

TOSHIBA

FILE No. A90-9611

SERVICE MANUAL

AIR CONDITIONER SPLIT TYPE

2 WAY CASSETTE TYPE, HEATPUMP

RAV-103TUH-PE

RAV-133TUH-PE/RAV-132AH-PE

RAV-163TUH-PE/RAV-162AH-PE

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SUMMARY

- The units referred to within this manual conform with the protection requirements of Directives 89/336/EEC Electromagnetic Compatibility and 73/23/EEC Low Voltage.
- Operating conditions of units are as follows:

OUTDOOR TEMPERATURE	-2 TO 43°C (COOL) -10 TO 21°C (HEAT)
ROOM TEMPERATURE	18 TO 32°C (COOL) 15 TO 29°C (HEAT)
ROOM HUMIDITY	LESS THAN 80% (COOL)

Note 1 : Cooling Capacity is based on the following temperature conditions:

Indoor air inlet temperature 27°C DB, 19°C WB.

Outdoor air inlet temperature 35°C DB.

Note 2: Heating Capacity is based on the following temperature conditions:

Indoor air inlet temperature 20°C DB.

Outdoor air inlet temperature 7°C DB, 6°C WB.

Note 3: For details on the Remote Controller and Control Circuits refer to Service Manual A90-9503.

1.SPECIFICATION

ITEM	MODEL	RAV-103TUH-PE	
Power source	Phase	1	
	V	220-240	
	Hz	50	
Power consumption	kW	0.07	
Power factor	%	93	
Running current	A	0.33	
Starting current	A	0.6	
Operating noise (SPL) (High, Med, Low)	dB(A)	40/36/34	
Refrigerant	Name of refrigerant	R-22	
Interconnection pipe	Larger side size	mm	ø12.7 (1/2)
	Coupler style		Flare
	Smaller side size	mm	ø6.4 (1/4)
	Coupler style		Flare
Condensate drain pipe diameter	mm	ø25.5(OD)	
Appearance colour		Grey (zinc galvanized steel + Thermal insulator)	
Dimensions	Height	mm	190
	Width	mm	910
	Depth	mm	480
Net weight	kg	23	
Heat exchanger type		Finned tube	
Indoor fan type		Transverse flow fan	
Air volume	m ³ /h	550	
Fan motor output	W	7 x 2	
CEILING PANEL Model		RBC-U133PG(W)-PE	
Appearance colour		Silky white (Munsell 2.9Y8.9/0.8)	
Dimensions	Height	mm	25
	Width	mm	1050
	Depth	mm	550
Net weight	kg	4.5	
Air filter		Washable	

Specifications are subject to change without notice.

ITEM	MODEL	RAV-133TUH-PE	
Cooling capacity	kW	3.6	
Heating capacity	kW	4.2	
Power source	Phase	1	
	V	220-240	
	Hz	50	
		COOLING	HEATING
Power consumption	kW	2.1	2.2
Power factor	%	89	89
Running current	A	10.3	10.7
Starting current	A	60	
Operating noise (SPL)	Indoor unit (High, Med, Low)	dB(A) 40/36/34	
	Outdoor unit	dB(A) 50	
Refrigerant	Name of refrigerant	R-22	
	Charge volume	kg	1.2
	Add. volume (20-30m)	g/m	35
Refrigerant control		Capillary tube & Expansion valve	
Interconnection pipe	Larger side size	mm	ø12.7 (1/2)
	Coupler style		Flare
	Smaller side size	mm	ø6.4 (1/4)
	Coupler style		Flare
	Standard length	m	7.5
	Maximum length (of one way)	*1 m	30
	Maximum height difference		
	If indoor unit higher	m	15
If outdoor unit higher	m	30	
Condensate drain pipe diameter	mm	ø25.5 (OD)	
INDOOR UNIT Model		RAV-133TUH-PE	
Appearance colour		Grey (zinc galvanized steel + thermal insulator)	
Dimensions	Height	mm	190
	Width	mm	910
	Depth	mm	480
Net weight	kg	23	
Heat exchanger type		Finned tube	
Indoor fan type		Transverse flow fan	
Air volume	m ³ /h	700	
Fan motor output	W	7 x 2	
Air filter		Washable	
OUTDOOR UNIT Model		RAV-132AH-PE	
Appearance colour		Bronze white (Munsell 6Y7.5/1)	
Dimensions	Height	mm	740
	Width	mm	880
	Depth	mm	310
Net weight	kg	61	
Heat exchanger type		Finned tube	
Outdoor fan type		Propeller fan	
Air flow volume	m ³ /h	2,700	
Fan motor output	W	39	
Compressor	Model	PH230X3-4LS	
	Output	kW	1.5
Protective device		High pressure switch, Fuse, Crankcase heater, Overload relay, Bimetal thermostat	
CEILING PANEL Model		RBC-U133PG(W)-PE	
Appearance colour		Silky white (Munsell 2.9Y8.9/0.8)	
Dimensions	Height	mm	25
	Width	mm	1050
	Depth	mm	550
Net weight	kg	4.5	
Air filter		Washable	

Specifications are subject to change without notice.

* Note 1 : These mean actual length.

