LCP INVERTER (1:1)

MODELS:

INDOOR UNIT

Four-way Ceiling Cassette

KV 24CC-ARF21
KV 36CC-ARF21
KV 48CC-ARF21

Ceiling-floor Mount: Convertible

KV 24CM-ARF21
KV 36CM-ARF21
KV 48CM-ARF21

OUTDOOR UNIT

Universal Outdoor Unit

KV 24ODU-ARF21
KV 36ODU-ARF21
KV 48ODU-ARF21

SERVICE MANUAL

LIGHT COMMERCIAL AIR CONDITIONING **2012**

CONTENTS

Part 1
General Information

1. Model Lists

1.1 Indoor Units

R410A (capacity multiplied by 1000Btu/h)

Type	Function	24	36	48
Four-way cassette	Cooling Only	√	√	√
Ceiling & floor	Cooling Only	√	√	√

1.2 Outdoor Units

Universal Outdoor unit Model	Compressor type	Compressor Brand	Matched indoor units
KV24ODU-ARF21	Rotary DC Inverter	GMCC	KV24CC-ARF21 KV24CM-ARF21
KV36ODU-ARF21	Rotary DC Inverter	MITSUBISHI	KV36CC-ARF21 KV36CM-ARF21
KV48ODU-ARF21	Rotary DC Inverter	MITSUBISHI	KV48CC-ARF21 KV48CM-ARF21

2. External Appearance

2.1 Indoor Units

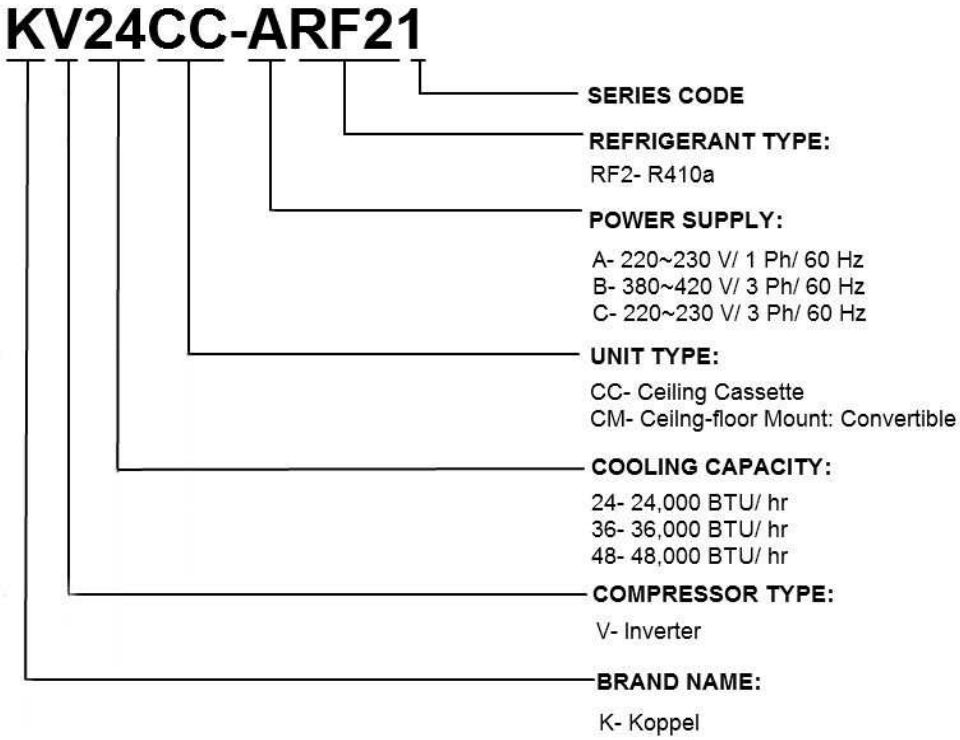
Four-way Ceiling Cassette	Ceiling-floor Mount: Convertible
	

2.2 Outdoor Units

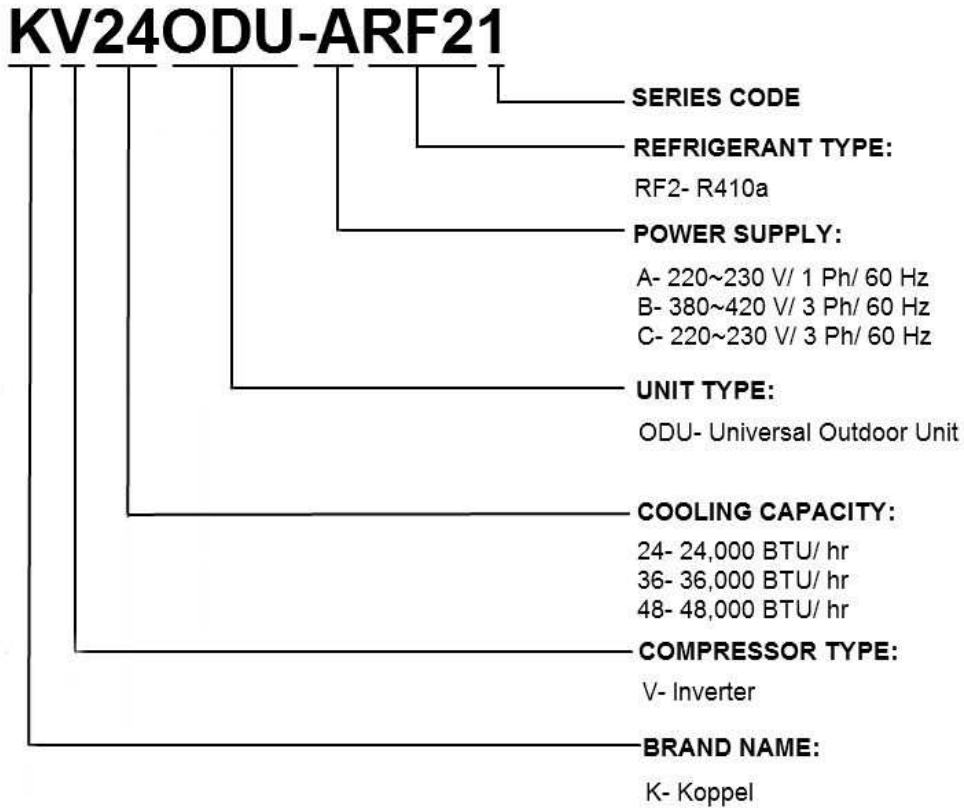
KV24ODU-ARF21 KV36ODU-ARF21	KV48ODU-ARF21
	

3. Nomenclature

3.1 Indoor Unit



3.2 Outdoor Unit



4. Features

4.1 Universal outdoor unit design

Indoor unit with the same capacity can match with the same outdoor unit.

4.2 High efficiency and energy saving.

Thanks to the DC inverter technology and optimized piping system, the EER and COP of whole series can easily reach A-class.

4.3 Low noise and low starting current.

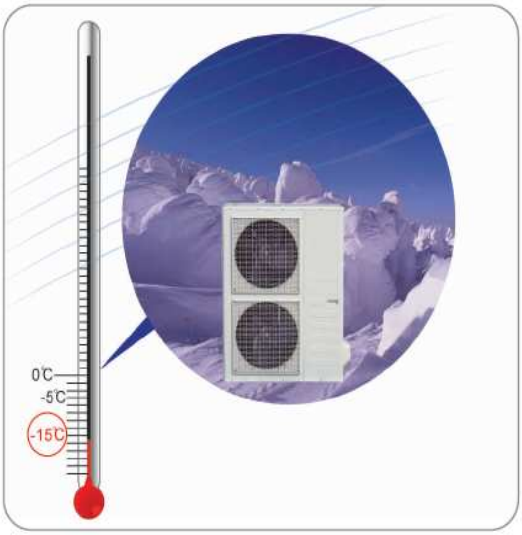
Thanks to the DC inverter technology, the system can work with low noise, and very small starting current.

4.4 Intelligent refrigerant adjustment technology.

Throttle part is made up of capillary and electronic expansion valve (EXV). The outdoor unit can output the most accurate capacity in any condition.

4.5 Working in cooling mode under -15℃.

Outdoor unit built-in with low ambient kit, it can control the outdoor unit's fan and cooling can be performed throughout the year for computer rooms, banquet halls, etc. Wide operation range covers outdoor temperatures as low as -15℃ for cooling.



4.6 Indoor & outdoor unit's power supply is separate.

4.7 All indoor units have network control function.

4.8 All indoor units have Auto-restart function.

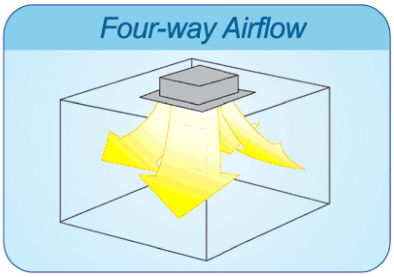
Part 2
Indoor Units

Four-way Ceiling Cassette Type

1. Features

(1) Low operation noise
—Streamline plate ensures quietness
—Creates natural and comfortable environment

(2) Efficient cooling——Equal, fast and wide range cooling

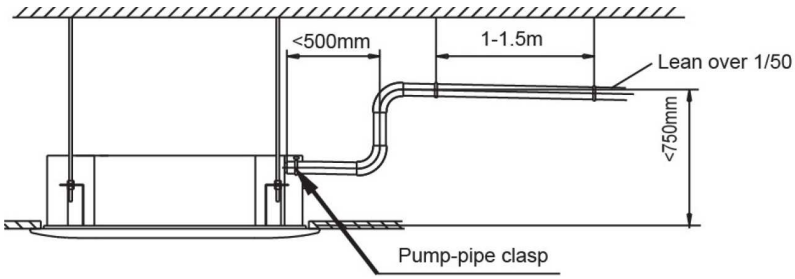


(3) Excellent performance. The optimal evaporator & sufficient airflow volume guarantees the excellent capacity

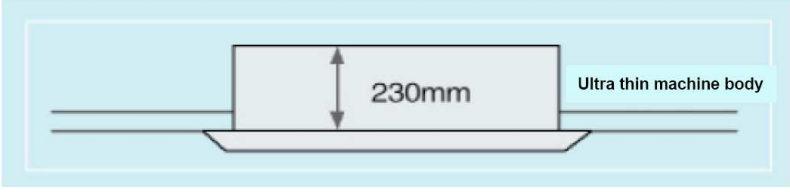
(4) The adoption of the most advanced 3- Dimensional Screw fan
—Reduces the air resistance passing through
—Smoothes the air flow
—Makes air speed distribution to the heat exchange uniform

(5) Fresh air makes life healthier and more comfortable.

(6) Drainage pump can take up the condenser water to750mm.

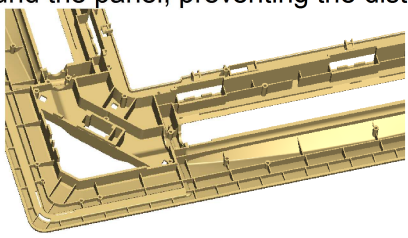


(7) Ultra thin machine body to easy installation and maintenance. 18K~24K:230mm, 36~48K:300mm.



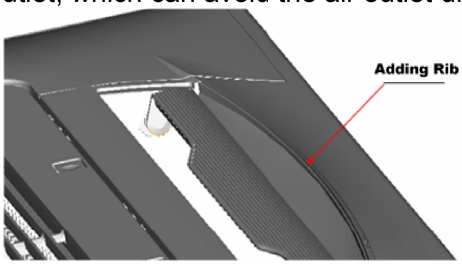
(8) Swing angle of louver
   1) Add one more swing motor, one motor driving two louvers. Controlling the interspace of each part, minimizing the angle loss.
   2) The swing angle of the first louver are 40~42 degrees and the second louver are 37~38 degrees. New evaporator and inner configuration designed can acquire high heat-exchanger effect.

(9) More strengthening rib design around the panel, preventing the distortion for the panel.

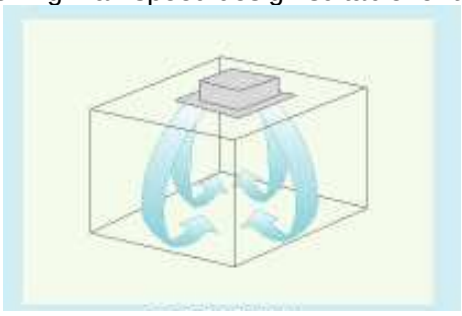


(10) New outlet frame design to make the phenomena of coagulation great improvement: prevent the condensing water from damaging the air guide strip.

(11) Adding rib on the panel of fan outlet, which can avoid the air outlet direct flow to people.

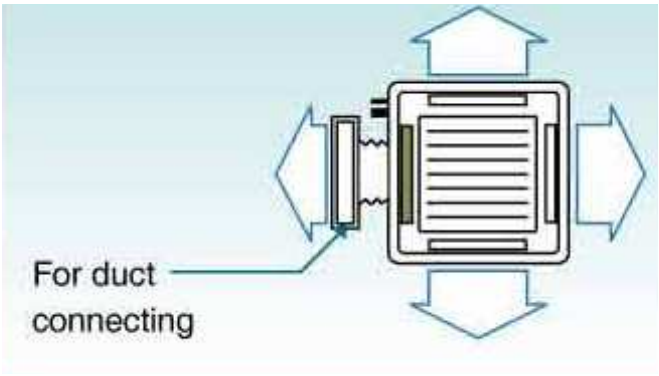


(12) 4 speeds available, optional super high fan speed design suitable for the large building over 3m high.

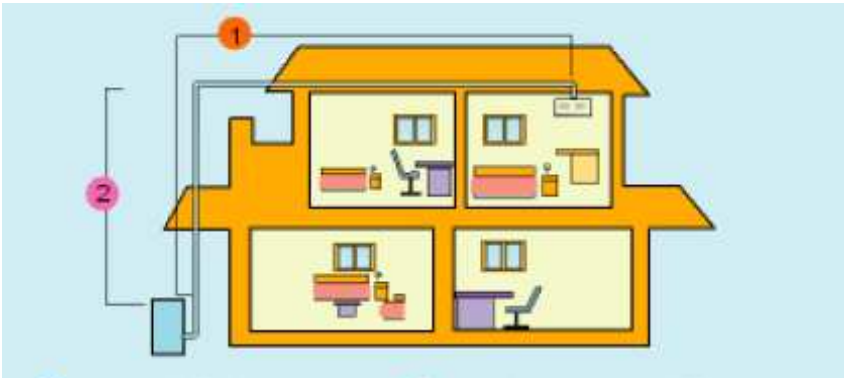


(13) Adding digital tube displaying on the display board. LED can display the Error Code to make the malfunction checking easier.

(14) Reserve spaces for air side-outlet, it is available to connect duct pipe hence air supplying from the four sides to nearby small room..

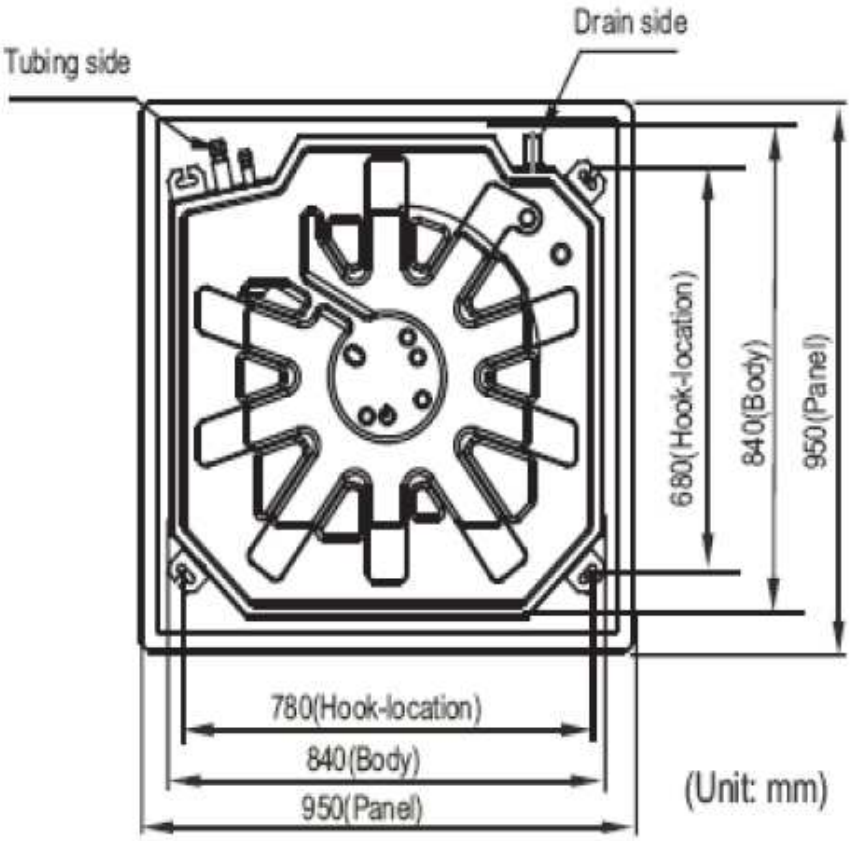


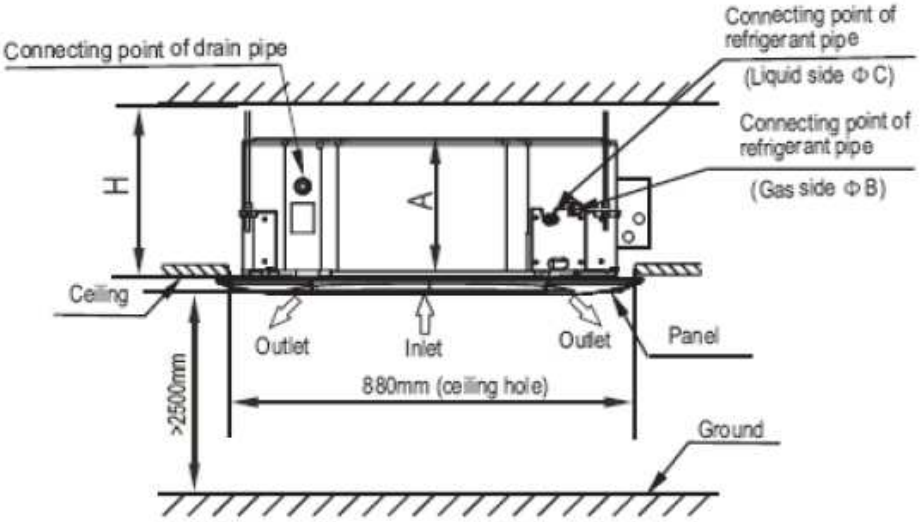
(15) The connecting pipe and drop height is higher. Max. pipe length up to 50m（refer to ①）, and Max. drop height up to 30m（refer to ②）.



(16) Optimal design, smaller Control Box, Space saving and convenient for wiring,
Using fire resistance galvanized steel for E-box material. Metal box make the control part more stable and prevent damaging.

2. Dimensions





Unit: mm

MODEL	A	B	C	H
KV24CC-ARF21	230	Φ15.9	Φ9.5	>260
KV36CC-ARF21 KV48CC-ARF21	300	Φ15.9	Φ9.5	>330

3. Service Space

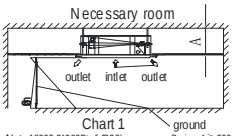


Chart 1

Note:18000-24000Btu/h(R22) Series A≥260mm
36000-48000Btu/h(R22) Series A≥330mm

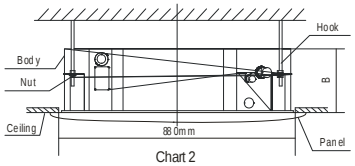


Chart 2

Note:18000-24000Btu/h(R22) Series B=240mm
36000-48000Btu/h(R22) Series B=310mm

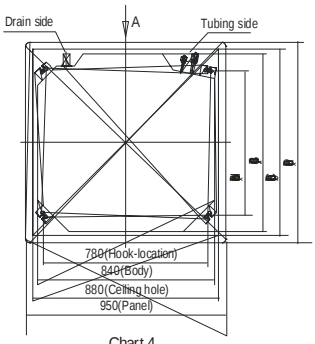


Chart 4

(Unit: mm)

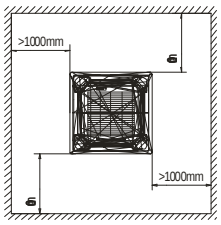


Chart 3

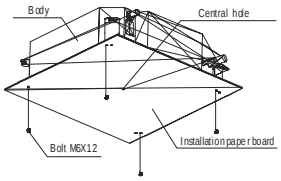
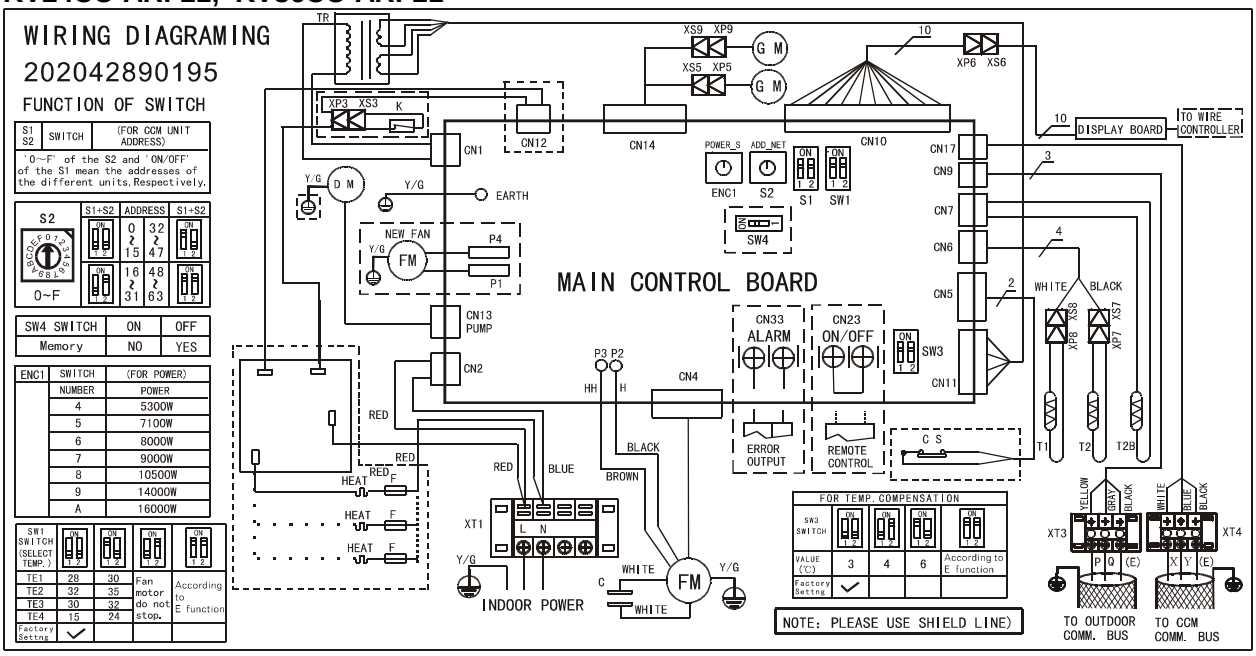


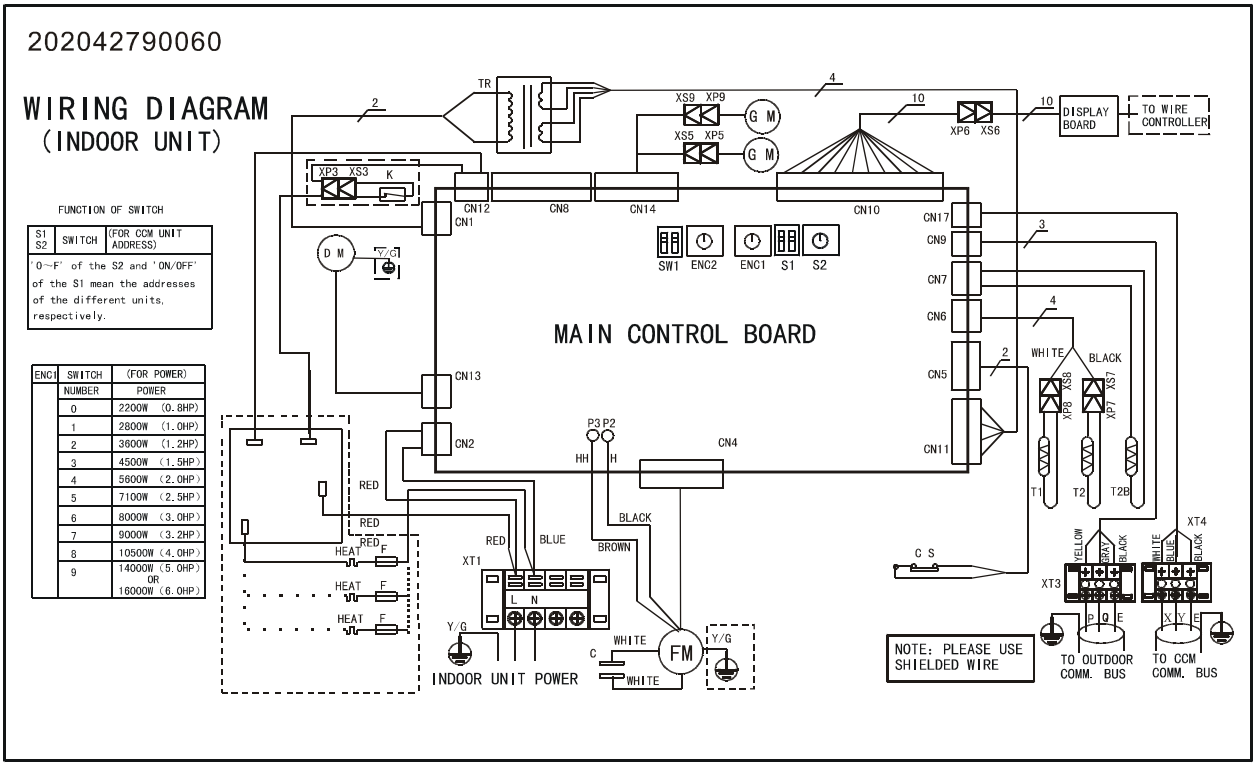
Chart 5

4. Wiring Diagrams

KV24CC-ARF21, KV36CC-ARF21



KV48CC-ARF21



5. Capacity Tables

5.1 Cooling Capacity

KV24CC-ARF21

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	7.52	7.15	6.79	6.50
	SC	5.56	5.51	5.43	5.46
	Input	2.10	2.28	2.38	2.46
24/17ºC DB/WB	TC	7.74	7.37	7.01	6.57
	SC	5.80	5.75	5.68	5.52
	Input	2.23	2.38	2.49	2.61
27/19ºC DB/WB	TC	7.88	7.52	**7.30**	6.79
	SC	5.83	5.79	5.69	5.57
	Input	2.28	2.41	**2.54**	2.66
32/23ºC DB/WB	TC	8.03	7.74	7.59	7.01
	SC	6.83	6.73	6.68	6.52
	Input	2.38	2.49	2.66	2.76

