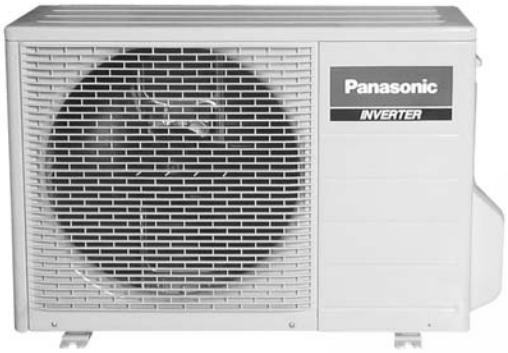
Order No. GMAC0506048C3

Service Manual

Air Conditioner



CS/CU-PE9DKE
CS/CU-PE12DKE

⚠ 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-techical 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 Features

- High Efficiency
- Enviromental Friendly (For Refrigerant : R410A Model)
  Zero ozone depleting potential and low global warming potential by using R410A refrigerant.
- Air Quality Indicator
- Comfort Environment
  Air filter with function to reduce dust and smoke
- Auto Restart Control
  Automatically restart after power failure
- Removable and washable Front Panel
- 12-hour Timer Setting
  Delay ON Timer and OFF Timer
- Breakdown Self Diagnosis function

2 Functions

Remote Control

OFF/ON

Operation START/STOP

- Turn on/off the air conditionor
- When stop the operation by pressing OFF/ON button,the cursor key points to OFF.

MODE

Operation Mode Selection

- Automatic Mode Operation
- Heating Mode Operation
- Cooling Mode Operation
- Soft Dry Mode Operation

FAN SPEED

Indoor Fan Speed Selection

- Low Speed
- Med- Speed
- Med Speed
- Med+ Speed
- High Speed
- Automatic Speed

A,B

Time Changing Button

- Change the setting time.

AIR SWING

Airflow Direction Control

- Horizontal Airflow Direction Control
  -Auto Control
  -Manual Control
- Vertical Airflow Direction Manual Control

TEMP

Room Temperature Setting

- Temperature Setting(16℃ to 30℃)
- Auto Operation

TIMER OFF/ON

Timer Operation Selection

- Stop/Start Operation Control
  (set the ON/OFF Timer hourly later)

TIMER SET/ CANCEL

Set /Cancel Timer Operation

- Set timer/Cancel the set timer
- By pressing SET button for 5seconds continuously to switch to set the sensor sensitivity.

CHECK

Check Point

- Self diagnosis function

ERROE RESET

ERROE Reset Point

- To reset the indoor unit.

RESET

Reset Point

- Clear memory data

Indoor Unit

Auto Switch Button

Power Switch ON/OFF

- When the remote control cannot be used or for repairing and testing ,please use this button.

Force Cooling Operation

- Keep pressing this button for 5 seconds to start the force cooling operation.

Force Heating Operation

- Keep pressing this button for 8 seconds to start the force heating operation.

Different Remote Controlling Setting

- Keep pressing this button for11 to change different remote controlling setting(A◂▸B) Mode.

Signal Receiving Sound

- Keep pressing this button for 16 seconds to turn off or turn on the signal receiving sound or H14 Abnormality Detection Mode.

Operation Indication Lamps

- Power (green) ..... Lights up in operation; Blinks during Hot Start operation and determining Auto Operation mode
- Timer(orange) ..... Light up in Timer Setting. Blinks in Self Diagnosis Control
- Air quality: Green / Orange / Red

Operation Mode

- Cooling/Heating/Soft Dry /Auto Operation

Anti-freezing Control for the Evaporator

- Cooling or Soft Dry Operation

Time Delay Safety Control

- The unit will restart operation in 3-4 minutes after each pause.

Warm Booting Control

- Indoor fan starts running when indoor piping temperature reaches 19℃ or above.

Indoor Fan Speed Control

- High,Med+, Med, Med-,Low
- Auto Fan Speed

Airflow Direction Control

- Automatic Airflow Direction Control
  The louver automatically swings up and down
- Five Manual Airflow Direction Control

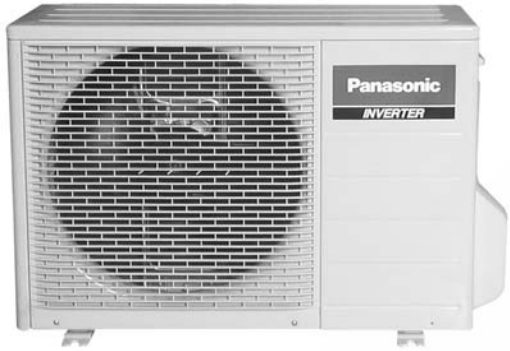
Delayed On-timer Control

- For cooling or soft dry mode, the unit starts 15 minutes before the set time with the remote control, but for heating mode 30 minutes before the set time.

Automatic Restart Control

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

Outdoor Unit



4-way Valve Control

- If the unit is stopped during Heating Operation, the 4-way valve will remain in heating mode operation for 3 minutes.

Overload Protector

- Inner protector

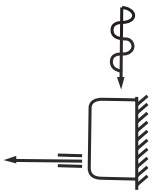
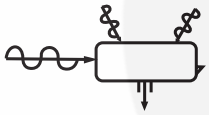
30 Seconds Forced Operation Control

- Once the compressor is activated, it does not stop within 30 seconds. It stops immediately with remote control ON/OFF button.

Total Running Current Control

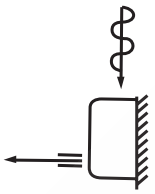
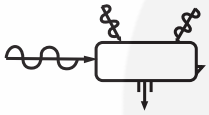
Deice Operation

3 Product Specifications

			Unit	CS-PE9DKE	CU-PE9DKE
Cooling Capacity			kW	2.50(0.90-3.00)	
Heating Capacity			kW	3.30(0.90-4.00)	
Moisture Removal			L /h	-	
Power Source			Phase V Cycle	Single 230 50	
Airflow Method			OUTLET INTAKE	SIDE VIEW 	TOP VIEW 
Air Circulation	Indoor Air (low)		m^3/min	6	-
	Indoor Air (medium)		m^3/min	7.7	-
	Indoor Air (high)		m^3/min	9.8	-
	Outdoor Air		m^3/min	-	22.5
Noise Level			dB(A)	Cooling:high42,Low27 Heating:high42,Low27	Cooling:high46 Heating:high47
Electrical Data	Input		W	Cooling:730(190-1000) Heating:820(170-1110)	
	Running Current		A	Cooling:3.4 Heating:3.7	
	EER/COP		W/W	Cooling:2.95(2.58-4.05) Heating:3.46(3.10-4.53)	
	Starting Current		A	3.7	
Piping Connection Port(Flare piping)			Inch Inch	G:half union3/8" L:half union1/4"	G:3-way valve3/8" L:2-way valve1/4"
Piping Size(Flare piping)			Inch Inch	G:gas side3/8" L:liquid side1/4"	G:gas side3/8" L:liquid side1/4"
Drain Hose	Inner Diameter		mm	12	-
	Length		m	0.65	-
Power Supply Cord Length (Number of core-wire)			m	1.9 3 core-wire/1.5mm^2	- -
Dimensions	Height		mm	280	540
	Width		mm	799	780
	Depth		mm	183	289
Net Weight			kg	8	30
Compressor	Type			-	Rotary(1 cylinder) Rolling piston type
	Motor Type			-	Induction(6 poles)
	Rated output		W	-	650
Air Circulation	type			Cross-flow fan	Propeller fan
	Motor type			Induction(8poles)	Induction(6 poles)
	Input		W	-	-
	Rated Output		W	30	15
	Fan Speed	Low	rpm	840±60	-
		Med	rpm	1080±60	-
		High	rpm	1370±60	670±60

		Unit	CS-PE9DKE	CU-PE9DKE
Heat Exchanger	Description		Evaporator	Condenser
	Tube Material		Copper	Copper
	Fin Type		Slot type	Corrugation type
	Rows/Stage		(Plate fin configuration,forced draft) 2 x 15	1X24
	FPI		20	18.5
	Dimensions	mm	610x252x25.4	726x504x18.2
Refrigerant Control Device			-	Capillary Tube
Refrigeration Oil		(c.c)	-	RB68A or Freol Alpha68M
Refrigerant (R410A)		g	-	840
Thermostat			Electronic Control	sensor
Protection Device			-	Inner protector
Capillary	Length	mm	-	600±10
	Circulation	L/min	-	8.15±0.2
	Inner Diameter	mm	-	1.3
Air Filter			P.P. Honeycomb	
Refrigerant Circulation Control Device			Capillary	
Fan Motor Capacitor		μF , V		1.2μF , 450V

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

			Unit	CS-PE12DKE	CU-PE12DKE
Cooling Capacity			kW	3.15(0.90-3.80)	
Heating Capacity			kW	4.10(0.90-5.00)	
Moisture Removal			L /h	-	
Power Source			Phase V Cycle	Single 230 50	
Airflow Method			OUTLET  INTAKE 	SIDE VIEW 	TOP VIEW 
Air Circulation	Indoor Air (low)		m^3/min	6.8	-
	Indoor Air (medium)		m^3/min	8.4	-
	Indoor Air (high)		m^3/min	9.9	-
	Outdoor Air		m^3/min	-	27.4
Noise Level			dB(A)	Cooling:high42,Low30 Heating:high42,Low33	Cooling:high48 Heating:high50
Electrical Data	Input		W	Cooling:900(190-1270) Heating:1110(170-1410)	
	Running Current		A	Cooling:4.2 Heating:4.9	
	EER/COP		W/W	Cooling:2.98(2.57-4.05) Heating:3.18(3.07-4.53)	
	Starting Current		A	4.9	
Piping Connection Port(Flare piping)			Inch Inch	G:half union3/8" L:half union1/4"	G:3-way valve3/8" L:2-way valve1/4"
Piping Size(Flare piping)			Inch Inch	G:gas side3/8" L:liquid side1/4"	G:gas side3/8" L:liquid side1/4"
Drain Hose	Inner Diameter		mm	12	-
	Length		m	0.65	-
Power Supply Cord Length (Number of core-wire)			m	1.9 3 core-wire/1.5mm^2	- -
Dimensions	Height		mm	280	540
	Width		mm	799	780
	Depth		mm	183	289
Net Weight			kg	8	34
Compressor	Type			-	Rotary(1 cylinder) Rolling piston type
	Motor Type			-	Induction(6 poles)
	Rated output		W	-	650
Air Circulation	type			Cross-flow fan	Propeller fan
	Motor type			Induction(8poles)	Induction(6 poles)
	Input		W	-	-
	Rated Output		W	30	25
	Fan Speed	Low	rpm	950±60	-
		Med	rpm	1170±60	-
		High	rpm	1380±60	770±60

		Unit	CS-PE12DKE	CU-PE12DKE
Heat Exchanger	Description		Evaporator	Condenser
	Tube Material		Copper	Copper
	Fin Type		Slot type	Corrugation type
	Rows/Stage		(Plate fin configuration,forced draft) 2 x 15	2X24
	FPI		20	17
	Dimensions	mm	610x252x25.4	$\frac{726}{696}$ X504x18.2
Refrigerant Control Device			-	Capillary Tube
Refrigeration Oil		(c.c)	-	RB68A or Freol Alpha68M
Refrigerant (R410A)		g	-	1020
Thermostat			Electronic Control	-
Protection Device			-	Inner protector
Capillary	Length	mm	-	300±10 565±20
	Circulation	L/min	-	11.3±0.2 12.3±0.2
	Inner Diameter	mm	-	1.3 1.5
Air Filter			P.P. Honeycomb	
Refrigerant Circulation Control Device			Capillary	
Fan Motor Capacitor		μF , V		1.8μF , 450V

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

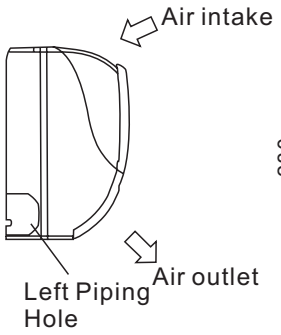
4 Dimensions

Indoor Unit

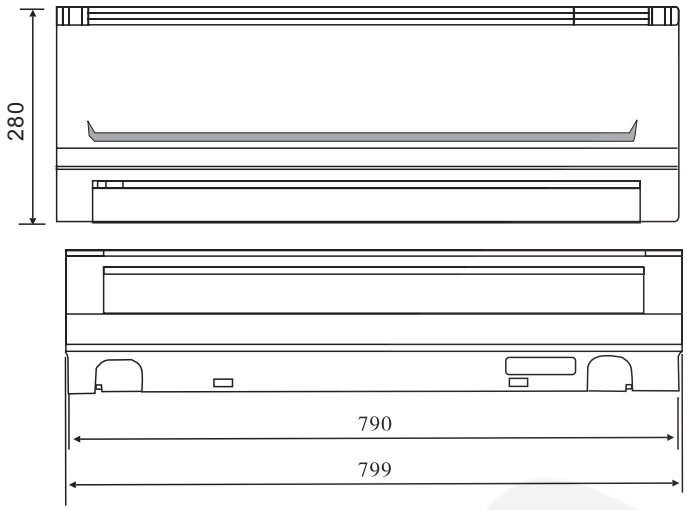
CS-PE9DKE
CS-PE12DKE

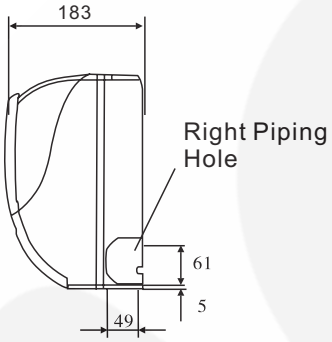
Unit : mm

Side view

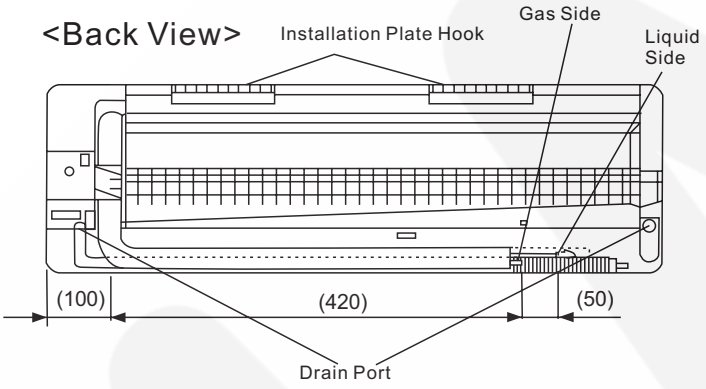


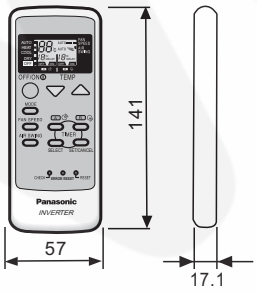
Front View



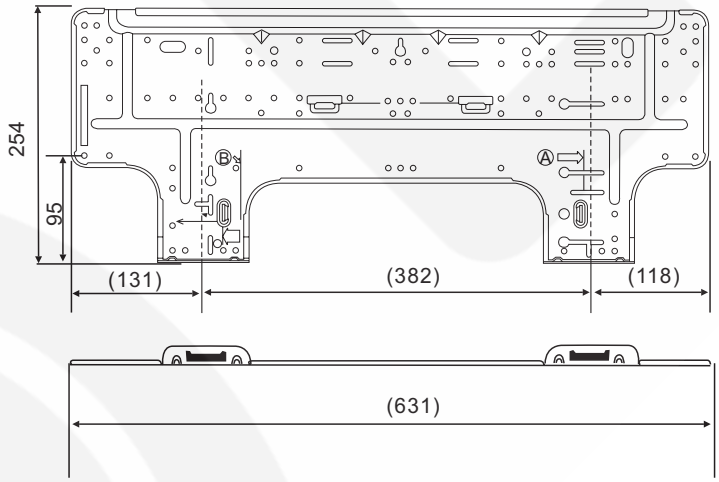


<Back View>





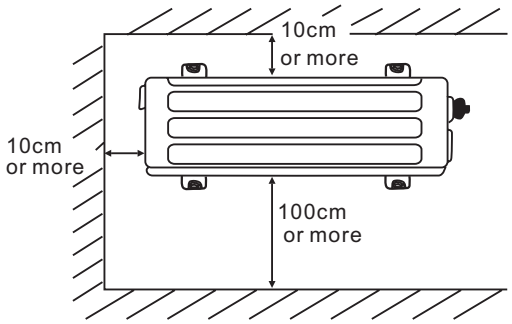
Installation plate (Front View)



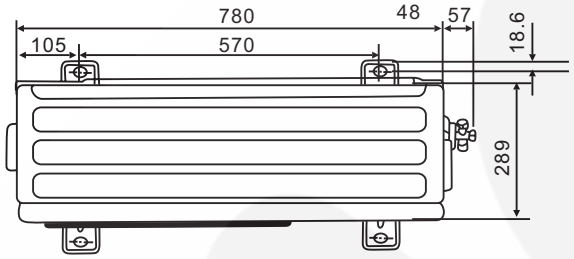
Outdoor Unit

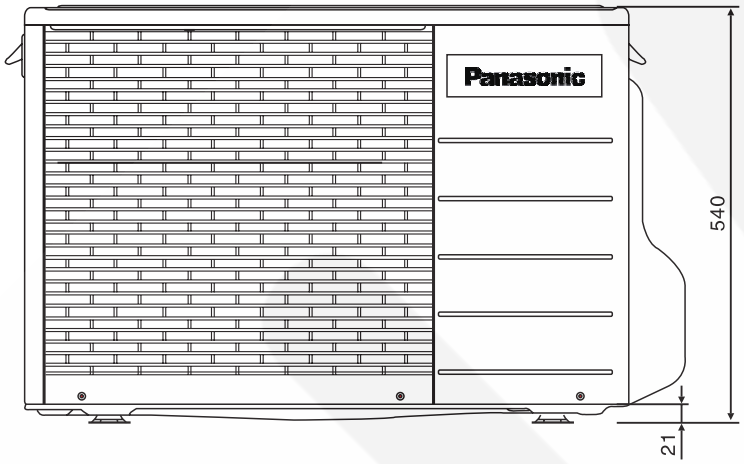
CU-PE9DKE
CU-PE12DKE

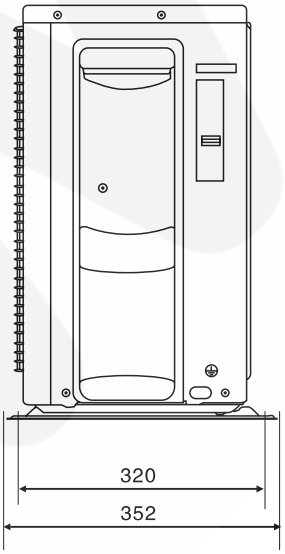
Unit : mm



<Top View>

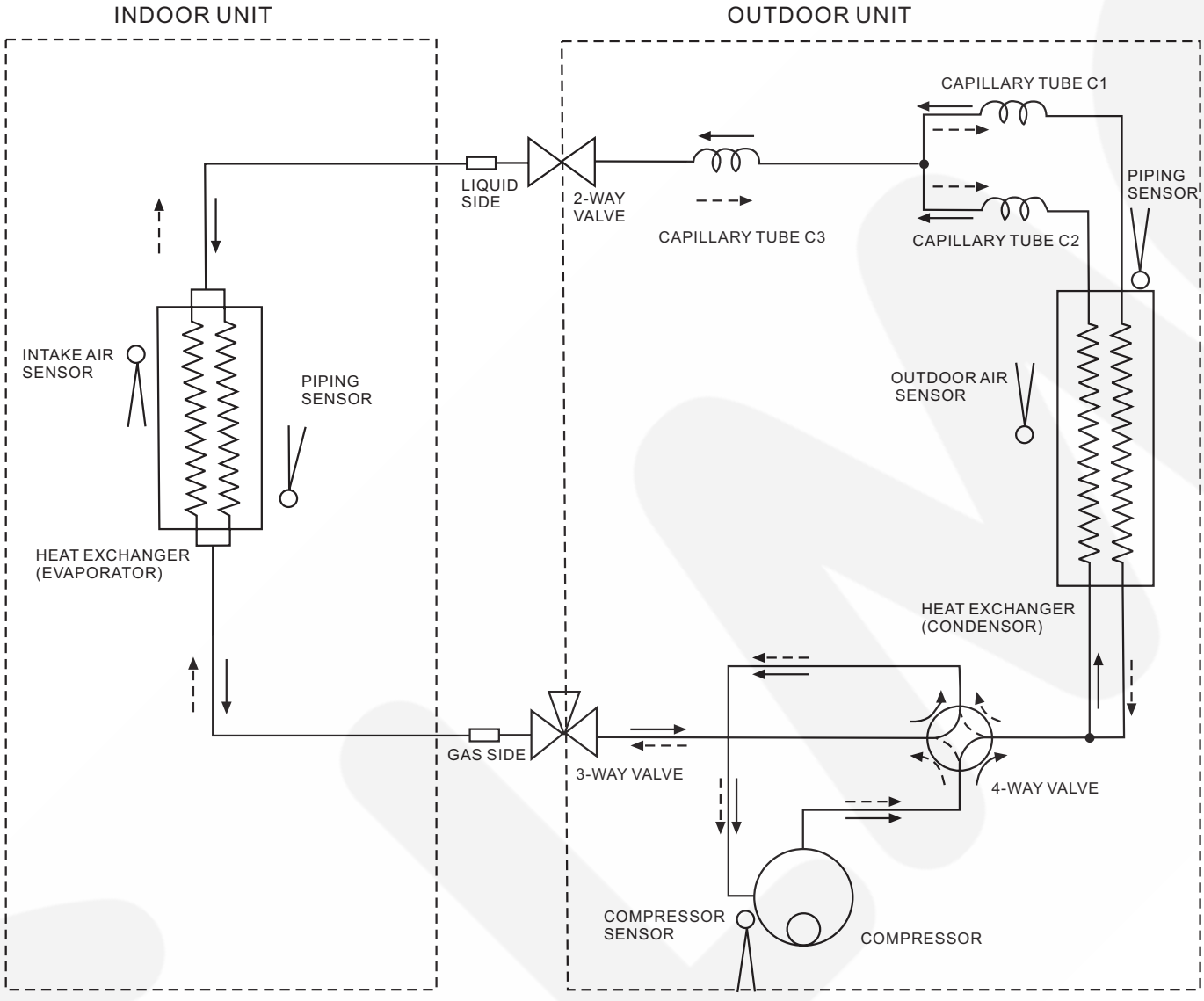






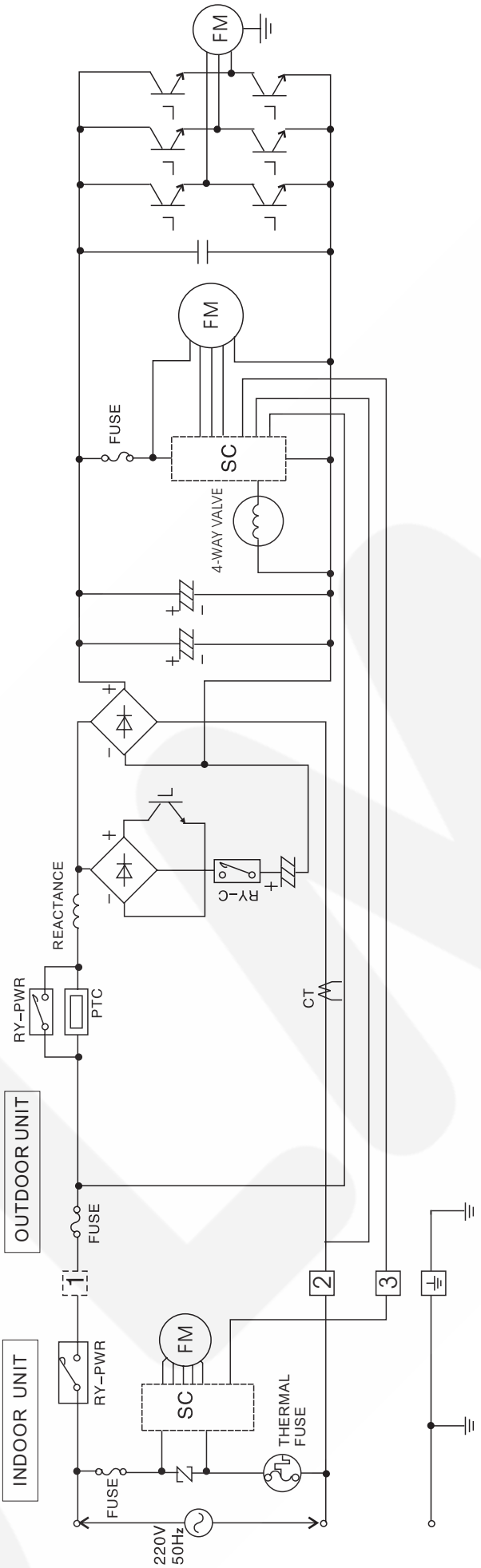
5 Refrigeration Cycle Diagram

CS/CU-PE9DKE
CS/CU-PE12DKE



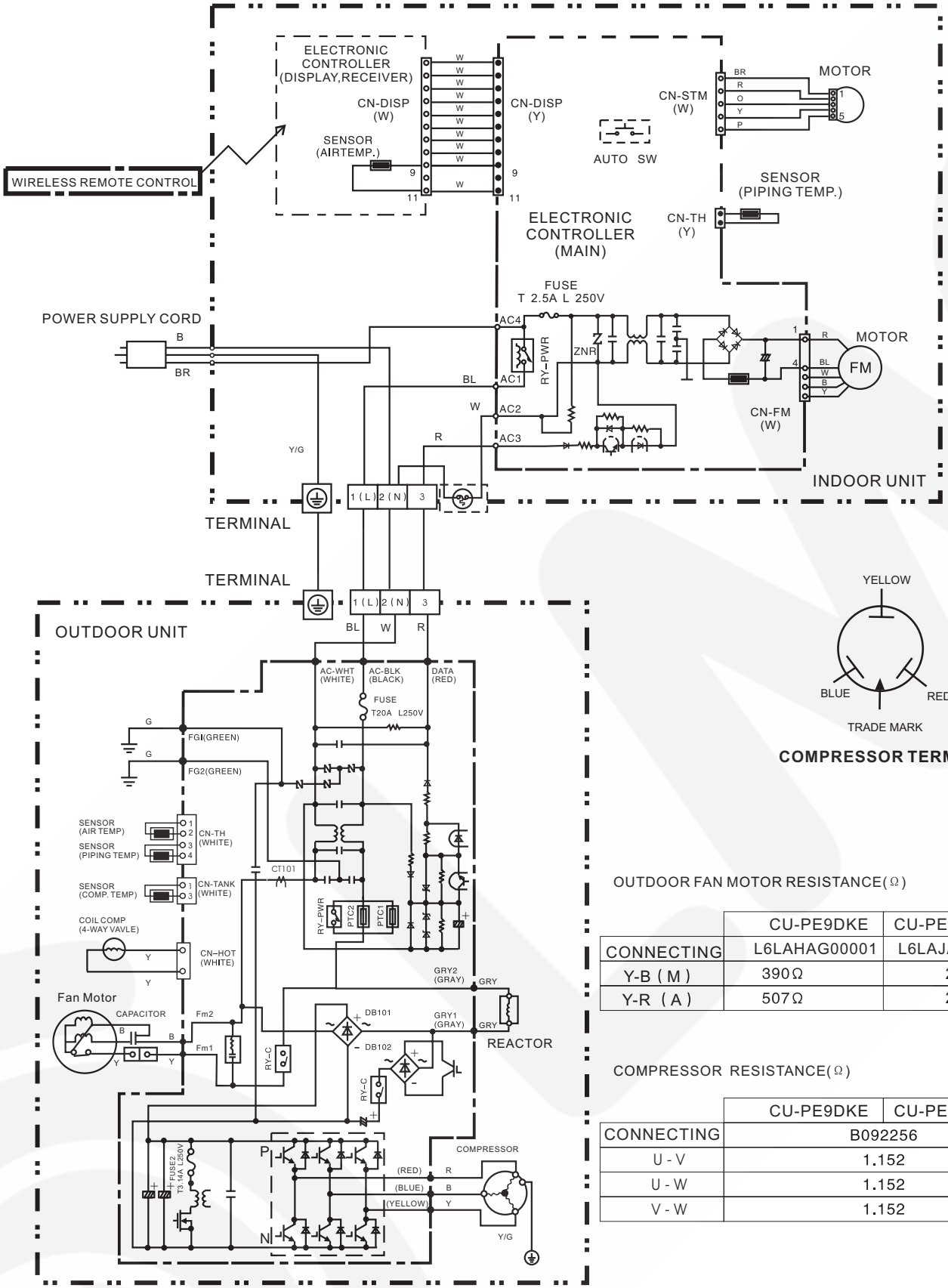
6 Block Diagram

CS-PE9DKE/CU-PE9DKE
CS-PE12DKE/CU-PE12DKE



7 Wiring Diagram

CS-PE9DKE/CU-PE9DKE
CS-PE12DKE/CU-PE12DKE



COMPRESSOR TERMINAL

OUTDOOR FAN MOTOR RESISTANCE(Ω)