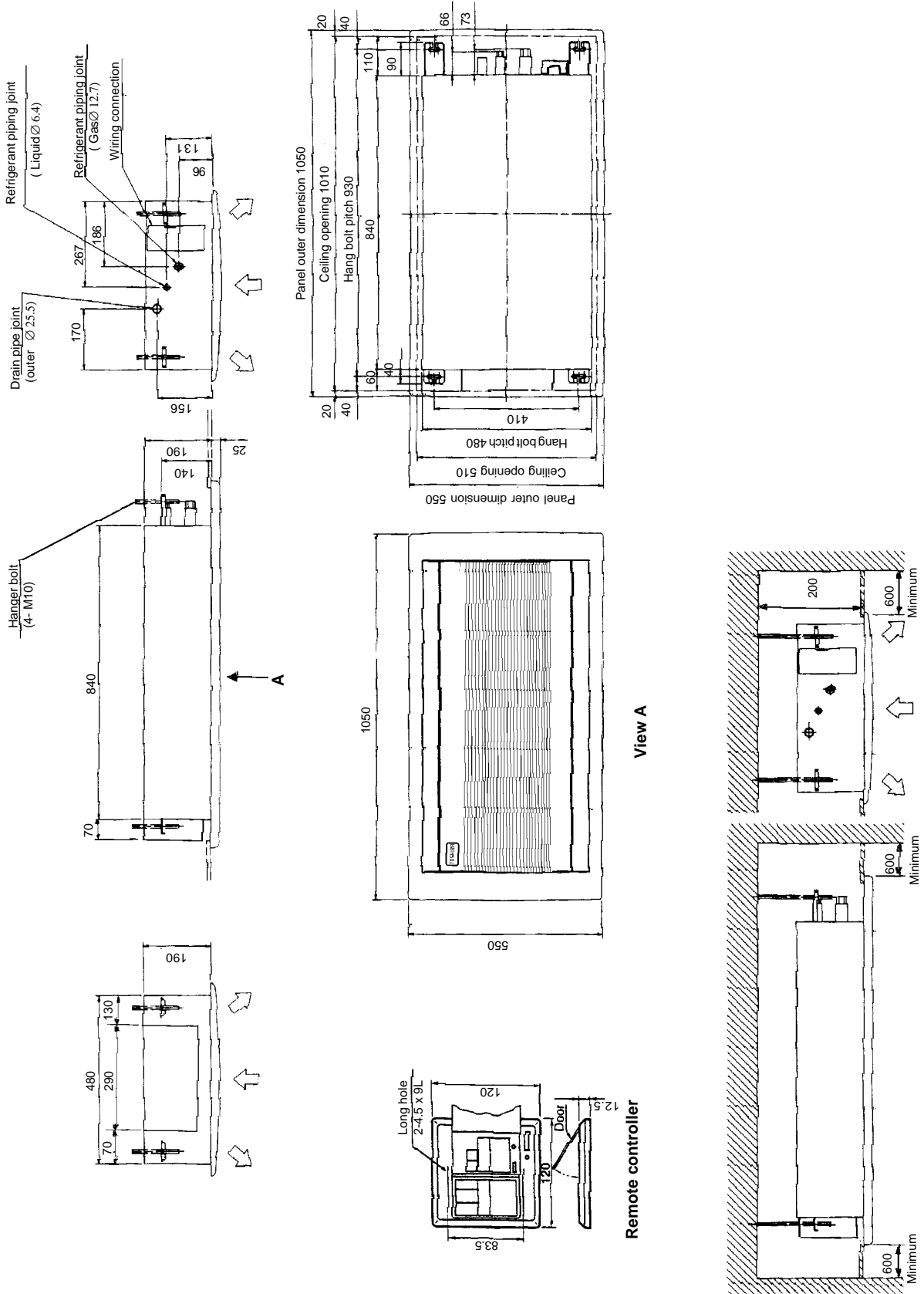
ITEM	MODEL	RAV-163TUH-PE	
Cooling capacity	kW	4.5	
Heating capacity	kW	5.0	
Power source	Phase	1	
	V	220-240	
	Hz	50	
		COOLING	HEATING
Power consumption	kW	2.3	2.2
Power factor	%	90	90
Running current	A	11.1	10.6
Starting current	A	60	
Operating noise (SPL)	Indoor unit (high/med/low) dB (A)	41/37/35	
	Outdoor unit dB (A)	50	
Refrigerant	Name of refrigerant	R-22	
	Charge volume kg	1.6	
	Add. volume (20-30m) g/m	35	
Refrigerant control		Capillary tube & Expansion valve	
Interconnection pipe	Larger side size mm	ø 12.7 (1/2)	
	Coupler style	Flare	
	Smaller side size mm	ø 6.4 (1/4)	
	Coupler style	Flare	
	Standard length m	7.5	
	Maximum length (of one way) *1 m	30	
	Maximum height difference		
	If indoor unit higher m	15	
If outdoor unit higher m	30		
Condensate drain pipe diameter	mm	ø 25.5(OD)	
INDOOR UNIT Model		RAV-163TUH-PE	
Appearance colour		Grey (zinc galvanized steel + thermal insulator)	
Dimensions	Height mm	190	
	Width mm	910	
	Depth mm	480	
Net weight	kg	23	
Heat exchanger type		Finned tube	
Indoor fan type		Transverse flow fan	
Air volume	m³/h	750	
Fan motor output	W	7 x 2	
Air filter		Washable	
OUTDOOR UNIT Model		RAV-162AH-PE	
Appearance colour		Bronze white (Munsell 6Y7.5/1)	
Dimensions	Height mm	740	
	Width mm	880	
	Depth mm	310	
Net weight	kg	61	
Heat exchanger type		Finned tube	
Outdoor fan type		Propeller fan	
Air flow volume	m³/h	2,700	
Fan motor output	W	39	
Compressor	Model	PH250X3-4LS	
	Output kW	1.5	
Protective device		High pressure switch, Fuse, Crankcase heater, Overload relay, Bimetal thermostat	
CEILING PANEL Model		RBC-U133PG(W)-PE	
Appearance colour		Silky white (Munsell 2.9Y8.9/0.8)	
Dimensions	Height mm	25	
	Width mm	1050	
	Depth mm	550	
Net weight	kg	4.5	
Air filter		Washable	

Specifications are subject to change without notice.

* Note 1 : These mean actual length.

2. CONSTRUCTION VIEWS

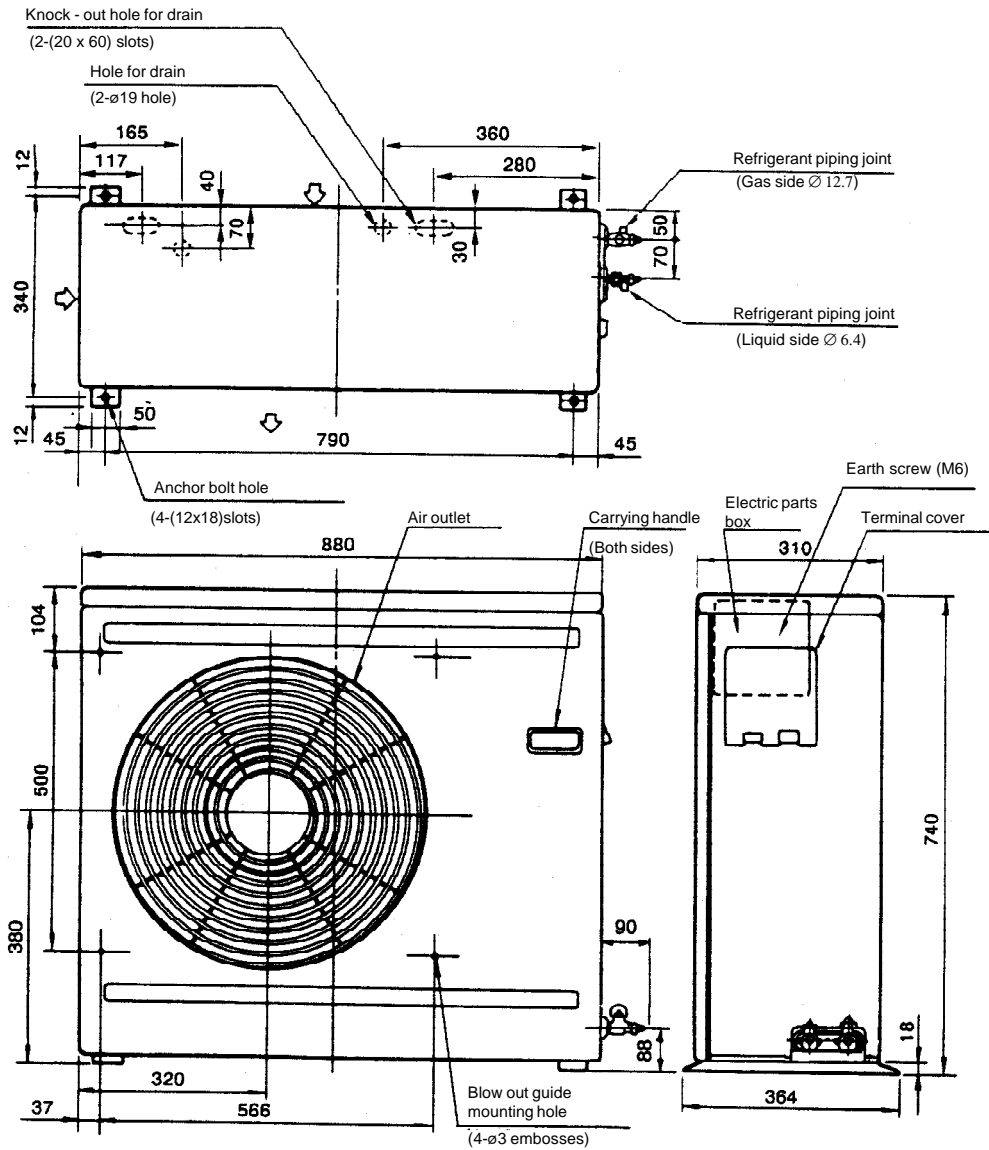
2.1 Indoor unit RAV-103TUH-PE RAV-133TUH-PE RAV-163TUH-PE



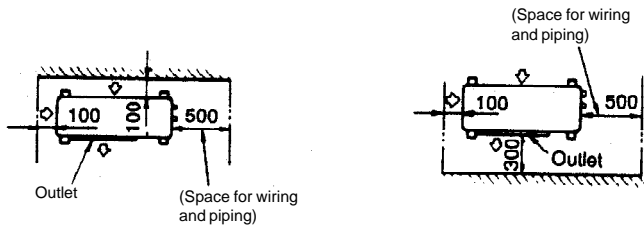
Space required for service and installation

(Unit: mm)

