Order No. MAC0602007C3

Service Manual

Air Conditioner

CS-PC30EKF CU-PC30EKF

CS-PC36EKF CU-PC36EKF

⚠ 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.

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Panasonic®

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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 running 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 or 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, electrical 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. 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.	
7. 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 at connection point of terminal, fire or electrical shock.	
8. 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.	⃠
9. Thickness of copper pipes used must be more than 0.8 mm. Never use copper pipes thinner than 0.8 mm.	⃠
10. It is desirable that the amount of residual oil is less than 40 mg/10 m.	⃠
11. 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.	⃠

⚠ **CAUTION**	
1. The equipment must be earthed. It may cause electrical shock if grounding is not perfect.	
2. 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.	⃠

⚠ CAUTION

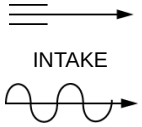
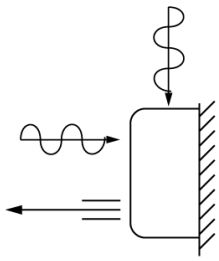
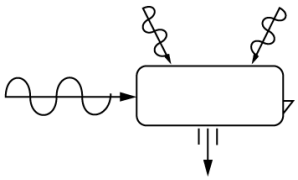
3. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.
4. Pb free solder has a higher melting point than standard solder; typically the melting point is 50 - 70°F (30 - 40°C) higher. Please use a high temperature soldering 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).

ATTENTION

1. Selection of the installation location. Select an installation location which is rigid and strong enough to support or hold the unit, and select a location for easy maintenance.
2. 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 connection. Use an approved circuit breaker for the permanent connection. It must be a double pole switch with a minimum 3.5 mm contact gap.
3. 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.
4. Installation work. It may need two people to carry out the installation work.
5. 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-PC30EKF CU-PC30EKF

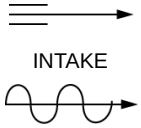
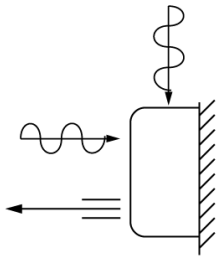
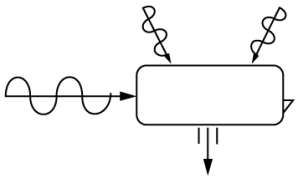
			Unit	Indoor unit	Outdoor unit
Power Source (Phase, Voltage, Cycle)			ø, V, Hz	Single, 220 - 240, 50	
Cooling Capacity			kW (BTU/h)	8.79 (30,000)	
Moisture Removal			l/h (Pint/h)	5.2 (11.0)	
Performance Test Condition				JIS	
Airflow Method				OUTLET INTAKE 	SIDE VIEW 	SIDE VIEW 
Air Volume	Lo		m^3/min (cfm)	16.9 (598) - 16.9 (598)	—
	Me		m^3/min (cfm)	18.5 (654) - 18.5 (654)	—
	Hi		m^3/min (cfm)	20.1 (710) - 20.1 (710)	51.0 (1,800) - 56.0 (1,980)
	SHi		m^3/min (cfm)	—	—
Noise Level			dB (A)	High 49 - 49, Low 44 - 44	High 53 - 54
Electrical Data	Input Power		W	3,050 - 3,150	
	Running Current		A	14.2 - 13.8	
	EER		W/W (BTU/hW)	2.88 - 2.79 (9.84 - 9.52)	
	Starting Current		A	74.0	
Piping Connection Port (Flare Piping)			inch inch	G ; Half Union 5/8” L ; Half Union 3/8”	G : 3-way valve 5/8” L ; 2-way valve 3/8”
Pipe Size (Flare Piping)			inch inch	G ; (Gas side) 5/8” L ; (Liquid side) 3/8”	G ; (Gas side) 5/8” L ; (Liquid side) 3/8”
Drain Hose	Inner diameter		mm	14	—
	Length		mm	660.5	—
Power Cord	Length		m	—	—
	Number of core-wire			—	—
Dimensions	Height		inch (mm)	13 - 13/32 (340)	31 - 5/16 (795)
	Width		inch (mm)	15 - 9/32 (1,150)	35 - 7/16 (900)
	Depth		inch (mm)	10 - 1/4 (260)	12 - 5/8 (320)
Net Weight			lb (kg)	40 (18)	154 (70)
Compressor	Description			—	Rotary (1 cylinder) rolling piston type
	Motor	Type		—	Induction (2-poles)
	Rated	Output	W	—	2,400
Air Circulation	Description			Cross-flow Fan	Propeller Fan
	Material			ASG30K1 or ASG32K1	PP (MICA 30% + GF 10%)
	Motor	Type		PWM (8-poles)	Induction (6-poles)
		Input	W	66.0	148 - 177
	Rated	Output	W	60	75
	Fan Speed	Low	rpm	1,070 - 1,070	—
		Medium	rpm	1,170 - 1,170	—
		High	rpm	1,270 - 1,270	685 - 735
		SuperHigh	rpm	—	—

		Unit	Indoor unit	Outdoor unit
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium (Pre Coat)	Aluminium (Blue Coat)
	Fin Type		Slit Fin	Louver Fin
	Row / Stage		(Plate fin configuration, forced draft)	
			2 x 14	2 x 30
	FPI		18	17
	Size (W x H x L)	mm	44 × 355.6 × 880	44 x 762 x 782.5:817.5
Refrigerant Control Device			—	Capillary Tube
Refrigerant Oil		(cm^3)	—	ATMOS M60 or SUNISO 4GDID
Refrigerant (R-22)		g (oz.)	—	2.15k (75.9)
Thermostat			—	—
Protection Device			—	—
Capillary Tube	Length	mm	—	—
	Flow Rate	l/min	—	—
	Inner Diameter	mm	—	—
Air Filter	Material		P.P.	—
	Style		Honeycomb	
Capacity Control			Capillary Tube	
Compressor Capacitor		µF, VAC	—	60 µF, 440VAC
Fan Motor Capacitor		µF, VAC	1.5 µF, 440VAC	3.0 µF, 440VAC

Note:

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

2.2. CS-PC36EKF CU-PC36EKF

			Unit	Indoor unit	Outdoor unit
Power Source (Phase, Voltage, Cycle)			ø, V, Hz	Single, 220 - 240, 50	
Cooling Capacity			kW (BTU/h)	10.55 (36,000)	
Moisture Removal			l/h (Pint/h)	6.4 (3.5)	
Performance Test Condition				JIS	
Airflow Method				OUTLET INTAKE 	SIDE VIEW 	SIDE VIEW 
Air Volume	Lo		m^3/min (cfm)	17.8 (629) - 17.7 (629)	—
	Me		m^3/min (cfm)	19.4 (685) - 19.4 (685)	—
	Hi		m^3/min (cfm)	21.0 (740) - 21.0 (740)	98.5 (3,480) - 103.0 (3,640)
	SHi		m^3/min (cfm)	—	—
Noise Level			dB (A)	High 50 - 50, Low 45 - 45	High 54 - 55
Electrical Data	Input Power		kW	3,300 - 3,400	
	Running Current		A	16.3 - 17.0	
	EER		W/W (BTU/hW)	3.20 - 3.10 (10.91 - 10.59)	
	Starting Current		A	114.0	
Piping Connection Port			inch	G ; Half Union 3/4”	G : 3-way valve 3/4”
(Flare Piping)			inch	L ; Half Union 3/8”	L ; 2-way valve 3/8”
Pipe Size			inch	G ; (Gas side) 3/4”	G ; (Gas side) 3/4”
(Flare Piping)			inch	L ; (Liquid side) 3/8”	L ; (Liquid side) 3/8”
Drain	Inner diameter		mm	14	—
Hose	Length		mm	660.5	—
Power Cord	Length		m	—	—
	Number of core-wire			—	—
Dimensions	Height		inch (mm)	13 - 13/32 (340)	46 - 3/32 (1,170)
	Width		inch (mm)	45 - 9/32 (1,150)	35 - 7/16 (900)
	Depth		inch (mm)	10 - 1/4 (260)	12 - 5/8 (320)
Net Weight			lb (kg)	40 (18)	194 (88)
Compressor	Description			—	Rotary (1 cylinder) rolling piston type
	Motor	Type		—	Induction (2-poles)
	Rated	Output	W	—	3,000
Air Circulation	Description			Cross-flow Fan	Propeller Fan
	Material			ASG30K1 or ASG32K1	PP (MICA 30% + GF 10%)
	Motor	Type		PWM (8-poles)	Induction (6-poles)
		Input	W	66.0	148 - 177
	Rated	Output	W	60	70 x 2
	Fan Speed	Low	rpm	1,120 - 1,120	—
		Medium	rpm	1,220 - 1,220	—
		High	rpm	1,320 - 1,320	750 - 800
		SuperHigh	rpm	—	—

		Unit	Indoor unit	Outdoor unit
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium (Pre Coat)	Aluminium (Blue Coat)
	Fin Type		Slit Fin	Louver Fin
	Row / Stage		(Plate fin configuration, forced draft)	
			2 x 14	2 x 54
	FPI		18	18
	Size (W x H x L)	mm	44 × 355.6 × 889	25.4 x 1,134 x 854.7:854.7
Refrigerant Control Device			—	Capillary Tube
Refrigerant Oil		(cm^3)	—	ATMOS M60 or SUNISO 4GDID
Refrigerant (R-22)		g (oz.)	—	2.20k (77.7)
Thermostat			—	—
Protection Device			—	—
Capillary Tube	Length	mm	—	—
	Flow Rate	l/min	—	—
	Inner Diameter	mm	—	—
Air Filter	Material		P.P.	—
	Style		Honeycomb	
Capacity Control			Capillary Tube	
Compressor Capacitor		µF, VAC	—	60 µF, 440VAC
Fan Motor Capacitor		µF, VAC	1.5 µF, 440VAC	3.0 µF, 440VAC

Note:

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

3 Features

- **High efficiency**

- **Compact design**

- **Wider range of horizontal discharge air**

- **Air Filter with function to reduce dust and smoke**

- **Automatic air swing and manual adjusted by Remote Control for vertical airflow**

- **Long Installation Piping**
  - CS/CU-PC30EK, CS/CU-PC36EKF, long piping up to 30 meter.

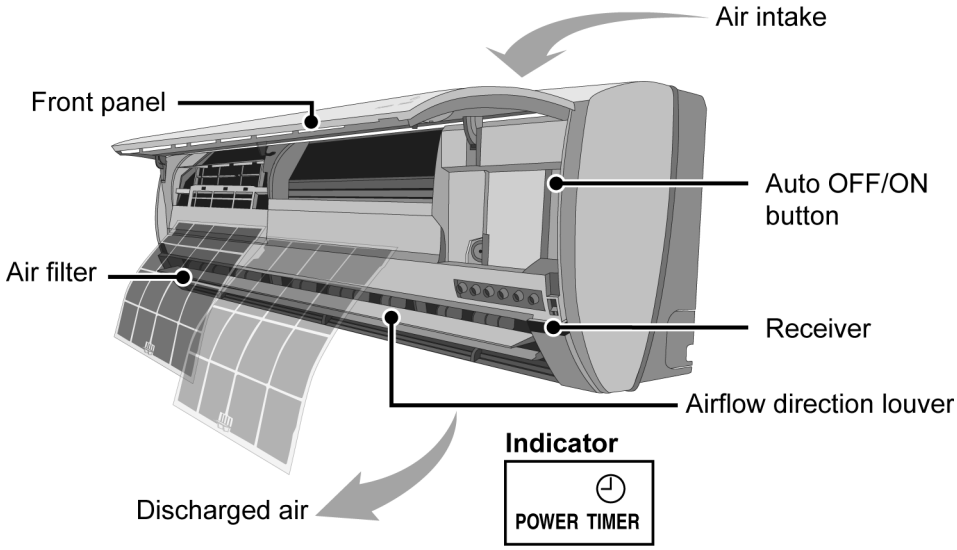
- **Quality Improvement**
  - Random auto restart after power failure for safety restart operation.
  - Gas leakage detection.
  - Prevent compressor reverse cycle.
  - Inner protector to protect compressor.
  - Noise prevention during soft dry operation.
  - Blue Coated Condenser for high resistance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

- **Operation Improvement**
  - 24-hour timer setting

- **Serviceability Improvement**
  - Removable and washable front panel

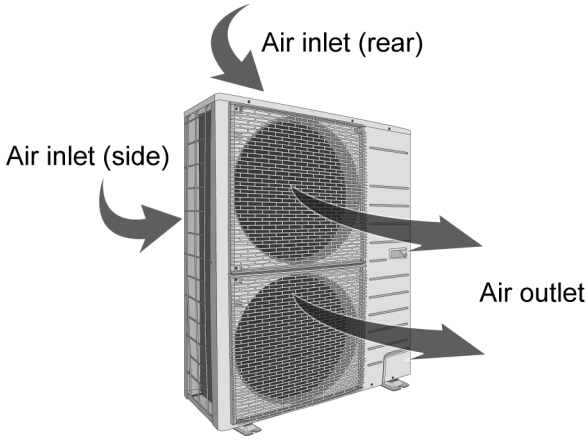
4 Location of Controls and Components

4.1. Indoor Unit

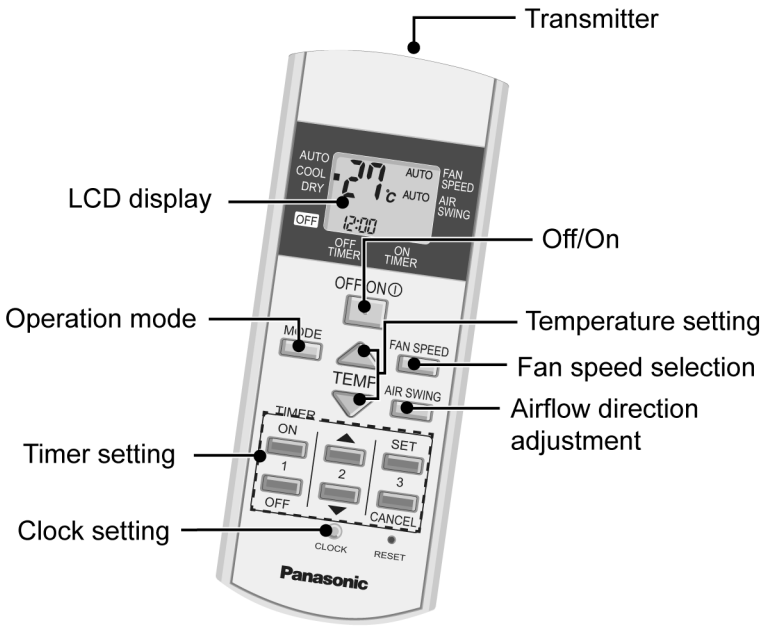


4.2. Outdoor Unit

• Outdoor unit shown is CU-PC36EK.



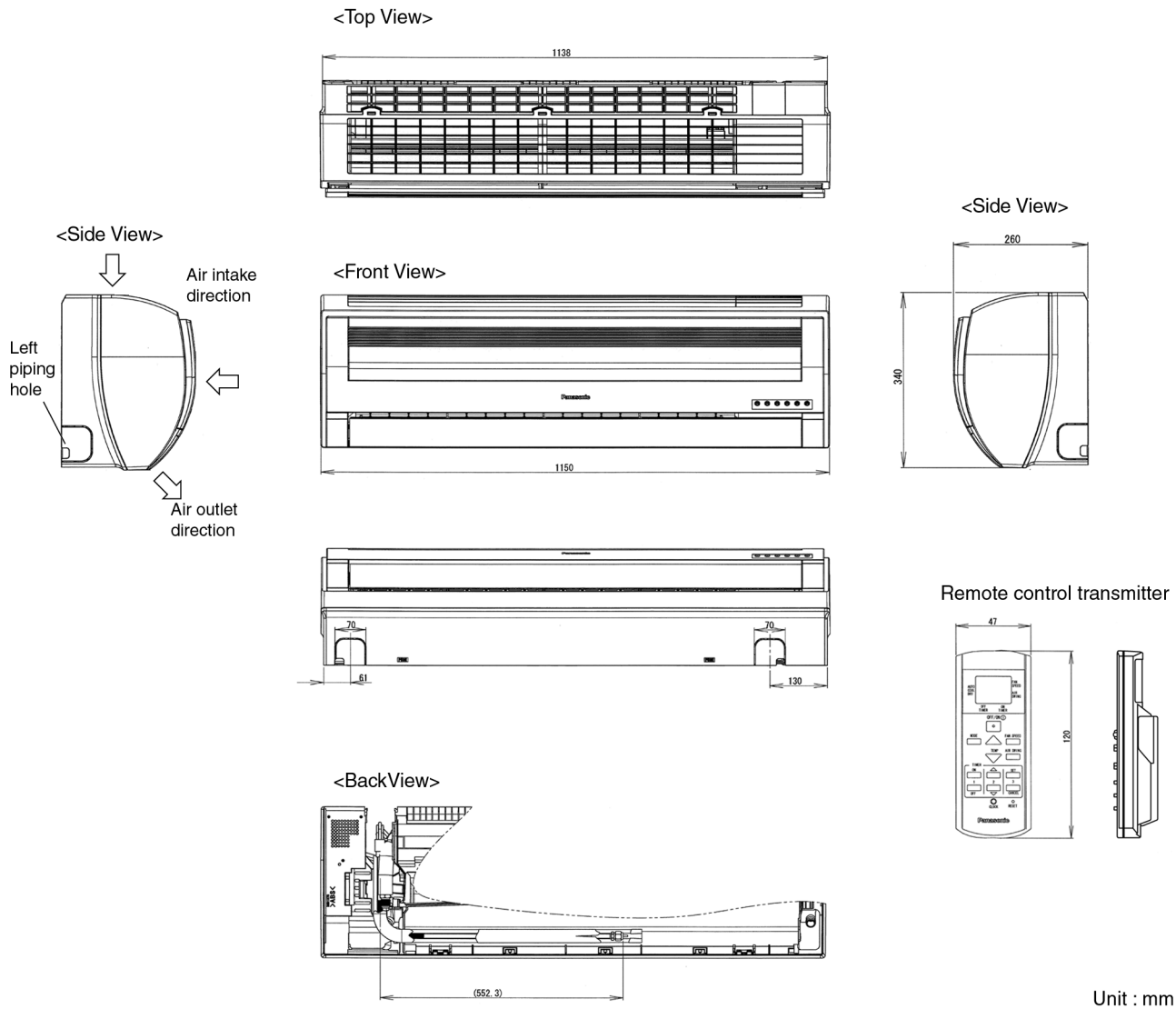
4.3. Remote Control



5 Dimensions

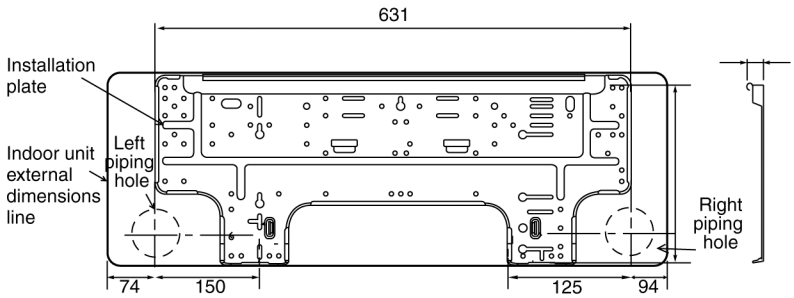
5.1. Indoor Unit & Remote Control

5.1.1. CS-PC30EKF CU-PC36EKF



Unit : mm

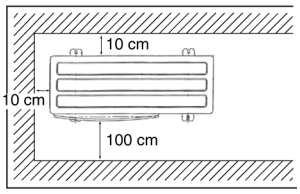
Relative position between the indoor unit and the installation plate <Front View>



