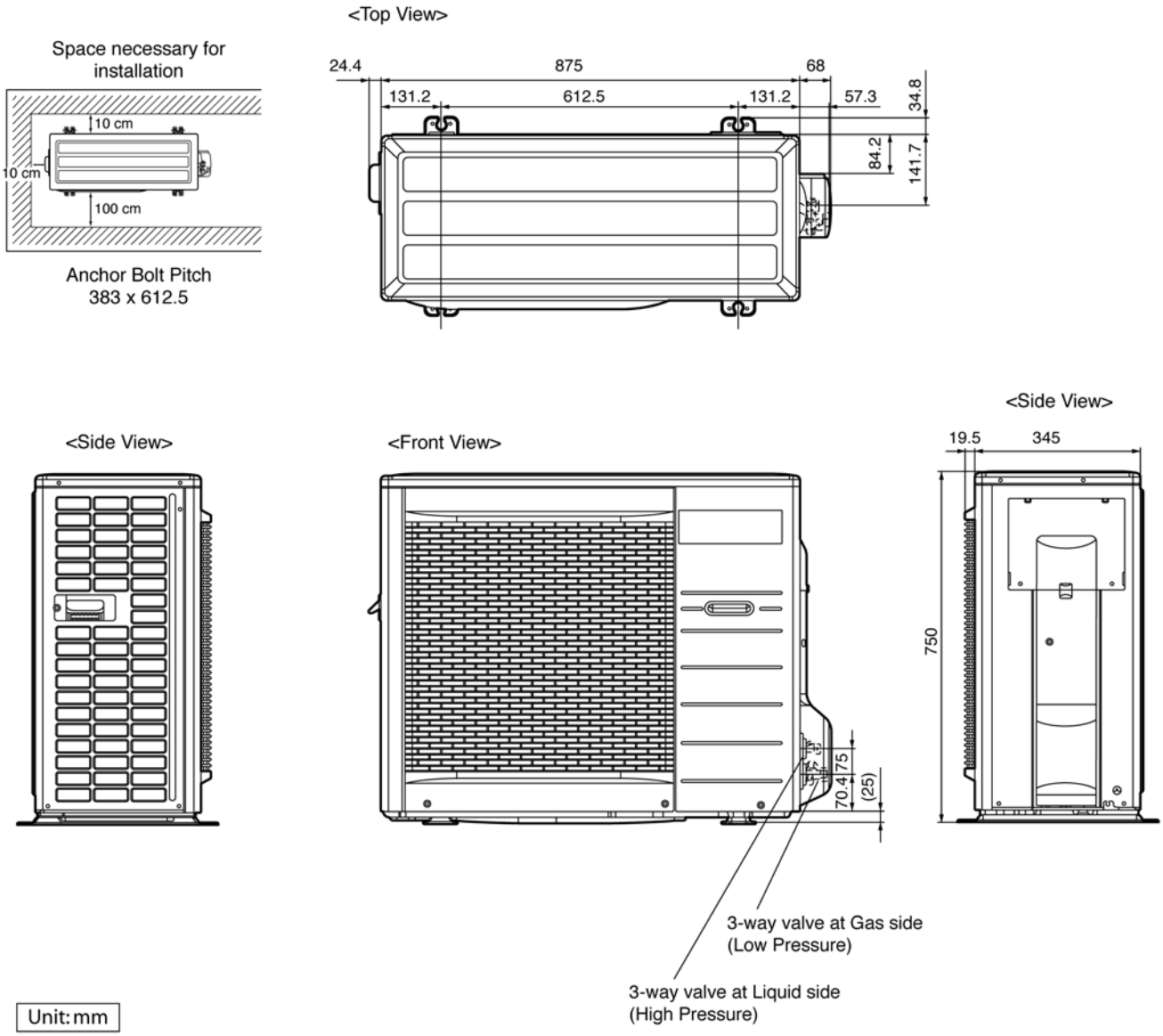
5.1. Indoor Unit

CS-C28HKF



5.2. Outdoor Unit

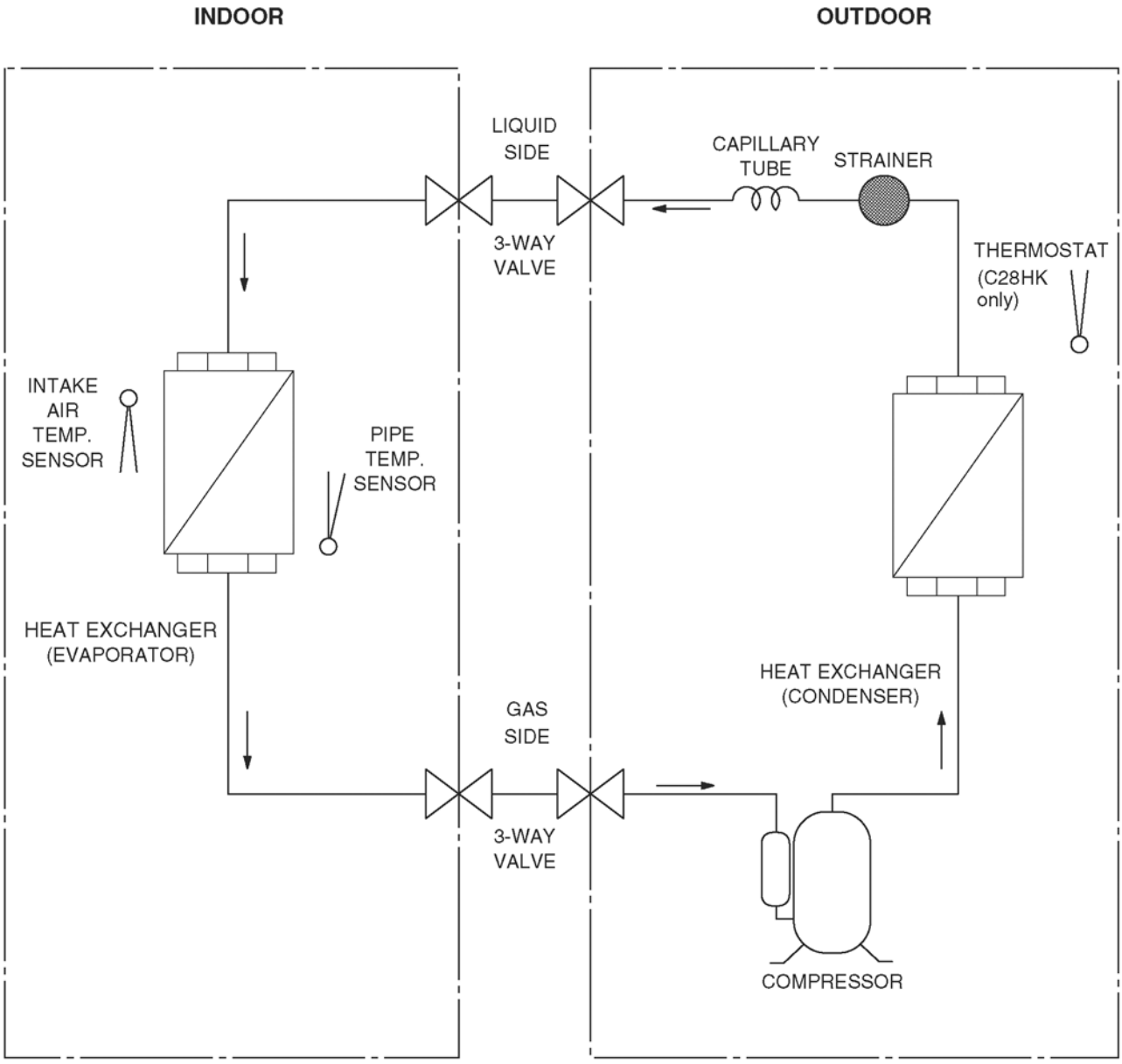
CU-C28HKF



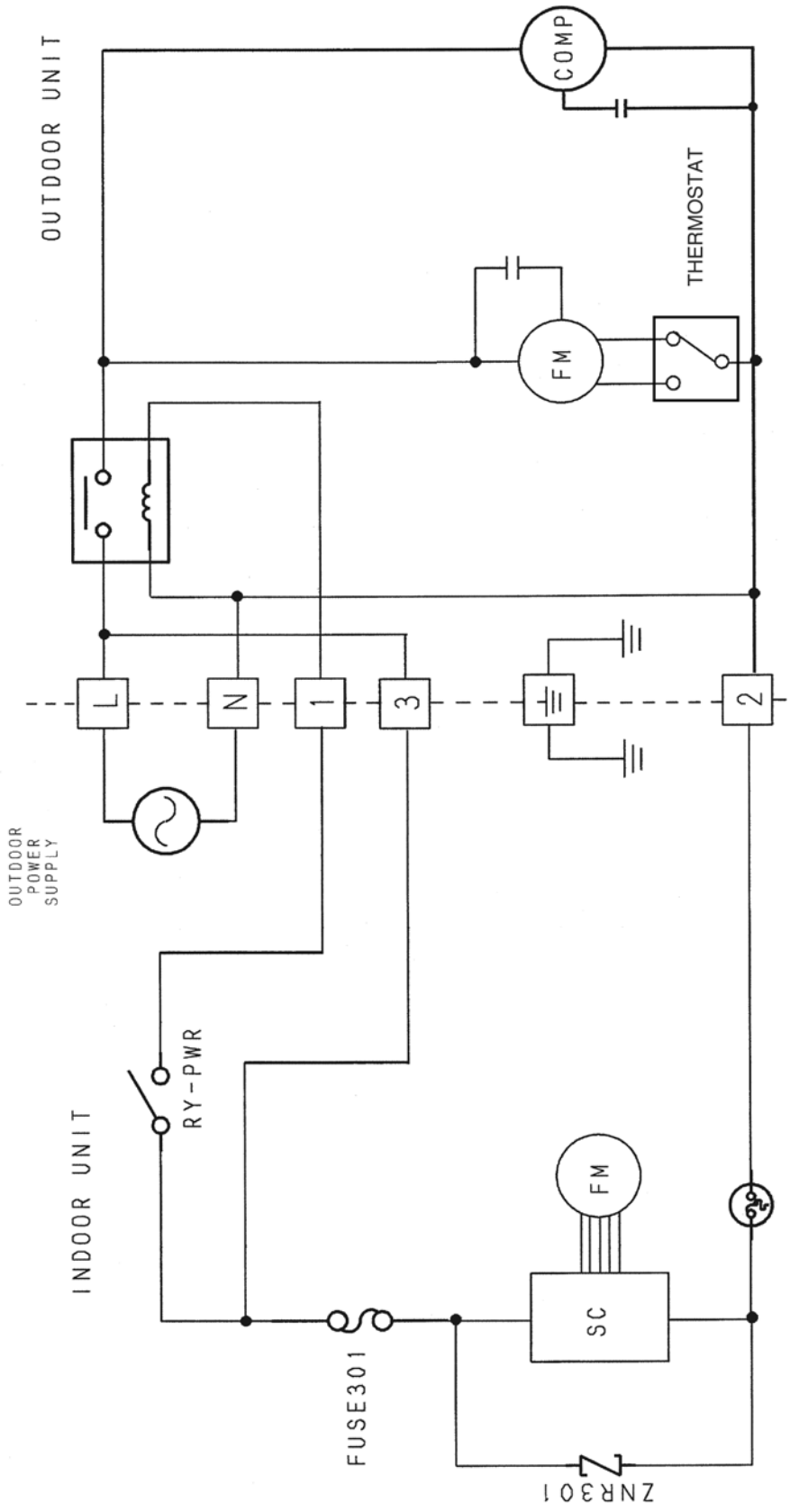
Unit: mm

6 Refrigeration Cycle Diagram

CS-C28HKF CU-C28HKF

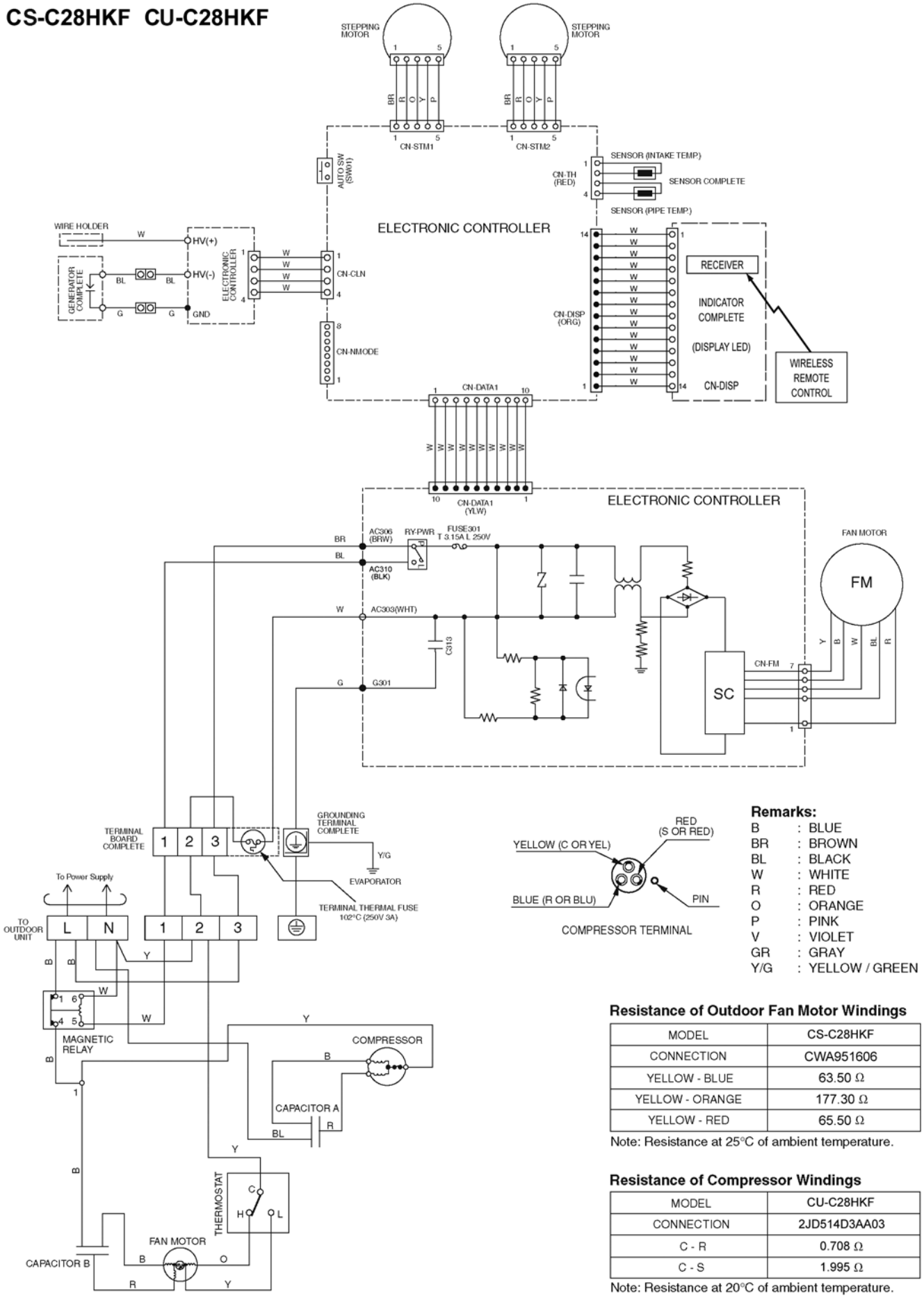


7 Block Diagram



8 Wiring Connection Diagram

CS-C28HKF CU-C28HKF



Remarks:

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

Resistance of Outdoor Fan Motor Windings

MODEL	CS-C28HKF
CONNECTION	CWA951606
YELLOW - BLUE	63.50 Ω
YELLOW - ORANGE	177.30 Ω
YELLOW - RED	65.50 Ω

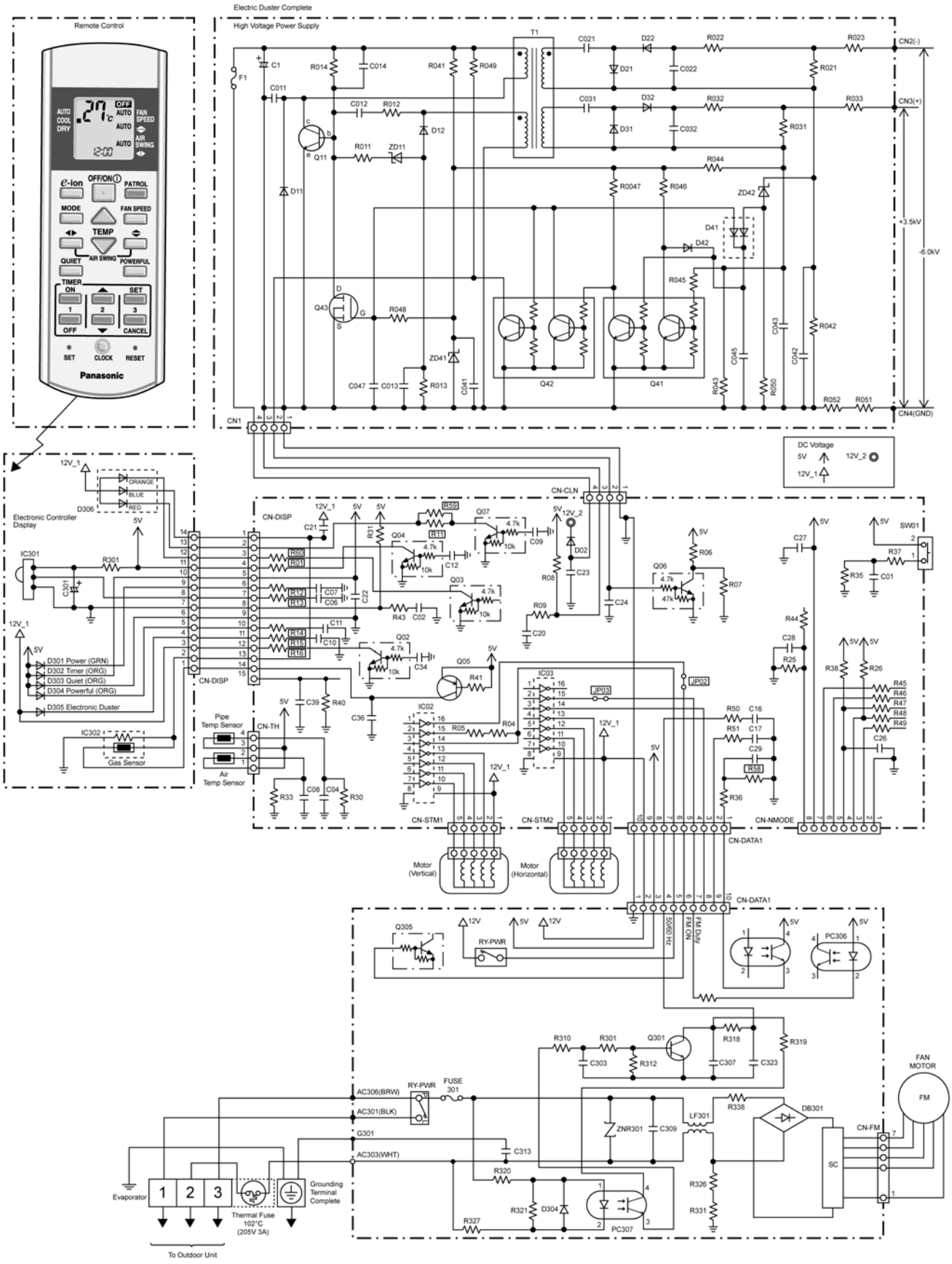
Note: Resistance at 25°C of ambient temperature.

Resistance of Compressor Windings

MODEL	CU-C28HKF
CONNECTION	2JD514D3AA03
C - R	0.708 Ω
C - S	1.995 Ω

Note: Resistance at 20°C of ambient temperature.