	CU-PE9DKE	CU-PE12DKE
CONNECTING	L6LAHAG00001	L6LAJAG00001
Y-B (M)	390Ω	290Ω
Y-R (A)	507Ω	287Ω

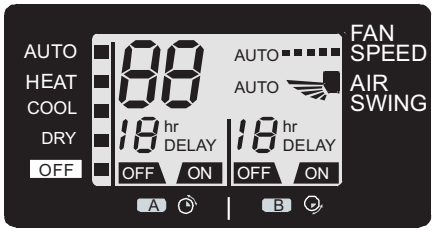
COMPRESSOR RESISTANCE(Ω)

	CU-PE9DKE	CU-PE12DKE
CONNECTING	B092256	
U - V	1.152	
U - W	1.152	
V - W	1.152	

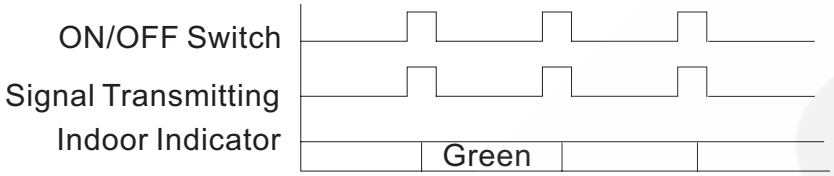
8 Operation Details

8.1 Operation and Display of Remote Controller

Original Setting



ON/OFF Button



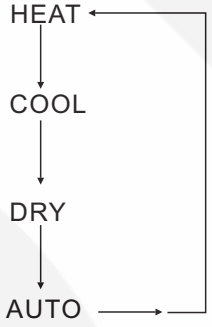
Mode Selecting Button

1.Function and Display of the button:

AUTO, HEAT, COOL, DRY can be selected by pressing the button. Initial display of LCD is as follow

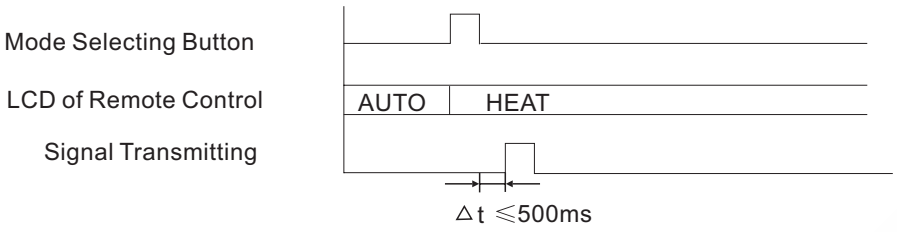
MODE	SET TEMP	FAN SPEED	AIR SWING
AUTO	25℃	AUTO	AUTO
HEAT	20℃	AUTO	AUTO
COOL	28℃	AUTO	AUTO
DRY	25℃	AUTO	AUTO

- Keeping the button depressed continuously, the operation mode will change as

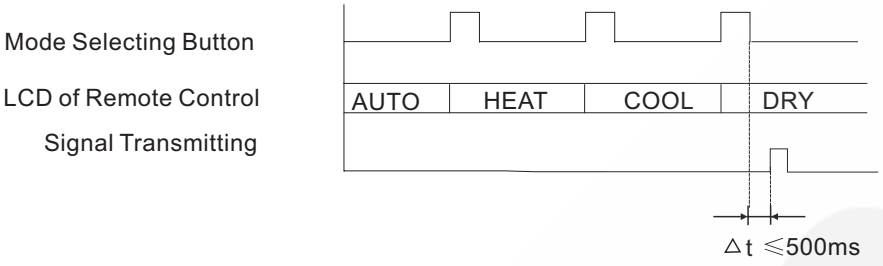


2.Shift time of the Mode selection button

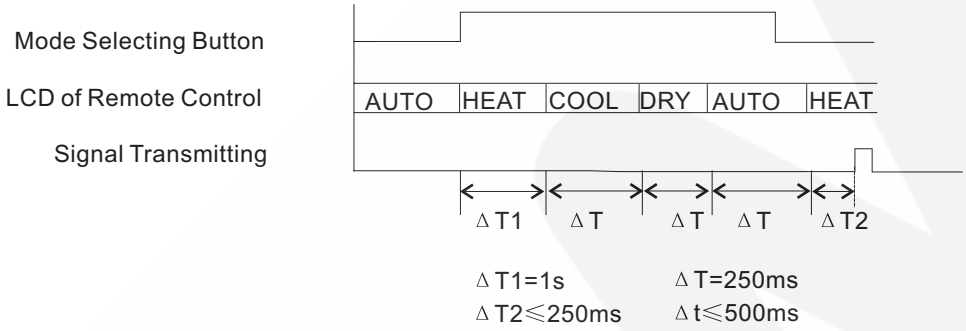
- Single press



- Keep depressed(less than 500ms)



- Keep depressed continuously



If the ON/OFF button is pressed after the operation mode is set, or change the operation mode during operation, or the signal is received from the remote controller, the indoor indicator will flash or light up to start the operation.

Fan Speed Button

1.The display on the remote controller changes as follow by pressing the AIR SWING button.

2.If the ON/OFF button is pressed after the fan speed mode is set, or change the fan speed mode during operation, or the signal is received from the remote controller, the indoor indicator will flash or light up to start the operation.

3.The shift time of the fan speed button is the same to that of mode selecting button.

Temp Adjusting Button

1.Press this button to change the set temperature

△ Increase the set temperature(Max.30℃)

▽ Decrease the set temperature(Min.16℃)

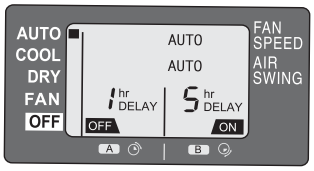
2.If the ON/OFF button is pressed after temperature is set, or change the temperature during operation, or the signal is received from the remote controller, the indoor indicator will flash or light up to start the operation.

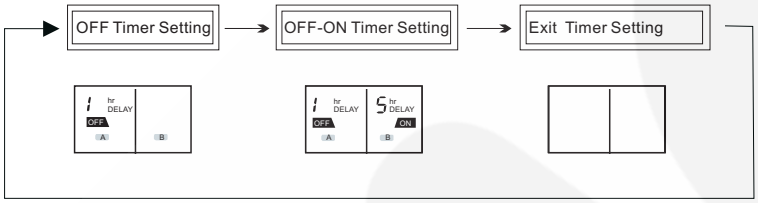
Timer Set Button

1.The Function of the Timer-Setting Button

1) SELECT Button

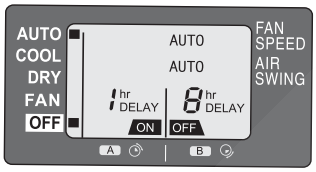
- When the airconditioner is in operation

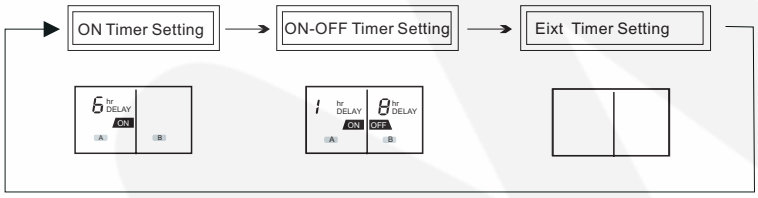




- When the airconditioner is turned off.

  Make sure that the cursor key on the display of remote control points to OFF .





2) Timer Selecting Button A and B

The set time can be changed with manner of 1,2,3,4,5,6,7,8,9,10,11,12,1,2,3,4… By pressing the buttons. Pressing the button A can change the time for ON Timer and OFF Timer, off time for OFF-ON Timer, on time for ON-OFF Timer; Pressing the button B can change the time for on time for OFF-ON Timer and off time for ON-OFF Timer setting.

3) SET/CANCEL Button

① Pressing the button to set or cancel the set timer during the timer setting or activate the previous timer setting. After the timer setting is determined, “ON” or “OFF” will stop flashing. If the timer setting is cancelled, “ON” or “OFF” will disappear on the remote control display.

The time on the remote control will change every hour.

② By pressing this button for 5 seconds continuously, the number indicating the air quality sensor sensitivity will appear in the remote control display. Then press △ or ▽ button to increase pr decrease the sensitivity.

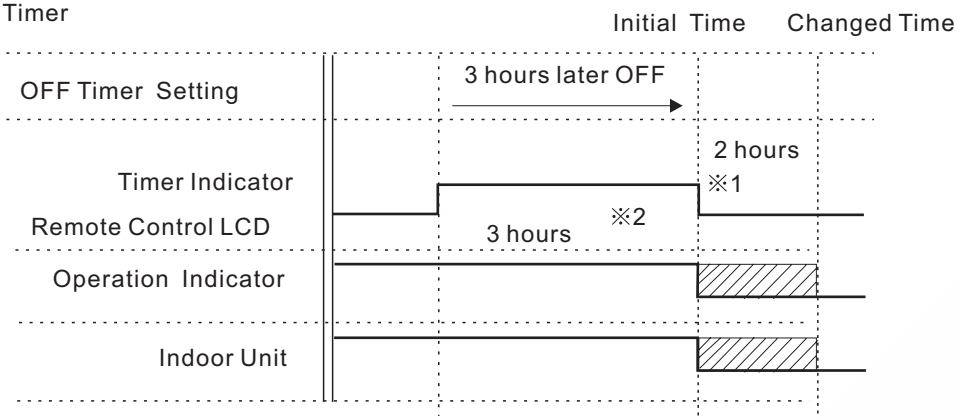
Indicate	0	1	2	3
Sensitivity	Turn off the air quality	Normal	Standard	hight

Notes:

- OFF Timer and OFF- ON Timer can only be set during the operation;
- During the operation, if the ON Timer or ON-OFF Timer is set, the operation will be stopped.
- Timer setting can operate only once.
- If the OFF/ON button on the remote control or the AUTO Switch on the indoor unit is pressed, the timer setting will be cancelled.
- If Auto Restart Control occurs , timer setting will be cancelled.

2.Timing Chart of Timer-Setting

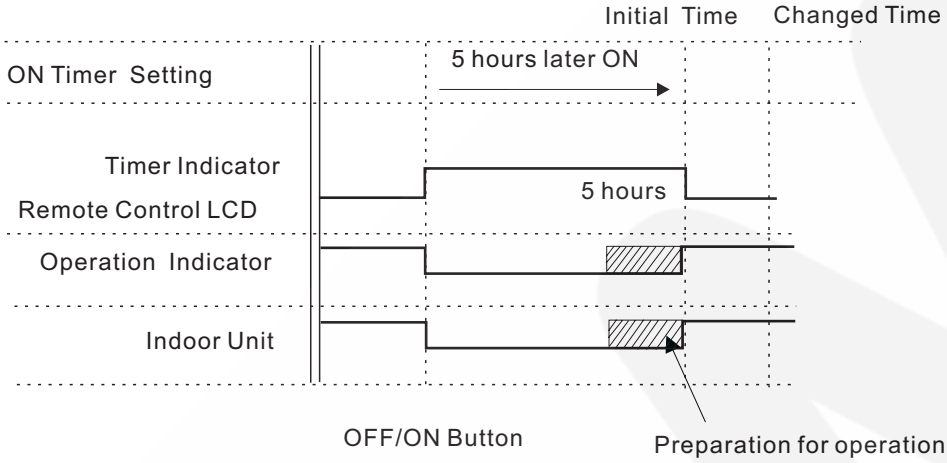
1) OFF Timer



※1:During timer operation changing the set time.

※2:During timer operation press the ON/OFF button to cancel the OFF-Timer and the timer indicator on the indoor unit will go off.

2) ON Timer



About Cursor Key Which Points To "OFF" On Remote Control

- When the ON/OFF button on the remote control is pressed, the cursor key which points to "OFF" will appear or disappear to indicate the ON/OFF status of the air conditioner.

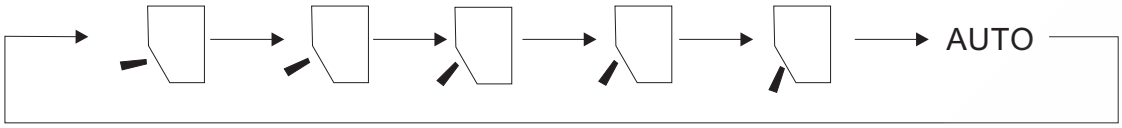
- For some reason (Ex. The signal of the remote control does not reach the signal receiver of the indoor unit.), the display of the remote control will not correspond with the actual ON/OFF status of the indoor unit:

1. The air conditioner is running but the cursor key which points to "OFF" appears. The air conditioner can be stopped with any button (Except for "ON/OFF", "TIMER SET", "TIMER ON") pressed.
2. The air conditioner is on standby, but the cursor key which points to "OFF" disappears. The air conditioner can be started with any button(Except for "ON/OFF", "TIMER SET", "TIMER OFF") pressed.

Air Swing Button

The airflow direction will change as below by pressing the AIR SWING button.

Airflow Direction:



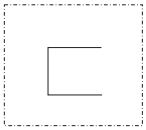
Display of Diagnosis

Refer to Diagnosis section.

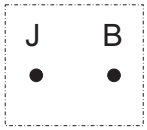
Change the Code of Remote Controller

Change the code of remote controller by joining or cutting jump wire on the remote controller and indoor PCB.

Four codes(A,B,C,D) can be selected.



Inside the battery box of remote controller.

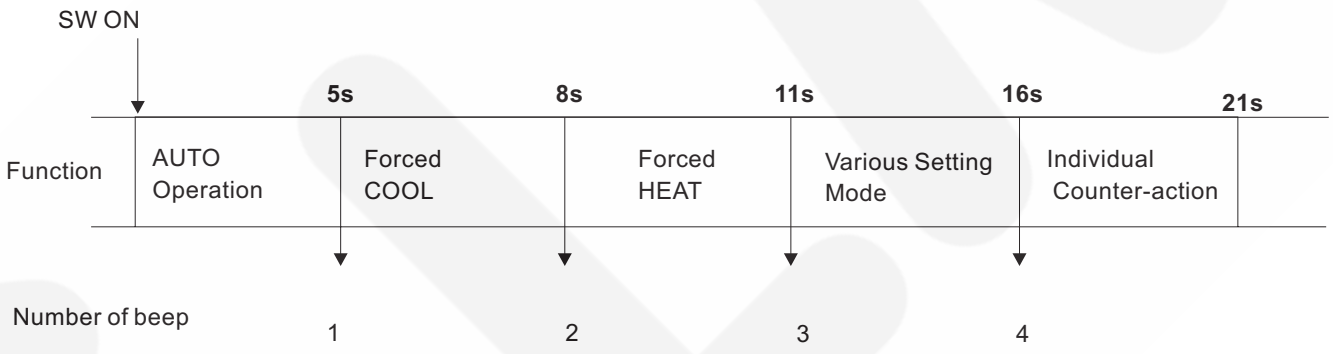


On indoor PCB

		J----B	
		Short	Open
Indoor PCB	Short	A	B
	Open	C	D

8.2 Operation and Display of Indoor Unit

AUTO Operation Switch



1. When the switch is pressed between 0 to 5 seconds, Auto Mode operation starts to function.
2. When the switch is pressed between 5 to 8 seconds, the unit is forced to operate in Cooling Mode.
3. When the switch is pressed between 8 to 11 seconds, the unit is forced to operate in Heating Mode.
4. When the switch is pressed between 11 to 16 seconds and together with the signal from the remote controller, the unit can be changed to different controlling setting .
5. When the switch is pressed between 16 to 21 seconds, either H14 error detection selection mode or remote controller's signal receiving sound can be cancelled or turned on.
6. If the intake air temperature is less than 16 ℃ and the Forced Cooling is activated, because the prior operation mode is heating, the compressor will stop for 3 minutes to start the Forced Cooling operation.

Indoor Unit Indicator

	ON	OFF	FLASH
Operation (Green)	Run	Stop	Hot start, deice control, mode judging and ON-Timer Operation detecting.
Timer (Orange)	Timer set	Timer not set	Malfunction happens.
Air Quality (Green Orange Red)	The air quality can be detected automatically by the air quality sensor and shown by the color of the air quality indicator as bellow.. Color of indocator :Green Air qualuty: Normal Orange Poor Red Bad		

8.3 Common Features

Indoor Fan Motor Control

1. Basic Fan Speed

- Fan speed is determined by the setting of the remote control. And W5~W6 can be calculated according the equations below:

Those operation modes W4:Low , W8 : Hi , W10 have been regulated in the EEPROM data.

Me- : W5=W4+W10

Me : W6=W5+W10

Me+ : W7=W6+W10

Cool.Dry

REMOTE CONTROL	—	○	○	○	○	○	—	—	—
FAN SPEED	SHI	HI	Me	Me+	Me-	Lo	Lo-	Slo	Sslo
ROTATING SPEED	W9C	W8C	Calculated			W4C	W3C	W2C	W1C

Heat

REMOTE CONTROL	—	○	○	○	○	○	—	—	—
FAN SPEED	SHI	HI	Me	Me+	Me-	Lo	Lo-	Slo	Sslo
ROTATING SPEED	—	W8W	Calculated			W4W	W3W	W2W	W1W

● **Basic fan speed of indoor unit**

			PE9DKE	PE12DKE
COOL	SHI	W 9C	1420	1430
	HI	W 8C	1360	1370
	Me+	W 7C	1190	1270
	Me	W 6C	1070	1160
	Me-	W 5C	950	1050
	Lo	W 4C	830	940
	Lo-	W 3C	770	880
	Slo	W 2C	740	840
	SSLo	W 1C	660	720
	Interval	W 10C	120	110
HEAT	SHi	W 8W	1420	1440
	Me+	W 7W	1270	1340
	Me	W 6W	1150	1360
	Me-	W 5W	1030	1180
	Lo	W 4W	910	1100
	Lo-	W 3W	670	800
	Slo	W 2W	580	580
	SSLo	W 1W	400	400
	Interval	W 10C	120	80

2. Indoor Fan Control

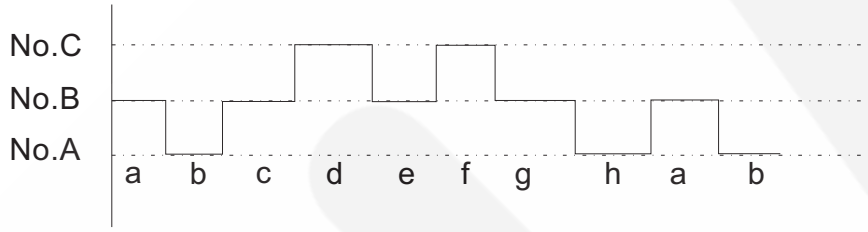
●Cool/Dry Operation

<table>
<tr><td colspan="6"></td><td>Cool Operation</td><td>Dry Operation</td></tr>
<tr><td colspan="6">Protection Operation</td><td colspan="2">Me</td></tr>
<tr><td colspan="6">Forced Cool</td><td>Hi</td><td></td></tr>
<tr><td rowspan="5">Other than above</td><td colspan="2">Minimum Control</td><td colspan="3">Mode judging for Auto Operation ON-Timer Operation detecting</td><td colspan="2">Lo-</td></tr>
<tr><td rowspan="4">Other than above</td><td colspan="3" rowspan="2">Mode judging during ON-Timer detecting</td><td>Auto Fan</td><td>Lo</td><td rowspan="2">Slo</td></tr>
<tr><td>Manual Fan</td><td>Setting of Remote</td></tr>
<tr><td rowspan="2">Other than above</td><td>Auto Fan</td><td>Other than above</td><td>Normal Auto Fan</td><td rowspan="2">Slo</td></tr>
<tr><td>Manual Fan</td><td>Other than above</td><td>Fan Speed Set</td></tr>
</table>

●Heat Operation

Protection Operation				Me
Forced Heat				Shi
Minimum Control	Mode judging in Auto Operation Preparing Operation of Timer-ON operation			Lo-
Other than above	Hot Start			Stop
	Deice Control			Stop
	Low Temperature Control			SSHi
	Maximum Control	Relay OFF(Comp OFF)		SLo- or SSLo
		Indoor Piping Temp Control(Auto Fan)		Refer to the following contents
	Other than above	Detection of Timer-ON Operation	Auto Fan Speed	Lo
			Manual Fan Speed	Setting On Remote Control
		Other than above	Auto Fan Speed	Auto
			Manual Fan Speed	Setting On Remote Control

● Auto Fan Speed for Cooling Operation
Following eight patterns repeat over and over for auto fan speed. Each pattern persists ten second.



UNIT: rpm

Temp. Of outdoor unit under 35℃

	PE9DKE	PE12DKE
No.A	970	1070
No.B	990	1090
No.C	950	1050

Temp. Of outdoor unit above 35℃

	PE9DKE	PE12DKE
No.A	1130	1220
No.B	1150	1240
No.C	1110	1200

●Auto Fan Speed for Heating Operation

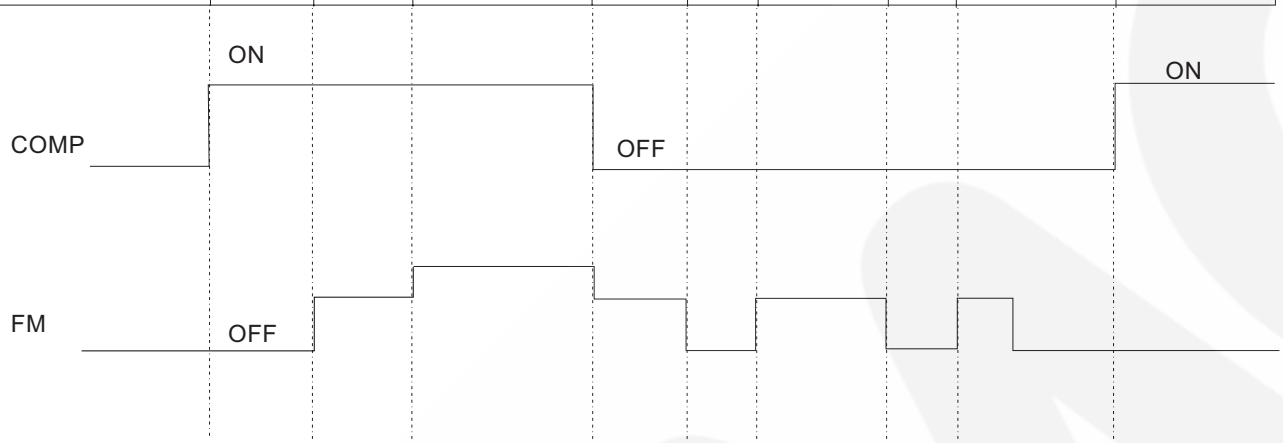
Refer to Piping Temperature Control.

3. Deodorizing Control

This type of control is applicable on Cooling Mode and Soft Dry Mode operating only.

● During cooling or soft dry operation with automatic fan speed, the unit will operate as state below for deodorizing purpose.

Deodorising Status	1	2	3	4	5	4	5	4.5.4....	1
Compressor status	ON			OFF					ON
Period(sec)	40	50	…	20	90	20	90	40	
Indoor fan speed	OFF	Slo	Note*	Slo	OFF	Slo	OFF	OFF	



Note*:Fan speed is automatic for cooling mode and Slo for soft dry mode.

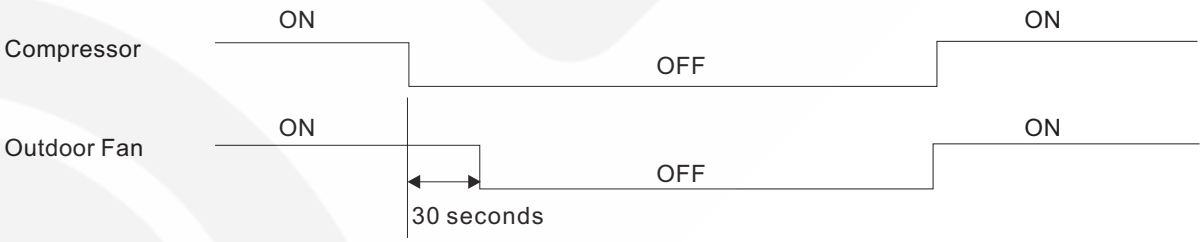
Outdoor Fan Motor Control

1. Specification of outdoor fan motor

Model	Fan Motor	Speed(rpm)
CU-PE9DKE	Induction Motor(6 Poles 1 speed)	670
CU-PE12DKE	Induction Motor(6 Poles 1 speed)	770

2. Operation of the fan motor

The outdoor fan runs during the operation of the compressor or within 30 seconds after the compressor stops.



Frequency for Compressor Operation

1. Basic Frequency

If the frequency for the compressor calculated is prohibited, 1 Hz larger than this calculated one will be selected.

Cool Dry						Heat					
12	●	46		80		12	●	46		80	
13	●	47		81		13	●	47		81	
14	●	48		82		14	●	48		82	**12**
15	●	49	●	83		15	●	49	●	83	**12**
16	●	50	●	84		16	●	50	●	84	**12**
17		51	**12**	85		17	●	51	●	85	
18	**12**	52	**9**	86		18	**9**	52		86	
19		53		87		19		53		87	
20		54		88		20	●	54		88	
21		55		89		21		55		89	
22		56	**9**	90		22		56	**12**	90	
23		57	●	91		23		57		91	
24		58		92		24		58		92	
25		59	●	93		25		59	●	93	
26		60	●	94		26		60	●	94	
27		61	●	95		27		61	●	95	
28		62		96		28		62		96	
29		63		97		29		63		97	
30		64		98		30		64		98	
31		65		99	●	31		65		99	●
32		66	**9**	100	●	32		66	**12**	100	●
33		67	●	101	●	33		67	**12**	101	●
34	●	68	●	102		34		68	**12**	102	
35	**12**	69		103		35		69	**9**	103	
36	**9**	70		104		36		70		104	
37		71		105		37		71	**9**	105	
38	**12**	72		106		38		72	**9**	106	
39	**12**	73	●	107		39		73		107	
40		74	●	108		40		74		108	
41	**9**	75		109		41		75		109	
42		76	●	110		42		76		110	
43		77	●	111		43		77		111	
44	**12**	78	●	112		44		78	**12**	112	
45	**12**	79		113		45		79		113	

2. Starting Control

Within 300 seconds after the start-up of the compressor, the frequency for the compressor will change as below.

- Start-up after the micron reset

Time From Start-up of Compressor	Min.Hz	Max.Hz
60	40	40
60-120s	40	40
120-300	\	110

- Start-up after thermal off (Set Temp Reached)

Time From Start-up of Compressor	Min.Hz	Max.Hz
60	38	38
60-120s	38	38
120-300	\	119

- Start-up after thermal off (Set Temp Reached, heating mode)

Time From Start-up of Compressor	Min.Hz	Max.Hz
60	40	40
60-120s	40	40
120-300	\	119

- Start-up under other conditions

Time From Start-up of Compressor	Min.Hz	Max.Hz
60	40	40
60-120s	40	40
120-300	\	110

Protection Control

A. Time Delay Safety Control

1.The compressor will not start for 3 minutes after the stop of the operation.
2.This control is not applicable if the power supply is turned off and turned on again.

B. 30 Seconds Forced Operation

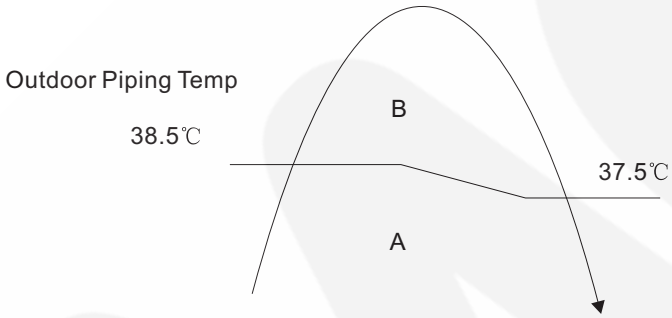
1.Once the compressor starts operation, it will not stop for 30 seconds.
2.However, it can be stopped using remote controller or Auto Switch on indoor unit.

C. Total Running Current Control

1.When the total outdoor unit running current(AC) exceeds I1 value, the frequency for compressor will decline.
2. If the running current is less than I1 value for 10 seconds, the frequency for compressor will increase.
3.However, if the total outdoor running current exceeds 17.0A, compressor will be stopped immediately for 3 minutes.

Current Value (A)(I1)

		PE9DKE	PE1DKE
COOL	A	4.5	6.1
	B	4.4	6.0
HEAT		4.0	5.0
		4.0	5.0



D. IPM Protection Control

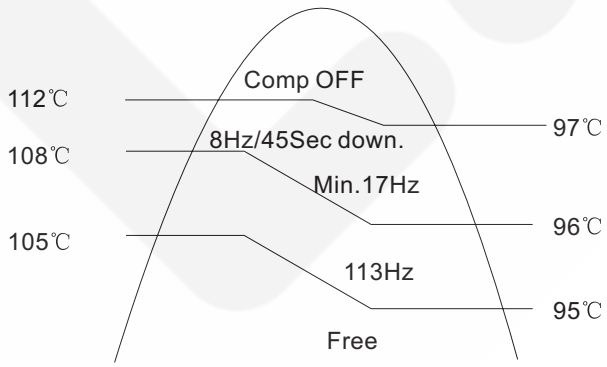
1.DC Peak Current Control
1>When electric current to IPM exceeds set value of DC17.3±1A,the compressor will stop. It will restart after three minutes.
2>If the set value is exceeded again within 30 seconds, the operation will restart after one minute. If this condition repeats continuously for seven times, all indoor and outdoor relays will be cut off.
3>Error code [F99] will be displayed.

2.Overheating Protection Control
When the IPM temperature rises to 90.0℃, compressor will stop immediately.
Compressor restarts after three minutes if the temperature decreases to 85℃.