2.2 Outdoor unit
RAV-132AH-PE
RAV-162AH-PE



Space required for service



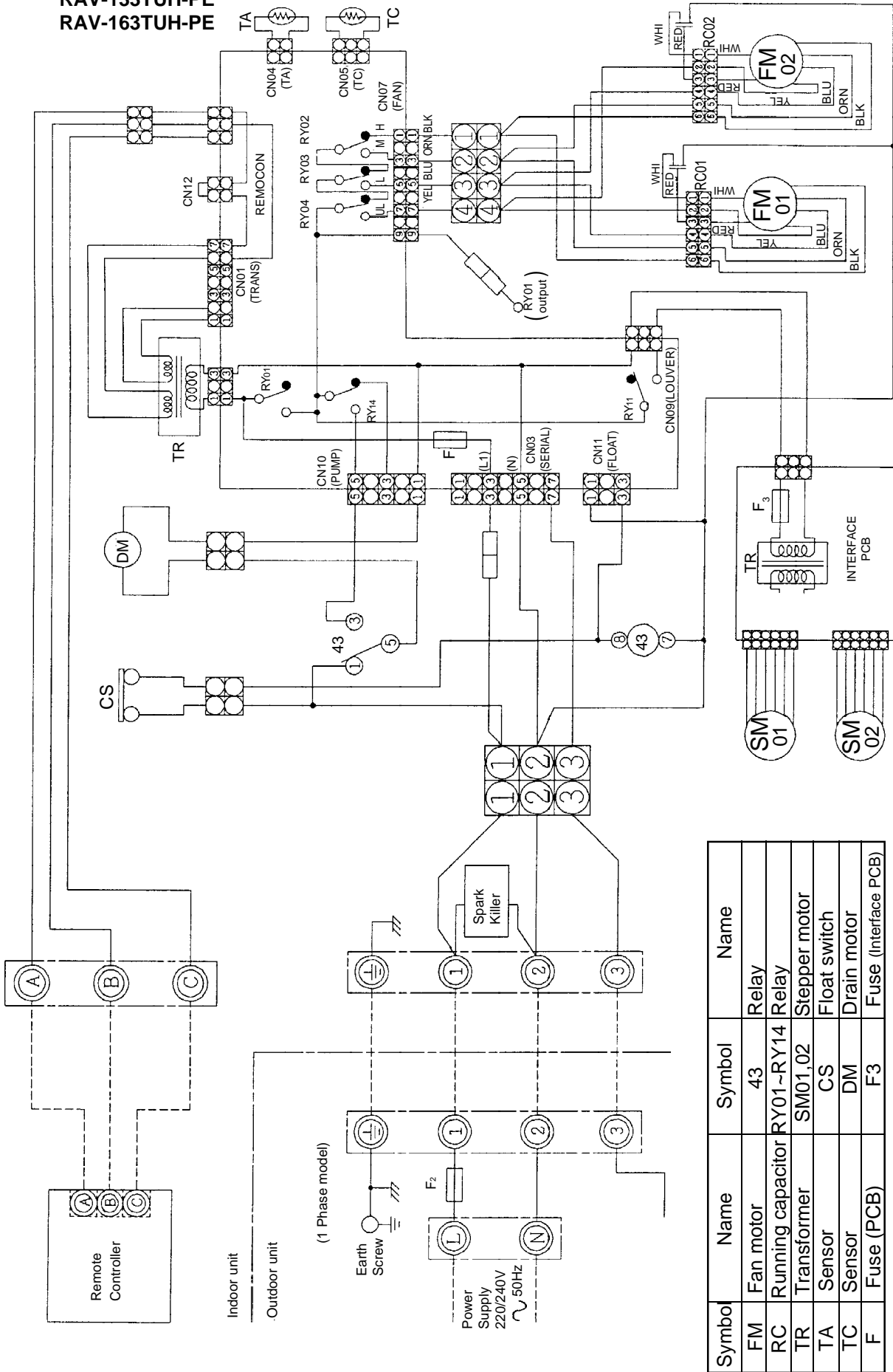
When installed with the inlet faced to the wall side

When installed with the outlet faced to the wall side

(Unit: mm)

3. WIRING DIAGRAM

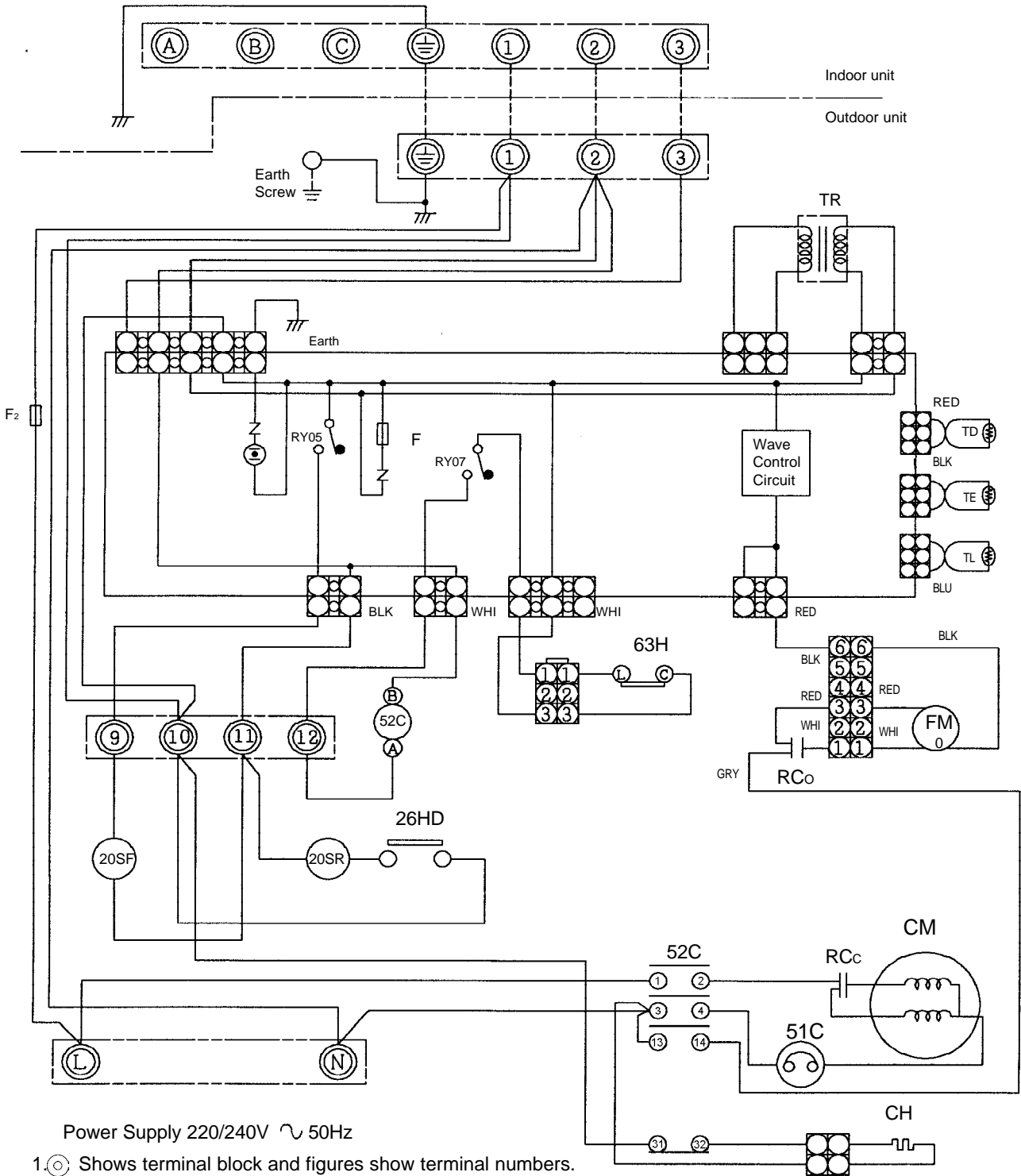
3.1 RAV-103TUH-PE RAV-133TUH-PE RAV-163TUH-PE



Symbol	Name	Symbol	Name
FM	Fan motor	43	Relay
RC	Running capacitor	RY01~RY14	Relay
TR	Transformer	SM01,02	Stepper motor
TA	Sensor	CS	Float switch
TC	Sensor	DM	Drain motor
F	Fuse (PCB)	F3	Fuse (Interface PCB)

- ⊙ Shows terminal block and figures show terminal numbers.
- Broken lines show wiring at site.
- Do not operate the units with magnetic contactor pushed in.