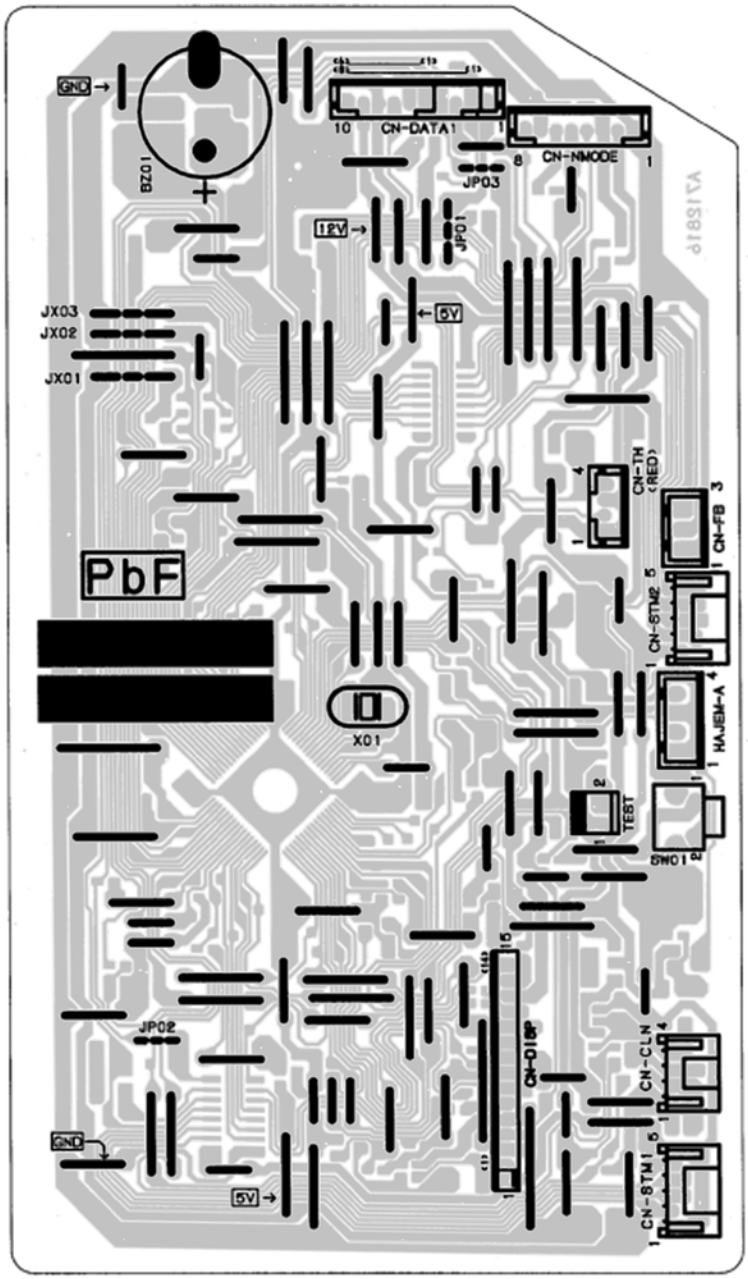
9 Electronic Circuit Diagram



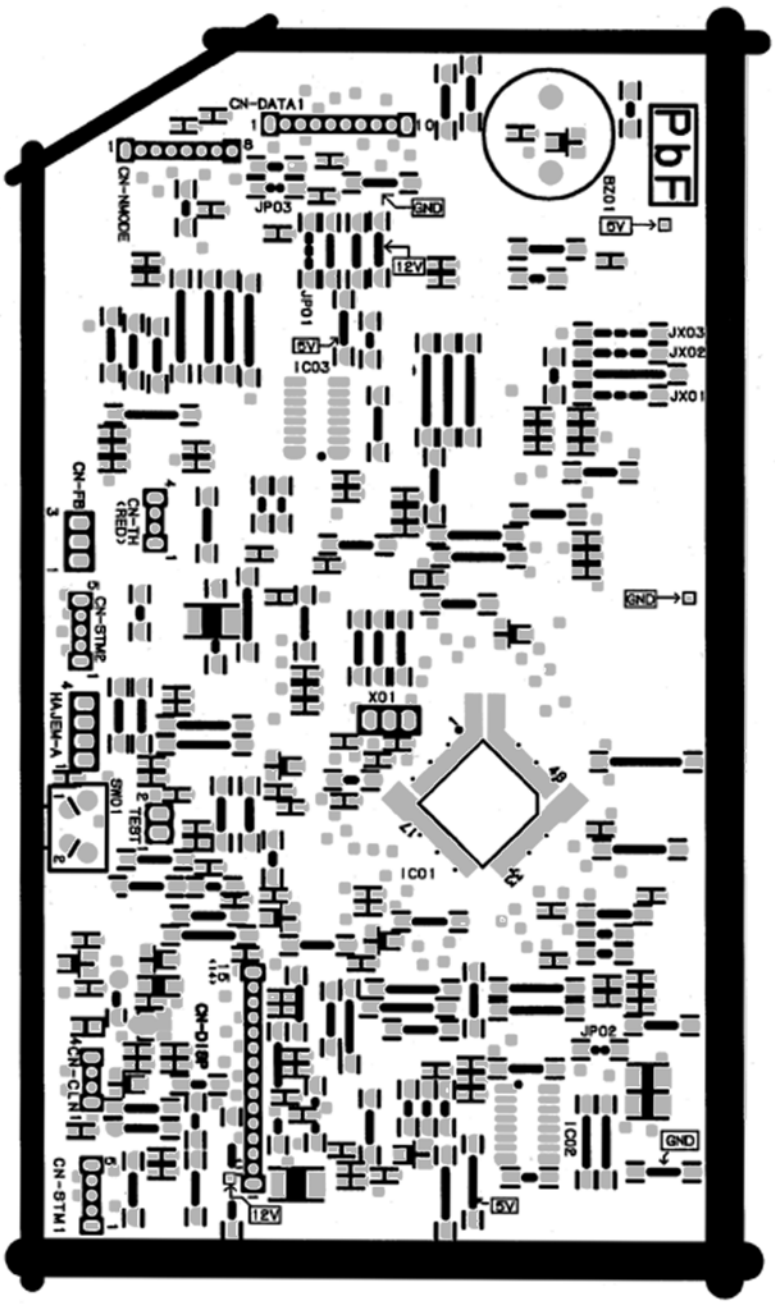
10 Printed Circuit Board

10.1. Main Printed Circuit Board

TOP VIEW

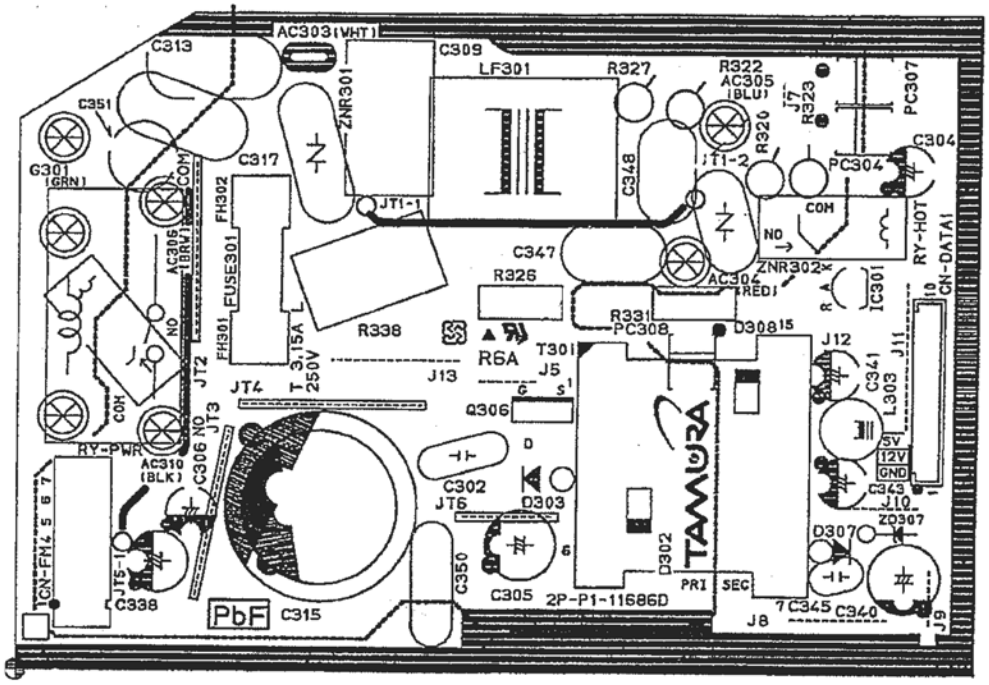


BOTTOM VIEW

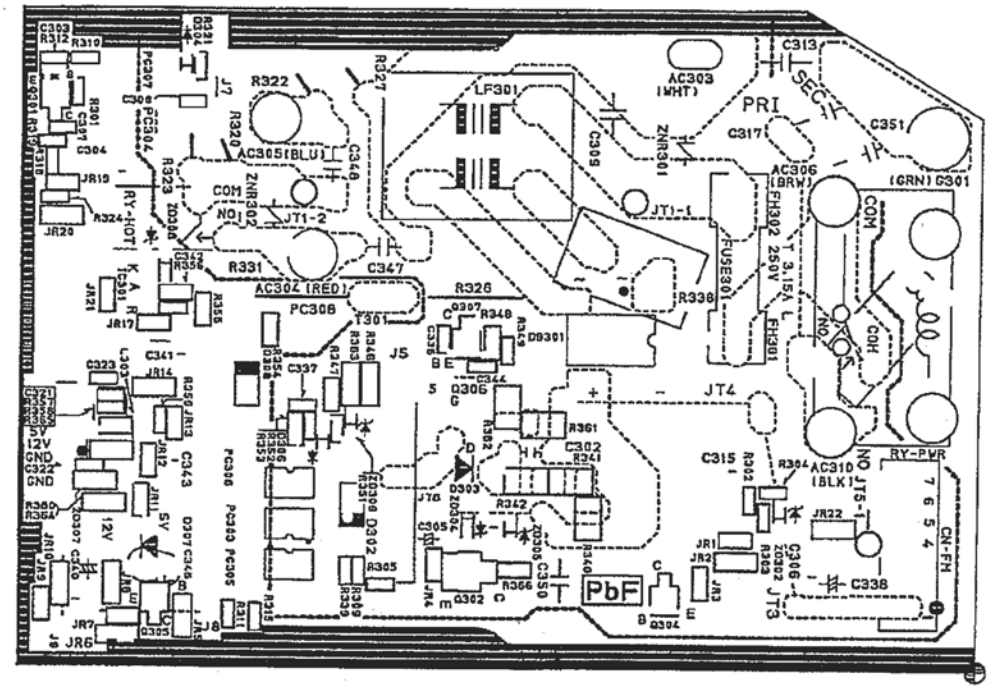

CN-DATA1
CN-NMODE
JP03
GND
12V
JP01
5V
IC03
JX03
JX02
JX01
CN-FB
CN-TH (RED)
CN-STM2
HAJEM-A
SW01
TEST
X01
IC01
CN-DISP
CN-CLN1
CN-STM1
JP02
IC02
GND
5V
12V
PbF

10.2. Power Printed Circuit Board

TOP VIEW

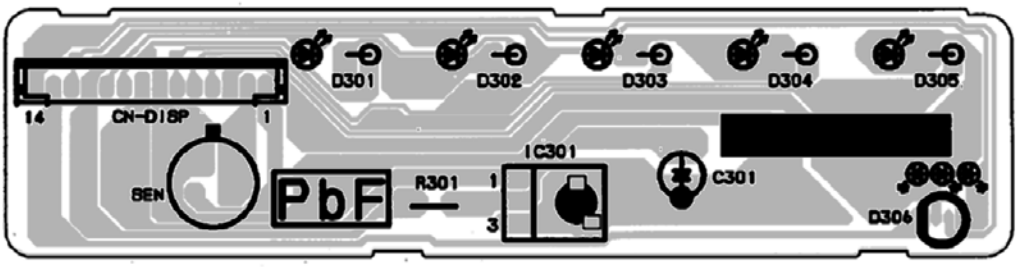


BOTTOM VIEW

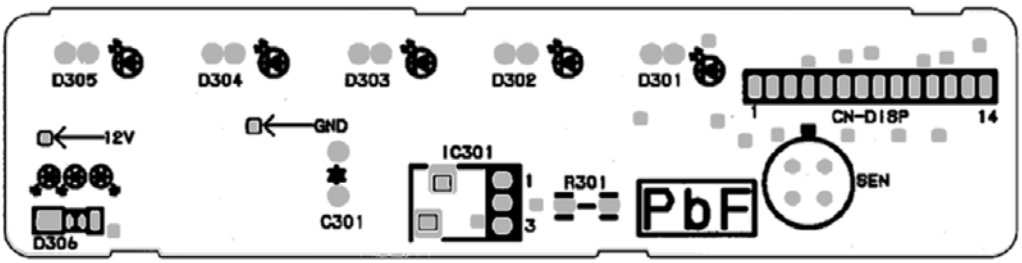


10.3. Indicator

TOP VIEW



BOTTOM VIEW



11 Installation Instruction

11.1. Select the Best Location

11.1.1. 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.
- Recommended installation height for indoor unit shall be at least 2.5 m.

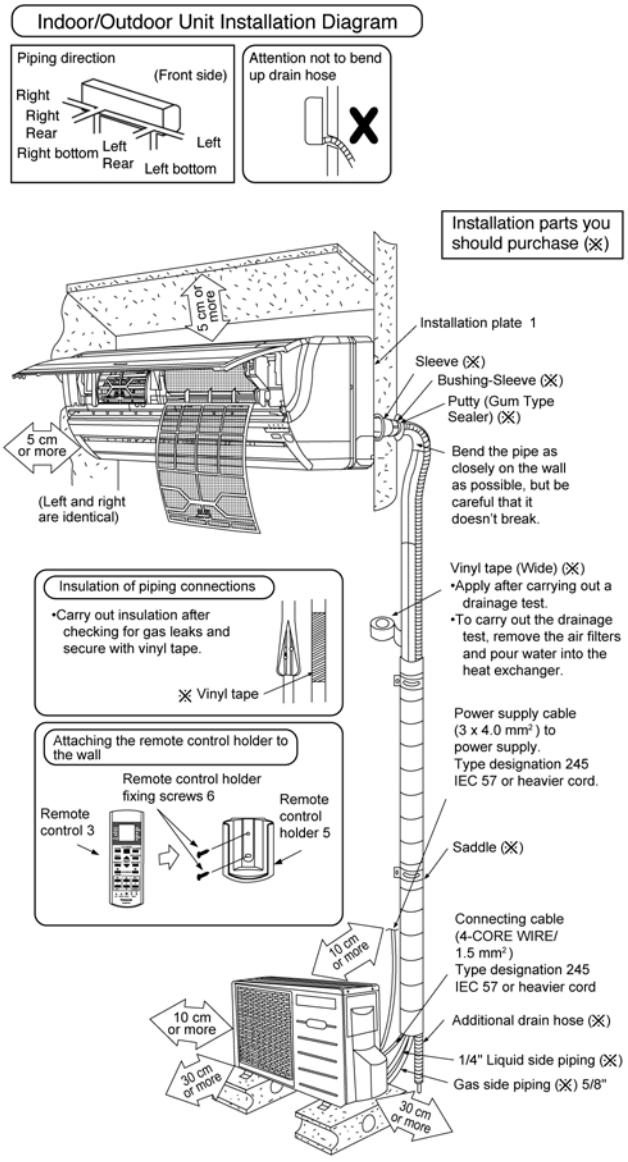
11.1.2. Outdoor Unit

- 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 7.5 m, additional refrigerant should be added as shown in the table.

Model	Piping size		Rate Length (m)	Max. Elevation (m)	Min. Piping Length (m)	Max. Piping Length (m)	Additional Refrigeration (g/m)
	Gas	Liquid					
C28HK	5/8”	1/4”	5	20	3	30	30

Example: For C28HK
If the unit is installed at a 10m distance, the quantity of additional refrigerant should be 75g....(10 - 7.5)m x 30g/m =75g

11.1.3. Indoor/Outdoor Unit Installation Diagram

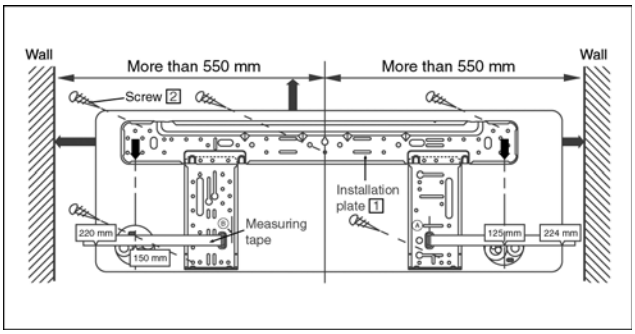


• This illustration is for explanation purposes only.
The indoor unit will actually face a different way.

11.2. Indoor Unit

11.2.1. How to Fix Installation Plate

The mounting wall is strong and solid enough to prevent it from the vibration.



The centre of installation plate should be at more than 550 mm at right and left of the wall.
The distance from installation plate edge to ceiling should more than 67 mm.
From installation plate left edge to unit's left side is 47 mm.
From installation plate right edge to unit's right is 73 mm.

B : For left side piping, piping connection for liquid should be about 126 mm from this line.
: For left side piping, piping connection about 174 mm from this line.
: For left side piping, piping connection about 984 mm from this line.

1. Mount the installation plate on the wall with 5 screws or more.
   (If mounting the unit on the concrete wall, consider using anchor bolts.)
   • Always mount the installation plate horizontally by aligning the marking-off line with the thread and using a level gauge

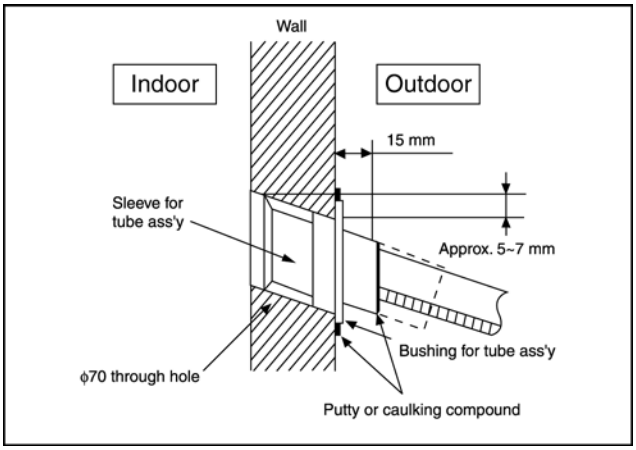
2. Drill the piping plate hole with ø70 mm hole-core drill.
   • Line according to the arrows marked on the lower left and right side of the installation plate. The meeting point of the extended line is the centre of the hole. Another method is by putting measuring tape at position as shown in the diagram above. The hole centre is obtained by measuring the distance namely 150 mm and 125 mm for left and right hole respectively.
   • Drill the piping hole at either the right or the left and the hole should be slightly slanted to the outdoor side.

11.2.2. To Drill a Hole in the Wall and Install a Sleeve of Piping

1. Insert the piping sleeve to the hole.
2. Fix the bushing to the sleeve.
3. Cut the sleeve until it extrudes about 15 mm from the wall.

Caution
When the wall is hollow, please be sure to use the sleeve for tube ass'y to prevent dangers caused by mice biting the connecting cable.

4. Finish by sealing the sleeve with putty or caulking compound at the final stage.



11.2.3. Indoor Unit Installation

1. **For the right rear piping**

Pull out the Indoor piping
↓
Install the Indoor Unit
↓
Secure the Indoor Unit
↓
Insert the connecting cable

2. **For the right and right bottom piping**

Pull out the Indoor piping
↓
Install the Indoor Unit
↓
Insert the connecting cable
↓
Secure the Indoor Unit

3. **For the embedded piping**

Replace the drain hose

↓

Bend the embedded piping

↓

- Use a spring bender or equivalent to bend the piping so that the piping is not crushed.

Install the Indoor Unit

↓

Cut and flare the embedded piping

↓

- When determining the dimensions of the piping, slide the unit all the way to the left on the installation plate.
- Refer to the section "Cutting and flaring the piping".

Pull the connecting cable into Indoor Unit

↓

- The inside and outside connecting cable can be connected without removing the front grille.

Connect the piping

↓

- Please refer to "Connecting the piping" column in outdoor unit section. (Below steps are done after connecting the outdoor piping and gas-leakage confirmation.)

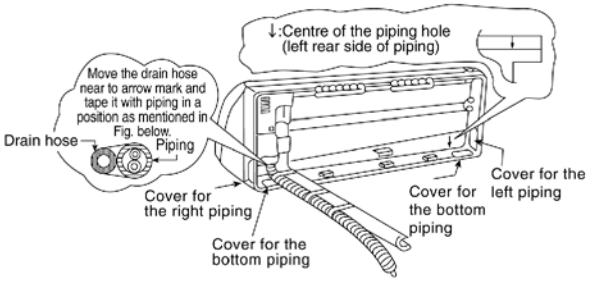
Insulate and finish the piping

↓

- Please refer to "Piping and finishing" column of outdoor section and "Insulation of piping connections" column as mentioned in Indoor/ Outdoor Unit Installation.

Secure the Indoor Unit

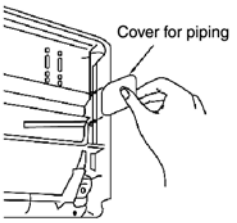
Pull out the piping and drain hose



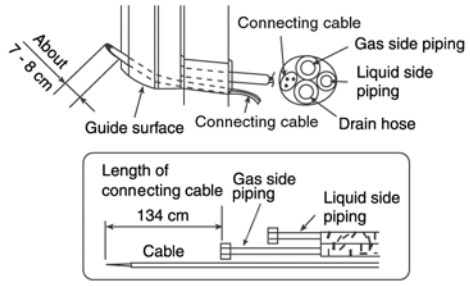
How to keep the cover

In case of the cover is cut, keep the cover at the rear of chassis as shown in the illustration for future reinstallation.

(Left, right and 2 bottom covers for piping.)

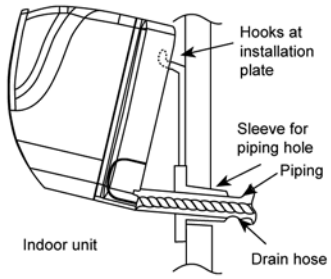


Insert the connecting cable



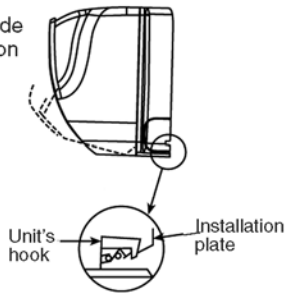
Install the Indoor Unit

Hook the indoor unit onto the upper portion of installation plate (Engage the indoor unit with the upper edge of the installation plate). Ensure the hooks are properly seated on the installation plate by moving in left and right.