E. Compressor Overheating Prevention Control

The frequency is also controlled by the temperature of the compressor.

Protection Control



F. Compressor Protection Control (Gas Leakage)

1.When the conditions listed in the table occur, the compressor stops and restarts after three minutes.
2. If this continuously occur for twice within 20 minutes, all indoor and outdoor relays will be cut off.
3.This control is not applicable for deice operation.

Comp Frequency	45Hz or Above	64Hz or Above	58Hz or Above	73Hz or Above
Total Outdoor Current	Ib≤I＜1.3	Ib≤I＜1.6	Ib≤I＜1.3	Ib≤I＜1.6
Indoor Piping Temp	20℃ or Above	25℃ or Less	20℃ or Above	25℃ or Less
Operation Mode	Cool/Dry	Heat	Cool/Dry	Heat
Model	PE9DKE		PE12DKE	

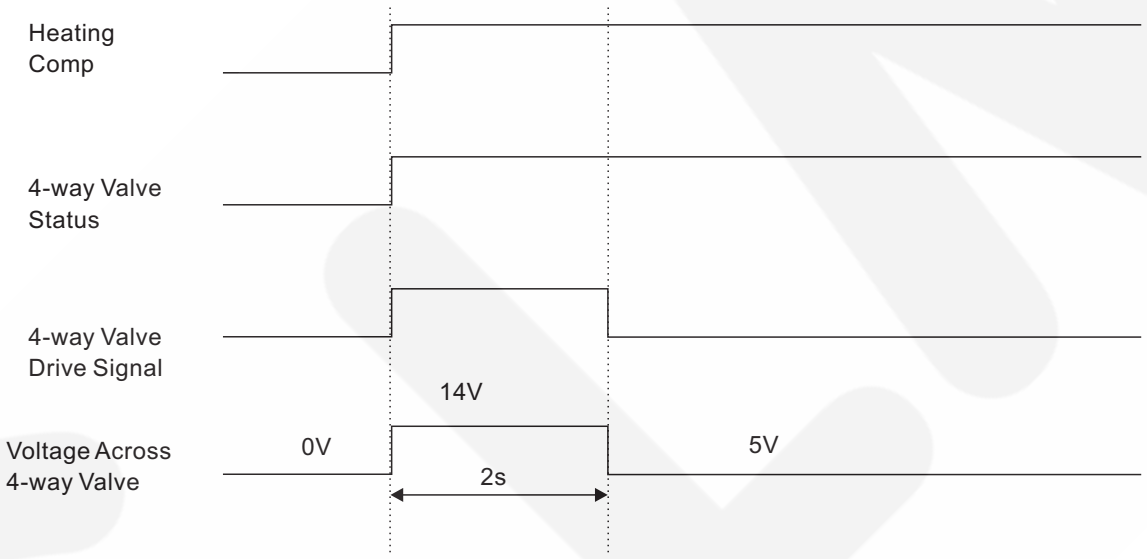
G. Low Operation Frequency Protection Control

If one of the following conditions exists, the compressor will run with the frequency of 40 Hz

Intake Air Temp	≥30℃ or ＜15℃	_____
Outdoor Temp	≥38℃ or ＜16℃	≥24℃ or ＜4℃
Indoor Piping Temp	＜30℃	≥0℃
Operation Mode	Cool/Dry	Heat

4-way Valve Control

1. The 4-way valve will be turned on as the compressor starts to operate and remains on all the time during the heating operation.
2.The 4-way valve remains on for less than 3 minutes after heating operation is stopped.
3.The 4-way valve remains off during cooling and soft dry operation.
4.If the operation is shifted from cooling or dry to heating mode, the switching of 4-way valve will be delayed for 3 minutes.



5.Heating Operation Mode

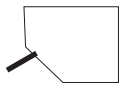
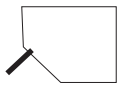
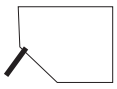
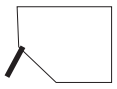
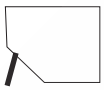
Four minutes after the start of the operation, if the indoor piping temperature detected is lower than 0 ℃ , the operation will stop.(Restarts in 3 minutes) If this situation happens 4 times within 30 minutes, error code “F11” will be displayed.

6.Cooling Operation Mode

Four minutes after the start of the operation, if the indoor piping temperature detected is higher than 45℃, the operation will stop (Restarts in 3minutes). If this situation happens 4 times within 30 minutes, error code “F11” will be displayed.

Airflow Direction Control

A. Vertical Airflow Direction

Vane Angle							
Cool	Manual Airflow		7°	14°	21°	28°	35°
	Auto Airflow		7°~35°				
Dry	Manual Airflow		7°	14°	21°	28°	35°
	Auto Airflow		7°				
Heat	Manual Airflow		0°	15°	30°	45°	60°
	Auto Airflow Direction	C	14°				
		B	52°				
		A	7°				

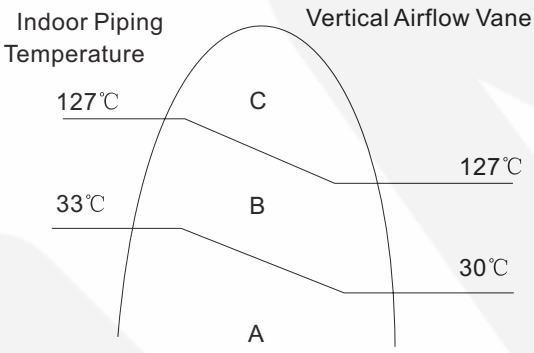
Notes:

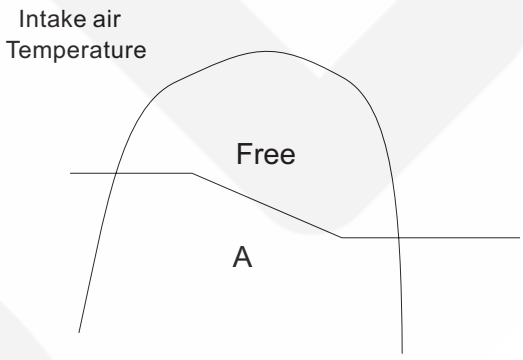
Manual Airflow Direction: The vertical airflow vane will be fixed at the angle desired according to the instructions of remote controller no matter the operation is cooling, soft dry or heating mode.

Auto Airflow Direction: Cool : The vertical airflow vane will swing up and down within the range indicated in the Form above.

Dry : Remain in the horizontal direction.

Heat : The vertical airflow vane will change according to indoor piping temperature as below..





C. Mode Judgement for Auto Operation

Airflow Mode Setting	Auto	Manual
Initializing When Power-On	Upper Limit	Lower Limit
Auto Operation	Upper Limit	Position Previously Set
Shifted to Auto Mode	Same to Cool/Dry/Heat	Same to Cool/Dry/Heat

Note:

When the air-conditioner is turned on, if manual airflow direction is selected and the angle is lower than the lower limit for heating operation, the airflow direction will be changed to the lower limit for heating mode. If Cooling operation is determined during the mode judgement, the airflow direction will be shifted to lower limit for cooling operation.

D. About Timer-Setting

During On-Timer operation, the airflow direction can be changed between Manual and Auto.

Self Diagnosis

A. About Self Diagnosis

When the air-conditioner is stopped due to malfunction detected by itself, the operation can be restarted using AUTO Switch on the indoor unit. In forced operation, the frequency for compressor and fan speed can not be changed and the signal receiving sound is different.

Normal Operation ON: “pep”

Forced Operation ON: “pep”,“pep”,“pep”,“pep”

Stop:“pep”

Note: Refer to the Diagnosis Code Table for the malfunction when forced operation is not available.

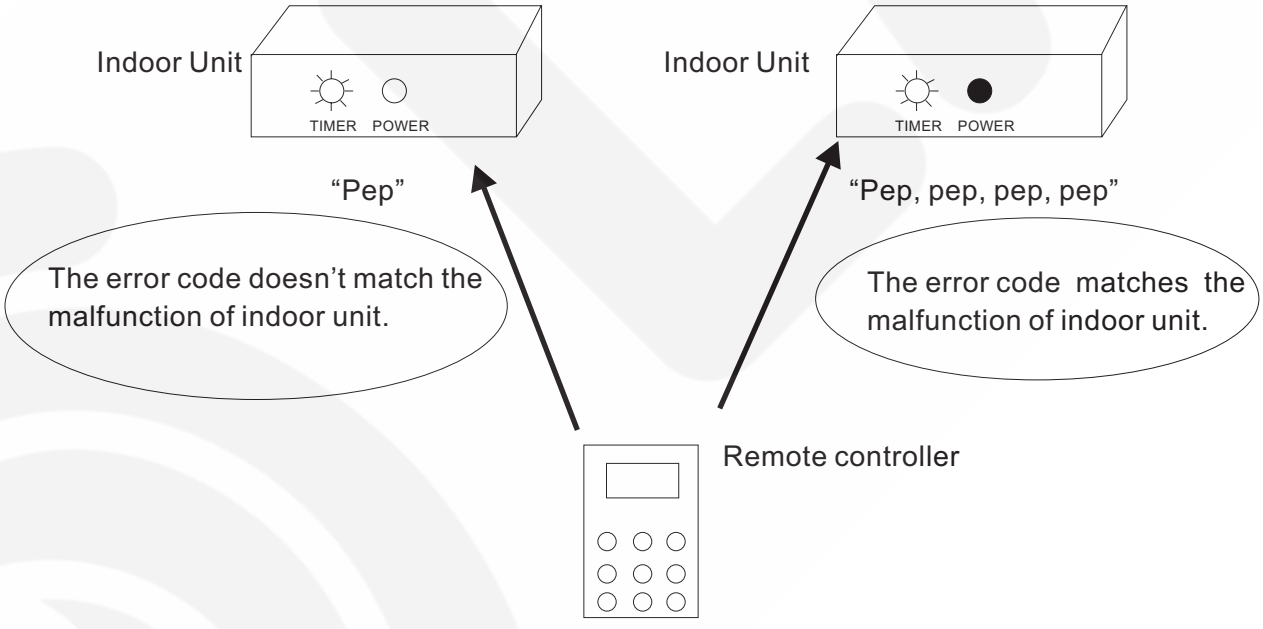
B. Display of Error Code

1.Keeping the CHECK button on the remote controller depressed for 5 seconds, error code ranging from H11 to H99 can be displayed on the remote controller.

2.The error code is changed and diagnosis signal is transmitted to the indoor unit by pressing the Temp Up button on the remote control.

3.When the malfunction of the air-conditioner matches the error code on the remote control, four beeps can be heard from the indoor unit and the operation indicator will light up.

4.Keep the CHECK button depressed continuously for 5 seconds to cancel the diagnosis function.



C. Diagnosis Code Table

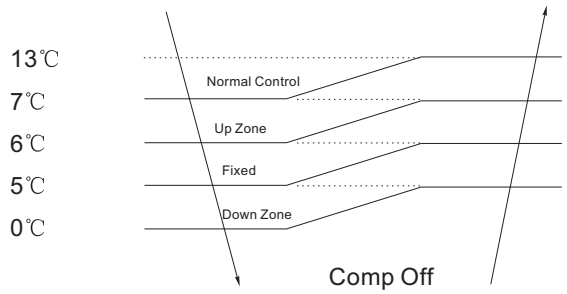
Code	Abnormality/Protection	Judgment	Check	Emergency Operation
H00	Normal			
H11	Indoor/Outdoor abnormal communication	>1minute after starting operation	Connecting cable, Indoor /outdoor PCB	○
H14	Indoor intake air temp sensor abnormality	-	Intake air temperature sensor(defected or disconnected)	X
H15	Outdoor compressor temperature sensor abnormality	Continue for 5 sec.	Compressor temperature sensor(defected or disconnected)	X
H16	Outdoor Current Transformer open circuit	-	Outdoor PCB, IPM module	X
H19	Indoor fan motor mechanism lock	-	Indoor PCB, fan motor	X
H23	Indoor heat exchanger temperature A sensor abnormality	Continue for 5 sec	Heat exchanger temperature sensor (defected or disconnected)	○
H25	Air filter abnormality	-		○
H27	Outdoor air temperature sensor abnormality	Continue for 5 sec	Outdoor temperature sensor(defected or disconnected)	○
H28	Outdoor heat exchanger temperature sensor abnormality	Continue for 5 sec.	Outdoor heat exchanger sensor (defected or disconnected)	○
H30	Discharge temperature sensor abnormality	Continue for 5 sec.	Discharge temperature sensor (defected or disconnected)	○
H33	Incorrect connection of Indoor/Outdoor cable	-	Indoor/outdoor supply voltage	X
H97	Outdoor fan motor lock	Twice within 30 minutes	Outdoor fan motor	X
H98	Indoor high pressure protection	-	Air filter dirty Air circulation short circuit	-
H99	Indoor heat exchanger anti-freezing protection	Indoor heat exchanger freezing	Insufficient refrigerant Air filter dirty	-
F11	Cooling/heating cycle changeover abnormality	4 times occurrence within 30 minutes	4-way valve V-coil	X
F16	Cooling/Dry cycle changeover abnormality	4 times occurrence within 30 minutes	Indoor PCB	X
F90	PFC control	4 times occurrence within 20 minutes	Voltage at PFC	X
F91	Refrigeration cycle abnormality	2 times occurrence within 20 minutes	No refrigerant (3-way valve is closed)	X
F93	Compressor abnormality	4 times occurrence within 20 minutes	Compressor	X
F95	Cool high pressure protection	4 times occurrence within 20 minutes	Outdoor refrigeration cycle	X
F96	IPM overheating protection	-	Excessive refrigerant Improper heat radiation IPM	X
F97	Outdoor compressor overheating protection	4 times occurrence within 20 minutes	Insufficient refrigerant Compressor	X
F98	Total running current protection	3 times occurrence within 20 minutes	Excess refrigerant Improper radiation	X
F99	Outdoor Peak Current Protection Control	4 times occurrence continuously within 30 minutes	Outdoor PCB IPM Compressor	X

8.3 Cooling Operation

Anti-freezing Control

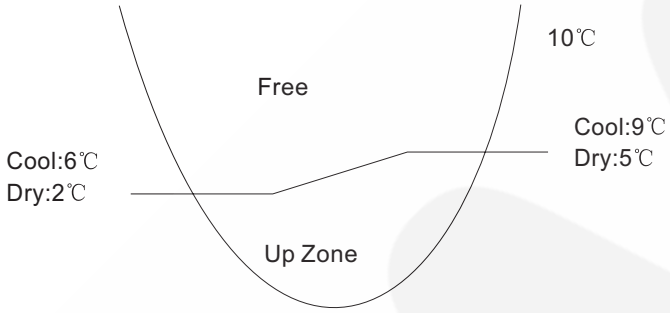
1 .Frequency of the compressor

For prevention of freezing of the indoor evaporator, the frequency of the compressor will be changed according to the indoor piping temperature.



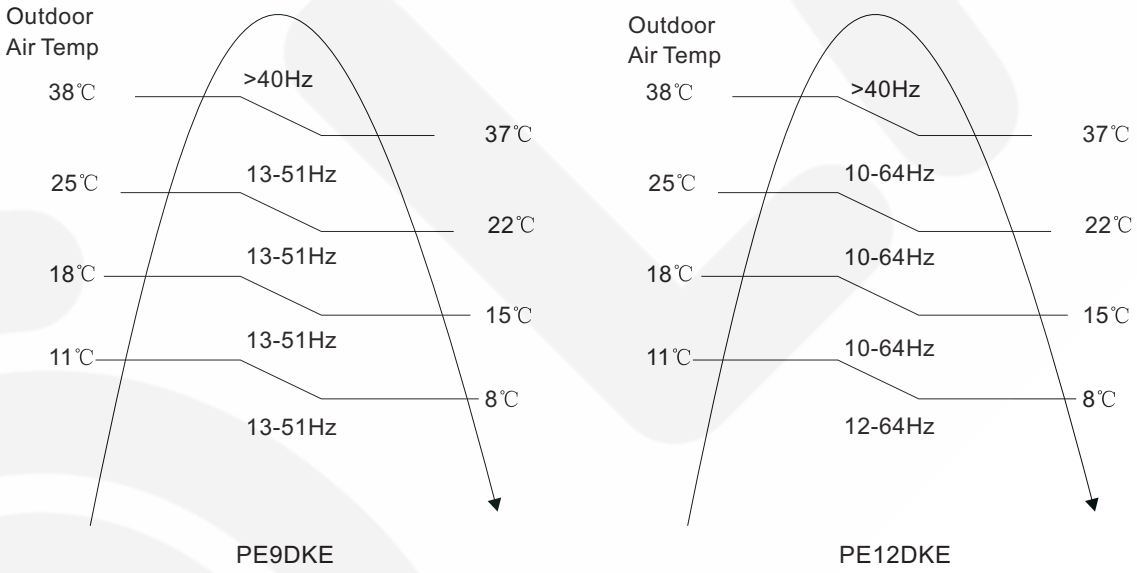
2 .Indoor Fan Control

Indoor fan speed changes according to the indoor fan speed.



Outdoor Air Temp Control

Operation Frequency for Compressor



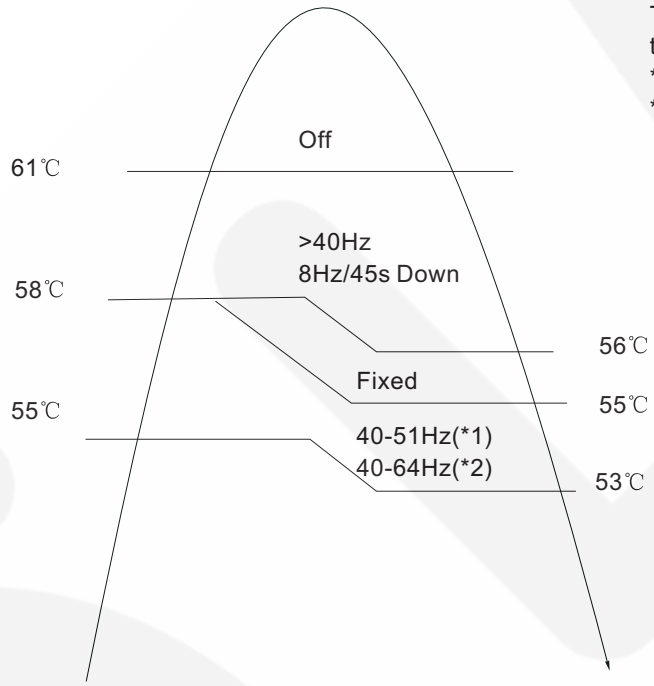
Anti-Fog Protection

① The indoor fan speed is higher than A but less than B.

② The indoor fan speed is less than A

	Outdoor Air Temp	Operation Time(S)		PE9DKE	PE12DKE
①	>30℃	0-30	a	45	58
		30-90	b	40	54
		90-420	c	40	54
	<30℃	0-30	a	45	58
		30-90	b	40	54
		90-420	c	35	46
②	>30℃	0-30	a	35	46
		30-90	b	35	46
		90-420	c	35	46
	<30℃	0-30	a	35	46
		30-90	b	35	46
		90-420	c	35	46
Indoor Fan Speed A				800	850
Indoor Fan Speed B				960	1020

Overload Protection For Cooling Operation



The frequency for the compressor will change according to the outdoor piping temperature.
*1 PE9DKE
*2 PE12DKE

8.4 Soft Dry Operation

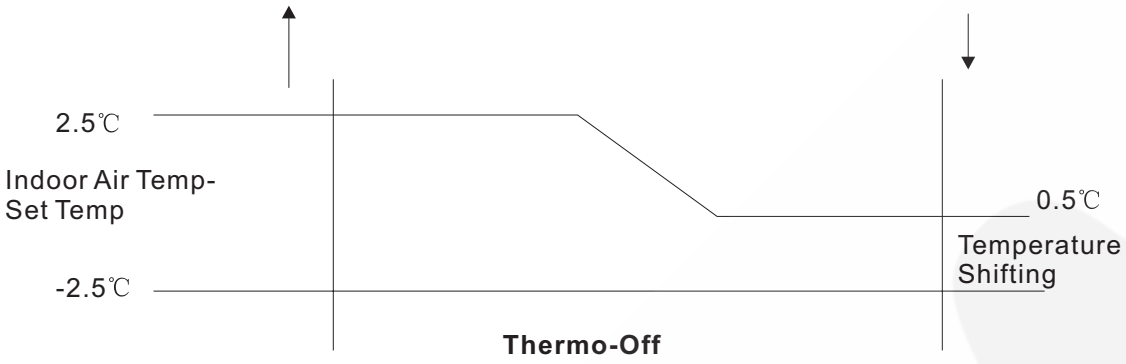
Method of frequency shifting is the same to that of cooling operation and the intake air temperature is measured every second.

Initial Frequency for Compressor

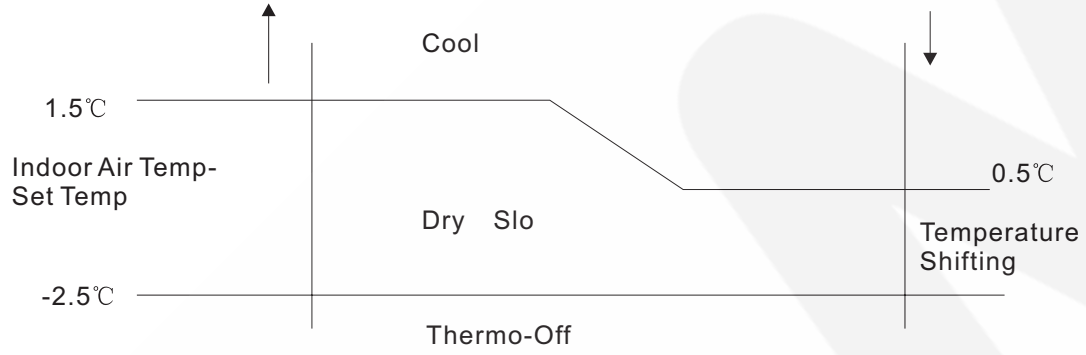
	PE9DKE	PE12DKE
∆T<4	24	31
∆T≥4	27	34

∆T=Outdoor Air Temp-Remote Control Setting Temp

Thermostat Features



Indoor Fan Control

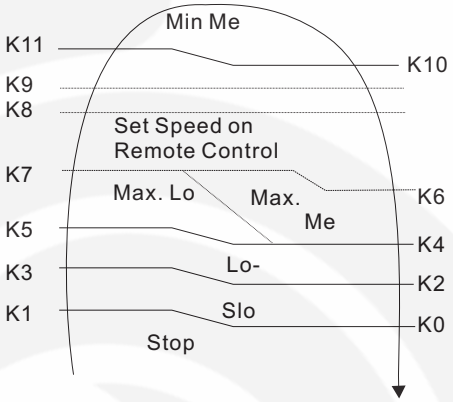


8.5 Heating Operation

Indoor Fan Control

1.Indoor fan is controlled by the indoor piping temperature.

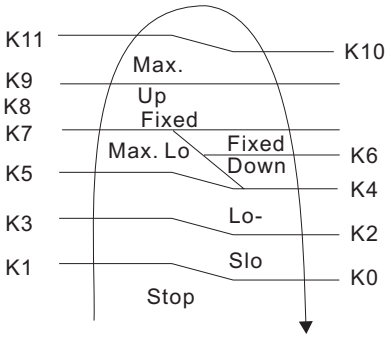
- Manual Fan Speed

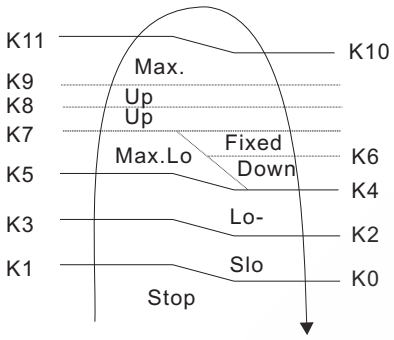


Piping Temperature(℃)

K0	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K10
16	19	24	322	342	35	36	39	42	55	55	58

- Auto Fan Speed





2.During heating operation, the maximum fan speed is Lo when the compressor stops.

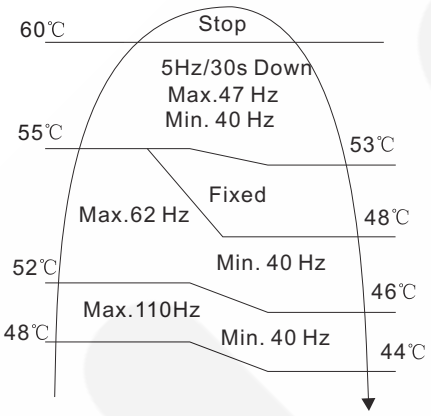
3.Hot Start

When the heating operation starts, the indoor fan stops and the compressor runs with the frequency of 117Hz. This is to prevent the cold airflow from blowing.

If the piping temperature rises to 19℃, and the indoor fan speed and airflow direction varies with the indoor piping temperature, the hot start control is completed.

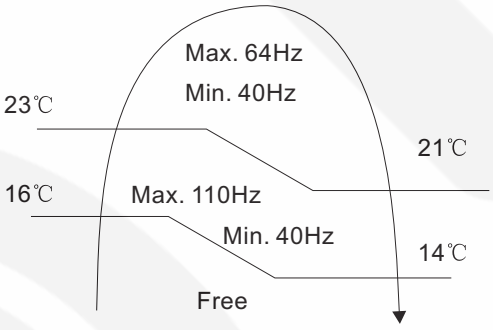
Overload Protection Control

The frequency for the compressor is determined by indoor piping temperature.



Outdoor Air Temp Control

One minute after the start-up of the compressor, outdoor air temperature control starts.



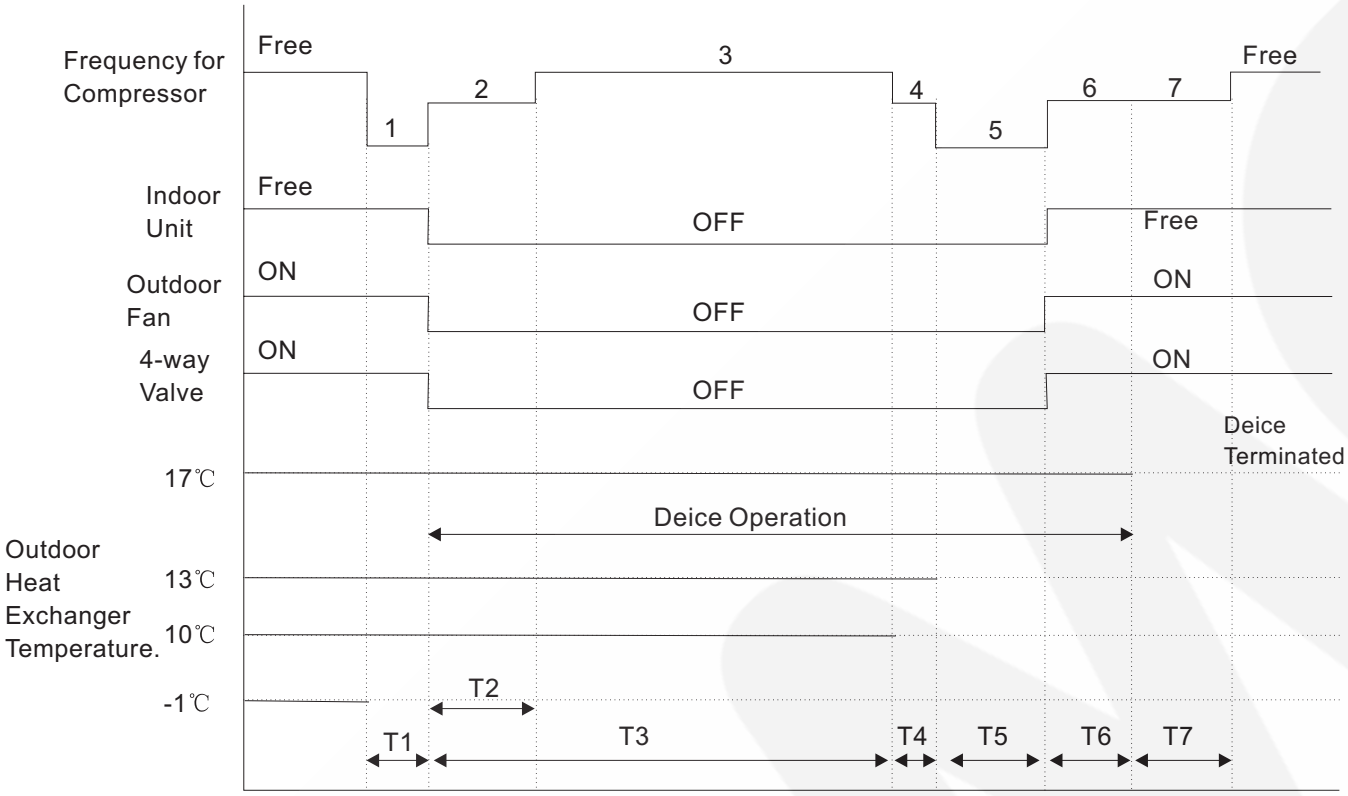
New JIS Deice Operation

Deice operation starts immediately after the deice instruction is received. But the first deice operation starts 1 hour after the heating operation is activated.

1.Outdoor heat exchanger temperature is lower than3 ℃ for 30minutes.

2.Outdoor heat exchanger temperature is lower than -1℃ continuously for 3 minutes.