5.2. Outdoor Unit

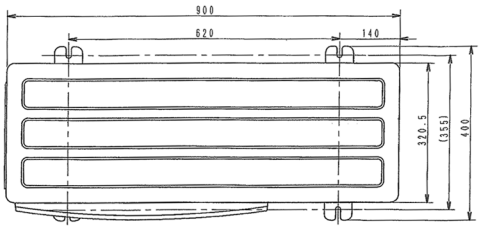
5.2.1. CU-PC30EKF

Space necessary for installation

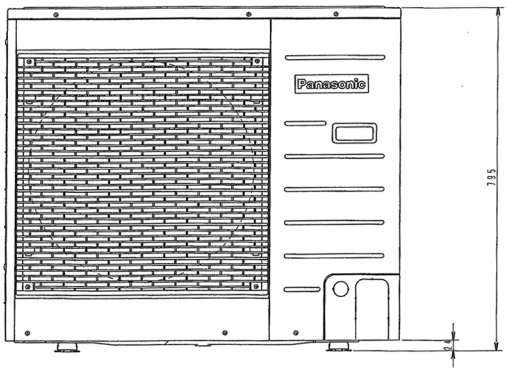


Anchor Bolt Pitch
261 x 474

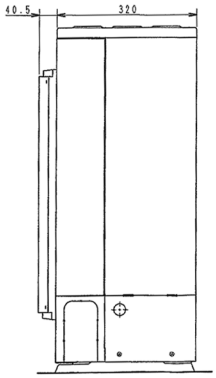
<Top View>



<Front View>



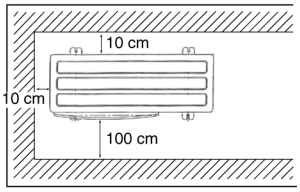
<Side View>



Unit : mm

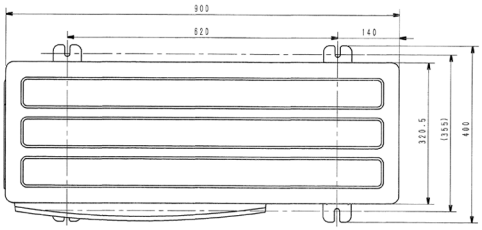
5.2.2. CU-PC36EKF

Space necessary for installation

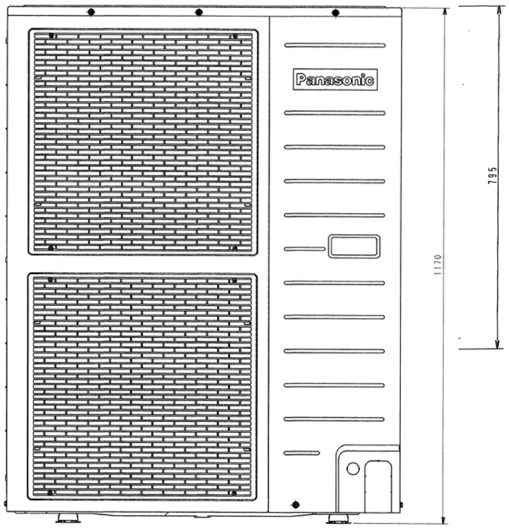


Anchor Bolt Pitch
261 x 474

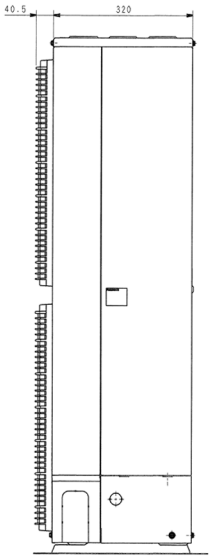
<Top View>



<Front View>



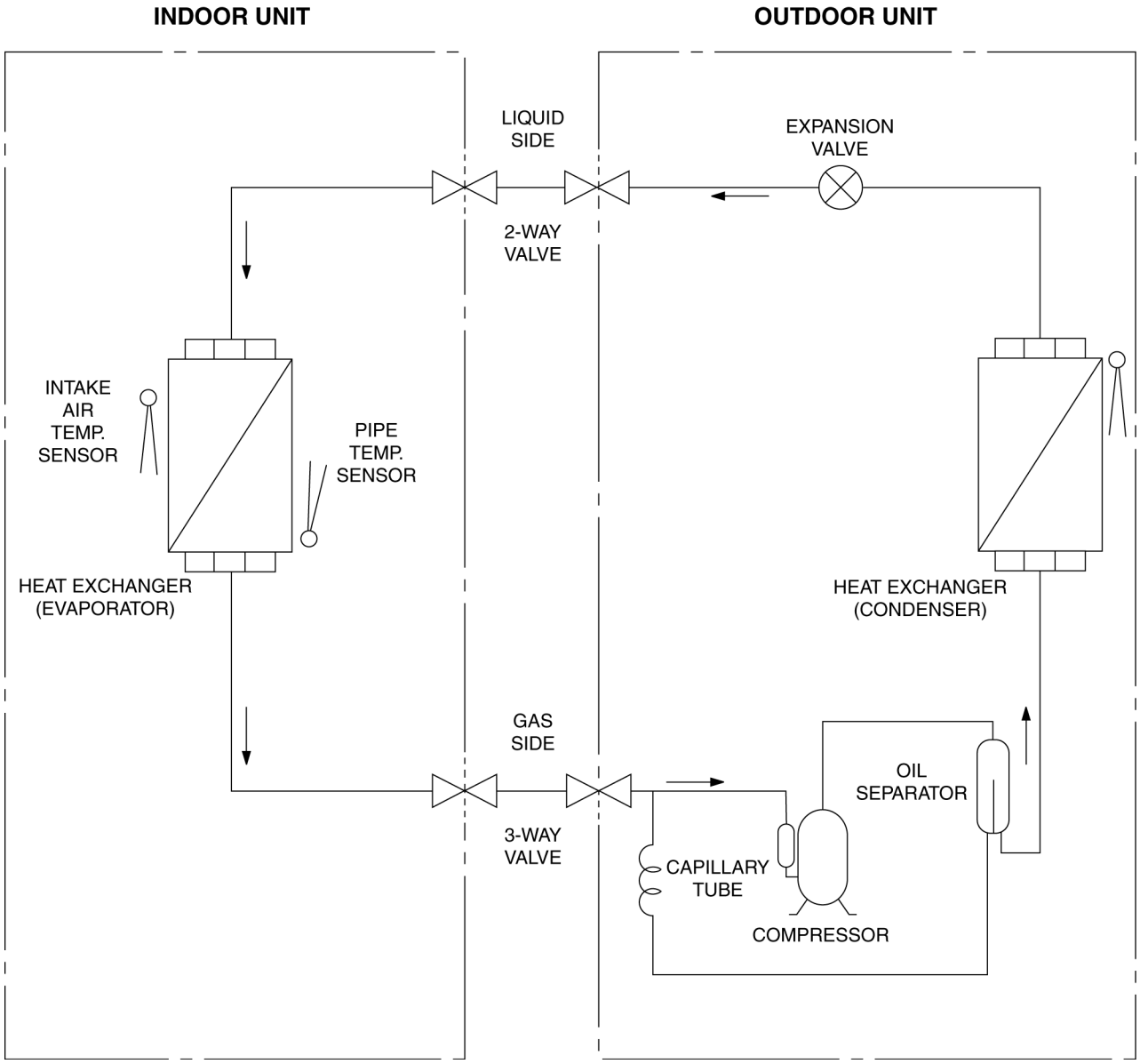
<Side View>



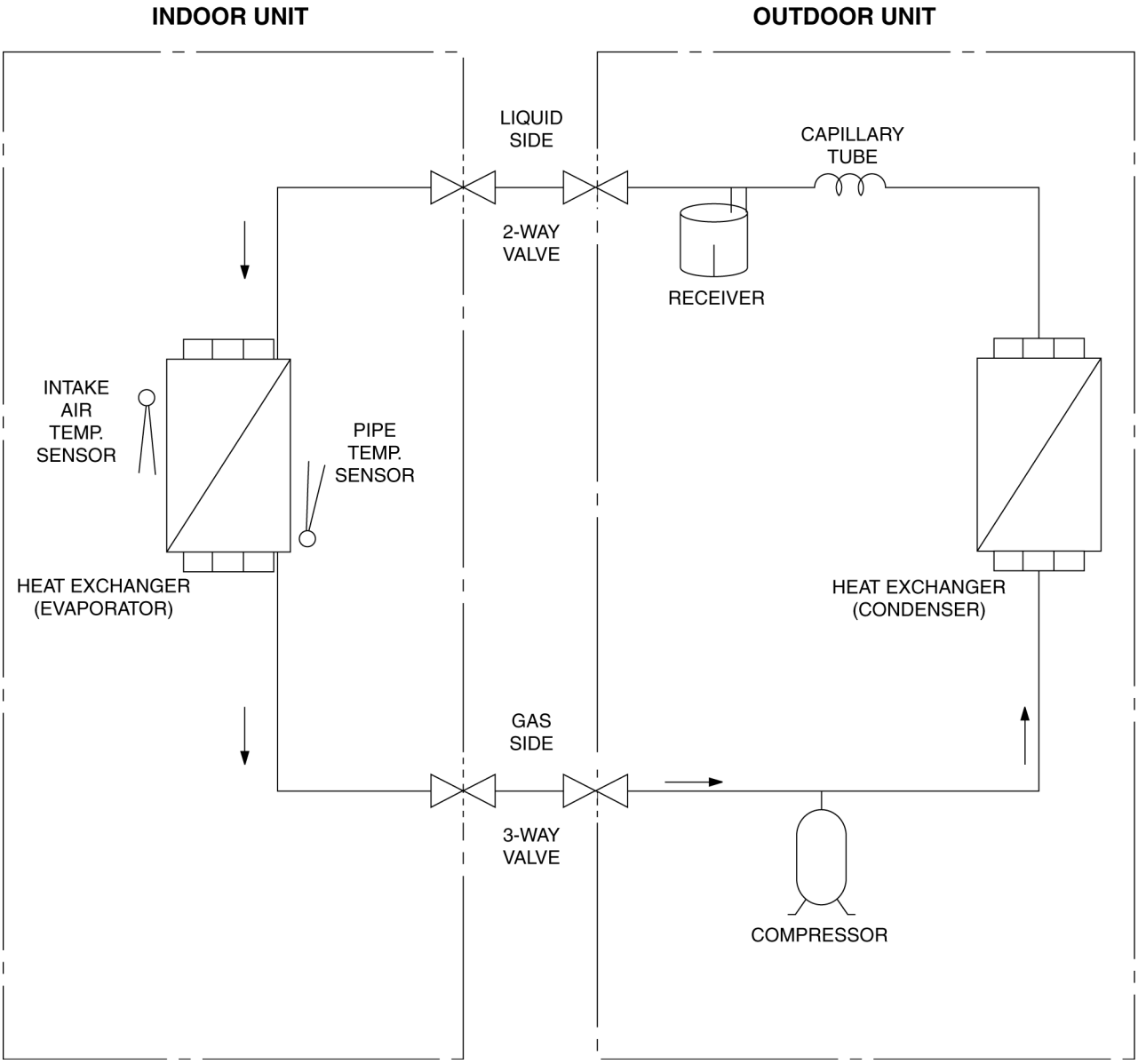
Unit : mm

6 Refrigeration Cycle Diagram

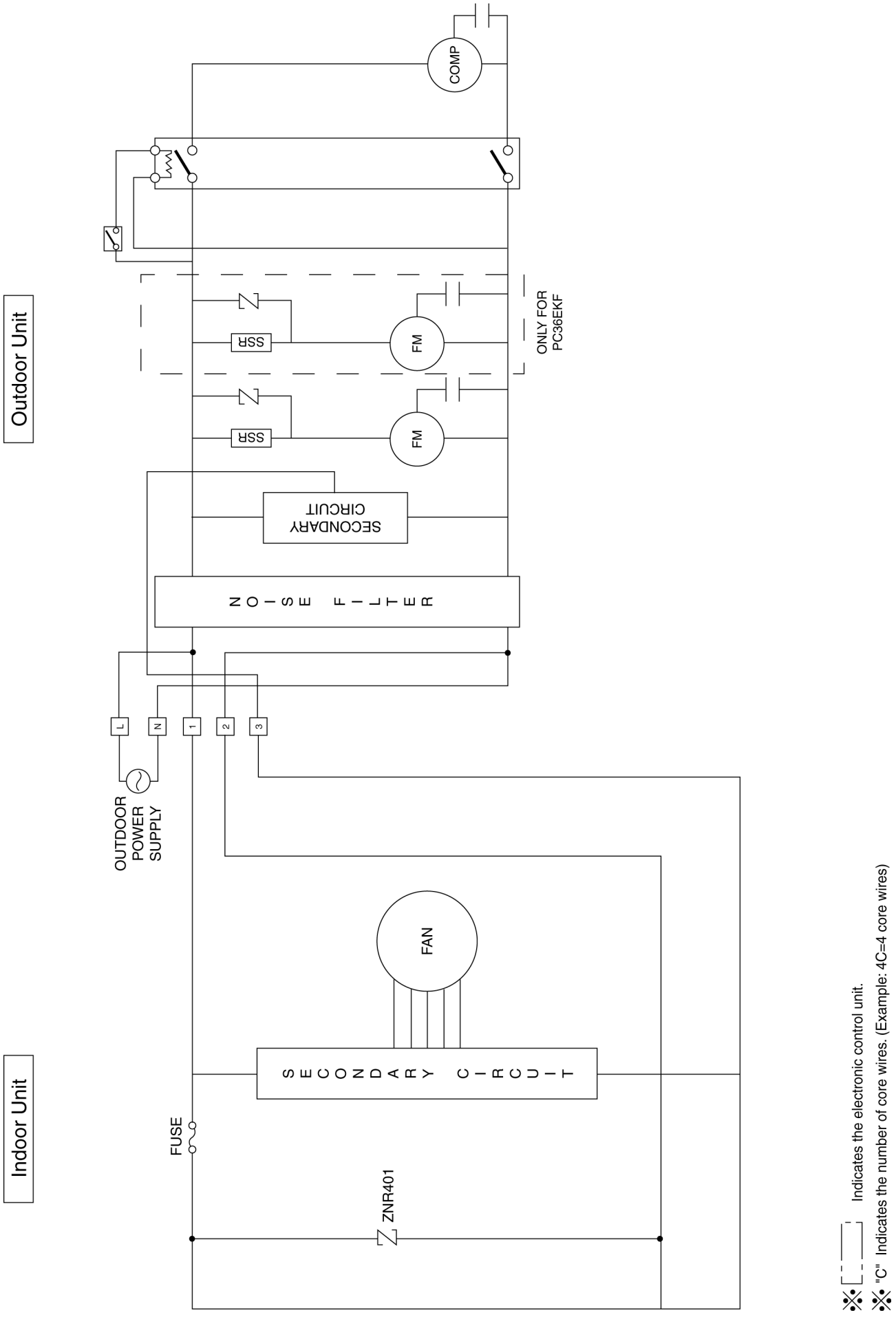
6.1. CS-PC30EKF CU-PC30EKF



6.2. CS-PC36EKF CU-PC36EKF

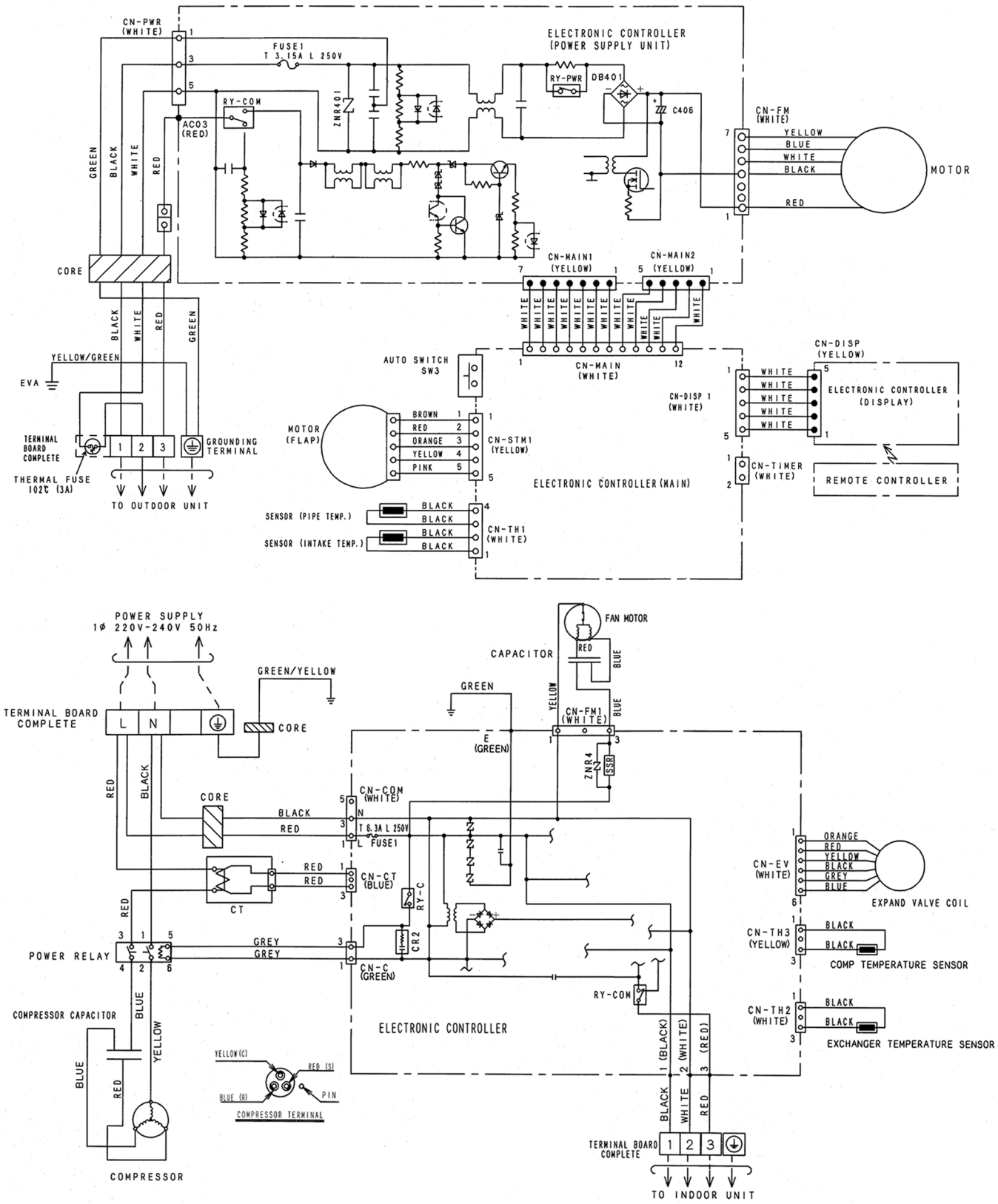


7 Block Diagram

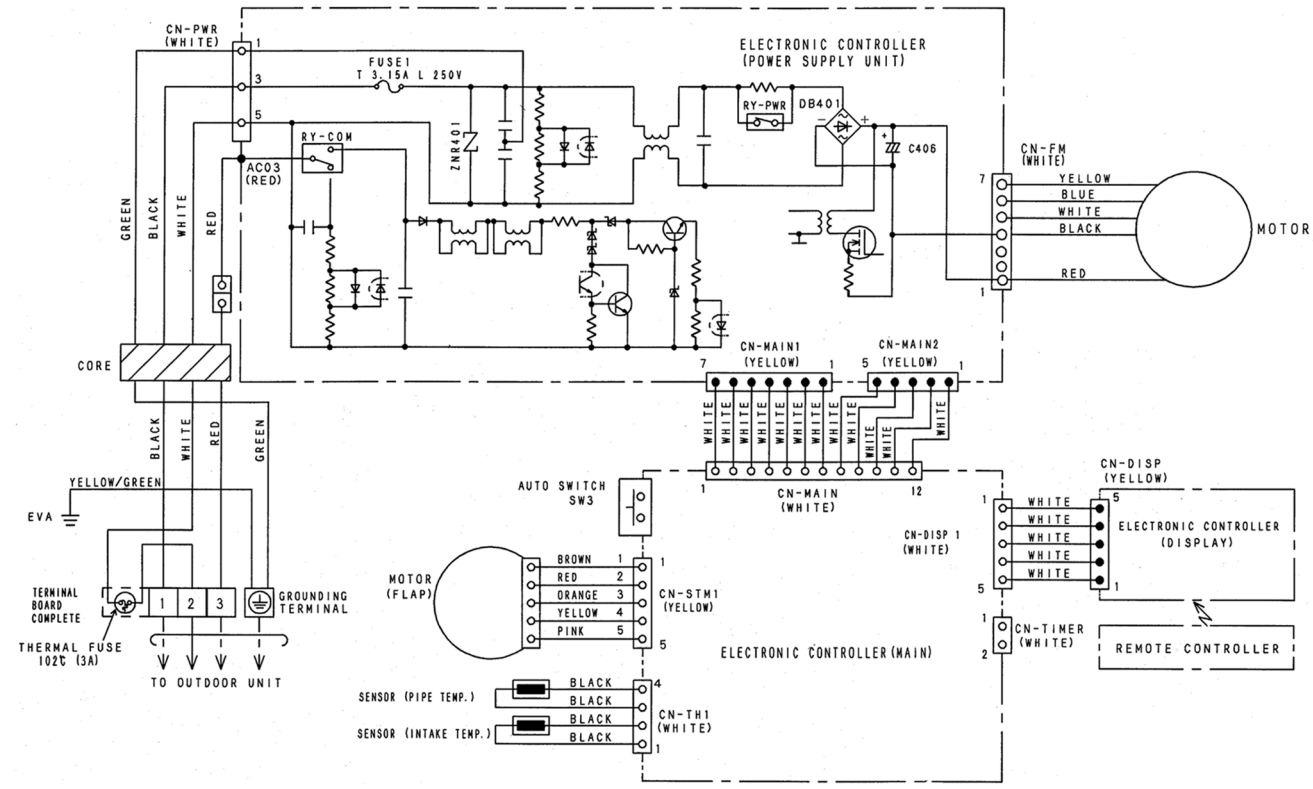


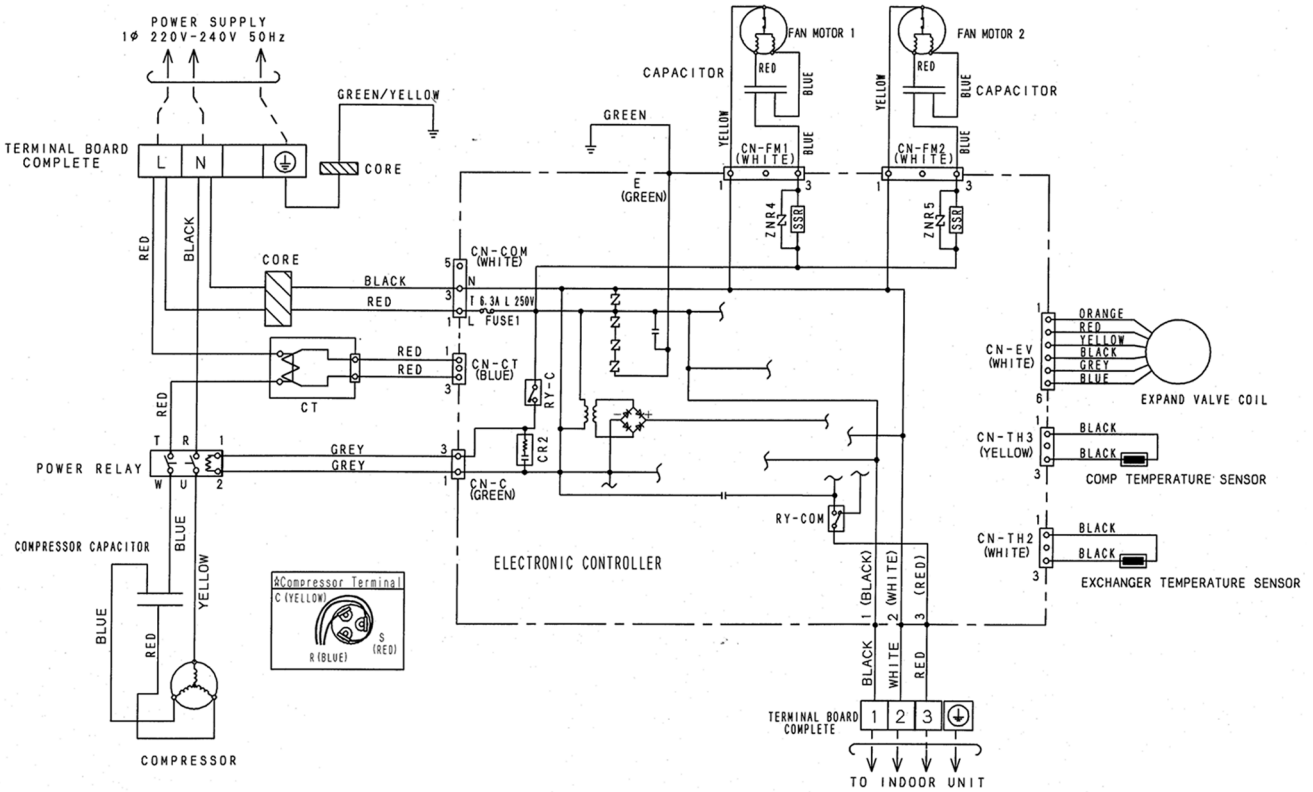
8 Wiring Connection Diagram

8.1. CS-PC30EKF CU-PC30EKF



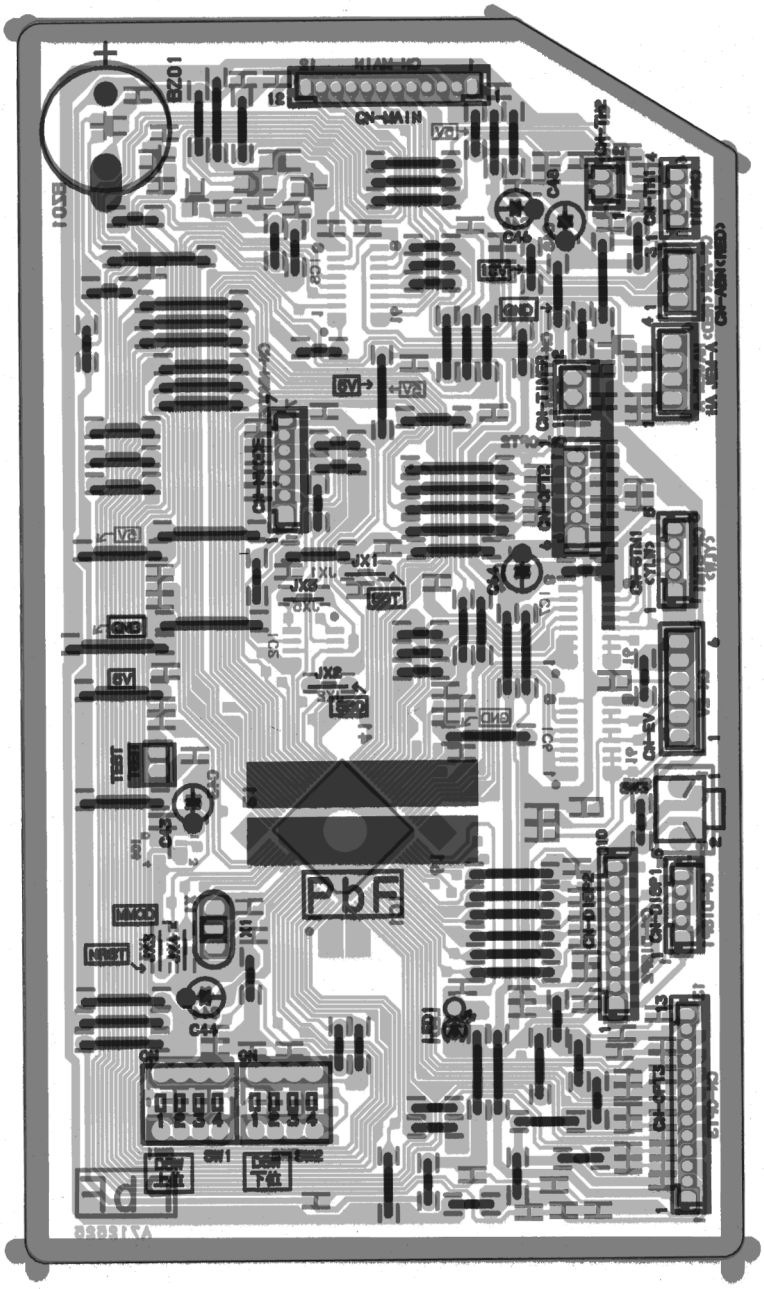
8.2. CS-PC36EKF CU-PC36EKF



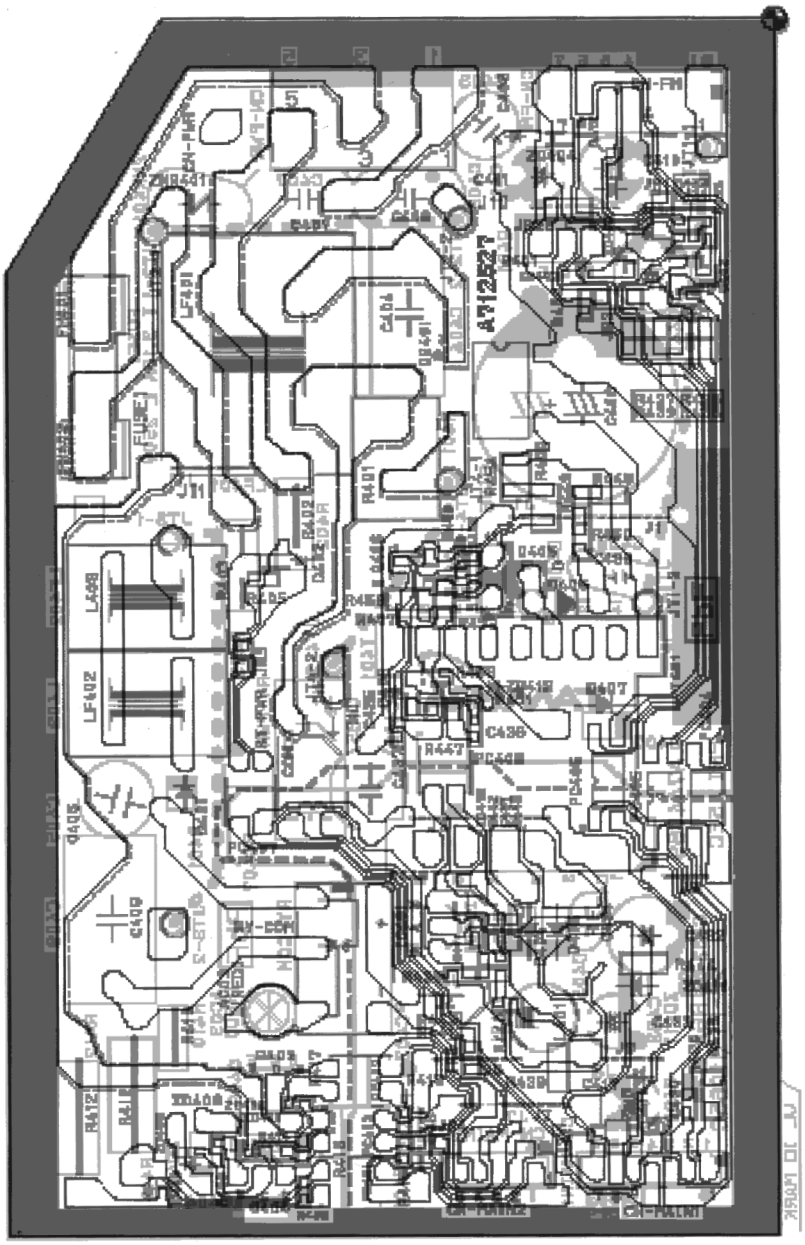


9 Printed Circuit Board

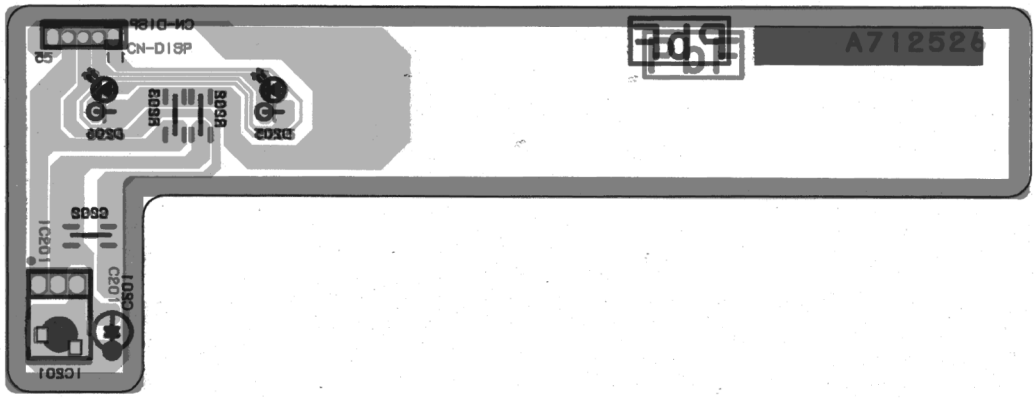
9.1. Indoor Unit



9.2. Outdoor Unit



9.3. Indicator



10 Installation Instruction

10.1. 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.
- Recommended installation height for indoor unit shall be at least 2.5 m.

OUTDOOR UNIT

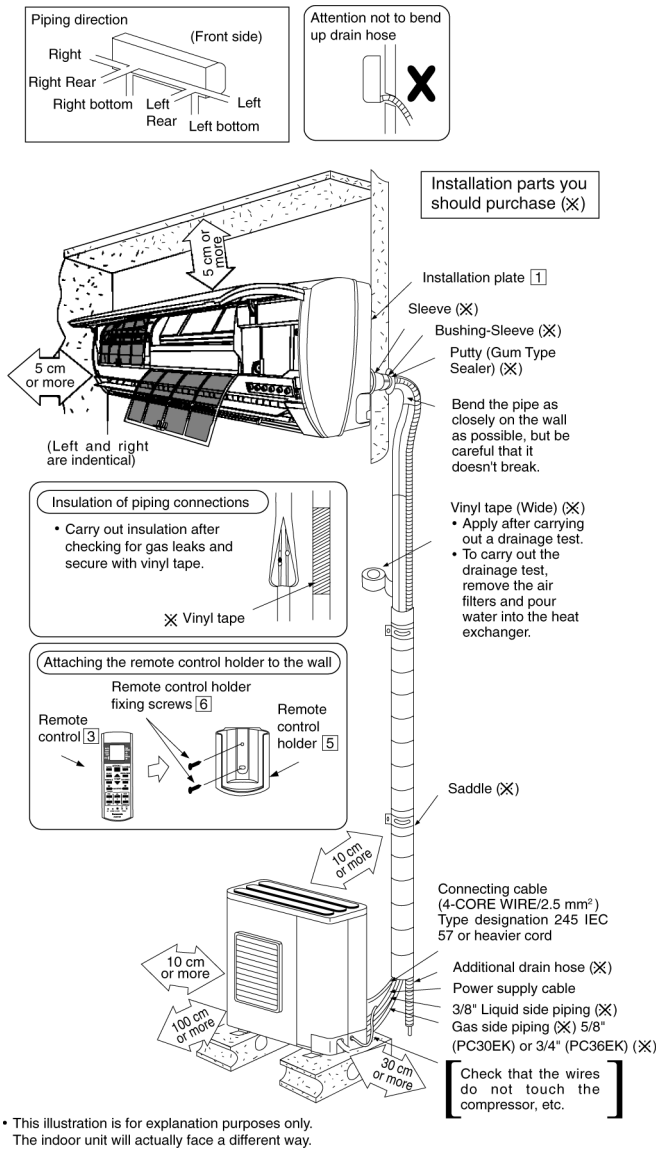
- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- There should not be any animal or plant which could be affected by hot air discharged.
- Keep the spaces indicated by arrows from wall, ceiling, fence or other obstacles.
- Do not place any obstacles which may cause a short circuit of the discharged air.
- If piping length is over 7.5 m, additional refrigerant should be added as shown in the table.