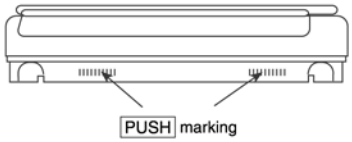


Secure the Indoor Unit

1. Press the lower left and right side of the unit against the installation plate until hooks engages with their slot (sound click).



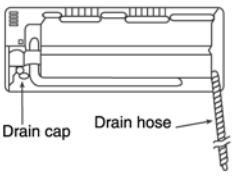
To take out the unit, push the PUSH marking at the bottom unit, and pull it slightly towards you to disengage the hooks from the unit.

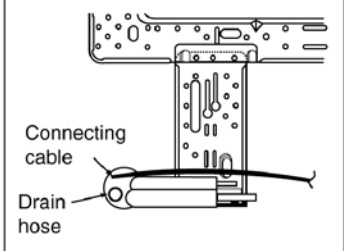


(This can be used for left rear piping and left bottom piping also.)

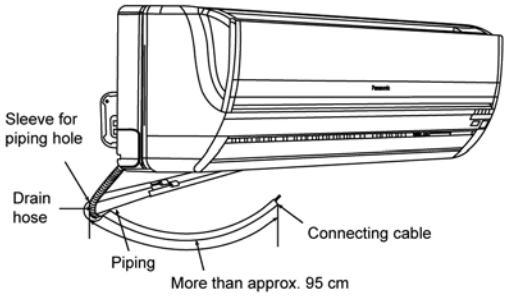
Exchange the drain hose and the cap

Rear view for left piping installation

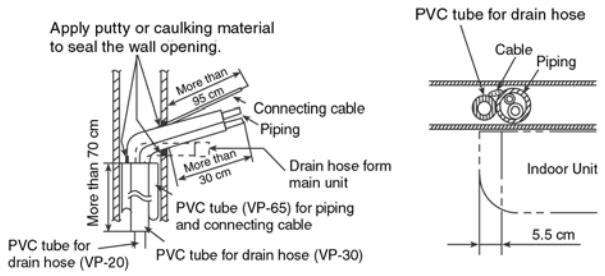




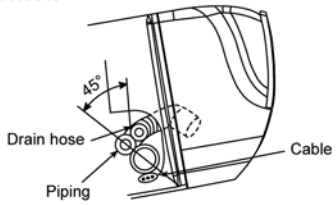
Adjust the piping slightly downwards.



• How to pull the piping and drain hose out, in case of the embedded piping.



• In case of left piping how to insert the connecting cable and drain hose.



(For the right piping, follow the same procedure)

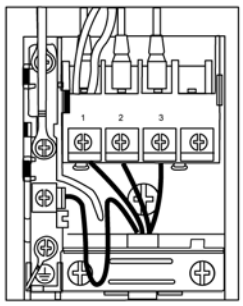
11.2.4. Connect the Cable to the Indoor Unit

1. The inside and outside connecting cable can be connected without removing the front grille.
2. Connecting cable between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 × 1.5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.
   • Ensure the colour of wires of outdoor unit and the terminal Nos. are the same to the indoor's respectively.

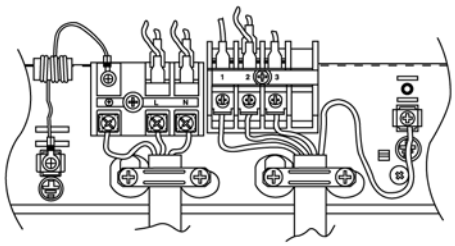
Terminals on the indoor unit	1	2	3	
Colour of wires				
Terminals on the outdoor unit	1	2	3	

3. Secure the cable onto the control board with the holder (clamper).

Indoor



Outdoor

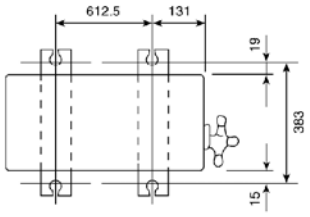


11.3. Outdoor Unit

11.3.1. Install the Outdoor Unit

• After selecting the best location, start installation according to Indoor/Outdoor Unit Installation Diagram.

1. Fix the unit on concrete or rigid frame firmly and horizontally by bolt nut (ø10 mm).
2. When installing at roof, please consider strong wind and earthquake. Please fasten the installation stand firmly with bolt or nails.



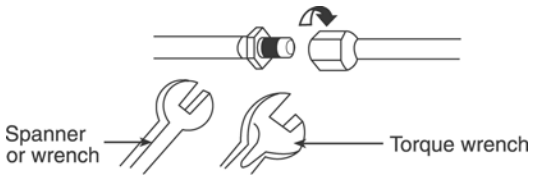
11.3.2. Connecting the Piping

Connecting The Piping To Indoor Unit

Please make flare after inserting flare nut (locate at joint portion of tube assembly) onto the copper pipe.
(In case of using long piping)

Connect the piping

- Align the center of piping and sufficiently tighten the flare nut with fingers.
- Further tighten the flare nut with torque wrench in specified torque as stated in the table.



MODEL	Piping size (Torque)	
	Gas	Liquid
C28HK	5/8" (65 N•m)	1/4" (18 N•m)

⚠ CAUTION

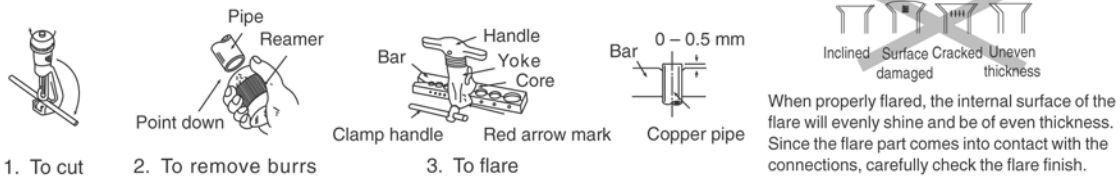
Do not over tighten, over tightening cause gas leakage.

Connect The Piping to Outdoor Unit

Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (located at valve) onto the copper pipe.
Align center of piping to valves and then tighten with torque wrench to the specified torque as stated in the table.

Cutting and Flaring the Piping

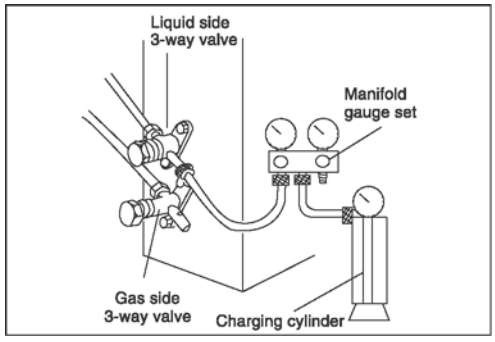
1. Please cut using pipe cutter and then remove the burrs.
2. Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused. Turn the piping end down to avoid the metal powder entering the pipe.
3. Please make flare after inserting the flare nut onto the copper pipes.

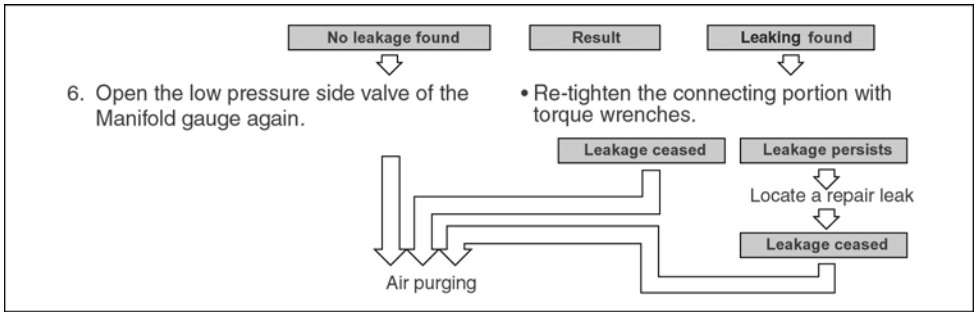


11.3.3. Air Purging of the Piping and Indoor Unit

1) Checking a gas leakage

1. Remove the service-port cap from both 3-way valves.
2. Connect the Manifold gauge set to the service port of Liquid side 3-way valve.
3. Connect the Charging Cylinder to the Manifold gauge set and open the valve of the Cylinder.
4. Open the low pressure side valve of the Manifold gauge for approx. 10 seconds and then close.
5. Check gas-leakage of the connecting portion of pipings with the gas-leak detector.





<For the left pipings>

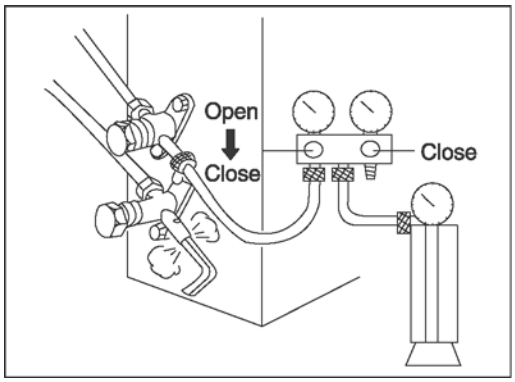
1) Measure the pressure.
2) Keep it for 5-10 minutes

- Ensure if the pressure indicated on the gauge is as same as that of measured at first time.

2) Air purging

The air remaining in the Refrigeration cycle which contains moisture may cause malfunction on the Compressor.

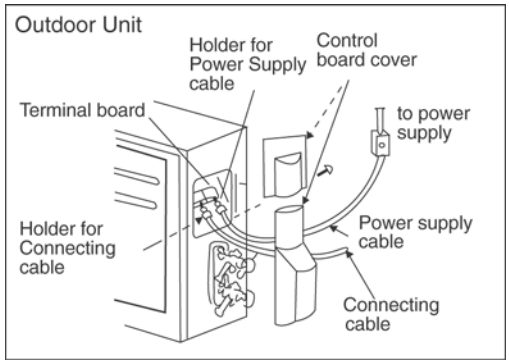
1. To purge the air, push the pin on the Gas side 3-way valve for three seconds with a Hexagonal wrench and set it free for one minute.
   • Repeat this for three times.
2. To balance the refrigerant, close the low pressure side valve on the Manifold gauge and release refrigerant from the piping through service port until the gauge indicates 0.5 - 0.3 MPa.
3. Set both 3-way valves to open position with the Hexagonal wrench for the unit operation.



11.3.4. Connect the Cable to the Outdoor Unit

(For detail refer to Wiring Diagram at unit)

1. Remove the control board cover from the unit by loosening the screw.
2. Connecting cable between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 × 1.5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.



Terminals on the indoor unit	1	2	3	⏚
Colour of wires				
Terminals on the outdoor unit	1	2	3	⏚

3. Secure the cable onto the control board with the holder (clamper).
4. Cable connection to the power supply through knife switch (Disconnecting means).
   • Connect the approved polychloroprene sheathed power supply cable 3 x 4.0 mm^2, type designation 245 IEC 57 or heavier cord to the terminal board, and connect the other end of the cable to knife switch (Disconnecting means).

Terminals on the indoor unit	L	N	⏚
Colour of wires			
Terminals on the knife switch (Disconnecting means)	(L)	(N)	⏚

Note: Knife switch (Disconnecting means) should have minimum 3.5 mm contact gap.
• Secure the cable onto the control board with the holder (clamper).

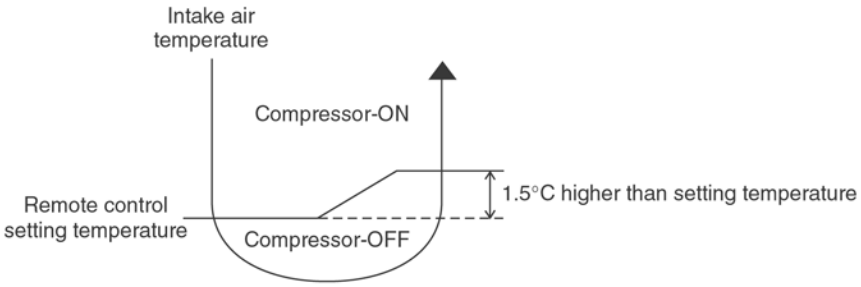
11.3.5. Pipe Insulation

1. Please carry out insulation at pipe connection portion as mentioned in Indoor/Outdoor Unit Installation Diagram. Please wrap the insulated piping end to prevent water from going inside the piping.
2. If drain hose or connecting piping is in the room (where dew may form), please increase the insulation by using POLY-E FOAM with thickness 6mm or above.

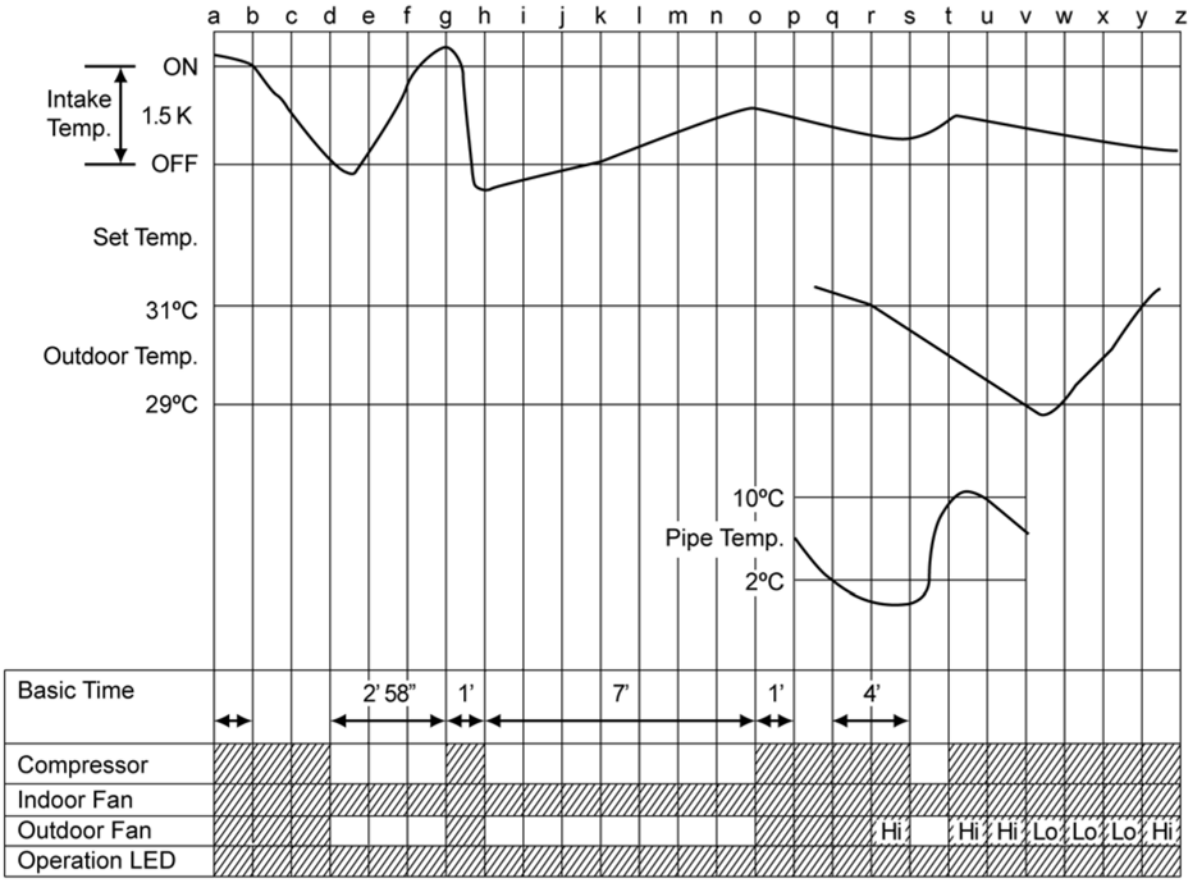
12 Operation Control

12.1. Cooling Operation

- Cooling operation can be set using remote control.
- This operation is applied to cool down the room temperature reaches the setting temperature set on the remote control.
- The remote control setting temperature, which takes the reading of intake air temperature sensor, can be adjusted from 16°C to 30°C.
- During cooling operation, the compressor will stop running and restart as shown in figure below.



12.1.1. Cooling Operation Time Diagram



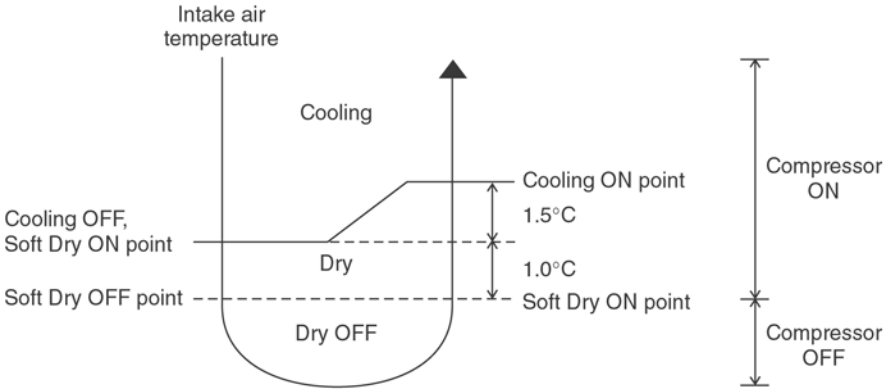
<Description of operation>

d – g	: restart control (waiting for 3 min.)
a – b, g – h, o – p	: 60 sec. Forcible operation.
h – o	: 7 min. time save control.
q – t	: freeze prevention control.
v – y	: outdoor fan control.

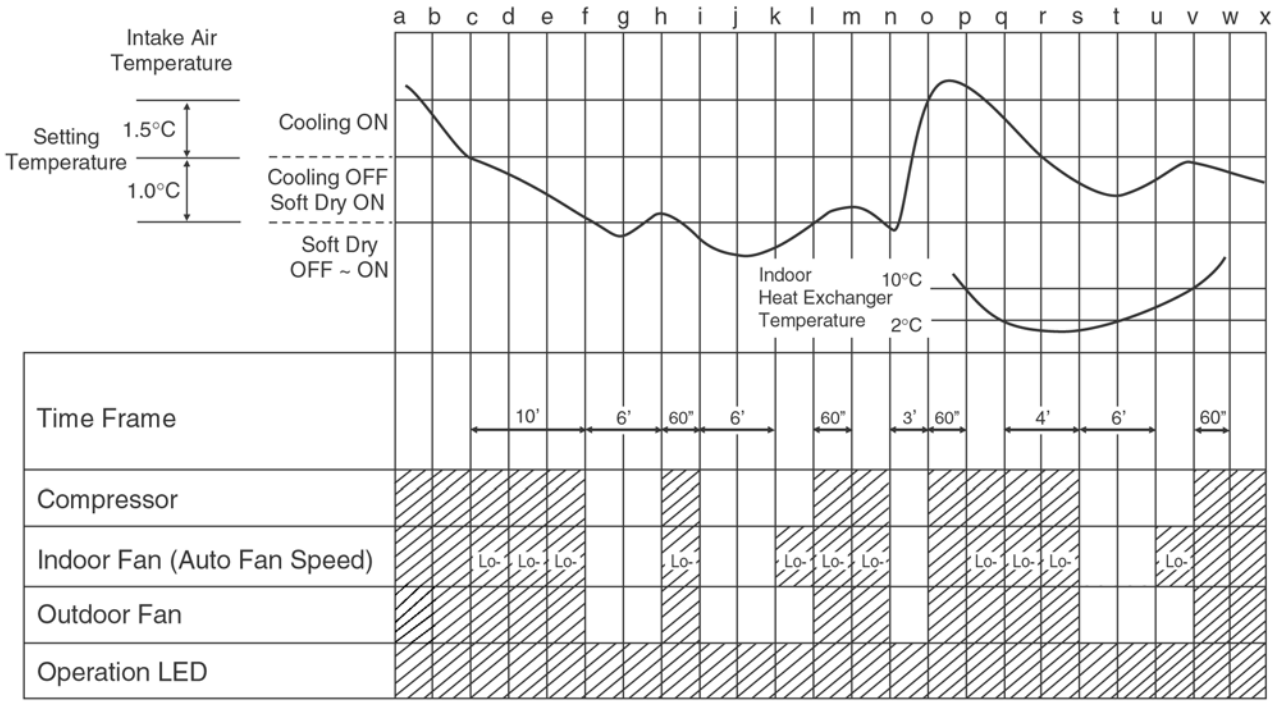
Operation
Stop

12.2. Soft Dry Operation

- Soft Dry operation can be set using remote control.
- Soft Dry operation is applied to dehumidify and to perform a gentle cooling to the room.
- This operation starts when the intake air temperature sensor reaches the setting temperature on the remote control.
- When operation begins, Soft Dry will be switched “ON” for a maximum 10 minutes, then Soft Dry operation will be turned “OFF” for a minimum 6 minutes. After that, the Soft Dry operation will be “ON” and “OFF” based on the setting temperature as shown in figure below.
- However after 3 minutes of compressor off, during Soft Dry “OFF” (within 6 minutes Soft Dry restart control), the indoor unit will start to operate at normal Cooling mode if the intake temperature is higher than Cooling “ON” point.



12.2.1. Soft Dry Operation Time Diagram



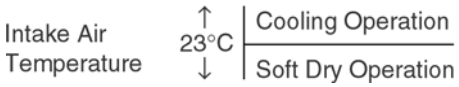
<Description of operation>

h – i, l – m, o – p, v – w : Minimum 60 seconds foreced operation
n – o : Minimum 3 minutes restart control (Time Delay Safety Control) - Cooling operation
f – h, i – k, s – u : Minimum 6 minutes restart control (Time Delay Safety Control) - Soft dry operation
q – v : Anti-Freezing Control

Operation
Stop

12.3. Automatic Operation

- Automatic operation can be set using remote control.
- This operation starts to operate with indoor fan at SLo speed for 20 seconds to judge the intake air temperature.
- After judged the temperature, the operation mode is determined by referring to the below standard.