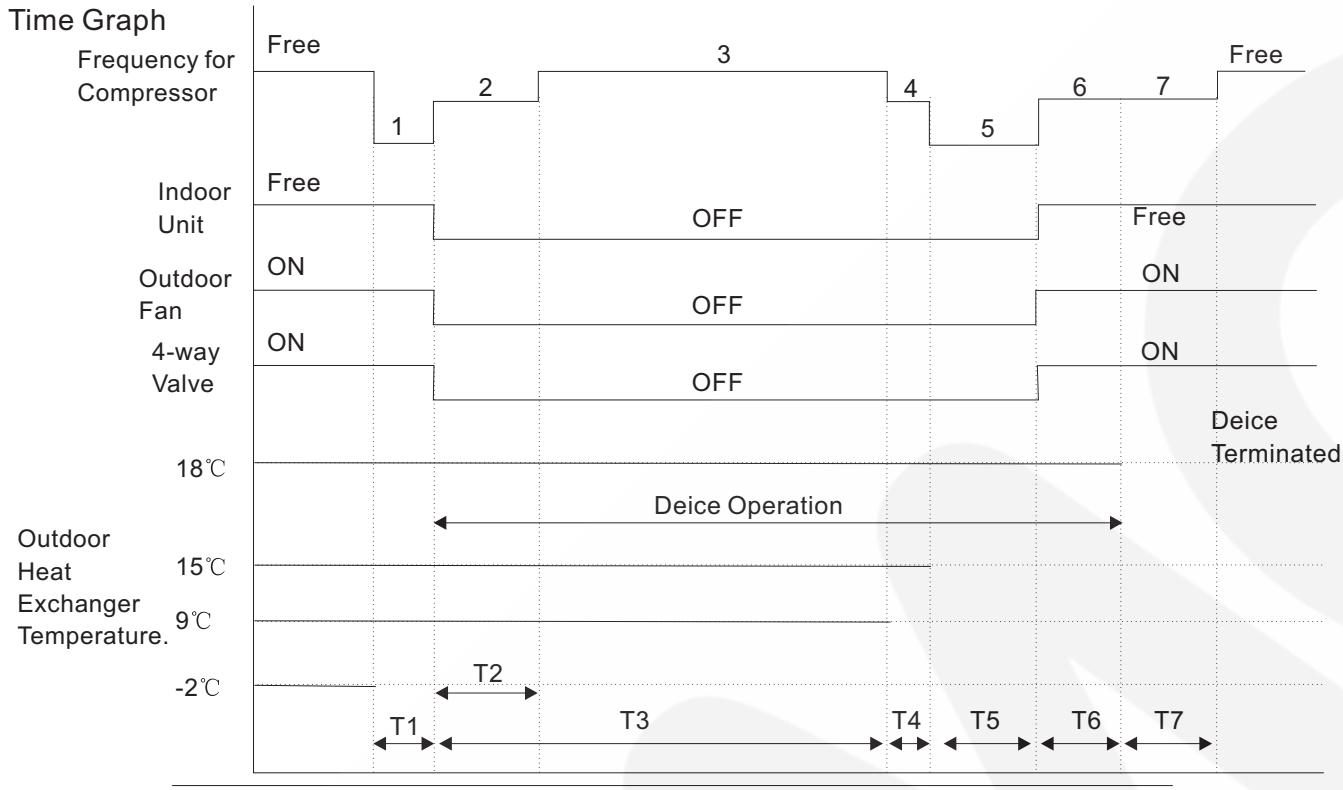
Time Graph



		1	2	3	4	5	6	7
Frequency For Compressor	PE9DKE	58Hz	58Hz	71Hz	51Hz	51Hz	99Hz	99Hz
	PE12DKE	58Hz	58Hz	71Hz	51Hz	51Hz	99Hz	99Hz
Indoor Fan		ON	OFF	OFF	OFF	OFF	ON	ON
Outdoor Fan		ON	OFF	OFF	OFF	OFF	ON	ON
4-way Valve		ON	OFF	OFF	OFF	OFF	ON	ON

Normal Deice Operation

Deice operation will start as the deice operation instruction is launched. But the first deice operation starts one hour after the heating operation starts.



		1	2	3	4	5	6	7
Frequency For Compressor	PE9DKE	40Hz	40Hz	65Hz	65Hz	40Hz	0Hz	0Hz
	PE12DKE	40Hz	40Hz	65Hz	65Hz	40Hz	0Hz	0Hz
Indoor Fan		ON	OFF	OFF	OFF	OFF	OFF	ON
Outdoor Fan		ON	OFF	OFF	OFF	OFF	ON	ON
4-way Valve		ON	OFF	OFF	OFF	OFF	OFF	ON

- If one of the following situations exists, the instruction of the deice will be launched: The outdoor heat exchanger temperature remains less than 3℃ for 120 minutes and -6℃for 3 minutes continuously, the outdoor air temperature is higher than -1℃ and the compressor is on.
- The outdoor heat exchanger temperature remains less than 3℃ for 80 minutes and -7℃for 3 minutes continuously, the outdoor air temperature is higher than -1℃ and the compressor is on
- The outdoor heat exchanger temperature remains less than 3℃ for 40 minutes and -9℃for 3 minutes continuously, the outdoor air temperature is higher than -3℃ and the compressor is on
- The outdoor heat exchanger temperature remains less than 3℃ for 40minutes and -11℃for 3 minutes continuously, the outdoor air temperature is lower than -3℃ and the compressor is on

  Note: The first deice operation occurs 60 minutes after the beginning of the operation.

8.6 Automatic Operation

If the Auto operation mode is selected, the operation mode will be judged by set temperature on remote control, intake air temperature and outdoor air temperature.
During operating mode judgement, indoor fan runs at low fan speed and outdoor fan runs in the purpose of detecting the intake air temperature and outdoor air temperature (for 20 seconds)

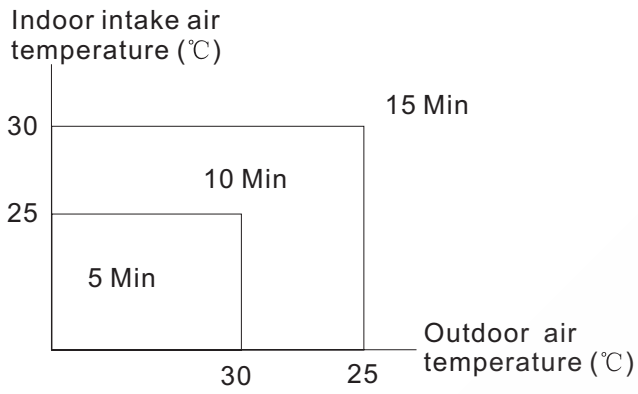
Set Temp=Remote Set Temp + Δ T

Set Temp on Remote Control	Δ T1	Δ T2	Δ T3
16,17,18	+10	-3	-5
19,20,21,22	+8	-3	-7
23,24,25,26	+7	-3	-7
27,28,29,30	+6	-3	-8

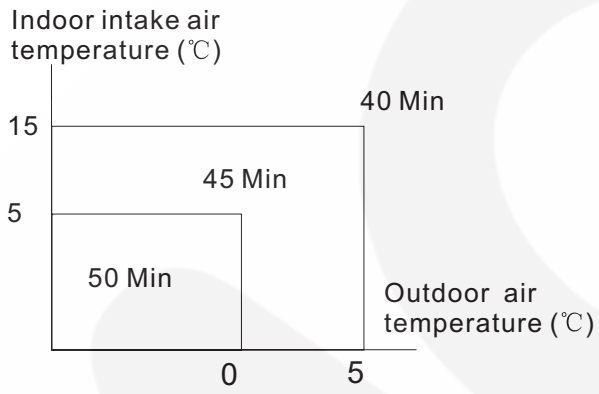
If the operation mode changed, Δ T1, Δ T2, Δ T3 will change as follow:
Cooling /Soft Dry →Heating Operation: -2℃
Heating →Cooling /Soft Dry Operation: +2℃

8.7 Delayed ON-Timer Control

Delay ON Timer ca be set using remote controller, the unit with timer set will start operate earlier than the setting time. This is to provide a comfortable environment when reaching the set On time.
Seventy minutes before the set time for ON Timer or ON-OFF Timer setting, indoor (at fan speed of Lo-) and outdoor fan motor start operate for 20 seconds to determine the indoor intake air temperature and outdoor air temperature in order to judge the operation mode.
From the above judgment, the decided operation will start operate earlier than the set time as shown below.



Cooling/Soft Dry



Heating

Timer Signal Receiving Sound During Operation

	Operation	Sound	Timer LED	Timer Setting
ON Timer Set	OFF	Beep-	ON	Valid
OFF Timer Set	ON	Beep	ON	Valid
ON-OFF Timer Set	OFF	Beep-	ON	Valid
OFF-ON Timer Set	ON	Beep	ON	Valid

Timer Signal Receiving Sound When the Air Conditioner Stops

	Operation	Sound	Timer LED	Timer Setting
ON Timer Set	OFF	Beep	ON	Valid
OFF Timer Set	OFF	None	OFF	Invalid
ON-OFF Timer Set	OFF	Beep	ON	Valid
OFF-ON Timer Set	OFF	None	OFF	Invalid

8.8 Auto Restart Control

If there is a power failure, operation will be automatically restarted after 3-4 minutes when the power is resumed. It will start with previous operation mode and airflow direction.

8.9 Air Quality Sensor Control

- Resistance of air quality sensor: Rs(air)=10kΩ~50kΩ(The worse the air quality, the smaller the resistance.)

Basic Operation

- Detecting and indicating of the air quality will not stop during the operation of the air conditioner.
- The power of the air quality sensor is always on during the operation of the air conditioner. When the air conditioner stops (The air conditioner is on standby.), the air conditioner will provide power to the air quality sensor intermittently (It will be on for 3 minutes after each 109 minutes.) for the purpose of air quality detecting.
- Within 2 minutes after the air conditioner starts to operate, the air quality sensor is in the process of preheating and the air quality indicator is red.

Resistance Reference

- Detecting of air quality(During the operation of the air conditioner):

(a) The measuring period is 20 minutes; The air conditioner will measure the resistance (Rs) of the air quality sensor once each 2 seconds and record the data. The maximum Rs within the 20 minutes will be selected as Rs(MAX) for this measuring period.

(b) Suppose the current Rs(MAX) as MAX and the resistance reference of the previous measuring period is as MAXR1.; If MAX>MAXR1, the resistance reference of the current measuring period is MAXR=MAX; If MAX<MAXR1, MAXR=MAXR1;

(c) Within 2 minutes after the power of the air quality sensor is turned on, the resistance reference of this measuring period is the maximum resistance of the sensor during this period.

	I	II	III
	20minutes	20minutes	20minutes
Maximum of Rs	MAX1	MAX2	MAX3
MAXR1 of previous measuring period	MAX0	MAX1	MAX2
Updating of MAXR	MAX1＜MAX0 →MAX0 MAX1＞MAX0→MAX1	MAX2＜MAX1 →MAX1 MAX2＞MAX1→MAX2	MAX3＜MAX2 →MAX2 MAX3＞MAX2→MAX3

The following conditions should be fulfilled

(d) The initial MAXR after the preheating of the air quality sensor when the air conditioner is turned on:
The air conditioner will compare the maximum value of the current measuring period (MAX) with the resistance reference 109 minutes before (MAXR0) and select the bigger one as the current resistance

(e) reference(MAXR).
When the air conditioner determines the air quality is getting worse: Air quality level 1 Air quality level 2, MAXR will not be updated; When the air quality gets better (air quality level 0), Rs detected at this time will be

(f) MAX and MAXR.
The air conditioner will not detect the air quality during deicing operation. The indication prior to the deicing operation will be held during the deicing operation.

● Detecting of air quality(When the air conditioner is on standby.)

(a) After the air conditioner stops operation, it will provides power to the air quality sensor intermittently to detect the air quality and update the resistance reference (MAXR). The power of the air quality sensor will be on for 3 minutes after each 109 minutes.

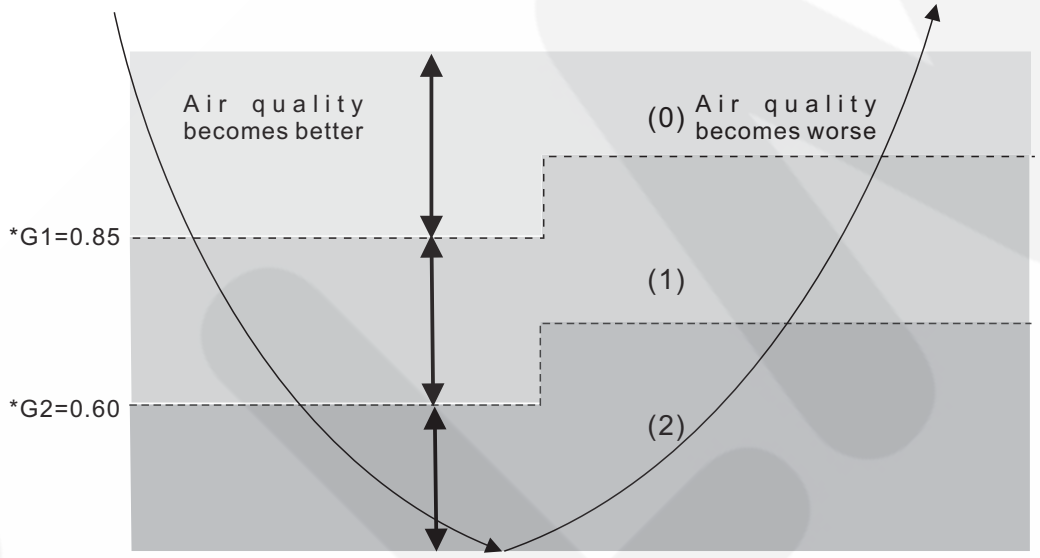
(b) During these 3 minutes, the air quality sensor will be in preheating process for 2 minutes and the other time is for measuring the resistance. The air conditioner will compare the maximum resistance measured in this period with the maximum value in the previous 109 minutes and the bigger one will be selected as resistance

Air Quality Control

● Detecting of air quality(When the air conditioner is on standby.)

Rs/MAXR will be calculated automatically every 2 seconds and the air quality level will be determined in accordance with the value below,

	Signal of Air Quality Sensor	Air Quality Level
Air Quality Getting Worse	Rs/MAXR≤G1	(0)→(1)
	Rs/MAXR≤G2	(1)→(2)
Air Quality Getting Better	Rs/MAXR≥G3	(2)→(1)
	Rs/MAXR≥G4	(1)→(0)



※ Set the sensitivity number of the air quality sensor as 2 (Standard)

Air Quality Level and Indicator

● During preheating of the air quality sensor the air quality indicator is red.

● The color of the air quality indicator varies with the air quality level:

Air Pollution Level 0: Green

Air Pollution Level 1:Orange

Air Pollution Level 2:Red

Forced Resetting

- Forced Resetting Time (The added operation time mentioned later not included.)
  (a) Air Pollution Level 2: Red: 5 minutes Orange: 8 minutes Green
  (B) Air Pollution Level 1: Red: 5 minutes Orange: 8 minutes Green

- Timer Resetting
  When the forced resetting mode is determined and the following conditions are fulfilled, the timer is reset.
  1) The air quality changes which results in the changing of the color of the air quality indicator.
  2) Compare Rs detected in current 2 seconds with R1 detected in previous 2 seconds and Rs/R1<0.95.
  3) Suppose Rs detected in previous 3 minutes is R2 and Rs/R2≤0.87.

Added Operation of Air Quality Sensor

- When the air quality getting worse
  If the air pollution level changes from 0 to 2, the color of the air quality indicator changes as below,
  Green ⟶ Orange (2 Sec.) ⟶ Red

- When the air quality getting better (added operation)
  If the air pollution level changes from 2 to o, the color of the air quality indicator changes as below,
  Red (60 Sec.) ⟶ Orange(60Sec.) ⟶ Green

- Judgment during added operation
  During added operation, if the air quality sensor judges that the air quality is getting worse, the added operation will be stopped immediately and the air quality indicator will shift to normal indication. If the air quality getting better, the air conditioner will judge the air quality until the added operation is finished.

Sensitivity Control of Air Quality Sensor

- The sensitivity number can be changed through the following procedure
  <Setting Sensitivity Number>
  1.Keep the SET button on the remote control depressed continuously for 5 seconds to select sensitivity control m ode.
  2.The previous sensitivity setting will be displayed in the temperature display.
  "0"=Turn off the air quality indicator
  "1"= Low Sensitivity.....G1=0.70, G2=0.45, G3=0.48, G4=0.73
  "2"=Standard Sensitivity.....G1=0.85, G2=0.60, G3=0.63, G4=0.88
  "3"=High Sensitivity.....G1=0.90, G2=0.65, G3=0.68, G4=0.93
  3.Press ▽or △button on the remote control to change the sensitivity

- Within 10 seconds after the sensitivity setting is finished, other settings are not available. The display of the remote control will change back to normal without pressing any button.

9 Installation Instructions

Required tools for Installation Works			
1. Philips screw driver	5. Spanner	9. Gas leak detector	13. Multimeter
2. Level gauge	6. Pipe cutter	10. Measuring tape	14. Torque wrench 18 N.m (1.8 kgf.m) 42 N.m (4.2 kgf.m) kgf.m)
3. Electric drill, hole core drill (ø70 mm)	7. Reamer	11. Thermometer	15. Vacuum pump
4. Hexagonal wrench (4 mm)	8. Knife	12. Megameter	16. Gauge manifold

9.1. Safety Precautions

Read the following “SAFETY PRECAUTIONS” carefully before installation.

Electrical work must be installed by a licensed electrician. Be sure to use the correct rating of the power plug and main circuit for the model to be 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 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 only.

The items to be followed are classified by the symbols:

⃠	Symbol with background white denotes item that is PROHIBITED from doing.

Carry out test running to confirm that no abnormality occurs after the installation. 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. If installation done by the user is defective, it will cause water leakage, electrical shock or fire.	
2. Install according to this installation instruction 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. 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 this 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 (1.5 mm^2) 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 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, explosion and injury.	
9. When connecting the piping, do not allow air or any substances other than the specified refrigerant (R410A) 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.	⃠
10. When connecting the piping, do not use any existing (R22) pipes and flare nuts. Using such same may cause abnormally high pressure in the refrigeration cycle (piping), and possibly result in explosion and injury. Use only R410A materials. Thickness of copper pipes used with R410A must be more than 0.8 mm. Never use copper pipes thinner than 0.8 mm. 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.	⃠

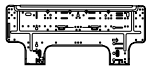
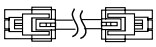
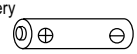
⚠ CAUTION

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.
3. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.

ATTENTION

1. Selection of the installation location.
   Select a 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 room air conditioner.
   Connect the power supply cord of the room air conditioner to the mains using one of the following method.
   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 15A/16A 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 15A/16A circuit breaker for the permanent connection. It must be a double pole witch with a minimum 3.5 mm contact gap.
3. Do not release refrigerant.
   Do not release refrigerant during piping work for installation, 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.

Attached accessories.

No.	Accessories part	Qty.	No.	Accessories part	Qty.
1	Installation plate 	1	5	Drain elbow 	1
2	Installation plate fixing screw 	5	6	Connecting Wire (Connector) 	1
3	Remote control 	1			
4	Battery 	2			

SELECT THE BEST LOCATION

INDOOR UNIT

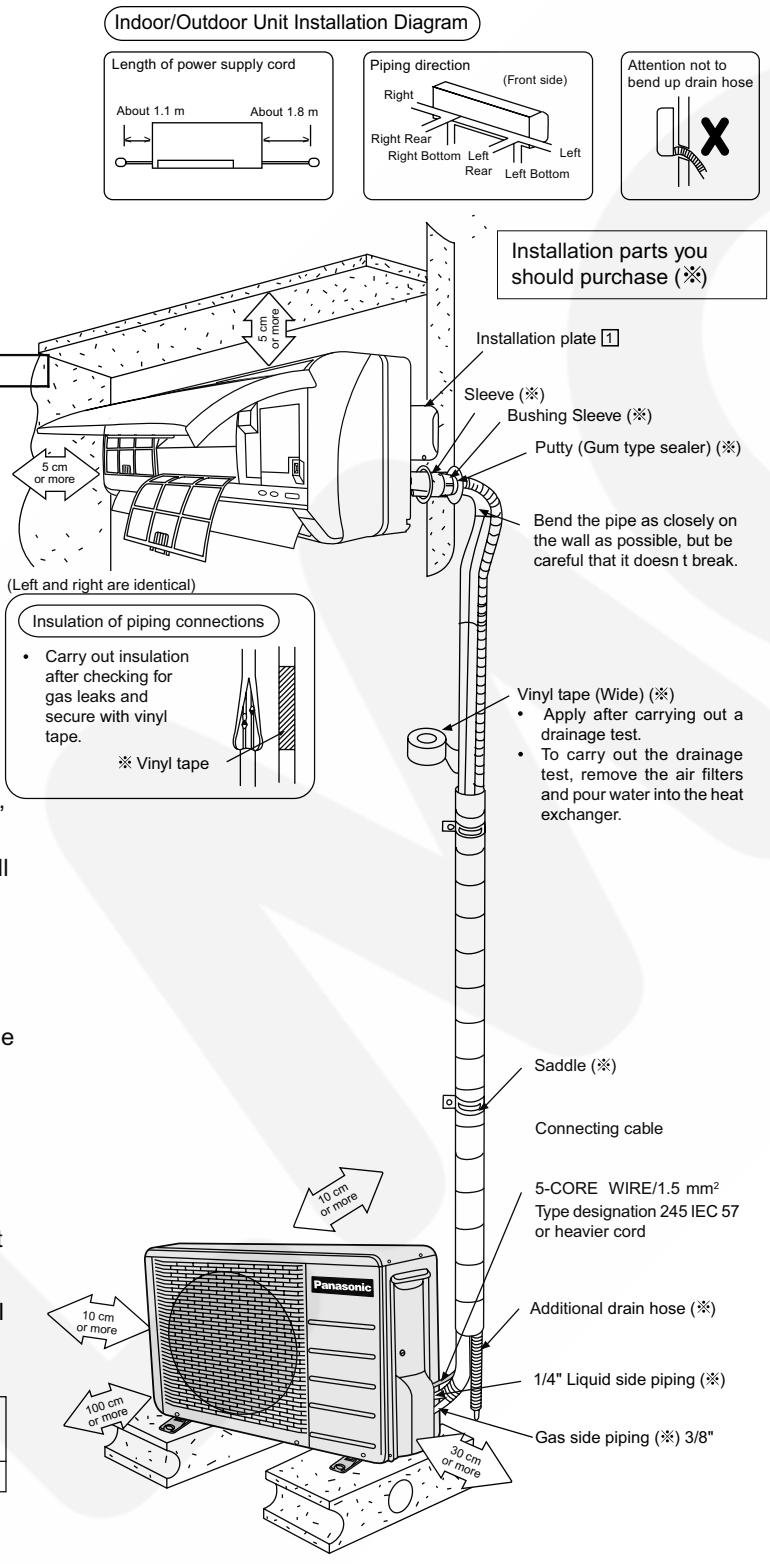
- ❏ There should not be any heat source or steam near the unit.
- ❏ There should not be any obstacles blocking the air circulation.
- ❏ A place where air circulation in the room is good.
- ❏ A place where drainage can be easily done.
- ❏ A place where noise prevention is taken into consideration.
- ❏ 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 the common length, additional refrigerant should be added as shown in the table.

Piping size		Common Length (m)	Max. Elevation (m)	Max. Piping Length (m)	Additional Refrigerant (g/m)
Gas	Liquid				
3/8"	1/4"	7.5	5	15	20

Indoor/Outdoor Unit Installation Diagram



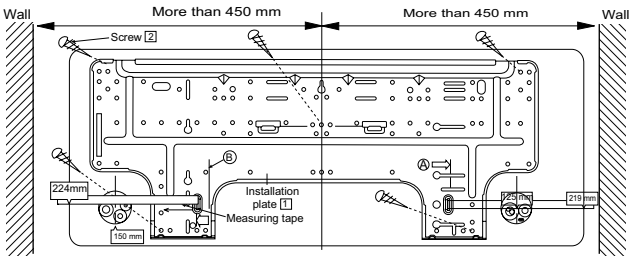
- This illustration is for explanation purposes only. The indoor unit will actually face a different way.

9.2. INDOOR UNIT

9.2.1. SELECT THE BEST LOCATION (Refer to "Select the best location" section)

9.2.2. 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 450 mm at right and left of the wall.

The distance from installation plate edge to ceiling should more than 75 mm.

From installation plate left edge to unit's left side is 74 mm.

From installation plate right edge to unit's right is 94 mm.

Ⓑ : For left side piping, piping connection for gas should be about 45 mm from this line.
: For left side piping, piping connecting cable should be about 800 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.

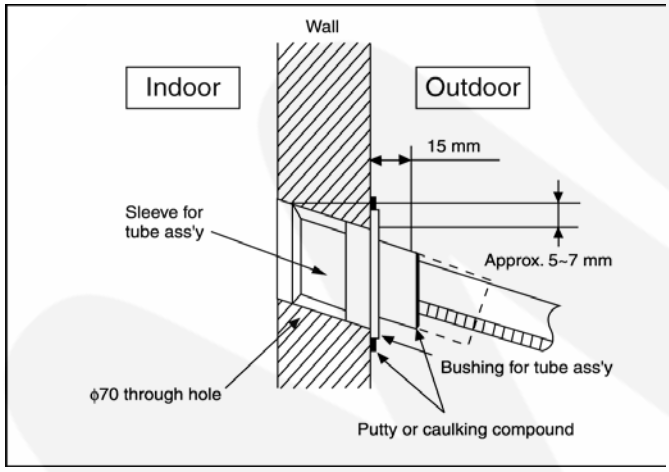
   - Line according to the arrows marked on the lower left and right side of the installation plate. The meeting point of the extended line is the centre of the hole. Another method is by putting measuring tape at position as shown in the diagram above. The hole centre is obtained by measuring the distance namely 105 mm and 145 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.

9.2.3. 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.



9.2.4. 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 determing the dimension 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.)

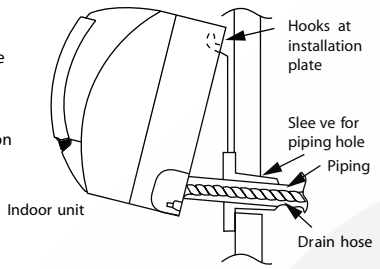
Insulate and finish the piping

↓ • 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

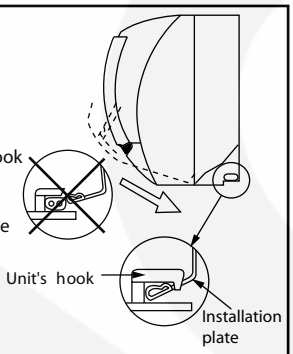
Installthe IndoorUnit

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.

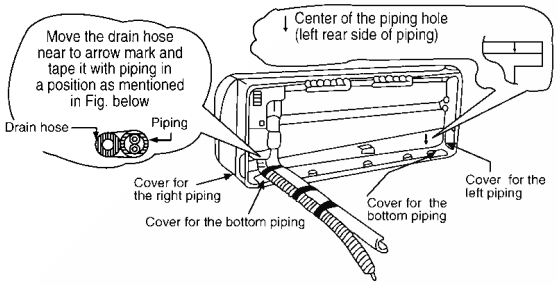


Secure the IndoorUnit

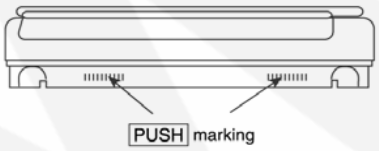
1. Tape the extra power supply cord in a bundle and keep it behind the chassis .
   • Ensure t hat the p ower s upply c ord is not clamped in between the unit's hook (2 positions) and installation plate.
2. Press the lower left and right side of the unit against the installation plate until hooks engages with their slots (sound click).



Pull out the piping and drain hose



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.

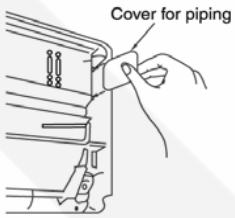


(This can be used for left rear piping & left bottom piping also.)

How to keep the cover

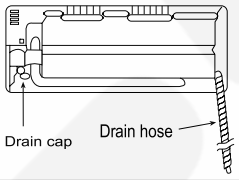
In case of the cover is cut, keep the cover at the rear of chassis as shown in the illustration for future reinstallation.