KV36CC-ARF21

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	11.33	10.78	10.23	9.79
	SC	8.38	8.30	8.18	8.22
	Input	3.42	3.71	3.88	4.00
24/17ºC DB/WB	TC	11.66	11.11	10.56	9.90
	SC	8.75	8.67	8.55	8.32
	Input	3.63	3.88	4.04	4.25
27/19ºC DB/WB	TC	11.88	11.33	**11.00**	10.23
	SC	8.79	8.72	8.58	8.39
	Input	3.71	3.92	**4.13**	4.33
32/23ºC DB/WB	TC	12.10	11.66	11.44	10.56
	SC	10.29	10.14	10.07	9.82
	Input	3.88	4.04	4.33	4.50

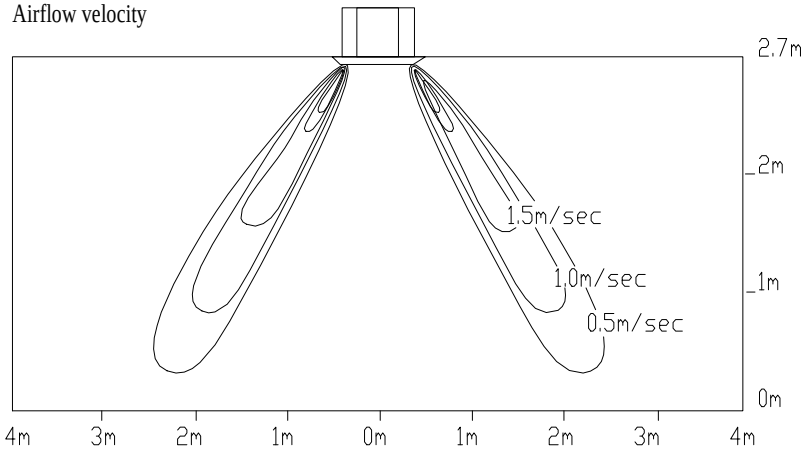
KV48CC-ARF21

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	14.42	13.72	13.02	12.46
	SC	10.67	10.56	10.42	10.47
	Input	3.89	4.22	4.41	4.55
24/17ºC DB/WB	TC	14.84	14.14	13.44	12.60
	SC	11.13	11.03	10.89	10.58
	Input	4.13	4.41	4.60	4.83
27/19ºC DB/WB	TC	15.12	14.42	**14.00**	13.02
	SC	11.19	11.10	10.92	10.68
	Input	4.22	4.45	**4.69**	4.92
32/23ºC DB/WB	TC	15.40	14.84	14.56	13.44
	SC	13.09	12.91	12.81	12.50
	Input	4.41	4.60	4.92	5.11

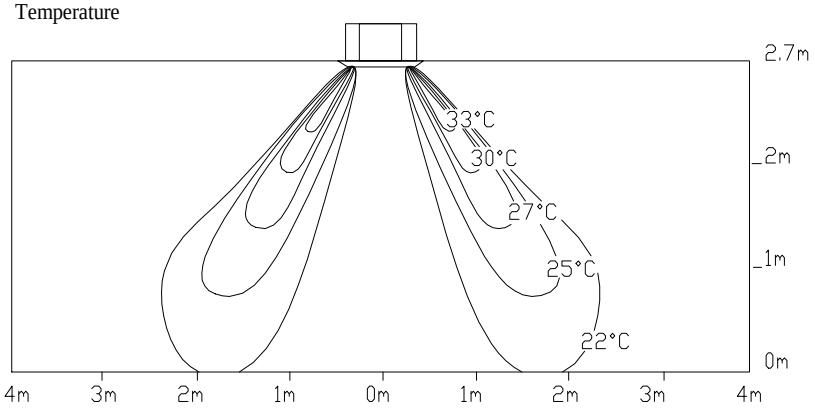
Notes:
TC : Total capacity ; kW
SC: Sensible heat capacity ; kW
Input: Input power; kW

6. Air Velocity and Temperature Distributions

Airflow velocity



Temperature

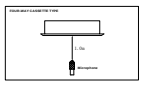


7. Electric Characteristics

Model	Indoor Unit				Power Supply
	Hz	Voltage	Min	Max	MFA
KV24CC-ARF21	60	220-240	198	254	15
KV36CC-ARF21	60	220-240	198	254	15
KV48CC-ARF21	60	220-240	198	254	15

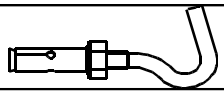
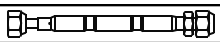
Notes:
MFA: Max. Fuse Amps. (A)

8. Sound Levels



Model	Noise level dB(A)		
	H	M	L
KV24CC-ARF21	42	40.5	39
KV36CC-ARF21	44	42.5	41
KV48CC-ARF21	44	42	41

9. Accessories

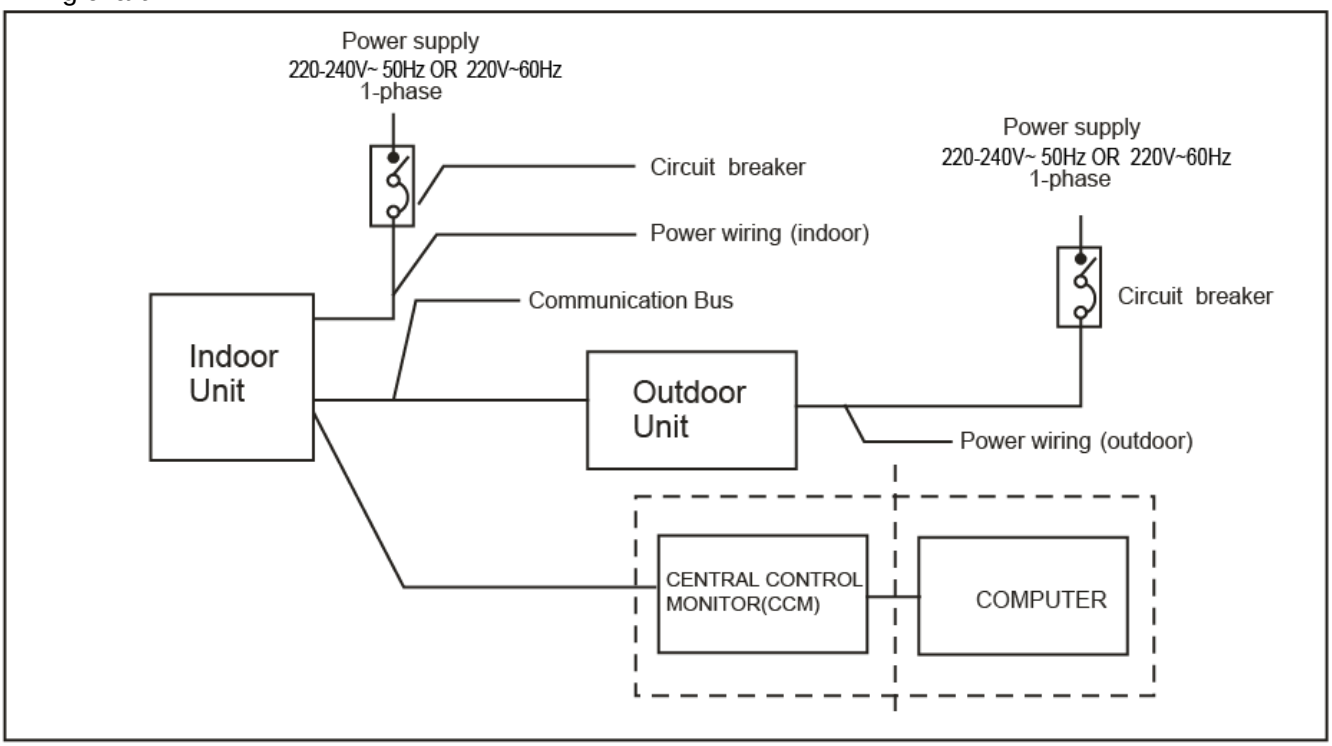
	Name	Shape	Quantity
INSTALLATION FITTINGS	Installation paper board		1
Tubing & Fittings	Soundproof / insulation sheath		2
	Connecting pipe group		1
Drainpipe Fittings	Out-let pipe sheath		1
	Out-let pipe clasp		1
	Drain joint		1
	Seal ring		1
Remote controller & Its Frame	Remote controller & Its Frame		1
	Remote controller holder		1
	Mounting screw(ST2.9×10-C-H)		2
	Alkaline dry batteries (AM4)		2
Others	Owner's manual		1
	Installation manual		1
Installation accessory (The product you have might not be provided the following accessories	Expansible hook		4
	Installation hook		4
	Orifice		1

10. The Specification of Power

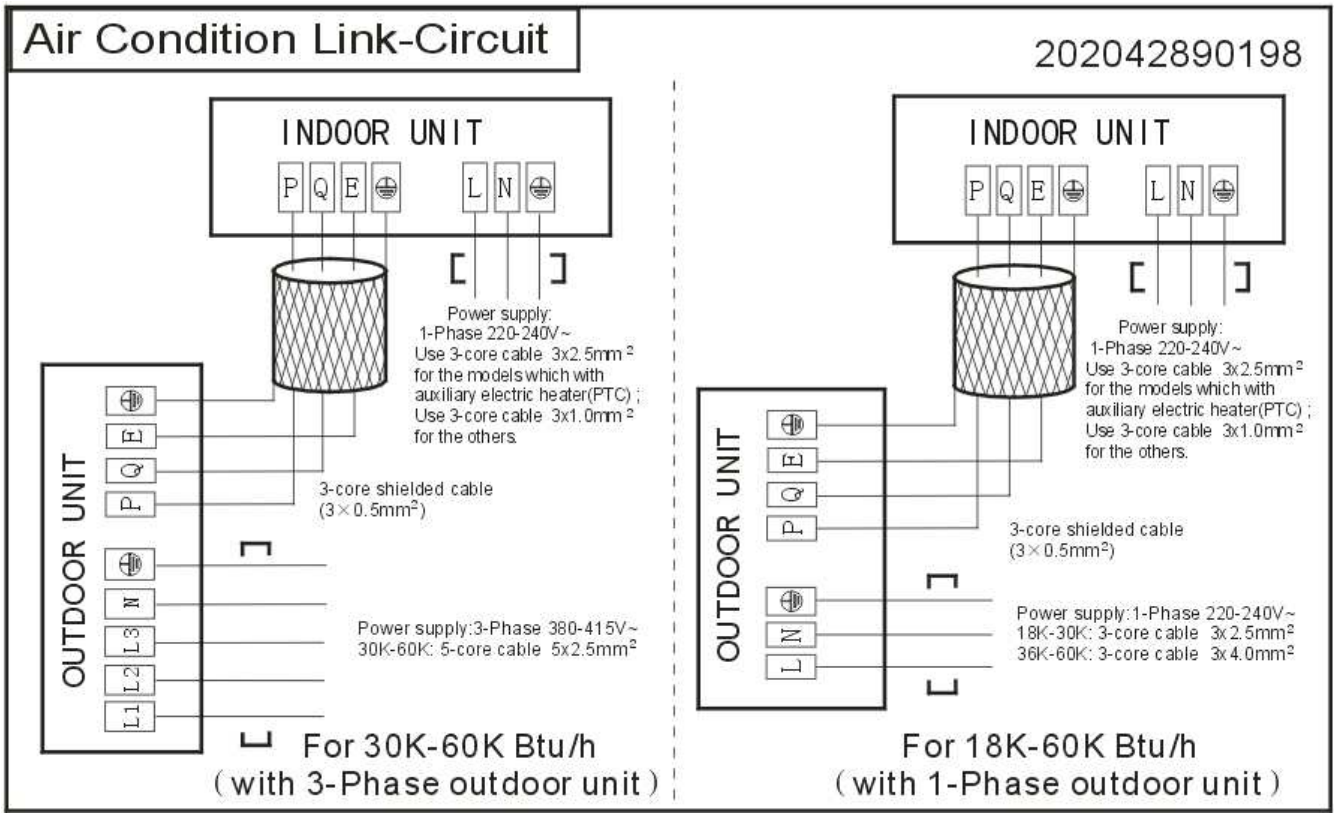
Type		KV24CC-ARF21	KV36CC-ARF21 KV48CC-ARF21
Indoor unit Power	Phase	1- Phase	1- Phase
	Frequency and Voltage	220-240V~, 60Hz	220-240V~, 60Hz
	Power Wiring(mm^2)	3X1.0	3X1.0
	Circuit Breaker(A)	15	15
Outdoor unit Power	Phase	1- Phase	1- Phase
	Frequency and Voltage	220-240V~,60Hz	220-240V~,60Hz
	Power Wiring(mm^2)	3X2.5	3X3.3
	Circuit Breaker(A)	30	40
Indoor/outdoor connection wiring(Weak Electric Signal) (mm^2)		3X0.5	3X0.5
Indoor/outdoor connection wiring(Strong Electric Signal) (mm^2)		—	—

11. Field Wiring

Wiring chart



KV24CC-ARF21, KV36CC-ARF21, KV48CC-ARF21



Ceiling & Floor Type

1. Features

1.1. New design, more modern and elegant appearance.

1.2. Convenient installation

--The ceiling type can be easily installed into a corner of the ceiling even if the ceiling is very narrow
--It is especially useful when installation of an air conditioner in the center of the ceiling is impossible due to a structure such as one lighting.

1.3. Two direction auto swing (vertical & horizontal) and wide angle air flow,

--Air flow directional control minimizes the air resistance and produces wilder air flow to vertical direction.
--The range of horizontal air discharge is widened which secures wider air flow distribution to provide more comfortable air circulation no matter where the unit is set up

1.4. Three level fan speed, more humanism design, meets different air-supply requirement.

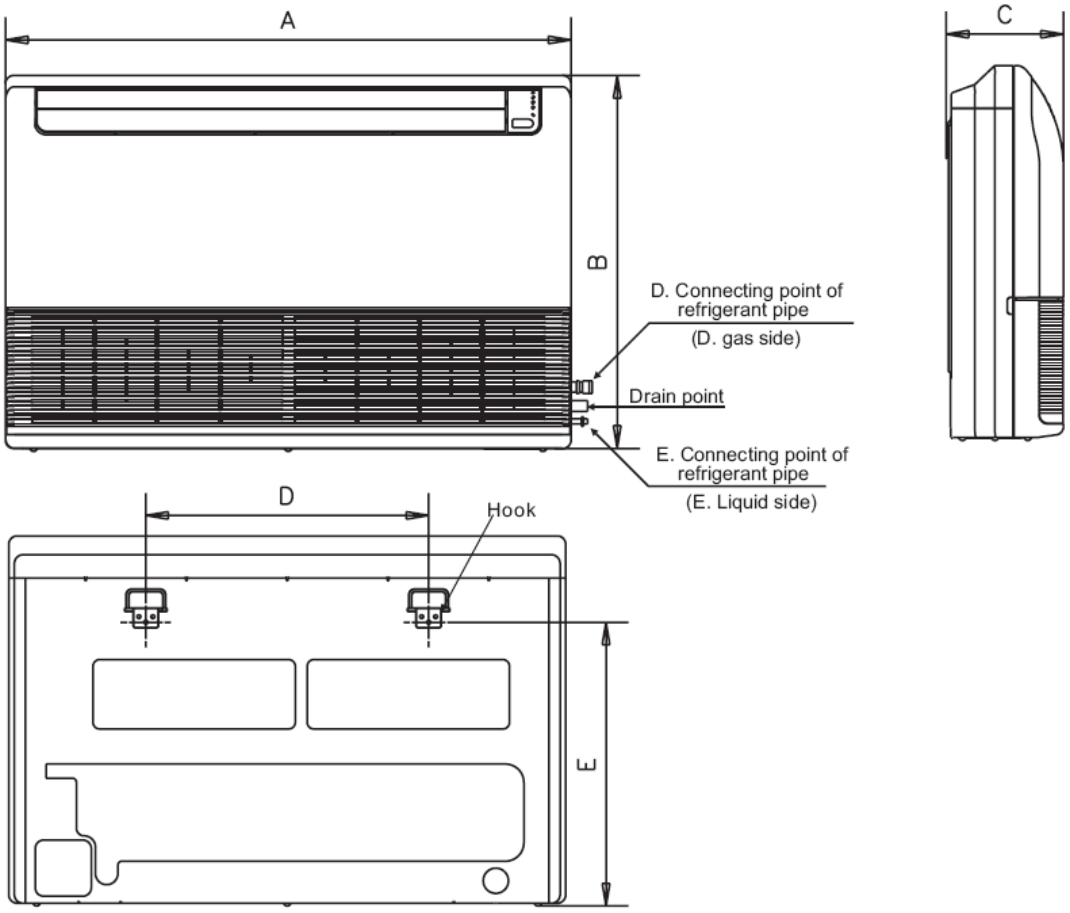
1.5. Water proof by utilizing the absorbing plastic film on water collector

1.6. Easy operation.

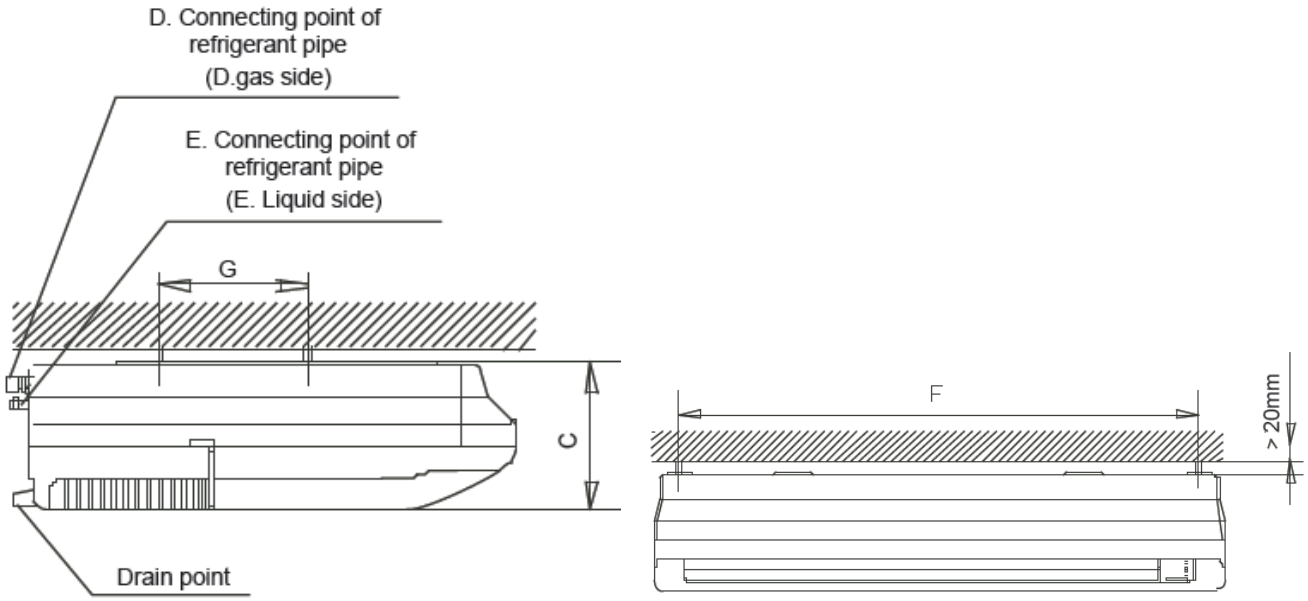
1.7. Remote control and optional wired control method.

2. Dimensions

a. Wall mounting installation

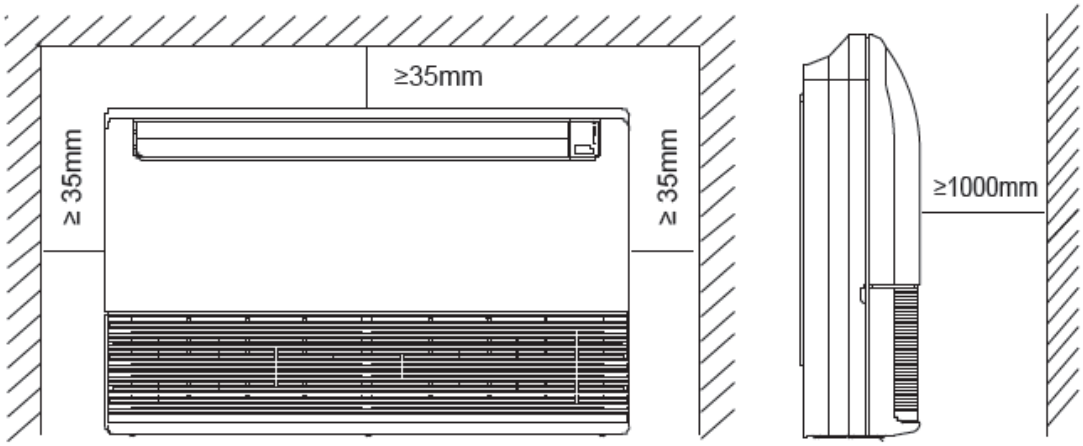


b. Ceiling installation



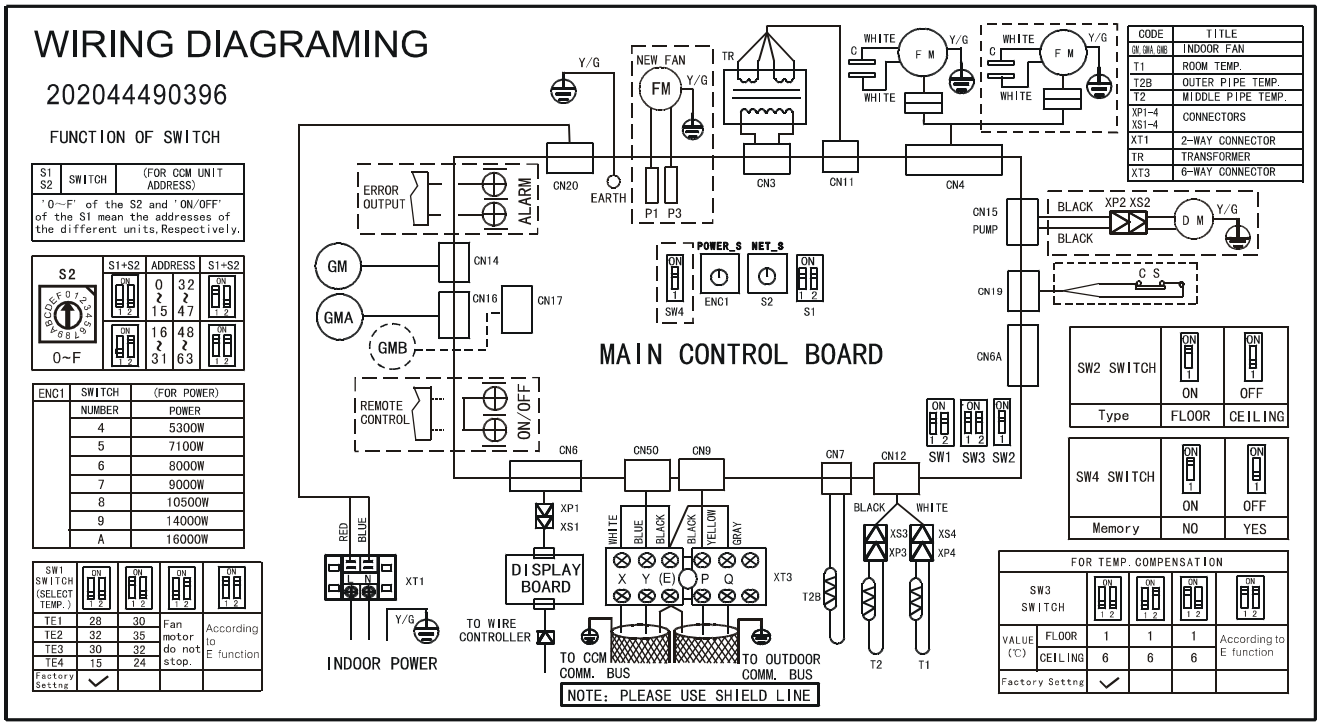
Capacity (Btu/h)	A	B	C	D	E	F	G
KV24CM-ARF21	990	660	203	505	506	907	200
KV36CM-ARF21	1280	660	203	795	506	1195	200
KV48CM-ARF21	1670	680	240	1070	450	1542	200

3. Service Space

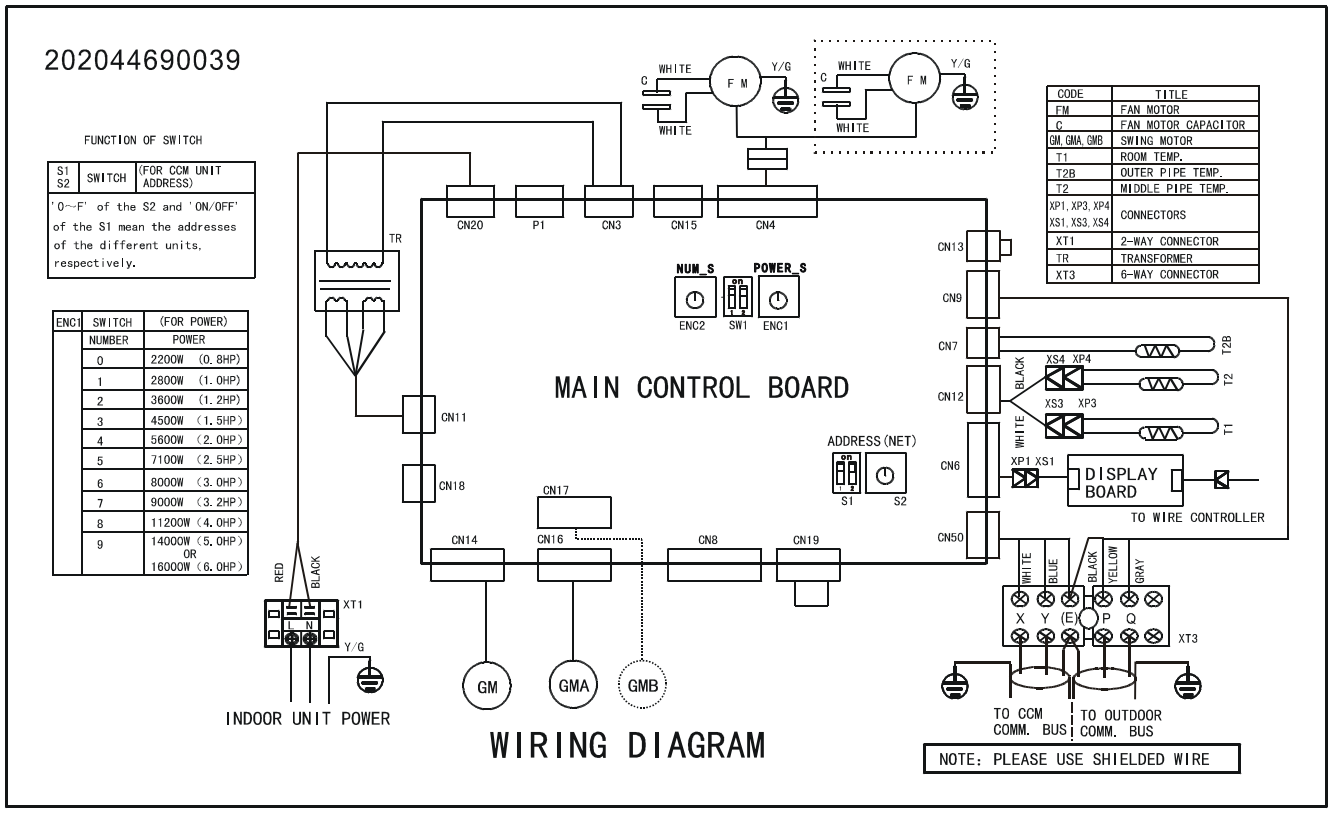


4. Wiring Diagrams

KV24CM-ARF21, KV36CM-ARF21



KV48CM-ARF21



5. Capacity Tables

6.1 Cooling Capacity

KV24CM-ARF21

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	7.52	7.15	6.79	6.50
	SC	5.56	5.51	5.43	5.46
	Input	2.10	2.28	2.38	2.46
24/17ºC DB/WB	TC	7.74	7.37	7.01	6.57
	SC	5.80	5.75	5.68	5.52
	Input	2.23	2.38	2.49	2.61
27/19ºC DB/WB	TC	7.88	7.52	**7.30**	6.79
	SC	5.83	5.79	5.69	5.57
	Input	2.28	2.41	**2.54**	2.66
32/23ºC DB/WB	TC	8.03	7.74	7.59	7.01
	SC	6.83	6.73	6.68	6.52
	Input	2.38	2.49	2.66	2.76