Model	Piping size		Rated Length (m)	Max. Elevation (m)	Max. Piping Length (m)	Additional Refrigerant (g/m)
	Gas	Liquid				
PC30EK	5/8”	3/8”	5	20	30	30
PC36EK	3/4”	3/8”	5	20	30	40

Example: For PC36EK

If the unit is installed at a 10m distance, the quantity of additional refrigerant should 75 g ..... (10 - 7.5) m x 40 g/m = 100 g

10.2. Indoor/Outdoor Unit Installation Diagram

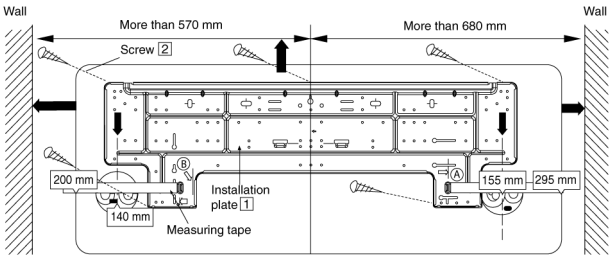


• This illustration is for explanation purposes only. The indoor unit will actually face a different way.

10.3. Indoor Unit

10.3.1. 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 680 mm at right and 570mm at left of the wall.
The distance from installation plate edge to ceiling should more than 73 mm.
From installation plate left edge to unit's left side is 20 mm.
From installation plate right edge to unit's right is 130 mm.

Ⓑ : For left side piping, piping connection for liquid should be about 155 mm from this line.
: For left side piping, piping connection for gas should be about 190 mm from this line.
: For left side piping, piping connection cable should be about 1100 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.

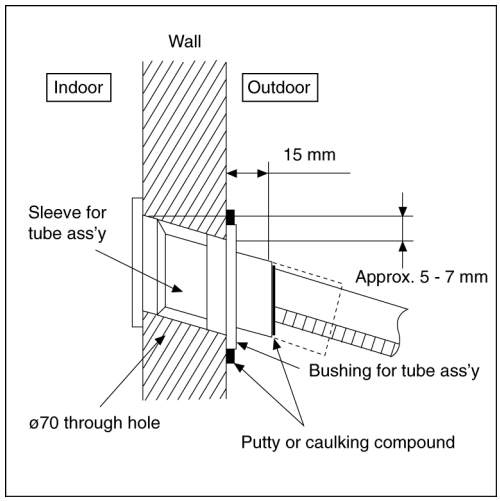
2. Drill the piping plate hole with ø70 mm hole-core drill.
   • Line according to the arrows marked on the lower left and right side of the installation plate. The meeting point of the extended line is the centre of the hole. Another method is by putting measuring tape at position as shown in the diagram above. The hole centre is obtained by measuring the distance namely 140 mm and 155 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.

10.3.2. 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.



10.3.3. INDOOR UNIT INSTALLATION

1. For the right rear piping

Install accessory of tube ass'y
↓
Install the Indoor Unit
↓
Secure the Indoor Unit
↓
Insert the connecting cable

2. For the right and right bottom piping

Install accessory of tube ass'y
↓
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.)

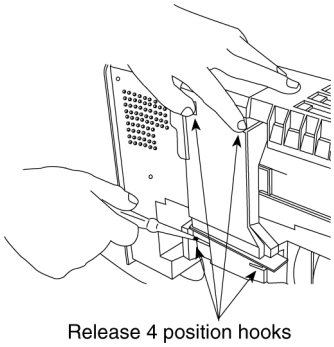
Insulate and finish the piping

↓ • 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

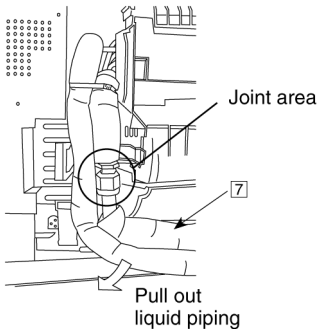
Install accessory of tube ass'y

1. Remove chassis back particular piece.

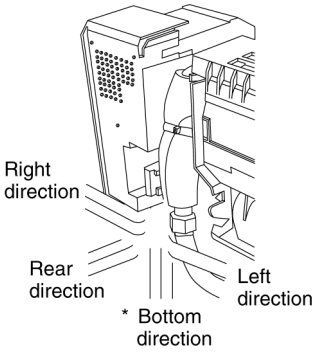


Release 4 position hooks

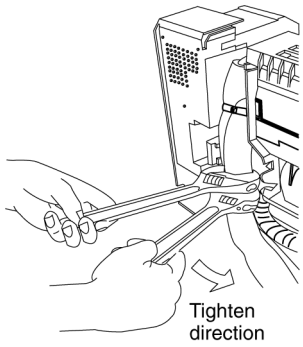
2. Connect tube ass'y [7] to gas side piping. Liquid side piping need to pull out to joint tube ass'y.



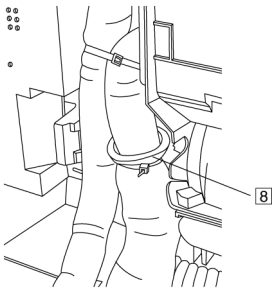
3. Set the piping direction.
   (For bottom piping, need to perform cutting and flaring process.)



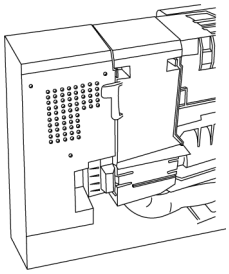
4. Use 2 spanner to tighten the nut. (tighten torque 65 N•m)

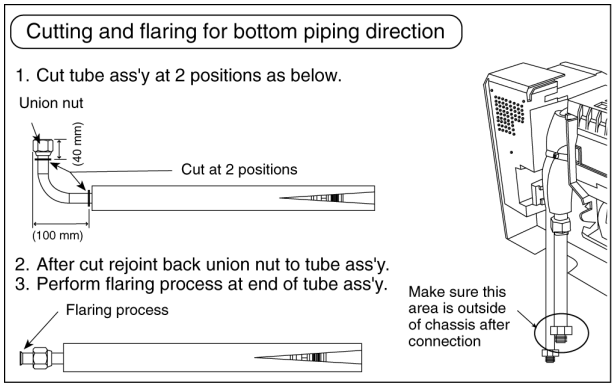


5. Check gas leak at joint area using tube connector [11] and connect to liquid side piping. (Refer indication label at chassis back for detail)
6. Cover the open tubing with the foam and bind it by band [8] .

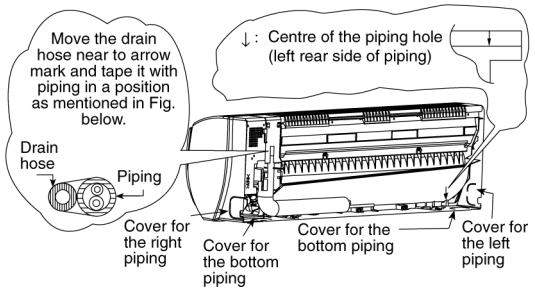


7. Close back the chassis back piece.





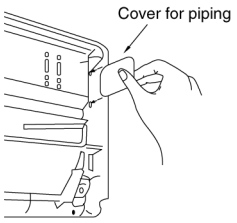
Pull out the piping and drain hose



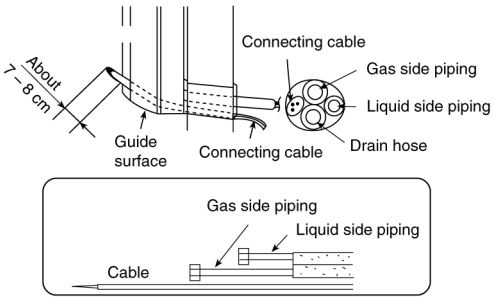
How to keep the cover

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.)

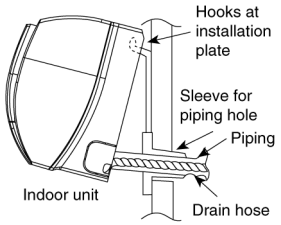


Insert the connecting cable



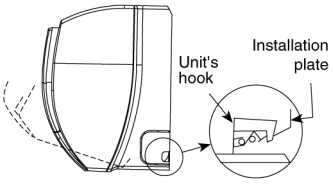
Install the indoor unit

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 it in left and right.

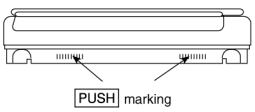


Secure the Indoor Unit

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



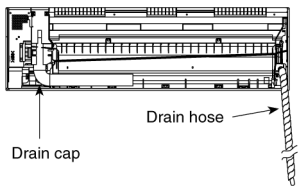
To take out the unit, push the PUSH marking at the bottom unit, and pull it slightly towards you to disengage the hooks from the unit.

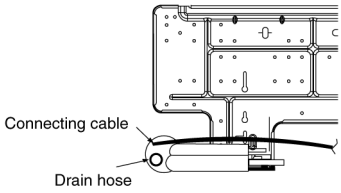


(This can be used for left rear piping and left bottom piping also.)

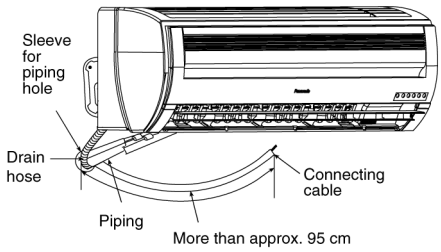
Exchange the drain hose and the cap

Rear view for left piping installation

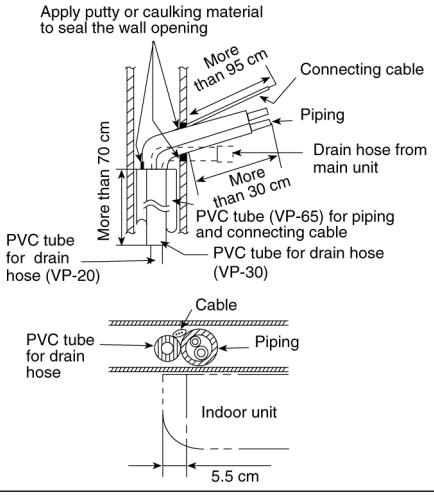




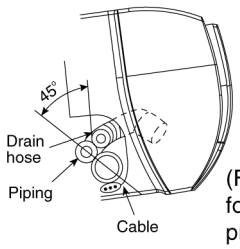
Adjust the piping slightly downwards.



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



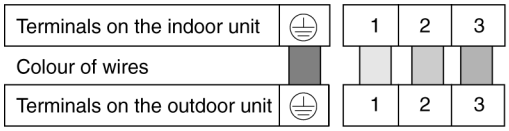
• In case of left piping how to insert the connecting cable and drain hose.



(For the right piping, follow the same procedure)

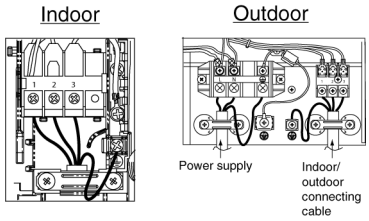
10.3.4. CONNECT THE CABLE TO THE INDOOR UNIT

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 4×2.5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.
   - Ensure the color of wires of outdoor unit and the terminal Nos. are the same to the indoor's respectively.
   - Earth lead wire shall be longer than the other lead wires as shown in the figure for the electrical safety in case of the slipping out of the cord from the anchorage.



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

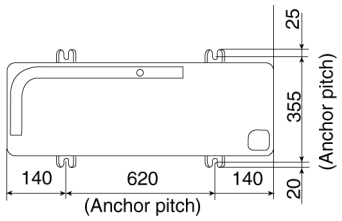
Terminal screw	Tightening torque N•cm {kgf•cm)
M3	69~98 {7~10}
M4	157~196 {16~20}
M5	196~245 {20~25}



10.4. Outdoor Unit

10.4.1. INSTALL THE OUTDOOR UNIT

- After selecting the best location, start installation according to Indoor/Outdoor Unit Installation Diagram.
  1. If installing the unit to a concrete base or other solid base, use M10 or W3/8 bolts and nuts to secure the unit, and ensure that the unit is fully upright and level.
     (The anchor bolt positions are shown in the diagram at the right side.)
     In particular, install the unit at a distance from the neighbouring building which conforms to regulations specified by local noise emission regulation standards.
  2. Do not install the outdoor unit to the building's roof.
  3. If there is a possibility that vibration may be transmitted to the rooms of the building, place rubber insulation between the unit and the installation surface.



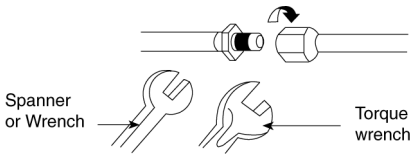
10.4.2. CONNECTING THE PIPING

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

- Connect tube ass'y [12] as shown in the picture. (PC36EK only)
- 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
PC30EK	5/8" [65 N•m]	3/8" [42 N•m)
PC36EK	3/4" [100 N•m]	3/8" [42 N•m)

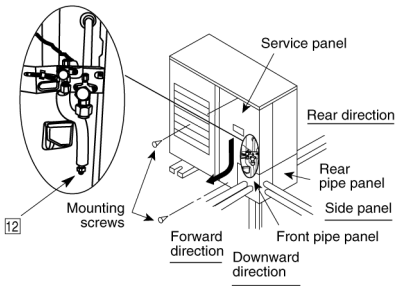
Connecting The Piping To Outdoor Unit

Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (locate at valve) onto the copper pipe.

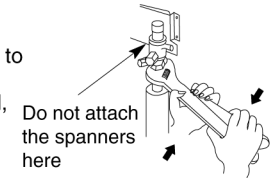
Align center of piping to valves and then tighten with torque wrench to the specified torque as stated in the table.

Local pipes can project in any of four directions.

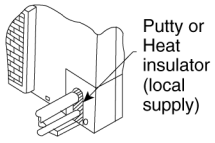
- Make holes in the pipe panels for the pipes to pass through.
- Be sure to install the pipe panels to prevent rain from getting inside the outdoor unit.
  [Removing the service panel].
  (1) Remove the two mounting screws.
  (2) Slide the service panel downward to release the pawls. After this, pull the service panel toward you to remove it.



Be sure to use two spanners to tighten.
(If the nuts are overtightened, it may cause the flares to break or leak.)

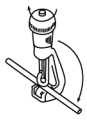


Close the tube joining area with putty heat insulator (local supply) without any gap as shown in right figure. (To prevent insects or small animal entering.)

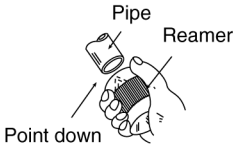


CUTTING AND FLARING THE PIPING

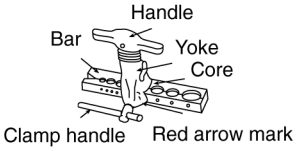
1. Please cut using pipe cutter and then remove the burrs.
2. Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused.
   Turn the piping end down to avoid the metal powder entering the pipe.
3. Please make flare after inserting the flare nut onto the copper pipes.



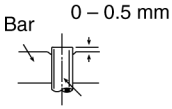
1. To cut



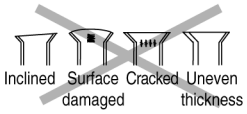
2. To remove burrs



3. To flare



■ Improper flaring ■

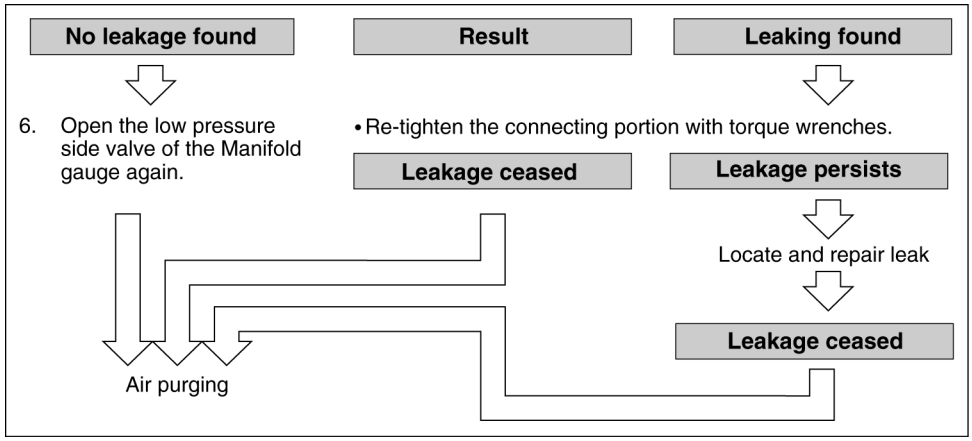


When properly flared, the internal surface of the flare will evenly shine and be of even thickness. Since the flare part comes into contact with the connections, carefully check the flare finish.

10.4.3. AIR PURGING OF THE PIPINGS AND INDOOR UNIT

1) Checking a gas leakage

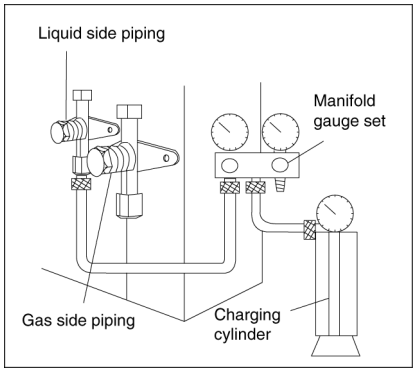
1. Remove the service port cap from 3-way valves.
2. Connect the Manifold gauge set to the service port of liquid side 3-way valve.
3. Connect the Charging Cylinder to the Manifold gauge set and open the valve of the Cylinder.
4. Open the low pressure side valve of the Manifold gauge for approx.10 seconds 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.

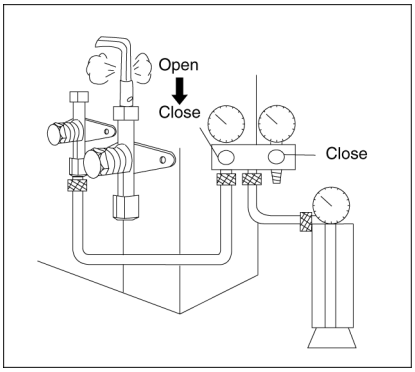


2) Air Purging

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 -0.3MPa.
3. Set both 3-way valves to open position with the Hexagonal wrench for the unit operation.

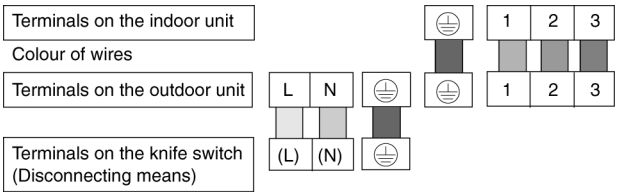




10.4.4. CONNECT THE CABLE TO THE OUTDOOR UNIT

(FOR DETAIL REFER TO WIRING DIAGRAM AT UNIT)

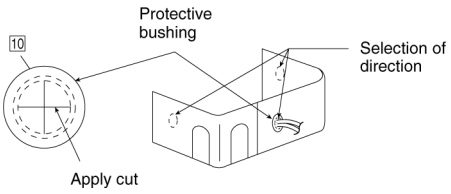
1. Remove the control board cover from the unit by loosening the screw.
2. Connecting cable between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 x 2.5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.

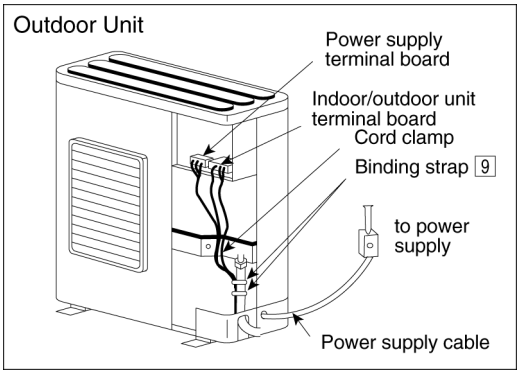


3. Secure the cable onto the control board with the holder (clamper).
4. Cable connection to the power supply (220-240V, 50Hz) through knife switch (Disconnecting means).
   - Connect the approved polychloroprene sheathed power supply cable (3 × 4.0 mm^2), type designation 245 IEC 57 or heavier cord to the terminal board, and connect the other end of the cable to knife switch (Disconnecting means).
5. Select required direction and apply protective bushing provided in accessories to protect cables from sharp edges.
6. Once all wiring work has been completed, tie the wires and cord stogether with the binding strap so that they do not touch other parts such as the compressor and pipes.

Note: Knife switch (Disconnecting means) should have minimum 3.5 mm contact gap.

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

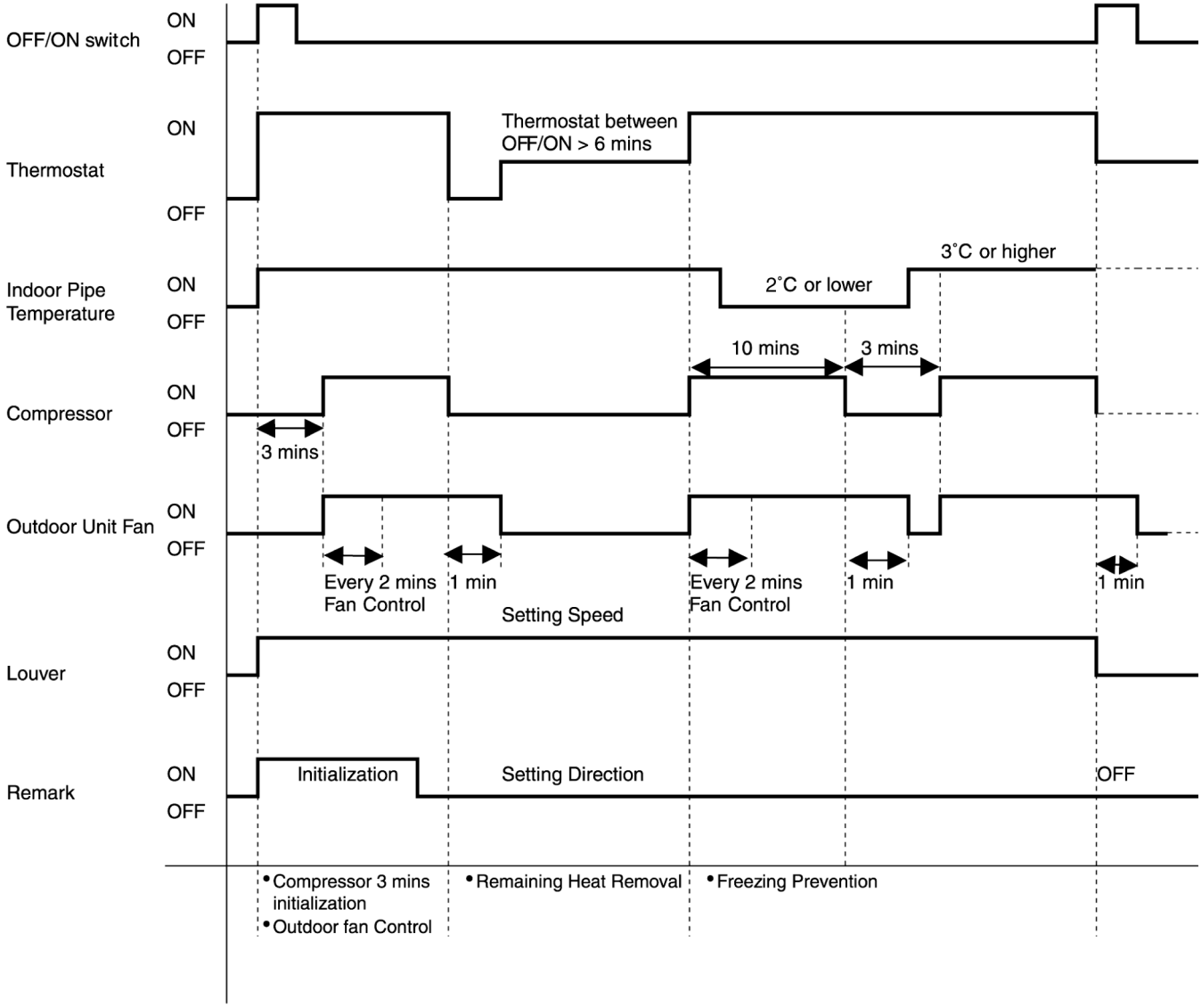




11 Operation And Control

11.1. 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.
- Cooling Operation Time Diagram.



11.2. Soft Dry Operation

- Soft Dry Operation can be set using remote control.
- Soft Dry operation is applied to dehumidify the room.
- When operation begins, the fan speed is fixed at Low speed while cooling operation is running until reaches the remote control setting temperature.

11.3. Auto Operation

- Automatic Mode can be set using remote control.
- This operation starts to judge the intake air temperature, setting temperature, and outdoor piping temperature. Then the unit starts to operate at determined operation mode.

11.4. Fan Operation

- Fan operation can be set using remote control.
- The indoor fan is operated at High, Medium or Low speed according to remote control setting.

11.5. Operation Control

11.5.1. Thermostat Control

- Depending on differences between room temperature and setting temperature, compressor operation is decided and starts operation.
- If temperature difference matches values shown below, thermostat switches off.

Cooling	0°C
Soft Dry	-1.0°C

11.5.2. Indoor Fan Control

- Manual Fan Speed
  Operation starts at High, Medium or Low speed set by remote control.
- Auto Fan Speed
  When operation start, or shifting to thermostat ON condition from thermostat OFF condition, indoor fan operates as below.

Thermostat & Compressor ON/OFF		Thermostat & Compressor ON			Thermostat & Compressor OFF			Thermostat & Compressor ON		
Time		40 sec.	50sec.	-	20 sec.	160 sec.	20 sec.	40 sec.	50 sec.	-
Cooling	Auto	Off	SSLo	Hi	SSLo	Off	SSLo	Off	SSLo	Me
Soft Dry	Auto	Off	SSLo	SLo	SSLo	Off	SSLo	Off	SSLo	SLo

11.5.3. Odour Cut Control

- Odour cut operation removes the odour generated at indoor heat exchanger by using drain water come out from indoor heat exchanger.
- Press “Odour” button at remote control to enable odour cut operation.
- Odour cut operation starts when compressor or thermostat is on.

Thermostat & Compressor ON/OFF	Thermostat & Compressor ON			Thermostat & Compressor OFF			Thermostat & Compressor ON		
Time	40 sec.	50sec.	-	20 sec.	160 sec.	20 sec.	40 sec.	50 sec.	-
Cooling	Off	SSLo	Normal Operation	SSLo	Off	SSLo	Off	SSLo	Normal Operation
Soft Dry	Off	SSLo	SLo	SSLo	Off	SSLo	Off	SSLo	SLo

11.5.4. Freeze Prevention Control

- After compressor starts operation for 4 minutes, the outdoor unit will stop its operation if indoor pipe temperature falls below 2ºC for 6 minutes.
- After 3 minutes stops, compressor restarts operation if indoor pipe temperature is 3ºC or more.
- This phenomenon is to protect the indoor heat exchanger from freezing and to prevent higher volume of refrigerant in liquid from returning to the compressor.