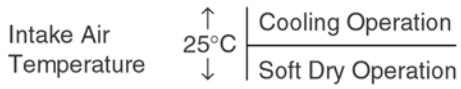
- Then, the unit start to operate at determined operation mode, until it is switched off using remote control, with the setting temperature as shown in below table.

	Setting Temperature (Standard)
Cooling Operation	25°C
Soft Dry Operation	22°C

- The setting temperature for all the operations can be changed one level up or one level down from the standard temperature as shown in below table by pressing on the temperature up or temperature down button at remote control.

		Cooling	Soft Dry
Higher →	+2°C	27°C	24°C
Standard →	±0°C	25°C	22°C
Lower →	–2°C	23°C	20°C

- The operation mode judging temperature and standard setting temperature can be increased by 2°C permanently, by open the circuit of JX03 at printed circuit board indoor unit.



	Setting Temperature (Standard)
Cooling Operation	27°C
Soft Dry Operation	24°C

12.4. Indoor Fan Speed Control

• Indoor Fan Speed can be set using remote control.

12.4.1. Fan Speed Rotation Chart

	Fan Speed (rpm)
COOL/DRY	CS-C28HKF
S Hi	1720
Hi	1670
Me	1580
Lo+	1500
Lo	1410
Lo-	1200
S Lo	960
Q Hi	1570
Q Me	1480
Q Lo	1310

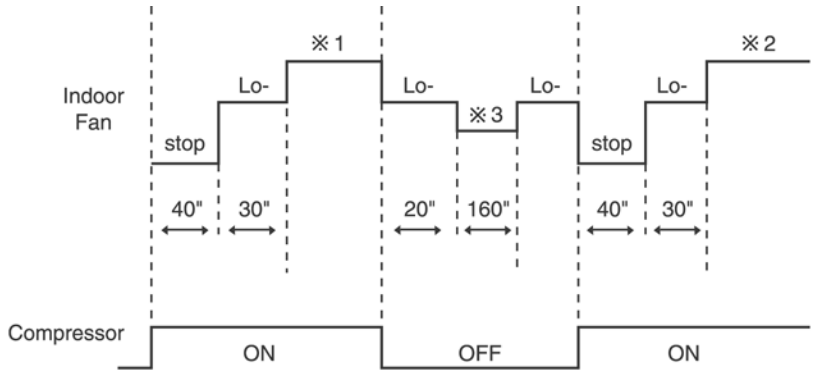
12.4.2. Automatic Fan Speed Control

• When set to Auto Fan Speed, the fan speed is adjusted between maximum and minimum setting as shown in the table.
- Fan speed rotates in the range of Hi, Me and Lo-.
- Deodorizing Control will be activated.

Tap				S Hi	Hi	Me	Lo+	CLo	Lo-	SLo	Stop
Cooling	Normal	Manual	Hi		○						
			Me			○					
			Lo					○			
		Auto			○	○			○		○
	Powerful	Manual		○							
		Auto		○							
Soft Dry		Manual							○		○
		Auto							○		○
Auto Mode judgement										○	
Cooling	Quiet	Manual	QHi		Hi-100						
			QMe			Me-100					
			QLo					cLo-100			
		Auto			Hi-100	Me-100			○		○
Soft Dry	Quiet	Manual							○		○
		Auto							○		○

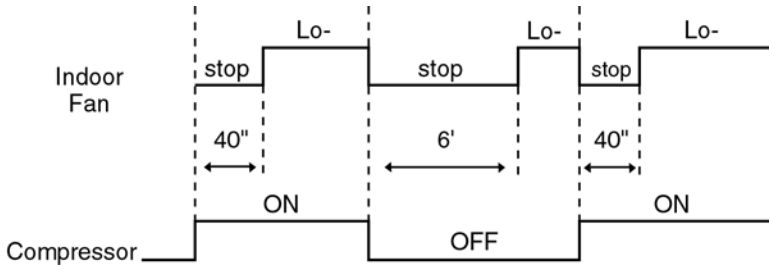
• Auto Fan Speed during Cooling operation:

1. Indoor fan will rotate alternately between off and on as shown in below diagram.
2. At the beginning of each compressor start operation, indoor fan will increase fan speed gradually for deodorizing purpose.
3. For the first time the compressor operate, indoor fan will be switched to Hi fan speed from Lo- after 70 seconds from the start of compressor. This cause the room temperature to achieve the setting temperature quickly.
4. During compressor stop, indoor fan will operate at Lo- for the beginning 20 seconds to prevent higher volume of refrigerant in liquid form returning to the compressor.
5. After the compressor at turn off condition for 3 minutes, indoor fan will start to operate at Lo- to circulate the air in the room.
   This is to obtain the actual reading of the intake air temperature.
6. For the resume of compressor operation, indoor fan will operate at Me fan speed to provide comfort and lesser noise environment, after 70 seconds from the restart of compressor.



※ 1 Fan Speed is Hi until the compressor stops (when the room temperature reaches setting temperature).
※ 2 Fan Speed is Me after the compressor restarts.
※ 3 Variable rpm is equivalent to Lo- rpm.

• Auto Fan Speed during Soft Dry operation:
1. Indoor fan will rotate alternately between off and Lo-.
2. At the beginning of each compressor start operation, indoor fan will increase fan speed gradually for deodorizing purpose.
3. When compressor at turn off condition for 6 minutes, indoor fan will start fan speed at Lo- to circulate the air in the room. This is to obtain the actual reading of intake air temperature.



12.4.3. Manual Fan Speed Control

• Manual fan speed adjustment can be carried out by using the Fan Speed selection button at the remote control.
• There are 3 types of fan speed settings: Lo, Me, Hi.

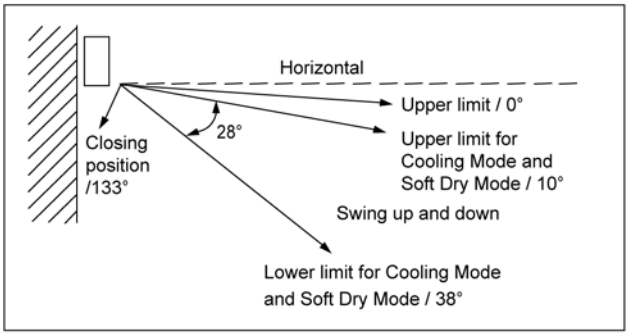
12.5. Outdoor Fan Speed Control

• There is 2 speed for outdoor fan motor. Outdoor fan speed can be changed to Hi or Lo according to outdoor temperature.
• For Cooling or Soft Dry operation when outdoor temperature reaches to 31°C (Hi-speed), 29°C (Lo-speed).
• When the air conditioner is turned on, the compressor and the outdoor fan will operate simultaneously.
• Likewise, both compressor and outdoor fan will stop at the same time if the unit is turned off.

12.6. Vertical Airflow Direction Control

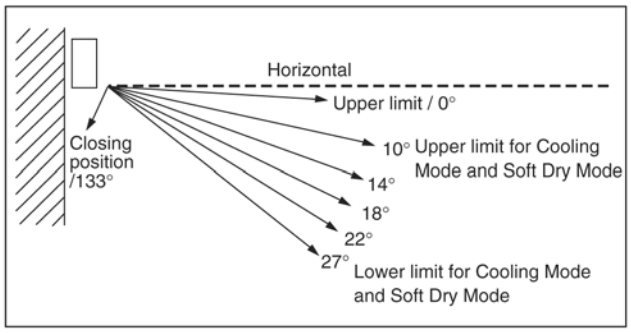
12.6.1. Auto Control

• When the vertical airflow direction is set to Auto using the remote control, the louver swings up and down as shown in the diagram.
• When stopped with remote control, the discharge vent is reset, and stop at the closing position.
• During Cooling operation or Soft Dry operation, indoor fan motor may stop to rotate at certain periods. At that condition, the louver will stop swinging and rest at the upper limit.



12.6.2. Manual Control

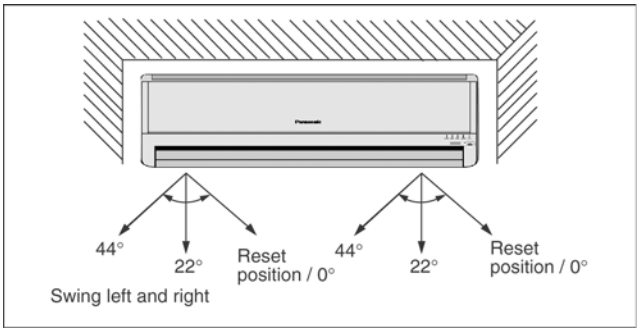
- When the vertical airflow direction is set to Manual using the remote control, the automatic airflow is released and the airflow direction louver move up and down in the range shown in the diagram.
- The louver can be adjusted by pressing the button to the desired louver position.
- When stopped with remote control, the discharge vent is reset, and stop at the closing position.



12.7. Horizontal Airflow Direction Control

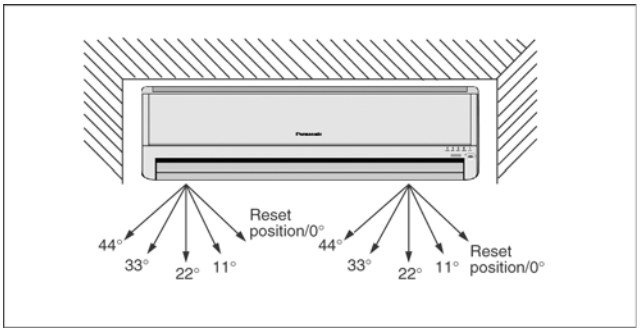
12.7.1. Auto Control

- When the horizontal airflow direction is set to Auto using the remote control, the vanes swings left and right as shown in the diagram.
- When stopped with remote control, the discharge vane is reset, and stop at the reset position.
- During Cooling operation or Soft Dry operation, indoor fan motor may stop to rotate at certain periods. At that condition, the vane will stop swinging and rest at 22° angle.



12.7.2. Manual Control

- When the horizontal airflow direction is set to Manual using the remote control, the automatic airflow is released and the airflow direction vane move left and right in the range shown in the diagram.
  The louver can be adjusted by pressing the button to the desired vane position.
- When stopped with remote control, the vanes is reset, and stopped at reset position.



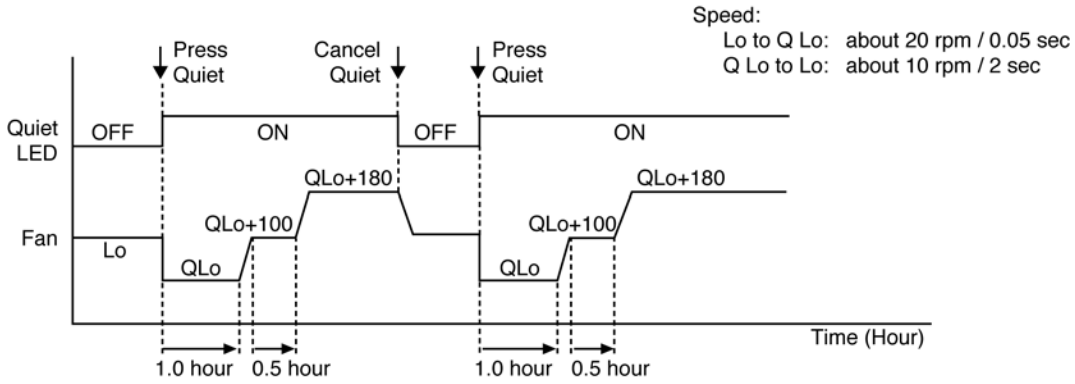
12.8. Powerful Operation

- To achieve the setting temperature quickly.
- When Powerful operation is set, the setting temperature will be automatically decreased 3°C internally against the present setting temperature (Lower temperature limit: 16°C).
- This operation automatically will be running under SHi Fan Speed (Cooling).
- Vertical Airflow Direction:-
  - In “Manual” setting, the vane will automatically shift down 10° lower than previous setting.
  - In “Auto” setting, the vane will automatically swing up and down. However the lower limit will be shifted 10° downward.
- Powerful operation stops when:-
  - Powerful operation has operate for 15 minutes.
  - Powerful mode button is pressed again.
  - Stopped by OFF/ON operation button
  - Timer OFF activates.
  - Quiet mode button is pressed.
  - Operation mode is changed.

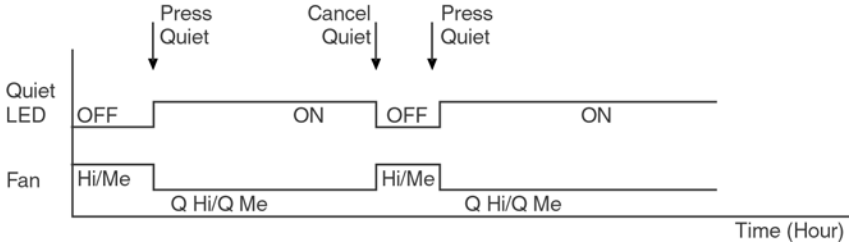
12.9. Quiet Operation

(For Cooling Operation or cooling region of Soft Dry Operation)

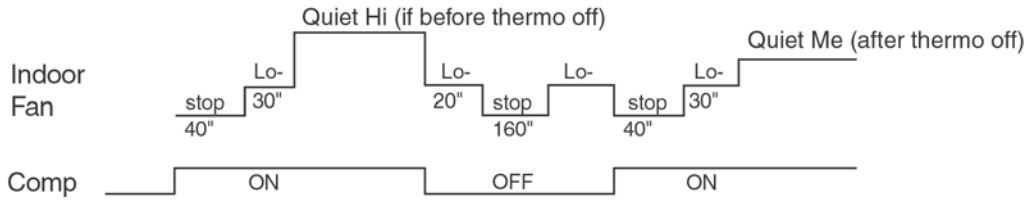
- To provide quiet cooling operation condition.
- Once the Quiet Mode is set at the remote control, the Quiet Mode LED illuminated. The sound level will reduce around 2 dB (A) for Lo fan speed or 3 dB(A) for Hi/Me fan speed against the present operation sound level.
- Manual Fan Speed:-
  - RPM control during Lo cool



  - RPM control during Hi & Me cool



- Auto Fan Speed:-



- Quiet operation stops when:-
  - Quiet button is pressed again.
  - Stopped by OFF/ON operation button.
  - Timer OFF activates.
  - Powerful button is pressed.

12.10. Timer Control

12.10.1. ON Timer

- When the ON Timer is set by using the remote control, the unit will start to operate slightly before the set time, so that the room will reach nearly to the set temperature by the set time.
- For Cooling and Soft Dry operation, the operation will start 15 minutes before the set time.
- For Automatic operation, the indoor fan will operate at SLo speed for 20 seconds, 15 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.

12.10.2. OFF Timer

- When the OFF Timer is set by using the remote control, the unit will stop operate according to the desired setting.
  Notes
  1. By pressing ON/OFF operation button, the ON Timer or OFF Timer setting will not be cancelled.
  2. To cancel the previous timer setting, press CANCEL button.
  3. To activate the previous timer setting, press SET button.
  4. If main power supply is switched off, the Timer setting will be cancelled.

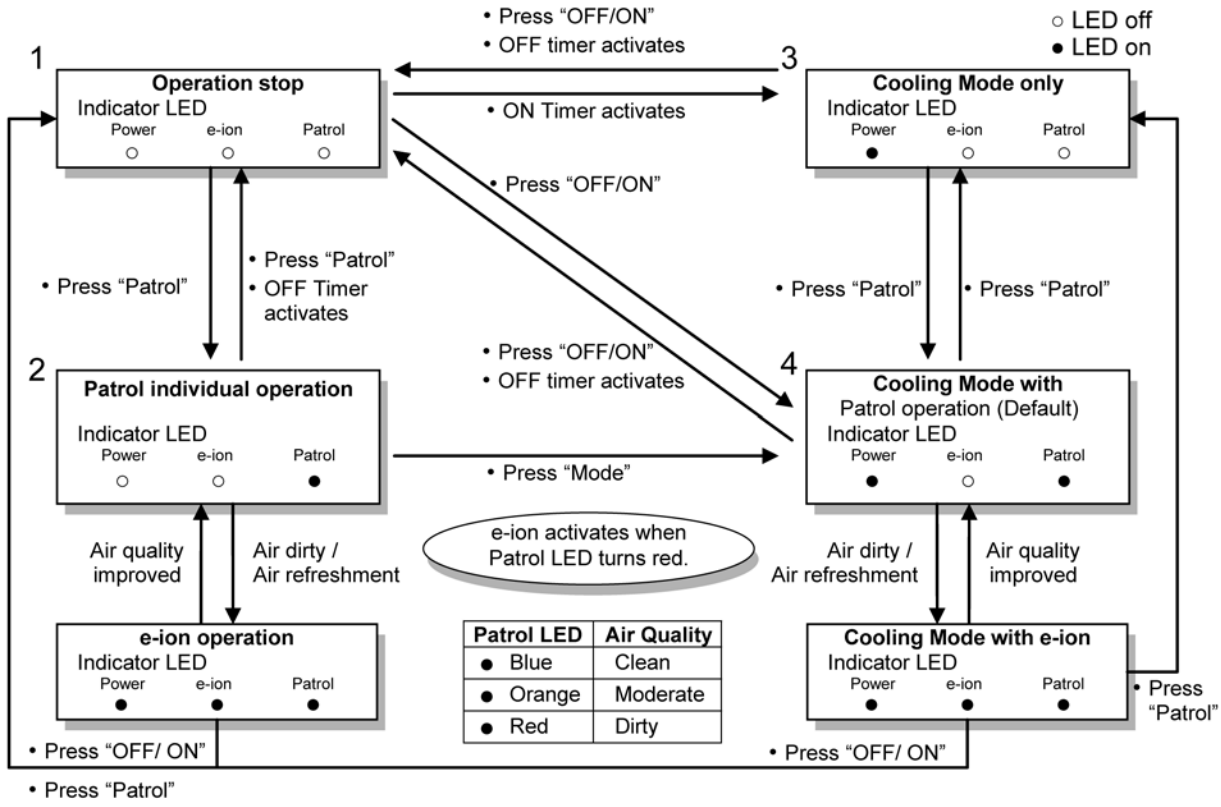
12.11. Random Auto Restart Control

- If there is a power failure during operation, the air conditioner will automatically restart after 3 to 4 minutes when the power is resumed.
- It will start with previous operation mode and airflow direction.
- If there are more than one air conditioner unit in operation and power failure occur, restart time for each unit to operate will be decided randomly using 4 parameters:- intake air temperature, setting temperature, fan speed and air swing louver position.
- This Random Auto Restart Control is not available when Timer is set.
- This control can be omitted by open the circuit of JX02. (Refer printed circuit board indoor unit)

12.12. Remote Control Signal Receiving Sound

- Long beep sound will be heard when:
  - Stopping the air conditioner using ON/OFF switch.
- Short beep sound will be heard for others setting.

12.13. Patrol Operation



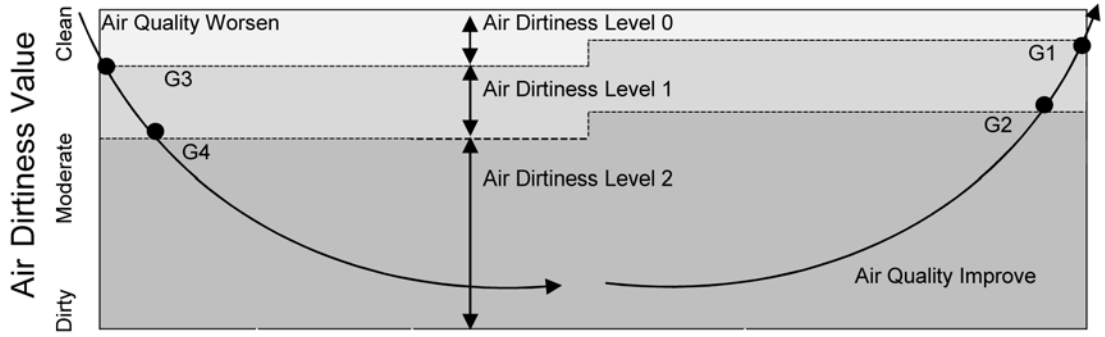
• To monitor air dirtiness level by using Patrol sensor and to maintain air freshness by activates e-ion operation.

• Patrol operation start condition
  - When the unit operation is started with “OFF/ON” button.
  - When the unit stops, “Patrol” button is pressed, Patrol individual operation will start.
  - During cooling only operation, “Patrol” button is pressed.

• Patrol operation stop condition (when any of the following condition is fulfilled):
  - When “OFF/ON” button is pressed.
  - During any operation with Patrol, "Patrol" button is pressed again.
  - When “e-ion” button is pressed.
  - When OFF Timer activates.

• Patrol operation disable
  - To disable the Patrol Operation during unit start (default) with “OFF/ON” button, press “Patrol” button and hold for 5 seconds, then release.
  - To disable the Patrol Operation, press “Patrol” button and hold for 15 seconds, then release.