**3.2 RAV-132AH-PE
RAV-162AH-PE**



Symbol	Name	Symb	Name	Symbol	Name
20SF	Solenoid Coil (4 Way Valve)	CM	Compressor	F2	Fuse (T5A)
RY05, 07	Relay	52C	Magnetic Contactor	63H	High Pressure Switch
51C	Overload Relay	FMo	Fan Motor (Out door)	CH	Crank Case Heater
20SR	Solenoid Coil (2 Way Valve)	TL	Sensor	F	Fuse (on PCB)
RCc	Running Capacitor (Compressor)	TE	Sensor	TR	Transformer
RCo	Running Capacitor (Fan motor)	26HD	Bimetal Thermostat	TD	Sensor

4. SPECIFICATION OF ELECTRICAL PARTS

4.1 RAV-103TUH-PE, RAV-133TUH-PE

No.	PARTS NAME	TYPE	SPECIFICATIONS						
1	Indoor unit fan motor (x2)	PAF-230-7-4	Output (Rated) 7W, 4 pole, 1 phase, 230V, 50Hz						
2	Running capacitor for indoor fan motor (x2)	EVM45M504UF	AC 450V, 0.5 μ F						
3	Transformer (Indoor unit)	ST-9586	AC187~264V						
4	Stepper motor (x2)	MP35EA2	DC12V, 80mNm						
5	Relay	LY2F	AC 240V, 2ab						
6	Drain pump	PCD-4N230TF-7	AC230V, 0.2A						
7	Float switch	FS-085-003E	AC230V, 0.5A						
8	Sensor for room temperature		Maximum input 38mA	°C	15	20	25	30	40
				K Ω	16.1	12.6	10.0	8.0	5.2
9	Indoor unit sensor for heat-exchanger temperature.	DTN-C103J40	Maximum input 34mA	°C	-12	0	25	50	
				K Ω	62.29	32.82	10.0	3.59	

4.2 RAV-163TUH-PE

No.	PARTS NAME	TYPE	SPECIFICATIONS						
1	Indoor unit fan motor (x2)	PAF-230-7-4	Output (Rated) 7W, 4 pole, 1 phase, 230V, 50Hz						
2	Running capacitor for indoor fan motor (x2)	EEP2H105HQA105	AC 500V, 1.0 μ F						
3	Transformer (Indoor unit)	ST-9586	AC187~264V						
4	Stepper motor (x2)	MP35EA2	DC12V, 80mNm						
5	Relay	LY2F	AC 240V, 2ab						
6	Drain pump	PCD-4N230TF-7	AC230V, 0.2A						
7	Float switch	FS-085-003E	AC230V, 0.5A						
8	Sensor for room temperature		Maximum input 38mA	°C	15	20	25	30	40
				K Ω	16.1	12.6	10.0	8.0	5.2
9	Indoor unit sensor for heat-exchanger temperature.	DTN-C103J40	Maximum input 34mA	°C	-12	0	25	50	
				K Ω	62.29	32.82	10.0	3.59	

4.3 RAV-132AH-PE

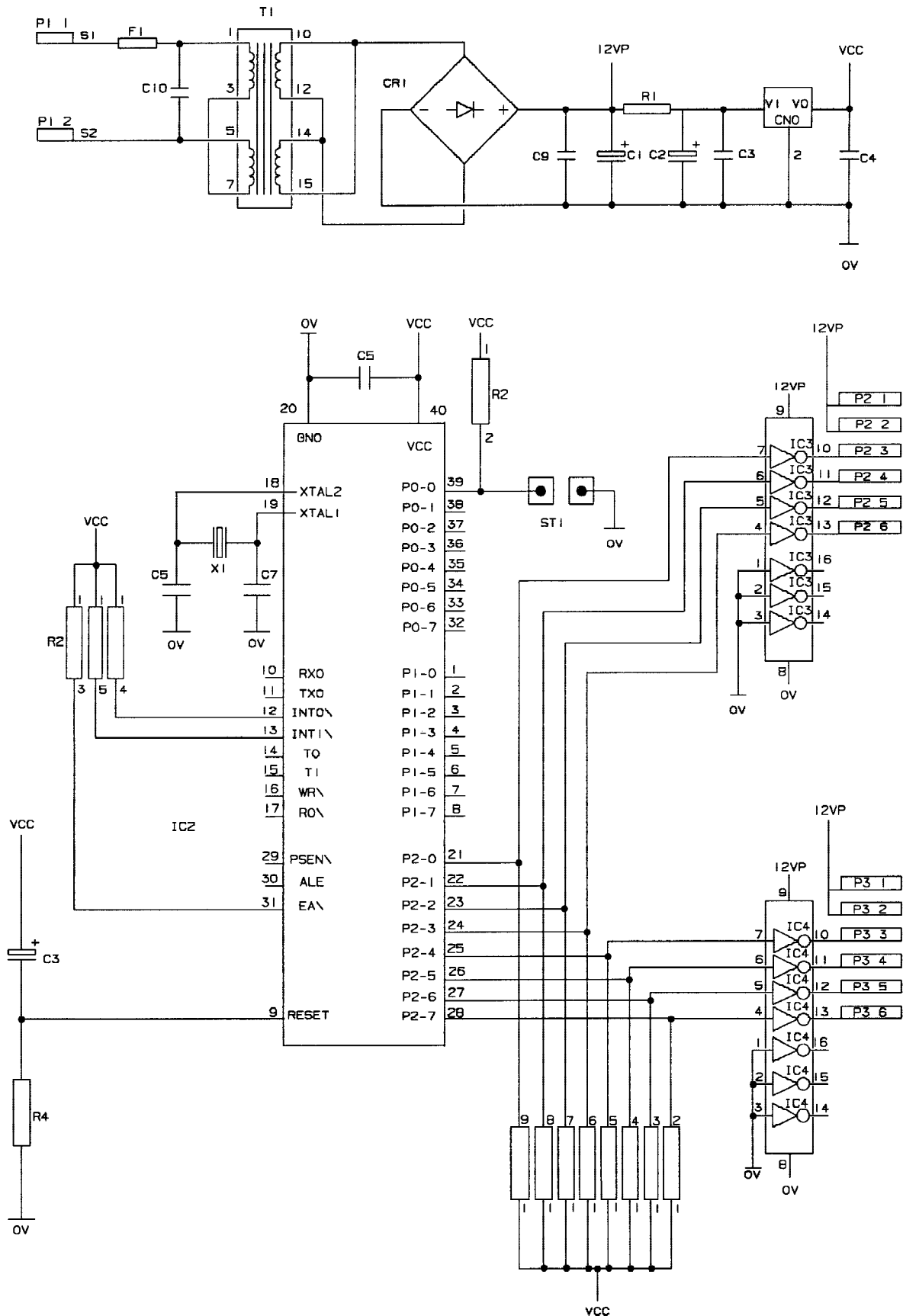
No.	PARTS NAME	TYPE	SPECIFICATIONS				
1	Compressor	PH230X3-4LS	Output (Rated) 1.5 kW, 2 pole, 220/240V, 1 phase, 50Hz				
2	Outdoor unit fan motor	SMF-230-39N-2	Output (Rated) 39W, 6 pole, 230V, 1 phase, 50Hz				
3	Running capacitor for outdoor fan motor	EEP2G405HQA114	AC 400V, 4 μ F				
4	Magnetic contactor	FMca-1S	AC 220-240V, 50Hz				
5	High pressure switch	ACB-2TBO4W	Tripping pressure 30kg/cm ² G pressure 23kg/cm ² G		Resetting		
6	Solenoid coil for four-way valve	CHV-AC240V	AC 220-240V				
7	Crankcase heater		AC 240V, 28W				
8	Sensor for defrosting		Maximum input	15.5mA	°C	-12	10
					K Ω	67.5	21.3
9	Fuse		T5A				
10	Sensor for cooling operation in low ambient temperature		Maximum input	15.5mA	°C	-12	10
					K Ω	67.5	21.3
11	Solenoid coil for two-way valve	NEV AC 240V	AC 220-240V, 50Hz				
12	Running capacitor for compressor	MT-44MP456W	AC 440V 45 μ F				
13	Transformer (Outdoor unit)	FT-67	AC 187-264V				
14	Overload relay	OL-177GM15	AC 240V, Tripping temp: 165°C, Resetting temp: 80°C				
15	Bimetal thermostat	CS-7	Tripping temp: 110°C, Resetting temp 90°C				