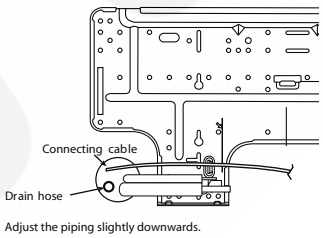
(Left, right and 2 bottom covers for piping)



Exchange the drain hose and the cap

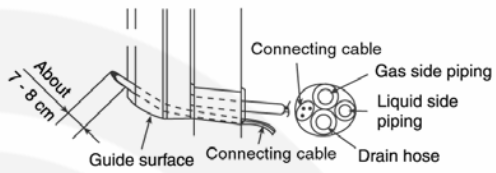
Refer view for left piping installation

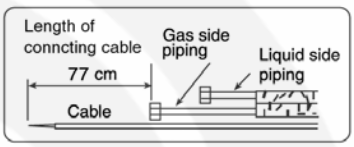


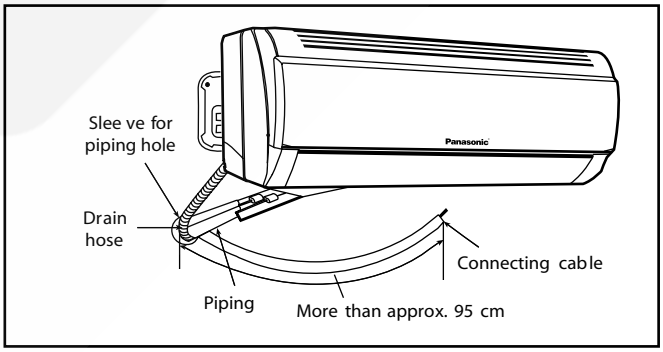


Adjust the piping slightly downwards

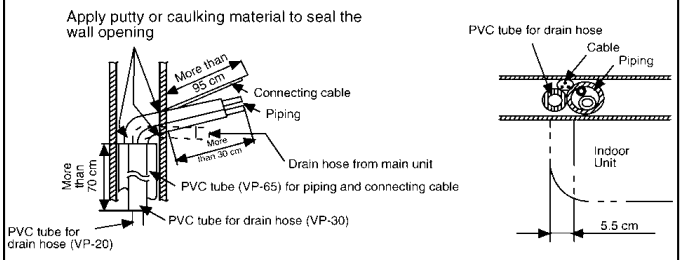
Insert the connecting cable



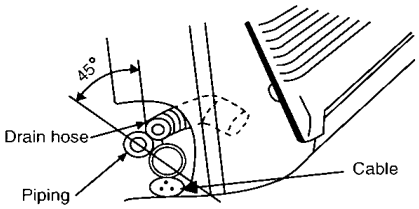




- How to pull the piping and drain hose out, in case of the embedded piping.



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

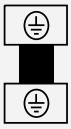


(For the right piping, follow the same procedure)

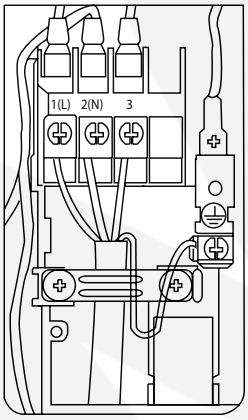
9.2.5. CONNECT THE CABLE TO THE INDOOR UNIT

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 [5] 4 x 1.5 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.

Terminals on the indoor unit	1(L)	2(N)	3
Color of wires			
Terminals on the outdoor unit	1(L)	2(N)	3



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

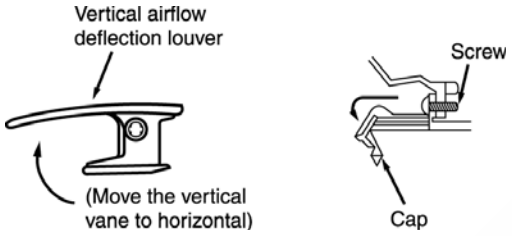


HOW TO TAKE OUT FRONT GRILLE

Please follow the steps below to take out front grille if necessary such as when servicing.

1. Set the vertical airflow direction louver to the horizontal position.
2. Slide down the two caps on the front grille as shown in the illustration at right, and then remove the two mounting screws.
3. Pull the lower section of the front grille towards you to remove the front grille.

When reinstalling the front grille, first set the vertical airflow direction louvre to the horizontal position and then carry out above steps 2 - 3 in the reverse order.



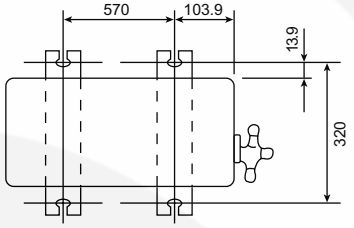
9.3. OUTDOOR UNIT

9.3.1. SELECT THE BEST LOCATION (Refer to “Select the best location ” section)

9.3.2. 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.



Unit: mm

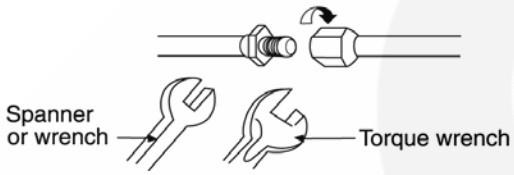
9.3.3. CONNECTING THE PIPING

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
PE9DKE PE12DKE	3/8” (42 N.m)	1/4” (18 N.m)

Connecting The Piping To Outdoor Unit

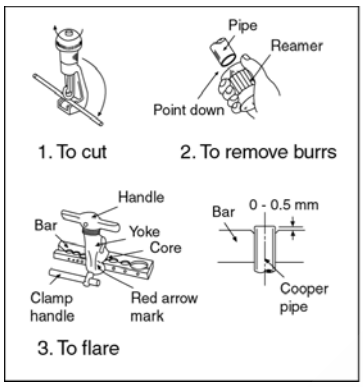
Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (located at valve) onto the copper pipe.

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

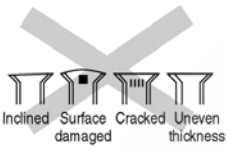
CUTTING AND FLARING THE PIPING

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.



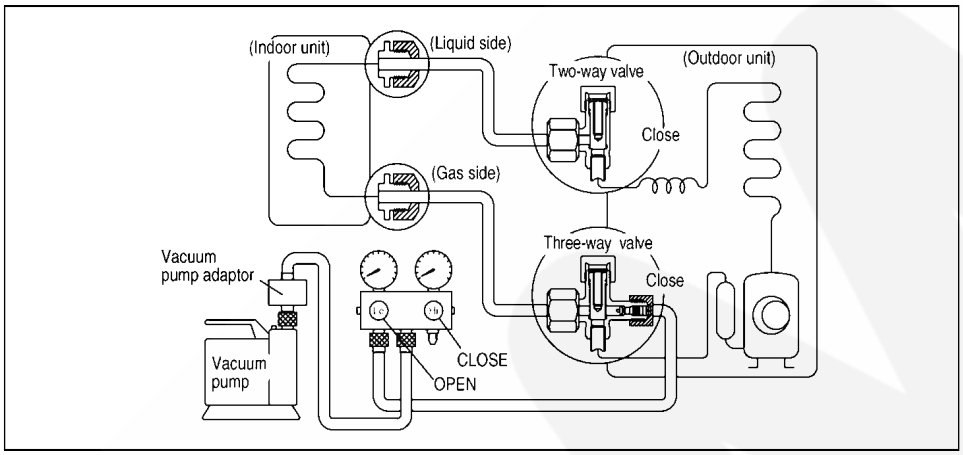
■ Improper flaring ■



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.

9.3.4. (a) EVACUATION OF THE EQUIPMENT (FOR EUROPE & OCEANIA DESTINATION)

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



1. Connect a charging hose with a push pin to the Low side of a charging set and the service port of the 3-way valve.

   Be sure to connect the end of the charging hose with the push pin to the service port.
2. Connect the center hose of the charging set to a vacuum pump with check valve, or vacuum pump and vacuum pump adaptor.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 cmHg (0 MPa) to -76 cmHg (-0.1 MPa). Then evacuate the air approximately ten minutes.
4. Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.

   Note: BE SURE TO FOLLOW THIS PROCEDURE IN ORDER TO AVOID REFRIGERANT GAS LEAKAGE.
5. Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6. Tighten the service port caps of the 3-way valve at torque of 18 N.m with a torque wrench.
7. Remove the valve caps of both of the 2-way valve and 3-way valve. Position both of the valves to “OPEN” using a hexagonal wrench (4 mm).
8. Mount valve caps onto the 2-way valve and the 3-way valve.

   Be sure to check for gas leakage.

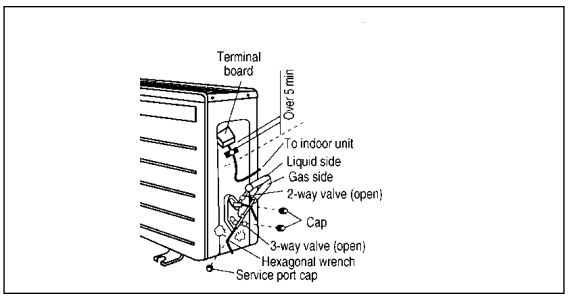
CAUTION

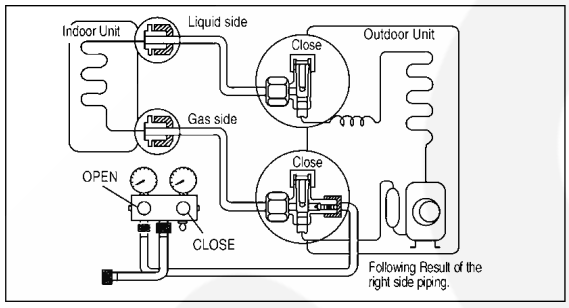
- If gauge needle does not move from 0 cmHg (0 MPa) to -76 cmHg (-0.1 MPa), in step 3 above take the following measure:
- If the leak stops when the piping connections are tightened further, continue working from step 3.
- If the leak does not stop when the connections are retightened, repair the location of leak.
- Do not release refrigerant during piping work for installation and reinstallation. Take care of the liquid refrigerant, it may cause frostbite.

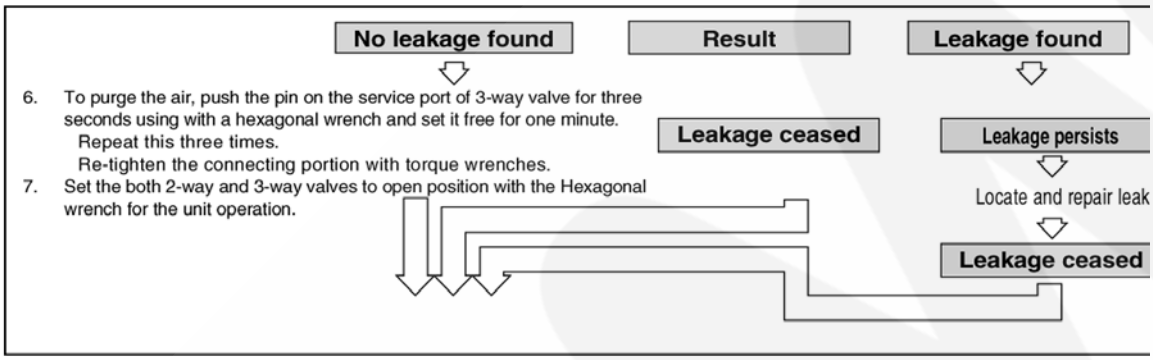
9.3.5. (b) AIR PURGING OF THE PIPING AND INDOOR UNIT

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

1. Remove the caps from the 2-way and 3-way valves.
2. Remove the service-port cap from the 3-way valves.
3. To open the valve, turn the valve stem of 2-way valve counter-clockwise approx. 90° and hold it there for ten seconds, then close it.
4. Check gas-leakage of the connecting portion of the pipings.
   For the left pipings, refer to item 4(A).
5. To open 2-way valve again, turn the valve stem counter-clockwise until it stops.







4(A). Checking gas leakage for the left piping.

(1) * Connect the manifold gauge to the service port of 3-way valve.
* Measure the pressure.

(2) * Keep it for 5-10 minutes.
Ensure that the pressure indicated on the gauge is the
* same as that of measured during the first time.

9.3.6. CONNECT THE CABLE TO THE OUTDOOR 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 1.5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.

Terminals on the indoor unit	1(L)	2(N)	3	⏚
Colour of wires				
Terminals on the outdoor unit	1(L)	2(N)	3	⏚

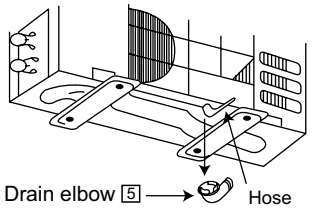
3. Secure the cable onto the control board with the holder (clamper).
4. Attach the control board cover back to the original position with the screw.

9.3.7. 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 6 mm or above.

DISPOSAL OF OUTDOOR UNIT DRAIN WATER

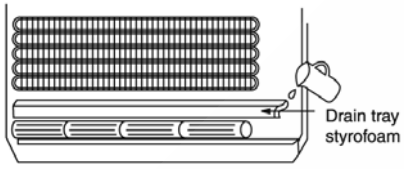
- If a drain elbow is used, the unit should be placed on a stand which is taller than 3 cm.
- If the unit is used in an area where temperature falls below 0°C for 2 or 3 days in succession, it is recommended not to use a drain elbow, for the drain water freezes and the fan will not rotate.



Install the hose at an angle so that the water smoothly flows out.

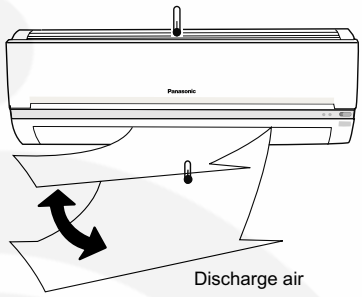
CHECK THE DRAINAGE

- Open front panel and remove air filters.
  (Drainage checking can be carried out without removing the front grille.)
- Pour a glass of water into the drain tray-styrofoam.
- Ensure that water flows out from drain hose of the indoor unit.



EVALUATION OF THE PERFORMANCE

- Operate the unit for fifteen minutes or more.
- Measure the temperature of the intake and discharge air.
- Ensure the difference between the intake temperature and the discharge is more than 8°C during cooling operation or 14°C during heating operation.



CHECK ITEMS

- ☐ Is there any gas leakage at flare nut connections?
- ☐ Has the heat insulation been carried out at flare nut connection?
- ☐ Is the connecting cable being fixed to terminal board firmly?
- ☐ Is the connecting cable being clamped firmly?
- ☐ Is the drainage OK?
  (Refer to “Check the drainage” section)
- ☐ Is the earth wire connection properly done?
- ☐ Is the indoor unit properly hooked to the installation plate?
- ☐ Is the power supply voltage complied with rated value?
- ☐ Is there any abnormal sound?
- ☐ Is the cooling operation normal?
- ☐ Is the thermostat operation normal?
- ☐ Is the remote control’s LCD operation normal?
- ☐ Is the air purifying filter installed?

10 Installation and Serving Air Conditioner Using R410A

10.1. OUTLINE

10.1.1 About R410A Refrigerant

1. Converting air conditioners to R410A

Since it was declared in1974 that chlorofluorocarbons (CFC), hydro chlorofluorocarbons (HCFC) and other substances pose a destructive danger to the ozone layer in the earth´s upper stratosphere (20 to 40 km above the earth), measures have been taken around the world to prevent this destruction.

The R22 refrigerant which has conventionally been used in ACs is an HCFC refrigerant and, therefore, possesses this ozone destroying potential. International regulations (the Montreal Protocol Ozone-Damaging Substances) and the domestic laws of various countries call for the early substitution of R22 by a refrigerant which will not harm the ozone layer.

- In ACs, the HFC refrigerant which has become the mainstream alternative called R410A.Compared with R22, the pressure of R410A is approximately 1.6 times as high at the same refrigerant temperature, but the energy efficiency is about the same. Consisting of hydrogen (H), fluorine (F) and carbon (C), R410A is an HFC refrigerant. Another typical HFC refrigerant is R407C. While the energy efficiency of R407C is some what inferior to that of R410A, it offers the advantage of having pressure characteristics which are about the same as those of R22, and is used mainly in packaged Acs.

2. The characteristics of HFC (R410A) refrigerants

a. Chemical characteristics

The chemical characteristics of R410A are similar to those of R22 in that both are chemically stable, non-flammable refrigerants with low toxicity.

However, just like R22, the specific gravity of R410A gas is heavier than that of air. Because of this, it can cause an oxygen deficiency if it leaks into a closed room since it collects in the lower area of the room. It also generates toxic gas when it isdirectly exposed to a flame, so it must be used in a well ventilated environment where it will not collect.

Table 1 Physical comparison of R410A and R22

	R410A	R22
Composition (wt%)	R32/R125(50/50)	R22(100)
Boiling point (°C)	-51.4	-40.8
Vaporizing pressure (25°C)	1.56 Mpa(15.9 kgf/cm2)	0.94 Mpa(9.6 kgf/cm2)
Saturated vapor density	64.0 kg/m3	44.4 kg/m3
Flammability	Non-flammable	Non-flammable
Ozone-destroying point (ODP)	0	0.005
Global-warming point (GWP)	1730	1700

b. Compositional change (pseudo-azeotropic characteristics)

R410A is a pseudo-azeotropic mixture comprising the two components R32 and R125. Multi-component refrigerants with these chemical characteristics exhibit little compositional change even from phase changes due to vaporization 9or condensation), which means that there is little change in the circulating refrigerant composition even when the refrigerant leaks from the gaseous section of the piping.

Accordingly, R410A can be handled in almost the same manner as the single-component refrigerant R22.

However, when charging, because there is a slight change in composition between the gas phase and the liquid phase inside a cylinder or other container, charging should basically begin with the liquid side.

c. Pressure characteristics

As seen in Table 2, the gas pressure of R410A is approximately 1.6 times as high as that of R22 at the same refrigerant temperature, which means that special R410A tools and materials with high-pressure specifications must be used for all refrigerant piping work and servicing.

Table 2 Comparison of R410A and R22 saturated vapor density

Refrigerant Temperature(°C)	R410A	R22
-20	0.30	0.14
0	0.70	0.40
20	1.35	0.81
40	2.30	1.42
60	3.73	2.33
65	4.15	2.60

d. R410A refrigerating machine oil

Conventionally, mineral oil or a synthetic oil such as alkylbenzene has been used for R22 refrigerating machine oil. Because of the poor compatibility between R410A and conventional oils like mineral oil, however, there is a tendency for the refrigerating machine oil to collect in the refrigerating cycle. For this reason, polyester and other synthetic oils which have a high compatibility with R410A are used as refrigerating machine oil.

Because of the high hygroscopic property of synthetic oil, more care must be taken in its handling than was necessary with conventional refrigerating machine oils. Also, these synthetic oils will degrade if mixed with mineral oil or alkylbenzene, causing clogging in capillary tubes or compressor malfunction. Do not mix them under any circumstances.

10.1.2 Safety Measure When Installing / Receiving Refrigerant Piping

Cause the gas pressure of R410A is approximately 1.6 times as high as that of R22, a mistake in installation or servicing could result in a major accident. It is essential that you use R410a tools and materials, and that you observe the following precautions to ensure safety.

1. Do not use any refrigerant other than R410A in Acs that have been used with R410A.
2. If any refrigerant gas leaks while you are working, ventilate the room. Toxic gas may be generated if refrigerant gas is exposed to a direct flame.
3. When installing or transferring an AC, do not allow any air or substance other than R410A to mix into the refrigeration cycle. If it does, the pressure in the refrigeration cycle can become abnormally high, possibly causing an explosion and/or injury.
4. After finishing the installation, check to make sure there is no refrigerant gas leaking.
5. When installing or transferring an AC, follow the instructions in the installation instructions carefully. Incorrect installation can result in an abnormal refrigeration cycle or water leakage, electric shock, fire, etc.
6. Do not perform any alterations on the AC unit under any circumstances. Have all repair work done by a specialist. Incorrect repairs can result in an water leakage, electric shock, fire, etc.

10.2. TOOL FOR INSTALLING / SERVICING REFRIGERANT PIPING

10.2.1 Necessary Tools

In order to prevent an R410A AC from mistakenly being charged with any other refrigerant, the diameter of the 3-way valve service port on the outdoor unit has been changed. Also, to increase its ability to withstand pressure, the opposing dimensions have been changed for the refrigerant pipe flaring size and flare nut. Accordingly, when installing or servicing refrigerant piping, you must have both the R410A and ordinary tools listed below.

Table 3 Tools for installation, transferring or replacement

Type of work	Ordinary tools	R410A tools
Flaring	Flaring tool (clutch type), pipe cutter, reamer	Copper pipe gauge for clearance Adjustment, flaring tool (clutch type)*1)
Bending, connecting pipes	Torque wrench (nominal diameter 1/4, 3/8,1/2) Fixed spanner (opposing sides 12 mm, 17 mm, 19 mm) Adjustable wrench, Spring bender	
Air purging	Vacuum pump Hexagonal wrench (opposing sides 4 mm)	Manifold gauge, charging hose, vacuum pump adaptor
Gas leak inspection	Gas leak inspection fluid or soapy water	Electric gas leak detector for HFC refrigerant*2)

*1) You can use the conventional (R22) flaring tool. If you need to buy a new tool, buy the R410A type.
*2) Use when it is necessary to detect small gas leaks.

*For other installation work, you should have the usual tools, such as screwdrivers (+,-), a metal-cutting saw, an electrical drill, a hole core drill (65 or 70 dia.), a tape measure, a level, a thermometer, a clamp meter, an insulation tester, a voltmeter, etc.

Table 4 Tool for serving

Type of work	Ordinary tools	R410A tools
Refrigerant charging		Electronic scale for refrigerant charging Refrigerant cylinder Charging orifice and packing for refrigerant cylinder
Brazing (Replacing refrigerating cycle part*1)	Nitrogen blow set (be sure to use nitrogen blowing for all brazing), and brazing), and brazing machine	

*1) Always replace the dryer of the outdoor unit at the same time. The replacement dryer is wrapped in a vacuum pack. Replace it last among the refrigerating cycle parts. Start brazing as soon as you have opened the vacuum pack, and begin the vacuuming

10.2.2. R410A Tools

1. Cooper tube gauge for clearance adjustment
   (used when flaring with the conventional flaring tool (clutch type))

   This gauge makes it easy to set the clearance for the copper tube to 1.0-1.5 mm from the clamp bar of the flaring tool.

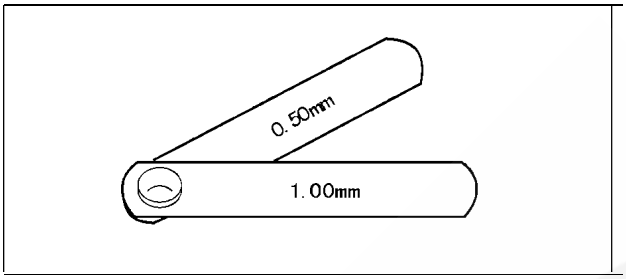


Fig. 1 Copper tube gauge for clearance adjustment

2. Flaring tool (clutch type)

   In the R410A flaring tool, the receiving hole for the clamp bar is enlarged so the clearance from the clamp bar can be set to 0-0.5 mm, and the spring inside the tool is strengthened to increase the strength of the pipe-expanding torque. This flaring tools can also be used with R22 piping, so we recommend that you select it if you are buying a new flaring tool.

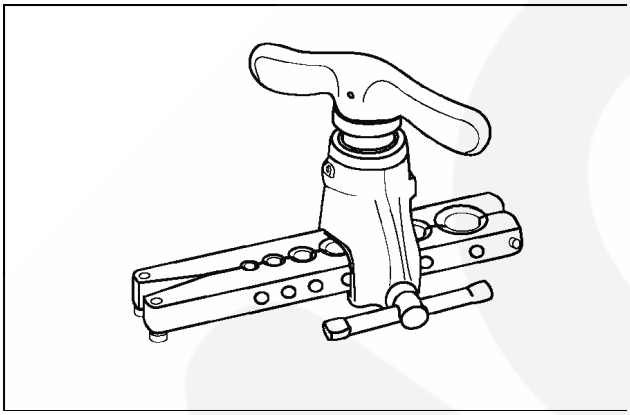


Fig. 2 Flaring tool (clutch type)

3. Torque wrenches

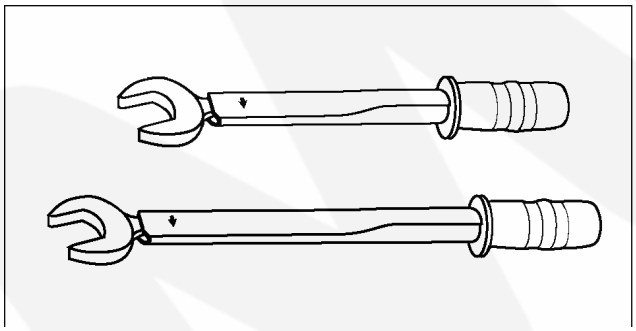


Fig. 3 Torque wrenches

Table 5

	Conventional wrenches	R410A wrenches
For 1/4 (opposite side x torque)	17 mm x 18 N.m (180 kgf.cm)	17 mm x 18 N.m (180 kgf.cm)
For 3/3 (opposite side x torque)	22 mm x 42 N.m (420 kgf.cm)	22 mm x 42 N.m (420 kgf.cm)
For 1/2 (opposite side x torque)	24 mm x 55 N.m (550 kgf.cm)	26 mm x 55 N.m (550 kgf.cm)

4. Manifold gauge

Because the pressure is higher for the R410A type, the conventional type cannot be used.

Table 6 Difference between R410A and conventional high / low-pressure gauges

	Conventional Gauges	R410A Gauges
High-pressure gauge (red)	-76 cmHg - 35 kgf/cm^3	-0.1 - 5.3 Mpa -76 cmHg - 53 kgf/cm^3
High-pressure gauge (blue)	-76 cmHg - 17 kgf/cm^3	-0.1 - 3.8 Mpa -76 cmHg - 38 kgf/cm^3

The shape of the manifold ports has been changed to prevent the possibility of mistakenly charging with another type of refrigerant.

Table 7 Difference between R410A and conventional manifold port size

	Conventional gauges	R410A gauges
Port size	7/6 UNF 20 threads	1/2 UNF 20 threads

5. Charging hose

The pressure resistance of the charging hose has been raised to match the higher pressure of R410A. The hose material has also been changed to suit HFC use, and the size of the fitting has been changed to match the manifold ports.

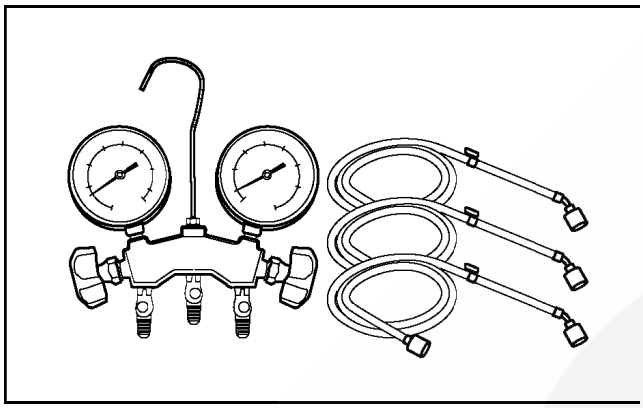


Fig. 4 Manifold gauge charging hose

Table 8 Difference between R410A and conventional charging hoses

		Conventional hoses	R410A hoses
Pressure resistance	Working pressure	3.4 MPa (35 kgf/cm^3)	5.1 MPa (52 kgf/cm^3)
	Bursting pressure	17.2 MPa (175 kgf/cm^3)	27.4 MPa (280 kgf/cm^3)
Material		NBR rubber	HNBR rubber Nylon coating inside

6. Vacuum pump adaptor

When using a vacuum pump for R410A, it is necessary to install an electromagnetic valve to prevent the vacuum pump oil from flowing back into the charging hose. The vacuum pump adaptor is installed for that purpose. if the vacuum pump oil (mineral oil) becomes mixed with R410A, it will damage the unit.

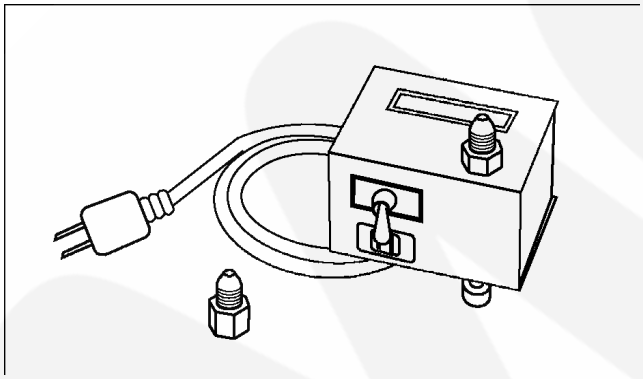


Fig. 5 Vacuum pump adaptor

7. Electric gas leak detector for HFC refrigerant

The leak detector and halide torch that were used with CFC and HCFC cannot be used with R410A (because there is no chlorine in the refrigerant).

The present R134a leak detector can be used, but the detection sensitivity will be lower (setting the sensitivity for R134a at 1, the level for R410A will drop to 0.6).

For detecting small amounts of gas leakage, use the electric gas leak detector for HFC refrigerant. (Detection sensitivity with R410A is about 23 g/year).

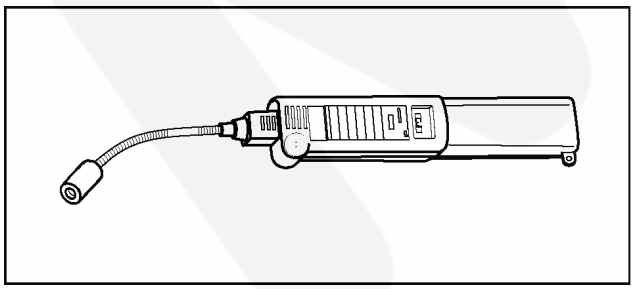


Fig. 6 Electric gas leak detector for HFC refrigerant

8. Electronic scale for refrigerant charging

Because of the high pressure and fast vaporizing speed of R410A, the refrigerant cannot be held in a liquid phase inside the charging cylinder when charging is done using the charging cylinder method, causing bubbles to form in the measurement scale glass and making it difficult to see the reading. (Naturally, the conventional R22 charging cylinder cannot be used because of the differences in the pressure resistance, scale gradation, connecting port size, etc.)