• Patrol Sensor Control
  - First 2 minutes from Patrol function activates is stabilization time, during stabilization time, no air dirtiness level is monitored. The Air Dirtiness level is set to Clean, Patrol LED turns blue color.
  - After that, Patrol sensor starts to record the resistance value at fixed interval. Higher resistance value indicates cleaner air.
  - The air dirtiness level is monitored by comparing the current resistance value with maximum resistance value from time to time to get the Air Dirtiness Value.
  - There are 3 air dirtiness level, based on the Air Dirtiness Value:
    - Air Dirtiness level 0: Clean - Patrol LED = blue color
    - Air Dirtiness level 1: Moderate - Patrol LED = orange color
    - Air Dirtiness level 2: Dirty - Patrol LED = red color



• Dirtiness level sensitivity adjustment.
  It is possible to change the Patrol sensor sensitivity, where the Threshold value (G1 ~ G4) will be shifted accordingly:
  1. Press and release “SET” button.
  2. Press “Timer ▲ ” / “Timer ▼ ” button to select sensitivity.
     (Air 1“Low Sensitivity” <–> Air 2 “Standard” (Default) <–> Air 3 “High Sensitivity”)
  3. Confirm setting by pressing “Timer Set” button. LCD returned to original display after 2 seconds.
  4. LCD returned to original display if remote control does not operate for 30 seconds.

• e-ion Control
  - e-ion operation starts condition
    - When dirtiness at level 2 (Patrol LED turns red).
    - 2 minutes after stabilization time (Patrol LED turns red).
    - 4 hours at level 0 (Patrol LED turns red).
  - e-ion operation time
    - If dirtiness level improves from level 2 to level 1 (Patrol LED from red to orange), the unit carries out level change after 60 seconds.
    - When dirtiness level returns to level 0 (Patrol LED turns blue) continuously for 11 minutes or more, e-ion operation stops.

• Dirtiness Level and fan speed
  - When e-ion operation starts, the fan speed increases based on dirtiness level:

	Dirtiness level	rpm shift	
		Patrol individual operation	Combine operation
e-ion ON	Dirtiness level 0	No change	No change
	Dirtiness level 1	+ 20	+ 20
	Dirtiness level 2	+ 40	+ 40

  - Indoor Fan Control
    - During any operation mode combines with Patrol operation, fan speed follows respective operation mode.
    - During Patrol individual operation if e-ion starts, only Auto Fan Speed and no Powerful operation is allowed. Even if “Fan Speed” button is pressed, no signal is sent to air conditioner, and no change on LCD display.
    - During Patrol individual operation if e-ion stops, Indoor Fan stop operation.

• Airflow direction (Horizontal, Vertical) Control
  - During any operation mode combines with Patrol operation, airflow direction follows respective operation mode.
  - During Patrol individual operation if e-ion starts, only Auto Air Swing is allowed. Even if “Air Swing” button is pressed, no signal is sent to air conditioner, and no change on LCD display.
  - During Patrol individual operation if e-ion stops, Airflow direction louver closed.

- Indicator
  - When Patrol operation starts, Patrol LED is ON with 3 different colors:

Patrol LED	Air Quality
Blue	Clean
Orange	Moderate
Red	Dirty

  - Then e-ion operation starts based on dirtiness level, both Patrol LED and e-ion LED are ON.

- Remote Control Receiving Sound

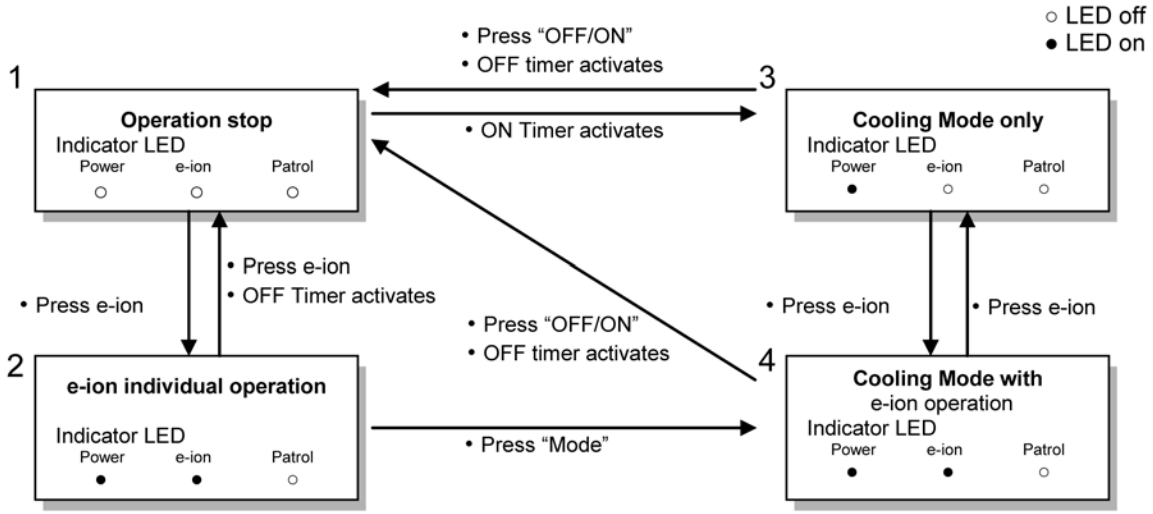
  • Normal Operation → Patrol Mode : Beep
  • Patrol Mode → Stop : Long Beep
  • Patrol Mode → Normal Operation : Beep
  • Stop → Patrol : Beep

- Timer Control
  - When ON timer activates when unit stops, previous operation resumes without Patrol operation.
  - When ON timer activates during any operation, no change and carry on current operation.
  - When OFF timer activates during any operation, all operation stops.

- Power Failure Control
  - During Patrol individual operation, if power failure occurs, after power resumes, Patrol individual operation resumes immediately.
  - During combination operation, if power failure occurs, after power resumes combination operation resume immediately.

- Error Detection Control
  - The Patrol error detection control starts once the power is supplied to Patrol sensor. However, the error will display when the Patrol operation is ON.
  - Error detection method:
    1. If the Patrol sensor is opened circuit continuously for 6 hours, Patrol sensor error occurs. However, the error will display only when the Patrol operation is ON.
  - Patrol Sensor Control after error occurs.
    1. During any operation mode combines with Patrol operation.
    a. Power supply to Patrol sensor is OFF.
    b. Air conditioner normal mode operation continues with Patrol LED blinking.
    c. The Patrol LED continues blinking if the patrol operation is ON and stops blinking if the Patrol operation is OFF.
  - During Patrol individual mode.
    1. Power supply to Patrol sensor is OFF.
    2. Patrol LED blinks.
    3. The Patrol LED continues blinking if the patrol operation is ON and stops blinking if the Patrol operation is OFF.
  - Error cancel condition:
    1. Power supply reset.

12.14. e-ion Operation



• This operation provides clean air by producing negative ions to attract dust captured at the positively charged e-ion filters.

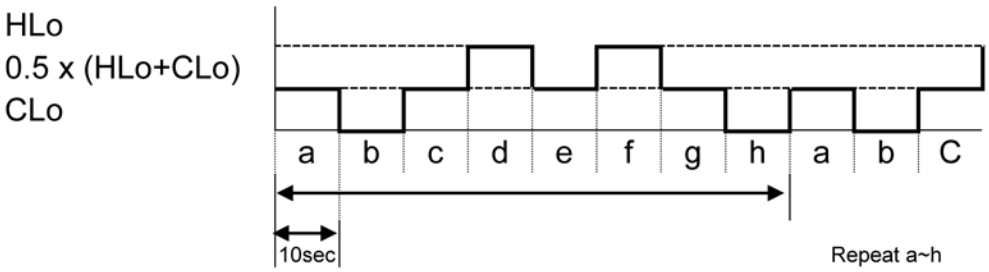
• e-ion operation start condition
  - During unit running at any operation mode, if "e-ion" button is pressed, combination operation (operation mode + e-ion operation) starts.
  - During unit is OFF, if "e-ion" button is pressed, e-ion individual operation starts.

• e-ion operation stop condition
  - When "OFF/ON" button is pressed to stop the operation.
  - When "e-ion" button is pressed again.
  - When "Patrol" button is pressed.
  - When OFF Timer activates.

• e-ion operation pause condition
  - When indoor fan stop (during deice, odor cut control, thermostat off, etc.). e-ion operation resume after indoor fan restarts.
  - When indoor intake temperature ≥ 40°C. e-ion operation resume after indoor intake temperature < 40°C continuously for 30 minutes.

• Indoor fan control
  - During any operation mode combines with e-ion operation, fan speed follows respective operation mode.
  - During e-ion individual operation - only Auto Fan Speed and no Powerful operation is allowed. Even if Fan Speed button is pressed, no signal is sent to air conditioner, and no change on LCD display.

  Auto Fan Speed for e-ion operation switches between HLo and CLo at pattern below:



• Airflow direction control
  - During any operation mode combines with e-ion operation, airflow direction follows respective operation mode.
  - During e-ion individual operation, only Auto Air Swing is allowed. Even if Air Swing button is pressed, no signal is sent to air conditioner, and no change on LCD display.

• Timer control
  - When ON timer activates when unit stops, previous operation resumes without e-ion operation.
  - When ON timer activates during any operation, no change and carry on current operation.
  - When OFF timer activates during any operation, all operation stops.

• Indicator
  - When e-ion operation starts, e-ion indicator ON.

• Remote Control Receiving Sound

• Normal Operation	→	e-ion Operation	: Beep
• e-ion Operation	→	Normal Operation	: Beep
• Stop	→	e-ion individual operation	: Beep
• e-ion individual operation	→	Stop	: Long Beep

• Power failure
  - During e-ion individual operation, if power failure occurs, after power resumes, e-ion individual operation resumes immediately.
  - During combination operation, if power failure occurs, after power resumes, combination operation resume immediately.
  - e-ion operation status is not memorized after OFF the unit. After OFF, when the operation is ON again, air conditioner operates without e-ion operation.

• e-ion Check Mode
  - To check if e-ion is malfunctioning, during e-ion operation press e-ion button for 15 seconds and release to enter e-ion Check Mode and supplies power to the e-ion AIR PURIFYING SYSTEM.
  - If abnormal discharge is detected at filter (short-circuited) due to water or dust adhesion, etc., the e-ion indicator blinks immediately.

• Error Detection Control

When e-ion indicator blink, it indicates error listed below:

1. e-ion AIR PURIFYING SYSTEM PCB main connector open:

• Judgment Method

- During e-ion operation (include during Patrol operation), e-ion AIR PURIFYING SYSTEM main connector to PCB is opened.

• Troubleshooting Methods

- Connect the connector or stop operation (include during Patrol operation) to cancel the blinking.

2. Abnormal Discharge error:

• Judgment Method

- During e-ion operation, feedback voltage is-Lo (at micro controller) is detected, it is judged abnormal discharge and stops power supplies to the e-ion AIR PURIFYING SYSTEM.
- Abnormal discharge is caused by ionizer or filter's high voltage power supply short-circuits due to water or dust adhesion, and so forth.
- When abnormal discharge occurred, every 30 minutes the unit supplies power to the e-ion AIR PURIFYING SYSTEM.
- When abnormal discharge occurs for 24 times continuously, e-ion indicator blinks (not applicable for e-ion Check Mode, where the error will shows immediately despite the 24 times counter)

• Troubleshooting Method

- Press "e-ion" button or "OFF/ON" button to stop the operation and check the e-ion AIR PURIFYING SYSTEM main connector to PCB.
- After that, press "e-ion" button again to confirm the e-ion indicator not blinking.
- The 24 times counter will be clear after 10 minutes of normal operation or when operation stops.

• Error Reset Method

- Press "OFF/ON" button to OFF the operation.
- Press AUTO OFF/ON button at indoor unit to OFF the operation.
- OFF Timer activates.
- Press "e-ion" button during e-ion individual mode.
- Power supply reset.

3. e-ion AIR PURIFYING SYSTEM breakdown error:

• Judgment Method

- When hi-feedback voltage (at micro controller) supplied to filter during e-ion stop, e-ion AIR PURIFYING SYSTEM breakdown error shows immediately.
- It is due to indoor PCB or filter's high voltage power supply damage.
- Operations except e-ion continue. Both Timer indicator and e-ion indicator blink.

• Troubleshooting Method

- Press "e-ion" button or "OFF/ON" button to stop the operation.
- Change main circuit board or filter's high voltage power supply.
- When lo-feedback voltage supplied to e-ion AIR PURIFYING SYSTEM during e-ion operation, e-ion indicator and Timer indicator stop blinking.

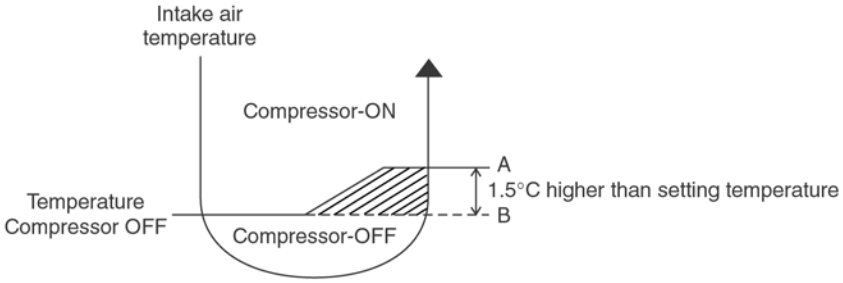
13 Protection Control

13.1. Restart Control (Time Delay Safety Control)

- When the thermo-off temperature (temperature which compressor stops to operate) is reached during:-
  - Cooling operation - the compressor stops for 3 minutes (minimum) before resume operation.
  - Soft Dry operation - the compressor stops for 6 minutes (minimum) before resume operation.
- If the operation is stopped by the remote control, the compressor will not turn on within 3 minutes from the moment operation stop, although the unit is turn on again within the period.
- This phenomenon is to balance the pressure inside the refrigerant cycle.

13.2. 7 Minutes Time Save Control

- The compressor will start automatically if it has stopped for 7 minutes and the intake air temperature falls between the compressor ON temperature (A) and compressor OFF temperature (B) during the period.
- This phenomenon is to reduce the built up humidity inside a room.



13.3. 60 Seconds Forced Operation

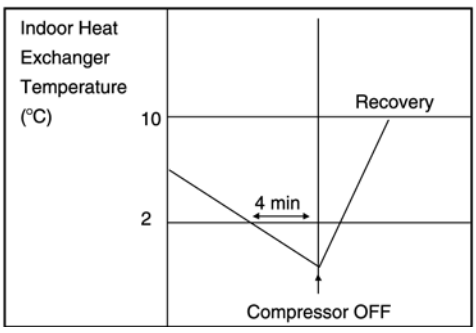
- Once the air conditioner is turned on, the compressor will not stop within 60 seconds in a normal operation although the intake air temperature has reached the thermo-off temperature. However, force stop by pressing the OFF/ON operation button at the remote control is permitted.
- The reason for the compressor to force operate at minimum 60 seconds is to allow the refrigerant oil run in a full cycle and return back to the outdoor unit.

13.4. Starting Current Control

- When the compressor, outdoor fan motor and indoor fan motor are simultaneously started, the indoor fan motor will start to operate at 1.6 second later.
- The reason of the difference is to reduce the starting current flow.

13.5. Freeze Prevention Control

- If the temperature of the indoor heat exchanger falls below 2°C continuously for 4 minutes or more, the compressor turns off. The fan speed setting remains the same.
- This phenomenon is to protect the indoor heat exchanger from freezing and to prevent higher volume of refrigerant in liquid form returning to the compressor.
- Compressor will restart again when the indoor heat exchanger temperature rises to 10°C (Recovery).
- Restart control (Time Delay Safety Control) will be applied in this Control if the recovery time is too short.



13.6. Compressor Reverse Rotation Protection Control

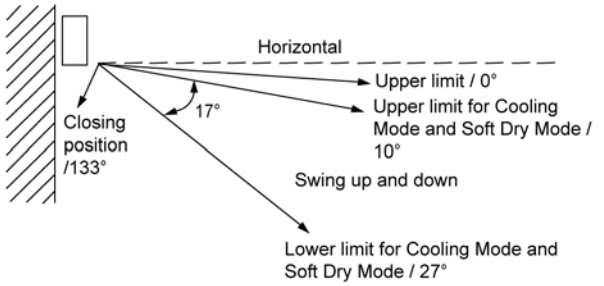
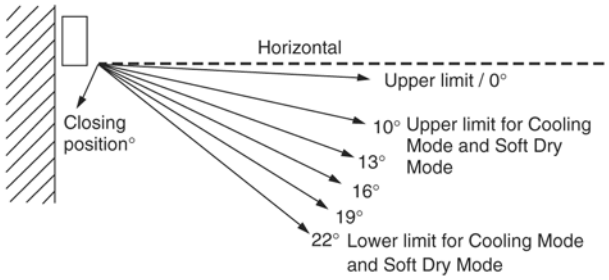
- If the compressor is operating continuously for 5 minutes or longer and the temperature difference between intake air and indoor heat exchanger is 2.5°C or less for continuous 2 minutes, compressor will stop and restart automatically.
- Time Delay Safety Control is activated before the compressor restart.

▲T = Intake air temperature - Indoor heat exchanger temperature

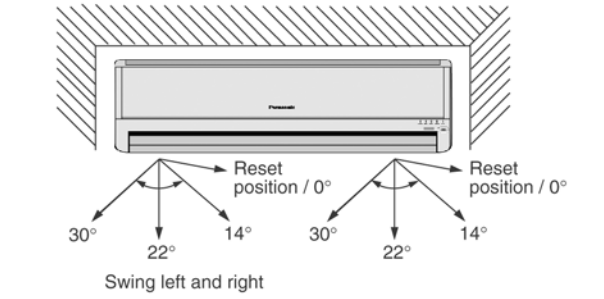
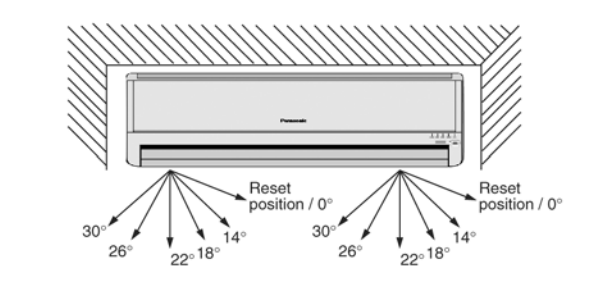
- This is to prevent compressor from rotate reversely when there is an instantaneous power failure.

13.7. Dew Prevention control

- To prevent dew formation at indoor unit discharge area.
- This control start if:-
  - Cooling mode or Quiet mode is activated.
  - Remote Control setting temperature is less than 25°C.
  - Fan speed is at Lo or QLo.
  - Room temperature is constant (±1°C) for 30 minutes.
  - Compressor is continuously running.
- Fan speed, angle of horizontal louver (vertical airflow angle) and angle of vertical louver (horizontal airflow angle) will be adjusted accordingly in this control.
  - Fan speed will be increased slowly if the unit is in quiet mode and Lo fan speed.
  - The angle of horizontal louver will be changed as table below:

Airflow direction auto control	Airflow direction manual control
	

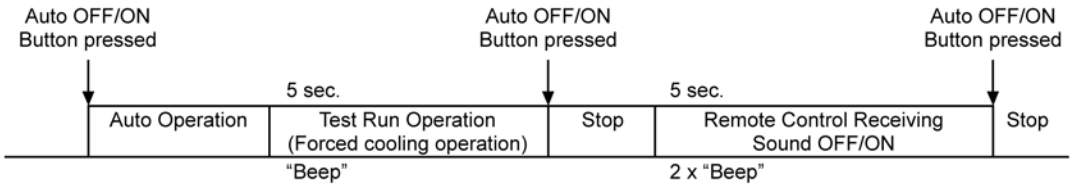
- The angle of vertical louver will be changed as table below:

Airflow direction auto control	Airflow direction manual control
	

- Dew prevention stop condition.
  - Remote Control setting temperature is less than 25°C.
  - Fan speed is at Lo or QLo.
  - Select Power operation.

14 Servicing Mode

14.1. Auto OFF/ON Button



1. AUTO OPERATION MODE
   The Auto operation will be activated immediately once the Auto OFF/ON button is pressed. This operation can be used to operate air conditioner with limited function if remote control is misplaced or malfunction.

2. TEST RUN OPERATION (FOR PUMP DOWN/SERVICING PURPOSE)
   The Test Run operation will be activated if the Auto OFF/ON button is pressed continuously for more than 5 seconds. A "beep" sound will be heard at the fifth seconds, in order to identify the starting of this operation.

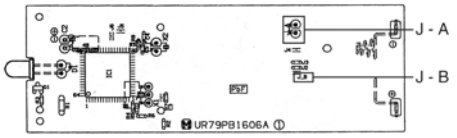
3. REMOTE CONTROL RECEIVING SOUND OFF/ON MODE
   The Remote Control Receiving Sound OFF/ON operation will be activated if (within 20 seconds of Test Run Operation) the Auto OFF/ON button is pressed for more than 5 seconds. 2 "beep" sound will be heard at to identify the starting of this operation.

   Press Auto OFF/ON button to toggle remote control receiving sound.
   - Short "beep": Turn ON remote control receiving sound.
   - Long "beep": Turn OFF remote control receiving sound.

   After Auto OFF/ON Button is pressed, the 20 seconds counter for Remote Control Receiving Sound OFF/ON Mode is restarted.

14.2. Select Remote Control Transmission Code

- There are 4 type of remote control transmission code could be selected and stored in EEPROM of indoor unit. The indoor unit will only operate when received signal with same transmission code from remote control. This could prevent signal interference when there are 2 or more indoor unit installed nearby together.
- To change remote control transmission code, short or open jumpers at the remote control printed circuit board.