4.4 RAV-162AH-PE

No.	PARTS NAME	TYPE	SPECIFICATIONS				
1	Compressor	PH250X3-4LS	Output (Rated) 1.5 kW, 2 pole, 220/240V, 1 phase, 50Hz				
2	Outdoor unit fan motor	SMF-230-39N-2	Output (Rated) 39W, 6 pole, 230V, 1 phase, 50Hz				
3	Running capacitor for outdoor fan motor	EEP2G405HQA114	AC 400V, 4 μ F				
4	Magnetic contactor	FMca-1S	AC 220-240V, 50Hz				
5	High pressure switch	ACB-2TBO4W	Tripping pressure 30kg/cm ² G pressure 23kg/cm ² G		Resetting		
6	Solenoid coil for four-way valve	CHV-AC240V	AC 220-240V				
7	Crankcase heater		AC 240V, 28W				
8	Sensor for defrosting		Maximum input	15.5mA	°C	-12	10
					K Ω	67.5	21.3
9	Fuse		T5A				
10	Sensor for cooling operation in low ambient temperature		Maximum input	15.5mA	°C	-12	10
					K Ω	67.5	21.3
11	Solenoid coil for two-way valve	NEV AC 240V	AC 220-240V, 50Hz				
12	Running capacitor for compressor	MT-44MP456W	AC 440V 45 μ F				
13	Transformer (Outdoor unit)	FT-67	AC 187-264V				
14	Overload relay	OL-177GM15	AC 240V, Tripping temp: 165°C, Resetting temp: 80°C				
15	Bimetal thermostat	CS-7	Tripping temp: 110°C, Resetting temp 90°C				

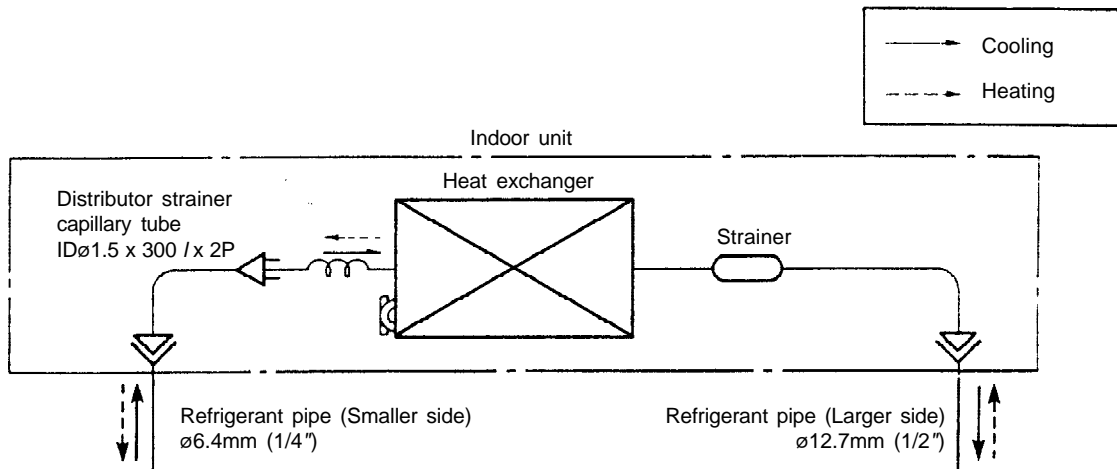
5. INTERFACE PCB FOR LOUVER OPERATION

An additional PCB, referred to as the Interface PCB, is fitted to this unit to operate the dc stepper motors, which drive the louvers. The power supply to the interface PCB is via relay RY11 on the indoor PCB.



