Air duct Type Air Conditioner

Service Manual

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Contents

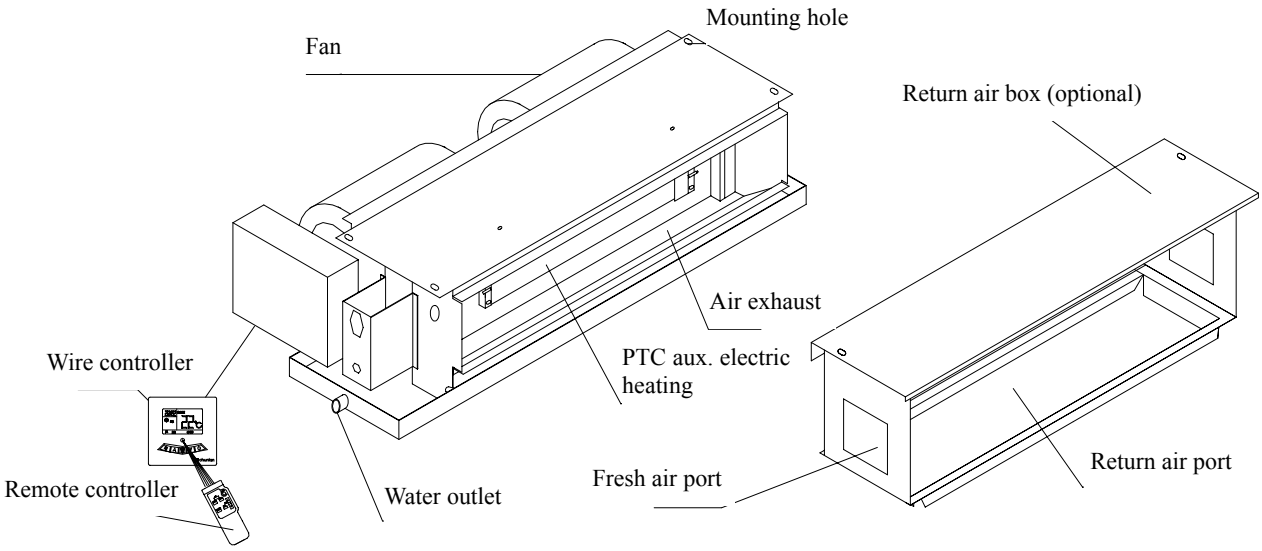
Chapter I Structure & features

I. Brief introduction

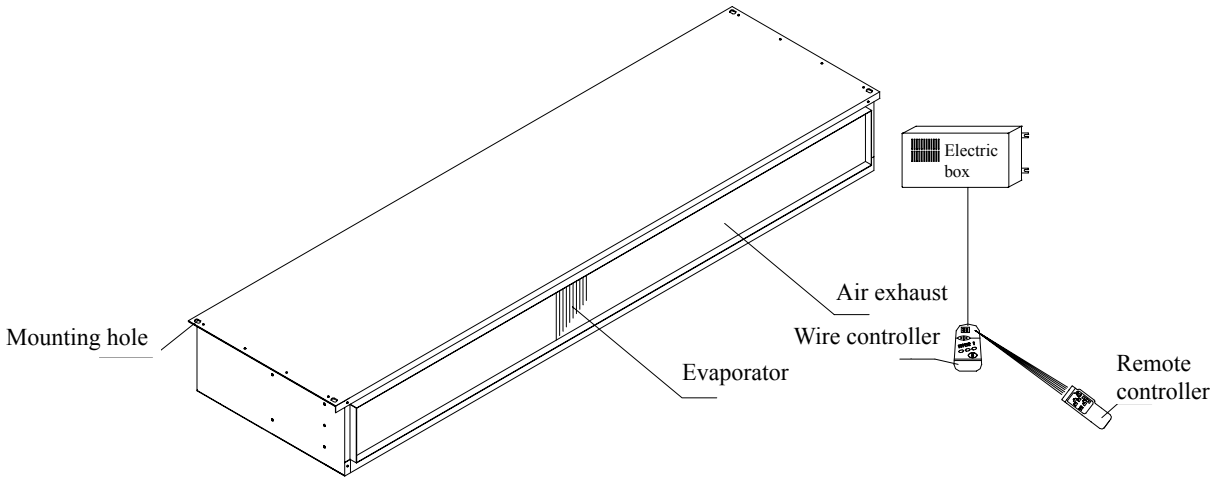
This air duct type air conditioner is our latest home (commercial) centralized air conditioning product. This product features high efficiency, energy saving, mild and silent operation, computerized intelligent control and healthy fresh air etc. In addition, wire and wireless controls are provided for easy operation. The product can be widely used in large area, multi-room composite compartment/houses, villa, and medium and small restaurants, bars, leisure and recreation sites.