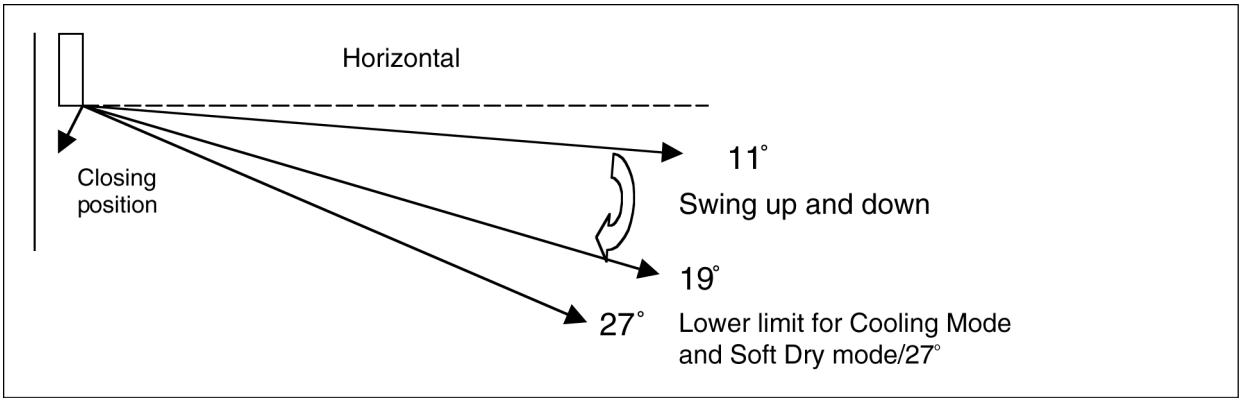
11.5.5. Dew Form Prevention Control

- During Cooling Operation, dew form prevention control activates if:
- Indoor temperature falls between 24ºC and 30ºC.
- Compressor and thermostat is ON.
- Indoor fan speed is Low speed.
- Setting temperature is less than 25ºC.
- During dew form prevention control, the louver is fixed at 30º.
- Fan speed and angle of horizontal louver (vertical airflow angle) will be adjusted accordingly in this control.
  - Fan speed will be increased slowly if the unit is in quiet mode but no change in normal cooling mode.
  - The angle of horizontal louver will be changed as below figure.

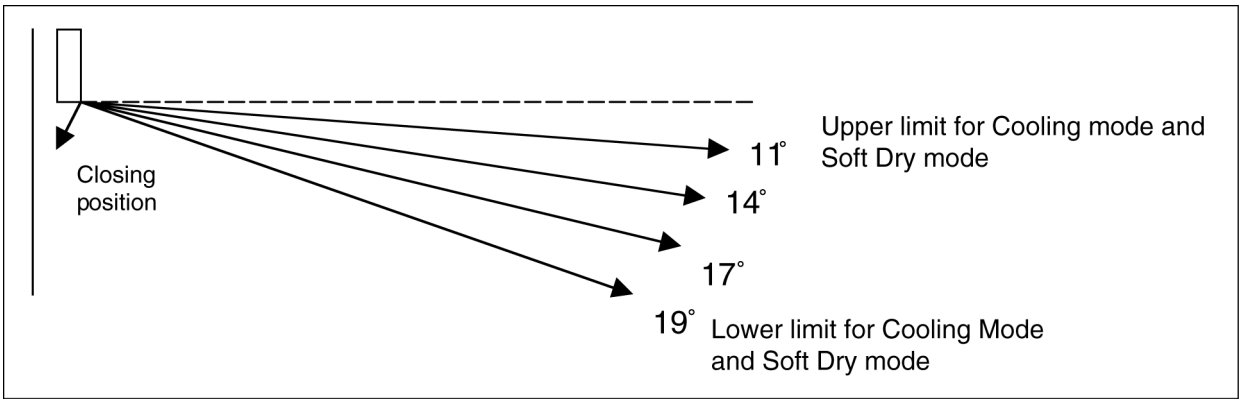
Operation Mode		Airflow direction auto-control	Airflow direction manual control
Cooling, Soft Dry	A	3° ~ 27°	3°, 11°, 19°, 27°
	B	11° ~ 19°	11°, 14°, 17°, 19°

Note:
A = Normal operation angle of rotation
B = Dew prevention angle of rotation

Horizontal Louver Angle
During dew prevention, the horizontal louver angle in Auto-control are as below figure.



During dew prevention, the horizontal louver angle in Manual are as below figure.

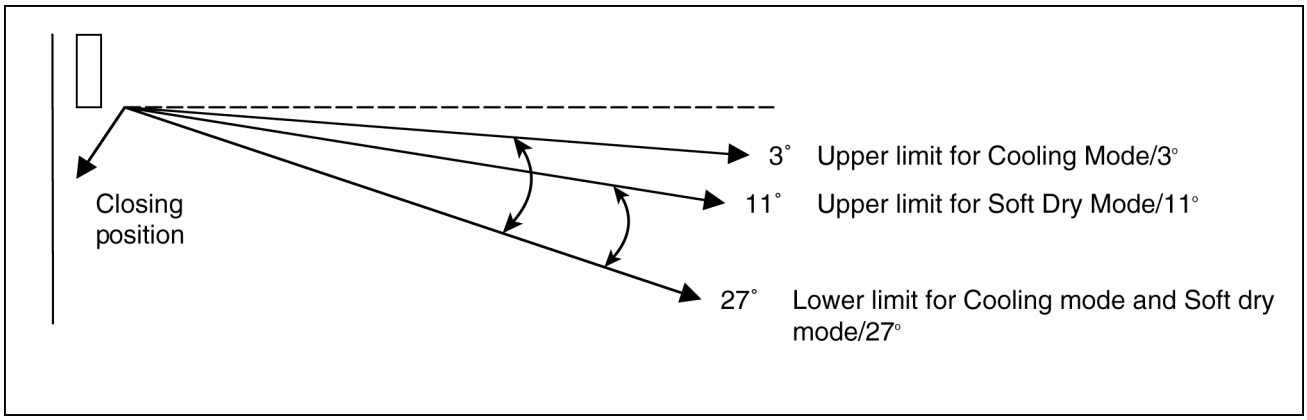


- Dew prevention control will be cancel when:
  - Any one of the condition above does not comply.

11.5.6. Vertical Airflow Direction Control

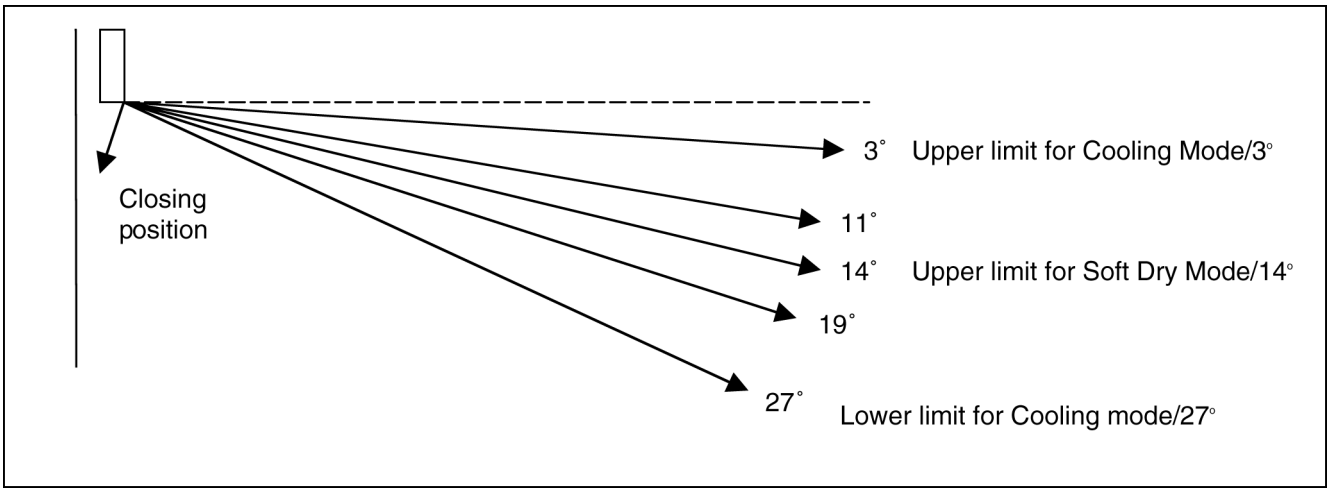
Auto Control

- 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 stop operation using the 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.



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 stop operation using the remote control, the discharge vent is reset, and stop at the closing position.



11.5.7. Horizontal Airflow Direction Control

- The horizontal airflow direction louvers can be adjusted manually by hand.

11.6. Outdoor Fan Control

- Outdoor fan speed changes according to outdoor pipe temperature.
- The fan speed is controlled by the timing of turning the outdoor fan ON and OFF within an interval.
- There unit compares current temperature (T2) with previous (2 seconds before) temperature (T1) and decides the outdoor fan ON time (X).

Judgement	Outdoor fan ON time (X)
45°C < T2	X = X + 100ms
40°C ≤ T2 < 45°C & T2 ≤ T1	X = X + 50ms
40°C ≤ T2 < 45°C & T2 < T1	X = X
35°C ≤ T2 < 40°C	X = X
30°C ≤ T2 < 35°C & T2 ≤ T1	X = X - 50ms
30°C ≤ T2 < 35°C & T2 < T1	X = X
T2 < 30°C	X = X - 50ms

Outdoor fan ON time (X) is a variable with the range of 200ms to 1600ms or continuosly ON.

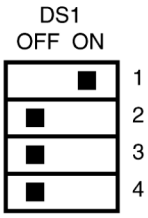
- Every 2 minutes, the outdoor pipe temperature is detected and the outdoor unit fan speed is changed automatically.

11.6.1. Outdoor Fan Remaining Heat Removal Control

- When compressor stop, outdoor fan operates at High speed for 1 minute to remove the remaining heat.

11.7. Test Run (Forced Cooling mode)

- Test run is necessary after installation is completed.
- To enable test run operation, at outdoor PCB, set the DS1 Switch 1 to ON position.



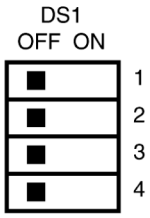
- Press Test Run button for 1 second.

11.7.1. Valve Error

- During test run, if the 3-way valve is close, valve error is shown on wired remote control.
- This control is to protect the compressor.
- Valve error is detected if comply with conditions below:
  - Power is on for the first time and within 5 minutes from compressor starts (However, the unit is considered power on for first time when compressor starts operating continuously for 7 minutes).
  - Indoor heat exchanger temperature at compressor start - 3ºC < current indoor heat exchanger temperature for 1 minute.
  - Indoor suction temperature - 3ºC < current heat exchanger temperature for 5 minutes.

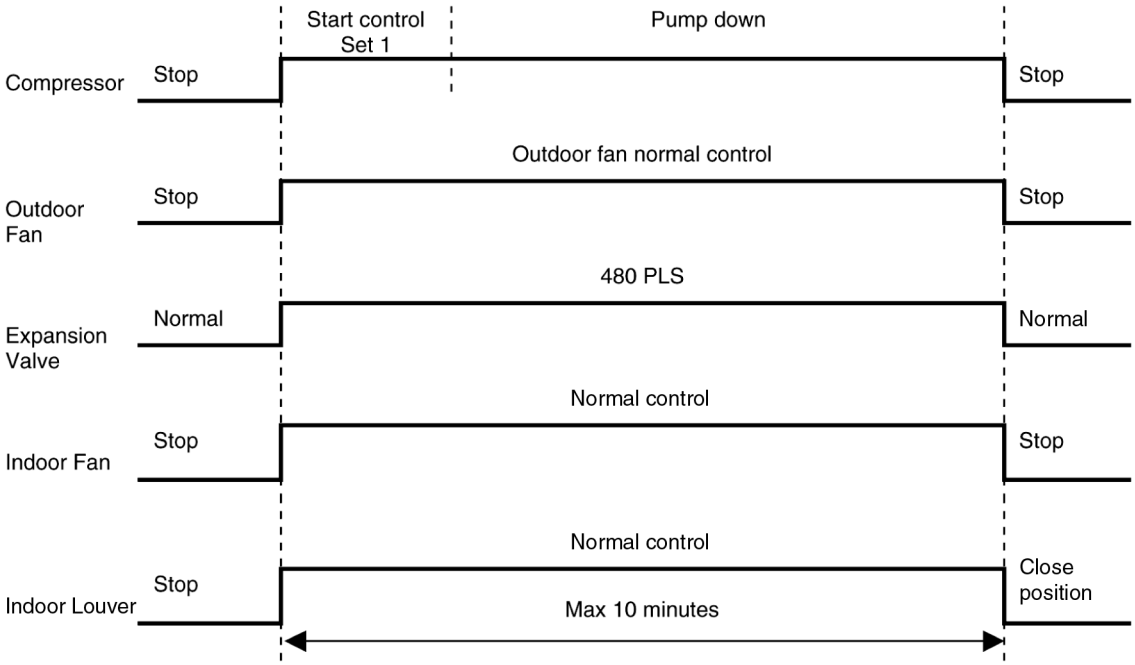
11.8. Pump down

• To enable pump down operation, at outdoor PCB, set the DS1 to OFF position.



• Press Test Run button for 1 second.

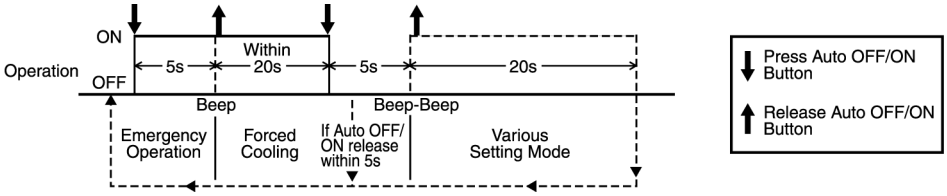
• During Pump Down operation, push the Test Run button again for 1 second to stop the pump down operation.
• The pump down operation run for 10 minutes.



12 Servicing Mode

12.1. Auto OFF/ON Button

- The “Auto OFF/ON Button” (behind the front grille) is used to operate the air conditioner if remote control is misplaced or malfunctioning.
- Forced cooling operation is possible by pressing the “Auto OFF/ON Button” for more than 5s where “beep” sound is heard then release the button.
- User able to select remote control transmission code and toggle remote control signal receiving sound under various setting mode.
- To enter various setting mode:
  - Press the “Auto OFF/ON Button” continuously for 5s (“beep” sound is heard) and release.
  - Within 20s, press the “Auto OFF/ON Button” continuously for 5s again (2 “beep” sound is heard) and release.
  - Various setting mode has limit up to 20s. Then return to normal operation.

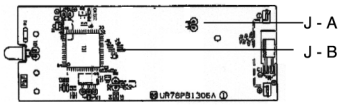


12.1.1. Toggle Remote Control Signal Receiving Sound

- Under various setting mode, press the “Auto OFF/ON Button” to toggle the remote control sound.
  - Short “beep”: Turn ON remote control signal receiving sound.
  - Long “beep”: Turn OFF remote control signal receiving sound.
- After “Auto OFF/ON Button” is pressed, the 20s counter for various setting mode is restarted.

12.1.2. Select Remote Control Transmission Code

- There are 4 types 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.

12.2. Remote Control Button

12.2.1. SET

- To change the type of remote control transmission signal (there are totally four types of transmission codes).
  - Modify the jumper (back of PCB) & connector (front of PCB) at remote control PCB.
  - Press with pointer for more than 10 seconds.
  - Face the transmitter towards indoor unit receiver and press the timer SET button (to send the signal) or if the timer SET button is not pressed for 30 seconds, the setting mode is cancelled.
  - Press timer CANCEL button to exit the setting mode.

12.2.2. CLOCK

- To change the remote control's clock-hour and minute.
  - Press once to enter the clock setting mode.
  - Use timer increment button timer decrement button to change the time.
  - Press once again to exit the setting mode.
- To change the time format (24 hours & 12 hours timer display).
  - Press for more than 5 seconds.

12.2.3. RESET

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

12.2.4. TIMER "▲"

- Press continuously for 5 seconds, LED intensity for Remote Control dimmer code is transmitted.
- Above condition will not happen when Timer is set.

12.2.5. TIMER "▼"

- Press continuously for 10 seconds, set the operation and display changes as Celsius or Fahrenheit.
- Above condition will not happen when Timer is set.

12.3. Test Mode Timer Table

Name		Time	Test Mode (When test point Short-circuited)	Remarks
Real Timer		1 hr.	1 min.	
		10 min.	10 sec.	
		1 min.	1 sec.	
Timer Delay Safety Control		2 min. 58 sec.	0 sec.	
Forced Operation		60 sec.	0 sec.	
Timer Save Control		7 min.	4.2 sec.	
Anti-Freezing		4 min.	0 sec.	
Auto Mode Judgement		20 sec.	0 sec.	
Soft Dry	OFF	6 min.	36 sec.	
	ON	10 min.	60 sec.	Soft Dry: 10 min. operation
Deodorizing Control	Cooling	40 sec.	4 sec.	
		70 sec.	7 sec.	
		20 sec.	2 sec.	
		180 sec.	18 sec.	
	Soft Dry	40 sec.	4 sec.	
		360 sec.	36 sec.	
Comp. Reverse Rotation Detection		5 min.	30 sec.	Com. ON 5 min. and above
		2 min.	0 sec.	
Comp./ Fan Motor Delay Timer		1.6 sec.	0 sec.	
Random Auto Restart Control		0 ~ 62 sec.	0 ~ 6.2 sec.	

13 Troubleshooting Guide

13.1. Refrigeration Cycle System

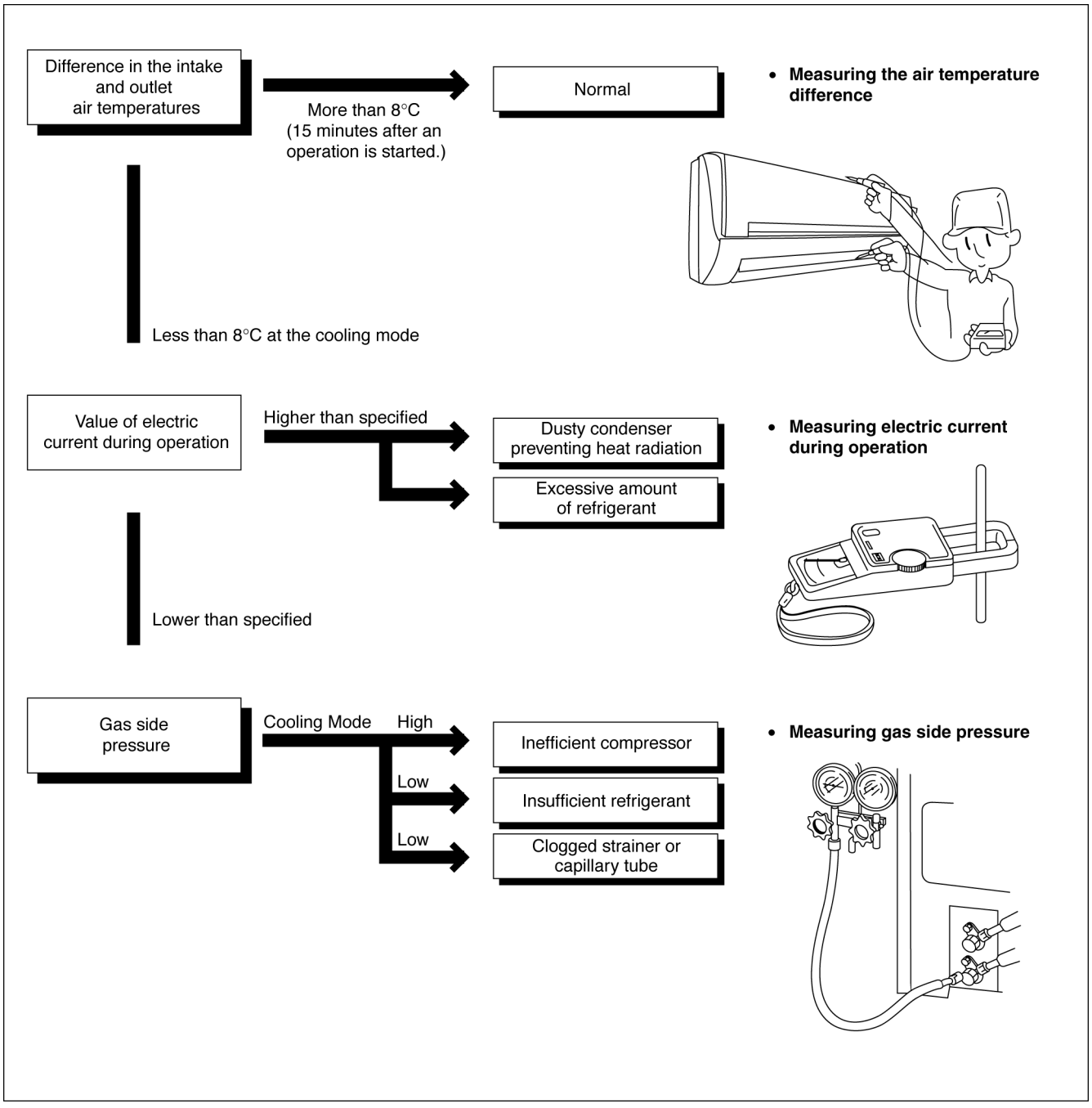
In order to diagnose malfunctions, make sure that there are no electrical problems before inspecting the refrigeration cycle. Such problems include insufficient insulation, problem with the power source, malfunction of a compressor and a fan.

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



13.2. Relationship Between The Condition Of The Air Conditioner And Pressure And Electric Current

Condition of the air conditoner	Cooling Mode		
	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.

13.3. 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.
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 has a humming sound.

13.4. Error Code Table

13.4.1. Self-diagnosis function

1. The self-diagnosis LEDs (red) on the outdoor unit printed circuit board can be used to indicate where the location of a problem is.
   Refer to the table below to remove the cause of the problem and then re-start the air conditioner system.
2. If the problem disappears and operation returns to normal, the self-diagnosis LED will remain illuminated until operation is resumed.
   ●… flashing blank off ○… light off ※…illuminated
3. When the Timer LED at indoor unit signal receiver flashes, it indicates there is error.
4. Diagnosis functions which are not applicable for this model is marked ★.

	Outdoor unit printed circuit board LED							Location of problem	Check location
	8	7	6	5	4	3	2		
★	※	○	●	●	●	●	○	Drain level Float switch problem	Drain pump and drain pipe, indoor unit connectors
★	※	●	○	○	○	○	○	Louver switch problem	Louver motor, decorative panel connection terminal, or indoor unit louver motor connectors
	※	●	○	○	○	●	●	D. C Fan motor problem	Indoor unit D. C Fan motor or connection terminals
	※	●	○	●	○	○	○	Indoor temperature sensor problem	Indoor temperature sensor lead wire or indoor unit connector
★	※	●	○	●	○	○	●	Remote control thermistor problem	Remote control thermistor
	※	●	○	●	○	●	○	Pipe temp. sensor problem (indoor unit)	Pipe temperature sensor lead wire or indoor unit connector
★	※	●	●	○	●	○	○	Remote control transmission problem	Remote control unit cable and connection terminals
	※	●	●	○	●	●	○	Indoor/outdoor unit disconnection problem	Indoor/outdoor unit connection cable and connection terminals, or indoor unit and outdoor unit power supplies (indoor side) (waiting timer approx. 13 minutes)
	※	●	●	○	●	●	●	Indoor/outdoor unit connection error problem	Indoor/outdoor unit connection wire (indoor side)
	○	○	●	○	●	○	●	Indoor/outdoor unit disconnection problem	Indoor/outdoor unit connection cable and connection terminals, or indoor unit and outdoor unit power supplies (waiting time approx. 13 minutes)
	○	○	●	○	○	○	○	Indoor/outdoor unit connection error problem	Indoor/outdoor unit connection wire
	○	○	●	●	○	○	○	System problem	Total capacity for the number of indoor units is insufficient or over. Check the total capacity and the number of indoor units
★	○	○	●	●	●	○	○	Open phase, or reversed phase of supply	Check the main power supply terminal board connections or switch over any two of the power supply wires
★	○	○	○	○	○	●	○	Suction pressure protection	Insufficient refrigerant
	○	○	○	○	○	○	●	High-pressure cut-off	Check the Refrigeration system
★	○	○	○	●	●	○	○	4 way valve information	Check the 4 way valve or lead wire
	○	○	●	○	●	●	○	3 way valve problem	Check the Refrigeration system
	○	○	○	○	○	●	●	Compressor overcurrent protection	Open phase or lock in compressor
	○	○	○	●	○	●	●	Compressor discharge temp. protection	Insufficient refrigerant
	○	○	○	○	●	○	●	Outdoor heat exchanger outlet temperature sensor problem	Outdoor heat exchanger outlet temperature sensor (EXCHANGER TEMPERATURE SENSOR) lead wire, connector
	○	○	○	○	●	●	○	Compressor discharge temperature sensor problem	Compressor discharge temperature sensor (COMP. TEMPERATURE SENSOR) lead wire, connector
★	○	○	●	●	○	●	●	High pressure switch open circuit problem	High-pressure switch lead wire, connector
★	○	○	●	●	●	○	●	Low pressure sensor problem	Low-pressure sensor lead wire, connector
	○	○	○	●	○	●	○	Current detector open circuit	Outdoor unit P.C.B. fault or connector

13.4.2. About the test operation

- Test operation can be carried out using the remote control unit or by using the switch on the printed circuit board inside the outdoor unit.
- If carrying out test operation at the printed circuit board of the outdoor unit, follow the procedure given below. (If using the remote control unit to carry out test operation, refer to the installation manual which is supplied with the indoor unit.)
- Press the SW1 with the PUMP DOWN setting mode for 1 second or more. The LED will operate as follows during test operation. (Be sure to select cooling mode first, and run the units in this mode for 5 minutes or more.)
- Press the TEST switch once more to cancel test operation mode. (Test operation will be cancelled automatically after 30 minutes.)

13.4.3. About the pump down operation

- Operate the pump down according to the following procedures.
  1. Confirm the valve on the liquid side and the gas side is surely open.
  2. Press the SW1 with the PUMP DOWN setting mode on outdoor printed circuit board for 1 second or more. Perform the cooling operation for 10 minutes or more.
  3. Set the liquid side 3 way valve to the close position and until when the gauge indicates at 0.01 a (0.1kg/cm 2 G).
  4. Immediately set the gas side valve to the close position and press the SW1 (stop the operation unit).

14 Disassembly and Assembly Instructions

⚠ WARNING

High voltages 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.