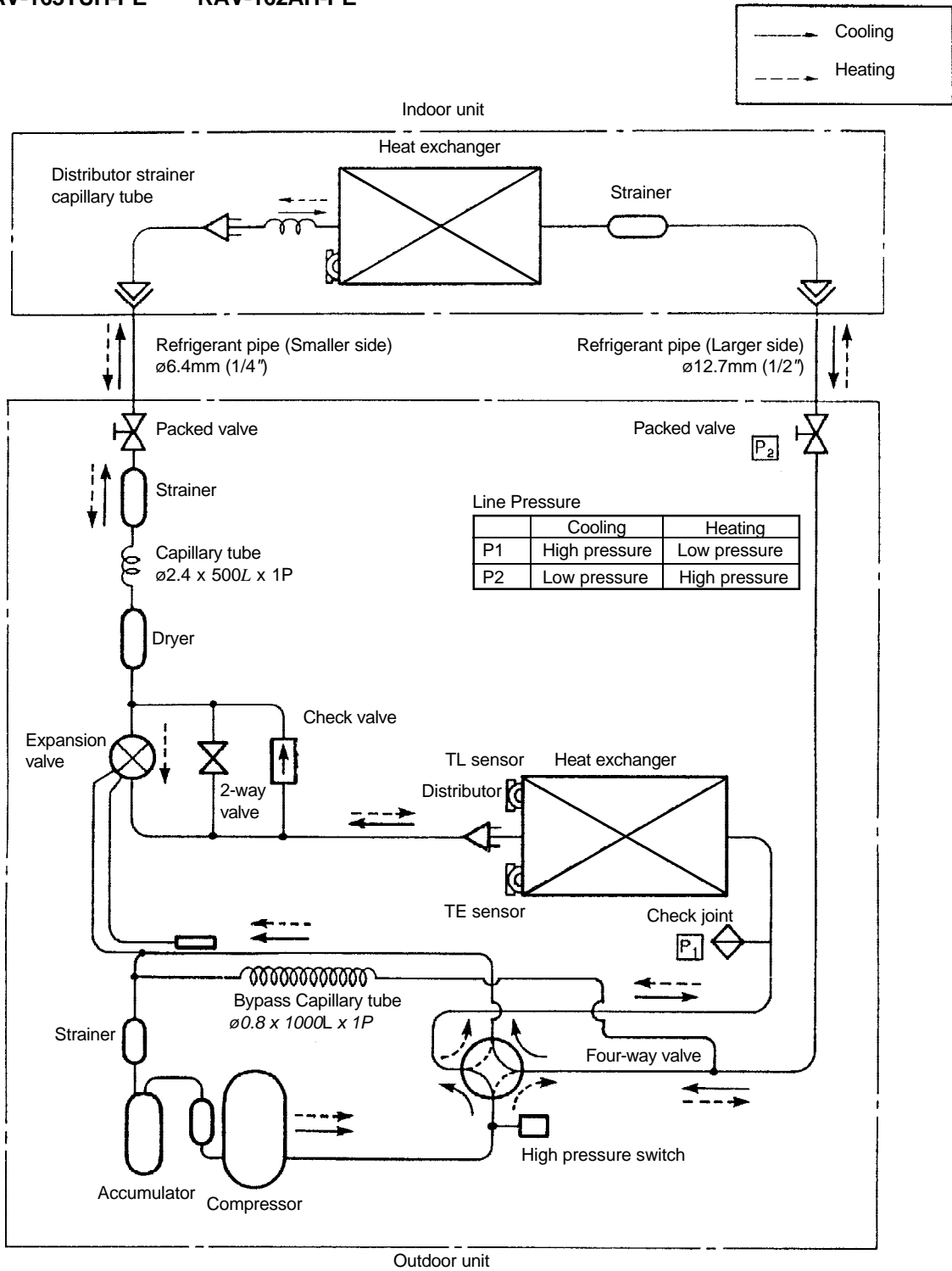
6. REFRIGERANT PIPING DIAGRAM

6.1 Indoor unit RAV-103TUH-PE



6.2 Indoor unit
RAV-133TUH-PE
RAV-163TUH-PE

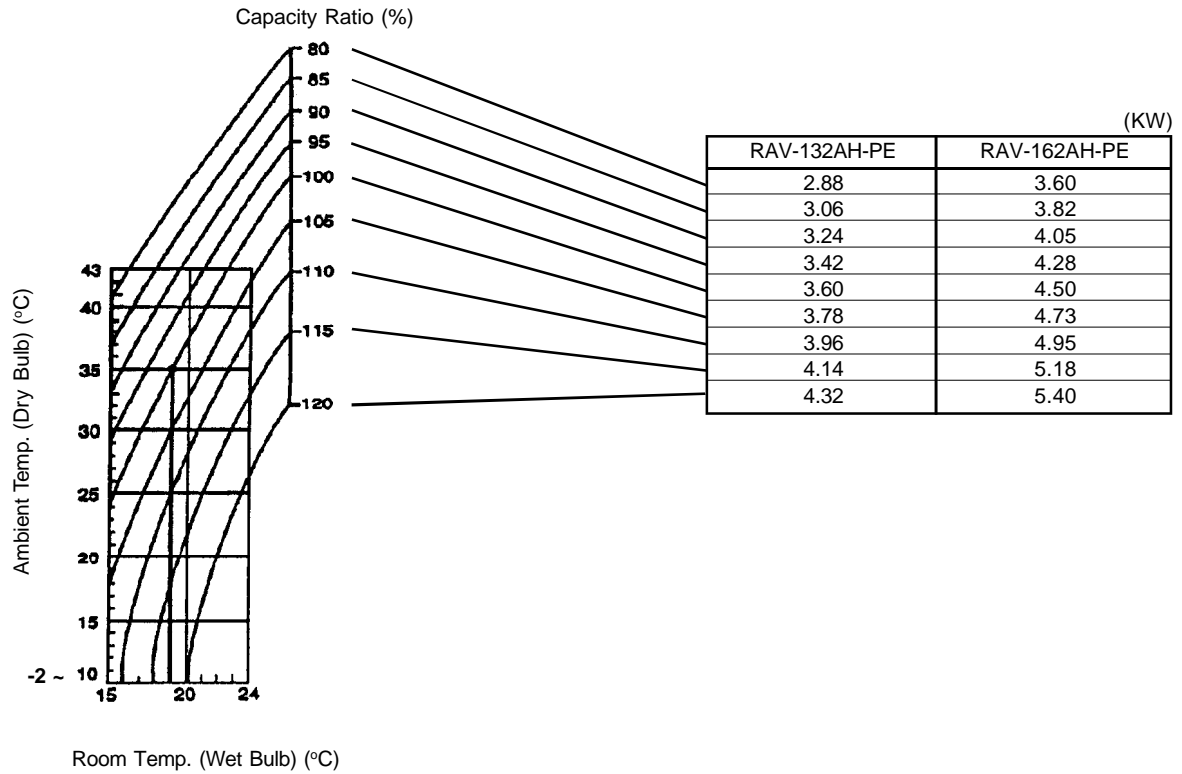
Outdoor unit
RAV-132AH-PE
RAV-162AH-PE



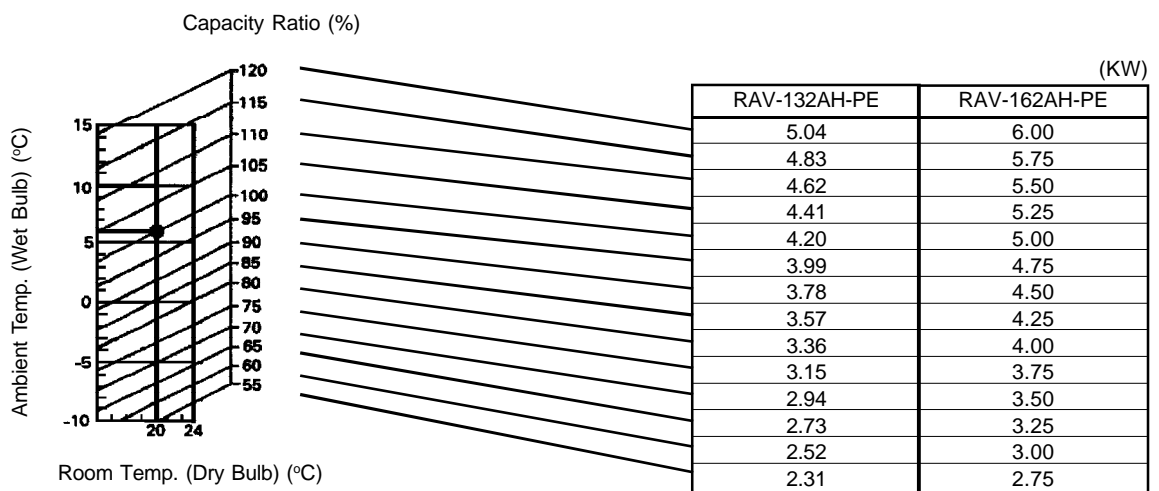
INDOOR UNIT		OUTDOOR UNIT		
MODEL	CAPILLARY	MODEL	MAIN CAPILLARY	BYPASS CAPILLARY
RAV-133TUH-P	IDφ 2.2x200 L x2P	RAV-132AH-PE	IDφ 2.4x500 L x1P	IDφ 0.8x1000 L x1P
RAV-163TUH-P	IDφ 1.5x200 L x2P	RAV-162AH-PE		

7. PERFORMANCE CHARACTER

7.1 Cooling capacity

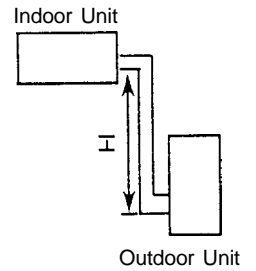
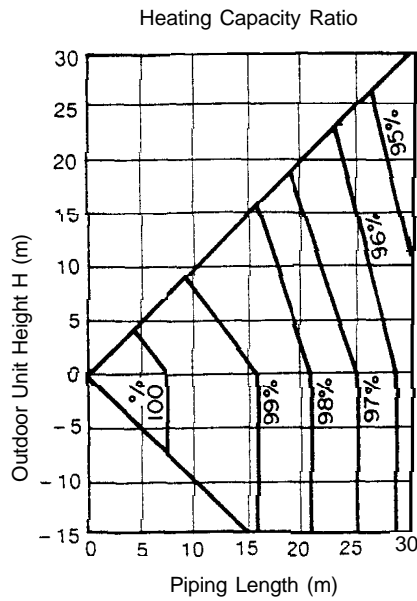
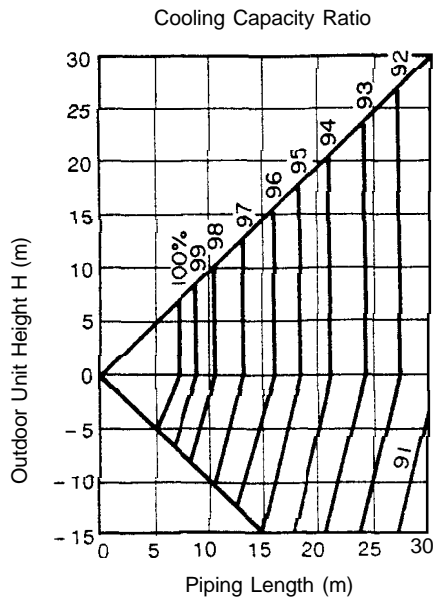