II. Indoor unit

1. Indoor unit of low static pressure series air duct type air conditioner

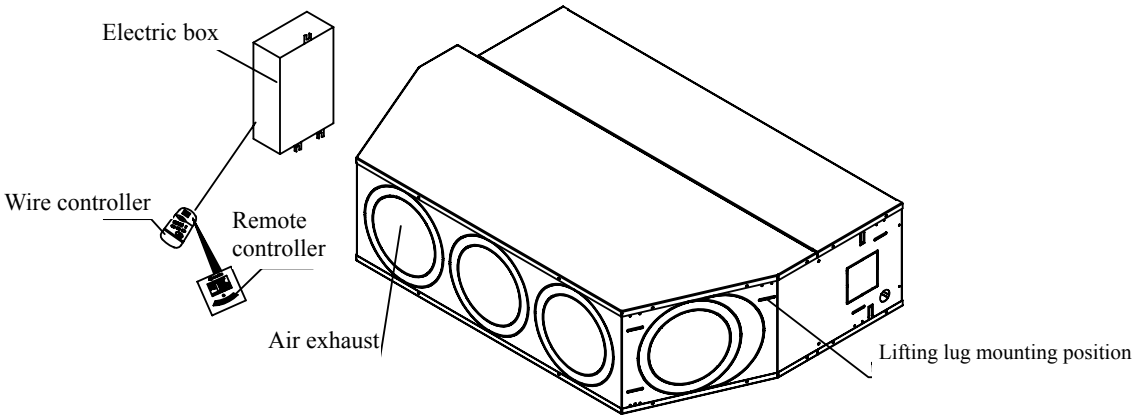


FRD23-B, FRD35-B & FRD50-B indoor unit outline



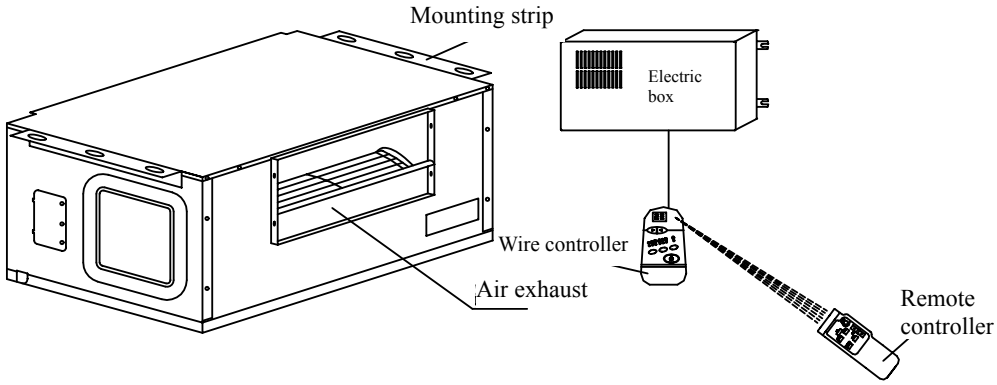
FR(D)71-B & FR(D)100-B indoor unit outline

2. Indoor unit of medium static pressure series air duct type air conditioner

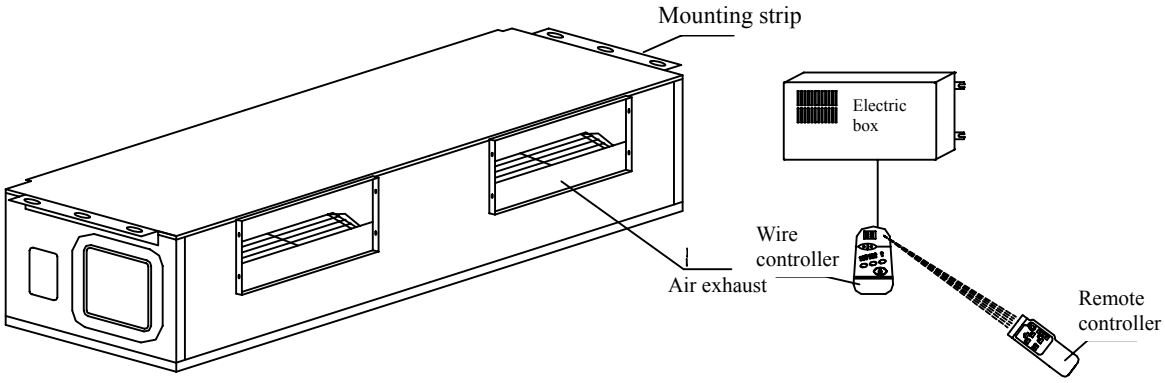


FR95-C & FR125-C/S indoor unit outline

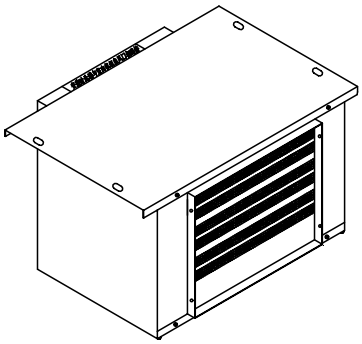
3. Indoor unit of high static pressure series air duct type air conditioner