KV36CM-ARF21

High speed		Indoor conditions (DB) at 0Pa			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	10.82	10.29	9.77	9.35
	SC	8.00	7.92	7.81	7.85
	Input	3.44	3.73	3.89	4.02
24/17ºC DB/WB	TC	11.13	10.61	10.08	9.45
	SC	8.35	8.27	8.16	7.94
	Input	3.64	3.89	4.06	4.26
27/19ºC DB/WB	TC	11.34	10.82	**10.50**	9.77
	SC	8.39	8.33	8.19	8.01
	Input	3.73	3.93	**4.14**	4.35
32/23ºC DB/WB	TC	11.55	11.13	10.92	10.08
	SC	9.82	9.68	9.61	9.37
	Input	3.89	4.06	4.35	4.51

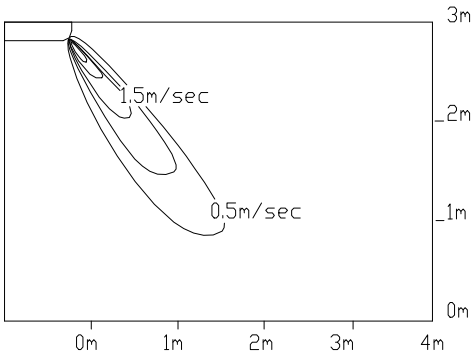
KV48CM-ARF21

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	14.42	13.72	13.02	12.46
	SC	10.67	10.56	10.42	10.47
	Input	3.89	4.22	4.41	4.55
24/17ºC DB/WB	TC	14.84	14.14	13.44	12.60
	SC	11.13	11.03	10.89	10.58
	Input	4.13	4.41	4.60	4.83
27/19ºC DB/WB	TC	15.12	14.42	**14.00**	13.02
	SC	11.19	11.10	10.92	10.68
	Input	4.22	4.45	**4.69**	4.92
32/23ºC DB/WB	TC	15.40	14.84	14.56	13.44
	SC	13.09	12.91	12.81	12.50
	Input	4.41	4.60	4.92	5.11

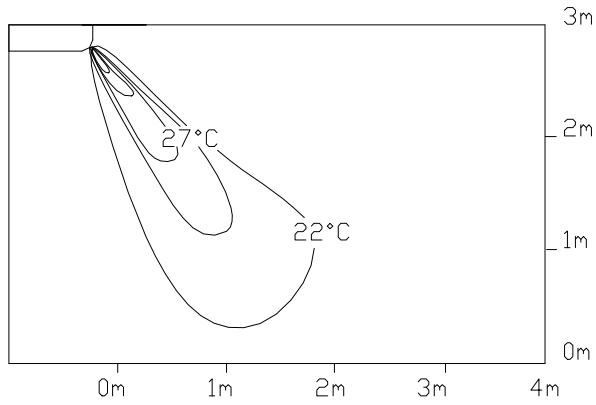
Notes:
TC : Total capacity ; kW
SC: Sensible heat capacity ; kW
Input: Input power; kW

6. Air Velocity and Temperature Distributions
Discharge angle 60° (CEILING)

Airflow velocity

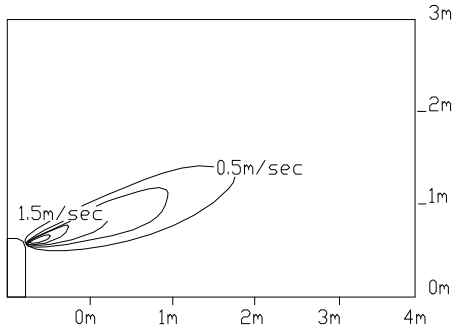


Temperature

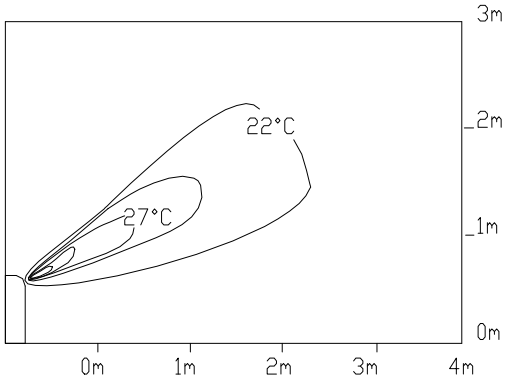


Discharge angle 60℃(FLOOR)

Airflow velocity



Temperature

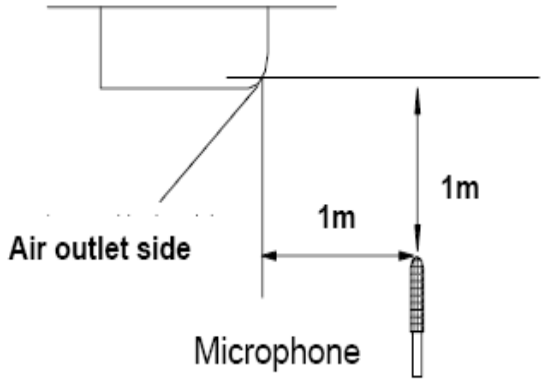


7. Electric Characteristics

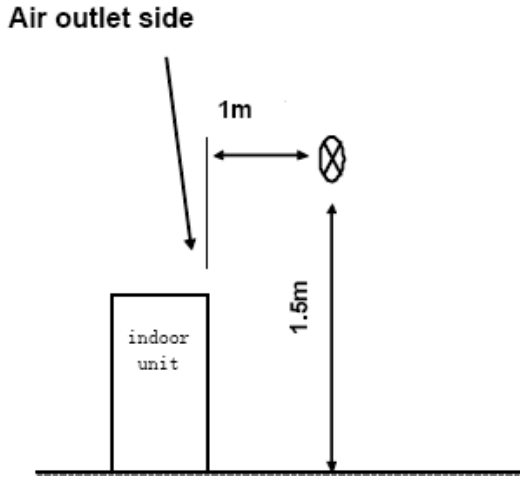
Model	Indoor Unit				Power Supply
	Hz	Voltage	Min	Max	MFA
KV24CM-ARF21	60	220-240	198	254	15
KV36CM-ARF21	60	220-240	198	254	15
KV48CM-ARF21	60	220-240	198	254	15

Notes:
MFA: Max. Fuse Amps. (A)

8. Sound Levels



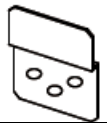
Ceiling



Floor

Model	Noise level dB(A)		
	H	M	L
KV24CM-ARF21	45	43	40
KV36CM-ARF21	45	43	40
KV48CM-ARF21	47	46	44

9. Accessories

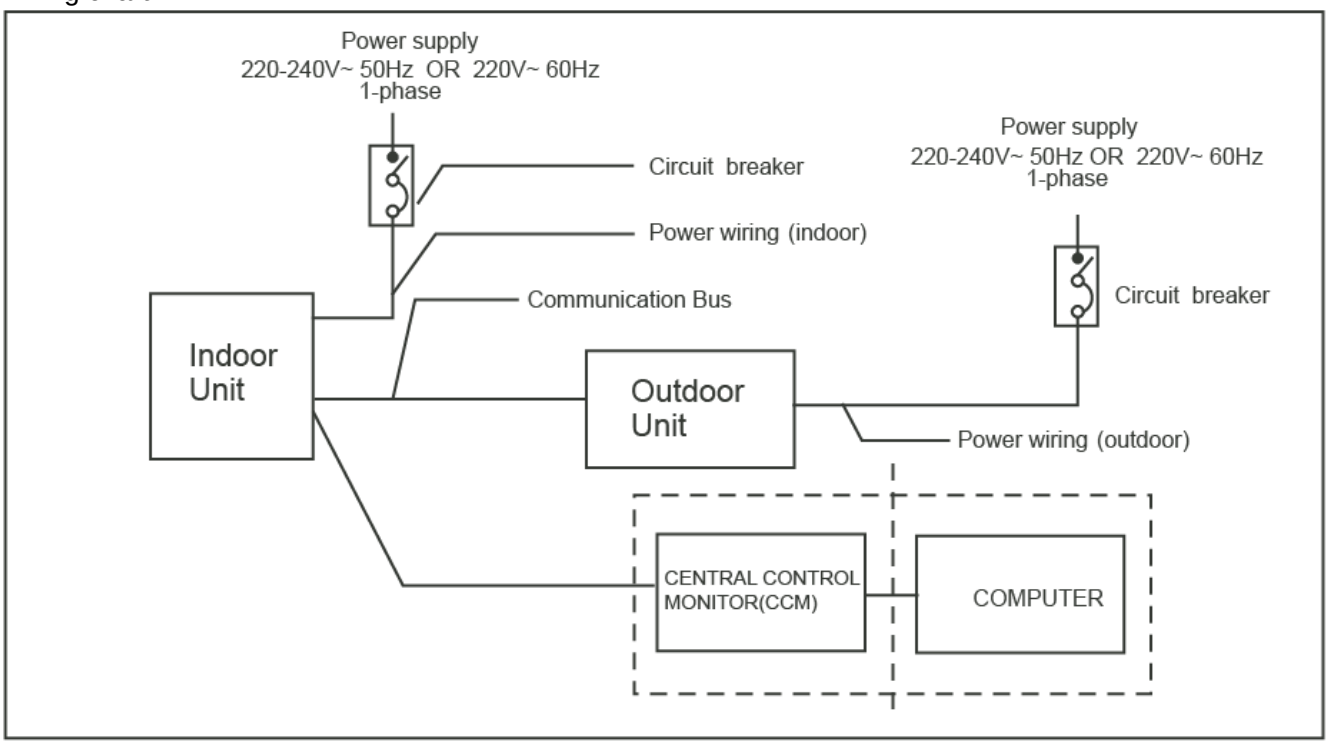
	Name	Shape	Quantity
Installation fittings	1.Hook		2
	2.Hanging arm		2
Remote controller & Its holder	3. Remote controller		1
	4. Remote controller holder		1
	5. Mounting screw (ST2.9×10-C-H)		2
	6. Alkaline dry batteries (AM4)		2
Others	7. Owner's manual		1
	8. Installation manual		1
	9. Remote controller manual		1

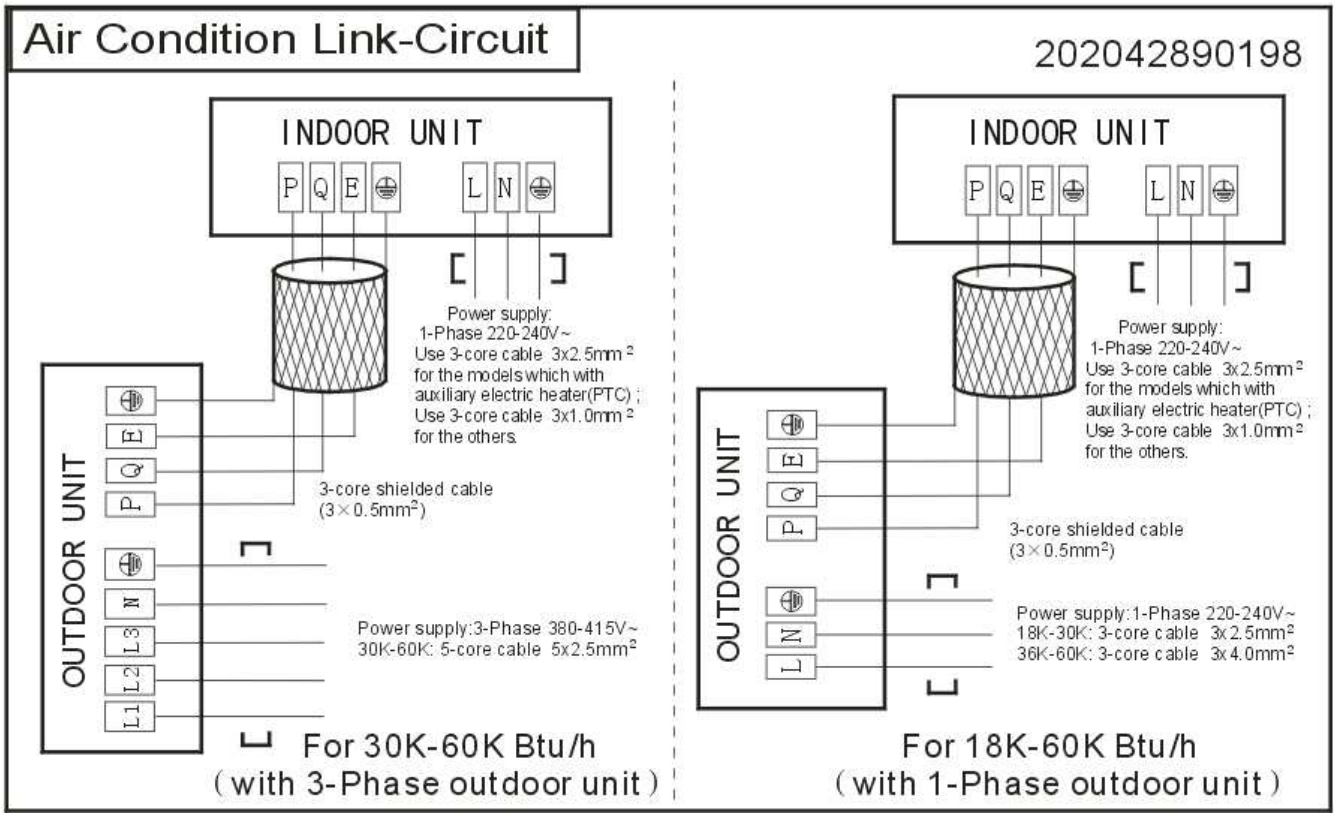
10. The Specification of Power

Type		KV24CM-ARF21 KV36CM-ARF21 KV48CM-ARF21
Indoor unit Power	Phase	1- Phase
	Frequency and Voltage	220V~,60Hz
	Power Wiring(mm^2)	3X1.0
	Circuit Breaker(A)	15
Outdoor unit Power	Phase	1- Phase
	Frequency and Voltage	220V~,60Hz
	Power Wiring(mm^2)	3X3.3
	Circuit Breaker(A)	40
Indoor/outdoor connection wiring(Weak Electric Signal) (mm^2)		3X0.5
Indoor/outdoor connection wiring(Strong Electric Signal) (mm^2)		—