14.1. Indoor Electronic Controllers Removal Procedures

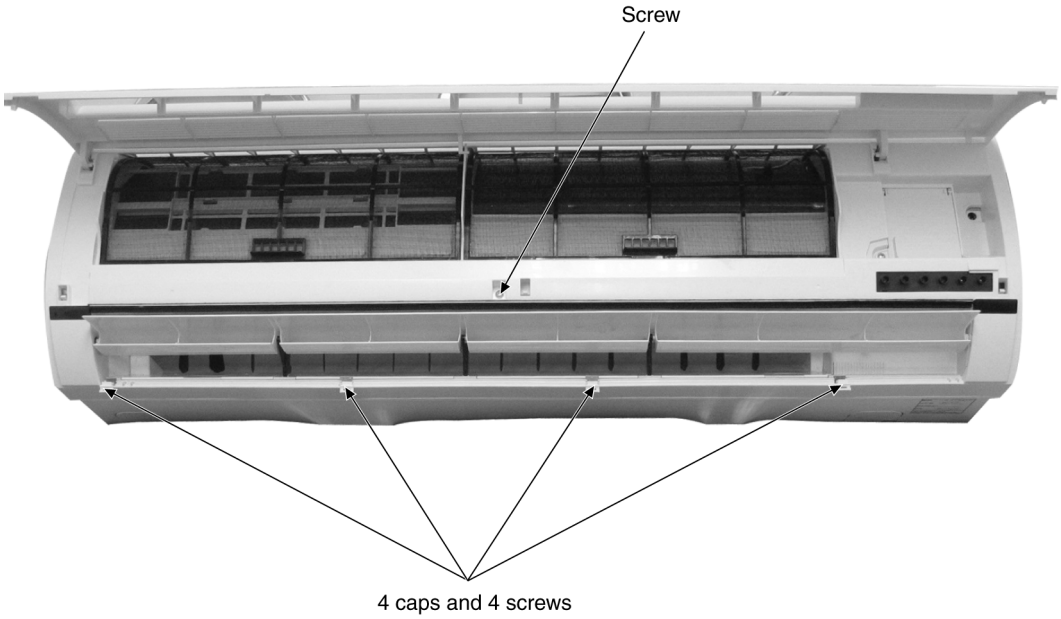


Fig. 1

- Remove the screw at the middle of the Front Grille. (Fig. 1)
- Remove 4 caps and 5 screws at the bottom of the Front Grille. (Fig.1)

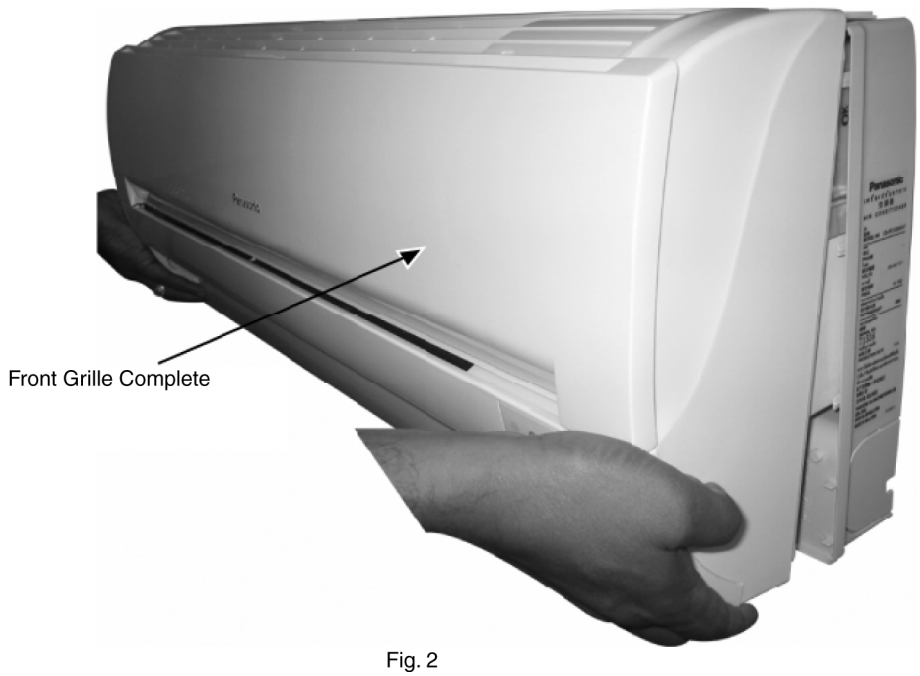


Fig. 2

- Remove the Front Grille Complete. (Fig. 2)

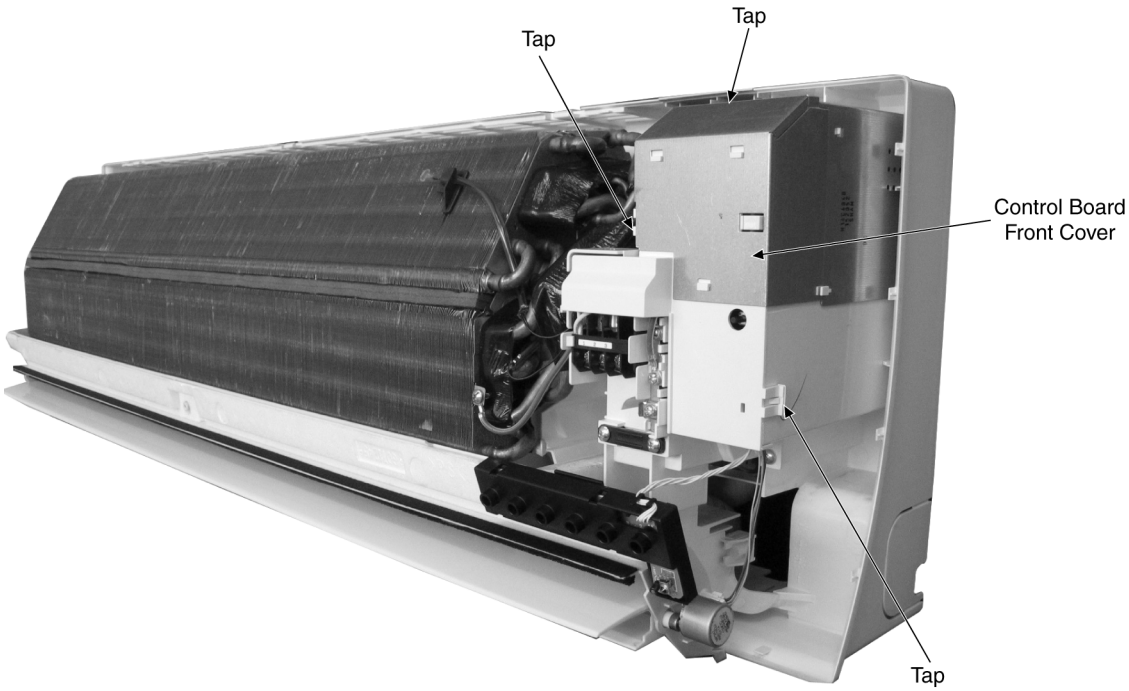


Fig. 3

- Release the taps on the top, on the left and on the right side of Control Board Front Cover. (Fig. 3)
- Then remove the Control Board Front Cover. (Fig. 3)

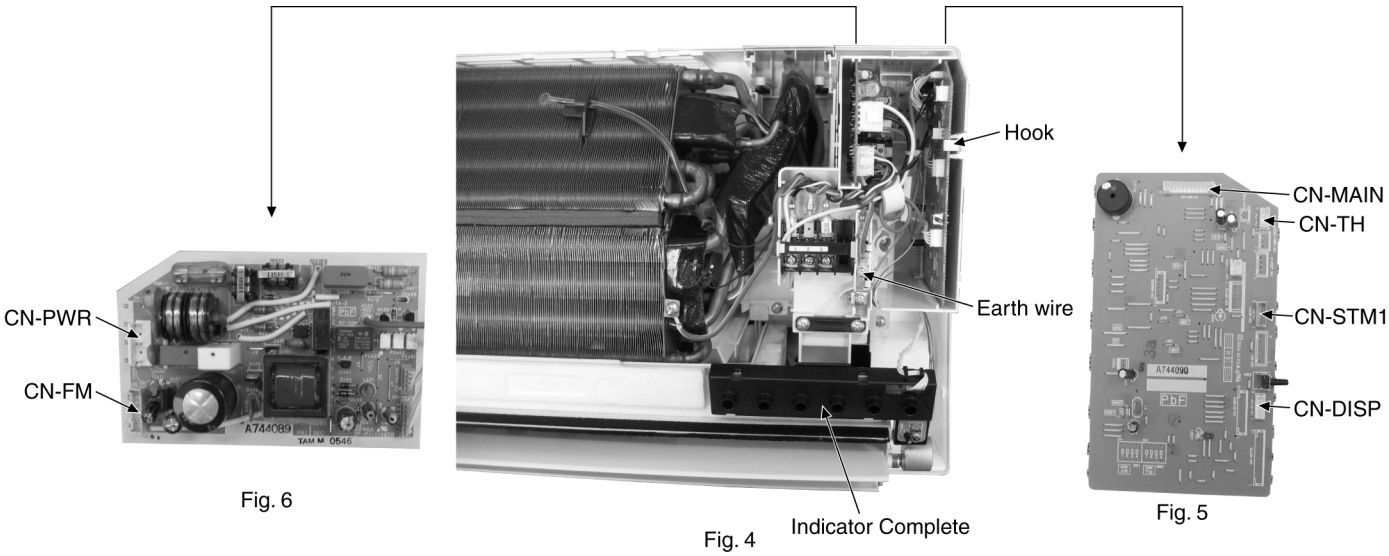


Fig. 6

Fig. 4

Fig. 5

- How to remove PCBs from the control board.
  - Remove the Indicator Complete. (Fig. 4)
  - Remove the earth wire. (Fig. 4)
  - Release CN-DISP. (Fig. 5)
  - Release CN-STM1. (Fig. 5)
  - Release CN-TH. (Fig. 5)
  - Release CN-MAIN. (Fig. 5)
  - Release CN-PWR. (Fig. 6)
  - Release CN-FM. (Fig. 6)
  - Pull the hook and remove the PCBs.

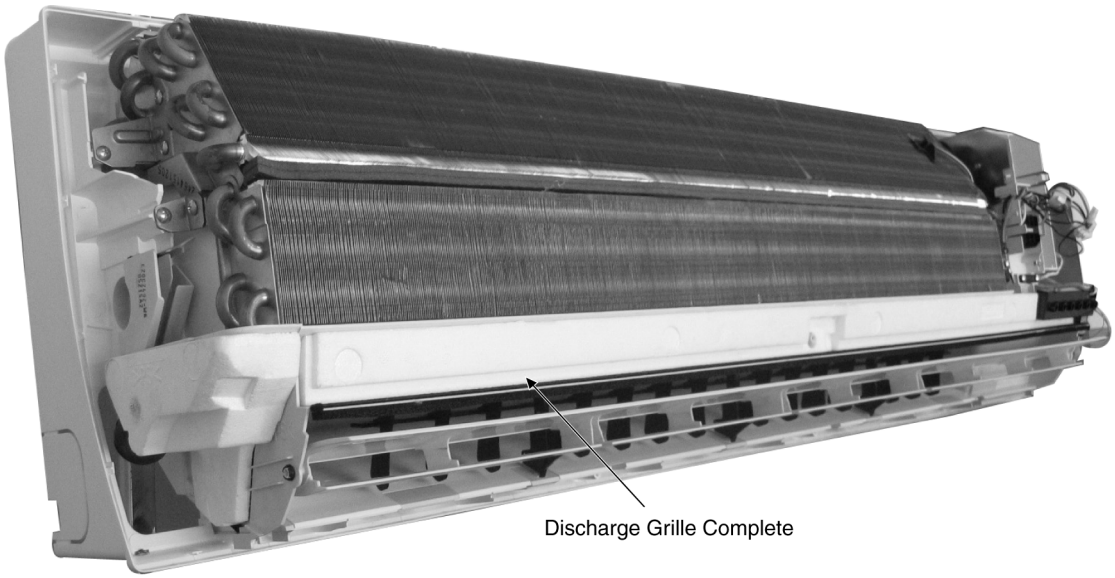


Fig. 7

• Pull down the Discharge Grille Complete. (Fig. 7)

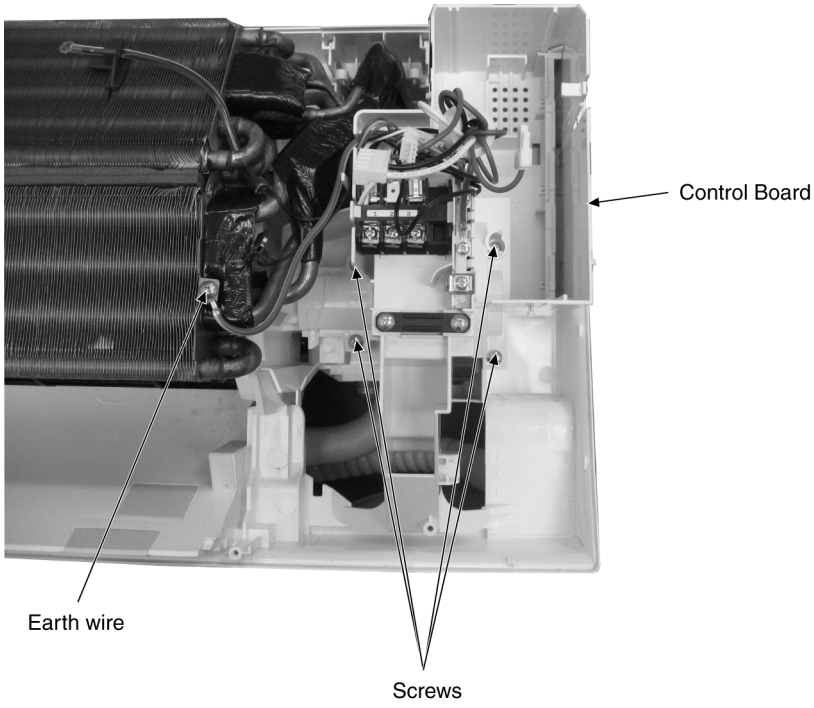


Fig. 8

• Remove the earth wire from the evaporator. (Fig. 8)
• Remove 2 screws on the left and right side of the control board. (Fig. 8)
• Then pull out the control board from the unit. (Fig.8)

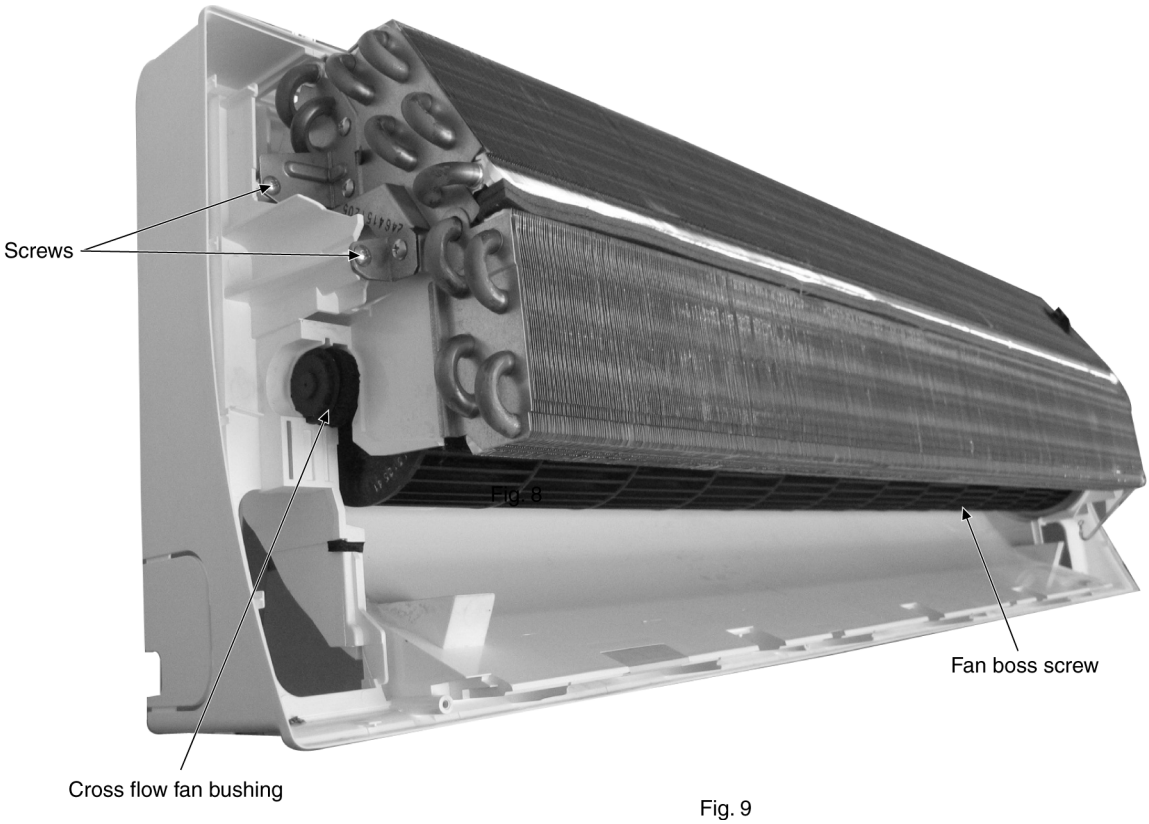


Fig. 9

- Remove the cross flow fan bushing from the chassis. (Fig. 9)
- Remove the screws on the left side of evaporator. (Fig. 9)
- Loosen the fan boss screw at the cross flow fan. (Fig. 9)

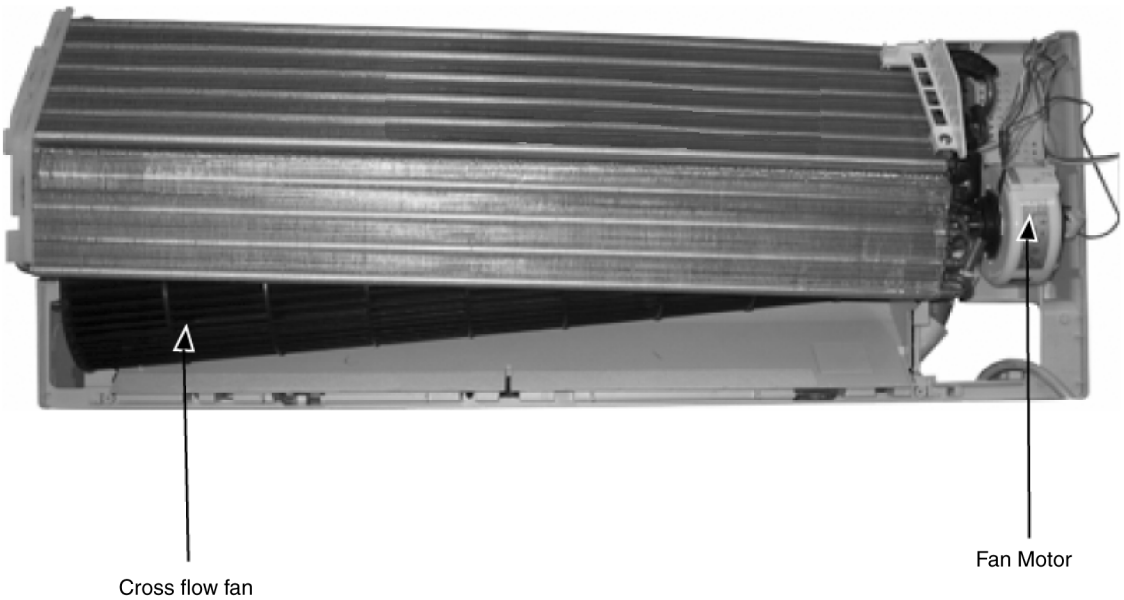


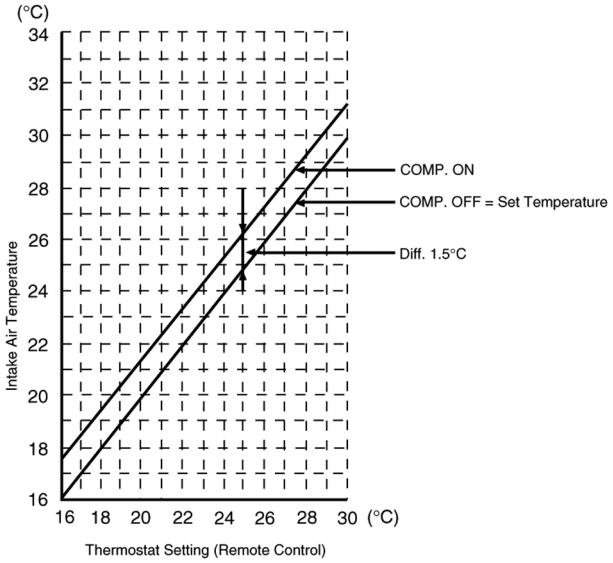
Fig. 10

- Push up the evaporator and remove cross flow fan by pulling both cross flow fan and fan motor. (Fig. 10)

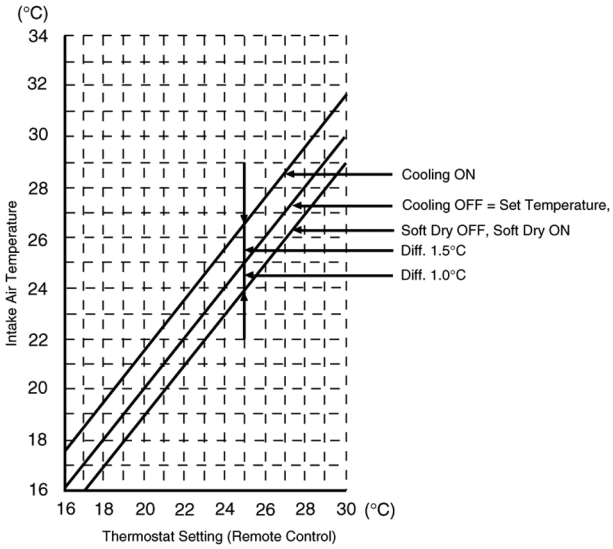
15 Technical Data

15.1. Thermostat Characteristics

Cooling



Soft Dry

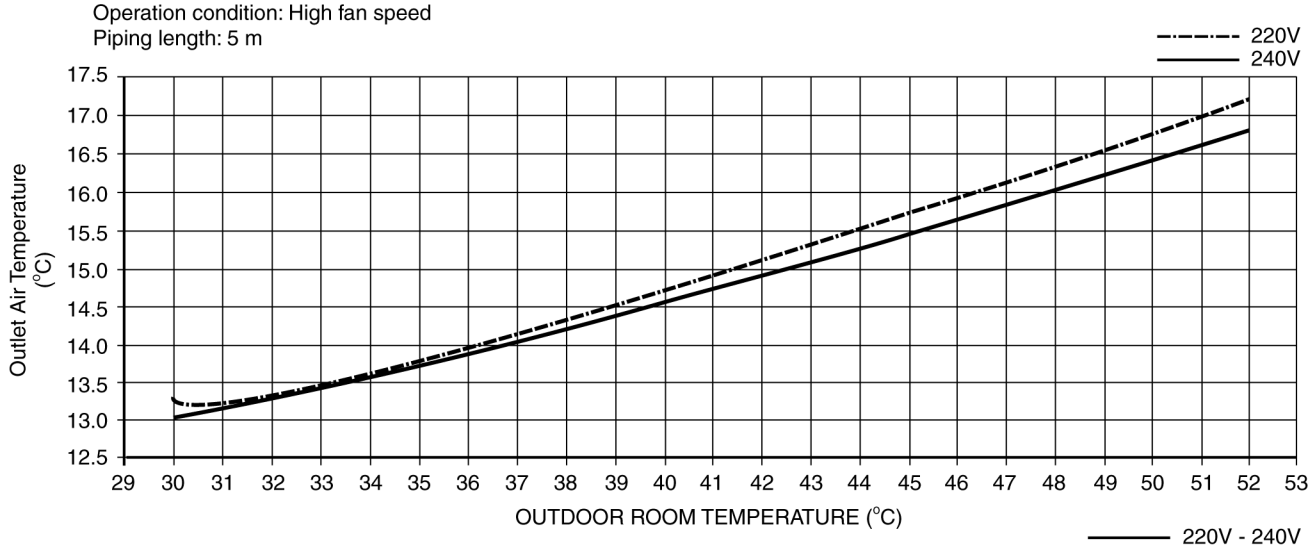


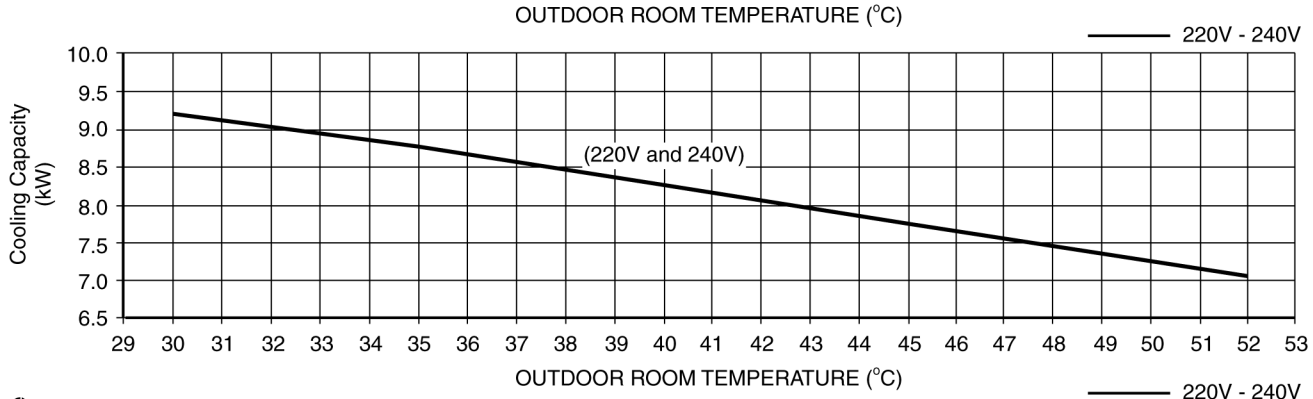
15.2. Operation Characteristics

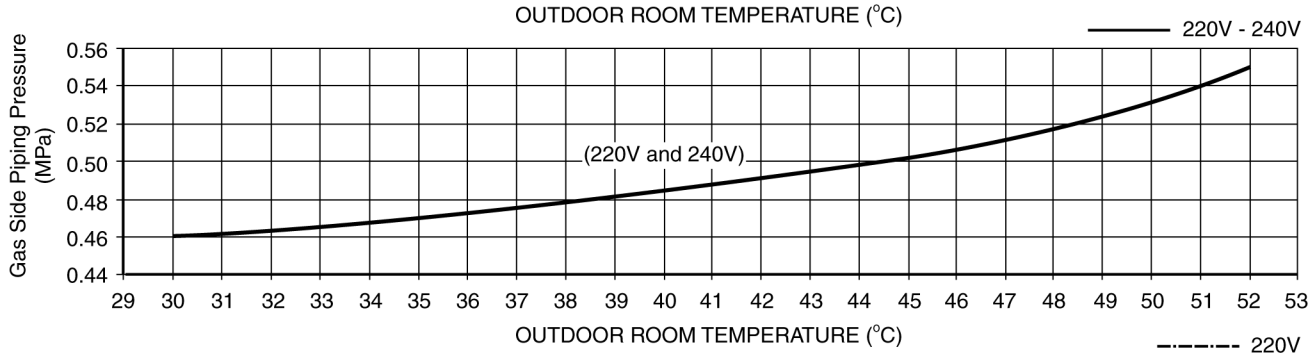
15.2.1. CS-PC30EKF CU-PC30EKF

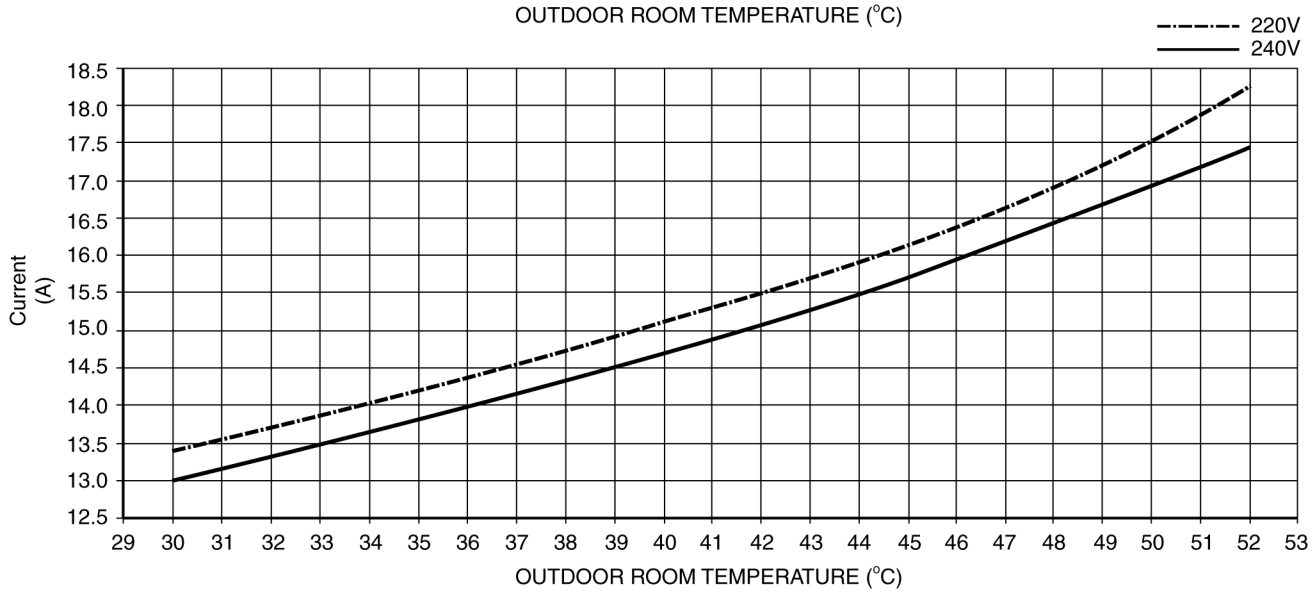
• Cooling Characteristic

[Condition] Room temperature: 27/19°C
Operation condition: High fan speed
Piping length: 5 m