The electronic scale has been strengthened by using a structure in which the weight detector for the refrigerant cylinder is held by four supports. It is also equipped with two connection ports, one for R22 *7/16 UNF, 20 threads) and one for R410A (1/2 UNF, 20 threads), so it can also be used for conventional refrigerant charging.

There are two types of electronic scales, one for 10-kg cylinders and one for 20-kg cylinders. (The 10-kg cylinder is recommended.)

Refrigerant charging is done manually by opening and closing the valve.

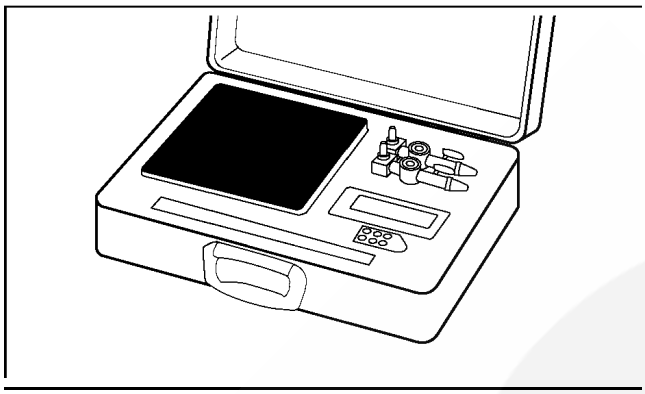


Fig. 7 Electronic scale for refrigerant charging

9. Refrigerant cylinders

The R410A cylinders are labeled with the refrigerant name, and the coating color of the cylinder protector is pink, which is the color stipulated by ARI of the U.S.

Cylinder equipped with a siphon tube are available to allow the cylinder to stand upright for liquid refrigerant charging.

Fig. 8 Refrigerant cylinders

10. Charging orifice and packing for refrigerant cylinders

The charging orifice must match the size of the charging hose fitting (1/2 UNF, 20 threads).

The packing must also be made of an HFC-resistant material.

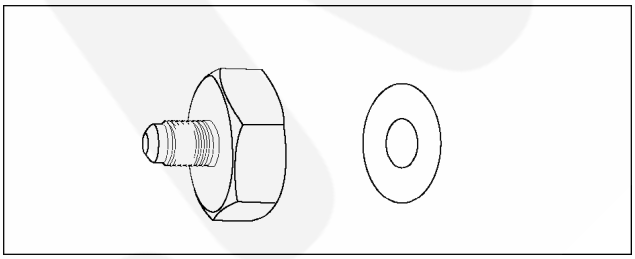


Fig. 9 Charging orifice and packing

10.2.3. R410A Tools Which Are Usable for R22 Models

Table 9 R410A tools which are usable for R22 models

	R410A tools	Usable for R22 models
(1)	Copper tube gauge for clearance adjustment	OK
(2)	Flaring tool (clutch type)	OK
(3)	Manifold gauge	NG
(4)	Charging hose	NG
(5)	Vacuum pump adaptor	OK
(6)	Electric gas leak detector for HFC refrigerant	NG
(7)	Electronic scale for refrigerant charging	OK
(8)	Refrigerant cylinder	NG
(9)	Charging orifice and packing for refrigerant cylinder	NG

10.3. REFRIGERANT PIPING WORK

10.3.1. Piping Materials

It is recommended that you use copper and copper alloy jointless pipes with a maximum oil adherence of 40 mg/10m. Do not used pipes that are crushed, deformed, or discolored (especially the inside surface). If these inferior pipes are used, impurities may clog the expansion valves or capillaries.
Because the pressure of ACs using R410A is higher than those using R22, it is essential that you select materials that are appropriate for these standards.
The thickness of the copper tubing used for R410A is shown in Table 10. Please be aware that tubing with a thickness of only 0.7 mm is also available on the market, but this should never be used.

Table 8 Difference between R410A and conventional charging hoses

Soft pipe		Thickness (mm)	
Nominal diameter	Outside diameter (mm)	R410A	(Reference) R22
1/4	6.35	0.80	0.70
3/8	9.52	0.80	0.70
1/2	12.7	0.80	0.70

10.3.2. Processing and Connecting Piping Materials

When working with refrigerant piping, the following points must be carefully observed: no moisture od dust must be allowed to enter the piping, and there must be no refrigerant leaks.

1. Procedure and precautions for flaring work
   a. Cut the pipe
      Use a pipe cutter, and cut slowly so the pipe will not be deformed.
   b. Remove burrs and clean shavings from the cut surface
      If the shape of the pipe end is poor after removing burrs, or if shavings adhere to the flared area, it may lead to refrigerant leaks.
      To prevent this, turn the cut surface downward and remove burrs, then clean the surface, carefully.
   c. Insert the flare nut (be sure to used the same nut that is used on the AC unit)
   d. Flaring
      Check the clamp bar and the cleanliness of the copper pipe.
      Be sure to sued the clamp bar to do the flaring with accuracy. Use either an R410A flaring tool, or a conventional flaring tool. flaring tools come in different sizes, so be sure to check the size before using. When using a conventional flaring tool, use the copper pipe gauge for clearance adjustment, etc., to ensure the correct A dimension (see Fig. 10)

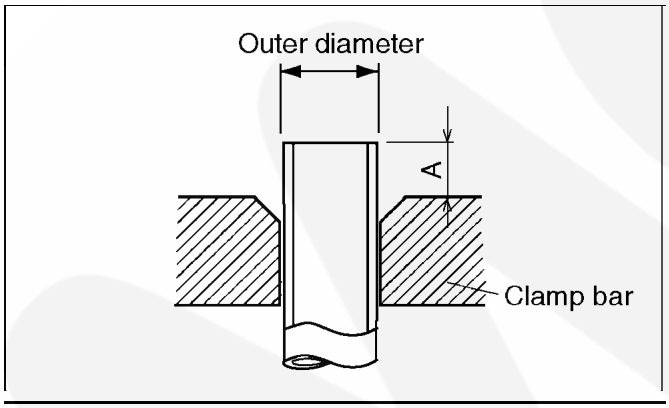


Fig. 10 Flaring dimensions

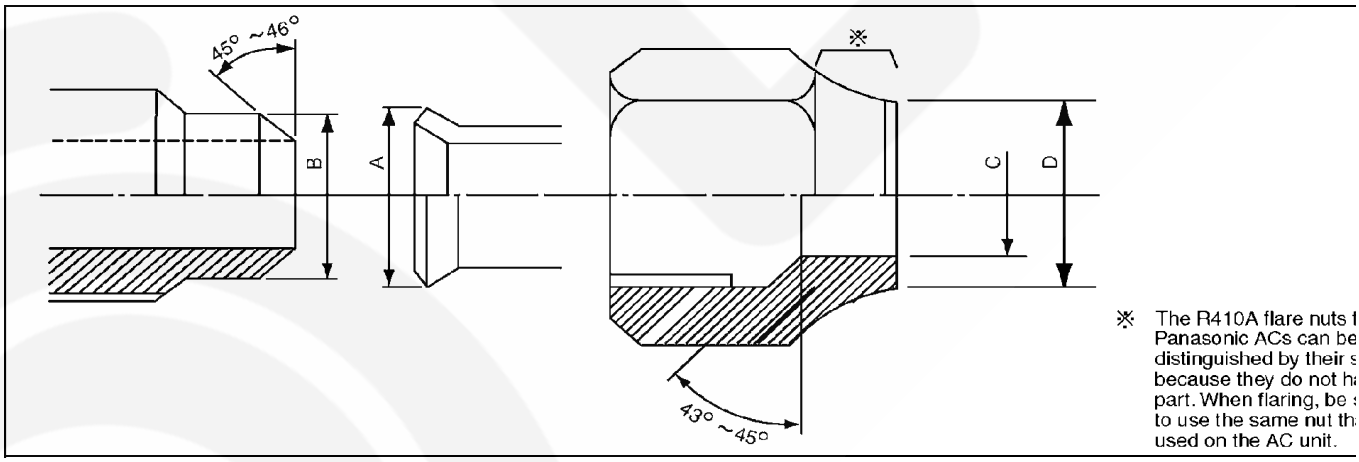


Fig. 11 Relation between the flare nut structure and flaring tool end

Table 11 R410A flaring dimensions

Nominal diameter (in)	Outside diameter (mm)	Wall thickness (mm)	A (mm)		
			R410A flaring tool, clutch type	Conventional flaring tool	
				Clutch type	Wing-nut type
1/4	6.35	0.8	0 - 0.5	1.0 - 1.5	1.5 - 2.0
3/8	9.52	0.8	0 - 0.5	1.0 - 1.5	1.5 - 2.0
1/2	12.70	0.8	0 - 0.5	1.0 - 1.5	2.0 - 2.5

Table 12 R410A flaring dimensions

Nominal diameter (in)	Outside diameter (mm)	Wall thickness (mm)	A (mm)		
			R410A flaring tool, clutch type	Conventional flaring tool	
				Clutch type	Wing-nut type
1/4	6.35	0.8	0 - 0.5	0.5 - 1.0	1.0 - 1.5
3/8	9.52	0.8	0 - 0.5	0.5 - 1.0	1.0 - 1.5
1/2	12.70	0.8	0 - 0.5	0.5 - 1.0	1.5 - 2.0

Table 13 R410A flaring and flare nut dimensions Unit: mm

Nominal diameter (in)	Outside diameter (mm)	Wall thickness (mm)	A +0, -0.4	B dimension	C dimension	D dimension	Flare nut width
1/4	6.35	0.8	9.1	9.2	6.5	13	17
3/8	9.52	0.8	13.2	13.5	9.7	20	22
1/2	12.70	0.8	16.6	16.0	12.9	23	26

Table 14 R410A flaring and flare nut dimensions Unit: mm

Nominal diameter (in)	Outside diameter (mm)	Wall thickness (mm)	A +0, -0.4	B dimension	C dimension	D dimension	Flare nut width
1/4	6.35	0.8	9.0	9.2	6.5	13	17
3/8	9.52	0.8	13.0	13.5	9.7	20	22
1/2	12.70	0.8	16.2	16.0	12.9	20	24

2. Procedure and precautions for flare connection

a. Check to make sure there are no scratches, dust, etc., on the flare and union.

b. Align the flared surface with the axial center of the union.

c. Use a torque wrench, and tighten to the specified torque. The tightening torque for R410A is the same as the conventional torque value for R22. Be careful, because if the torque is too weak, it may lead to a gas leak. If it is too strong, it may split the flare nut or make it impossible to remove the flare nut.

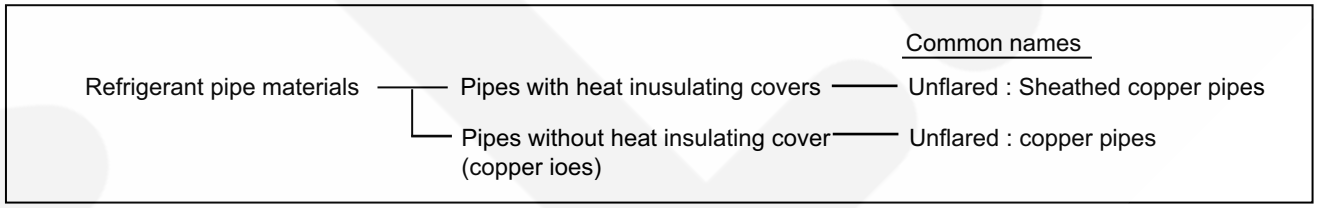
Table 15 R410A tightening torque

Nominal diameter (in)	Outside diameter (mm)	Tightening torque N.m (kgf.cm)	Torque wrench tightening torque N.m (kgf.cm)
1/4	6.35	14 - 18 (140 - 180)	18 (180)
3/8	9.52	33 - 42 (330 -420)	42 (420)
1/2	12.70	55 (550)	55 (550)

10.3.3. Storing and managin g Piping Material s

1. Types of piping and their storage

The following is a general classification of the refrigerant pipe materials used for ACs.



Because the gas pressure of R410A is approximately 1.6 times as high as that of R22, copper pipes with the thickness shown in Table 10, and with minimal impurities must be used. Care must also be taken during storage to ensure that pipes are not crushed, deformed, or scratched, and that no dust, moisture or other substance enters the pipe interior. When storing sheathed copper pipes or plain copper pipes, seal the openings by pinching or taping them securely.

2. Makings and management

a. Sheathed copper pipes and copper-element pipes

When using these pipes, check to make sure that they are the stipulated thickness. For flare nuts, be sure to used the same nut that is used on the AC unit.

b. Copper pipes
Use only copper pipes with the thickness given in table 10, and with minimal impurities. Because the surface of the pipe is exposed, you should take special care, and also take measures such as marking the pipes to make sure they are easily distinguished from other piping materials, to prevent mistaken use.

3. Precautions during refrigerant piping work
Take the following precautions on-site when connecting pipes. (Keep in mind that the need to control the entry of moisture and dust is even more important that in conventional piping).

a. Keep the open ends of all pipes sealed until connection with AC equipment is complete.

b. Take special care when doing piping work on rainy days. The entering of moisture will degrade the refrigerating machine oil, and lead to malfunctions in the equipment.

c. Complete all pipe connections in as short a time as possible. If the pipe must be left standing for a long time after removing the seal, it must be thoroughly purged with nitrogen, or dried with a vacuum pump.

10.4. INSTALLATION, TRANSFERRING, SERVICING

10.4.1. Inspecting Gas Leaks with a Vacuum Pump for New Installations (Using New Refrigerant Piping)

1. From the viewpoint of protecting the global environment, please do not release refrigerant into the atmosphere.

a. Connect the projecting side (pin-pushing side) of the charging hose for the manifold gauge to the service port of the 3-way valve. (1)

b. Fully open the handle Lo of the manifold gauge and run the vacuum pump. (2) (If the needle of the low-pressure gauge instantly reaches vacuum, re-check step a).)

c. Continue the vacuum process for at least 15 minutes, then check to make sure the low-pressure gauge has reached -0.1 MPa (-76 cmHg). Once the vacuum process has finished, fully close the handle Lo of the manifold gauge and stop the vacuum pump operation, then remove the charging hose that is connected to the vacuum pump adaptor. (Leave the unit in that condition for 1-2 minutes, and make sure that the needle of the manifold gauge does not return.) (2) and (3)

d. Turn the valve stem of the 2-way valve 90 counter-clockwise to open it, then, after 10 seconds, close it and inspect for a gas leak (4)

e. Remove the charging hose from the 3-way valve service port, then open both the 2-way valve and 3-way valve. (1) (4) (Turn the valve stem in the counter-clockwise direction until it gently makes contact. Do not turn it forcefully).

f. Tighten the service port cap with a torque wrench (18 N.m (1.8 kgf.m)). (5) Then tighten the 2-way valve and 3-way valve caps with a torque wrench (42 N.m (4.2 kgf.m)) or (55 N.m (5.5 kgf.m)).

g. After attaching each of the caps, inspect for a gas leak around the cap area. (5) (6)

Precau tions

Be sure to read the instructions for the vacuum pump, vacuum pump adaptor and manifold gauge prior to use, and follow the instructions carefully.

Make sure that the vacuum pump is filled with oil up to the designated line on the oil gauge.

The gas pressure back flow prevention valve on the charging hose is generally open during use. When you are removing the charging hose from the service port, it will come off more easily if you close this valve.

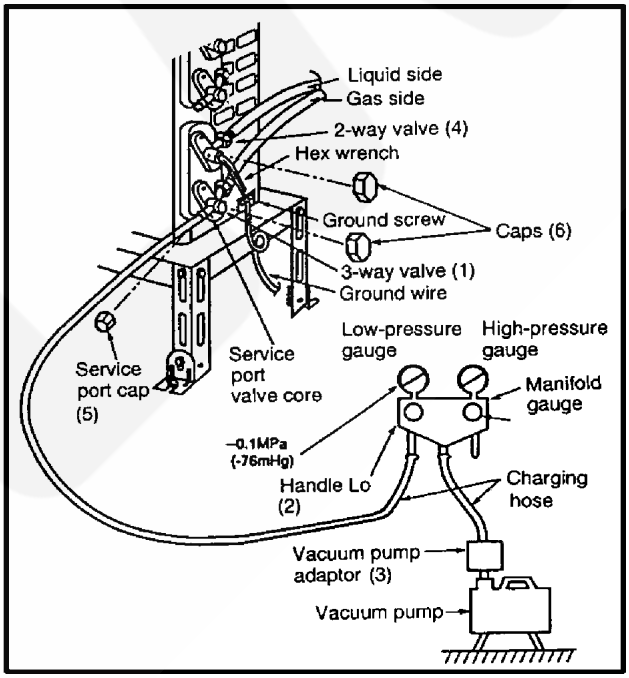


Fig. 12 Vacuum pump air purging configuration

10.4.2. Transferring (Using New Refrigerant Piping)

1. Removing the unit
   a. Collecting the refrigerant into the outdoor unit by pumping down
      The refrigerant can be collected into the outdoor unit (pumping down) by pressing the TEST RUN button, even when the temperature of the room is low.
      - Check to make sure that the valve stems of the 2-way valve and 3-way valve have been opened by turning them counter-clockwise. (Remove the valve stem caps and check to see that the valve stems are fully opened position. Always use a hex wrench (with 4-mm opposing sides) to operate the valve stems.)
      - Press the TEST RUN button on the indoor unit, and allow preliminary for 5-6 minutes. (TEST RUN mode)
      - After stopping the operation, let the unit sit for about 3 minutes, then close the 2-way valve by turning the valve stem in the clockwise direction.
      - Press the TEST RUN button on the indoor unit again, and after 2-3 minutes of operation, turn the valve stem of the 3-way valve quickly in the clockwise direction to close it, then stop the operation.
      - Tighten the caps of the 2-way valve and 3-way valve to the stipulated torque.
      - Remove the connection pipes (liquid side and gas side).
2. Installing the unit
   Install the unit using new refrigerant piping. Follow the instructions in section 4.1 to evacuate the pipes connecting the indoor and outdoor units, and the pipes of the indoor unit, and check for gas leaks.

10.4.3. AC Units Replacement (Using Existing Refrigerant Piping)

When replacing and R410A AC unit with another R410A AC unit, you should re-flare the refrigerant piping. Even though the replacement AC unit uses the R410A, problems occur when, for example, either the AC unit maker or the refrigerating machine oil is different.
When replacing an R22 AC unit with an R410A AC unit, the following checks and cleaning procedures are necessary but are difficult to do because of the chemical characteristics of the refrigerating machine oil (as described in items c) and d) of section 10.1.1.(2)). In this case, you should use new refrigerant piping rather than the existing piping.

1. Piping check
   Because of the different pressure characteristics of R22 and R410A, the design pressure for the equipment is 1.6 times different. the wall thickness of the piping must comply with that shown in Table 10, but this is not easy to check. Also, even if the thickness is correct, there may be flattened or bent portions midway through the piping due to sharp curves. Buried sections of the piping also cannot be checked.
2. Pipe cleaning
   A large quantity of refrigerating machine oil (mineral oil) adheres to existing pipes due to the refrigeration cycle circulation. If the pipes are used just as they are for the R410A cycle, the capacity will be lowered due to the incompatibility of this oil with the R410A, or irregularities may occur in the refrigeration cycle. For this reason, the piping must be thoroughly cleaned, but this is difficult with the present technology.

10.4.4. Refrigerant Compatibility (Using R410A Refrigerant in R22 ACs and Vice Versa)

Do not operate an existing R22 AC with the new R410A refrigerant. Doing so would result in improper functioning of the equipment or malfunction, and might lead to a major accident such as an explosion in the refrigeration cycle. Similarly, do not operate an R410A AC with R22 refrigerant. The chemical reaction between the refrigerating machine oil used in R410A ACs and the chlorine that is contained in R22 would cause the refrigerating machine oil to degrade and lead to malfunction.

10.4.5. Recharging Refrigerant During Servicing

When recharging is necessary, insert the specified amount of new refrigerant in accordance with the following procedure.

1. Connect the charging hose to the service port of the outdoor unit.
2. Connect the charging hose to the vacuum pump adaptor. At this time, fully open the 2-way valve and 3-way valve.
3. Fully open the handle Lo of the manifold gauge, turn on the power of the vacuum pump and continue the vacuum process for at least one hour.
4. Confirm that the low pressure gauge shows a reading of -0.1 Mpa (-76 cmHg), then fully close the handle Lo, and turn off the vacuum pump. Wait for 1-2 minutes, then check to make sure that the needle of the Low pressure gauge has not returned. See Fig. 13 for the remaining steps of this procedure.

5. Set the refrigerant cylinder onto the electronic scale, then correct the hose the cylinder and to the connection port for the electronic scale. (1)(2)

   Precau tion:

   Be sure to set up the cylinder for liquid charging. If you use a cylinder equipped with a siphon tube, you can charge the liquid without having to turn the cylinder around

6. Remove the charging hose of the manifold gauge from the vacuum pump adaptor, and connect it to the connection port of the electronic scale. (2)(3)
7. Open the valve of the refrigerant cylinder, then open the charging valve slightly and close it. Next, press the check valve of the manifold gauge and purge the air. (2)(4) (Watch the liquid refrigerant closely at this point.)
8. After adjusting the electronic scale to zero, open the charging valve, then open the valve Lo of the manifold gauge and charge with the liquid refrigerant. (2)(5) (Be sure to read the operating instructions for the electronic scale.)
9. If you cannot charge the stipulated amount, operate the unit in the cooling mode while charging a little of the liquid at a time (about 150 g/time as a guideline). If the charging amount is insufficient from one operation, wait about one minute, then use the same procedure to do the liquid charging again.

   Precau tion:

   Never use the gas side to allow a larger amount of liquid refrigerant to be charged while operating the unit.

10. Close the charging valve, and after charging the liquid refrigerant inside the charging hose, fully close the valve Lo of the manifold gauge, and stop the operation of the unit. (2)(5)
11. Quickly remove the charging hose from the service port. (6) If you stop midway through, the refrigerant that is in the cycle will be discharged.
12. After putting on the caps for the service port and operating valve, inspect around the caps for a gas leak. (6)(7)

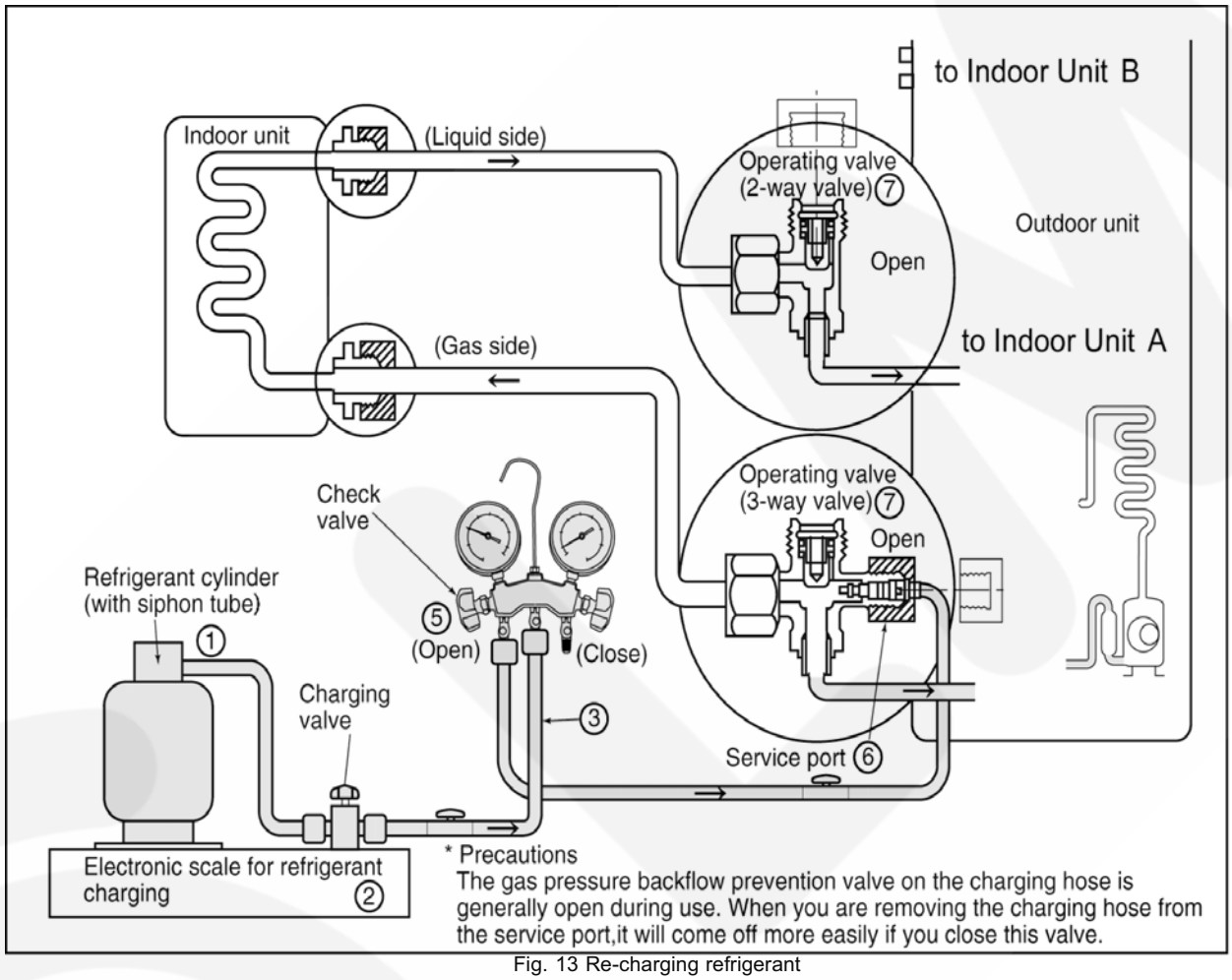


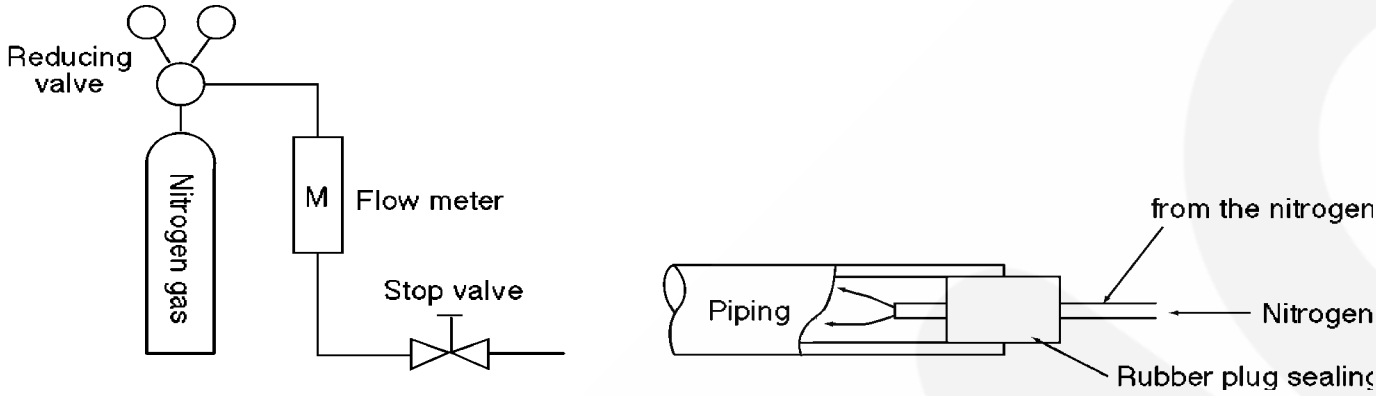
Fig. 13 Re-charging refrigerant

10.4.6. Brazing

As brazing requires sophisticated techniques and experiences, it must be performed by a qualified person.
In order to prevent the oxide film from occurring in the pipe interior during brazing, it is effective to proceed with brazing while letting dry nitrogen gas (N2) flow.

<Brazing Method for Preventing Oxidation>

1. Attach a reducing valve to the nitrogen gas cylinder.
2. Attach a reducing valve to the nitrogen gas cylinder.
3. Apply a seal onto the clearance between the piping and inserted pipe for the nitrogen gas in order to prevent the nitrogen gas from flowing backward.
4. When the nitrogen gas is flowing, be sure to keep the piping end open.
5. Adjust the flow rate of nitrogen gas so that it is lower than 0.05 m^3/h, or 0.02 MPa (0.2 kgf/cm^2) by means of the reducing valve.
6. After taking the steps above, keep the nitrogen gas flowing until the piping cools down to a certain extent (i.e. temperature at which pipes are touchable with finger).
7. Completely remove the flux after brazing.



Cautions during brazing

1. General Cautions
   a. The brazing strength should be high as required.
   b. After operation, airtightness should be kept under pressurized condition.
   c. During brazing do not allow component materials to become damaged due to overheating.
   d. The refrigerant pipe work should not become blocked with scale or flux.
   e. The brazed part should not restrict the flow in the refrigerant circuit.
   f. No corrosion should occur from the brazed part.
2. Preventing of Overheating

   Due to heating, the interior and exterior surfaces of treated metal may oxidize. Especially, when the interior of the refrigerant circuit oxidizes due to overheating, scale occurs and stays in the circuit as dust, thus exerting a fatally adverse effect. So, make brazing at adequate brazing temperature and with minimum of heating area.
3. Overheating Protection

   In order to prevent components near the brazed part from overheating damaged or quality deterioration due to flame or heat, take adequate steps for protection such as (1) by shielding with a metal plate, (2) by using a wet cloth, and (3) by means of heat absorbent.
4. Movement during Brazing

   Eliminate all vibration during brazing to protect brazed joints from cracking and breakage.
5. Oxidation Preventative

   In order to improve the brazing efficiency, various types of antioxidant are available on the market. However, the constituents of these are widely varied, and some are anticipated to corrode the piping materials, or adversely affect HFC refrigerant, lubricating oil, etc. Exercise care when using an oxidation preventive.