11. Field Wiring

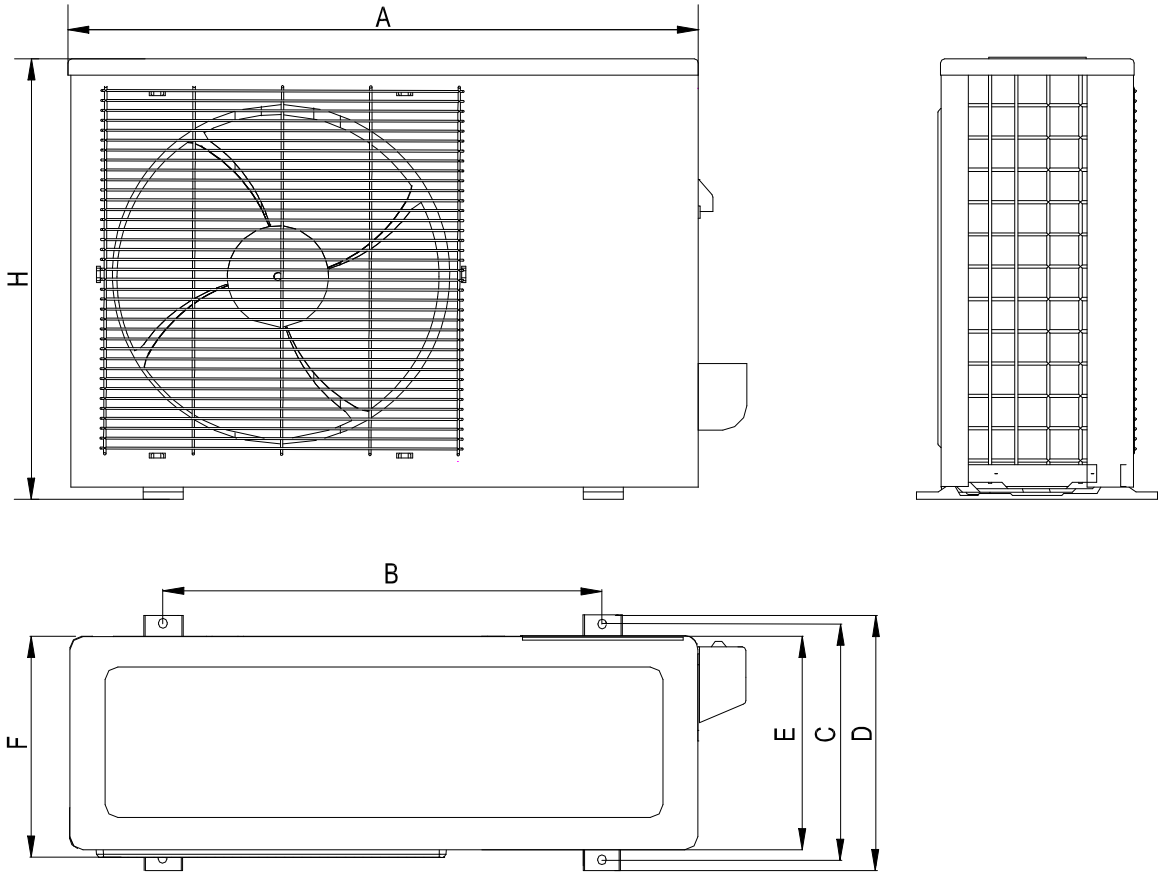
Wiring chart





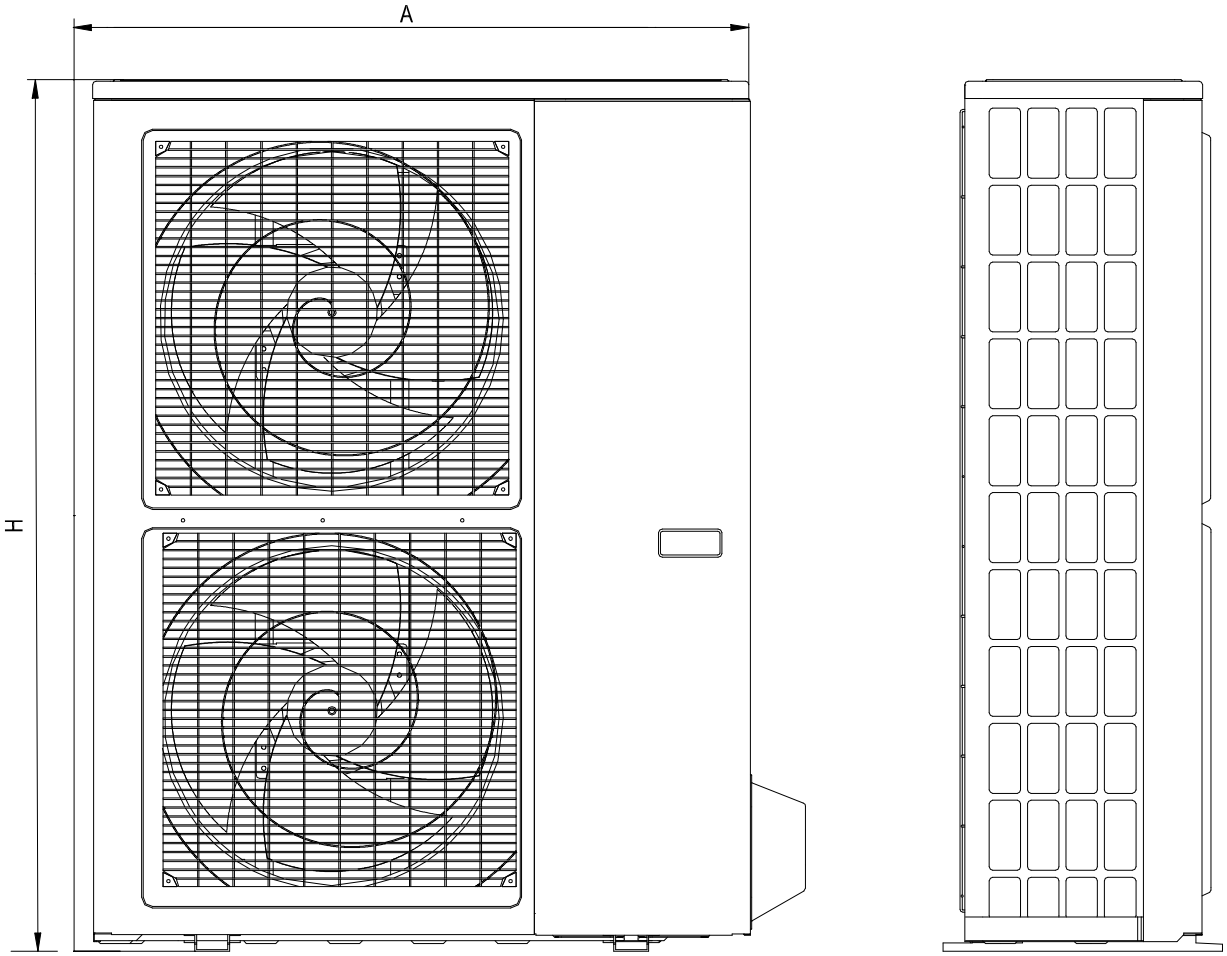
Part 3
Outdoor Units

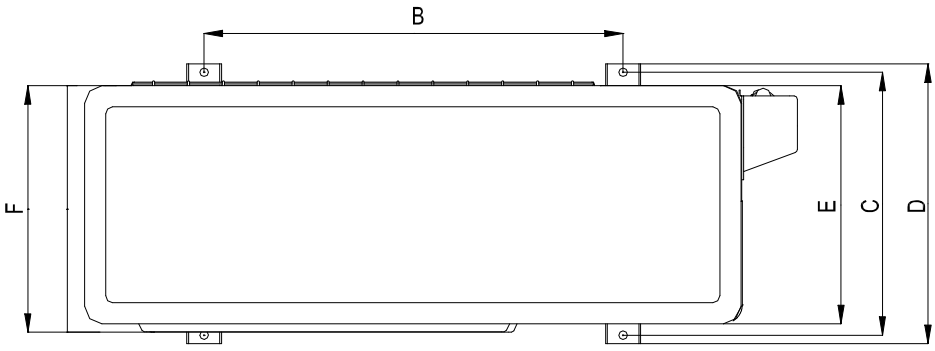
1. Dimensions



Unit: mm

MODEL	A	B	C	D	E	F	H
KV24ODU-ARF21	842	560	335	360	312	324	695
KV36ODU-ARF21	990	624	366	396	340	354	966

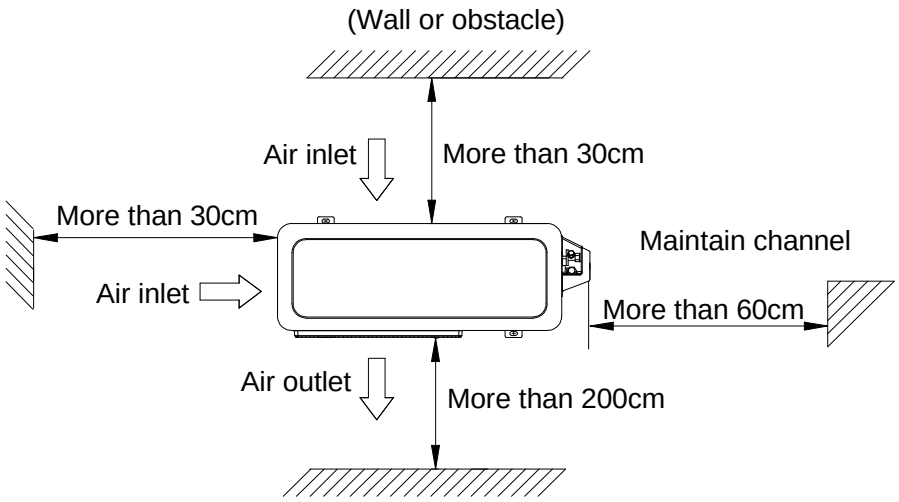


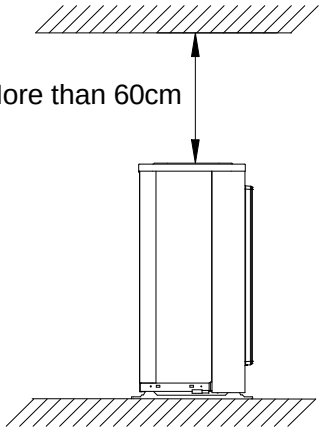


Unit: mm

MODEL	A	B	C	D	E	F	H
KV48ODU-ARF21	940	600	376	400	340	360	1245

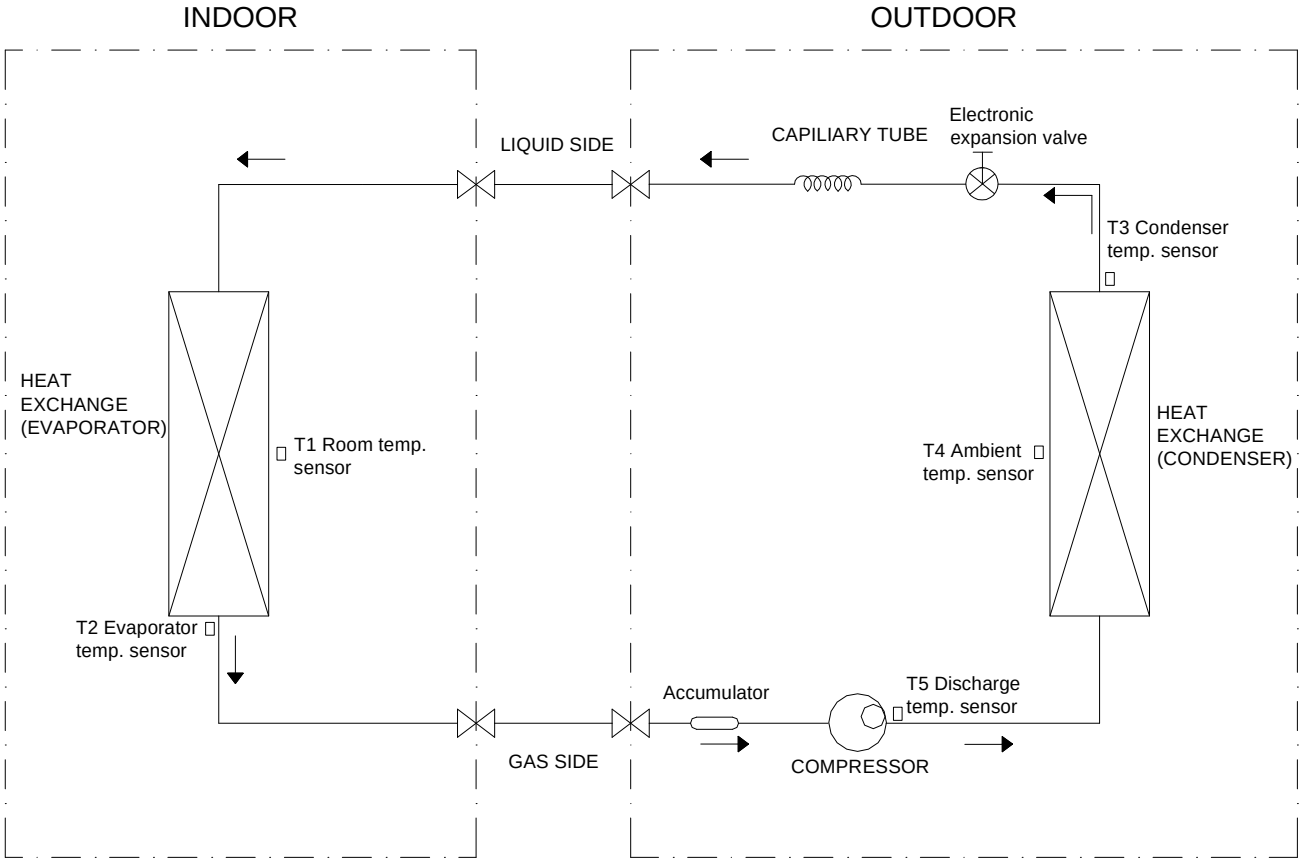
2. Service Space





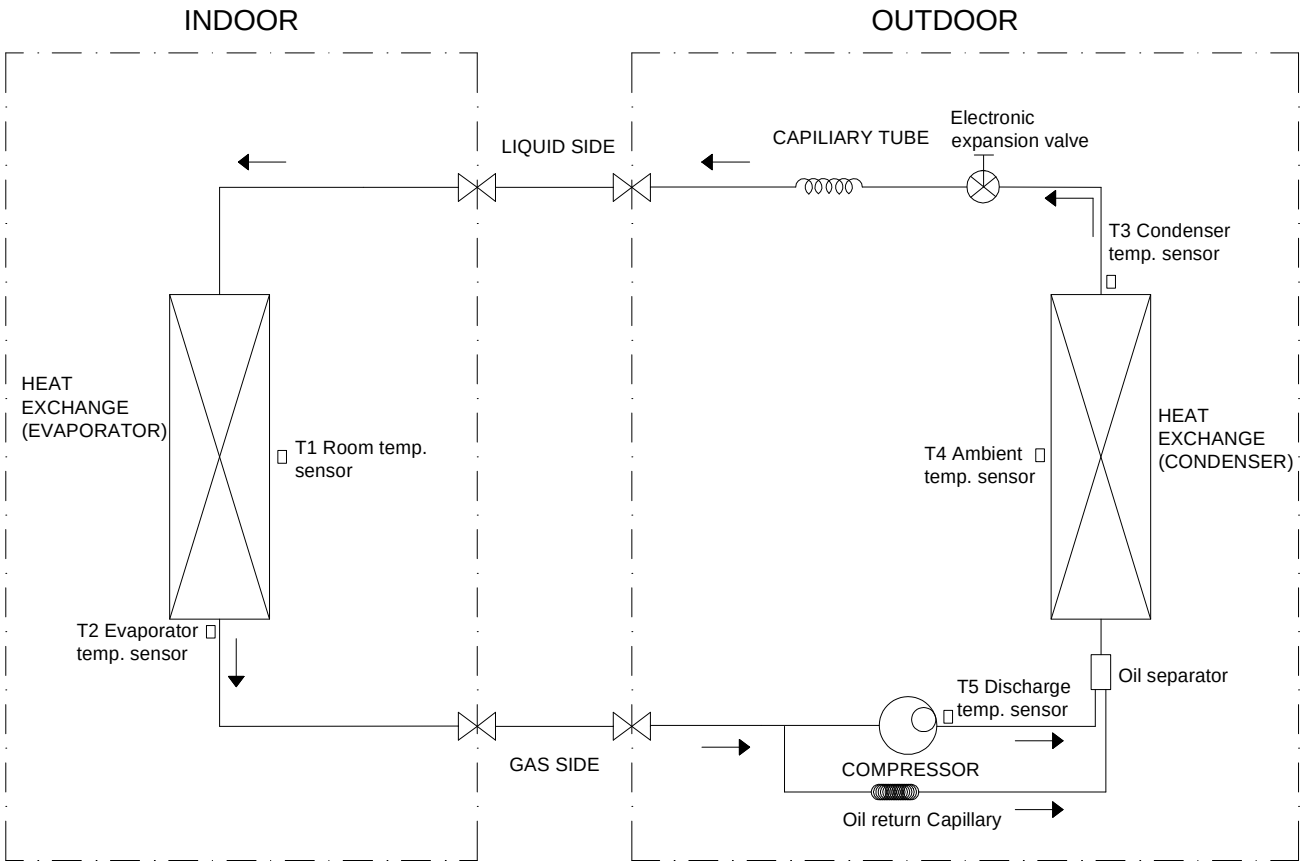
3. Piping Diagrams

KV24ODU-ARF21, KV36ODU-ARF21



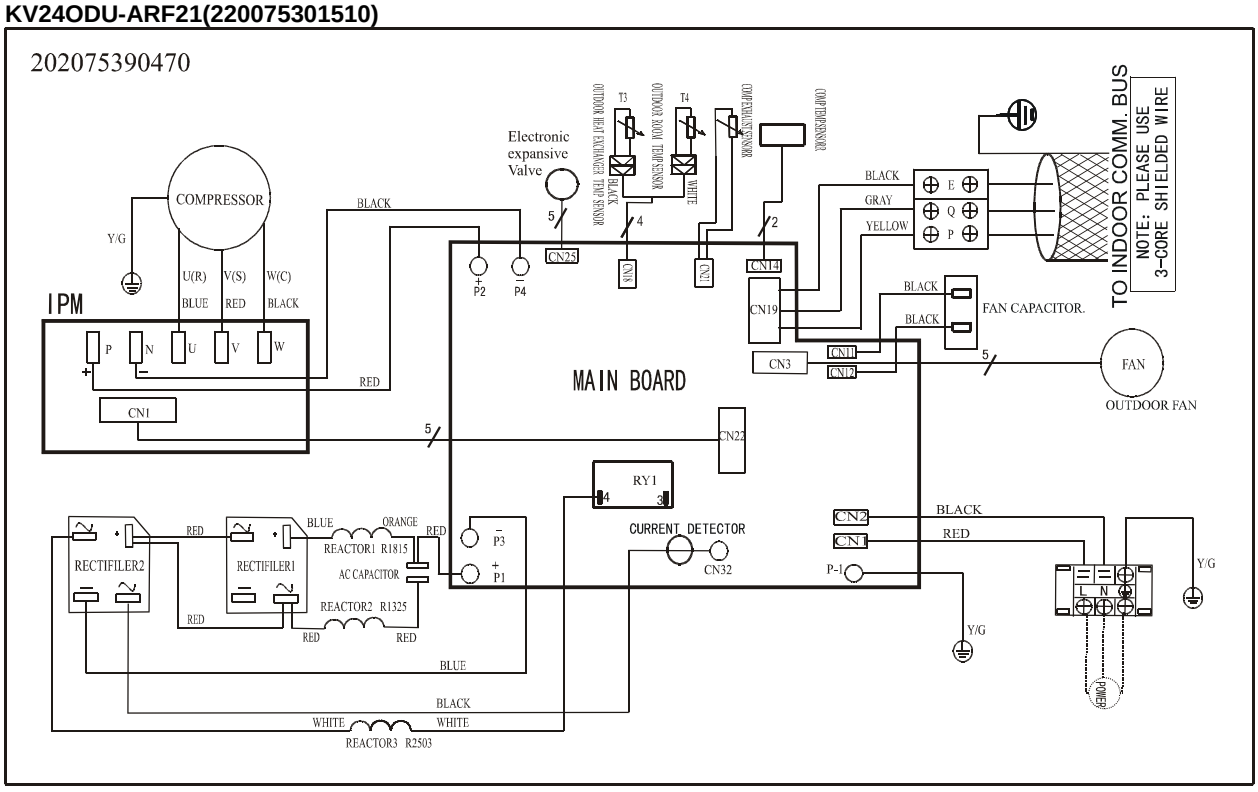
Notes: KV24ODU-ARF21(220075301740) & KV36ODU-ARF21(220075502120) have no EXV.

KV48ODU-ARF21

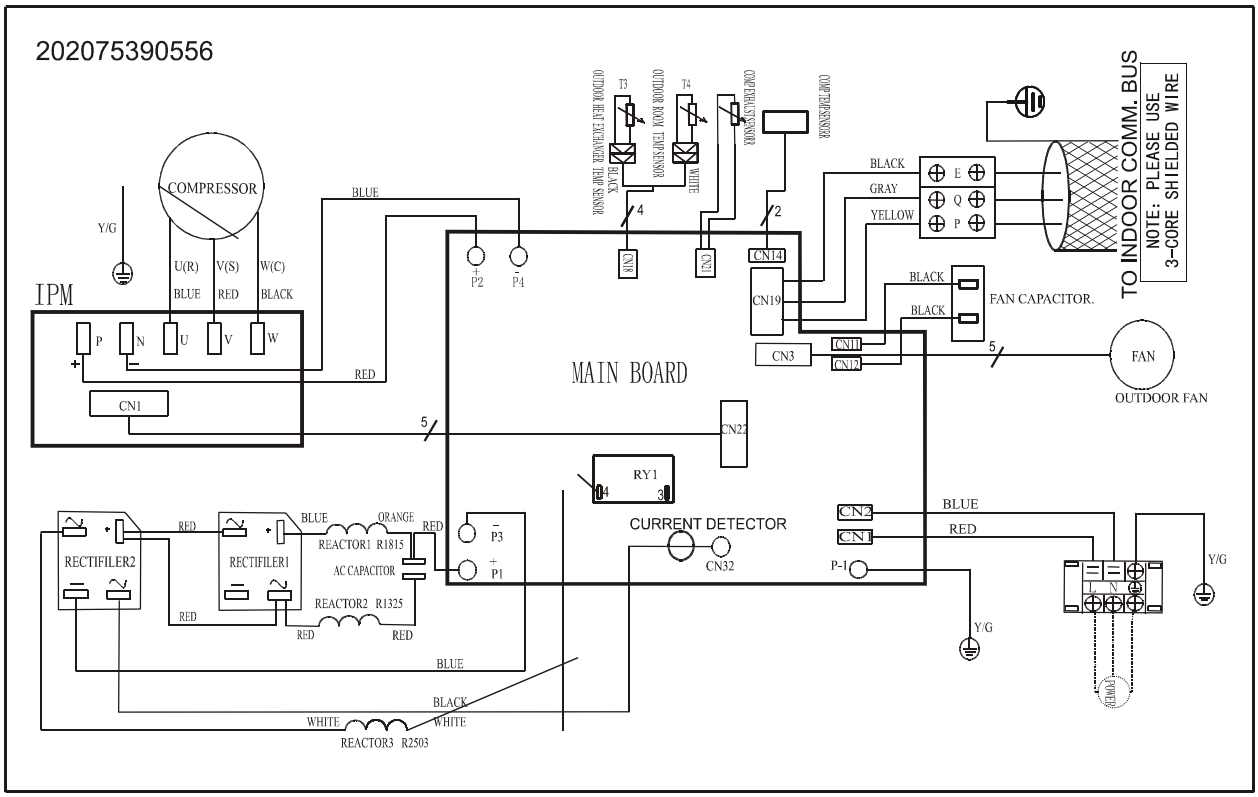


4. Wiring Diagrams

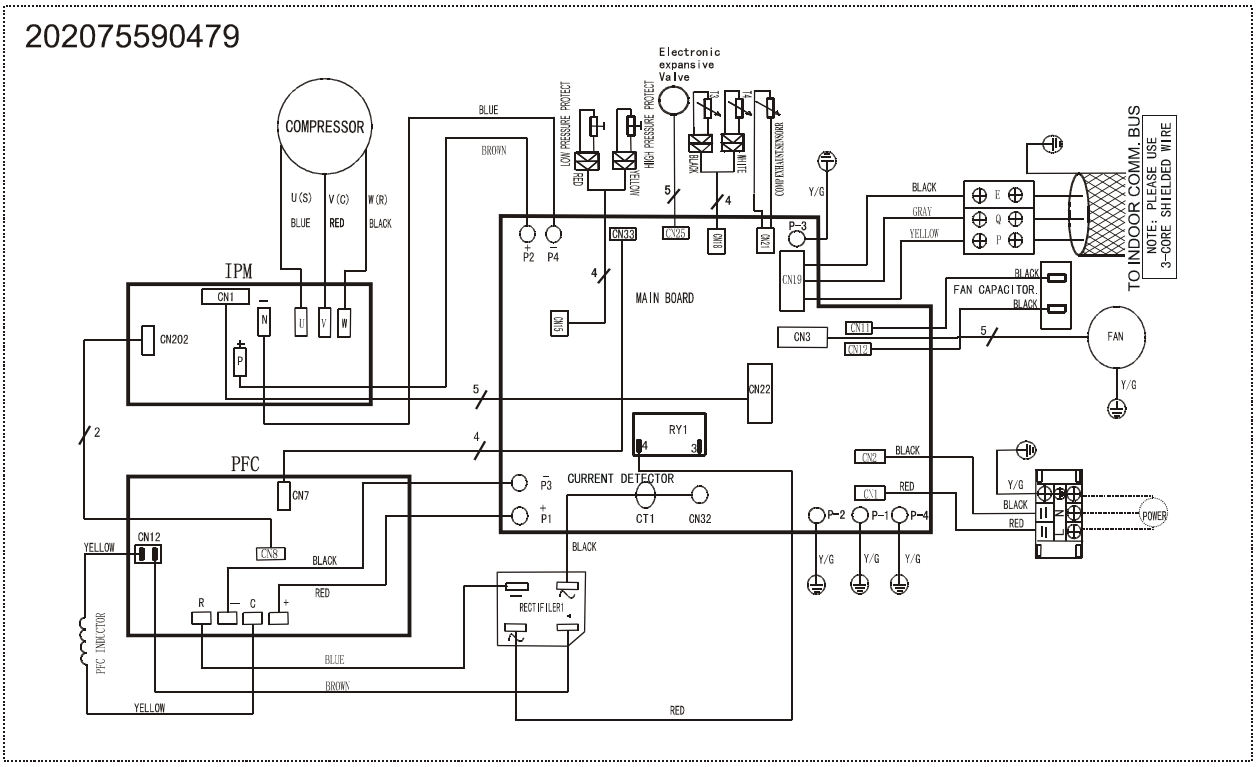
KV24ODU-ARF21(220075301510)



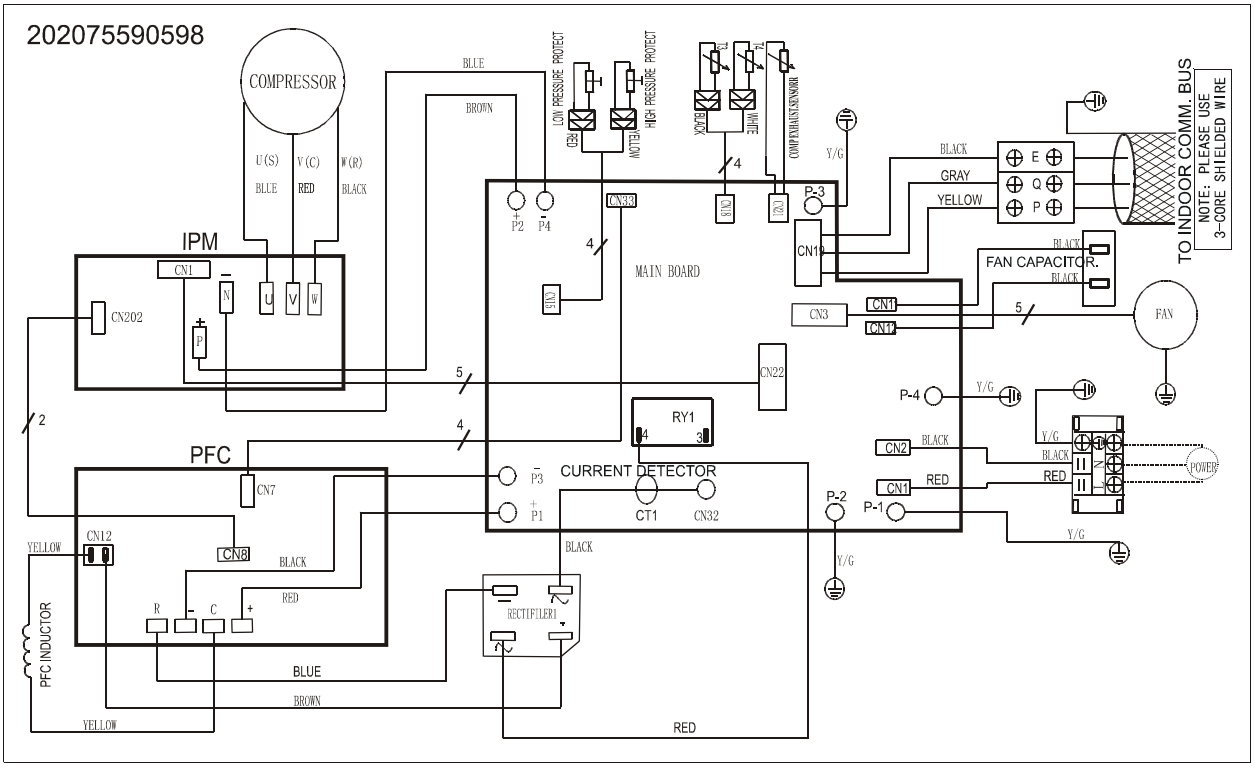
KV24ODU-ARF21(220075301740)



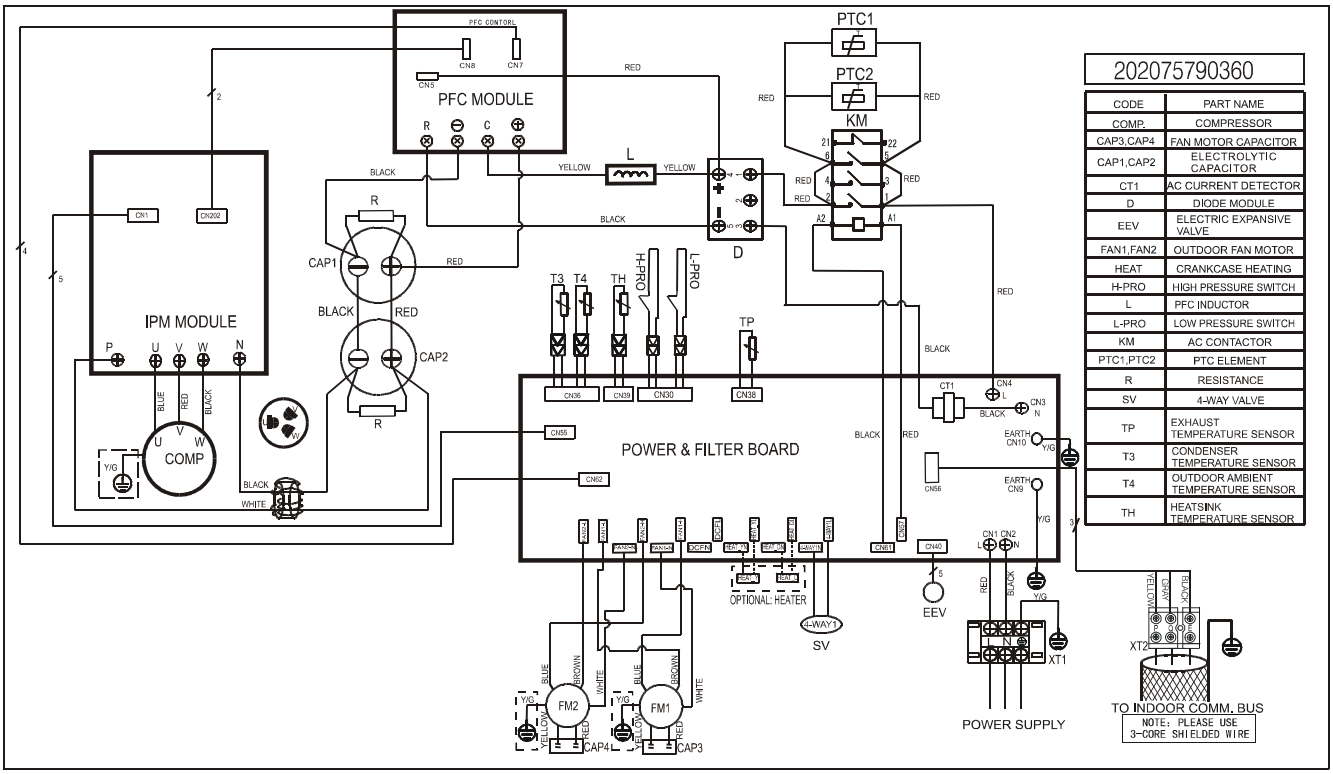
KV36ODU-ARF21(220075501730)



KV36ODU-ARF21(220075502120)



KV48ODU-ARF21



202075790360

CODE	PART NAME
COMP.	COMPRESSOR
CAP3,CAP4	FAN MOTOR CAPACITOR
CAP1,CAP2	ELECTROLYTIC CAPACITOR
CT1	AC CURRENT DETECTOR
D	DIODE MODULE
EEV	ELECTRIC EXPANSIVE VALVE
FAN1,FAN2	OUTDOOR FAN MOTOR
HEAT	CRANKCASE HEATING
H-PRO	HIGH PRESSURE SWITCH
L	PFC INDUCTOR
L-PRO	LOW PRESSURE SWITCH
KM	AC CONTACTOR
PTC1,PTC2	PTC ELEMENT
R	RESISTANCE
SV	4-WAY VALVE
TP	EXHAUST TEMPERATURE SENSOR
T3	CONDENSER TEMPERATURE SENSOR
T4	OUTDOOR AMBIENT TEMPERATURE SENSOR
TH	HEATSINK TEMPERATURE SENSOR

5. Electric Characteristics

Model	Outdoor Unit			
	Hz	Voltage	Min.	Max.
KV24ODU-ARF21	60	220-240	198	254
KV36ODU-ARF21	60	220-240	198	254
KV48ODU-ARF21	60	220-240	198	254

6. Operation Limits

Temperature Mode	Cooling operation
Room temperature	≥17℃
Outdoor temperature	0℃～50℃
	（-15℃～50℃：For the models with low temperature cooling system）

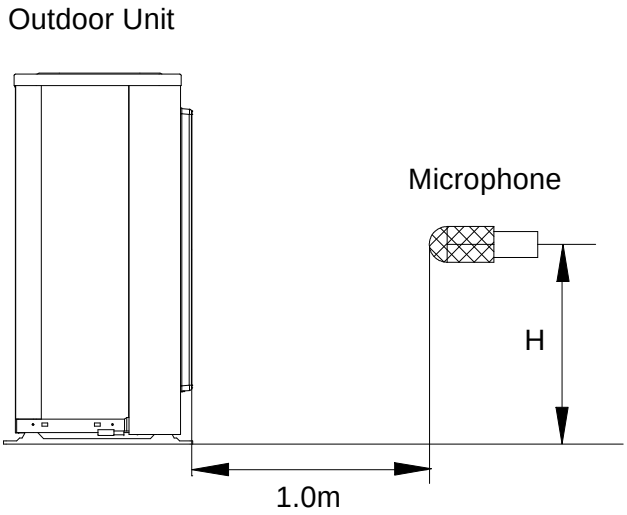
CAUTION:

1. If the air conditioner is used beyond the above conditions, certain safety protection features may come into operation and cause the unit to operate abnormally.

2. The room relative humidity should be less than 80%. If the air conditioner operates beyond this figure, the surface of the air conditioner may attract condensation. Please set the vertical air flow louver to its maximum angle (vertically to the floor), and set HIGH fan mode.