FR(D)95 & FR(D)125/S indoor unit outline

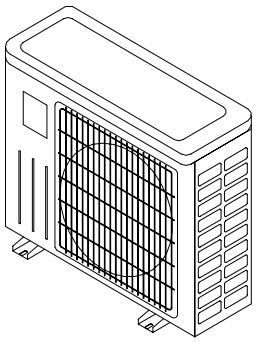


FR(D)180/S & FR(D)260/S indoor unit outline

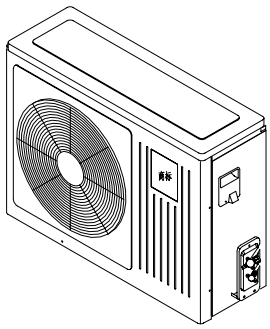


FRD95, FRD125/S, FRD180/S & FRD20/S auxiliary electric heating box c Air intake

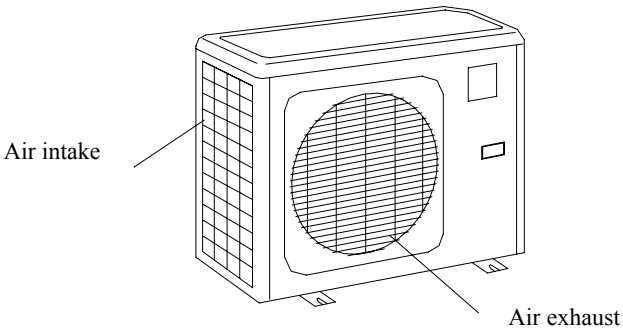
III Outdoor units



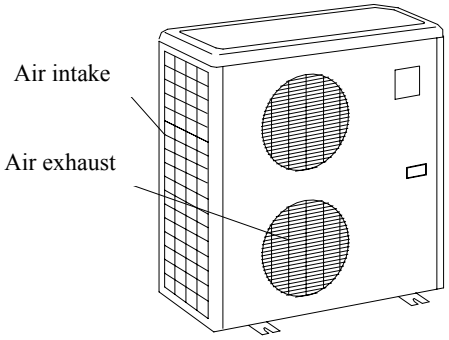
FRD23-B, FRD35-B, FRD50-B outdoor unit



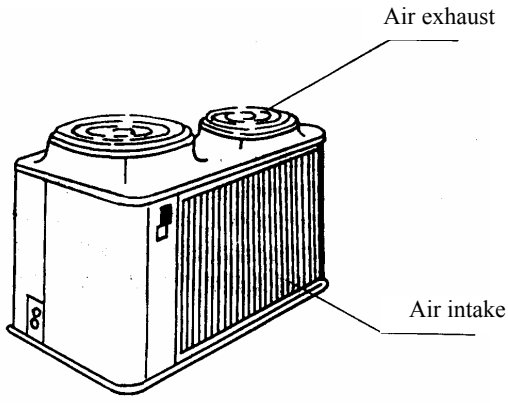
FRD71-B, FR71-B outdoor unit



FR(D)95, FR(D)125/S, FR95-C, FR125-C/S, FR(D)100-B outdoor unit outline



FR(D)180/S outdoor unit outline

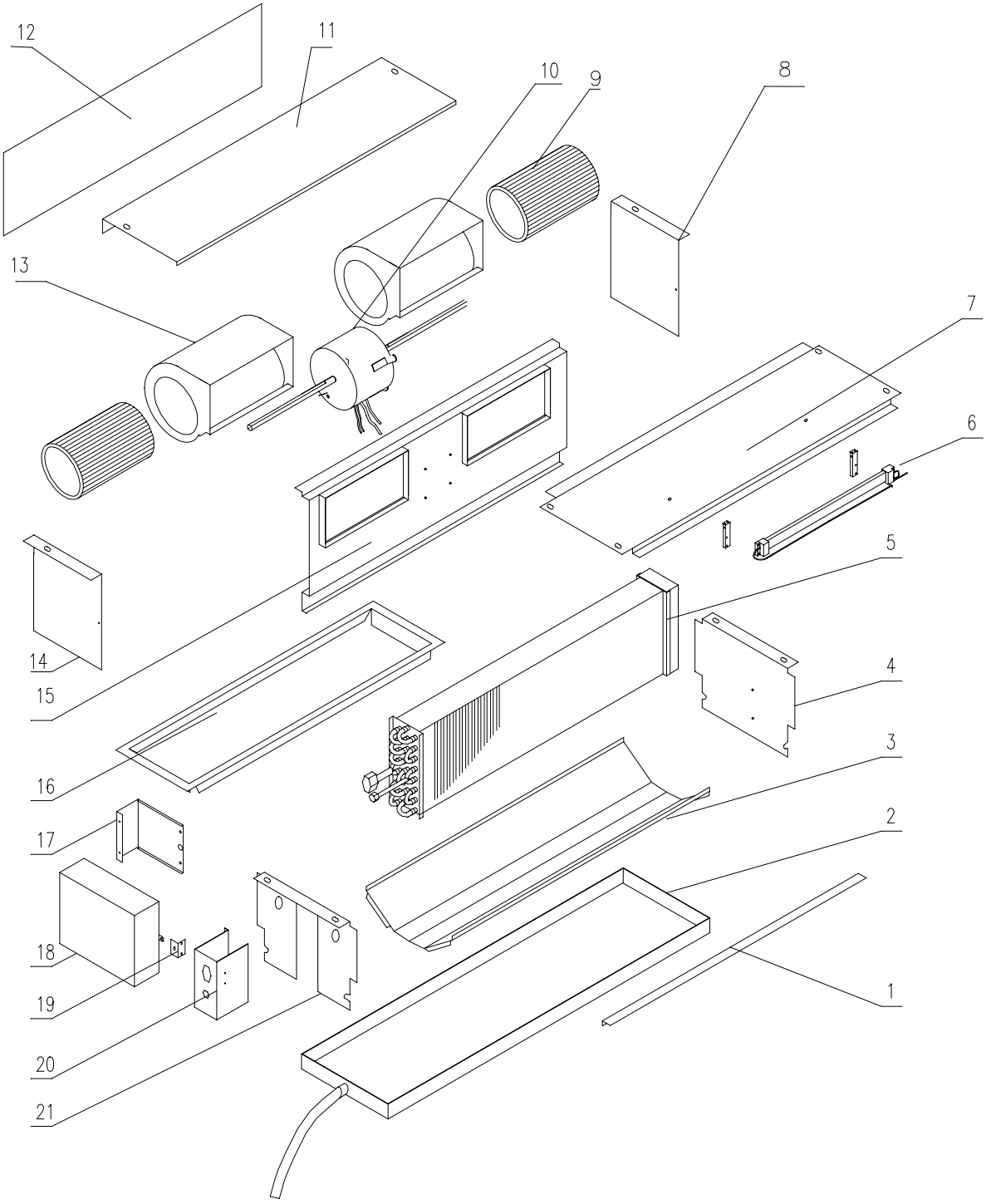


FR(D)260/S outdoor unit outline

Chapter II Exploded views & dismantling sequence of parts

I. Exploded view & dismantling sequence of indoor unit of FRD23-B, FRD35-B and FRD50-B

1. Exploded view of FRD23-B, FRD35-B and FRD50-B indoor unit



Exploded view of indoor unit of FRD23-B, FRD35-B & FRD50-B

2. Exploded view schedule for FRD23-B, FRD35-B and FRD50-B in door unit

No.	Description	Remark
1	Air exhaust strip	
2	Water tray assembly	
3	Water accumulation plate	