7.2 Heating capacity



7.3

Cooling capacity
RAV-132AH-PE
RAV-162AH-PE



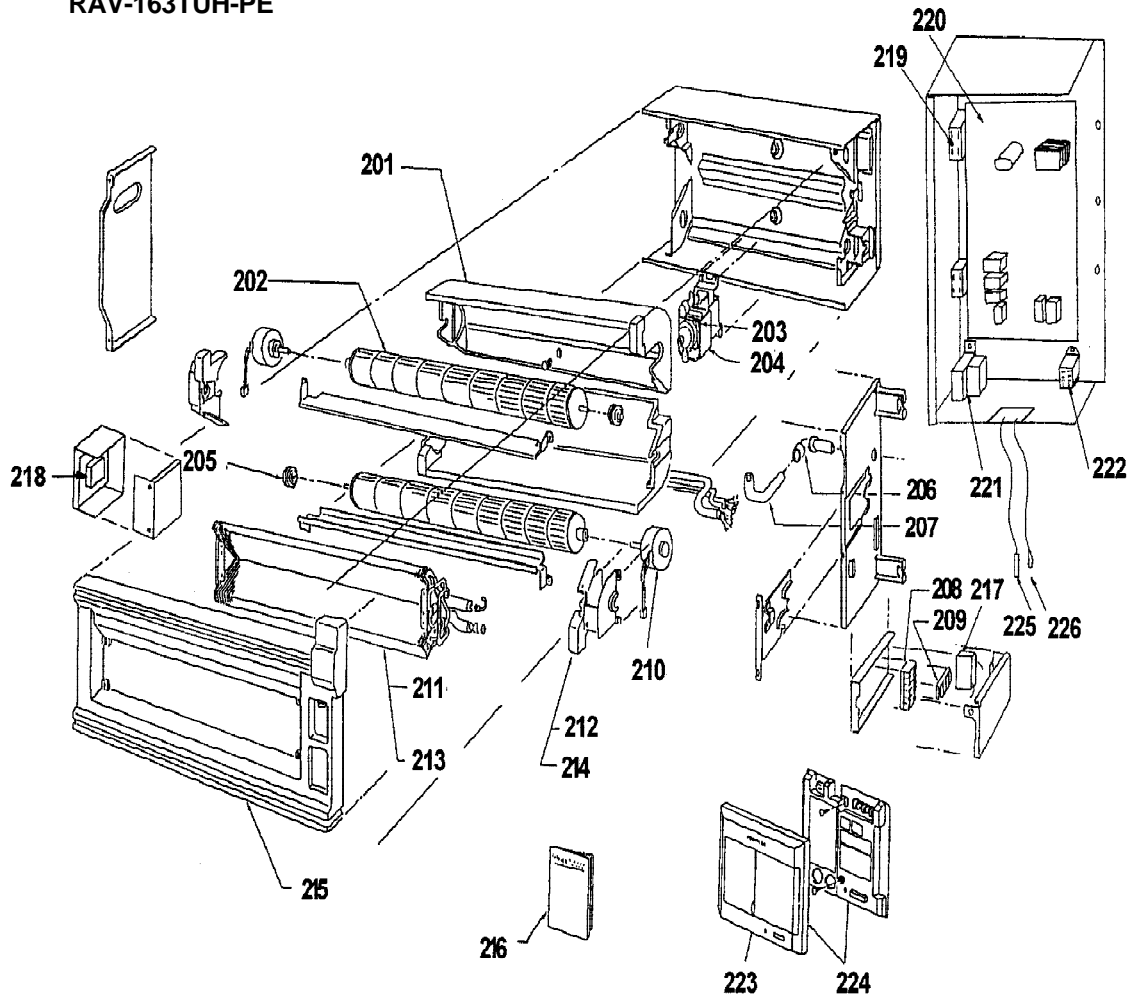
7.4 Piping length/additional refrigerant volume

Model	Piping length less than (m)	20	Additional amount of refrigerant at installation site (kg)					Recharge quantity (kg)						
			25	30	35	40	45	50	5	10	15	20	25	30
RAV-132AH-PE	Filled at factory		0.15	0.35					0.95	1.05	1.10	1.20	1.35	1.55
RAV-162AH-PE	Filled at factory		0.15	0.35					1.35	1.45	1.50	1.60	1.75	1.95

- The amount of refrigerant put into the outdoor unit at the factory is equivalent to that which fills up 20m length of refrigerant pipe.
- If the length of refrigerant pipe is 20m or less, addition of refrigerant at the installation site is unnecessary. If the length of the pipe exceeds 20m, add the refrigerant R-22.
- Overcharge or undercharge of refrigerant in the outdoor unit will cause malfunction of the compressor. The prescribed amount of the replenishment of the refrigerant is shown in the table above. The permissible amount of refrigerant is the prescribed amount $\pm 50g$.

8. EXPLODED VIEWS AND PARTS LIST

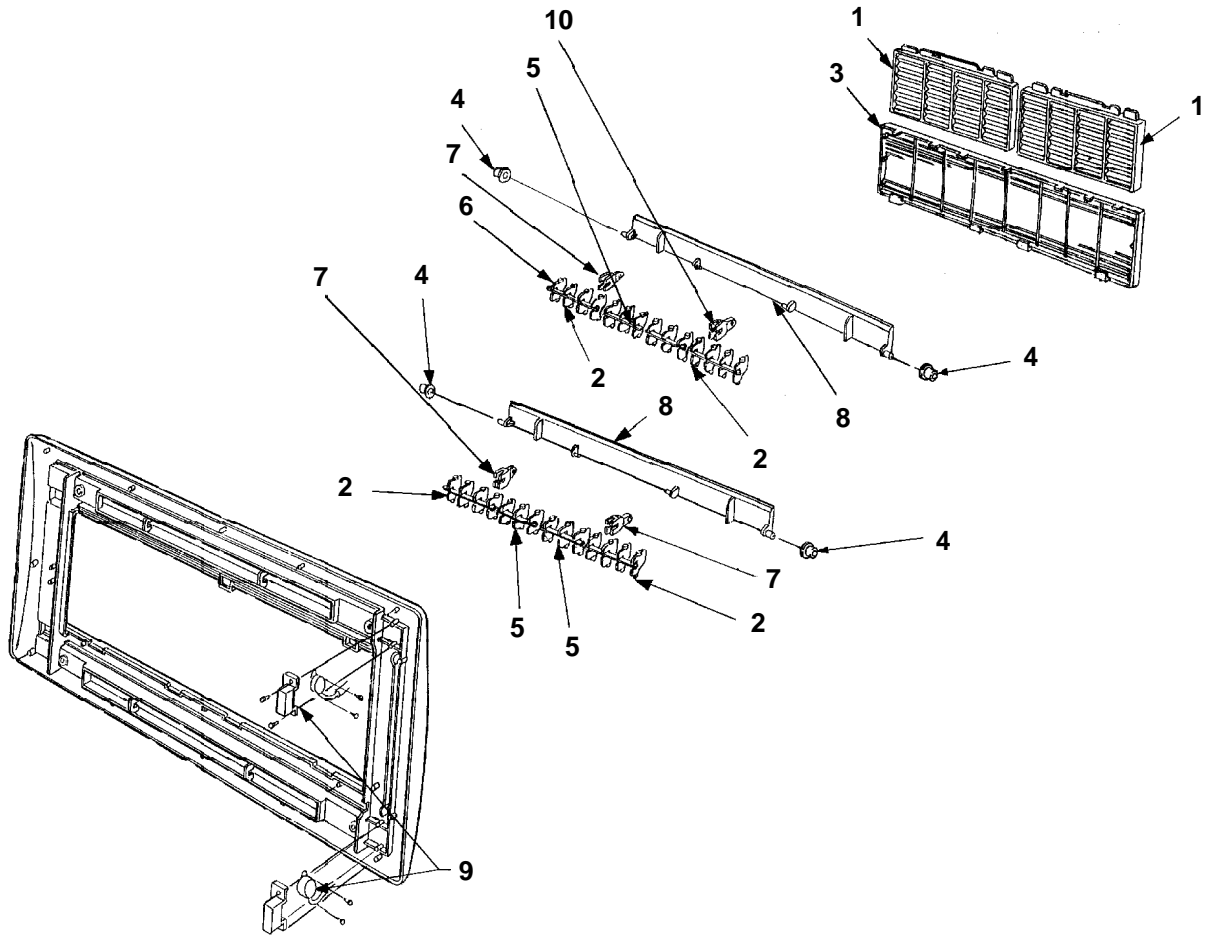
8.1 Indoor unit RAV-103TUH-PE RAV-133TUH-PE RAV-163TUH-PE