3. The optimum performance will be achieved during this operating temperature zone.

7. Sound Levels



Note: H= 0.5 × height of outdoor unit

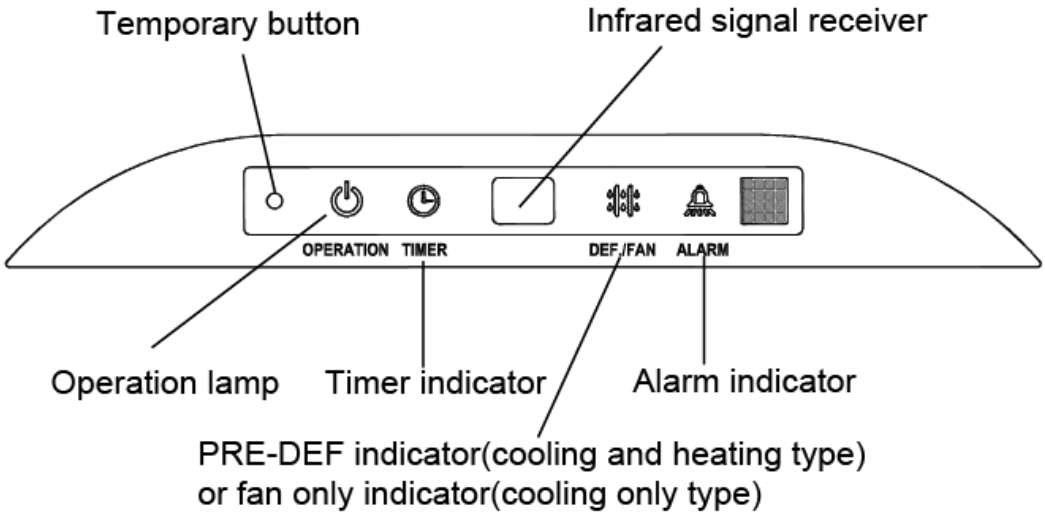
Model	Noise level dB(A)
KV24ODU-ARF21	54
KV36ODU-ARF21	55
KV48ODU-ARF21	60

8. Troubleshooting

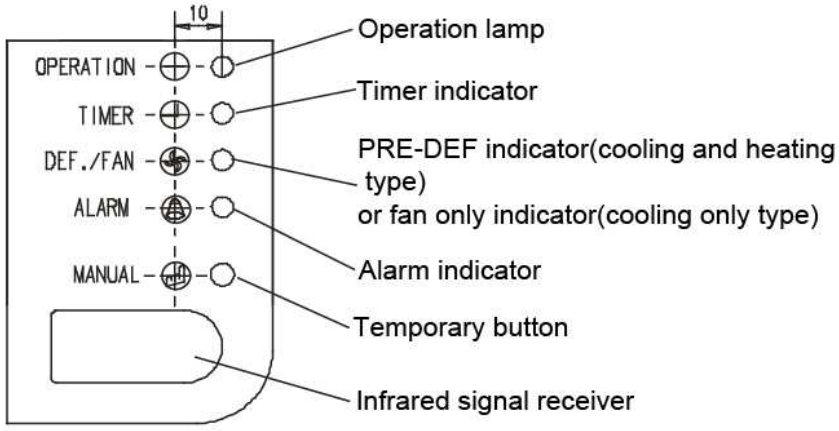
9.1 Indoor unit malfunction

9.1.1 Display board

Normal 4-way cassette



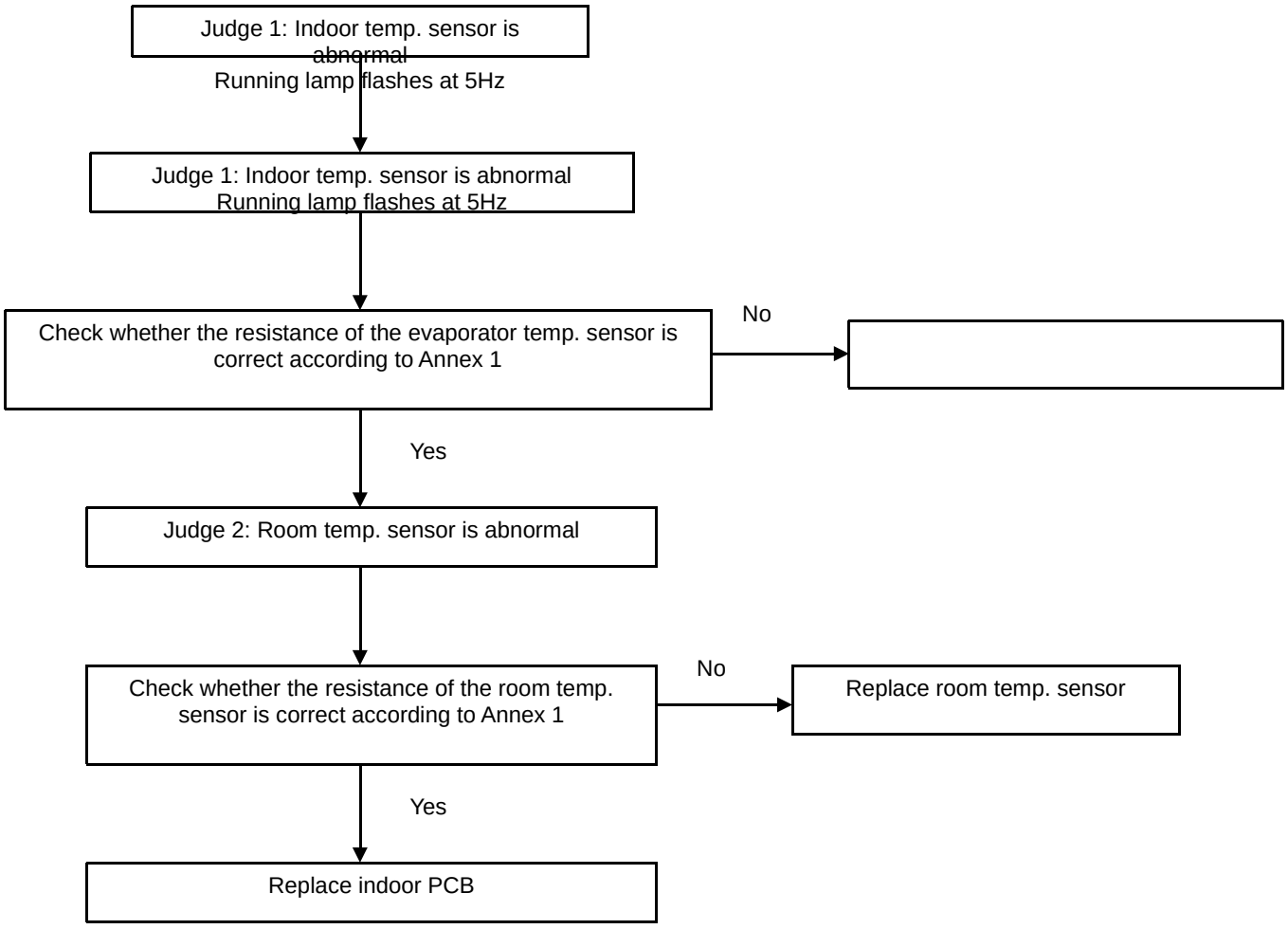
Ceiling & Floor



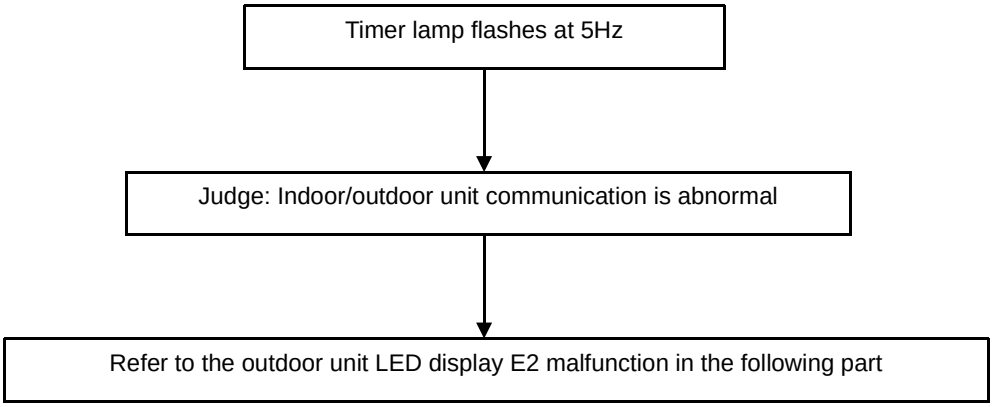
9.1.2 Troubleshooting

NO.	Malfunction	Running lamp	Timer lamp	Defrosting lamp	Alarm lamp	Display(nixie tube)
1	Communication malfunction between indoor and outdoor units.	X	☆	X	X	E1
2	Open or short circuit of T1 temperature sensor	☆	X	X	X	E2
3	Open or short circuit of T2 temperature sensor	☆	X	X	X	E3
4	Open or short circuit of T2B temperature sensor	☆	X	X	X	E4
5	Full-water malfunction	X	X	X	☆	EE
6	EEPROM malfunction	X	X	☆	X	E7
7	Outdoor unit malfunction	X	X	X	◎	Ed
X(off) ☆(flash at 5Hz) ◎(flash at 0.5Hz)						

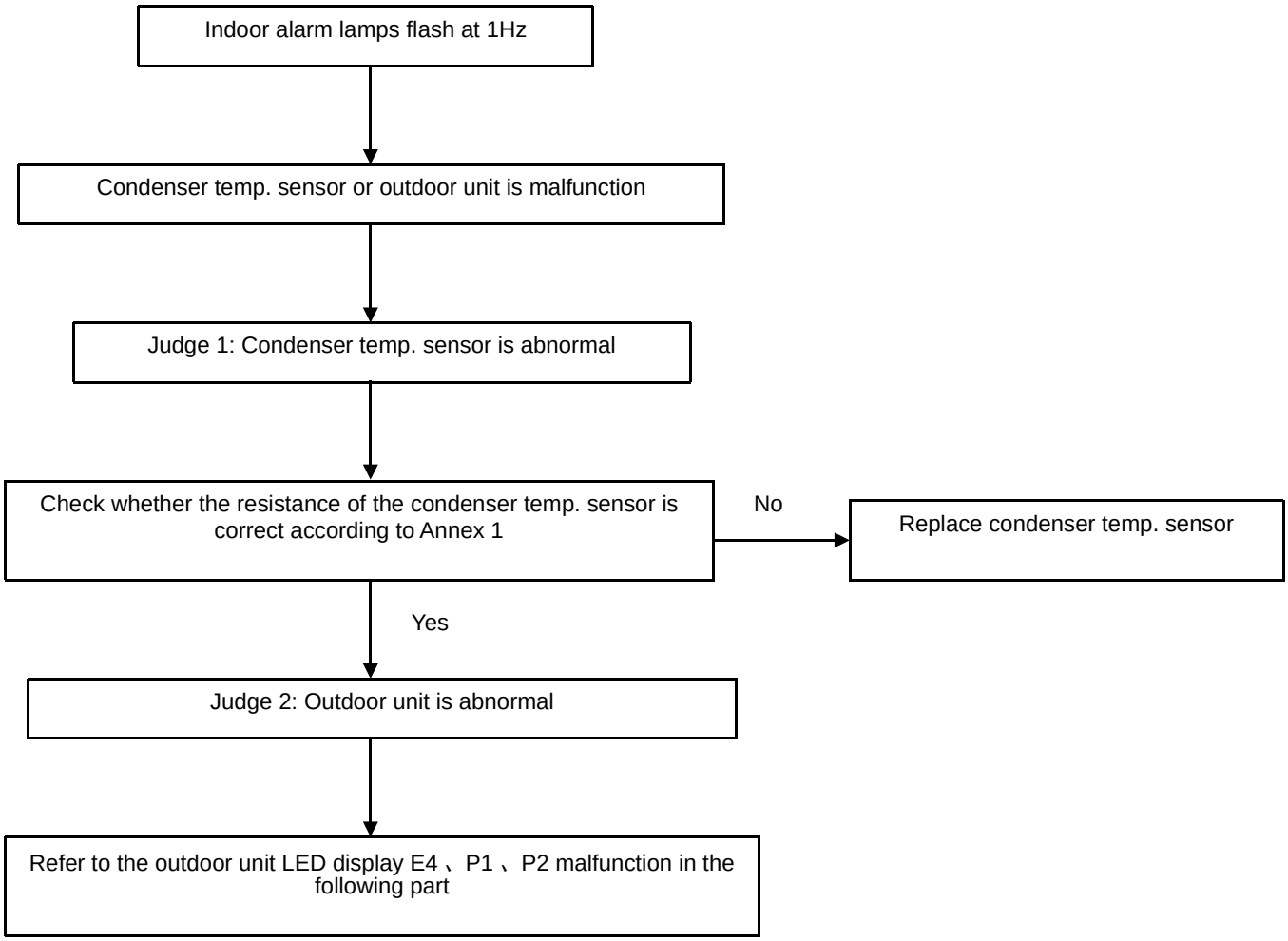
1. Running lamp flashes



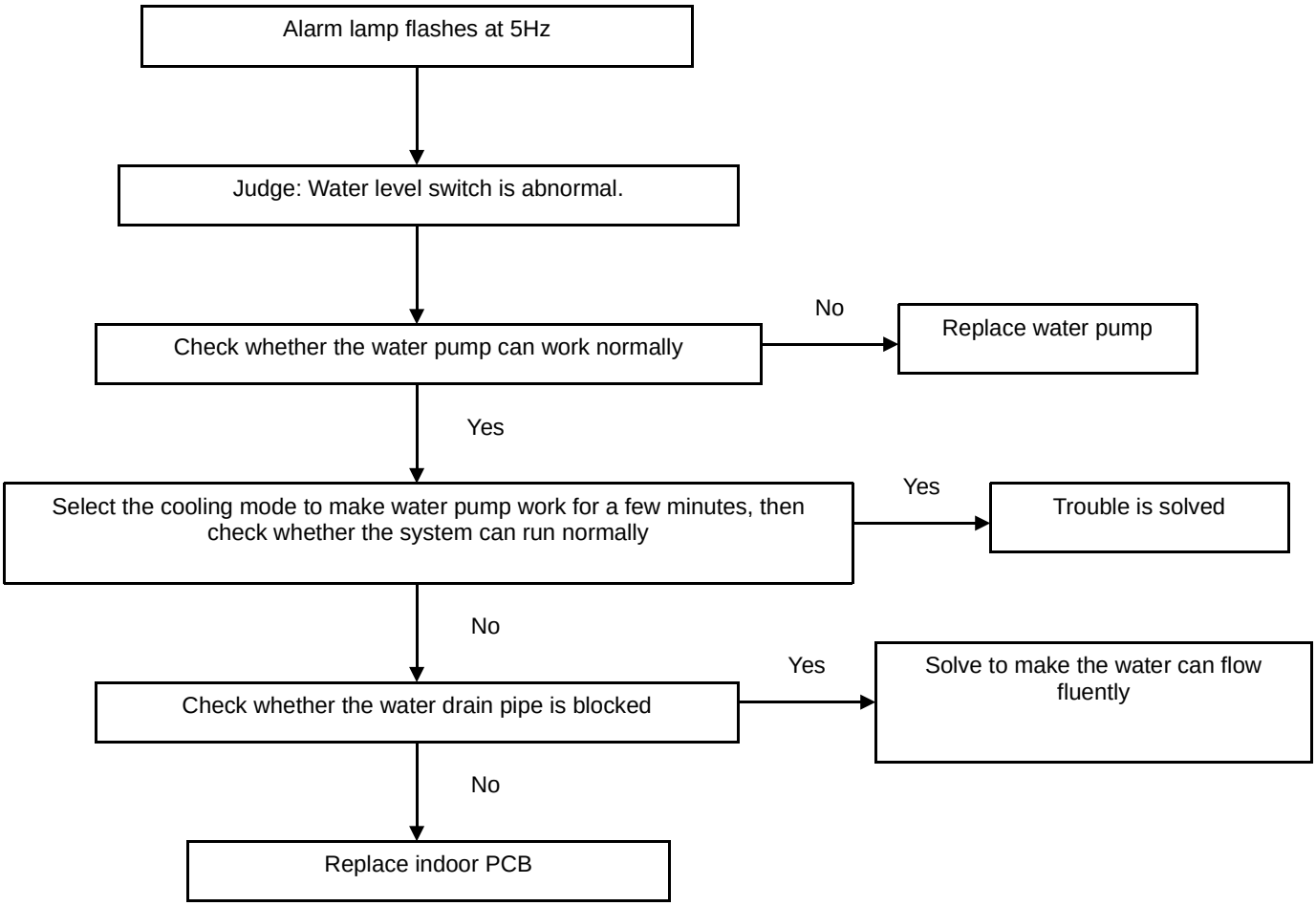
2. Timer lamp flashes



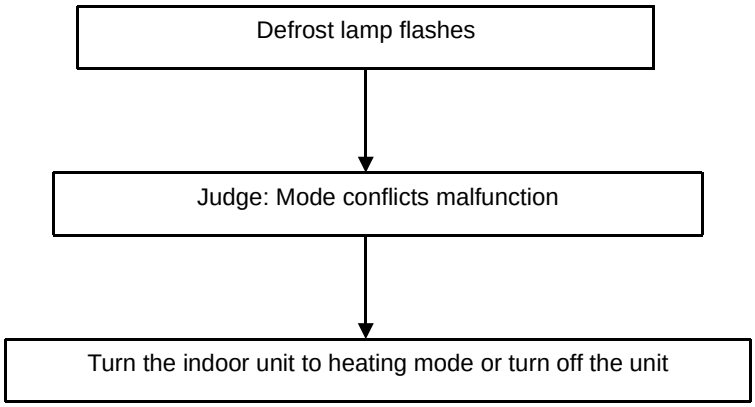
3. Alarm lamp slow-flash



4. Alarm lamp quick-flash



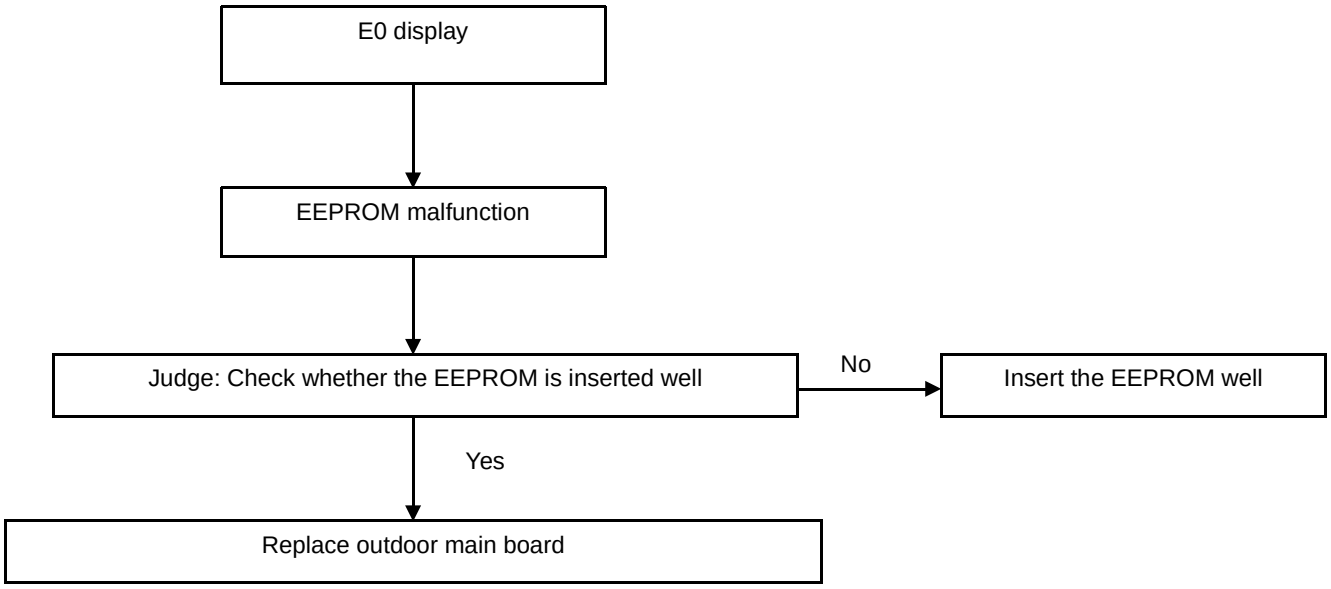
5. Defrost lamp flashes



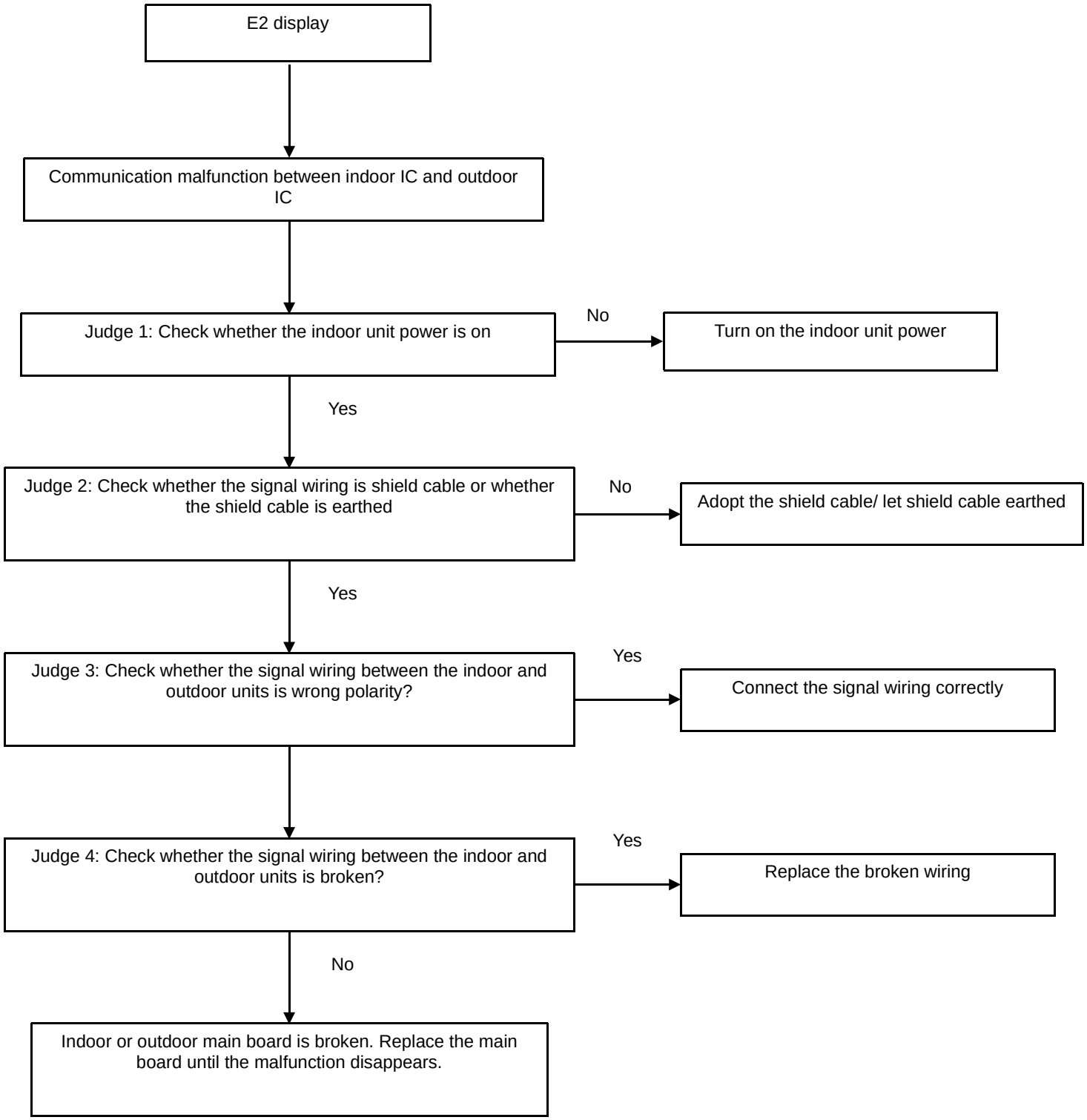
9.2 Outdoor unit malfunction

Display	Malfunction or Protection
E0	EEPROM malfunction
E2	Communication malfunction between indoor IC and outdoor IC
E3	Communication malfunction in outdoor IC and DSP
E4	Malfunction of outdoor temperature sensor
E5	Voltage protection of compressor
E6	PFC module protection (Only for 36K, 48K)
P0	Top temperature protection of compressor
P1	High pressure protection
P2	Low pressure protection
P3	Current protection of compressor
P4	Discharge temperature protection of compressor
P5	High temperature protection of condenser
P6	Module protection
P7	High temperature protection of evaporator