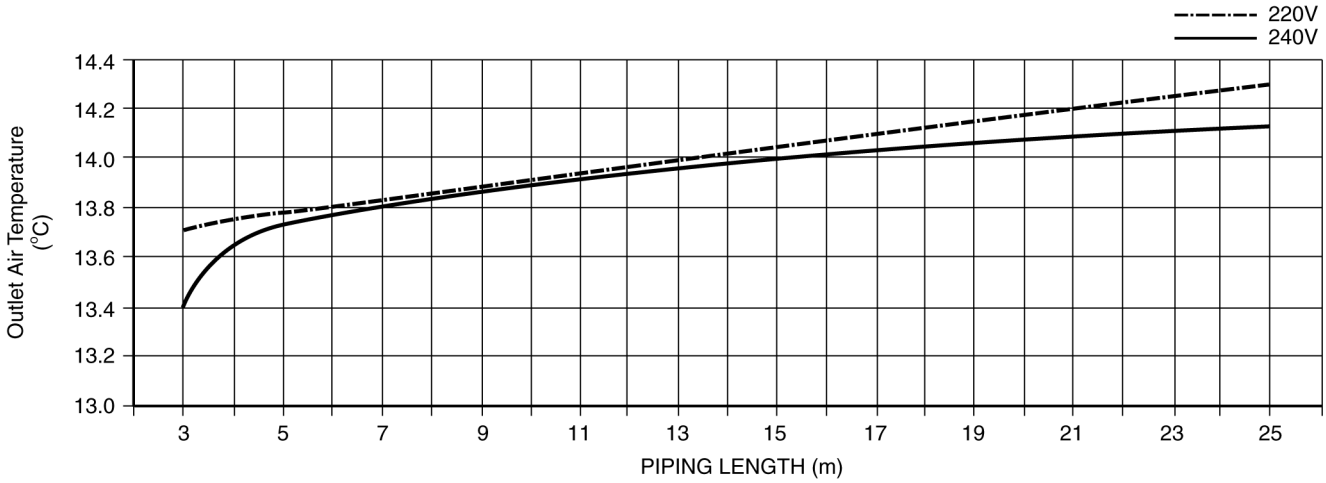


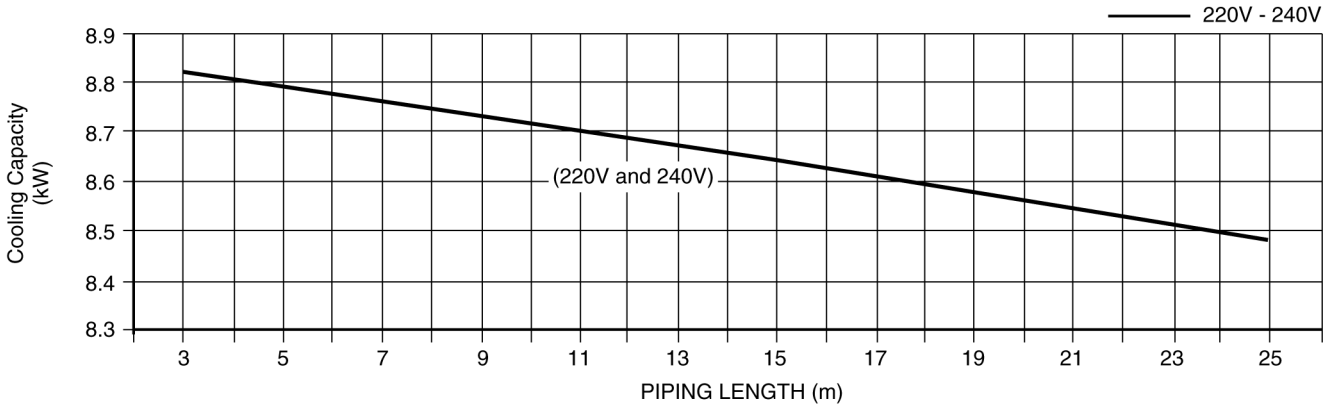


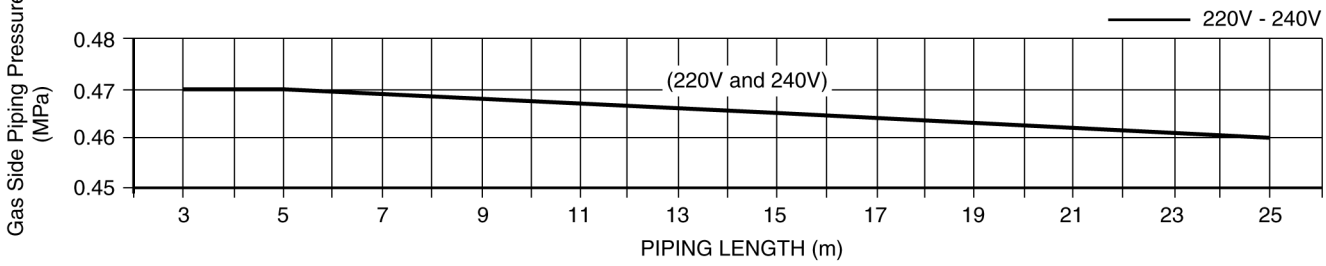


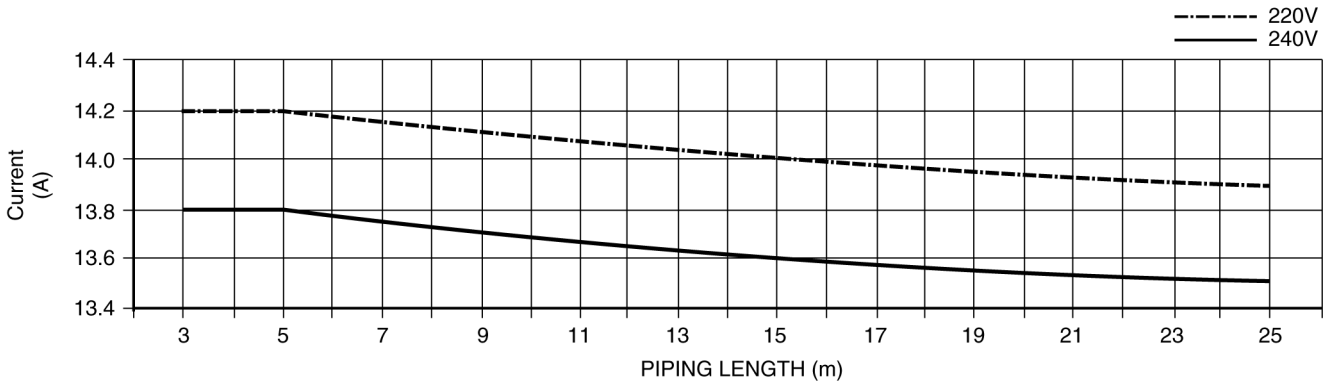
• Piping Length Characteristic

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





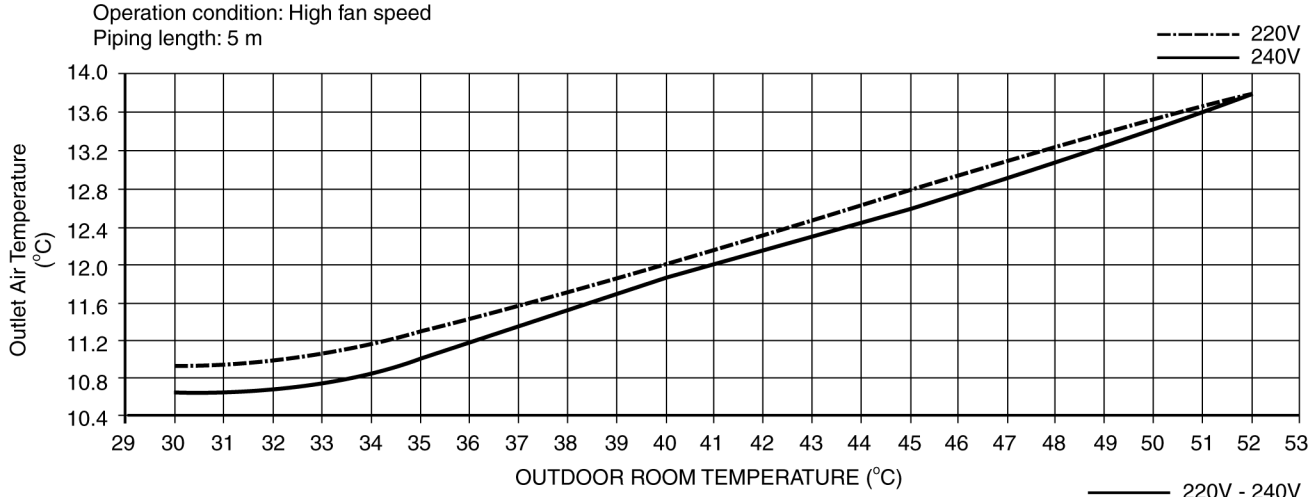


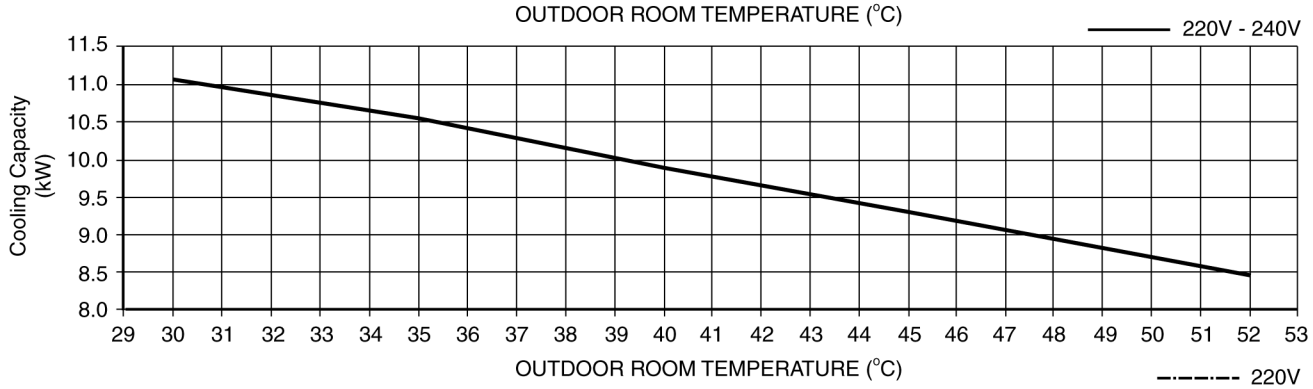


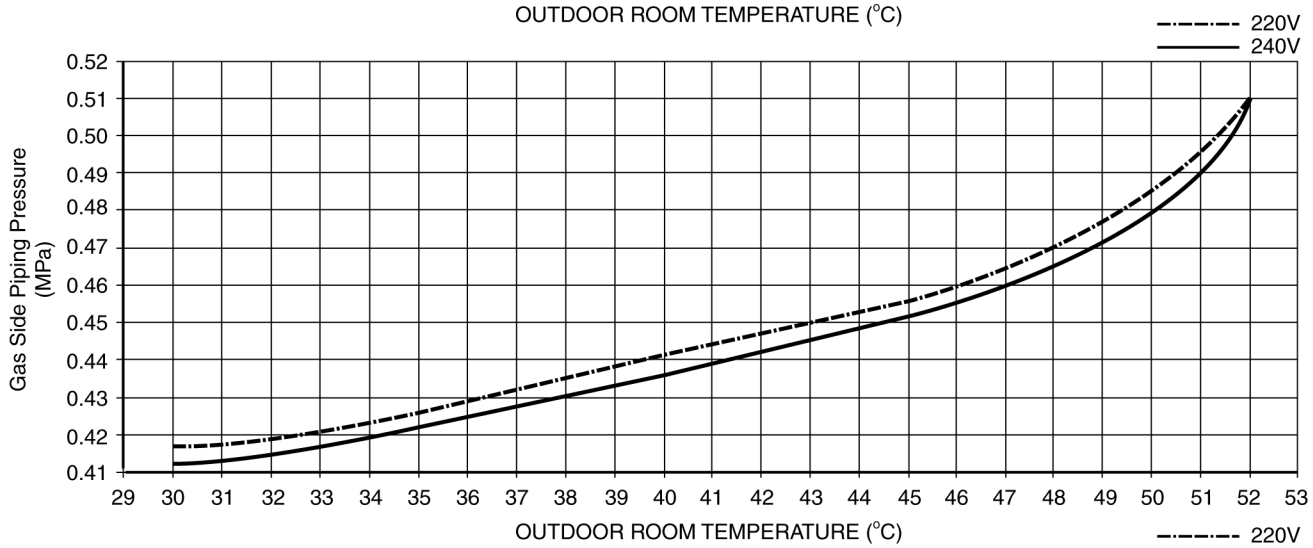
15.2.2. CS-PC36EKF CU-PC36EKF

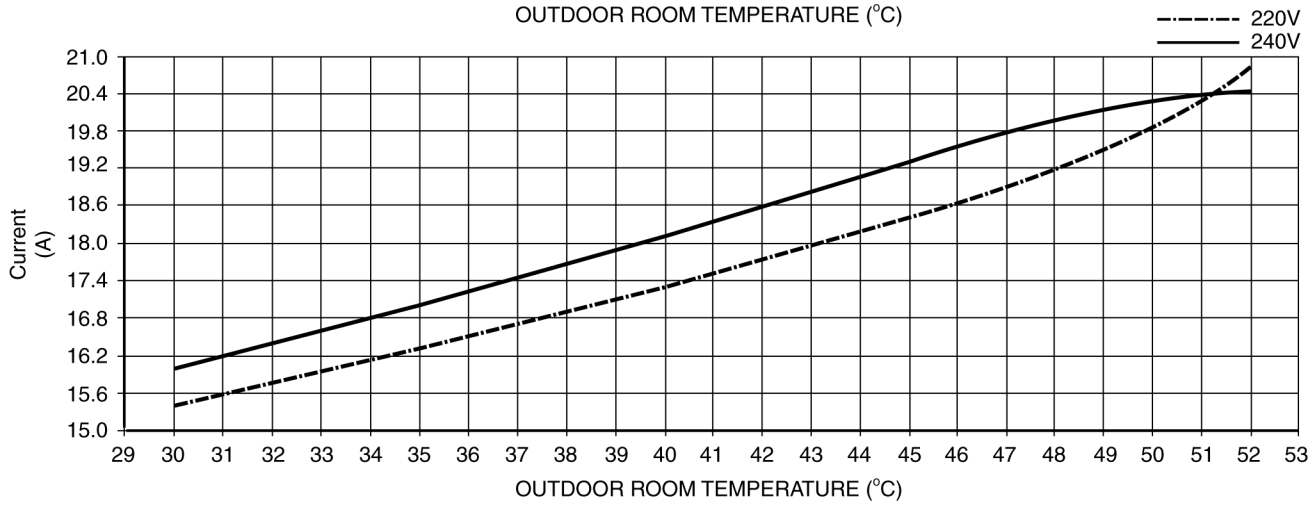
• Cooling Characteristic

[Condition] Room temperature: 27/19°C
Operation condition: High fan speed
Piping length: 5 m



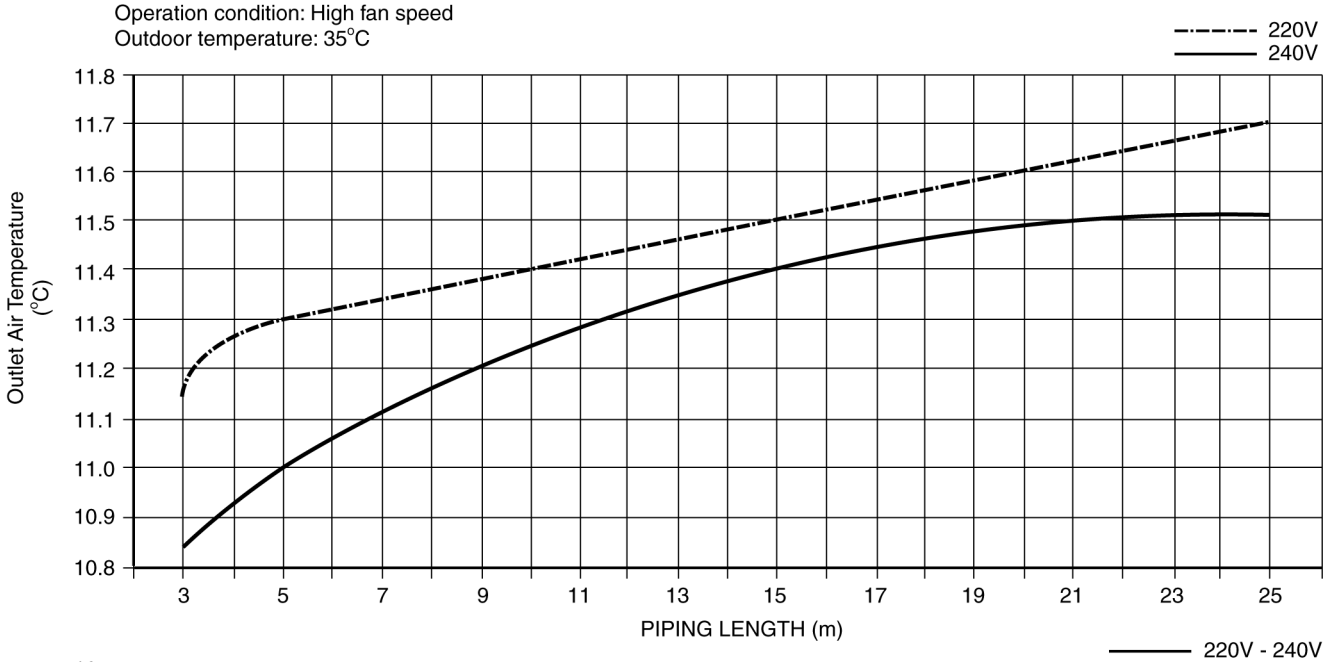


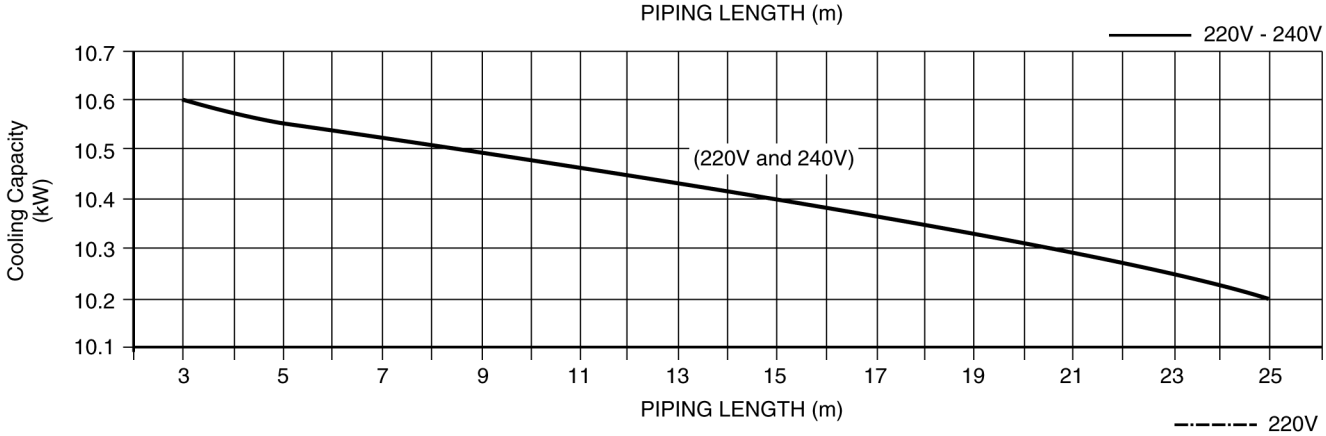


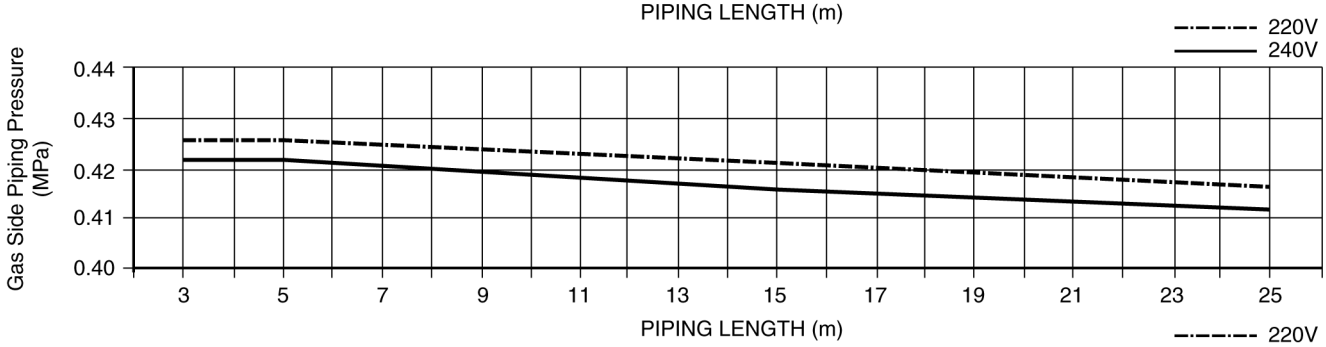


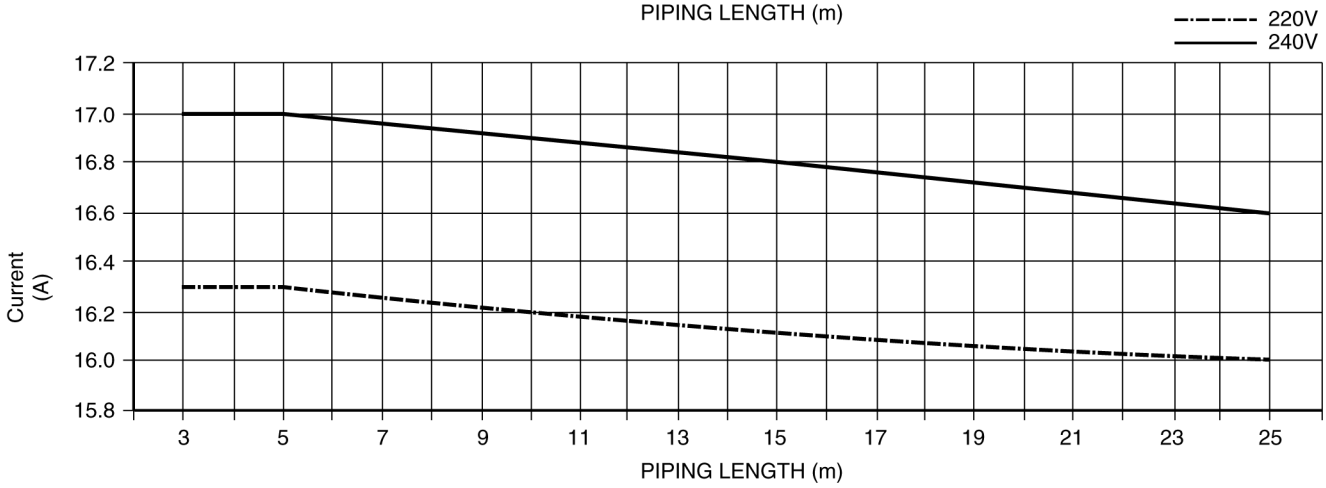
• Piping Length Characteristic

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









15.3. Discharge and Suction Pressure

15.3.1. CS-PC30EKF CU-PC30EKF

Power source : 240V, 50Hz, 1 phase

Indoor Wet Bulb Temperature	Outdoor Ambient Temperature									
	10ºC		20ºC		30ºC		40ºC		50ºC	
	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge
	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC
16	1.38	38.05	1.48	41.3	1.66	45.7	1.98	53	2.56	64.3
18	1.4	39.2	1.51	42	1.7	46.6	2.09	55.3	2.7	66.8
20	1.45	40.4	1.56	43.3	1.76	48	2.15	56.7	2.78	68.1
22	1.49	41.4	1.6	44.3	1.8	48.9	2.17	56.9	2.8	68.4

Indoor Wet Bulb Temperature	Outdoor Ambient Temperature									
	10ºC		20ºC		30ºC		40ºC		50ºC	
	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction
	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC
16	0.39	-0.58	0.4	0.34	0.41	0.93	0.42	1.23	0.56	8.98
18	0.4	0.34	0.42	1.23	1.44	2.67	0.45	3.23	0.59	10.43
20	0.42	1.23	0.44	2.67	0.47	4.34	0.48	4.88	0.62	11.83
22	0.45	3.23	0.47	4.34	0.5	5.68	0.52	6.98	0.65	13.18

15.3.2. CS-PC36EKF CU-PC36EKF

Power source : 240V, 50Hz, 1 phase

Indoor Wet Bulb Temperature	Outdoor Ambient Temperature									
	10ºC		20ºC		30ºC		40ºC		50ºC	
	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge	Discharge pressure	Saturate temperature Discharge
	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC
16	1.32	36.9	1.37	38.4	1.47	41	1.9	51.3	2.47	62.6
18	1.35	37.7	1.4	39.2	1.49	41.5	1.92	51.8	2.49	63.1
20	1.37	38.4	1.42	39.7	1.53	42.5	1.94	52.2	2.51	63.3
22	1.39	38.8	1.44	40.2	1.6	44.3	1.95	52.4	2.53	63.8

Indoor Wet Bulb Temperature	Outdoor Ambient Temperature									
	10ºC		20ºC		30ºC		40ºC		50ºC	
	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction	Suction pressure	Saturate temperature Suction
	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC	Mpa	ºC
16	0.35	-3.11	0.36	-2.41	0.37	-1.51	0.4	0.34	0.52	6.98
18	0.36	-2.41	0.38	-0.88	0.4	0.34	0.42	1.23	0.54	7.74
20	0.4	0.34	0.41	0.93	0.43	2.1	0.44	2.67	0.56	8.98
22	0.42	1.23	0.44	2.67	0.46	3.79	0.48	4.88	0.59	10.43