Location No	Part No	Description
201	43A22001	Casing Assembly
202	43020288	Fan
203	43151217	Float Switch
204	43A70003	Pump Assembly
205	43020253	Bearing
206	43071019	Drain Connection
207	43070164	Drain Hose
208	43A60002	3 P Terminal
209	43A60001	4 P Terminal
210	43A21014	Fan Motor
211	43019604	Sensor Fix Plate
212	43A22002	Casing Outlet
213	43A44012	Heat Exchanger (RAV-103TUH-PE)
213	43A44010	Heat Exchanger (RAV-133TUH-PE)
213	43A44011	Heat Exchanger (RAV-163TUH-PE)

Location No	Part No	Description
214	43039240	Canoe Clip
215	43A72001	Drain Pan
216	43A88004	Manual
217	43155086	Spark Killer
218	43A69008	Interface PC Board
219	37555721	Capacitor, Metal Film (RAV-103/133TUH-PE)
219	43155100	Capacitor, Metal Film (RAV-163TUH-PE)
220	43A69002	PC Board
221	43A58002	Transformer
222	43154141	Relay
223	43A62001	Cover, Remote Controller
224	43A69004	Remote Controller
225	43A50002	Sensor (TC)
226	43150118	Sensor (TA)

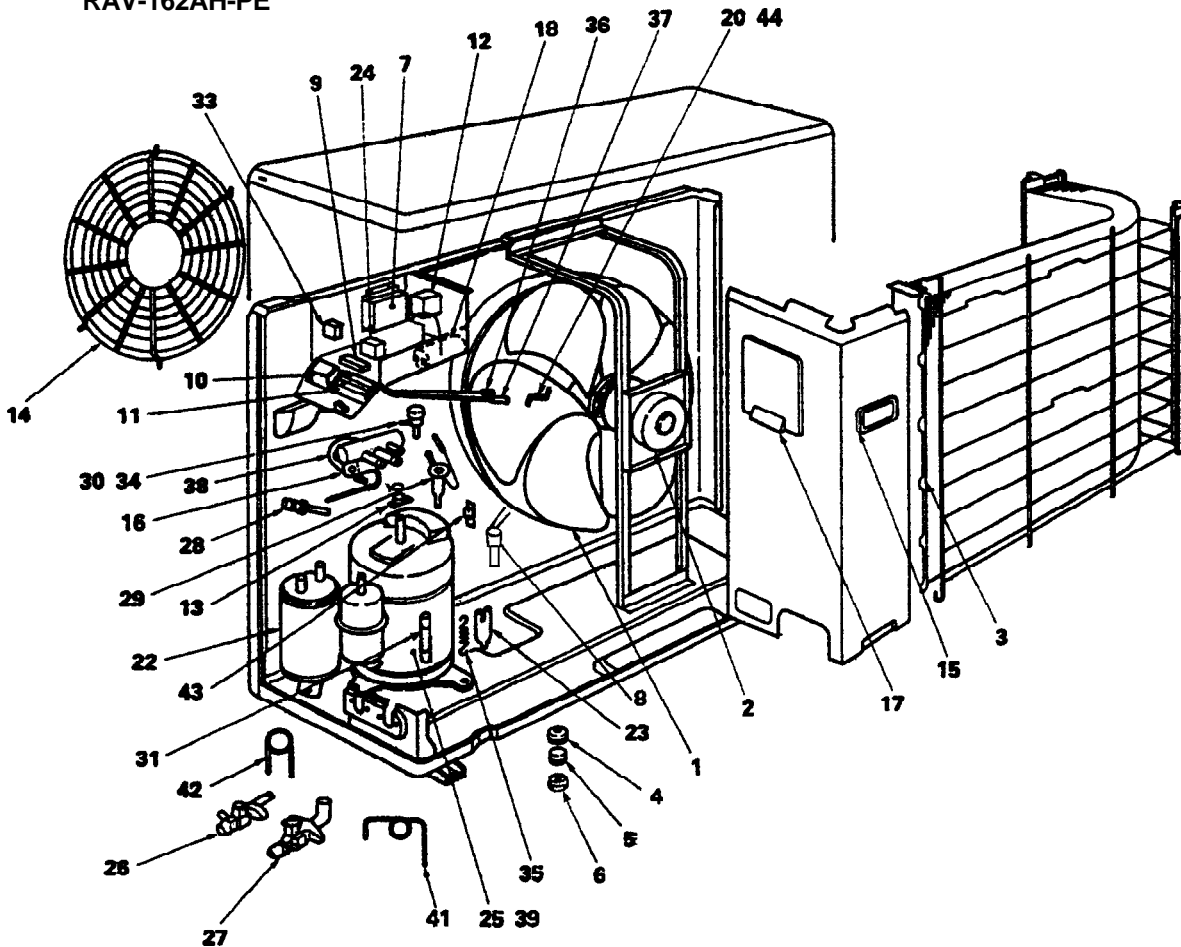
8.2 CEILING PANEL
RBC-U133PG(W)-PE



Location number	Part Number	Description
1	43080392	Filter
2	43007108	Plate connect (long)
3	43009504	ASM-Grille-Out
4	43007107	Bushing
5	43007109	Plate connect (short)

Location number	Part Number	Description
6	43009503	Grille-L-R
7	43007124	Support plate
8	43009499	ASM-Grille-Out
9	43A26001	ASM-Motor
10	43007125	Support plate

8.3 Outdoor unit
RAV-132AH-PE
RAV-162AH-PE



Location No.	Part No.	Description
1	43120156	Fan, Propeller
2	43A21003	Motor, Fan, AC230V, 50Hz
3	43A43001	Condenser
4	43149212	Base, Spring, A
5	43149198	Spring, Buffer
6	43049132	Base, Spring, B
7	43A69003	PC Board
8	43A49001	Switch, High-Pressure
9	43060479	Terminal, 4P
10	43A60003	Terminal, 2P
11	43A60001	Terminal, 4P
12	43152334	Magnetic Contactor
13	43054286	Relay, Overload
14	43A19001	Guard, Fan
15	43119368	Hanger
16	43A46004	Solenoid Coil
17	43162027	Cover, Electric Parts
18	43155115	Capacitor, Plastic Film, 45MFD, 440V
20	43107215	Holder, Sensor (TE)
22	43148105	Accumulator
23	43145082	Dryer
24	43155080	Capacitor, Electrolytic

Location No.	Part No.	Description
25	43041837	Compressor, AC220/240V, 50Hz, PH230X3-4LS (RAV-132AH-PE)
25	43041845	Compressor, AC220/240V, 50Hz, PH250X3-4LS (RAV-162AH-PE)
26	43146454	Packed Valve (1/4")
27	43146406	Packed Valve (1/2")
28	43147321	Check Joint
29	43146424	Expansion Valve
30	43046198	Coil, 2-Way Valve
31	43146283	1-Way Valve
33	43A58003	Transformer, Power
34	43046151	Valve, 2-Way
35	43193043	Spring
36	43A50001	Sensor, Cond. Out (TL)
37	43150196	Sensor, Heat Exch. (TE)
38	43146418	Valve 4-Way
39	43157167	Heater, Crankcase
41	43146459	Capillary Tube
42	44246235	Capillary Tube
43	43150122	Thermostat, Bimetal
44	43107215	Holder, Sensor (TL)

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