Remote Control Printed Circuit Board	Transmission Code Combination		
	J-A	J-B	Remote Control No.
	* Short	Open	A (default)
	Open	Open	B
	Short	Short	C
	Open	Short	D

- Under various setting mode, after select the transmission code combination of remote control, press any button of remote control to transmit a signal to indoor unit. The transmission code will be stored in EEPROM.
- After signal is received, the various setting mode is cancelled and return to normal operation.

14.3. Remote Control Button

14.3.1. SET BUTTON

• To check current remote control transmission code.
  - Press for more than 10 seconds.

• To change the air quality sensor sensitivity:
  - Press and release with pointer.
  - Press the Timer Decrement button to select sensitivity:
    1. Low Sensitivity
    2. Standard (Default)
    3. Hi Sensitivity
  - Confirm setting by pressing Timer Set button, a “Beep” sound will be heard. LCD returns to original display after 2 seconds.
  - LCD returns to original display if remote control does not operate for 30 seconds.

14.3.2. CLOCK BUTTON

• To change the remote control’s time format.
  - Press for more than 5 seconds.

14.3.3. RESET (RC)

• To clear and restore the remote control setting to factory default.
  - Press once to clear the memory.

14.3.4. TIMER ▲

• To change indoor unit indicator’s LED intensity.
  - Press continuously for 5 seconds.

14.3.5. TIMER ▼

• To change remote control display from Degree Celsius (°C) to Degree Fahrenheit (°F).
  - Press continuously for 10 seconds.

15 Troubleshooting Guide

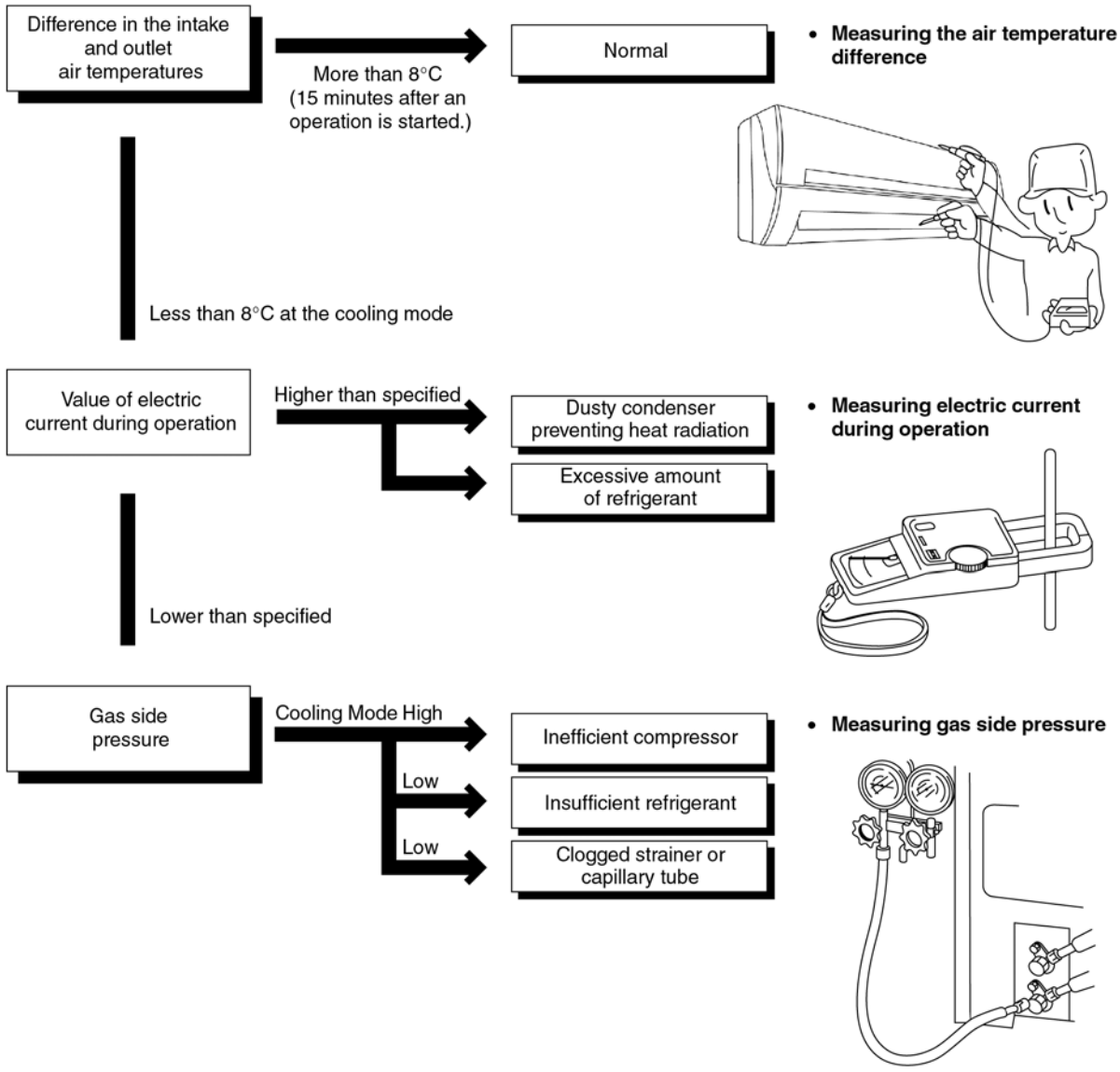
15.1. Refrigeration Cycle System

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 and 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/cm²G)	Outlet air temperature (°C)
Cooling Mode	0.4 ~ 0.6 (4 ~ 6)	12 ~ 16

* Condition: Indoor fan speed; High
Outdoor temperature: 35°C



- **Measuring the air temperature difference**

- **Measuring electric current during operation**

- **Measuring gas side pressure**

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

Condition of the air conditioner	Cooling Mode		
	Low Pressure	High Pressure	Electric current during operating
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.

15.1.2. Diagnosis methods of a malfunction of a compressor

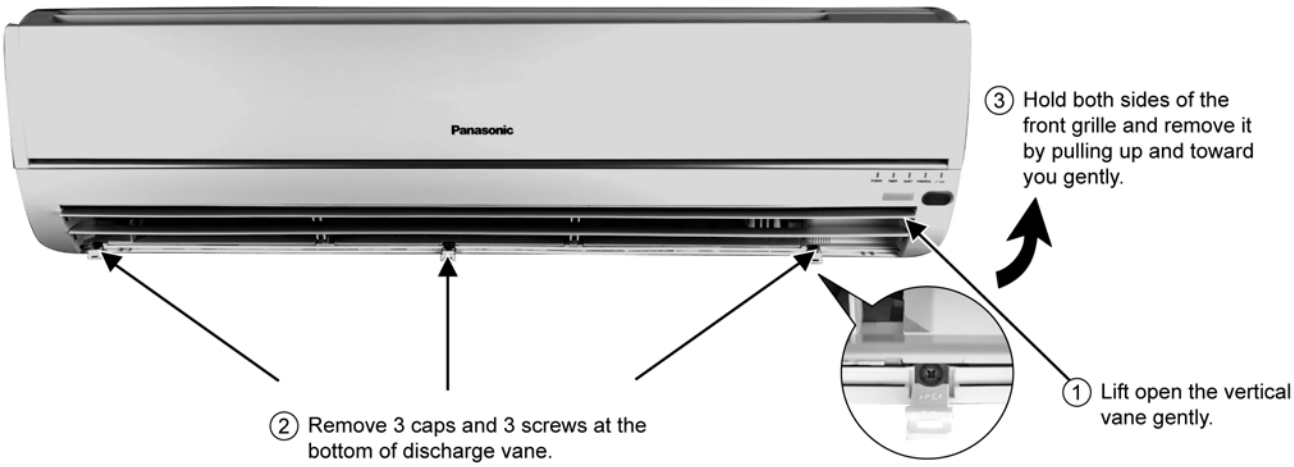
Nature of fault	Symptom
Insufficient compressing of a compressor	• Electric current during operation becomes approximately 20% lower than the normal value. • The discharge tube of the compressor becomes abnormally hot (normally 70 to 90°C). • The difference between high pressure and low pressure becomes almost zero.
Locker 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 has a humming sound.

16 Disassembly and Assembly Instructions

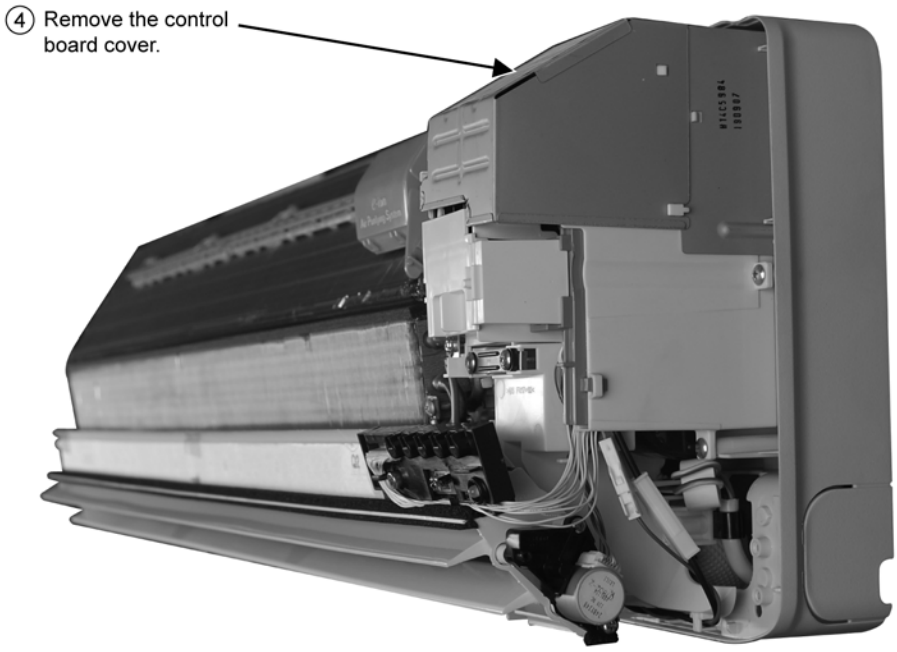
⚠ WARNING

High Voltage are generated in the electrical parts area by the capacitor. Ensure that the capacitor has discharged sufficiently before proceeding with repair work. Failure to heed this caution may result in electric shocks.

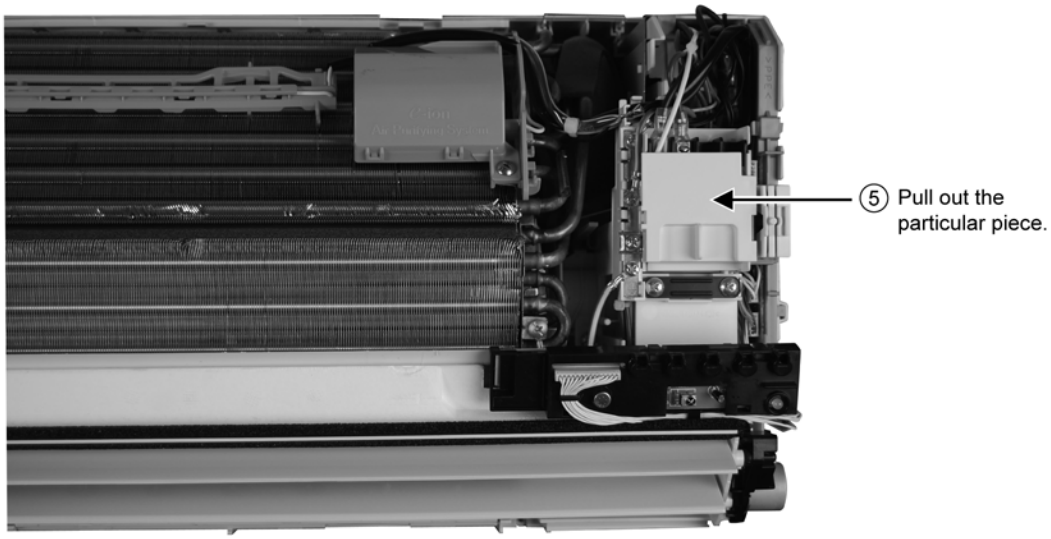
16.1. Indoor Electronic Controllers and Control Board Removal Procedures



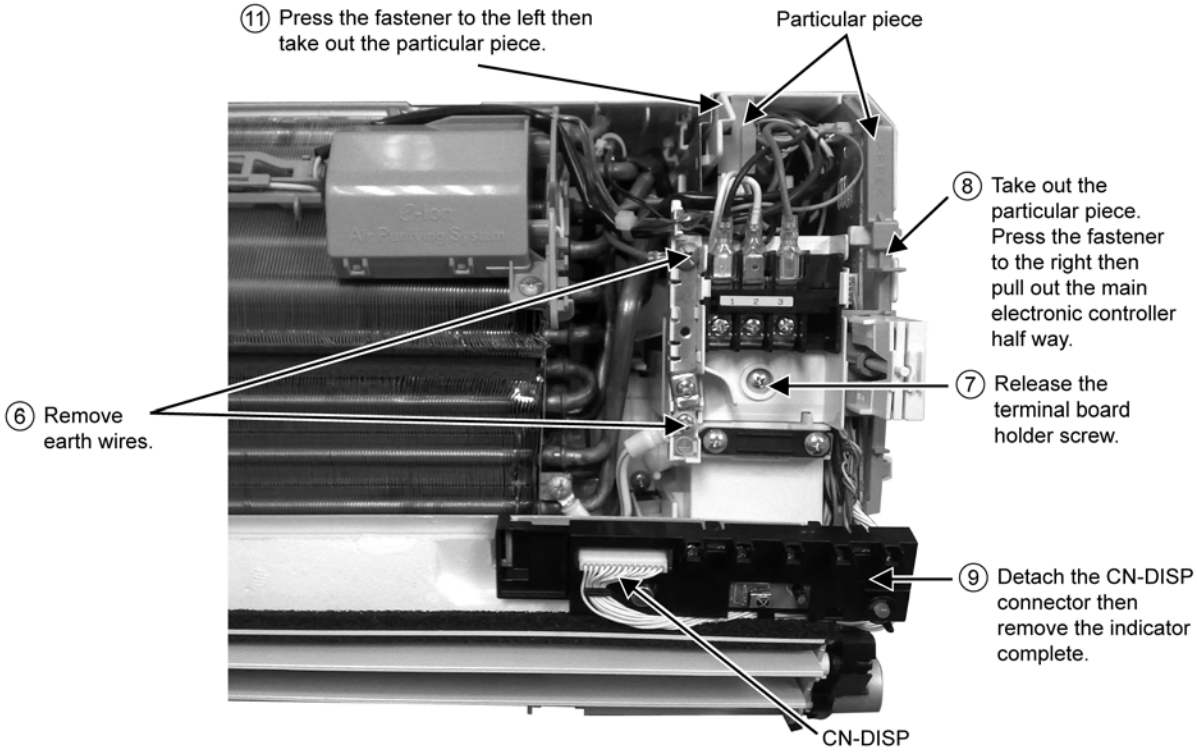
(Fig.1)



(Fig.2)

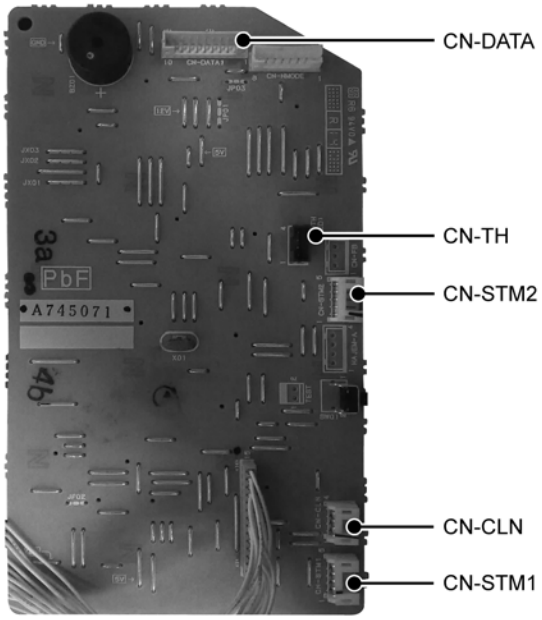

⑤ Pull out the particular piece.

(Fig.3)

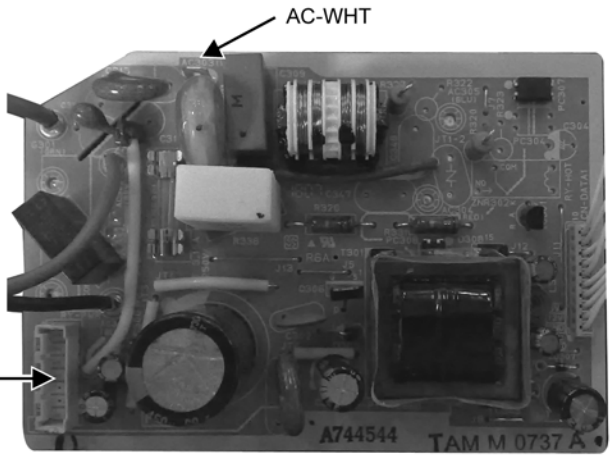

⑪ Press the fastener to the left then take out the particular piece.
Particular piece
⑧ Take out the particular piece. Press the fastener to the right then pull out the main electronic controller half way.
⑦ Release the terminal board holder screw.
⑥ Remove earth wires.
⑨ Detach the CN-DISP connector then remove the indicator complete.
CN-DISP

(Fig.4)

⑩ Detach 5 connectors as labeled from the electronic controller. Then pull out slowly while pressing the fastener to the right.

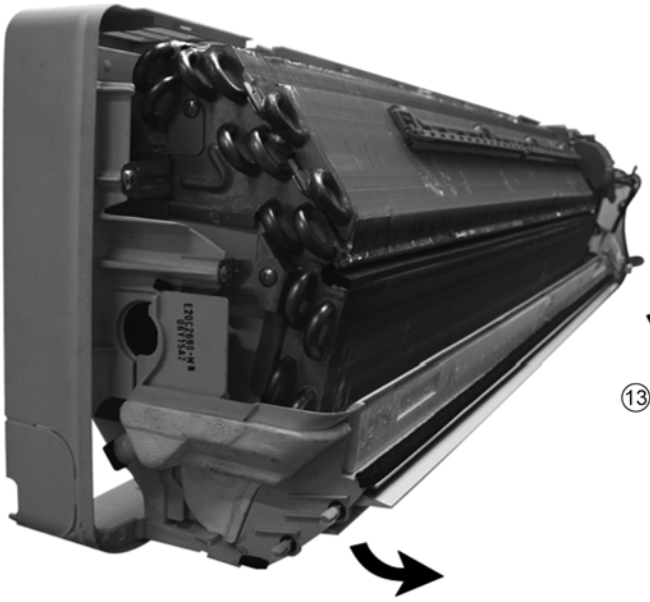


(Fig.5)



⑫ Detach the CN-FM connector from the electronic controller. Then, pull it slowly while pressing the fastener to the left.

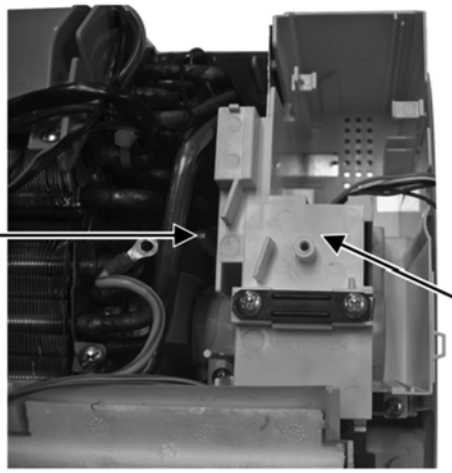
(Fig.6)



⑬ Remove the drain hose from the discharge grille.

⑭ Then pull out the discharge grille downward gently to dismantle it.

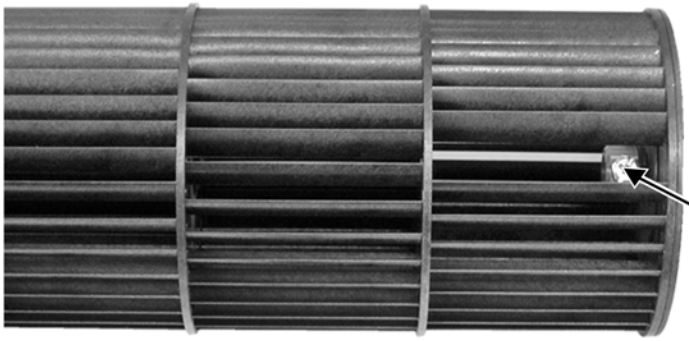
(Fig.7)



Control board fastener

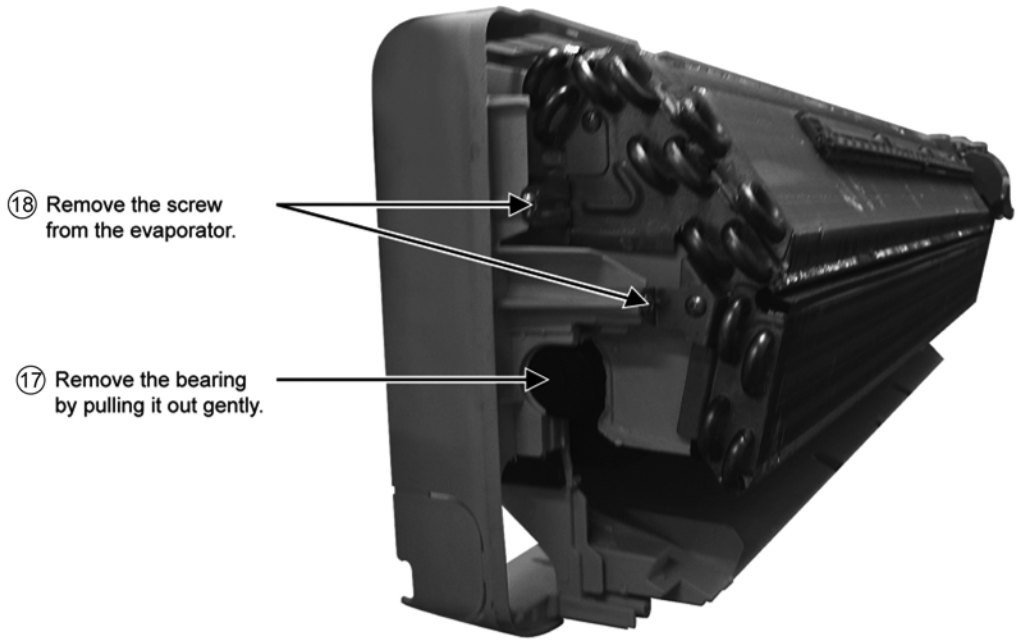
⑮ Remove 3 screws holding the control board. Press down the control board fastener and the whole control board can be remove.