15.4. Fan Performance

15.4.1. CS-PC30EKF CU-PC30EKF

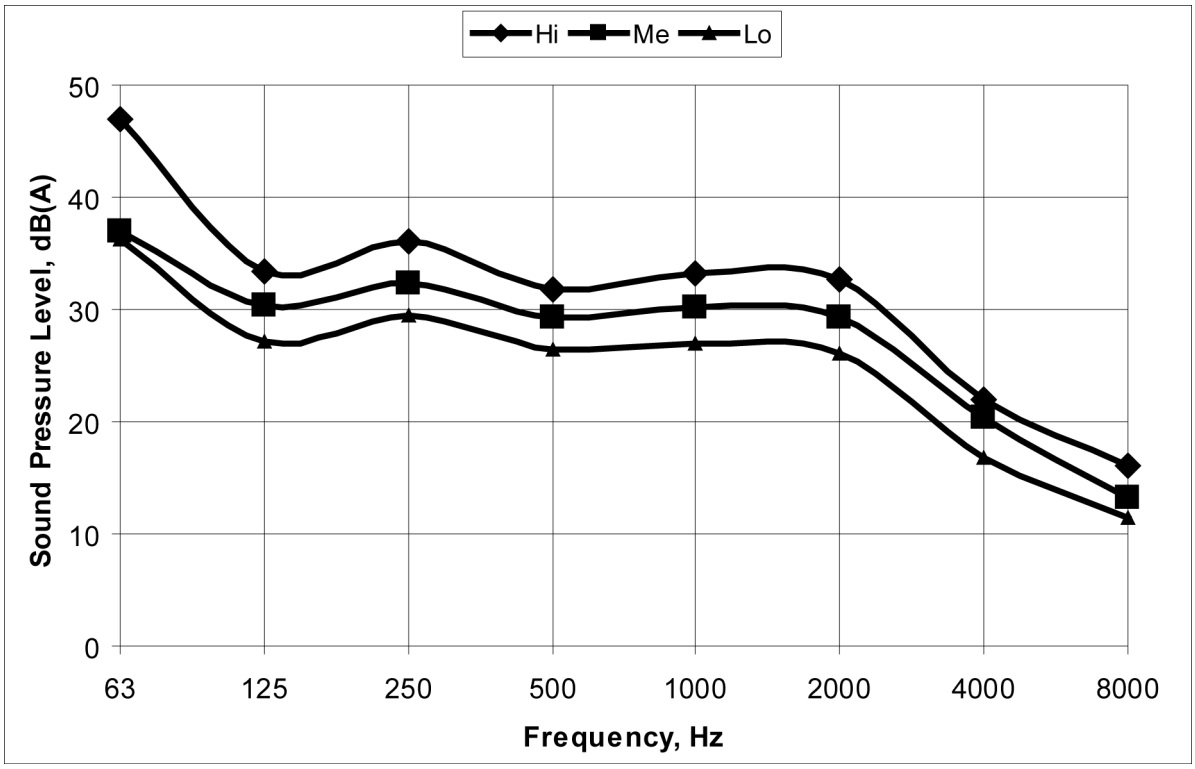
Item / Model		INDOOR			OUTDOOR
		CS-PC30EKF			CU-PC30EKF
Mode		Hi (220/240)	Me (220/240)	Lo (220/240)	Hi (220/240)
Air Volume	m^3/min	19.70	17.50	15.30	51.00/56.00
Running Current	A	0.49/0.52	0.40/0.41	0.31/0.33	0.66/0.68
Power Consumption	KW	0.06/0.06	0.04/0.04	0.03/0.03	0.14/0.16
Fan Speed	rpm	1270/1270	1170/1170	1070/1070	685/735

15.4.2. CS-PC36EKF CU-PC36EKF

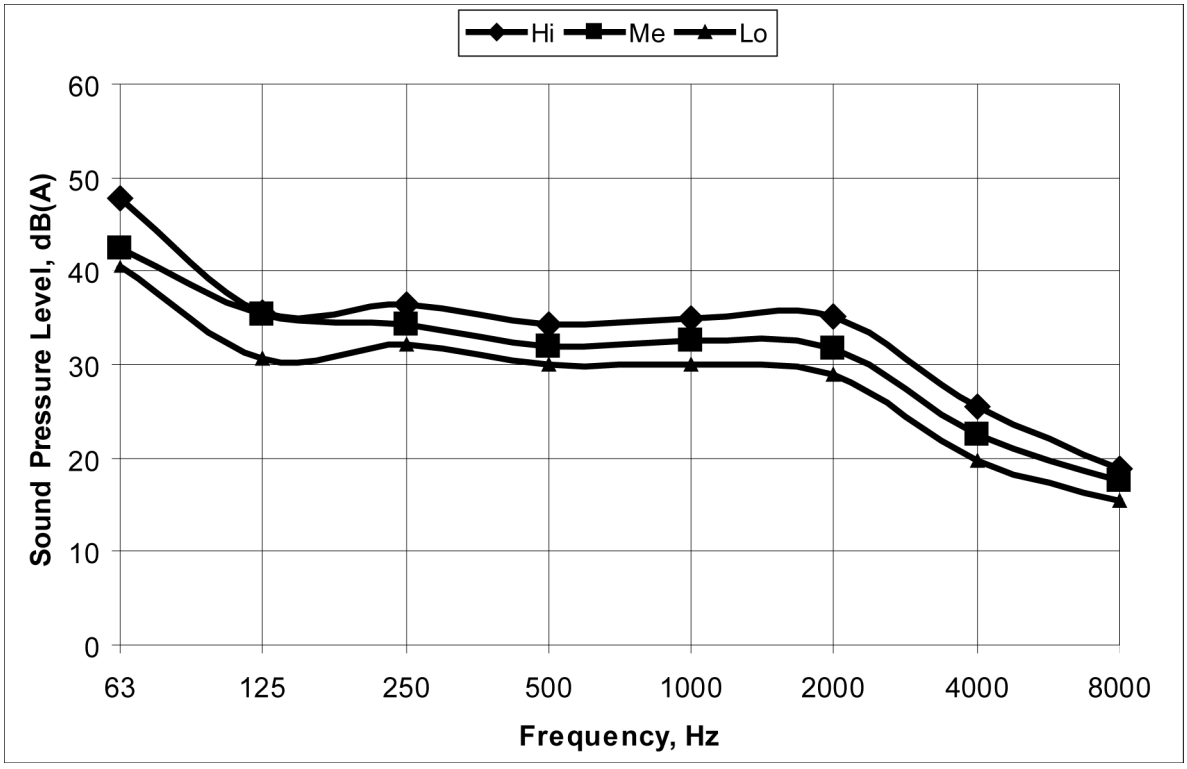
Item / Model		INDOOR			OUTDOOR
		CS-PC36EKF			CU-PC36EKF
Mode		Hi (220/240)	Me (220/240)	Lo (220/240)	Hi (220/240)
Air Volume	m^3/min	21.00	18.75	16.60	98.50/103.00
Running Current	A	0.52/0.55	0.42/0.44	0.34/0.36	0.55/0.56
Power Consumption	KW	0.06/0.06	0.05/0.05	0.04/0.04	0.12/0.13
Fan Speed	rpm	1320/1320	1220/1220	1120/1120	750/800

15.5. Sound Data

15.5.1. CS-PC30EKF CU-PC30EKF



15.5.2. CS-PC36EKF CU-PC36EKF

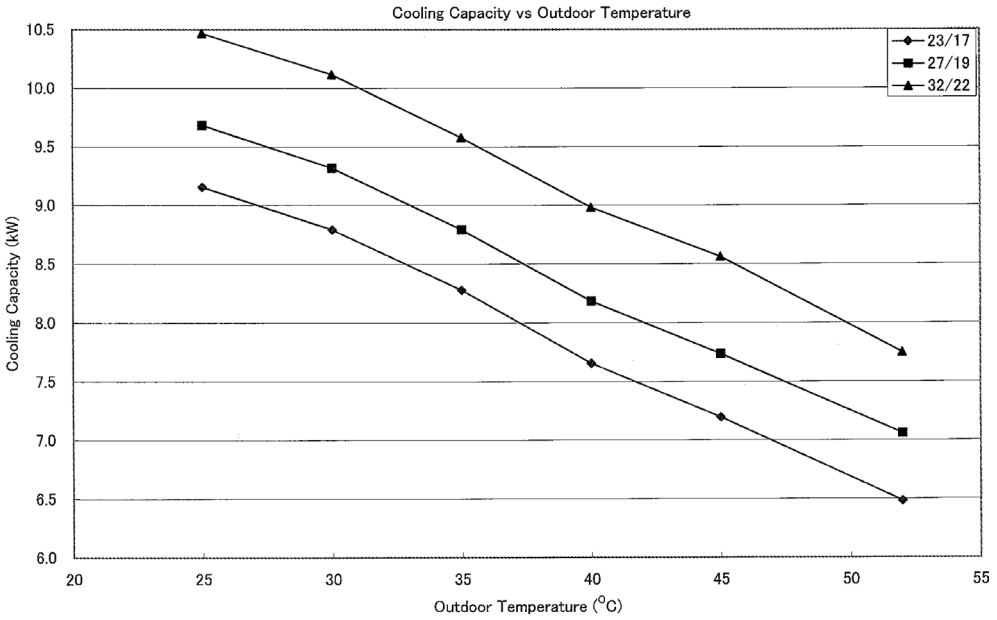


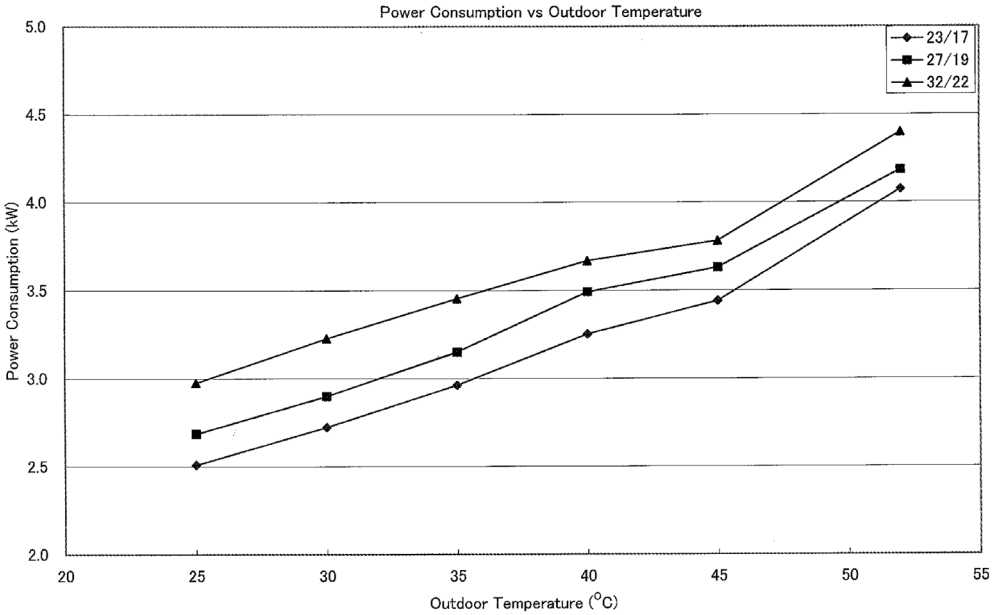
15.6. Cooling Capacity Performance Data

15.6.1. CS-PC30EKF CU-PC30EKF

Power source : 240V, 50Hz, 1 phase

Indoor Ambient Temp.		Air Temperature Entering Condenser ¡C (D.B)																	
		25℃			30℃			35℃			40℃			45℃			52℃		
		TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT
D.B.	W.B.	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW
23	17	9.1551	5.5513	2.5074	8.7900	5.6282	2.7218	8.2761	5.4487	2.9610	7.6541	5.2179	3.2508	7.1943	5.0513	3.4398	6.4803	4.1832	4.0727
	19	9.6690	4.6667	2.6586	9.3580	4.7051	2.8728	8.8847	4.6282	3.1374	8.2761	4.4744	3.4398	7.8569	4.3974	3.6414	7.2574	4.1381	4.4302
	22	10.5480	3.6026	2.8728	10.2640	3.7051	3.1122	9.8042	3.7179	3.3894	9.1686	3.6538	3.7170	8.7359	3.6410	3.9438	7.8935	3.5908	5.0015
25	17	9.0469	6.5513	2.5074	8.6953	6.4615	2.7090	8.1815	6.2436	2.9484	7.5864	6.0128	3.2256	7.1672	5.8077	3.4146	6.5556	4.7773	4.0481
	19	9.6690	5.7821	2.6712	9.3444	5.7564	2.8854	8.8306	5.6154	3.1374	8.2220	5.4231	3.4272	7.8028	5.2821	3.6414	7.1999	4.8380	4.4793
	22	10.5480	4.5513	2.8854	10.2234	4.6026	3.1122	9.7231	4.5641	3.3894	9.6459	4.4231	3.7044	8.6548	4.3846	3.9312	7.8800	4.2569	4.9885
27	17	8.9252	7.5385	2.5200	8.5872	7.4103	2.7090	8.1003	7.1410	2.9484	7.5324	6.8590	3.2004	7.1267	6.6923	3.3894	6.5475	5.6745	4.0235
	19	9.6825	6.7949	2.6838	9.3174	6.7179	2.8980	8.7900	6.5000	3.1500	8.1815	6.2821	3.4902	7.7352	6.0897	3.6288	7.0575	5.4990	4.1827
	22	10.5345	5.5000	2.8980	10.1829	5.5000	3.1248	9.6555	5.3974	3.4020	8.9658	5.1923	3.6918	8.5736	5.1154	3.9186	7.8315	4.8750	4.9754
29	17	8.9117	8.2821	2.4948	8.5872	8.0641	2.7090	8.0868	7.6667	2.9106	7.6000	7.2051	3.1248	7.2213	6.8462	3.2634	6.7198	5.3612	3.7148
	19	9.6690	7.7949	2.6712	9.3174	7.6923	2.8854	8.7900	7.4231	3.1122	8.2356	7.1538	3.3390	7.8299	6.9744	3.4776	7.2643	6.4061	4.0292
	22	10.4939	6.5128	2.9358	10.1423	6.4872	3.1878	9.5879	6.3205	3.4272	8.9793	6.1282	3.6792	8.2601	6.0128	3.8304	7.7471	5.6605	4.5892
32	17	8.8982	8.2692	2.4822	8.5872	8.1410	2.6964	7.5188	7.1282	2.8854	7.6405	7.2436	3.0744	7.2754	6.8974	3.1752	6.8137	5.4361	3.4956
	19	9.6555	9.0641	2.6586	9.3174	8.8333	2.8854	8.7900	8.3333	3.0870	8.2761	7.8462	3.2886	7.8975	7.4872	3.3894	7.4085	6.4490	3.8055
	22	10.4669	8.1410	2.9736	10.1153	8.0513	3.2256	9.5743	7.8077	3.4524	8.9793	7.5769	3.6666	8.5601	7.3846	3.7800	7.7471	6.8136	4.3974

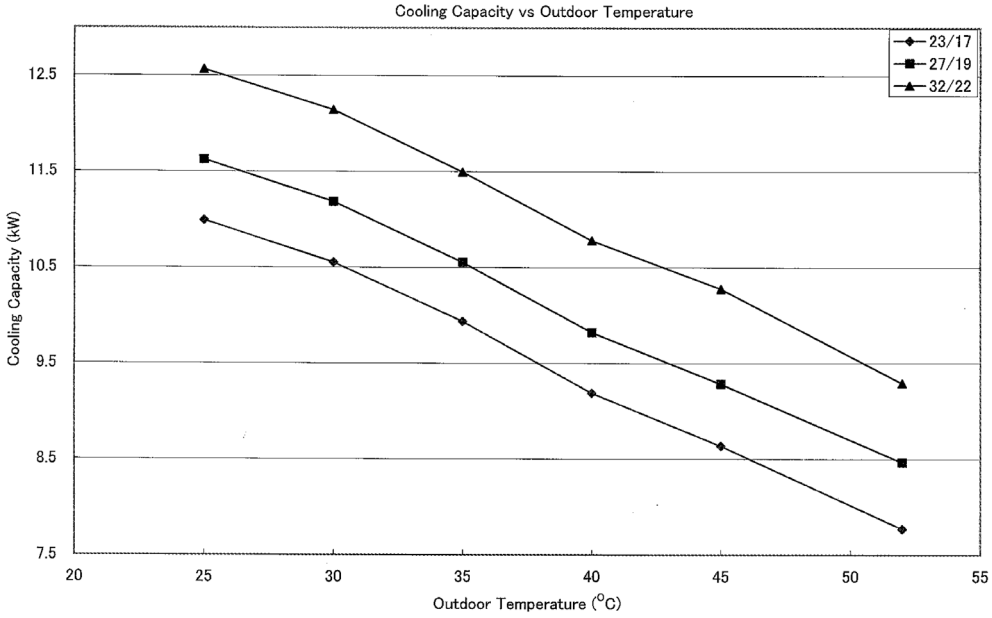


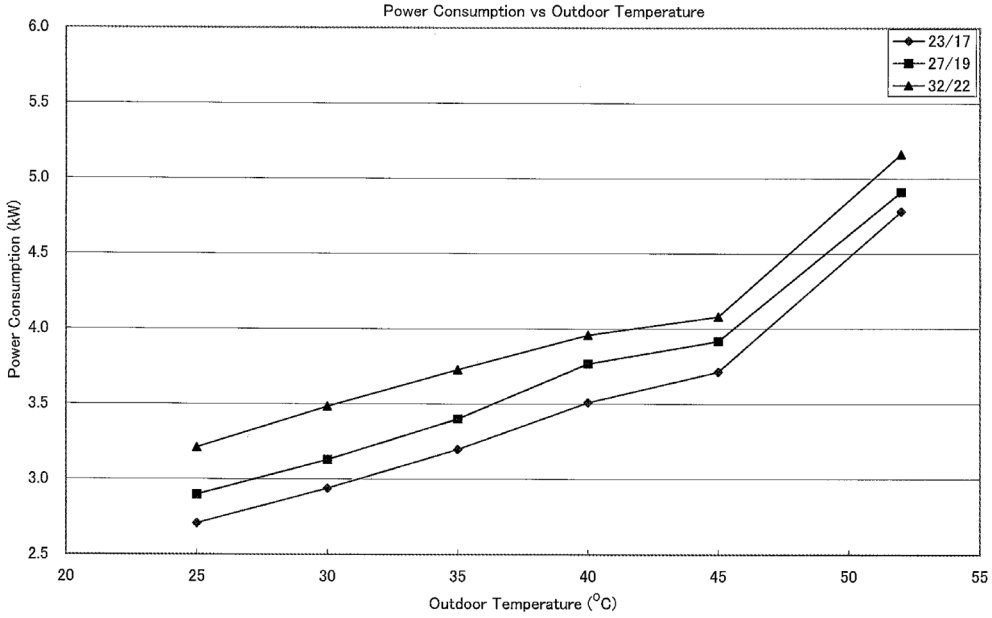


15.6.2. CS-PC36EKF CU-PC36EKF

Power source : 240V, 50Hz, 1 phase

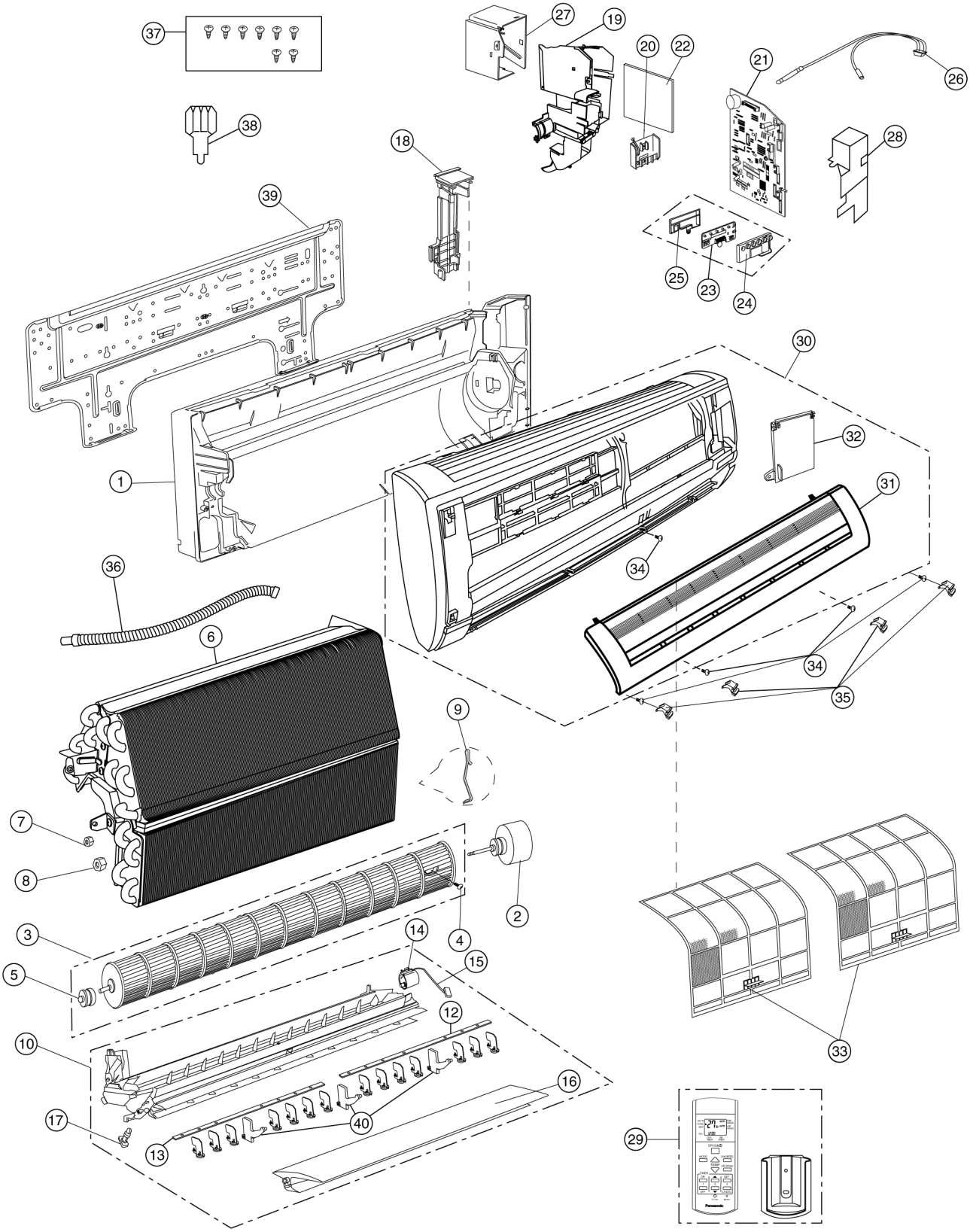
Indoor Ambient Temp.		Air Temperature Entering Condenser °C (D.B)																	
		25°C			30°C			35°C			40°C			45°C			52°C		
		TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT	TC	SHC	IPT
D.B.	W.B.	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW
23	17	10.9882	6.6786	2.7064	10.5500	6.7712	2.9376	9.9332	6.5552	3.1960	9.1866	6.2776	3.5088	8.6348	6.0771	3.7128	7.7704	5.0327	4.7800
	19	11.6050	5.6144	2.8696	11.2317	5.6606	3.1008	10.6636	5.5681	3.3864	9.9332	5.3830	3.7128	9.4301	5.2905	3.9304	8.7022	4.9784	5.1996
	22	12.6600	4.3342	3.1008	12.3192	4.4576	3.3592	11.7673	4.4730	3.6584	11.0045	4.3959	4.0120	10.4851	4.3804	4.2568	9.4649	4.3200	5.8701
25	17	10.8584	7.8817	2.7064	10.4364	7.7737	2.9240	9.8196	7.5115	3.1824	9.1055	7.2339	3.4816	8.6023	6.9871	3.6856	7.8607	5.7474	4.7511
	19	11.6050	6.9563	2.8832	11.2155	6.9254	3.1144	10.5987	6.7557	3.3864	9.8683	6.5244	3.6992	9.3652	6.3547	3.9304	8.6331	5.8205	5.2572
	22	12.6600	5.4755	3.1144	12.2705	5.5372	3.3592	11.6699	5.4910	3.6584	11.5773	5.3213	3.9984	10.3877	5.2750	4.2432	9.4487	5.1214	5.8548
27	17	10.7123	9.0693	2.7200	10.3065	8.9151	2.9240	9.7222	8.5912	3.1824	9.0405	8.2519	3.4544	8.5536	8.0514	3.6584	7.8509	6.8269	4.7222
	19	11.6212	8.1748	2.8968	11.1830	8.0822	3.1280	10.5500	7.8200	3.4000	9.8196	7.5578	3.7672	9.2840	7.3264	3.9168	8.4624	6.6157	4.9091
	22	12.6438	6.6169	3.1280	12.2218	6.6169	3.3728	11.5888	6.4935	3.6720	10.7610	6.2467	3.9848	10.2903	6.1542	4.2296	9.3906	5.8650	5.8395
29	17	10.6961	9.9639	2.6928	10.3065	9.7017	2.9240	9.7060	9.2236	3.1416	9.1217	8.6683	3.3728	8.6672	8.2364	3.5224	8.0575	6.4500	4.3599
	19	11.6050	9.3778	2.8832	11.1830	9.2544	3.1144	10.5500	8.9305	3.3592	9.8845	8.6066	3.6040	9.3976	8.3907	3.7536	8.7104	7.7070	4.7290
	22	12.5951	7.8354	3.1688	12.1731	7.8046	3.4408	11.5076	7.6041	3.6992	10.7772	7.3727	3.9712	10.2741	7.2339	4.1344	9.2894	6.8100	5.3892
32	17	10.6798	9.9485	2.6792	10.3065	9.7943	2.9104	9.0243	8.5758	3.1144	9.1704	8.7146	3.3184	8.7322	8.2981	3.4272	8.1701	6.5401	4.1027
	19	11.5888	10.9048	2.8696	11.1830	10.6272	3.1144	10.5500	10.0256	3.3320	9.9332	9.4395	3.5496	9.4788	9.0077	3.6584	8.8833	7.7587	4.4664
	22	12.5626	9.7943	3.2096	12.1406	9.6863	3.4816	11.4914	9.3933	3.7264	10.7772	9.1156	3.9576	10.2741	8.8843	4.0800	9.2894	8.1973	5.1611





16 Exploded View and Replacement Parts List

16.1. 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.