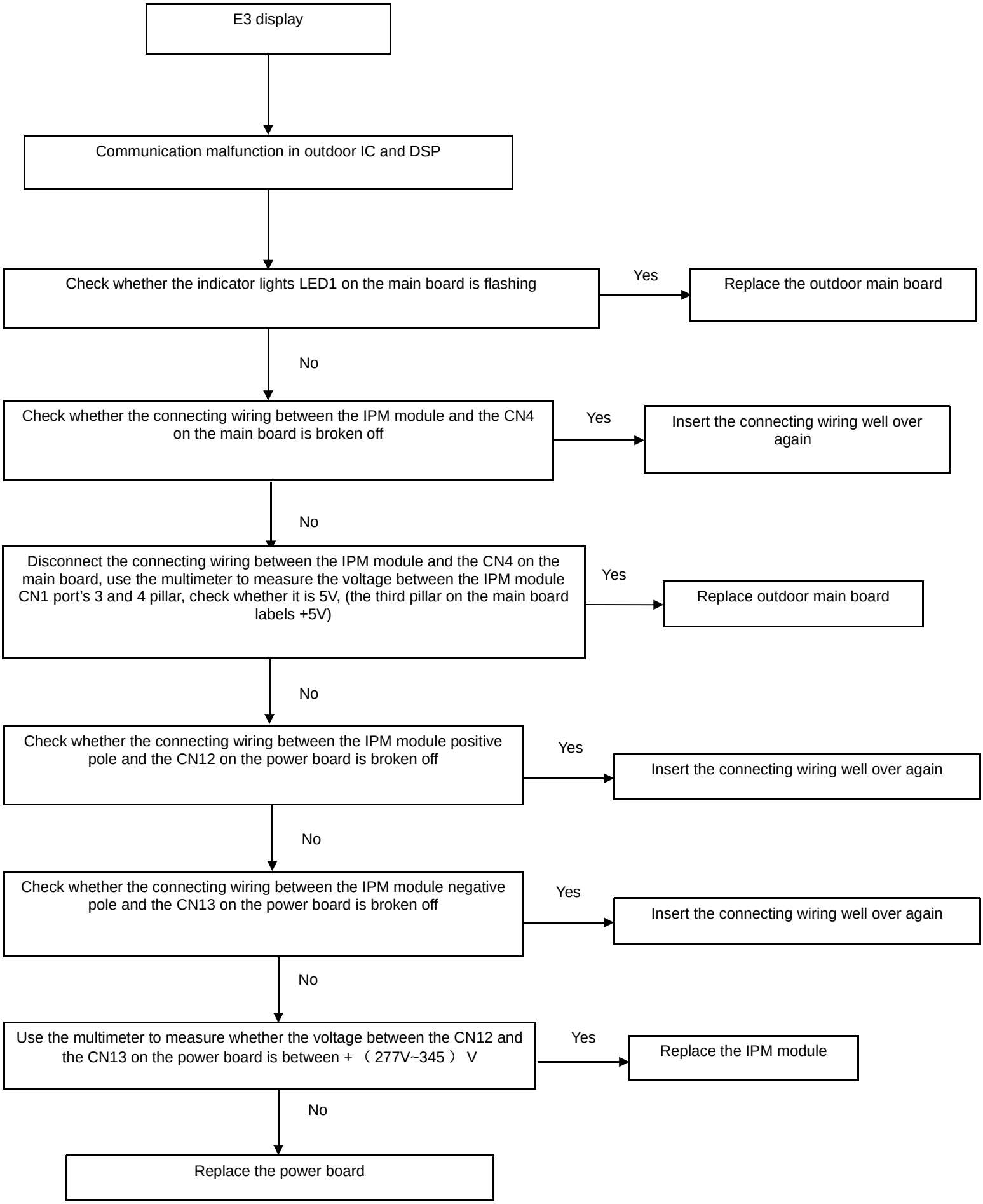
1. E0 malfunction



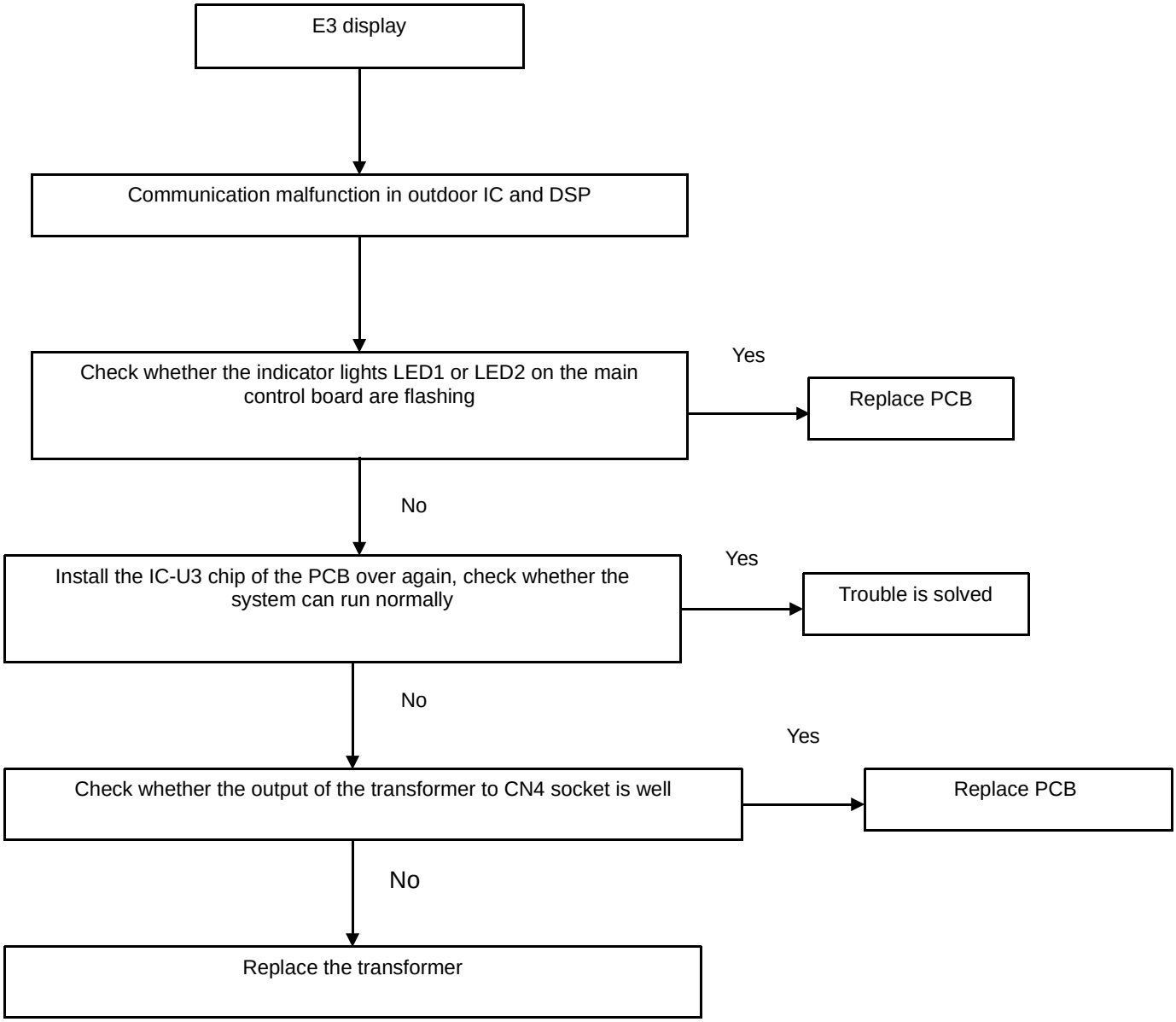
2. E2 malfunction



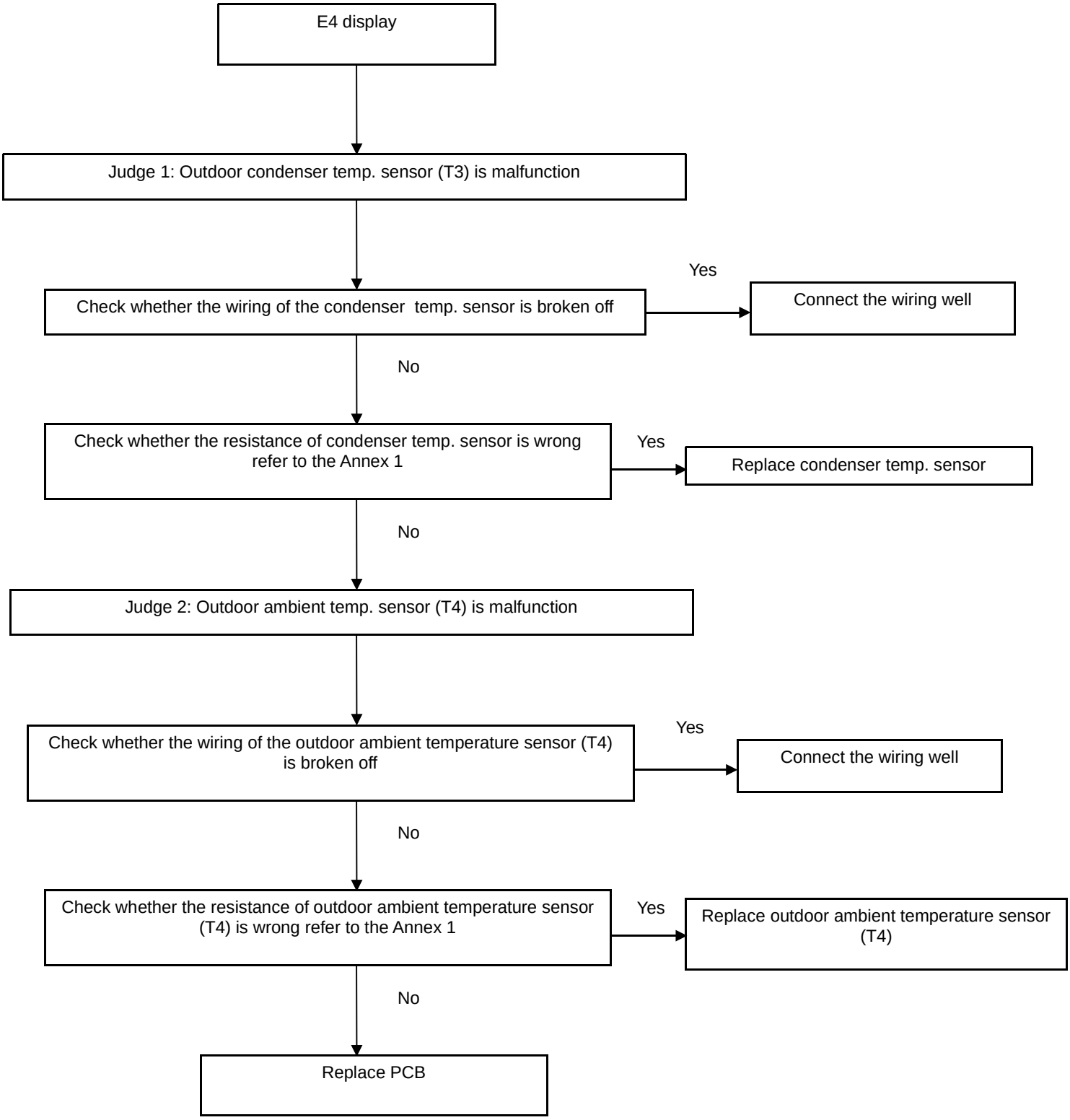
3. E3 malfunction (For 18K & 24K & 30K)



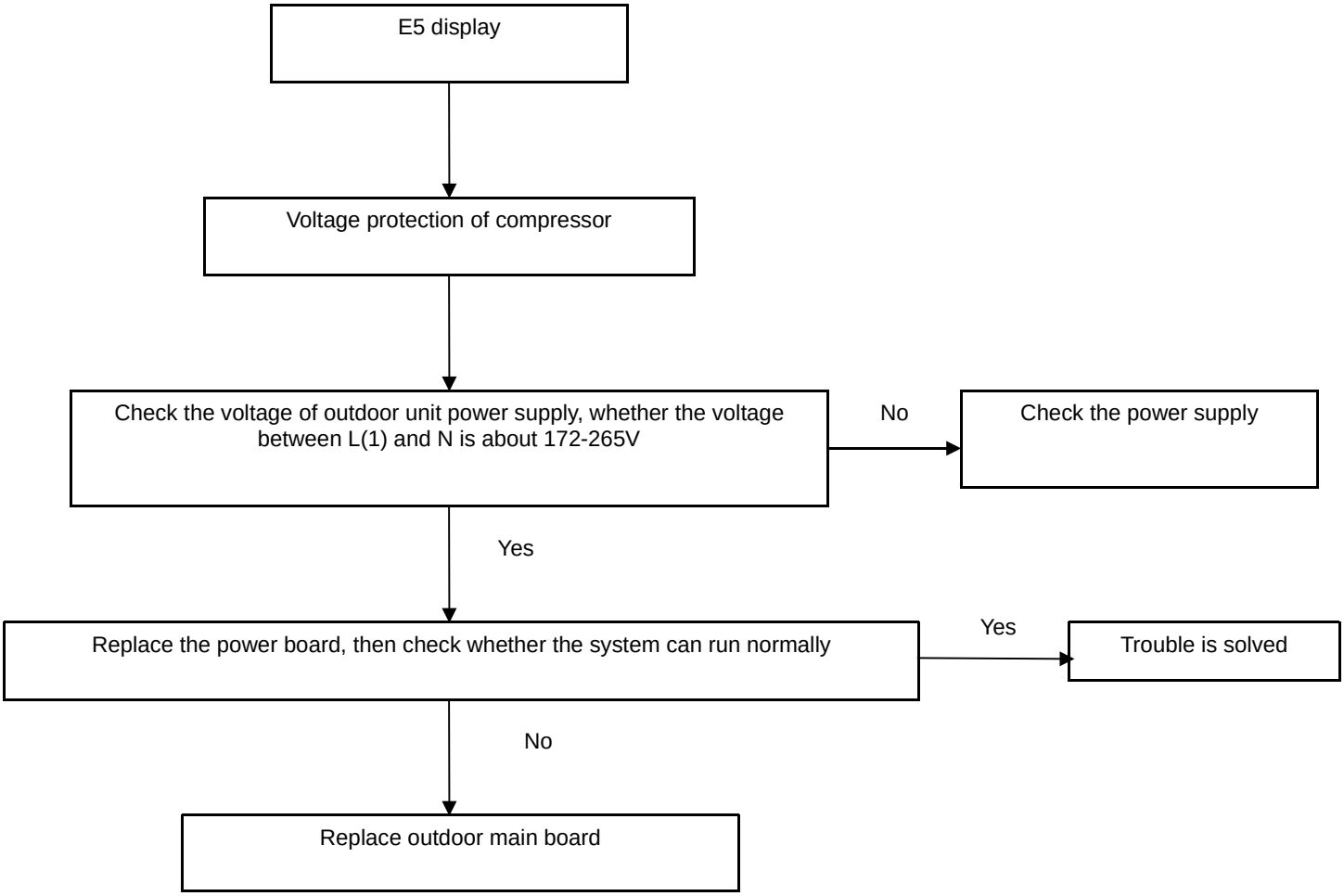
4. E3 malfunction (For 36K & 48K & 60K)



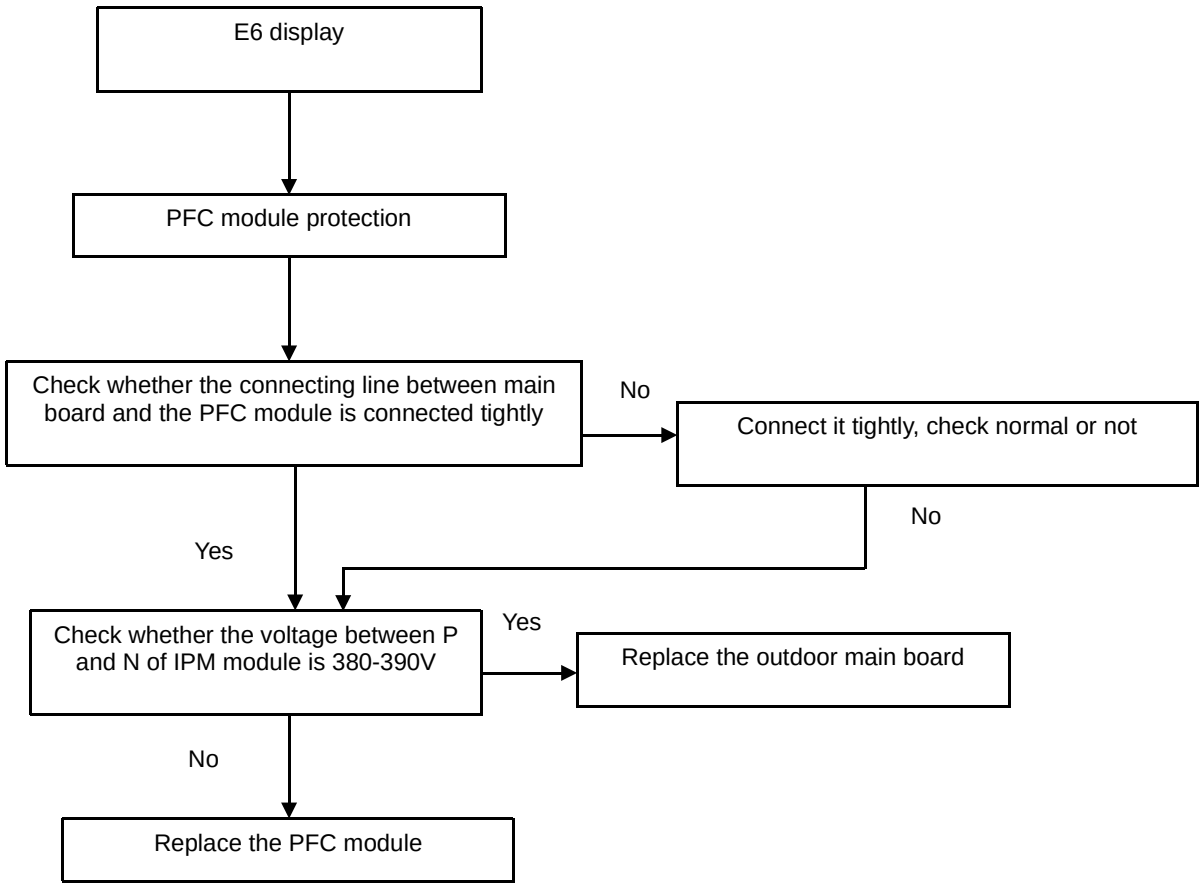
5. E4 malfunction



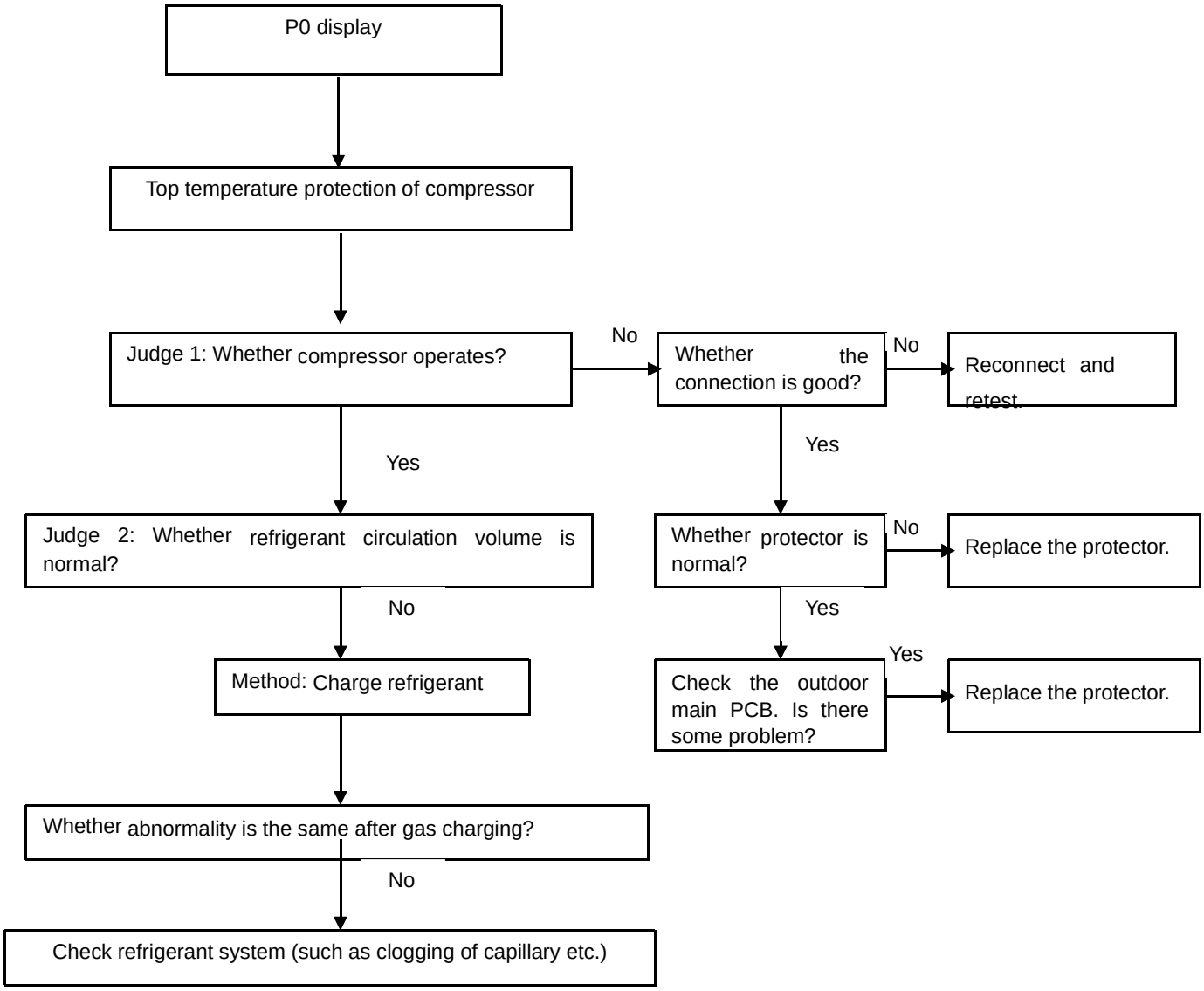
6. E5 malfunction



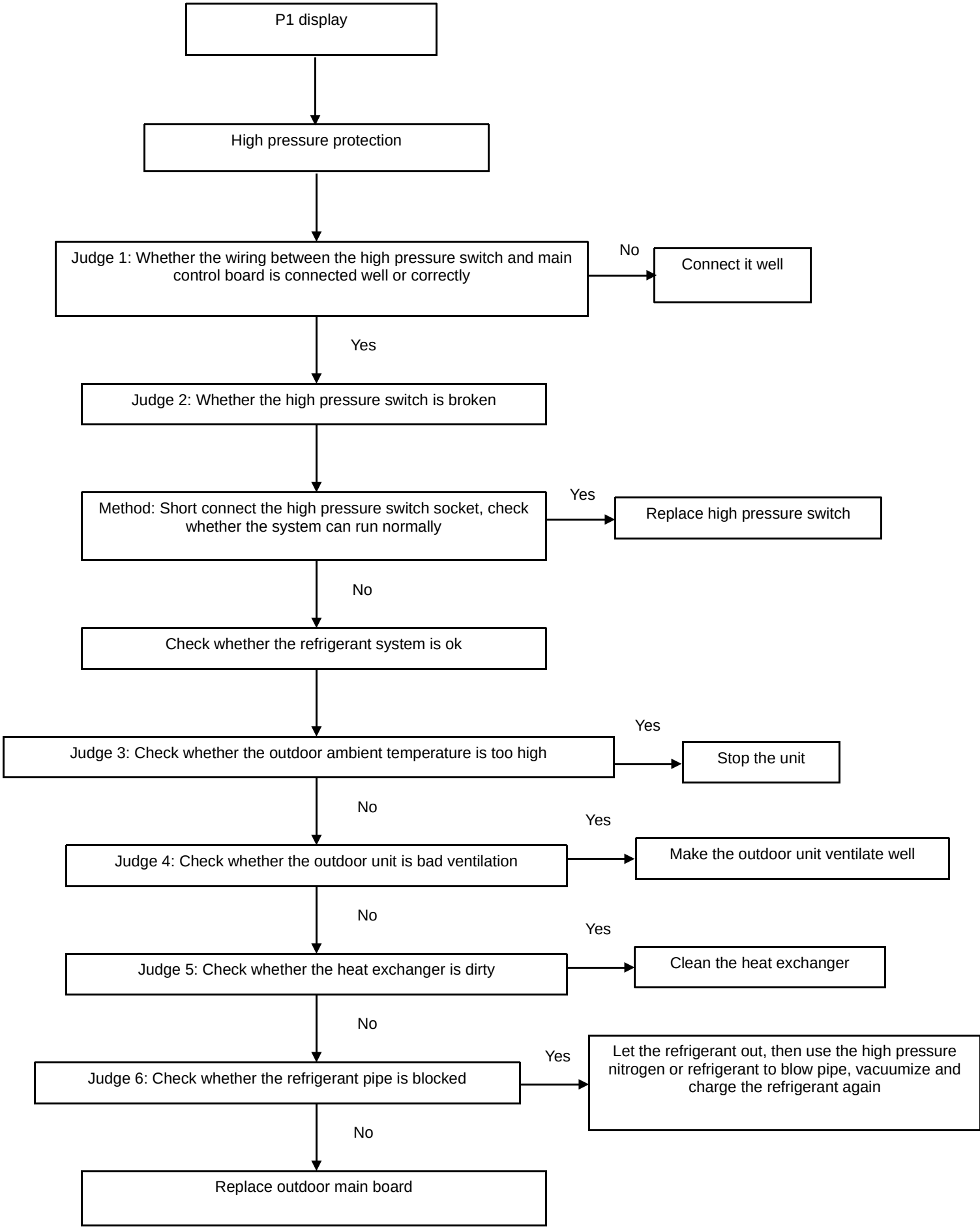
7. E6 malfunction (Only for 30K, 36K with 1 phase)