(Fig.8)

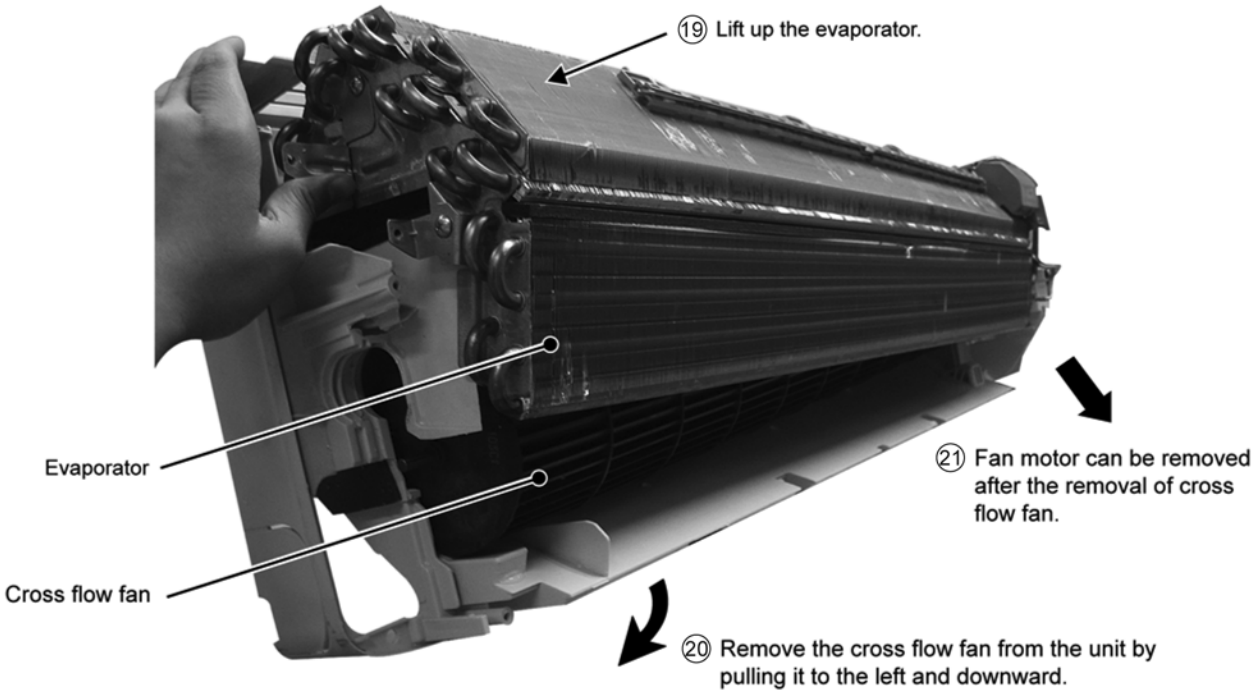


⑯ Remove the screw that holding the cross flow fan and fan motor axis.

(Fig.9)


⑱ Remove the screw from the evaporator.
⑰ Remove the bearing by pulling it out gently.

(Fig.10)


⑲ Lift up the evaporator.
Evaporator
Cross flow fan
㉑ Fan motor can be removed after the removal of cross flow fan.
⑳ Remove the cross flow fan from the unit by pulling it to the left and downward.

(Fig.11)

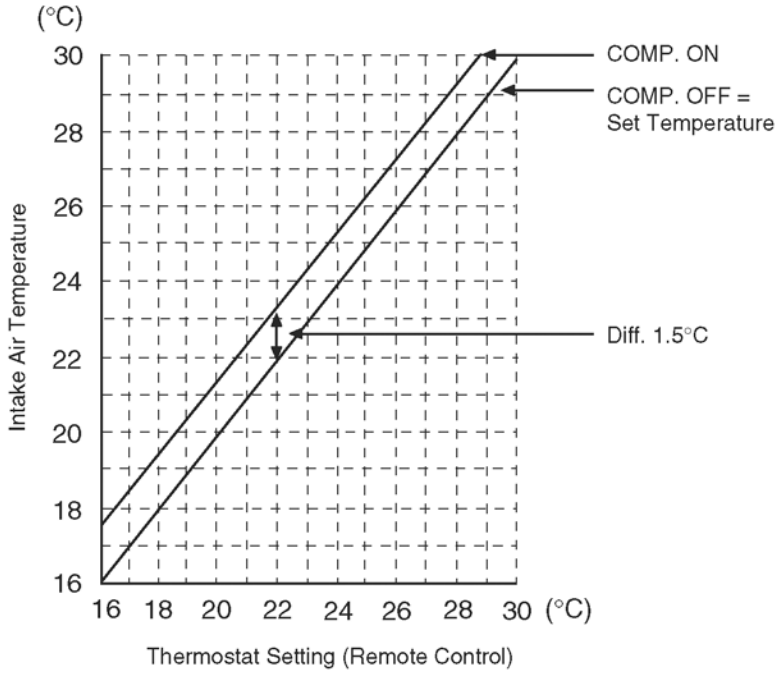
17 Technical Data

17.1. Thermostat Characteristics

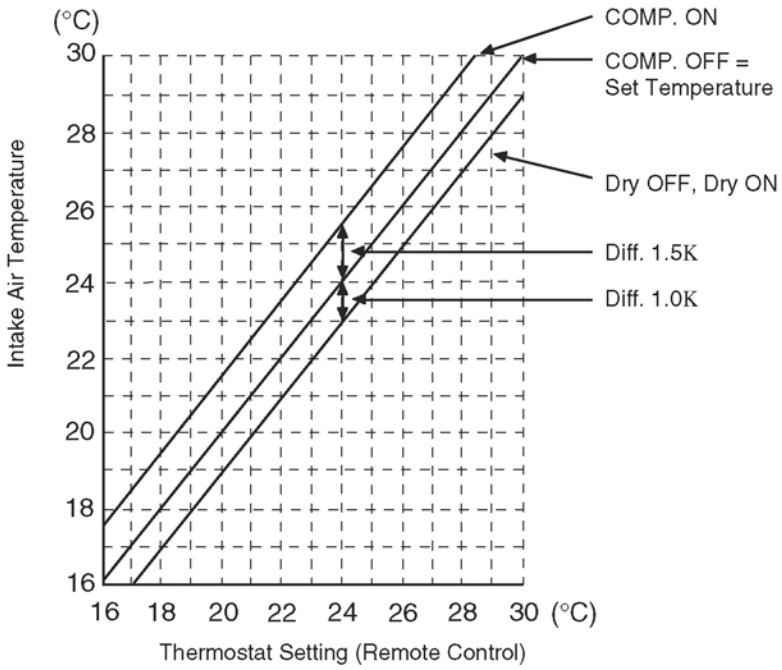
[1] Characteristics of thermostat

CS-C28HKF

- **Cooling**



- **Soft Dry**

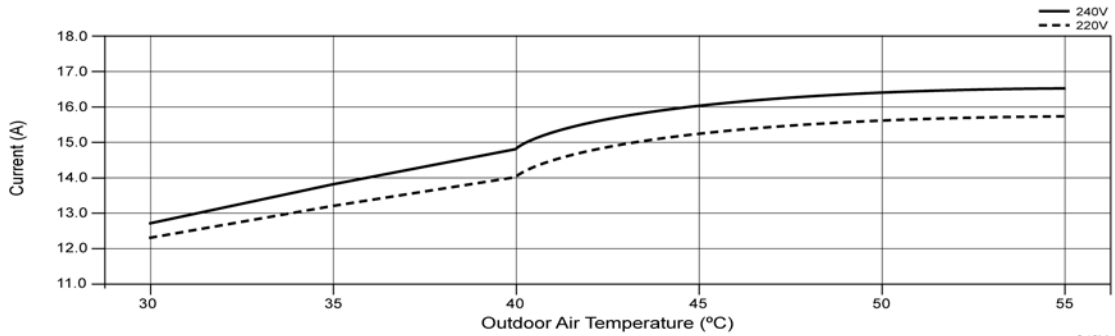


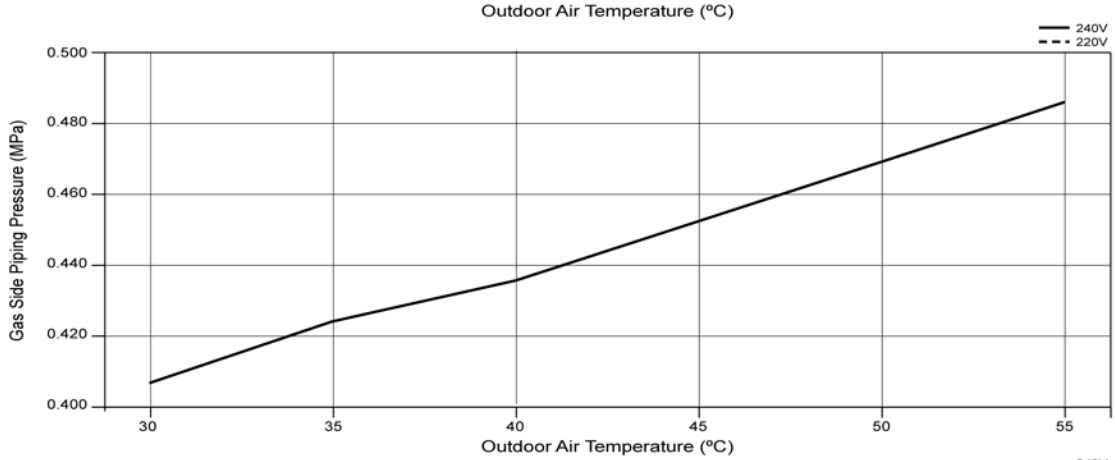
17.2. Operation Characteristics

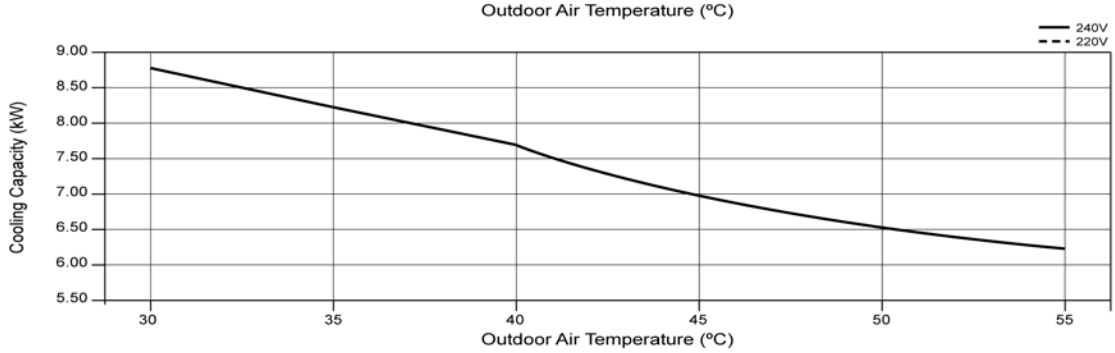
17.2.1. CS-C28HKF CU-C28HKF

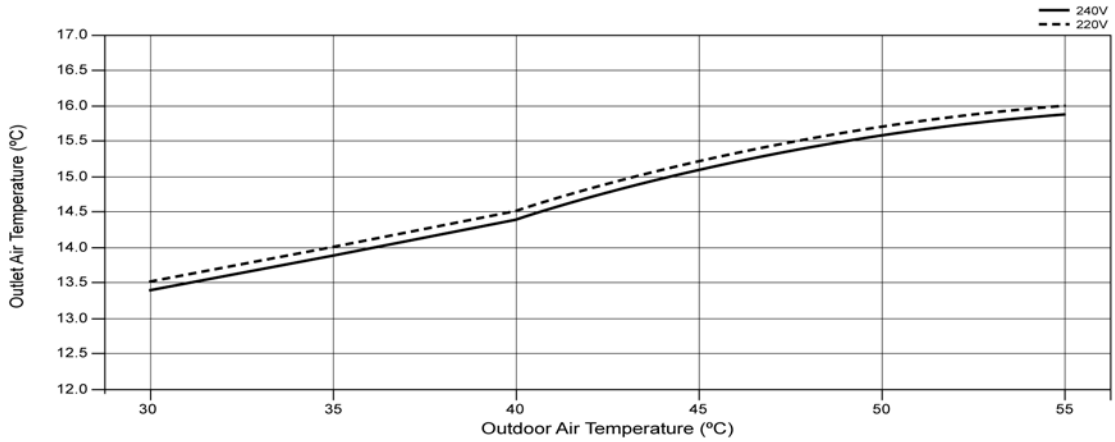
- **Cooling Characteristic**

[Condition] Room temperature : 27/19ºC
Operation condition : At High fan
Piping length : 5m



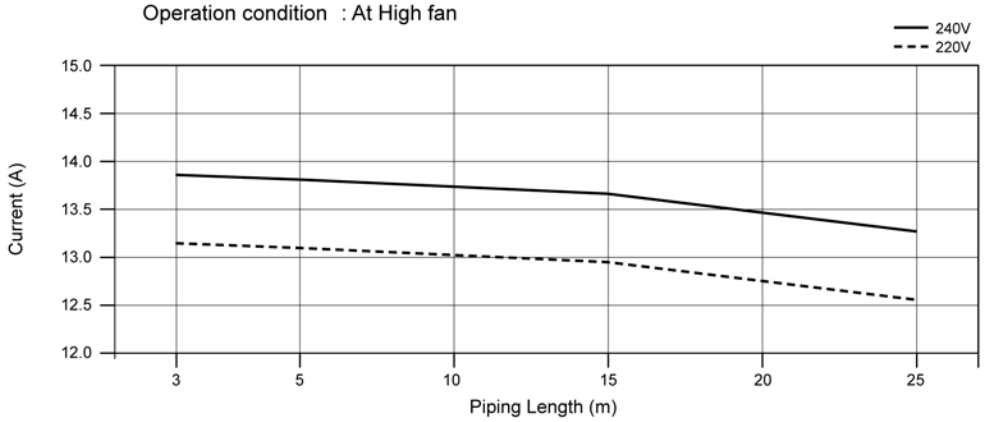


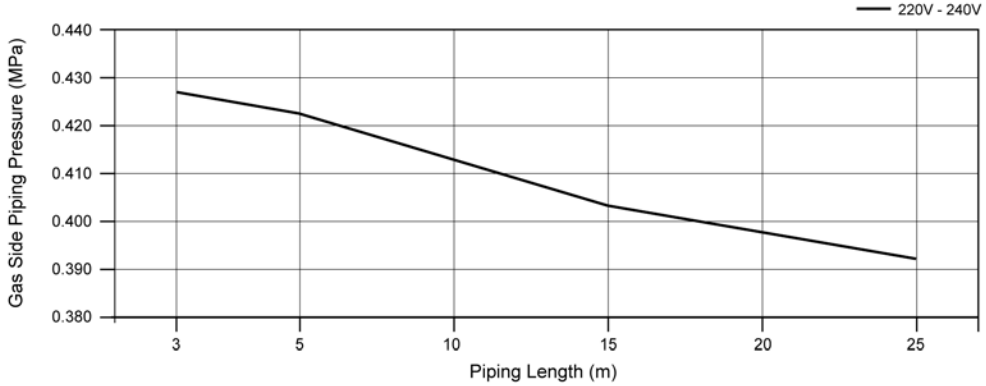


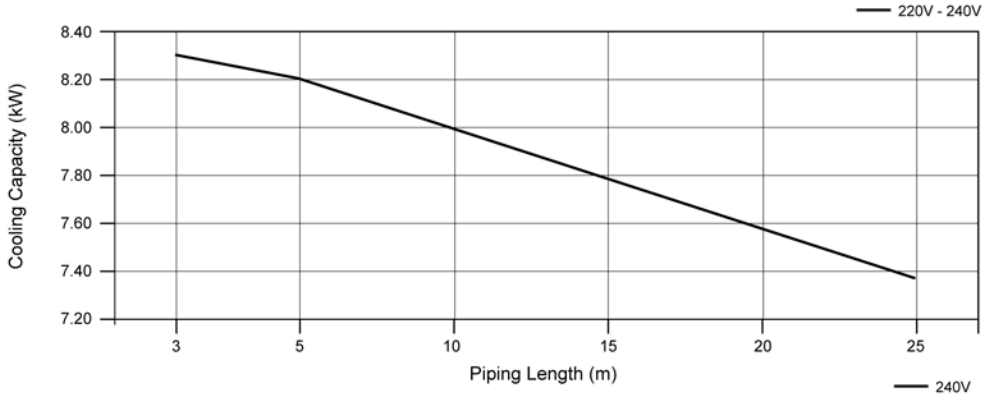


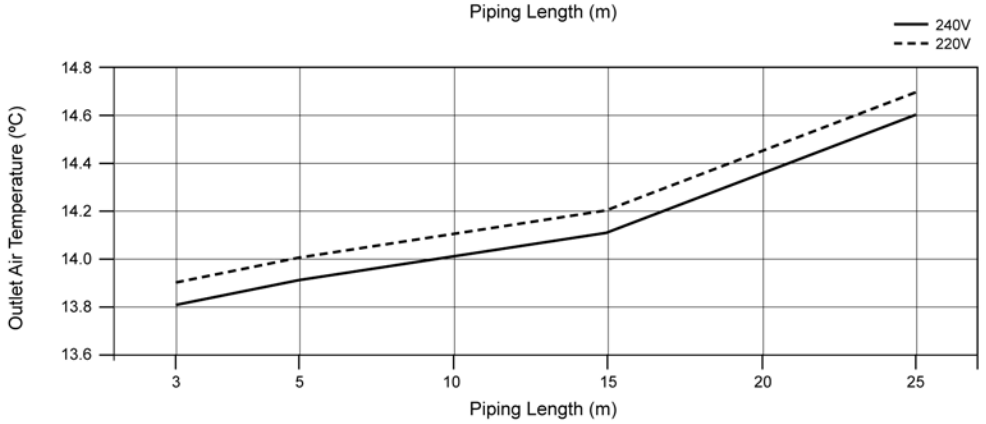
• Piping Length Characteristic

[Condition] Room temperature : 27/19ºC
Outdoor temperature: 35/24°C
Operation condition : At High fan









17.3. Fan Performance

CS-C28HKF CU-C28HKF			Hi	Me	Lo
Indoor	Fan Speed	rpm	1670	1580	1410
	Air Flow	m^3/min	18.4	17.4	15.5
		ft^3/min	650	615	548
Outdoor	Fan Speed	rpm	860 - 890		
	Air Flow	m^3/min	48.5 - 50.5		
		ft^3/min	1710 - 1780		