10.4.7. Servicing Tips

The drier must also be replaced whenever replacing the refrigerant cycle parts. Replacing the refrigerant cycle parts first before replacing the drier. The drier is supplied in a vacuum pack. Perform brazing immediately after opening the vacuum pack, and then start the vacuum within two hours. In addition, the drier also needs to be replaced when the refrigerant has leaked completely.

11 Disassembly of the parts

Removal Procedure For Intake Grille

1. Open the intake grille and pull it to the horizontal position. (Fig. 1)

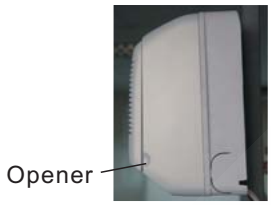


Fig. 1

2. Pull up the intake grille until it falls off.(Fig. 2)

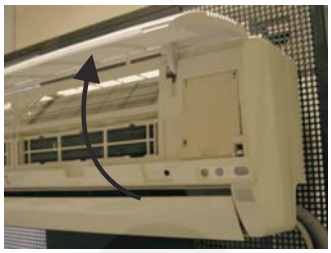


Fig. 2

Removal Procedure For Front Grille

1.Remove the two caps at the discharge port (right and left) (Fig. 3)

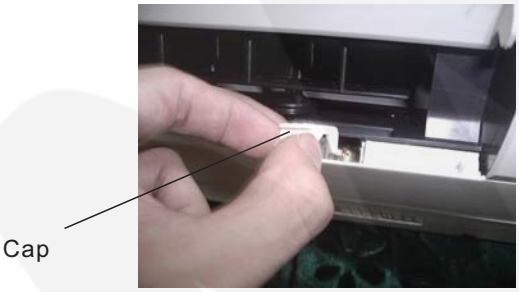


Fig. 3

2.Release the two screws under the both caps. (Fig. 4)

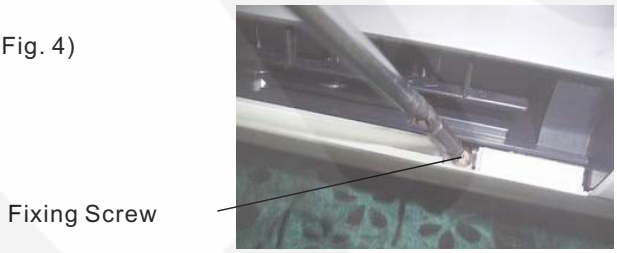


Fig. 4

3.Pull out the front grille from the unit body. (Fig.5)

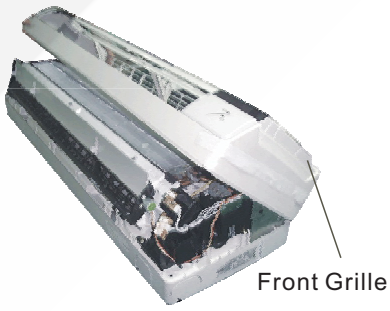


Fig. 5

Removal Procedure For Electronic Controller

1、Remove indicador complete

Afer removing the front grille, loose the screw behind the indicator, the whole indicator can be released.

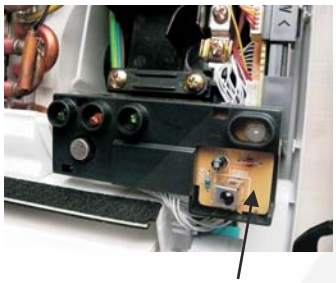


Fig 6

2、Remove the cover of control board and holder

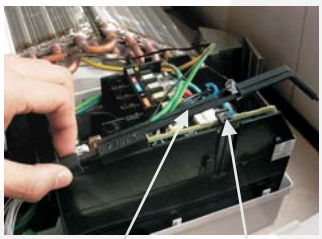


Fig 7

3、Break off the earing ,release the holder slightly.
Be sure to avoid cracking of the holder.

4. Release the lead wire CN-FM, CN-STM, CN-DISP and earth wire(Yellow/Green). Take out the sensor from the socket. Pull out the whole electronic controller.

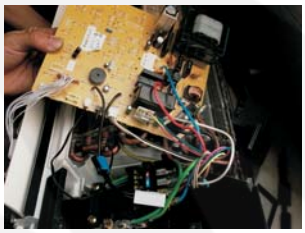


Fig 8

5. Remove the whole control board
Loose the screw s of control board,earings slightly, then the whole control board can be pulled out.

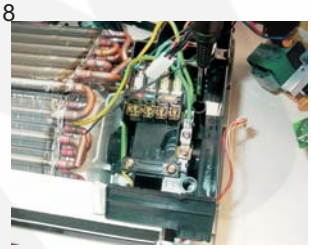


Fig 9

Removal Procedure For the Discharge Grille

1. Separate the drain hose and the drain plate(Fig.10)

Fig 10

2. Pull out the discharge grille slightly (Fig. 11)

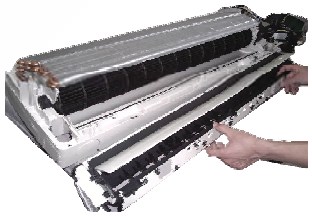


Fig. 11

Removal Procedure For Cross Flow Fan

1. Release the two fixing screws,disassembly the fixing board from evaporator on the left side of the evaporator and pull out the whole evaporator. (Fig. 12)

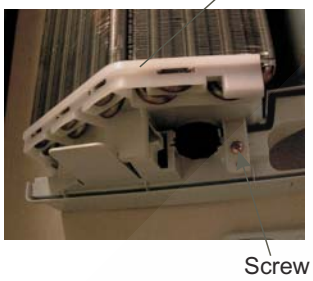


Fig. 12

2.Loose the fixing screw of the cross flow fan. (Fig. 13)

Fig. 13

3.After removing the bearing (refer to fig14) , indoor fan can be taken out from the left side.

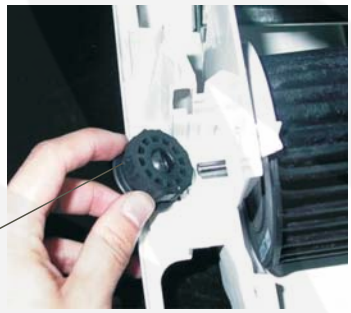


Fig 14

4. Lift up the indoor fan slightly, and then pull the fan motor out.（Fig15）

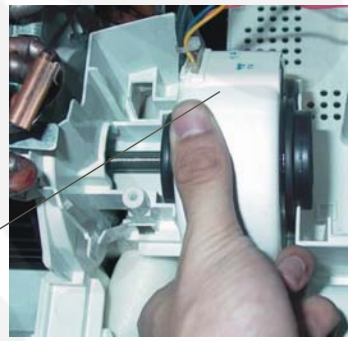


Fig 15

Remote control reset

If the display is chaotic or can not be adjusted,
Use a pin to press RESET button to reset the remote control to the original set by manufacture.

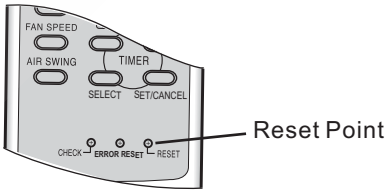


Fig 16

12 Troubleshooting Guide

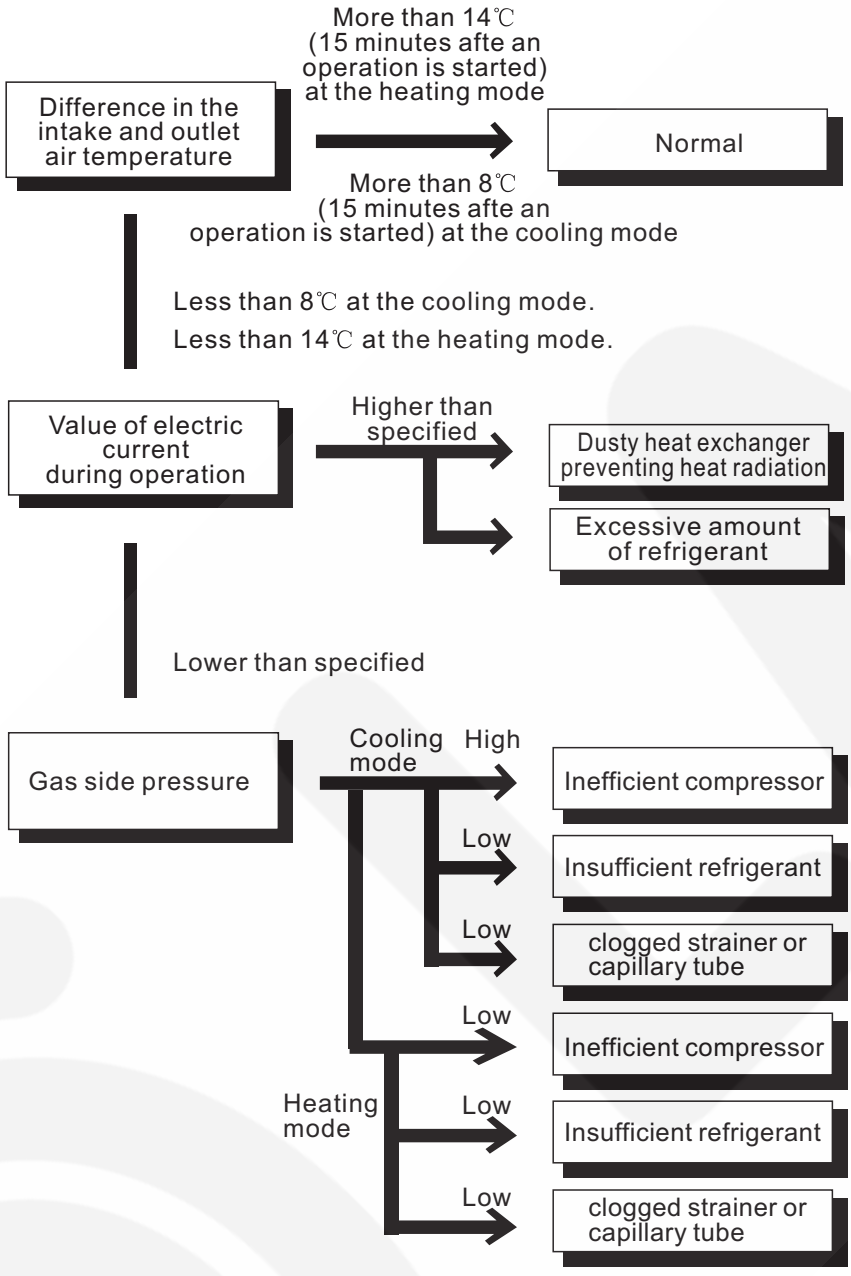
12.1. Refrigeration cycle system

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 compressor or 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 to the right.

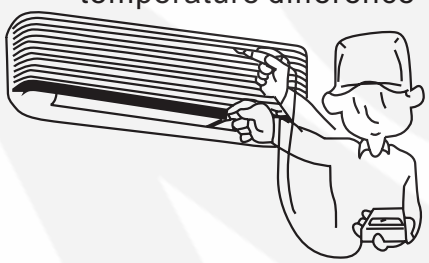
Normal pressure and outlet air temperature(standard)

	Gas side pressure Mpa (kg/cm^2G)	Outlet air temperature (℃)
Cooling mode	0.9~1.2(9~12)	12~16
Heating mode	2.3~2.9(23~29)	36~45

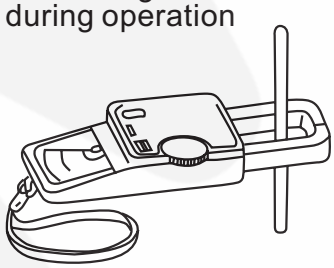
★ Condition: indoor fan speed: high
outdoor temperature:
35℃ (Cooling mode)
7℃ (Heating mode)



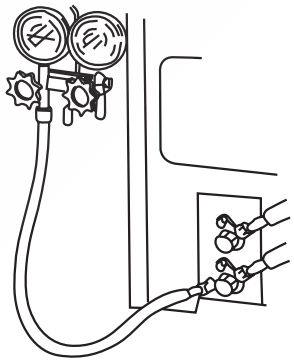
- Measuring the air temperature difference



- Measuring electric current during operation



- Measuring gas side pressure



12.2. Relationship between the condition of air conditioner and pressrue and electric current

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

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

12.3. Diagnosis methods of a malfunction of a compressor .

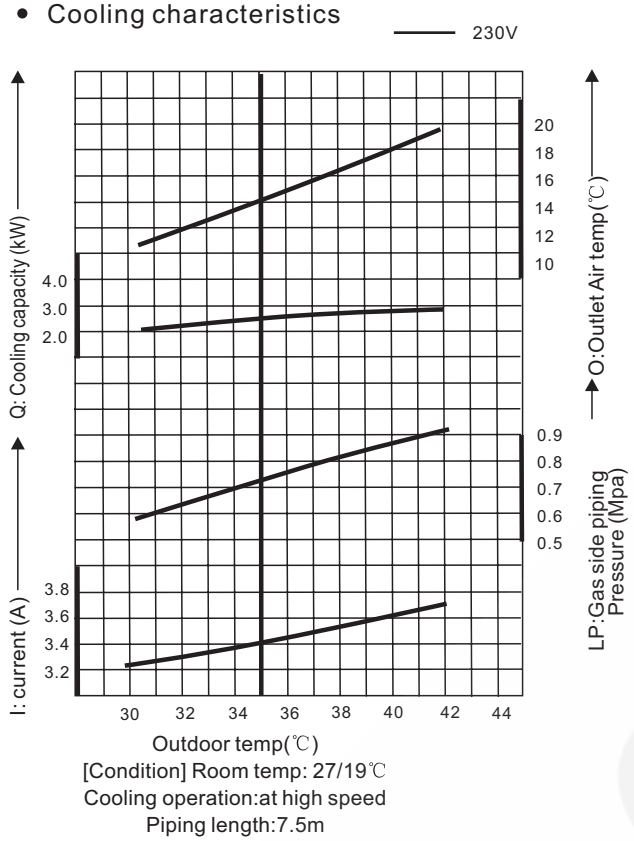
Nature of fault	Symptom
Insufficient compressing of a compressor	• Electric current during operation becomes approximately 80% lower than the normal level. • The discharge tube of the compressor becomes abnormally hot (normally 70~90℃). • The difference between high pressure and low pressure becomes 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.
Inefficient switches of the 4-way valves	• Electric current during operation becomes approximately 20% lower than the normal valve. • The temperature difference between from the discharge tube to the 4-way valve and from suction tube to the 4-way valve becomes almost zero.

13 Technical Data

■ Operating characteristics

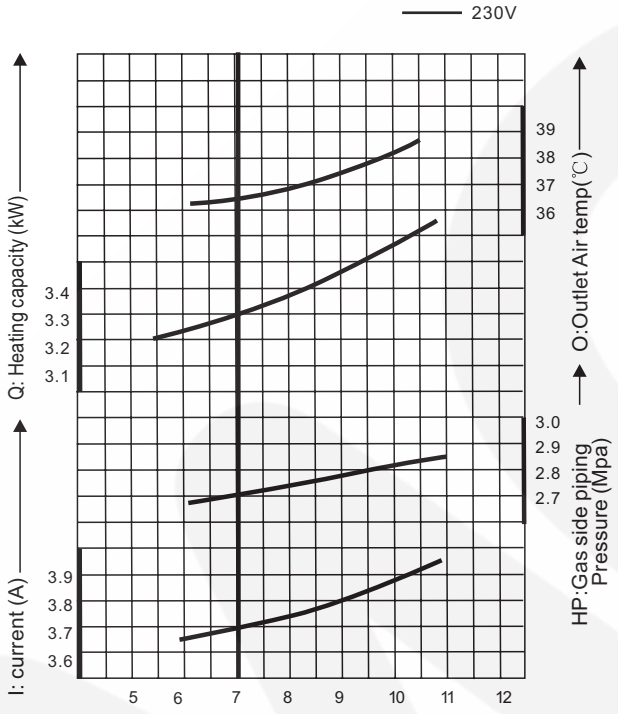
CS-PE9DKE/CU-PE9DKE

- Cooling characteristics



[Condition] Room temp: 27/19℃
Cooling operation:at high speed
Piping length:7.5m

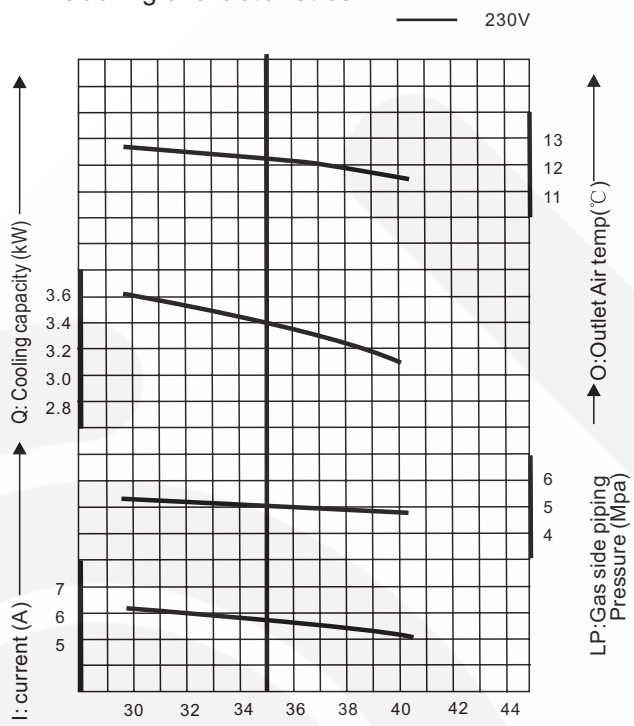
- Heating characteristics



[Condition] Room temp: 27/19℃
Heating operation:at high speed
Piping length:7.5m

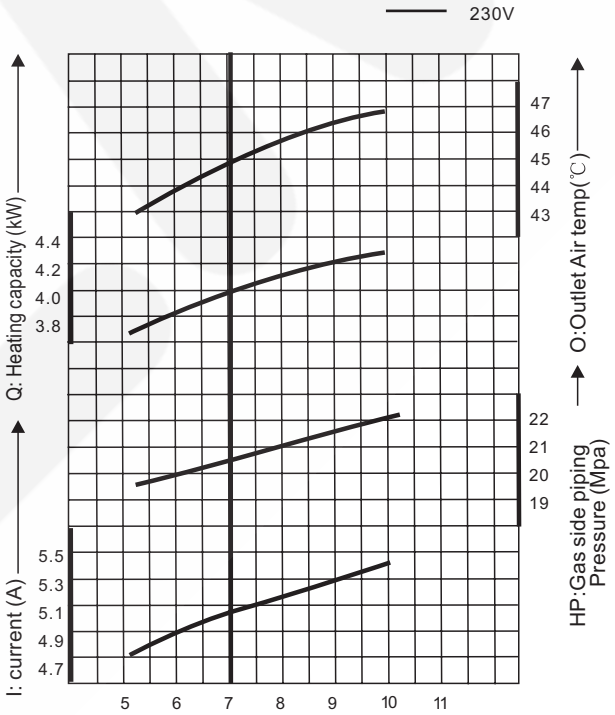
CS-PE12DKE/CU-PE12DKE

- Cooling characteristics



[Condition] Room temp: 27/19℃
Cooling operation:at high speed
Piping length:7.5m

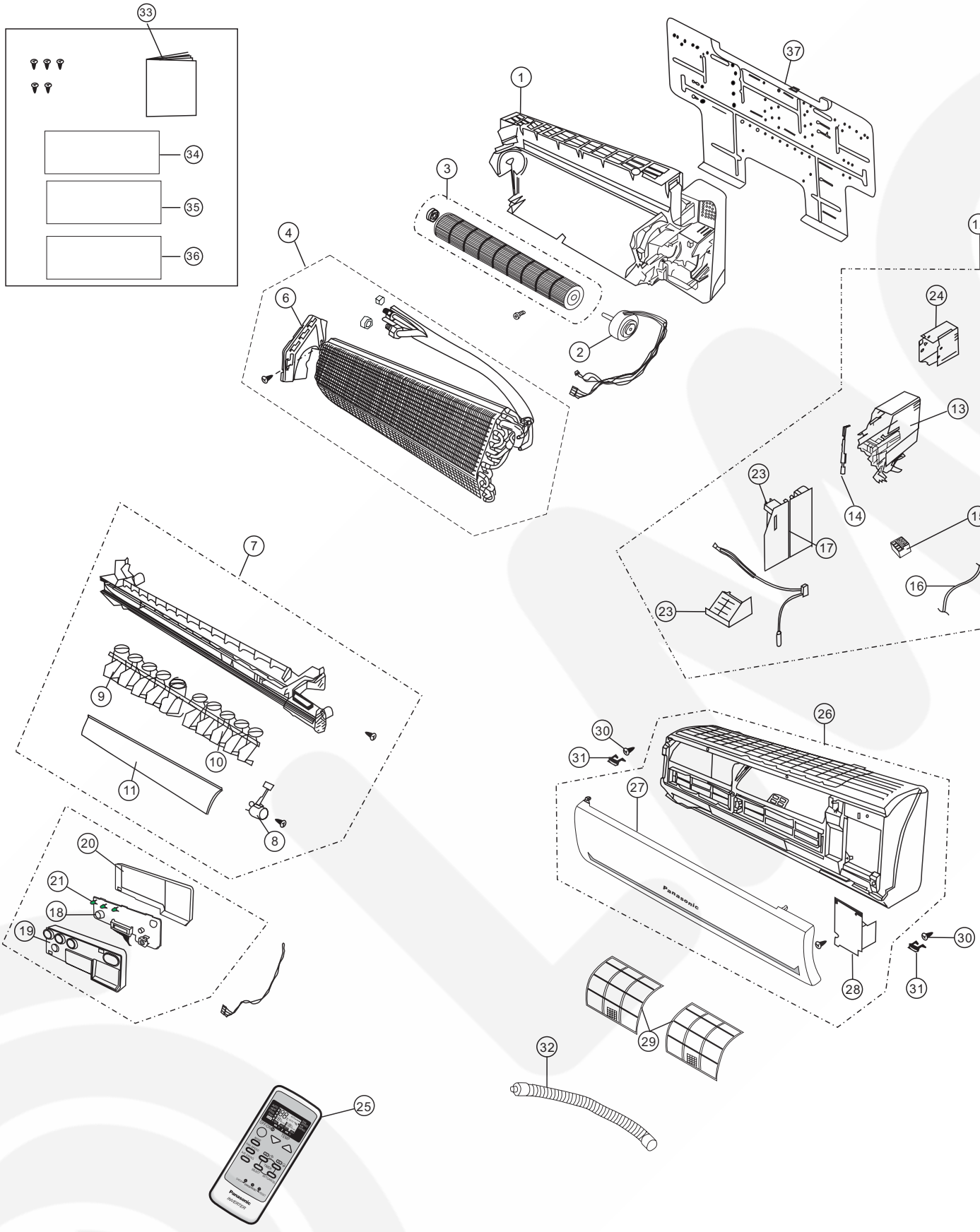
- Heating characteristics



[Condition] Room temp: 27/19℃
Heating operation:at high speed
Piping length:7.5m

14 Exploded View

CS-PE9DKE
CS-PE12DKE



15 Replacement Parts List

CS-PE9DKE
CS-PE12DKE

No.	DESCRIPTION&NAME	Q'TY	CS-PE9DKE	CS-PE12DKE	RE
1	CHASSIS COMPLETE	1	CWD50C1427	CWD50C1427	
2	FAN MOTOR	1	ARW41W8P30AC	ARW41W8P30AC	
3	CROSS FLOW FAN COMPLETE	1	CWH02C1036	CWH02C1036	
4	EVAPORATOR	1	CWB30C1558	CWB30C1558	
6	FIXING BOARD	1	CWD661043	CWD661043	
7	DISCHARGE GRILLE COMPLETE	1	CWE20C2436	CWE20C2409	
8	AIR SWING MOTOR	1	CWA981091	CWA981091	
9	HORIZONTAL VANE(LEFT)	1	CWE24C1104	CWE24C1104	
10	HORIZONTAL VANE(RIGHT)	1	CWE24C1105	CWE24C1105	
11	VERTICAL VANE	1	CWE24C1100	CWE24C1100	
12	C-BOX	1	CWH14C4628A	CWH14C4628B	
13	CONTROL BOARD	1	CWH102265	CWH102265	
14	HOLDER	1	CWD932493	CWD932493	
15	TERMINAL BOARD COMPLETE	1	CWA28C2234	CWA28C2234	
16	POWER SUPPLY CORD COMPLETE	1	CWA20C2443	CWA20C2443	
17	ELECTRONIC CONTROLLER	1	CWA743824A	CWA743824B	
18	SENSOR	1	L2GZ00000003	L2GZ00000003	
19	INDICATOR HOLDER-FRONT	1	CWD932491	CWD932491	
20	INDICATOR HOLDER-BACK	1	CWD932492	CWD932492	
21	INDICATOR PCB	1	CWA743836	CWA743836	
23	CONTROL BOARD FRONT COVER	1	CWH131235	CWH131235	
24	CONTROL BOARD TOP COVER	1	CWH131237	CWH131237	
25	REMOTE CONTROL	1	CWA75C2683	CWA75C2683	
26	FRONT GRILLE COMPLETE	1	CWE11C3214	CWE11C3214	
27	FRONT GRILLE	1	CWE22K1259	CWE22K1259	
28	GRILLE DOOR	1	CWE141073	CWE141073	
29	AIR FILTER	2	CWD001144	CWD001144	
30	SCREW-FRONT GRILLE	2	XTT4+16CFJ	XTT4+16CFJ	
31	CAP-FRONT GRILLE	2	CWH521109	CWH521109	
32	DRAIN HOSE	1	CWH851063	CWH851063	
33	OPERATING INSTRUCTIONS	1	CWF564703	CWF564703	
34	INSTALLATION INSTRUCTIONS	1	CWF612795	CWF612795	
35	INSTALLATION INSTRUCTIONS	1	CWF612796	CWF612796	
36	INSTALLATION INSTRUCTIONS	1	CWF612797	CWF612797	
37	INSTALLATION PLATE	1	CWH361067	CWH361067	

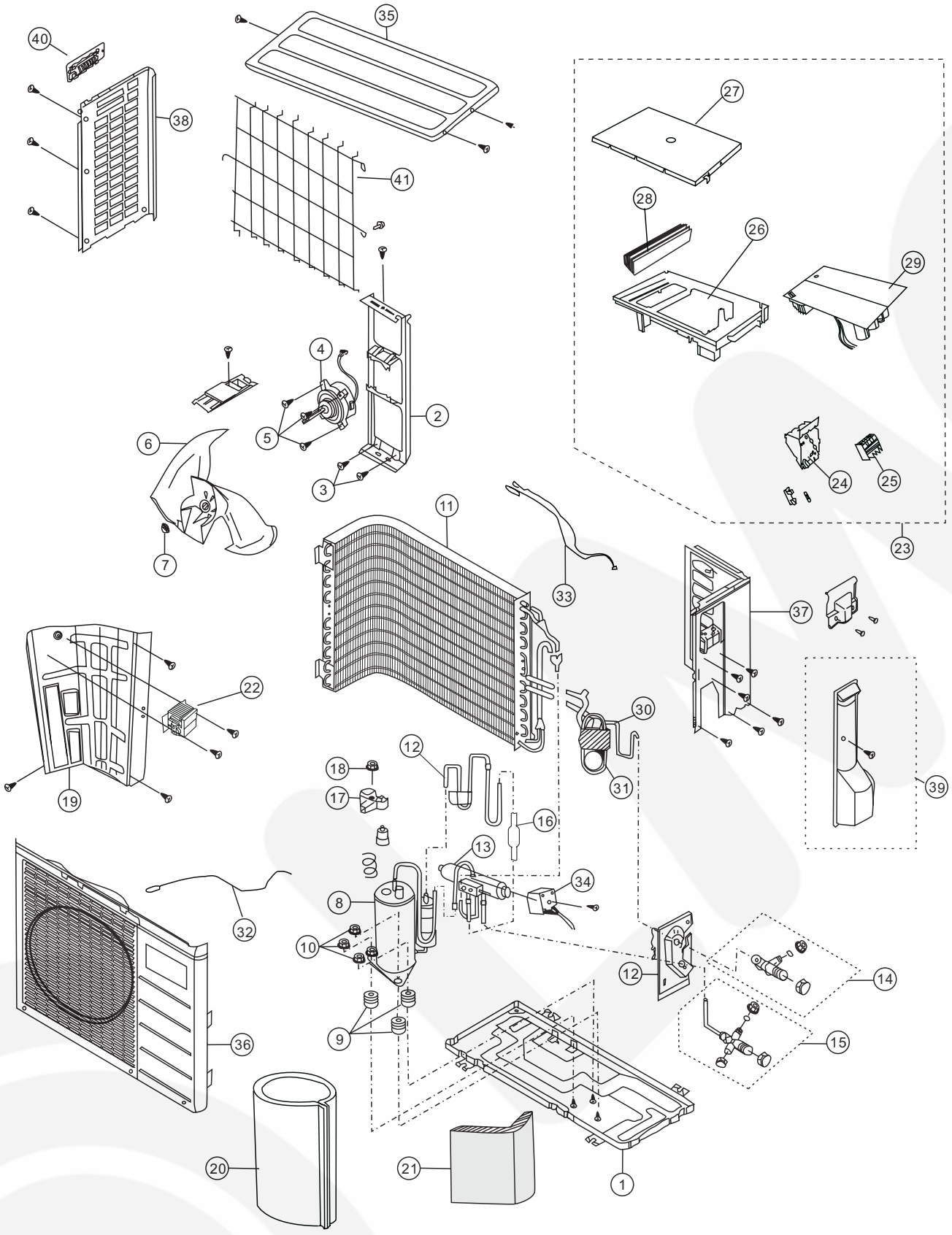
Note:

1.All parts are supplied from GMAC, P.R. China.