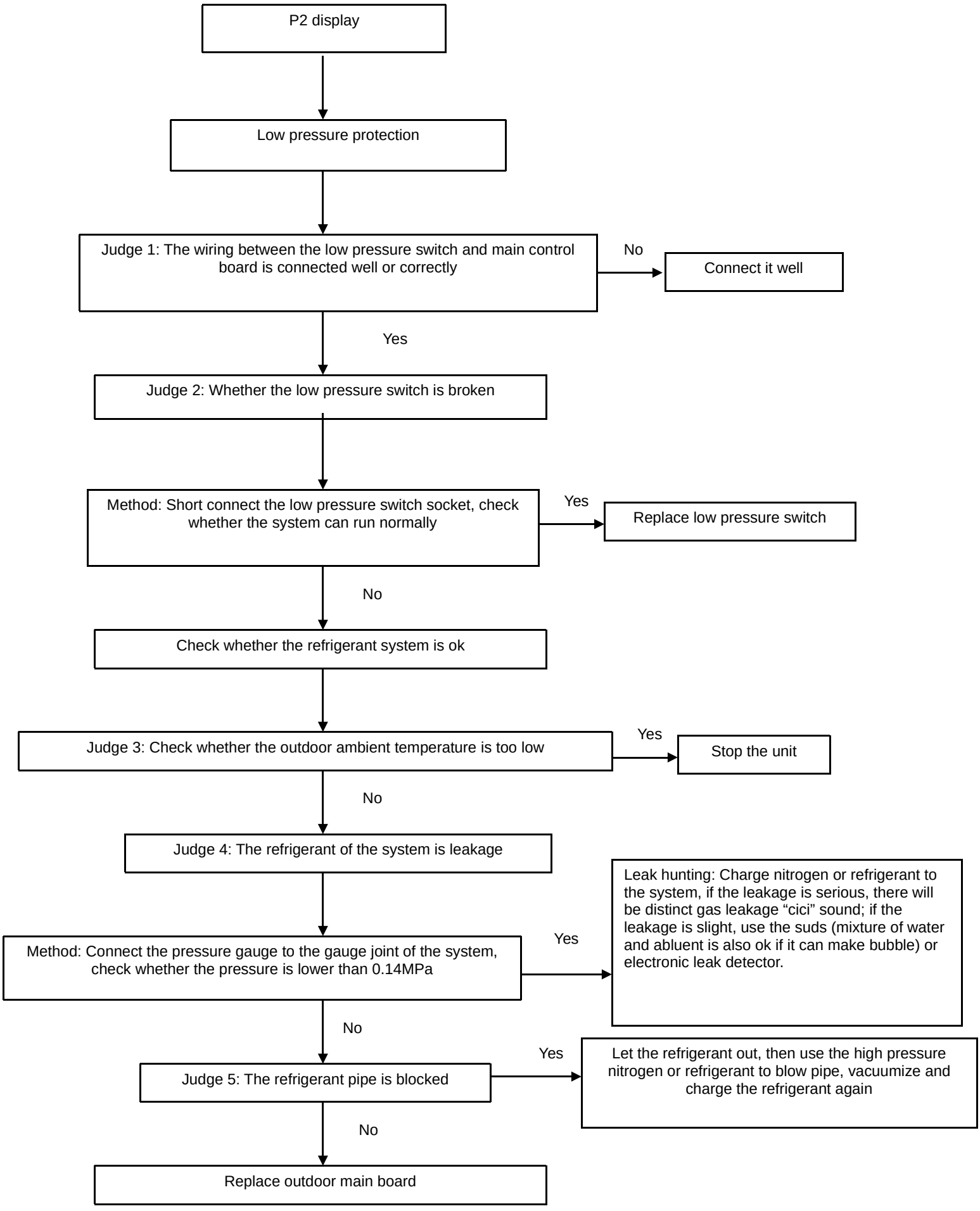
8. P0 malfunction



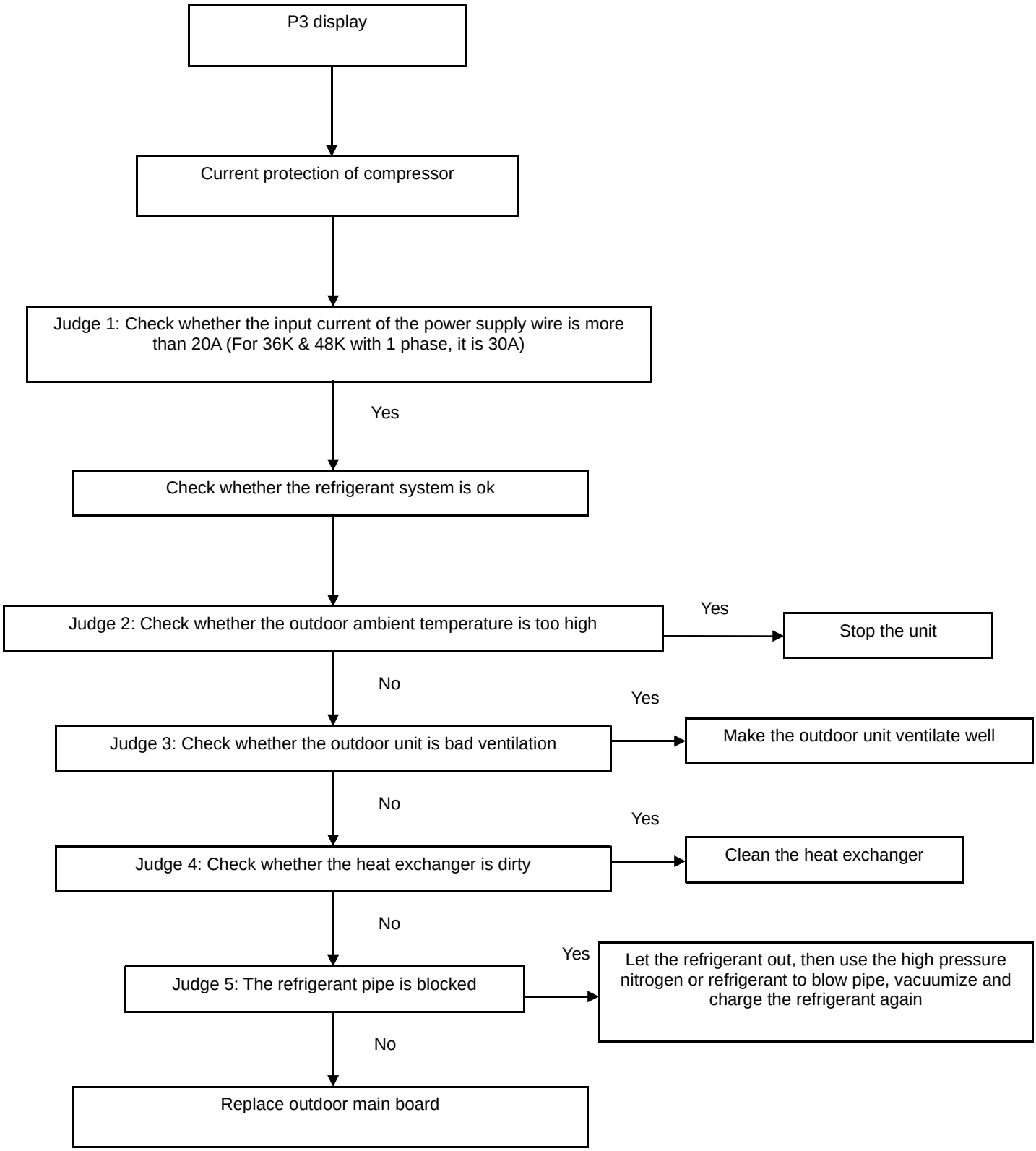
9. P1 malfunction



10. P2 malfunction

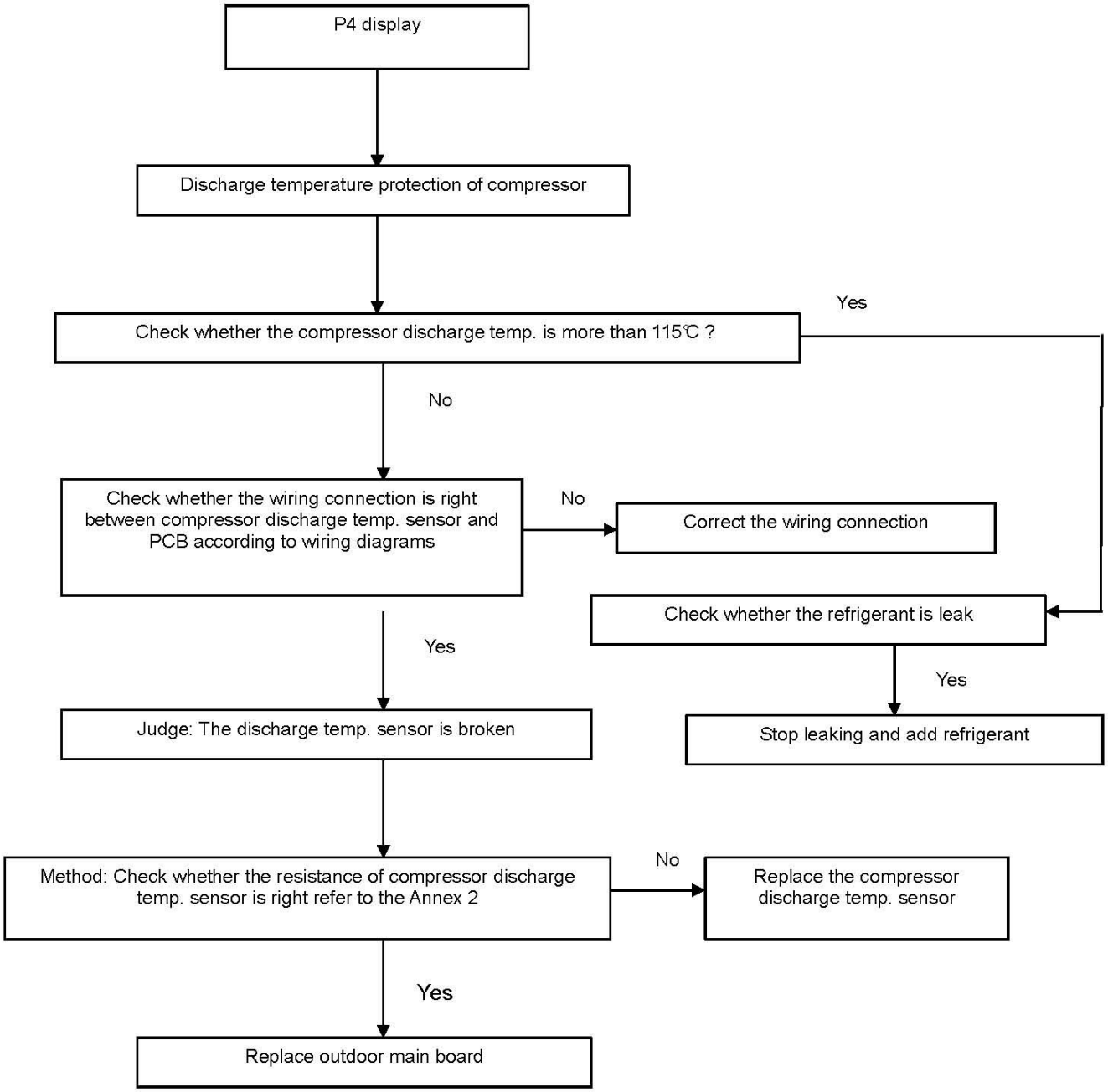


11. P3 malfunction



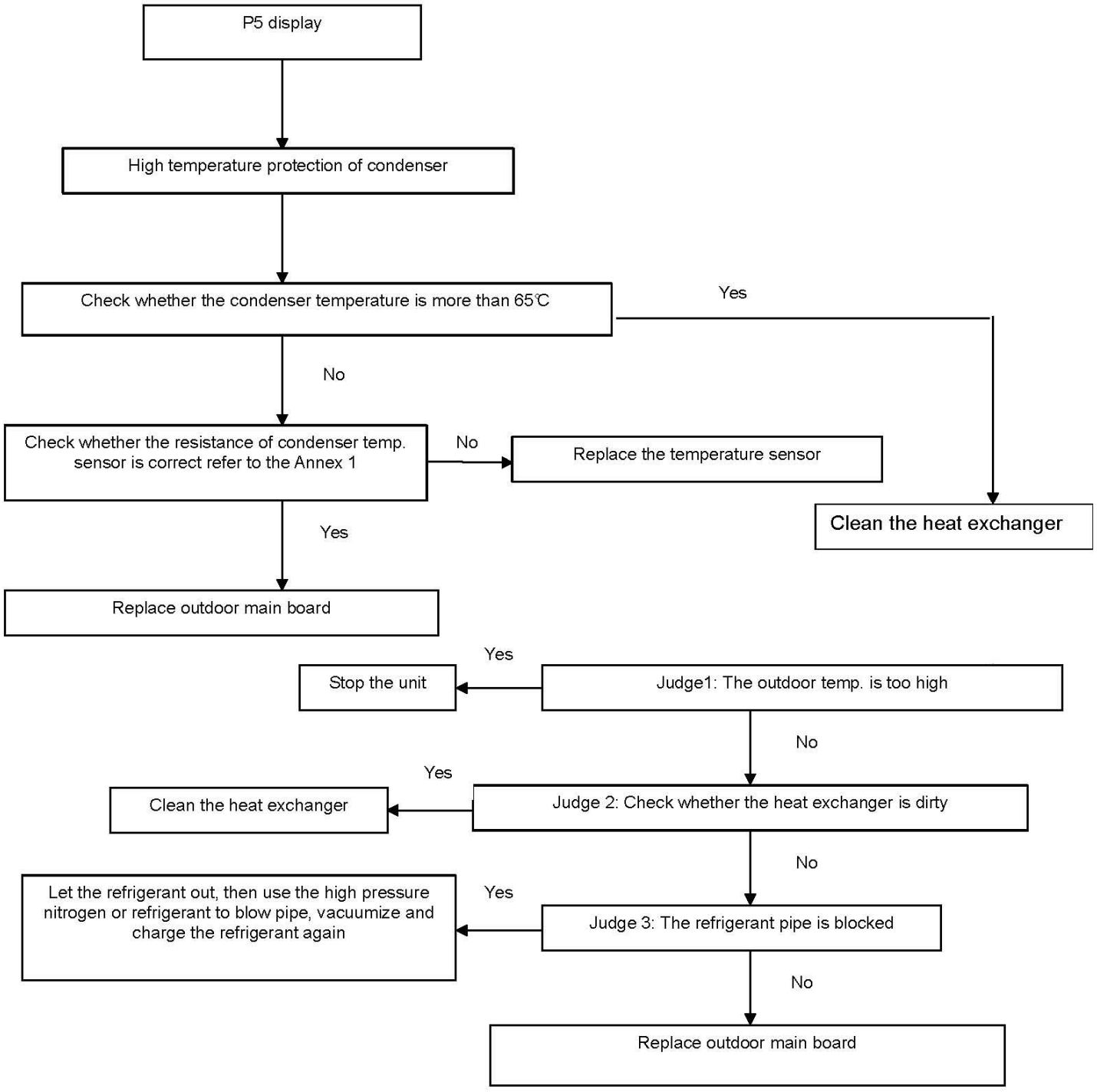
12. P4 malfunction

When compressor discharge temperature is higher than 115℃, the unit will stop, and unit runs again when compressor discharge temperature is lower than 90℃ .

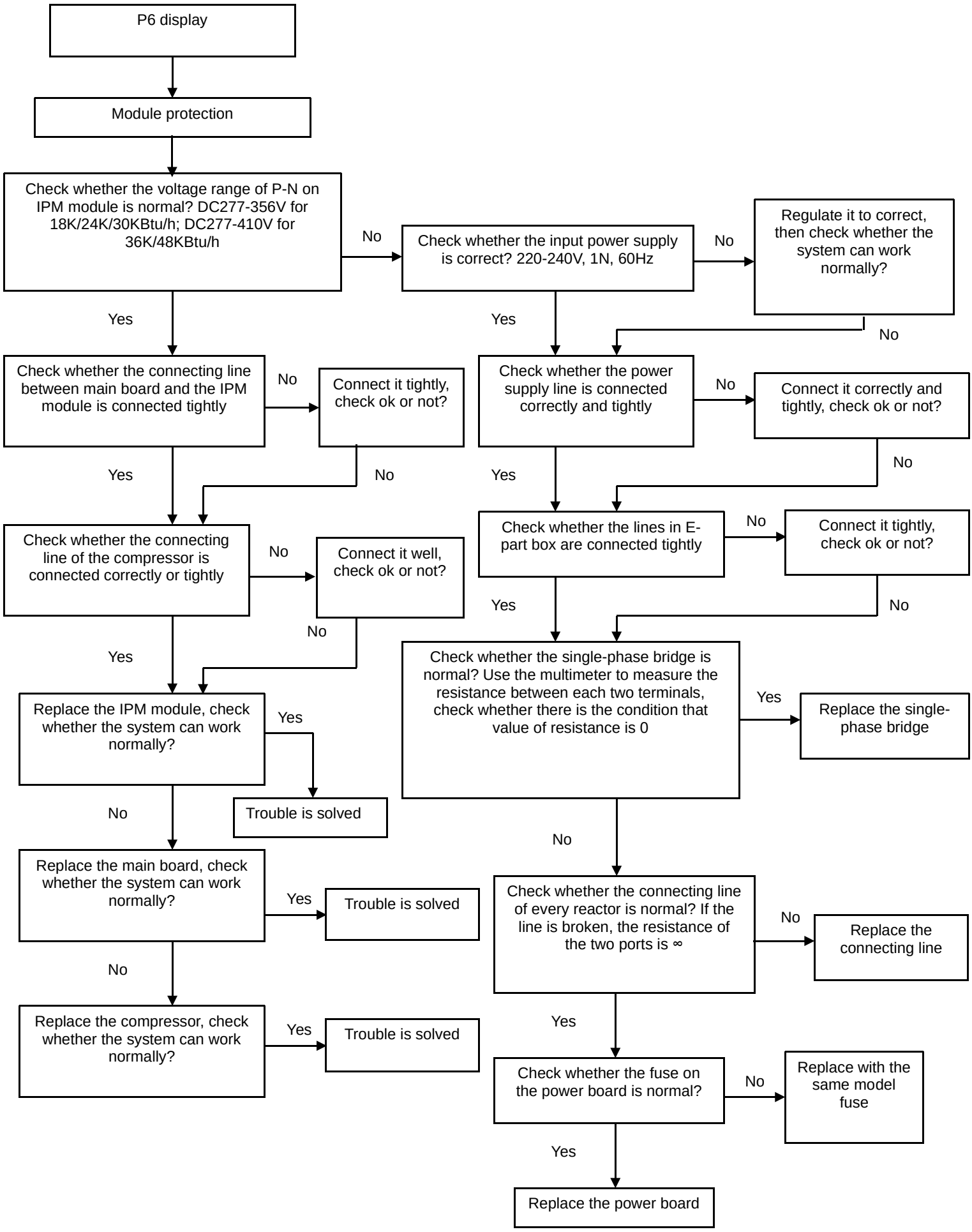


13. P5 malfunction

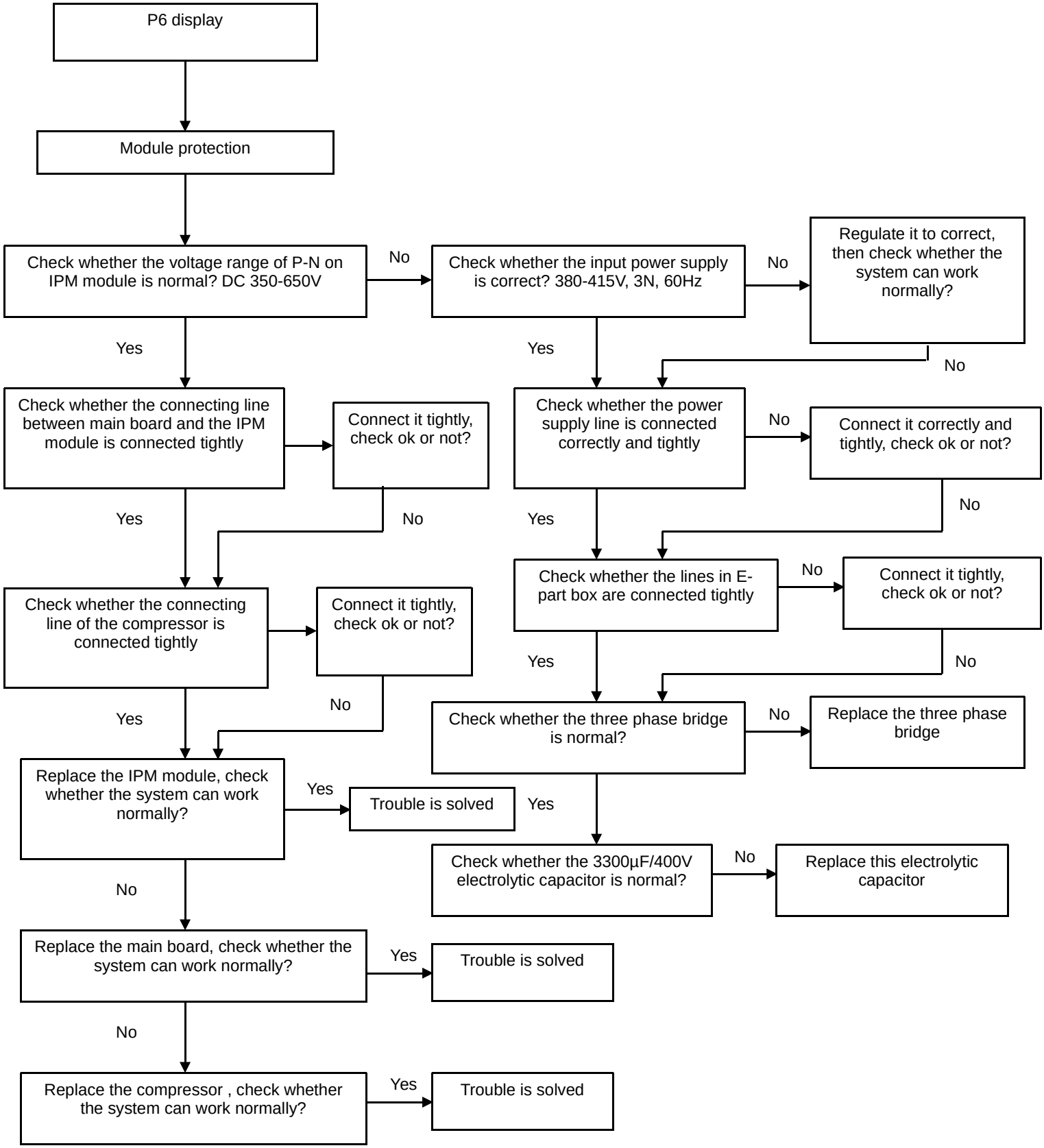
When condenser high temp. is more than 65℃, the un it will stop, and unit runs again when outdoor pipe temp. less than 52℃.



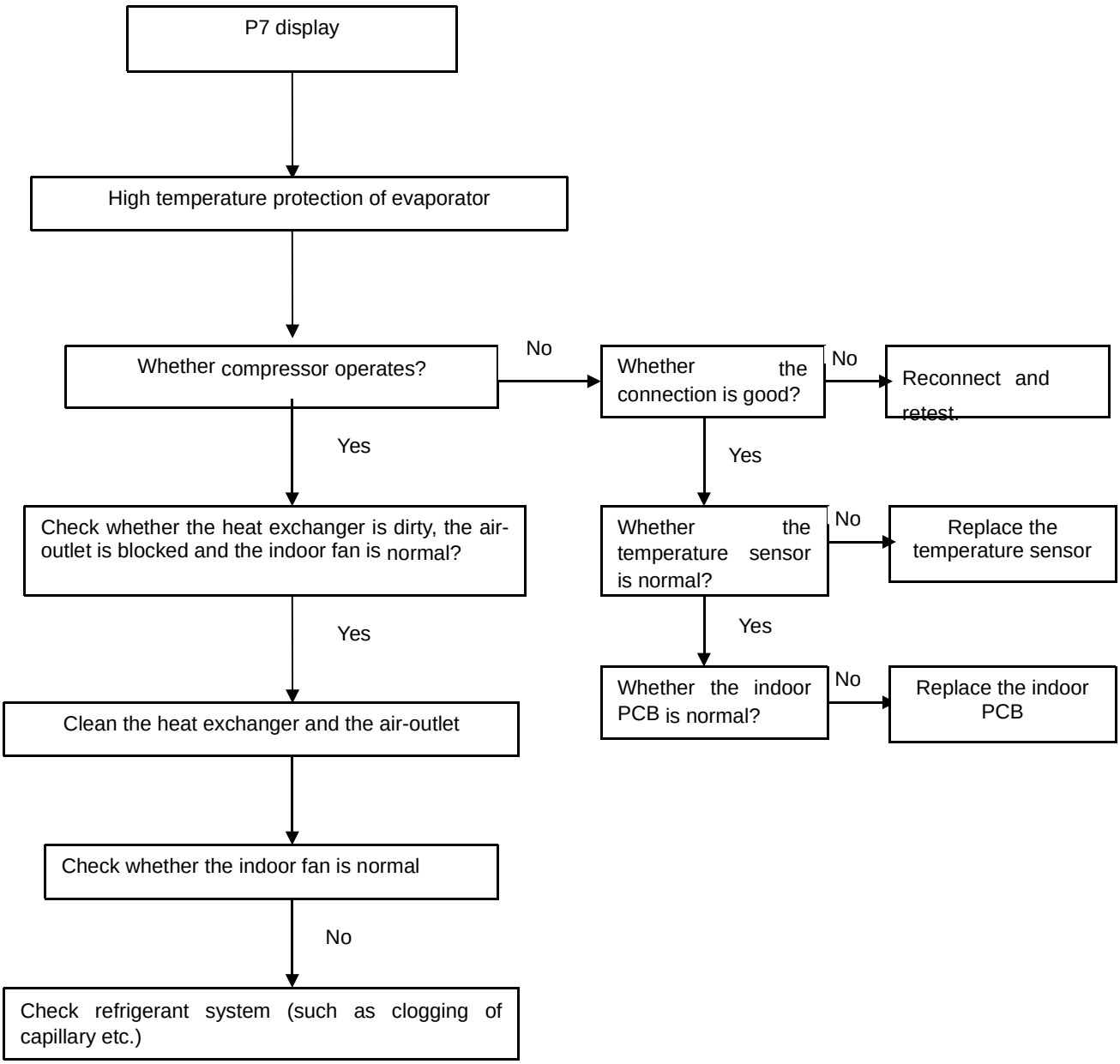
14. P6 malfunction (For single phase units)



15. P6 malfunction (For three phases units)



16. P7 malfunction


P7 display
High temperature protection of evaporator
Whether compressor operates?
No
Whether the connection is good?
No
Reconnect and retest.
Yes
Yes
Check whether the heat exchanger is dirty, the air-outlet is blocked and the indoor fan is normal?
Whether the temperature sensor is normal?
No
Replace the temperature sensor
Yes
Yes
Clean the heat exchanger and the air-outlet
Whether the indoor PCB is normal?
No
Replace the indoor PCB
Check whether the indoor fan is normal
No
Check refrigerant system (such as clogging of capillary etc.)

Appendix Indoor Temp. and Pipe Temp. Sensor Resistance Value Table (℃--K)

℃	K Ohm	℃	K Ohm	℃	K Ohm	℃	K Ohm
-20	115.266	20	12.6431	60	2.35774	100	0.62973
-19	108.146	21	12.0561	61	2.27249	101	0.61148
-18	101.517	22	11.5000	62	2.19073	102	0.59386
-17	96.3423	23	10.9731	63	2.11241	103	0.57683
-16	89.5865	24	10.4736	64	2.03732	104	0.56038
-15	84.2190	25	10.000	65	1.96532	105	0.54448
-14	79.3110	26	9.55074	66	1.89627	106	0.52912
-13	74.5360	27	9.12445	67	1.83003	107	0.51426
-12	70.1698	28	8.71983	68	1.76647	108	0.49989
-11	66.0898	29	8.33566	69	1.70547	109	0.48600
-10	62.2756	30	7.97078	70	1.64691	110	0.47256
-9	58.7079	31	7.62411	71	1.59068	111	0.45957
-8	56.3694	32	7.29464	72	1.53668	112	0.44699
-7	52.2438	33	6.98142	73	1.48481	113	0.43482
-6	49.3161	34	6.68355	74	1.43498	114	0.42304
-5	46.5725	35	6.40021	75	1.38703	115	0.41164
-4	44.0000	36	6.13059	76	1.34105	116	0.40060
-3	41.5878	37	5.87359	77	1.29078	117	0.38991
-2	39.8239	38	5.62961	78	1.25423	118	0.37956
-1	37.1988	39	5.39689	79	1.21330	119	0.36954
0	35.2024	40	5.17519	80	1.17393	120	0.35982
1	33.3269	41	4.96392	81	1.13604	121	0.35042
2	31.5635	42	4.76253	82	1.09958	122	0.3413
3	29.9058	43	4.57050	83	1.06448	123	0.33246
4	28.3459	44	4.38736	84	1.03069	124	0.32390
5	26.8778	45	4.21263	85	0.99815	125	0.31559
6	25.4954	46	4.04589	86	0.96681	126	0.30754
7	24.1932	47	3.88673	87	0.93662	127	0.29974
8	22.5662	48	3.73476	88	0.90753	128	0.29216
9	21.8094	49	3.58962	89	0.87950	129	0.28482
10	20.7184	50	3.45097	90	0.85248	130	0.27770
11	19.6891	51	3.31847	91	0.82643	131	0.27078
12	18.7177	52	3.19183	92	0.80132	132	0.26408
13	17.8005	53	3.07075	93	0.77709	133	0.25757
14	16.9341	54	2.95896	94	0.75373	134	0.25125
15	16.1156	55	2.84421	95	0.73119	135	0.24512
16	15.3418	56	2.73823	96	0.70944	136	0.23916
17	14.6181	57	2.63682	97	0.68844	137	0.23338
18	13.9180	58	2.53973	98	0.66818	138	0.22776
19	13.2631	59	2.44677	99	0.64862	139	0.22231

Part 4
Installation

1.Precaution on Installation

1). Measure the necessary length of the connecting pipe, and make it by the following way.

a. Connect the indoor unit at first, then the outdoor unit.

Bend the tubing in proper way. Do not harm them.

Specially Notice the pipe length/height/dimension of each capacity.

Maximum pipe length

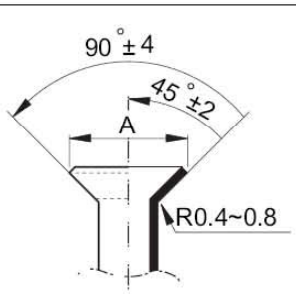
Model	Max. Length	Max. Elevation
24,000Btu/h	25m	12m
36,000Btu/h	30m	20m
48,000Btu/h	50m	25m

Piping sizes

Model	Liquid(mm)	Gas(mm)
24,000Btu/h	9.5	15.9
36,000Btu/h	9.5	15.9
48,000Btu/h	9.5	19

CAUTIONS

- Daub the surfaces of the flare pipe and the joint nuts with frozen oil, and wrench it for 3~4 rounds
- With hands before fasten the flare nuts.
- Be sure to use two wrenches simultaneously when you connect or disconnect the pipes.