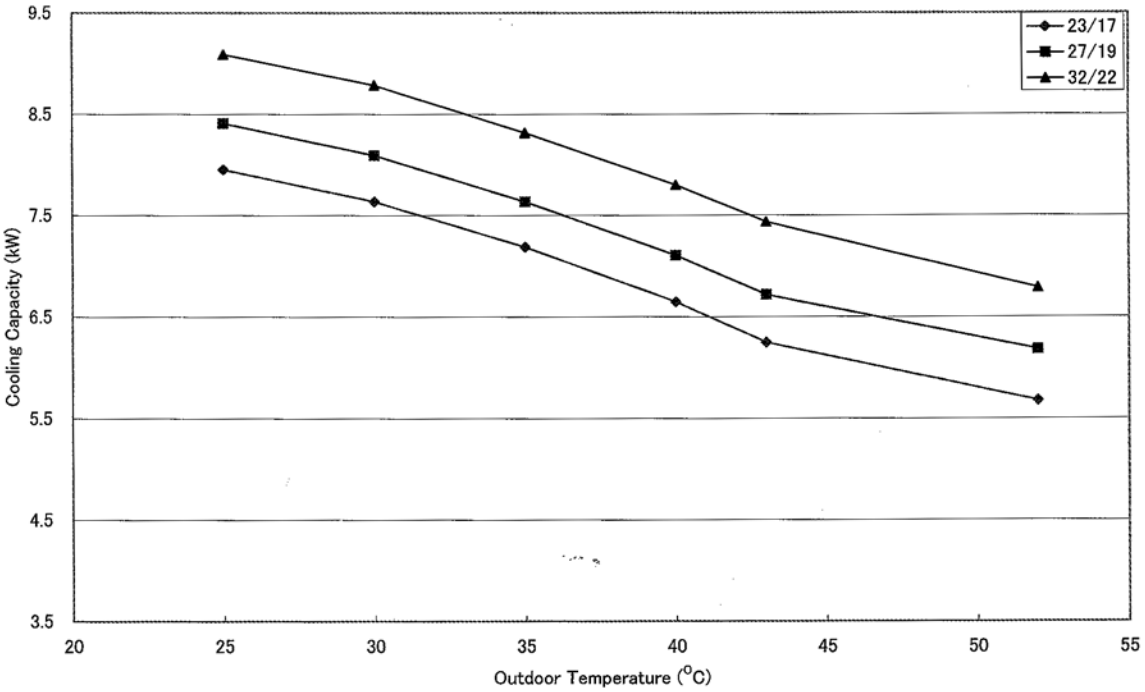
17.3.1. CS-C28HKF

Indoor Intake Ambient Temperature (°C)		Outdoor Intake Air Ambient Temperature (D.B./°C)								
		25			30			35		
D.B	W.B	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT
23	17	8.5403	5.1127	2.3243	8.2000	5.1832	2.5229	7.7203	5.0176	2.7448
	19	9.0200	4.2976	2.4645	8.7297	4.3329	2.6630	8.2886	4.2624	2.9083
	22	9.8400	3.3177	2.6630	9.5751	3.4120	2.8850	9.1463	3.4243	3.1419
25	17	8.4394	6.0336	2.3243	8.1114	5.9507	2.5112	7.6326	5.7498	2.7331
	19	9.0200	5.3251	2.4762	8.7174	5.3013	2.6747	8.2377	5.1717	2.9083
	22	9.8400	4.1902	2.6747	9.5374	4.2386	2.8850	9.0708	4.2033	3.1419
27	17	8.3263	6.9421	2.3360	8.0106	6.8240	2.5112	7.5563	6.5764	2.7331
	19	9.0323	6.2574	2.4878	8.6920	6.1869	2.6864	8.2000	5.9860	2.9200
	22	9.8277	5.0651	2.6864	9.4997	5.0651	2.8966	9.0077	4.9708	3.1536
29	17	8.3132	7.6268	2.3126	8.0106	7.4267	2.5112	7.5440	7.0602	2.6981
	19	9.0200	7.1783	2.4762	8.6920	7.0840	2.6747	8.2000	6.8363	2.8850
	22	9.7892	5.9975	2.7214	9.4612	5.9745	2.9550	8.9446	5.8204	3.1770
32	17	8.3009	7.6153	2.3010	8.0106	7.4973	2.4995	7.0143	6.5649	2.6747
	19	9.0077	8.3476	2.4645	8.6920	8.1344	2.6747	8.2000	7.6744	2.8616
	22	9.7646	7.4973	2.7565	9.4366	7.4144	2.9901	8.9314	7.1906	3.2003

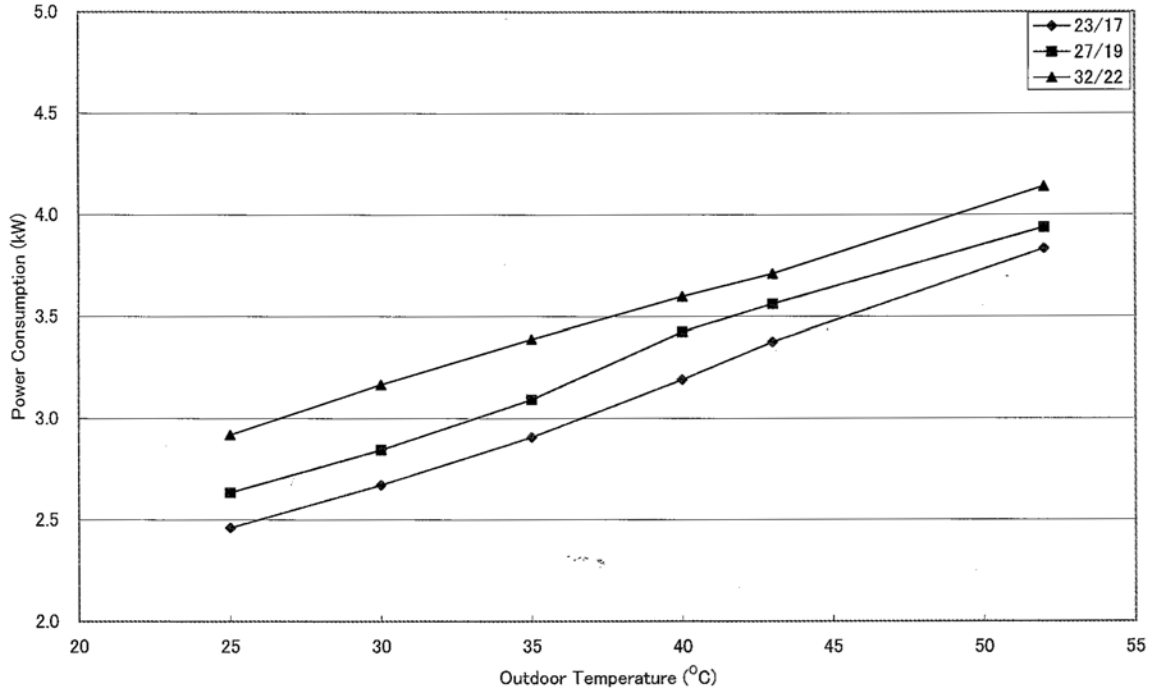
Indoor Intake Ambient Temperature (°C)		Outdoor Intake Air Ambient Temperature (D.B./°C)								
		40			43			55		
D.B	W.B	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT
23	17	7.1406	4.8052	3.0134	6.7117	4.6519	3.1886	5.7277	3.7294	3.9078
	19	7.7203	4.1205	3.1886	7.3292	4.0500	3.3755	6.4140	3.7458	4.2506
	22	8.5534	3.3653	3.4456	8.1492	3.3530	3.6558	6.9766	3.2956	4.7990
25	17	7.0774	5.5375	2.9901	6.6863	5.3480	3.1653	5.7941	4.2492	3.8842
	19	7.6703	4.9938	3.1770	7.2791	4.8642	3.3755	6.3632	4.3394	4.2979
	22	8.9987	4.0729	3.4339	8.0737	4.0377	3.6442	6.9643	3.8860	4.7865
27	17	7.0266	6.3165	2.9667	6.6486	6.1631	3.1419	5.7867	5.0988	3.8605
	19	7.6326	5.7851	3.2354	7.2160	5.6080	3.3638	6.2377	4.9093	4.0132
	22	8.3640	4.3534	3.4222	7.9983	4.7109	3.6325	6.9216	4.4231	4.7739
29	17	7.0897	6.6354	2.8966	6.7363	6.3050	3.0251	5.9393	4.6912	3.5644
	19	7.6826	6.5879	3.0952	7.3046	6.4231	3.2237	6.4206	5.7515	3.8661
	22	8.3763	5.6441	3.4106	7.9852	5.5375	3.5507	6.8470	5.1152	4.4034
32	17	7.1274	6.6707	2.8499	6.7871	6.3517	2.9434	6.0229	4.7675	3.3542
	19	7.7203	7.2258	3.0485	7.3677	6.8954	3.1419	6.5477	5.6678	3.6515
	22	8.3763	6.9782	3.3989	7.9852	6.8003	3.5040	6.8470	6.1156	4.2194

TC: Cooling Capacity (kW)
SHC: Sensible Heat capacity (kW)
IPT: Cooling Power Consumption (kW)

Cooling Capacity vs Outdoor Temperature
CS/CU-C28HKF

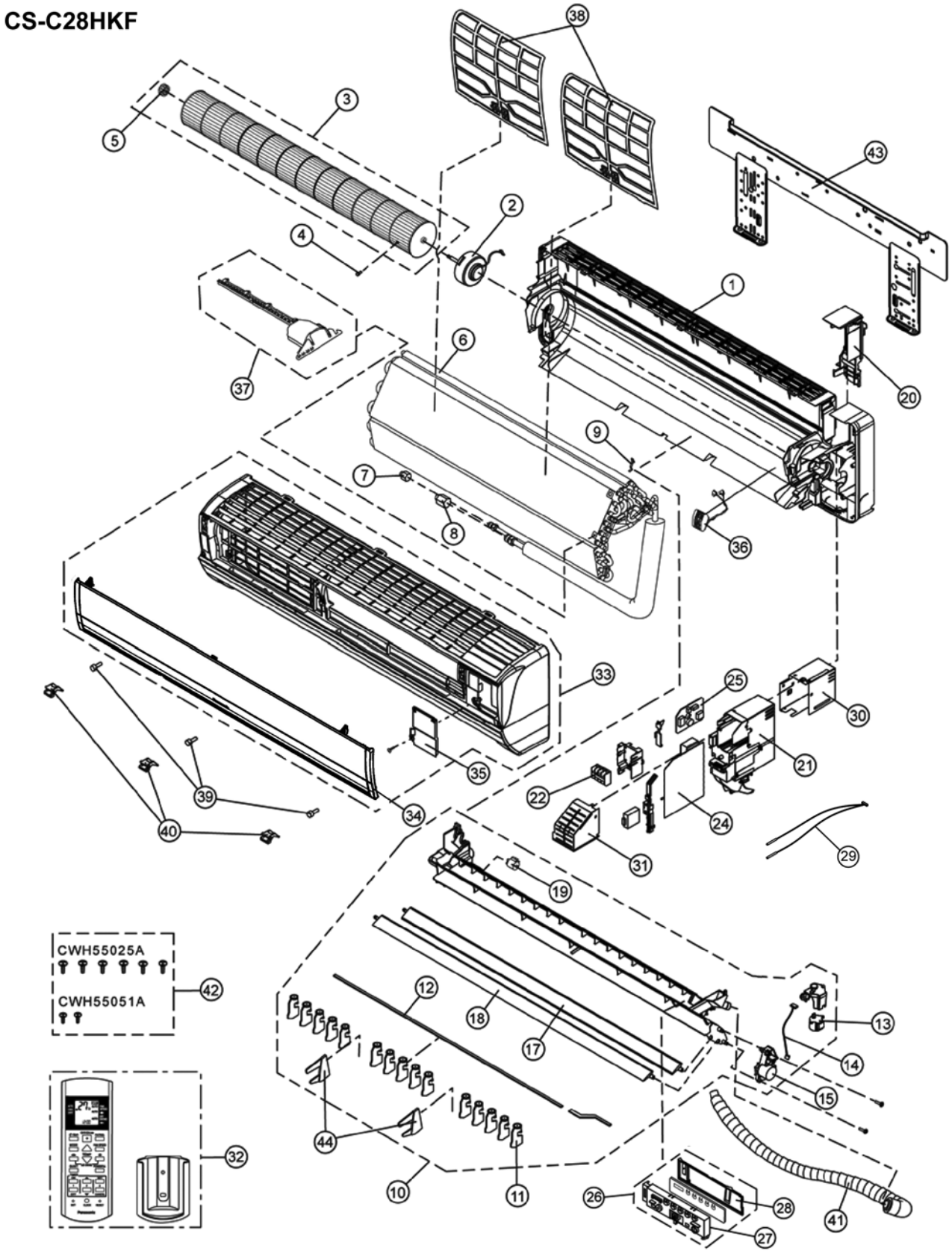


Power Consumption vs Outdoor Temperature
CS/CU-C28HKF



18 Exploded View and Replacement Parts List

18.1. Indoor Unit



Note
The above exploded view is for the purpose of parts disassembly and replacement.
The non-numbered parts are not kept as standard service parts.

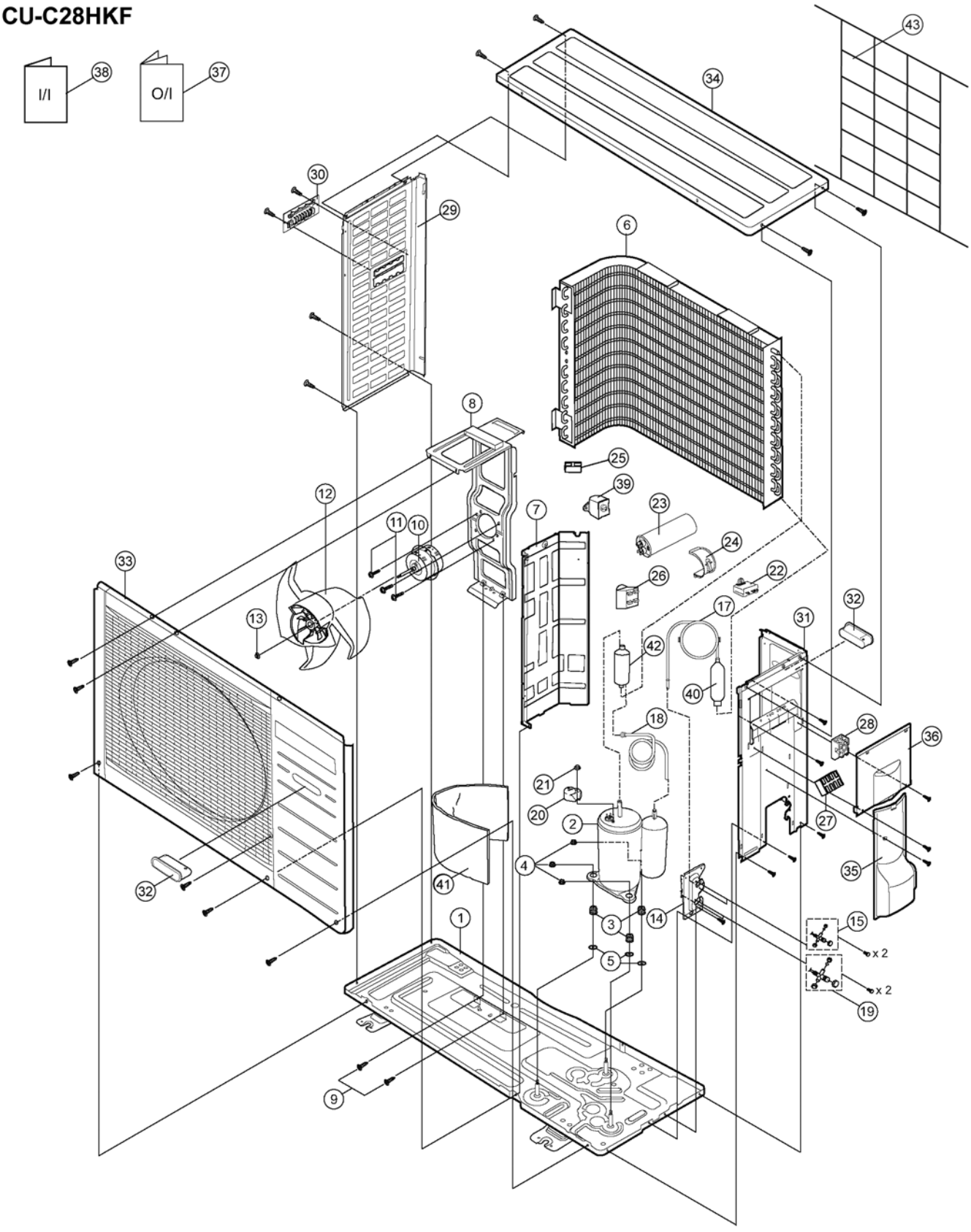
REF. NO.	PART NAME & DESCRIPTION	QTY.	CS-C28HKF
1	CHASSY COMPLETE	1	CWD50C1520
2	FAN MOTOR,DC 30W 3PH	1	ARW51H8P30AC
3	CROSS FLOW FAN COMPLETE	1	CWH02C1010
4	SCREW - CROSS FLOW FAN	1	CWH551146
5	BEARING ASS'Y	1	CWH64K007
6	EVAPORATOR CO.	1	CWB30C1576
7	FLARE NUT (1/4")	1	CWT251026
8	FLARE NUT (1/2")(5/8")	1	CWT251036
9	INTAKE AIR SENSOR HOLDER	1	CWH32143
10	DISCHARGE GRILLE COMPLETE	1	CWE20C2683
11	VERTICAL VANE	15	CWE241088
12	CONNECTING BAR	1	CWE261025
13	A.S.MOTOR, DC SINGLE 12V 300 OHM	1	CWA98260+MJ
14	LEAD WIRE - AIR SWING MOTOR	1	CWA67C3977
15	A.S. MOTOR, DC SINGLE 12V 300 OHM	1	CWA98K1009
16	LEAD WIRE - AIR SWING MOTOR	1	—
17	HORIZONTAL VANE	1	CWE241152C
18	HORIZONTAL VANE	1	CWE241153C
19	CAP FOR DRAIN TRAY COMPLETE	1	CWH521096
20	BACK COVER CHASSIS	1	CWD932162B
21	CONTROL BOARD CASING	1	CWH102334
22	TERMINAL BOARD COMPLETE	1	CWA28C2082J
23	P.S.CORD	1	—
24	ELECTRONIC CONTROLLER - MAIN	1	CWA73C3009
25	ELECTRONIC CONTROLLER - POWER	1	CWA744544
26	INDICATOR COMPLETE	1	CWE39C1184
27	INDICATOR HOLDER	1	CWD932817
28	INDICATOR HOLDER	1	CWD932818
29	SENSOR COMPLETE	1	CWA50C2122
30	CONTROL BOARD TOP COVER	1	CWH131209
31	CONTROL BOARD FRONT COVER	1	CWH131210
32	REMOTE CONTROL COMPLETE	1	CWA75C3155
33	FRONT GRILLE COMPLETE	1	CWE11C3894
34	INTAKE GRILLE COMPLETE	1	CWE22C1411
35	GRILLE DOOR	1	CWE141076
36	ION - GENERATOR	1	CWH94C0014
37	E-ION AIR PURIFYING SYSTEM	1	CWH14C5600
38	E-ION FILTER	2	CWD00K1005
39	SCREW - FRONT GRILLE	3	XTT4+16CFJ
40	CAP - FRONT GRILLE	3	CWH521062A
41	DRAIN HOSE	1	CWH851063
42	BAG COMP.- INSTALLATION SCREW	1	CWH82C067
43	INSTALLATION HOLDER ASSY	1	CWH36K1007
44	FULCRUM	2	CWH621047

(NOTE)

• All parts are supplied from PHAAM, Malaysia (Vendor Code: 061).

18.2. Outdoor Unit

CU-C28HKF



Note
The above exploded view is for the purpose of parts disassembly and replacement.
The non-numbered parts are not kept as standard service parts.

Ref. No.	PART NAME & DESCRIPTION	QTY.	CU-C28HKF
1	CHASSY ASS'Y	1	CWD50K2100
2	COMPRESSOR	1	2JD514E3AA03
3	ANTI - VIBRATION BUSHING	3	CWH50055
4	NUT - COMPRESSOR MOUNT	3	CWH561049
5	PACKING - COMP. MOUNT	3	CWB81043
6	CONDENSER	1	CWB32C2227
7	SOUND PROOF BOARD	1	CWH151056
8	FAN MOTOR BRACKET	1	CWD541055
9	SCREW - FAN MOTOR BRACKET	3	CWH551198
10	FAN MOTOR (AC 80W SINGLE)	1	CWA951606
11	SCREW - FAN MOTOR MOUNT	3	CWH55252J
12	PROPELLER FAN ASS'Y	1	CWH03K1017
13	NUT - PROPELLER FAN	1	CWH561038J
14	HOLDER COUPLING	1	CWH351036
15	3-WAY VALVE (LIQUID)	1	CWB011161
16	CAPILLARY TUBE ASS'Y	1	-
17	TUBE ASSY (CAPILLARY TUBE)	1	CWT023253
18	TUBE ASSY (CAPILLARY TUBE)	1	CWT023148
19	3-WAY VALVE (GAS)	1	CWB011484
20	TERMINAL COVER	1	CWH171012
21	NUT - TERMINAL COVER	1	CWH7080300J
22	CAPACITOR - FM(5.0μF/440V)	1	DS441505NPQB
23	CAPACITOR - COMPRESSOR(60μF/440V)	1	DS441606CPNA
24	HOLDER CAPACITOR	1	CWH30071
25	TERMINAL BOARD ASS'Y	1	CWA28K1144
26	ELECTRO MAGNETIC SWITCH	1	CWA00192
27	TERMINAL BOARD ASS'Y	1	CWA28K224J
28	TERMINAL BOARD ASS'Y	1	CWA28K1170
29	CABINET SIDE PLATE (L)	1	CWE041082A
30	HANDLE	1	CWE161010
31	CABINET SIDE PLATE COMPLETE	1	CWE04C1126
32	HANDLE	2	CWE16000E
33	CABINET FRONT PLATE ASS'Y	1	CWE06K1045
34	CABINET TOP PLATE ASS'Y	1	CWE03K1011A
35	CONTROL BOARD COVER	1	CWH131168
36	CONTROL BOARD COVER COMPLETE	1	CWH131169A
37	OPERATION INSTRUCTIONS	1	CWF565777
38	INSTALLATION INSTRUCTIONS	1	CWF613319
39	THERMOSTAT	1	CWA151040
40	STRAINER	1	CWB11004
41	SOUND PROOF MATERIAL	2	CWG302230
42	OIL SEPARATER ASS'Y	1	CWB16K1009
43	WIRE NET	1	CWD041041A

(NOTE)

• All parts are supplied from PHAAM, Malaysia (Vendor Code: 061).

[PHAAM] Printed in Malaysia
SSBZ0712-00