<Model: CS-PC30EKF CS-PC36EKF>

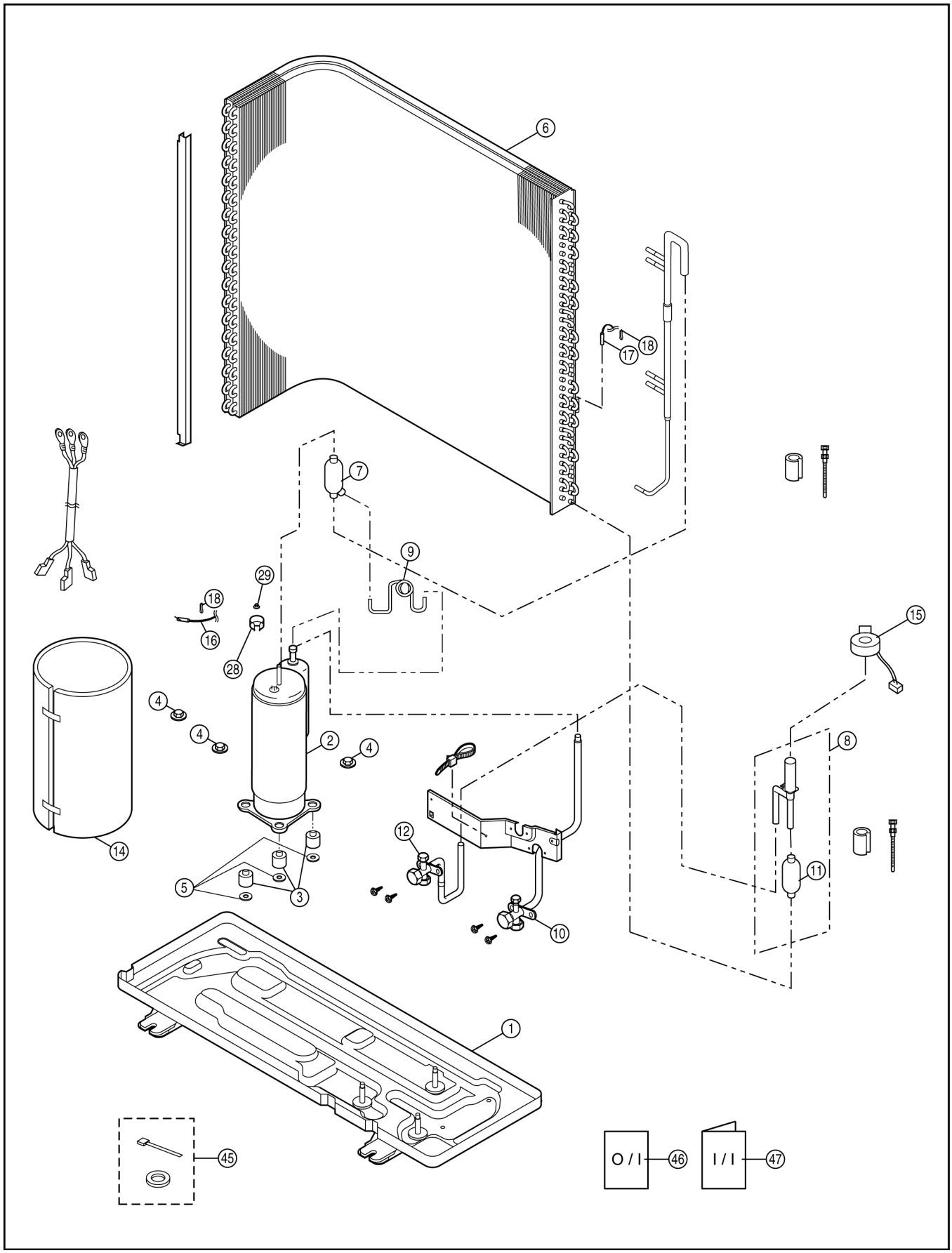
REF. NO.	PART NAME & DESCRIPTION	QTY.	CS-PC30EKF	CS-PC36EKF	REMARKS
1	CHASSY COMPLETE	1	CWD50C1477	←	
2	FAN MOTOR DC 60W 3PH	1	ARW42A8P60AC	←	O
3	CROSS FLOW FAN COMPLETE	1	CWH02C1044	←	
4	SCREW - CROSS FLOW FAN	1	CWH551146	←	
5	BEARING ASS'Y	1	CWH64K007	←	
6	EVAPORATOR COMPLETE	1	CWB30C1838	←	
7	FLARE NUT (3/8)	1	CWT251027	←	
8	FLARE NUT (5/8)	1	CWT251036	CWT251037	
9	INTAKE AIR SENSOR HOLDER	1	CWH32143	←	
10	DISCHARGE GRILLE COMPLETE	1	CWE20C2492	←	
11	VERTICAL VANE	14	CWE241196	←	
12	CONNECTING BAR	1	CWE261094	←	
13	CONNECTING BAR	1	CWE261095	←	
14	A.S.MOTOR, DC SINGLE 12V 300OHM	1	CWA981162J	←	O
15	LEAD WIRE - AIR SWING MOTOR	1	CWA67C6023	←	
16	HORIZONTAL VANE	1	CWE241197	←	
17	CAP - DRAIN TRAY	1	CWH4612103	←	
18	BACK COVER CHASSIS	1	CWD932631	←	
19	CONTROL BOARD CASING	1	CWH102299	←	
20	TERMINAL BOARD COMPLETE	1	CWA28C2246	←	O
21	ELECTRONIC CONTROLLER - MAIN	1	CWA73C2130	CWA73C2131	O
22	ELECTRONIC CONTROLLER - POWER	1	CWA744089	←	
23	ELEC. CONT. - INDICATOR AND RCVR	1	CWE39C1150	←	O
24	INDICATOR HOLDER	1	CWD932633	←	
25	INDICATOR HOLDER	1	CWD932634	←	
26	SENSOR COMPLETE	1	CWA50C2356	←	O
27	CONTROL BOARD TOP COVER	1	CWH131265	←	
28	CONTROL BOARD FRONT COVER	1	CWH131266	←	
29	REMOTE CONTROL COMPLETE	1	CWA75C2811	←	O
30	FRONT GRILLE COMPLETE	1	CWE11C3402	←	
31	INTAKE GRILLE COMPLETE	1	CWE22C1269	←	
32	GRILLE DOOR	1	CWE141092	←	
33	AIR FILTER	2	CWD001193	←	
34	SCREW - FRONT GRILLE	5	XTT4+16CFJ	←	
35	CAP - FRONT GRILLE	4	CWH521142	←	
36	DRAIN HOSE	1	CWH85284	←	
37	BAG COMPLETE - INSTALLATION SCREW	1	CWH82C1423	←	
38	BAG COMPLETE - TUBE CONNECTOR	1	CWH82C1425	←	
39	INSTALLATION PLATE	1	CWH361079	←	
40	FULCRUM	3	CWH621063	←	

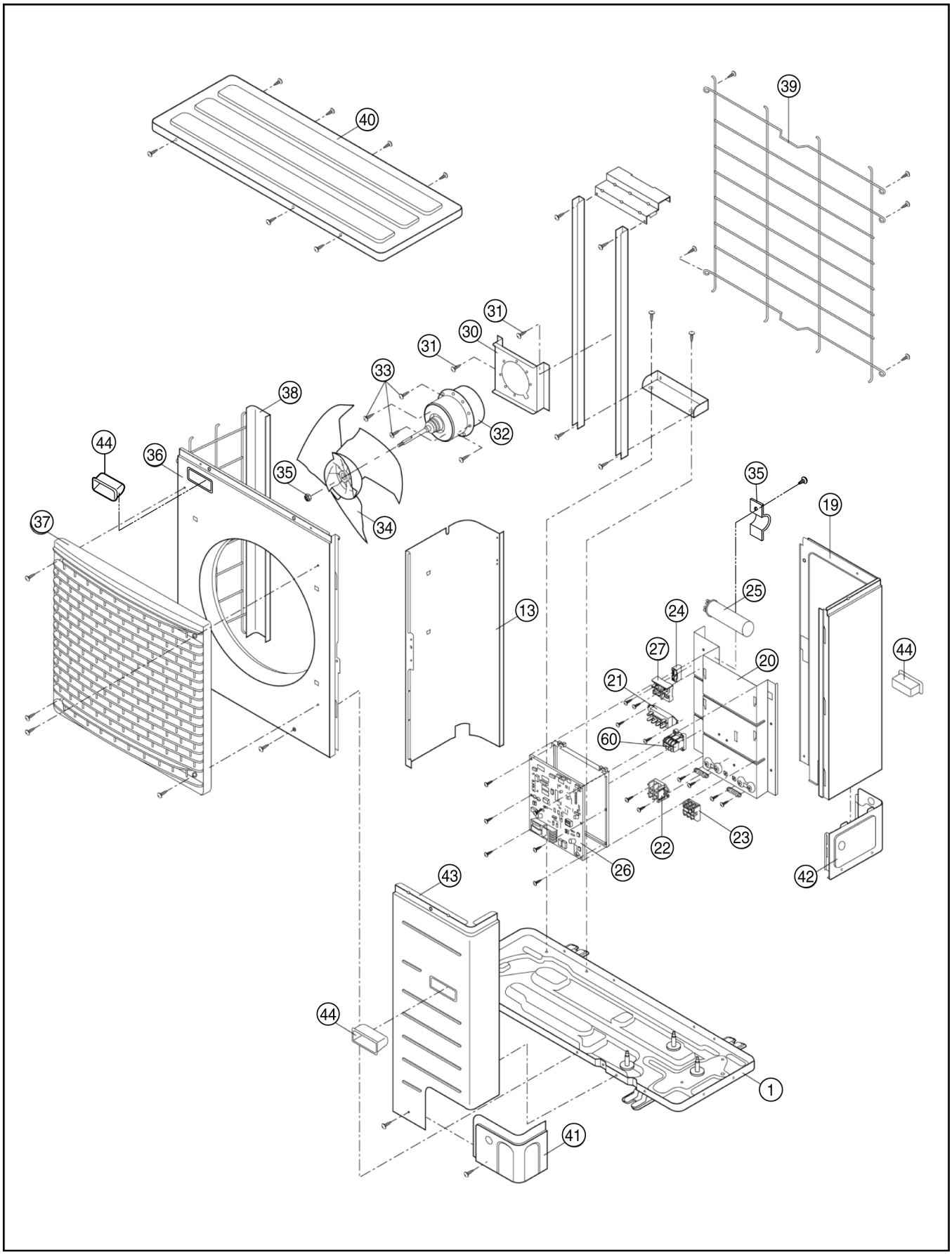
(Note)

- All parts are supplied from PHAAM, Malaysia (Vendor Code: 061).
- “O” marked parts are recommended to be kept in stock.

16.2. Outdoor Unit

16.2.1. CU-PC30EKF





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.

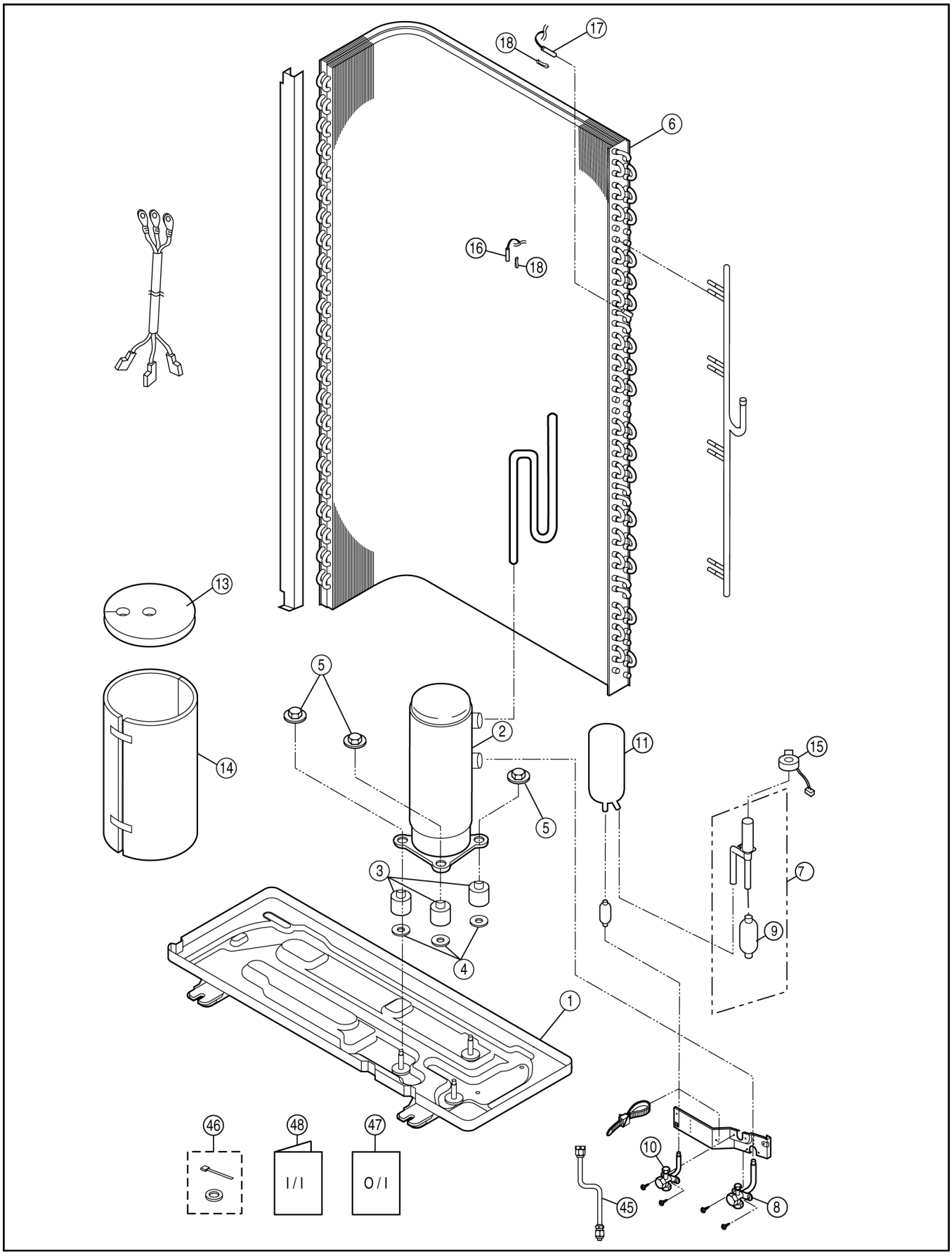
<Model: CU-PC30EKF>

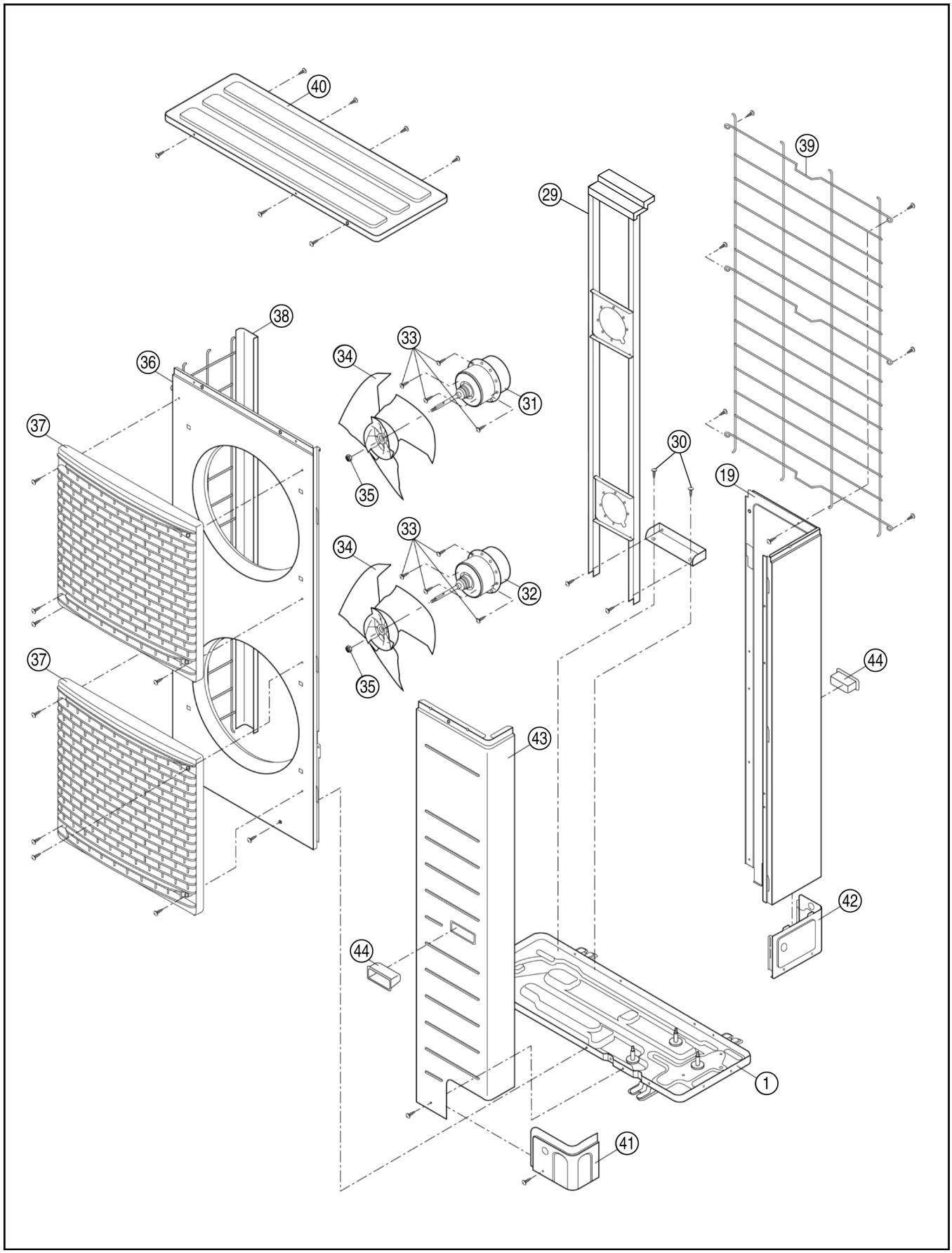
REF. NO.	PART NAME & DESCRIPTION	QTY.	CU-PC30EKF	REMARKS
1	BASE PAN ASS'Y	1	CWD52K1102	
2	COMPRESSOR	1	2JD514D5AA03	O
3	ANTI - VIBRATION BUSHING	3	CWH50055	
4	NUT FOR COMP. MOUNT.	3	CWH561049	
5	PACKING	3	CWB811017	
6	CONDENSER COMPLETE	1	CWB32C1778	
7	OIL SEPARATER	1	CWB16000	
8	TUBE ASS'Y (EXP. VALVE STRAINER)	1	CWT01C3691	
9	TUBE ASS'Y (CAPILLARY TUBE)	1	CWT024153	
10	3-WAYS VALVE (GAS)	1	CWB011429	O
11	STRAINER	1	CWB11061	
12	3-WAYS VALVE (LIQUID)	1	CWB011294	O
13	SOUND PROOF BOARD	1	CWH151078	
14	SOUND PROOF MATERIAL - COMP	1	CWG302372	
15	V-COIL COMPLETE	1	CWA43C2128J	
16	PIPE SENSOR (DISCHARGE)	1	CWA50C2292	
17	PIPE SENSOR (COIL)	1	CWA50C2293	
18	SPRING FOR SENSOR	2	CWH711010	
19	CABINET REAR PLATE	1	CWE02C1033	
20	CONTROL BOARD	1	CWH10K1078	
21	MAGNETIC RELAY	1	K6C2A9A00001	
22	TERMINAL BOARD ASS'Y	1	CWA28K1107	
23	TERMINAL BOARD ASS'Y	1	CWA28K1076J	
24	CAPACITOR - FM (3.0MF/460V)	1	DS461305QP-A	O
25	CAPACITOR - COMP. (60MF/440V)	1	DS441606CPNA	O
26	ELECTRONIC CONTROLLER - MAIN	1	CWA73C2132R	O
27	TRANSFORMER	1	CWA401060	
28	TERMINAL COVER	1	CWH171012	
29	NUT FOR TERMINAL COVER	1	CWH7080300J	
30	BRACKET - FAN MOTOR	1	CWD54K1027	
31	SCREW - BRACKET FAN MOTOR	2	CWH551040J	
32	FAN MOTOR	1	CWA951513	O
33	SCREW - FAN MOTOR	4	CWH551040J	
34	PROPELLER FAN	1	CWH001019	
35	NUT FOR PROPELLER FAN	1	CWH561038J	
36	CABINET FRONT PLATE	1	CWE061118A	
37	DISCHARGE GRILLE	1	CWE201073	
38	CABINET SIDE PLATE ASS'Y	1	CWE04K1019A	
39	WIRE NET	1	CWD041063A	
40	CABINET TOP PLATE COMPLETE	1	CWE03C1032	
41	PIPE COVER (FRONT)	1	CWD601074A	
42	PIPE COVER (BACK)	1	CWD601081A	
43	CABINET FRONT PLATE COMPLETE	1	CWE06C1131	
44	HANDLE	3	CWE161008	
45	WIRING COVER AND BAND	1	CWH82C1105	
46	OPERATION INSTRUCTION	1	CWF565152	
47	INSTALLATION INSTRUCTION	1	CWF612934	

(Note)

- All parts are supplied from PHAAM, Malaysia (Vendor Code: 061).
- "O" marked parts are recommended to be kept in stock.

16.2.2. CU-PC36EKF

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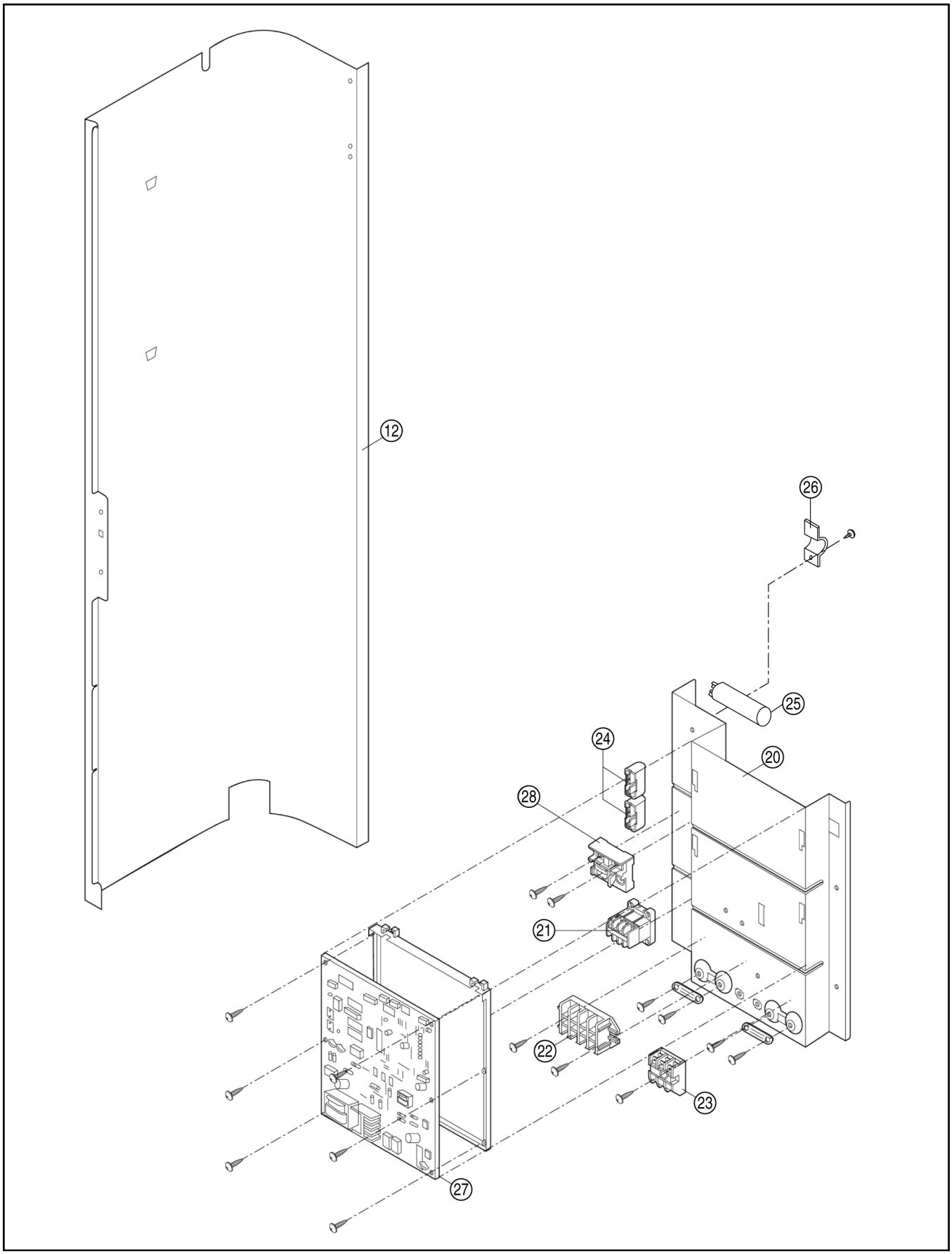

Note:
The above exploded view is for the purpose of parts disassembly and replacement.
The non-numbered parts are not kept as standard service parts.

<Model: CU-PC36EKF>

REF. NO.	PART NAME & DESCRIPTION	QTY.	CU-PC36EKF	REMARKS
1	BASE PAN ASS'Y	1	CWD52K1157	
2	COMPRESSOR	1	ZR47K3PFJ512	O
3	ANTI - VIBRATION BUSHING	3	CWH501020	
4	PACKING	3	CWB811017	
5	NUT FOR COMP. MOUNT.	3	CWH561049	
6	CONDENSER COMPLETE	1	B32C1773	
7	TUBE ASS'Y (EXP. VALVE + STRAINER)	1	CWT01C3770	
8	3-WAYS VALVE (GAS)	1	CWB011295	O
9	STRAINER	1	CWB11061	
10	3-WAYS VALVE (LIQUID)	1	CWB011299	O
11	RECEIVER	1	CWB141022	
12	SOUND PROOF BOARD	1	CWH151079	
13	SOUND PROOF MATERIAL	1	CWG302311	
14	SOUND PROOF MATERIAL	1	CWG302371	
15	V-COIL COMPLETE	1	CWA43C2203	
16	PIPE SENSOR (DISCHARGE)	1	CWA50C2293	
17	PIPE SENSOR (COIL)	1	CWA50C2294	
18	SPRING FOR SENSOR	2	CWH711010	
19	CABINET REAR PLATE	1	CWE02C1034	
20	CONTROL BOARD	1	CWH10K1070	
21	COMPRESSOR RELAY	1	K6C5E8A00001	
22	TERMINAL BOARD ASS'Y	1	CWA28K1107	
23	TERMINAL BOARD ASS'Y	1	CWA28K1076J	
24	CAPACITOR - FAN MOTOR (3/460)	2	DS461305QP-A	O
25	CAPACITOR - COMP.	1	DS441606CPNA	O
26	HOLDER CAPACITOR	1	CWH30071	
27	ELECTRONIC CONTROLLER - MAIN	1	CWA73C2133R	O
28	TRANSFORMER	1	CWA401060	
29	BRACKET - FAN MOTOR	1	CWD54K1026	
30	SCREW - BRACKET FAN MOTOR	2	CWH551040J	
31	FAN MOTOR AC 70W SINGLE	1	CWA951366	O
32	FAN MOTOR AC 70W SINGLE	1	CWA951403	O
33	SCREW - FAN MOTOR	8	CWH551040J	
34	PROPELLER FAN ASS'Y	2	CWH03K1017	
35	NUT FOR PROPELLER FAN	2	CWH561038J	
36	CABINET FRONT PLATE	1	CWE061092A	
37	DISCHARGE GRILLE	2	CWE201075	
38	CABINET SIDE PLATE	1	CWE04K1022A	
39	WIRE NET	1	CWD041064A	
40	CABINET TOP PLATE COMPLETE	1	CWE03C1032	
41	PIPE COVER (FRONT)	1	CWD601074A	
42	PIPE COVER (BACK)	1	CWD60K1003A	
43	CABINET FRONT PLATE	1	CWE06C1163	
44	HANDLE	2	CWE161008	
45	TUBE ASS'Y. (FLARE NUT - LIQ. SIDE)	1	CWT01C3768	
46	WIRING COVER AND BAND	1	CWH82C1105	
47	OPERATING INSTRUCTION	1	CWF565152	
48	INSTALLATION INSTRUCTION	1	CWF612934	

(Note)

- All parts are supplied from PHAAM, Malaysia (Vendor Code: 061).
- "O" marked parts are recommended to be kept in stock.