Pipe gauge	Tightening torque	Flare dimension A Min (mm) Max		Flare shape
Φ6.4	14.2~17.2N.m (144~176 kgf.cm)	8.3	8.7	
Φ9.5	32.7~39.9N.m (333~407kgf.cm)	12.0	12.4	
Φ12.7	49.5~60.3N.m (504~616kgf.cm)	15.4	15.8	
Φ15.9	61.8~75.4N.m (630~770 kgf.cm)	18.6	19.1	
Φ19	97.2~118.6N.m (990~1210kgf.cm)	22.9	23.3	

b. The stop value of the outdoor unit should be closed absolutely (as original state). Every time you connect it, first loosen the nuts at the part of stop value, then connect the flare pipe immediately (in 5 minutes). If the nuts have been loosened for a long time, dusts and other impurities may enter the pipe system and may cause malfunction later. So please expel the air out of the pipe with refrigerant before connection.

c. Expel the air after connecting the refrigerant pipe with the indoor unit and the outdoor unit. Then fasten the nuts at the repair-points.

2) Locate The Pipe

a. Drill a hole in the wall (suitable just for the size of the wall conduit), then set on the fittings such as the wall conduit and its cover.

b. Bind the connecting pipe and the cables together tightly with binding tapes. Do not let air in, which will cause water leakage by condensation.

c. Pass the bound connecting pipe through the wall conduit from outside. Be careful of the pipe allocation to do no damage to the tubing.

3) Connect the pipes.

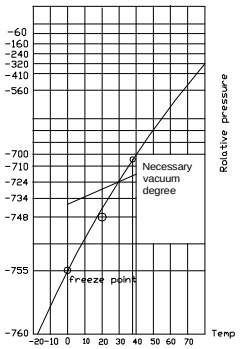
4) Then, open the stem of stop values of the outdoor unit to make the refrigerant pipe connecting the indoor unit with the outdoor unit in fluent flow.

5) Be sure of no leakage by checking it with leak detector or soap water.

6) Cover the joint of the connecting pipe to the indoor unit with the soundproof / insulating sheath (fittings), and bind it well with the tapes to prevent leakage.

2. Vacuum Dry and Leakage Checking

1) Vacuum Dry: use vacuum pump to change the moisture (liquid) into steam (gas) in the pipe and discharge it out of the pipe to make the pipe dry. Under one atmospheric pressure, the boiling point of water(steam temperature) is 100℃. Use vacuum pump to make the pressure in the pipe near vacuum state, the boiling point of water falls relatively. When it falls under outdoor temperature, the moisture in the pipe will be vaporized.

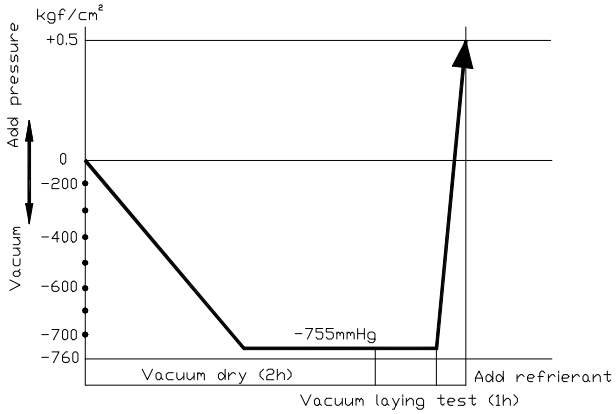


2) Vacuum dry procedure

There are two methods of vacuum dry due to different construction environment: common vacuum dry, special vacuum dry.

①. Common vacuum dry procedure

- Vacuum dry (for the first time)---connect the all-purpose detector to the inlet of liquid pipe and gas pipe, and run the vacuum pump more than two hours (the vacuum pump should be below -755mmHg)
- If the pump can't achieve below -755mmHg after pumping 2 hours, moisture or leakage point will still exist in the pipe. At this time, it should be pumped 1 hour more.
- If the pump can't achieve -755mmHg after pumping 3 hours, please check if there are some leakage points.
- Vacuum placement test: place 1 hour when it achieves -755mmHg, pass if the vacuum watch shows no rising. If it rises, it shows there's moisture or leakage point.
- Vacuuming from liquid pipe and gas pipe at the same time.
- Sketch map of common vacuum dry procedure.



②. Special vacuum dry procedure

- This vacuum dry method is used in the following conditions:
- There's moisture when flushing the refrigerant pipe.
- Rainwater may enter into the pipe.
- Vacuum dry for the first time ····· 2h pumping

③. Vacuum destroy for the second time ····· Fill nitrogen to 0.5Kgf/cm^2

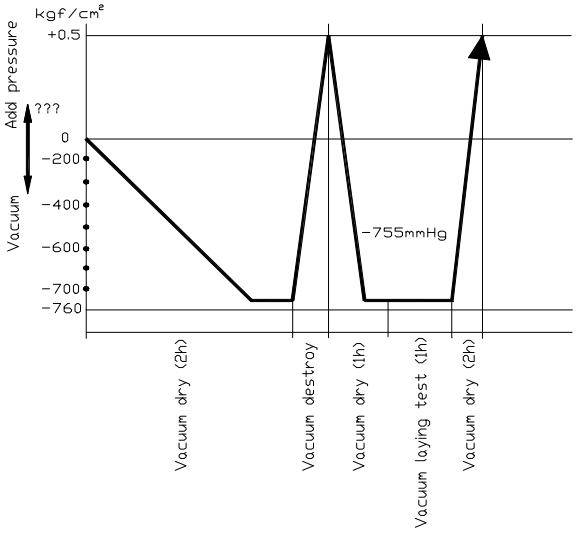
Because nitrogen is for drying gas, it has vacuum drying effect during vacuum destroy. But if the moisture is too much, this method can't dry thoroughly. So, please pay more attention to prevent water entering and forming condensation water.

④. Vacuum dry for the second time·····1h pumping

Determinant: Pass if achieving below -755mmHg. If -755mmHg can't be achieved in 2h, repeat procedure ③ and ④.

⑤. Vacuum placing test ····· 1h

⑥. Sketch map of special vacuum dry procedure



3. Additional Refrigerant Charge

Caution:

a) Refrigerant cannot be charged until field wiring has been completed.
b) Refrigerant may only be charged after performing the leak test and the vacuum pumping.
c) When charging a system, care shall be taken that its maximum permissible charge is never exceeded, in view of the danger of liquid hammer.
d) Charging with an unsuitable substance may cause explosions and accidents, so always ensure that the appropriate refrigerant is charged.
e) Refrigerant containers shall be opened slowly.
f) Always use protective gloves and protect your eyes when charging refrigerant.

The outdoor unit is factory charged with refrigerant. Calculate the added refrigerant according to the diameter and the length of the liquid side pipe of the outdoor unit/indoor unit.

R(g) D(mm) / L(m)	φ6.4	Φ9.5	Φ12.7
Less than 5m (One-way)	—	—	—
Added Refrigerant When Over 5m(One-way)	11g/m×(L-5)	30g/m×(L-5)	60g/m×(L-5)

Remark:

R (g): Additional refrigerant to be charged
L (m): The length of the refrigerant pipe (one-way)
D (mm): Liquid side piping diameter

4. Water Drainage

4.1 Gradient and Supporting

1). Keep the drainpipe sloping downwards at a gradient of at least 1/50. Keep the drainpipe as short as possible and eliminate the air bubble.

2). The horizontal drainpipe should be short. When the pipe is too long, a prop stand must be installed to keep the gradient of 1/50 and prevent bending. Refer to the following table for the specification of the prop stand.

Material	Diameter	Distance between the prop stands
Hard PVC pipe	25~40mm	1.5~2m

3). Precautions

① The diameter of drainpipe should meet the drainage requirement at least.

② the drainpipe should be heat-insulated to prevent atomization.

③ Drainpipe should be installed before installing indoor unit. After powering on, there is some water in water-receiver plate. Please check if the drain pump can operate correctly.

④ All connection should be firm.

⑤ Wipe color on PVC pipe to note connection.

⑥ Climbing, horizontal and bending conditions are prohibited.

⑦ The dimension of drainpipe can't less than the connecting dimension of indoor drainpipe.

⑧ Heat-insulation should be done well to prevent condensation.

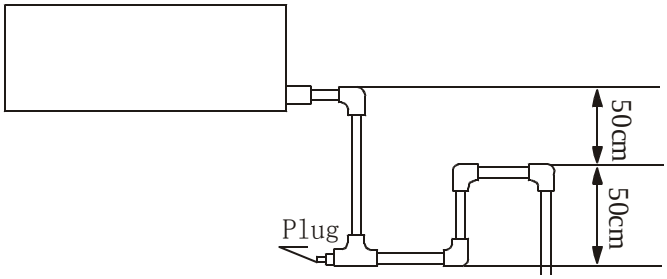
⑨ Indoor units with different drainage type can't share one convergent drainpipe.

4.2 Drainpipe Trap

1). If the pressure at the connection of the drainpipe is negative, it needs to design drainpipe trap.

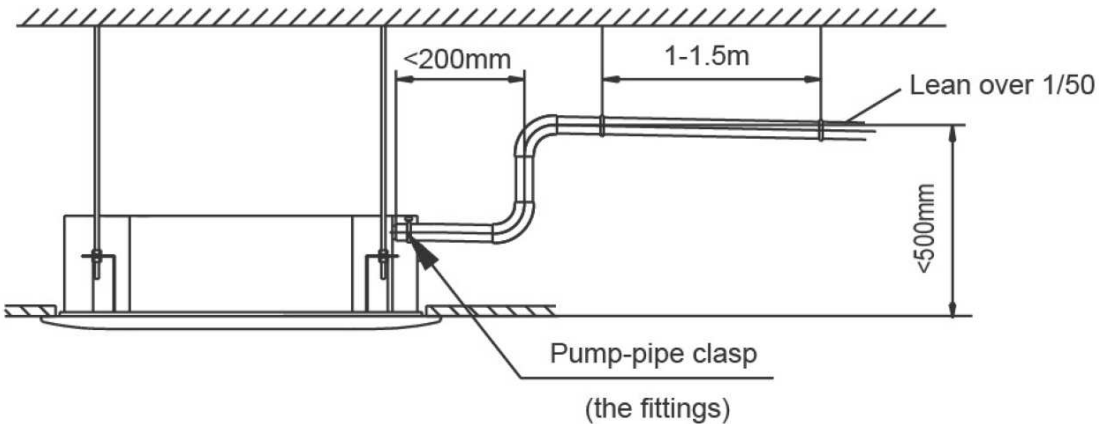
2). Every indoor unit needs one drainpipe trap.

3). A plug should be designed to do cleaning.

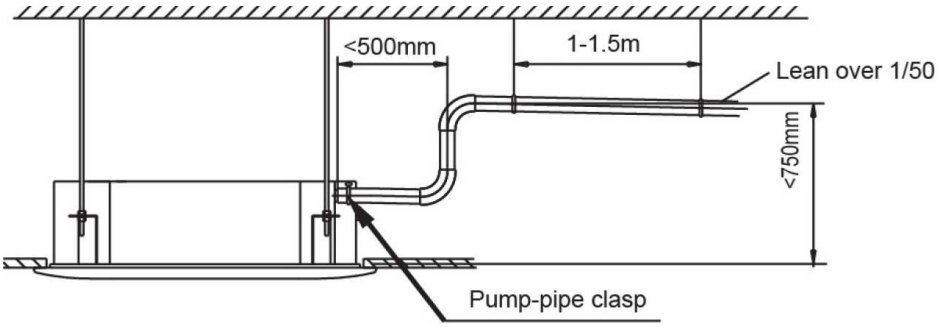


4.3 Upwards drainage (drain pump)

For Four-way cassette(compact)



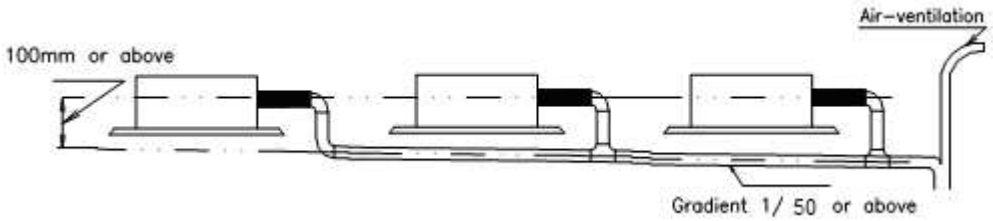
For Four-way cassette



4.4 Convergent drainage

1). The number of indoor units should be as small as possible to prevent the traverse main pipe overlong.

2). Indoor unit with drain pump and indoor unit without drain pump should be in different drainage system.



3). Selecting the diameter

Number of connecting indoor units → Calculate drainage volume → Select the diameter

Calculate allowed volume =Total cooling capacity of indoor units (HP)×2 (l/ hr)

Material	Allowed volume(lean 1/50) (l/ hr)	I.D. (mm)	Thick
Hard PVC	∽≤14	₵25	3.0
Hard PVC	14＜∽≤88	₵30	3.5
Hard PVC	88＜∽≤334	₵40	4.0
Hard PVC	175＜∽≤334	₵50	4.5
Hard PVC	334＜∽	₵80	6.0

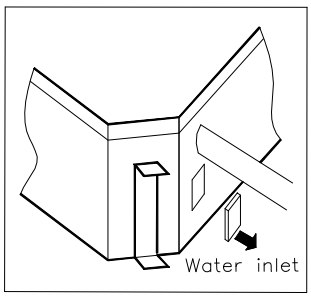
4.5 Drainage test

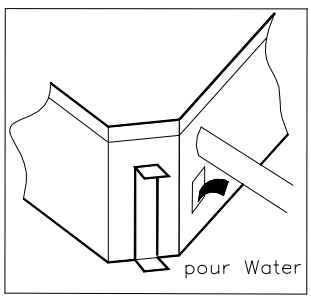
1). Drainage without drain pump

After finishing drainpipe installation, pour some water into the water receiver plate to check if the water flows smoothly.

2). Drainage with drain pump

① Poke the Water Level Switch, remove the cover, use water pipe to pour 2000ml water into the water receipt plate through the water inlet.





② Turn on the power to Cooling operation. Check the pump's operation and switch on the Water Level Switch. Check the pump's sound and look into the transparent hard pipe in the outlet at the same time to check if the water can discharge normally.

③ Stop the air conditioner running, turn off the power, and put back the cover.

- Stop the air conditioner. After 3 minutes, check if it has abnormity. If the collocation of drainpipes is illogical, the water will flow back overfull, which will cause the alarm lamp flashes, even overflow from the water receipt plate.
- Keep on pouring water until it gives an alarm signal for high water level, check if the pump drains water at once. If the water level can't fall below the alarmed water level after 3 minutes, the air conditioner will stop. Turn off the power and drain the remained water, and then turn on the air conditioner.

Note: the drain stuff in the main water receipt plate is for maintenance. Stuff up the drain stuff to prevent water leakage.

5. Insulation Work

5.1 Insulation material and thickness

1). Insulation material

Insulation material should adopt the material which is able to endure the pipe's temperature: no less than 70℃ in the high-pressure side, no less than 120℃ in the low-pressure side(For the cooling type machine, no requirements at the low-pressure side.)

Example: Heat pump type----Heat-resistant Polyethylene foam (withstand above 120℃)

Cooling only type---- Polyethylene foam (withstand above 100℃)

2). Thickness choice for insulation material

Insulation material thickness is as follows:

	Pipe diameter (mm)	Adiabatic material thickness
Refrigerant pipe	Φ6.4—Φ25.4	10mm
	Φ28.6—Φ38.1	15mm
Drainage pipe	Inner diameterΦ20—Φ32	6mm

5.2 Refrigerant pipe insulation

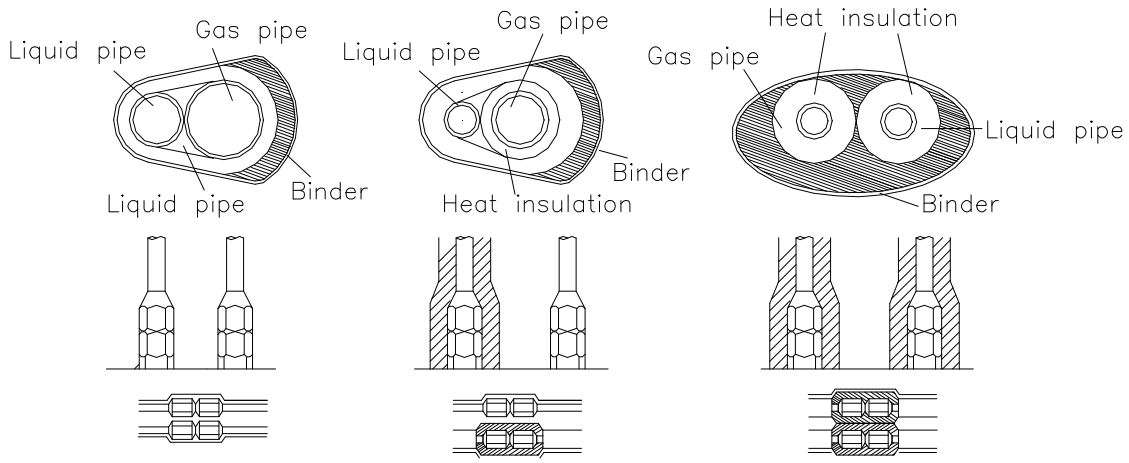
1). Work Procedure

① Before laying the pipes, the non-jointing parts and non-connection parts should be heat insulated.

② When the gas proof test is eligible, the jointing area, expanding area and the flange area should be heat insulated

2). Insulation for non-jointing parts and non-connection parts

wrong	right	
Gas pipe and liquid pipe should not be put together to insulate	Insulate the gas pipe (cooling only)	Insulate the gas pipe and liquid pipe

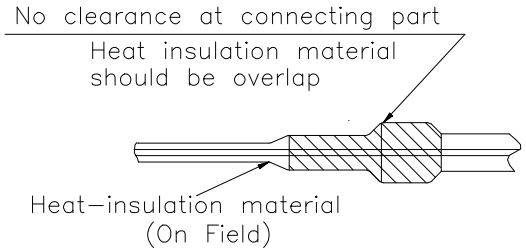


For construction convenience, before laying pipes, use insulation material to insulate the pipes to be deal with, at the same time, at two ends of the pipe, remain some length not to be insulated, in order to be welded and check the leakage after laying the pipes.

3). Insulate for the jointing area, expanding area and the flange area

① Insulate for the jointing area, expanding area and the flange area should be done after checking leakage of the pipes

② Make sure there's no clearance in the joining part of the accessorial insulation material and local preparative insulation material.



5.3 Drainage pipe insulation

1) The connection part should be insulated, or else water will be condensing at the non-insulation part.

5.4 Note

1) The jointing area, expanding area and the flange area should be heat insulated after passing the pressure test

2) The gas and liquid pipe should be heat insulated individually, the connecting part should be heat insulated individually.

3) Use the attached heat-insulation material to insulate the pipe connections (pipes' tie-in ,expand nut) of the indoor unit.

6. Wiring

Please refer to the Wiring Diagram.

7. Test Operation

(1) The test operation must be carried out after the entire installation has been completed.
(2) Please confirm the following points before the test operation.

- The indoor unit and outdoor unit are installed properly.
- Tubing and wiring are correctly completed.
- The refrigerant pipe system is leakage-checked.
- The drainage is unimpeded.
- The ground wiring is connected correctly.
- The length of the tubing and the added stow capacity of the refrigerant have been recorded.
- The power voltage fits the rated voltage of the air conditioner.
- There is no obstacle at the outlet and inlet of the outdoor and indoor units.
- The gas-side and liquid-side stop values are both opened.
- The air conditioner is pre-heated by turning on the power.

(3) According to the user's requirement, install the remote controller when the remote controller's signal can reach the indoor unit smoothly.
(4) Test operation
Set the air conditioner under the mode of "COOLING" with the remote controller, and check the following points.
Indoor unit

- Whether the switch on the remote controller works well.
- Whether the buttons on the remote controller works well.
- Whether the air flow louver moves normally.
- Whether the room temperature is adjusted well.
- Whether the indicator lights normally.
- Whether the temporary buttons works well.
- Whether the drainage is normal.
- Whether there is vibration or abnormal noise during operation.

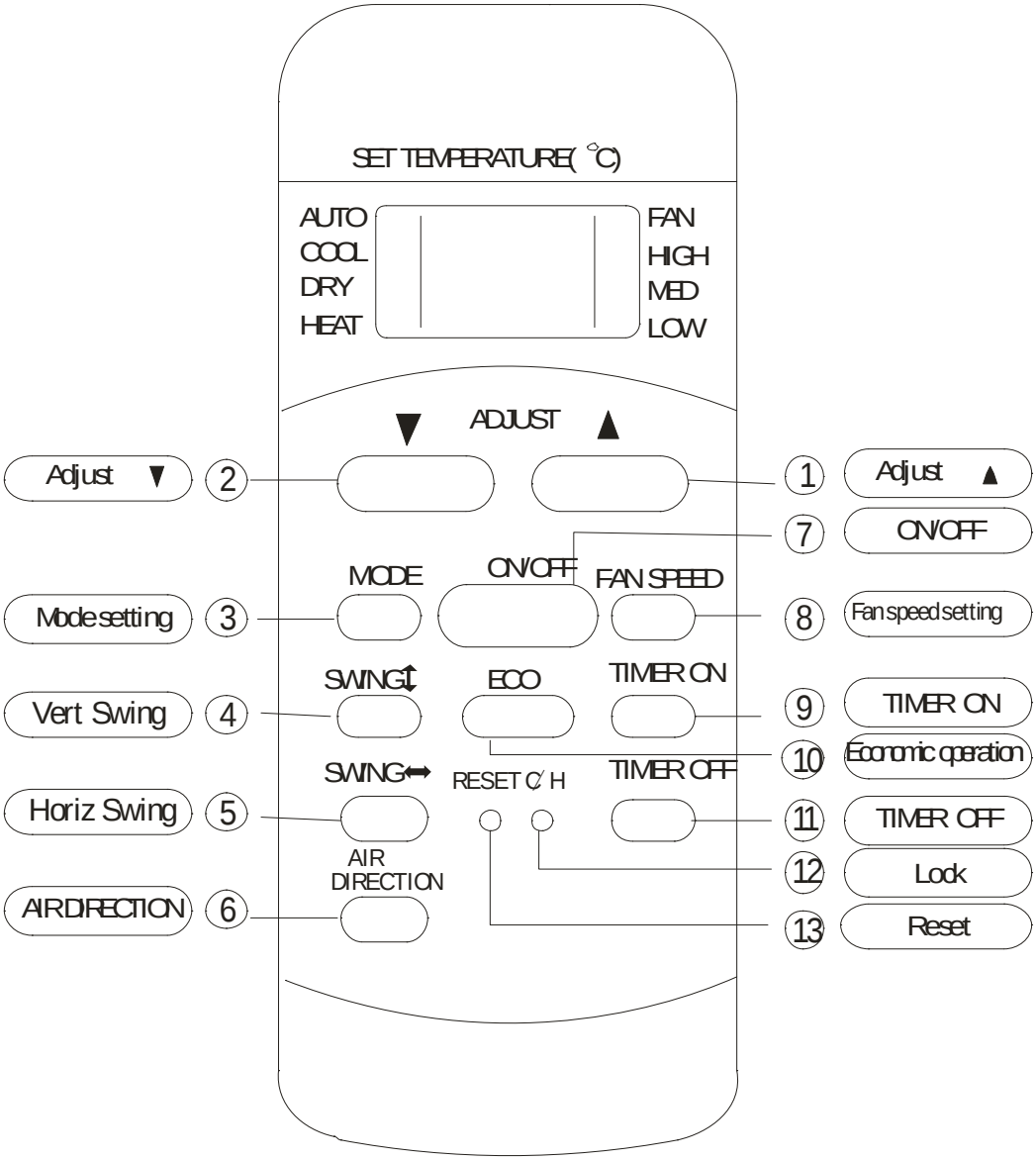
Outdoor unit

- Whether there is vibration or abnormal noise during operation.
- Whether the generated wind, noise, or condensed of by the air conditioner have influenced your neighborhood.
- Whether any of the refrigerant is leaked.

Part 5
Control

1. Wireless Remote Controller

1.1 RG51Q1/BG(C)E



General Function for wireless remote controller:

Model and Specification

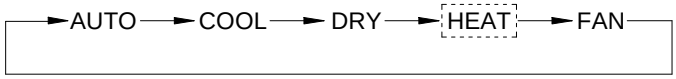
Model	RG51Q1/BG(C)E
Rated voltage	3.0V(Dry batteries R03/LR03×2)
Min voltage for sending signal of CPU	2.0V
Effective receiving distance	8m(when using 3.0 voltage, it Gets 11m)
Operation condition	-5~60℃

Buttons and functions

1. Adjust ▼ : Decrease the set temp. Keeping pressing will decrease the temp with 1℃ per 0.5s.

2. Adjust ▲ : Increase the set temp. Keeping pressing will increase the temp with 1℃ per 0.5s.

3. MODE: Once pressing, running mode will be selected in the following sequence:



NOTE: No heating mode for cool only type unit.

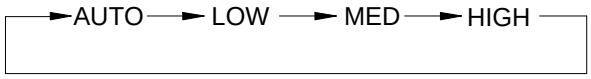
4. VERT SWING: Used to stop or start horizontal louver movement or set the desired up/down air flow direction. The louver changes 6 degree in angle for each press. If keep pushing more than 2 seconds, the louver will swing up and down automatically.

5. HORIZ SWING: Used to stop or start vertical louver movement.

6. AIR DIRECTION: Used to set the desired up/down air flow direction. The louver changes 6 degree in angle for each press.

7. ON/OFF: For turning on or turning off the air conditioner.

8. FAN SPEED: Fan speed will be selected in following sequence once pressing this button:



9. TIME ON: For time ON setting. Once pressing this button, the time will increase by 0.5 hour. When the set time exceeds 10 hours, pressing the button will increase the time by 1 hour. Adjusting the figure to 0.00 will cancel time ON setting.

10. ECO: Activate or turn off economic operation mode. It is suggested to turn on this function when sleeping. (Only available when remote controller is used with corresponding unit.)

11. TIME OFF: For time OFF setting. Once pressing this button, the time will increase by 0.5 hour. When the set time exceeds 10 hours, pressing the button will increase the time by 1 hour.

Adjust the figure to 0.00 will cancel time ON setting.

12. C/H (inner located): Press this button with a needle of 1mm to shift the mode between Cooling only and Cooling & Heating according to the feature of the machine.

13.RESET (inner located): Press this button with a needle of 1mm to cancel the current setting and reset remote controller

A Tradition of leadership and excellence for over 50 years

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