2."*" marked parts are recommended to be kept in stock.

16 Exploded View

CU-PE9DKE
CU-PE12DKE



17 Replacement Parts List

CU-PE9DKE
CU-PE12DKE

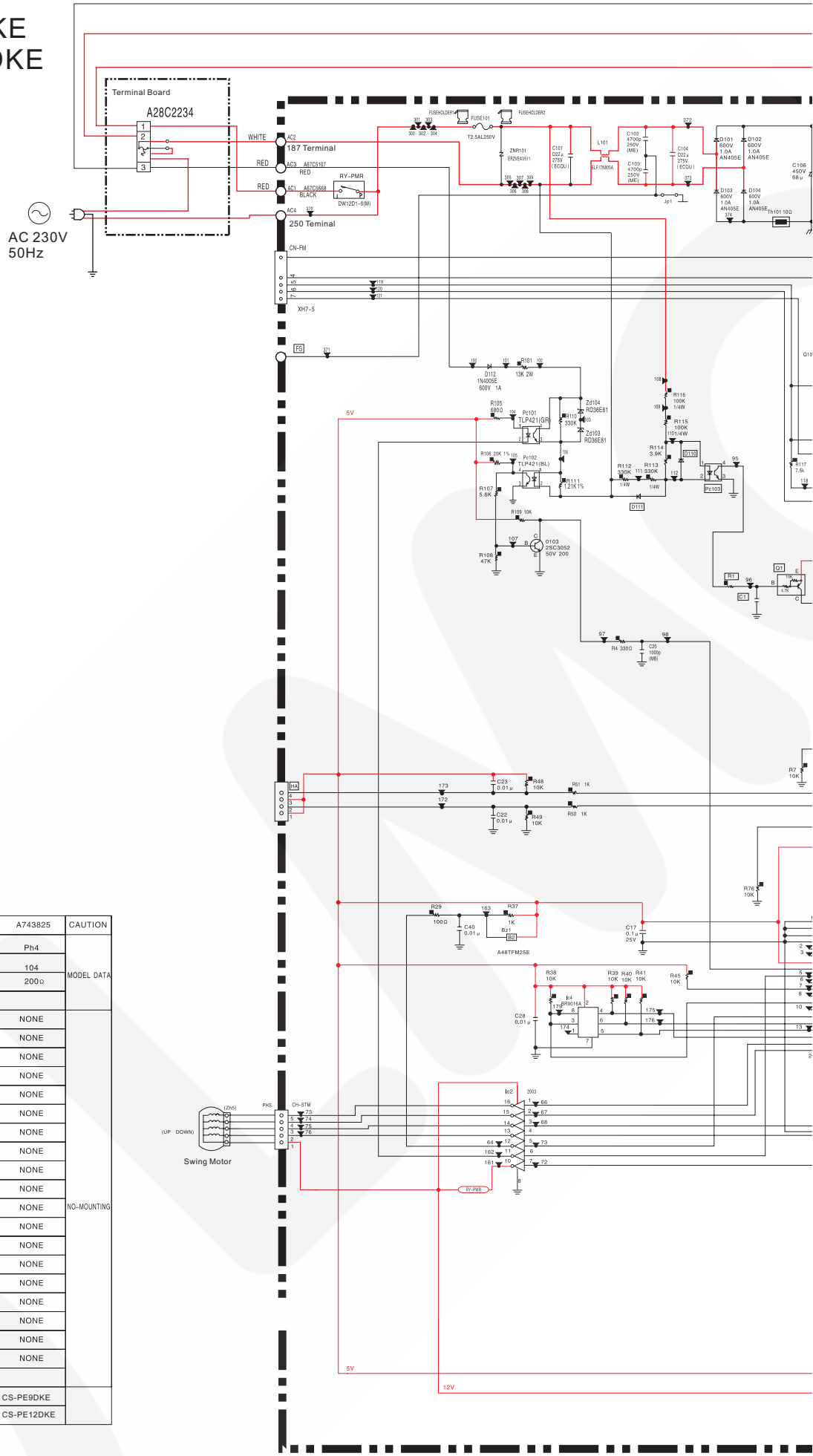
No.	DESCRIPTION&NAME	Q'ty	CU-PE9DKE	CU-PE12DKE	RE
1	BASE ASS'Y	1	CWD50K2114A	CWD50K2114A	
2	HOLDER-FAN MOTOR	1	CWD541020	CWD541020	
3	SCREW-F.M. HOLDER	2	CWH551060J	CWH551060J	
4	FAN MOTOR	1	L6LAHAG00001	L6LAJAG00001	
5	FIXING SCREW-FAN MOTOR	4	CWH55406J	CWH55293J	
6	PROPELLER FAN	1	CWH03K1010	CWH03K1010	
7	NUT-P.FAN	1	CWH561036J	CWH561036	
8	COMPRESSOR	1	CWB092256	CWB092256	
9	MOUNT RUBBER(COMP.)	3	CWH50077	CWH50077	
10	NUT-COMP.MOUNT	3	CWH56000J	CWH56000J	
11	CONDENSER	1	CWB32C1491	CWB32C1500	
12	HOLDER-COUPLING	1	CWH351040	CWH351040	
13	4-WAY VALVE	1	CWB001037J	CWB001037J	
14	2-WAY VALVE	1	CWB021241	CWB021241	
15	3-WAY VALVE	1	CWB011261	CWB011261	
16	FILTER	1	CWB101016	CWB101016	
17	TERMINAL COVER	1	CWH17006	CWH17006	
18	NUT-TERMINAL COVER	1	7080300J	7080300J	
19	SOUND PROOF PANEL	1	CWH151088	CWH151083	
20	SOUND PROOF PANEL	1	CWG302269	CWG302269	
21	SOUND PROOF PANEL	1	CWG302281	CWG302281	
22	REACTOR	1	CWA421050J	CWA421060J	
23	CONTROL BOX COMPLETE	1	CWH14C4648A	CWH14C4659A	
24	CONTROL BOARD	1	CWH102283	CWH102283	
25	TERMINAL BOARD ASS'Y	1	CWA28K1121	CWA28K1121	
26	CONTROL BOARD	1	CWH102248	CWH102248	
27	CONTROL BOARD COVER	1	CWH131214	CWH131214	
28	RADIATOR	1	CWA581085	CWA581085	
29	ELECTRONIC CONROLLER	1	CWA743776A	CWA743821A	
30	TUBE ASS'Y(CAPILLARY)	1	CWT01C3431	CWT01C3433	
31	CAPILLARY	1	CWB15386	CWB15416	
32	SENSOR(COMP.)	1	CWA50C2209J	CWA50C2209J	
33	SENSOR(PIPNG)	1	CWA50C2282J	CWA50C2282J	
34	V-COIL COMPLTE	1	CWA43C2179J	CWA43C2179J	
35	SURFACE COVER	1	CWE031055A	CWE031055A	
36	CABINET FRONT PLATE	1	CWE06C1090	CWE06C1090	
37	CABINET SIDE PLATE(R)	1	CWE041157A	CWE041157A	
38	CABINET SIDE PLATE(L)	1	CWE041118A	CWE041118A	
39	CONTROL BOARD COVER	1	CWH13C1119	CWH13C1119	
40	HANDLE	1	CWE161001	CWE161001	
41	PROOF NET-CONDENSER	1	CWD041048A	CWD041034A	

Note:

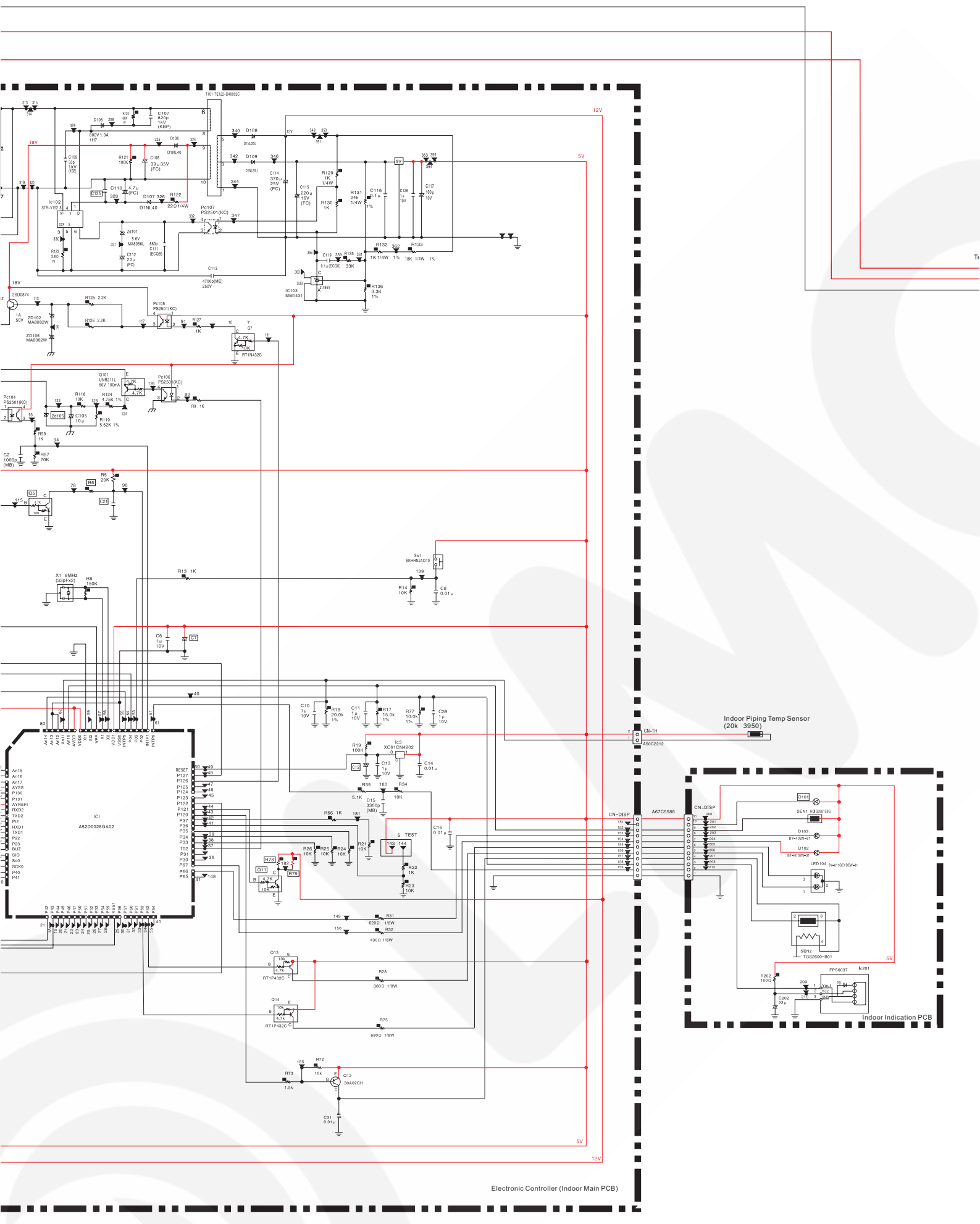
All parts are supplied from GMAC, P.R. China.

18 Electronic Diagram

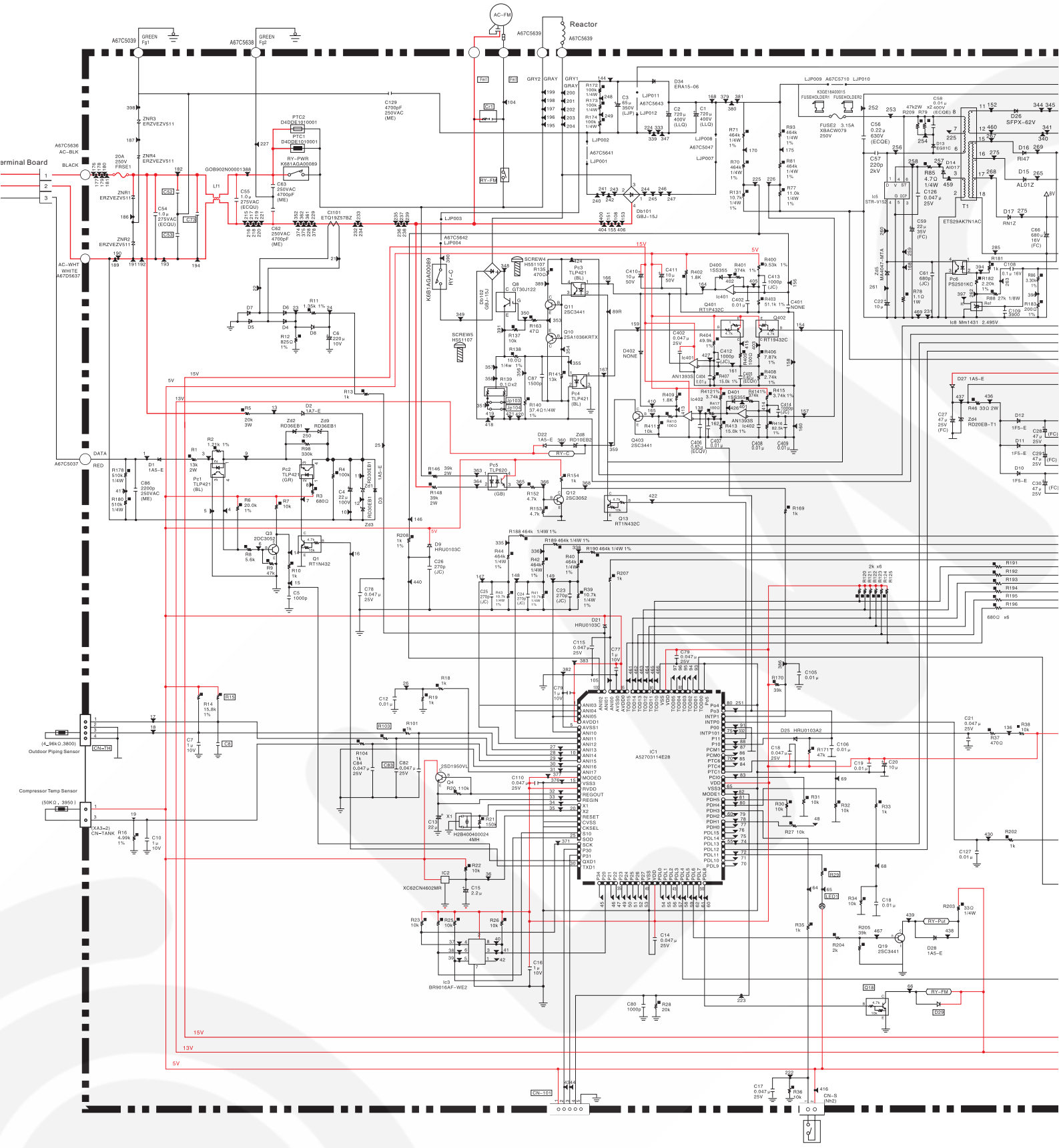
● CS/CU-PE9DKE
CS/CU-PE12DKE

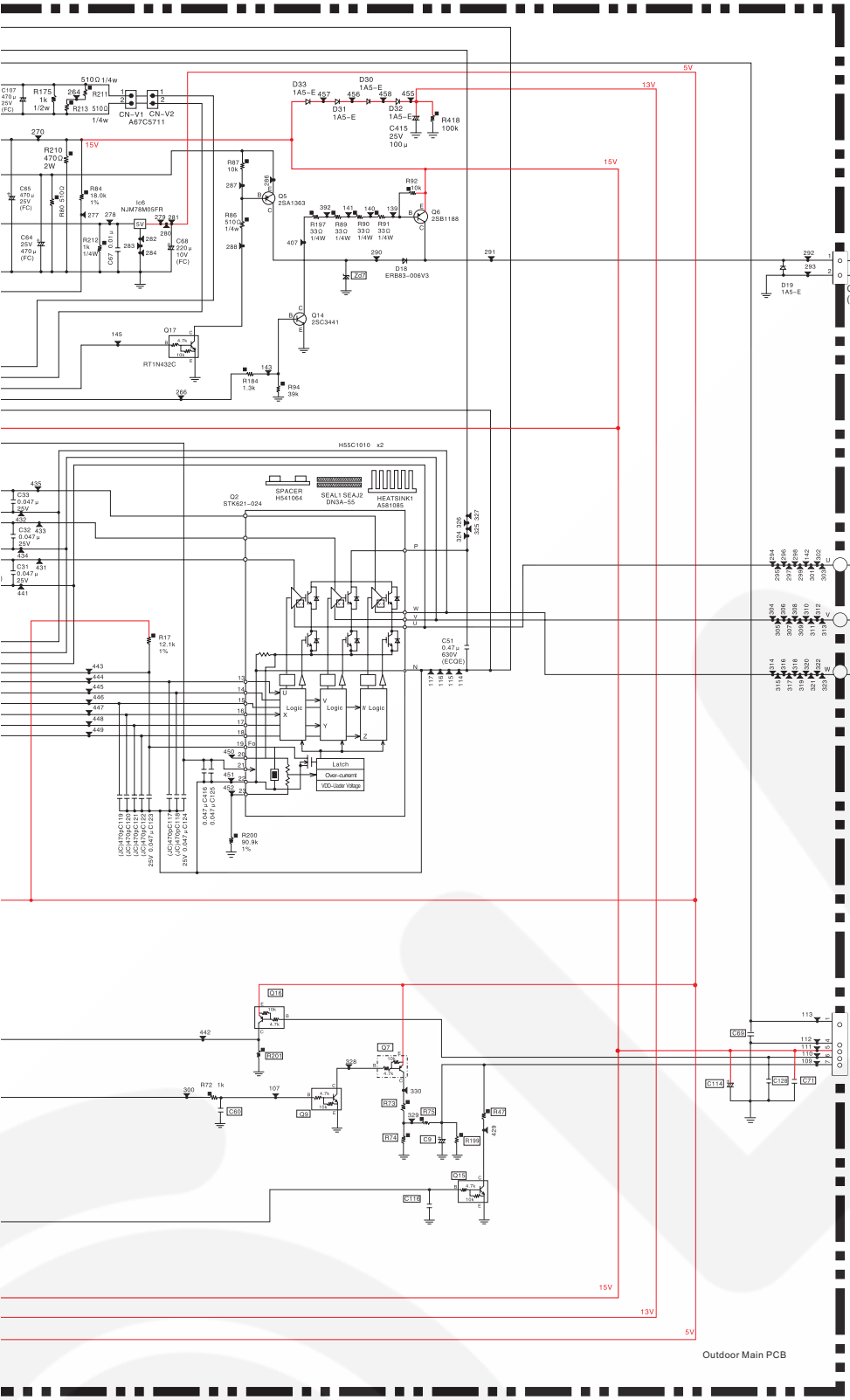


	CODE NO.		A743825	CAUTION
MAIN	REF NO.	CN-VF	Ph4	MODEL DATA
		R80	104	
		R81	200Ω	
		C1	NONE	NO-MOUNTING
		C7	NONE	
		C12	NONE	
		C21	NONE	
		C41	NONE	
		C125	NONE	
		C110	NONE	
		C111	NONE	
		FG	NONE	
		HA	NONE	
		PC103	NONE	
		Q1	NONE	
		Q5	NONE	
		Q11	NONE	
		R1	NONE	
		R6	NONE	
		R78	NONE	
		R79	NONE	
		Z105	NONE	
REMARK			CS-PE9DKE	
			CS-PE12DKE	


Indoor Piping Temp Sensor
(20k 3950)
CN-TH
A50C2212
CN-DISP
A67C5586
Indoor Indication PCB
Electronic Controller (Indoor Main PCB)
IC1
A52D0028GA02
12V
5V
18V

6 7 8 9 10


Reactor
AC-FM
RY-FM
RY-C
RY-PWR K681AGA00089
RY-Pul
IC1 A52703114E28
IC2 XC62CN4602MR
IC3 BR9016AF-WE2
Q1 RT1N432
Q2 2DC3052
Q3 2DC3052
Q4 2SD1950VL
Q10 2SA1036KRTX
Q11 2SC3441
Q12 2SC3052
Q13 RT1N432C
Q19 2SC3441
Q401 RT1P532C
Q402 RT1N432C
Q403 RT1N432C
Q403 2SC3441
IC401 AN13935
IC402 AN13935
IC5 STR-V152
T1 ETS29AK7N1AC
Outdoor Piping Sensor
Compressor Temp Sensor
(50KΩ, 3950)
CN-TH
CN-TANK
CN-101
CN-S (NN2)
A67C5639
A67C5638
A67C5642
A67C5641
A67C5643
A67C5047
A67C5710
A67C5636
A67C5037
A67C5637
LJP001
LJP002
LJP003
LJP004
LJP007
LJP008
LJP009
LJP010
LJP011
LJP012
GREEN Fg1
GREEN Fg2
BLACK
AC-BLK
AC-WHT
WHITE
DATA
RED
Terminal Board
FUSE2 3.15A XBACW079 250V
FUSELHOLDER1 FUSELHOLDER2
K3GE18A00015
D25 HRU0103A2
D21 HRU0103C
D9 HRU0103C
D26 SFPX-62V
D15 AL01Z
D16 RI47
D17 RM1Z
D18 AL01Z
D28 1A5-E
D29 1A5-E
Zd1 RD36EB1
Zd2 RD36EB1
Zd3 RD30EB1
Zd4 RD20EB-T1
Zd5 RD30EB1
Zd6 RD10EB2
Zd7 RD30EB1
Zd8 RD10EB2
Zd9 RD36EB1
Db101 GBJ-15J
Db102 GBJ-15J
PTC1 D4DDE1010001
PTC2 D4DDE1010001
Pc1 TLP421 (BL)
Pc2 TLP421 (GR)
Pc3 TLP421 (BL)
Pc4 TLP421 (BL)
Pc5 TLP820 (GB)
Pc6 PS2501KC
Ic8 Mm1431 2.495V
Ic401 AN13935
Ic402 AN13935
Ic5 STR-V152
Ic401 RT1P532C
Ic402 RT1P532C
Ic3 BR9016AF-WE2
Ic2 XC62CN4602MR
Ic1 A52703114E28
ZNR1 ERZVEZV511
ZNR2 ERZVEZV511
ZNR3 ERZVEZV511
ZNR4 ERZVEZV511
20A 250V FRSE1
GOB902N00001
Lf1
Cr1
Fn1
Fn2
SCREW4 H551107
SCREW5 H551107
K6B1AGA00089
Jp103
Jp104
Jp105
Jp106
X1 H2B400400024 4MH
5V
13V
15V



CODE NO.	A743776	A743821	CAUTION DIFFERENCE POINT
C8	1μ 10V	←	
C83	0.047μ 25V	←	POWER
CN-TH	XH4	←	
R15	15.0K 1%	←	
R103	1K	←	
C9	NONE	←	FAN MOTOR
C60	ERJ3GEY0R00V	←	
C69	NONE	←	
C71	NONE	←	
C114	NONE	←	
C116	ERJ3GEY0R00V	←	
C128	NONE	←	
D29	1A5-E	←	
CN-FM1	NONE	←	
CR1	J0HBJY000004	←	
FM1	A67C5043	←	
FM2	NONE	←	
Q7	NONE	←	
Q9	NONE	←	
Q15	NONE	←	
Q16	NONE	←	
Q18	RJ1N432C	←	
R47	NONE	←	
R73	NONE	←	
R74	NONE	←	
R75	NONE	←	
R199	NONE	←	
R201	ERJ3GEY0R00V	←	
RY-FM	K6B1AGA00123	←	
C52	NONE	←	EMC
C53	NONE	←	
C73	NONE	←	
CN-101	NONE	←	NO-MOUNTING
JP103	NONE	←	
JP104	NONE	←	
LED1	NONE	←	
R29	NONE	←	
ZD7	NONE	←	
REMARK	CU-PE9DKE	CU-PE12DKE	

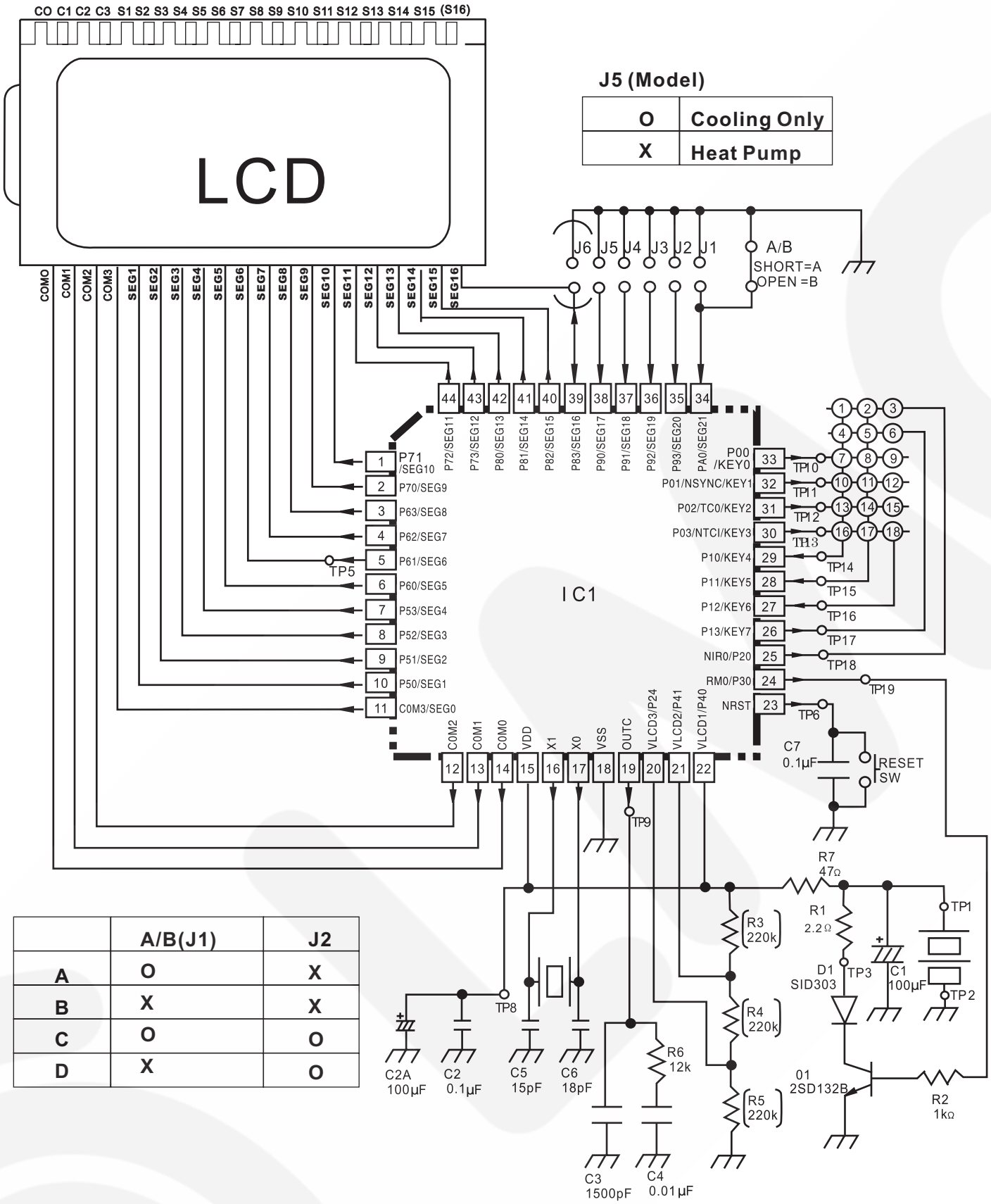
16 17 18 19 20

18.2 How to use electronic circuit diagram.

Before using the circuit diagram, read the following carefully.

- Voltage measurement
  Voltage has been measured with a digital tester when the indoor fan is set at high Fan Speed under the following conditions without setting the timer.
  Use them for servicing.
  Voltage indication is in red.
- Measurement point
- Indication for capacitor
  Type:
  Electrolytic Capacitor: Not indicated…NHG series aluminium electrolytic capacitor
  FC……FC series aluminium electrolytic capacitor
  T……Ta series aluminium electrolytic capacitor
  Ceramic capacitor: Not indicated……KB series aluminium electrolytic capacitor
  NB……NB series ceramic capacitor
  JC…… JC
- Indication for resistance
  K……KΩ
  M……MΩ
  W……Watt
  Not indication……1/10 W
- ▭ ……Refer to the Form

Key No	Key Name
1	OFF/ON
2	TEMP DOWN
3	TEMP UP
4	/
5	/
6	/
7	MODE
8	/
9	/
10	FAN SPEED
11	TIMER A
12	TIMER B
13	SWING
14	SELECT
15	SET/CANCEL
16	/
17	CHECK
18	ERROR RESET



	A/B(J1)	J2
A	O	X
B	X	X
C	O	O
D	X	O