4	Right side plate assembly	
5	Heat exchanger assembly	
6	PTC electric heater	
7	Heat exchange section top plate assembly	
8	Fan section left side plate assembly	Optional
9	Impeller	
10	Motor	
11	Fan section top plate	Optional
12	Fan section rear plate assembly	Optional
13	Spiral casing	
14	Fan section right side plate assembly	Optional
15	Fan mounting plate	
16	Fan section bottom plate	Optional
17	Electric box mounting plate	
18	Electric box	
19	Electric box fixing block	
20	Heat exchanger protection plate	
21	Left side plate assembly	

3. Dismantling sequence of indoor unit of FRD23-B, FRD35-B and FRD50-B

(1) Remove 18

(2) Remove 17, 19

(3) Remove 12

(4) Remove 11

(5) Remove 16

(6) Remove 14, 8

(7) Remove 9, 13

(8) Remove 10

(9) Remove 15

(10) Remove 7, 6

(11) Remove 20

(12) Remove 21, 4

(13) Remove 5

(14) Remove 3, 1

(15) Remove 2.

Annex: Dismantling sequence of typical parts

Indoor capacitor

(1) Remove 12

(2) Remove capacitor.

Indoors motor:

(1) Remove fan section rear plate 12

(2) Remove fan section top plate 11

(3) Remove spiral casing 13 and impeller 9

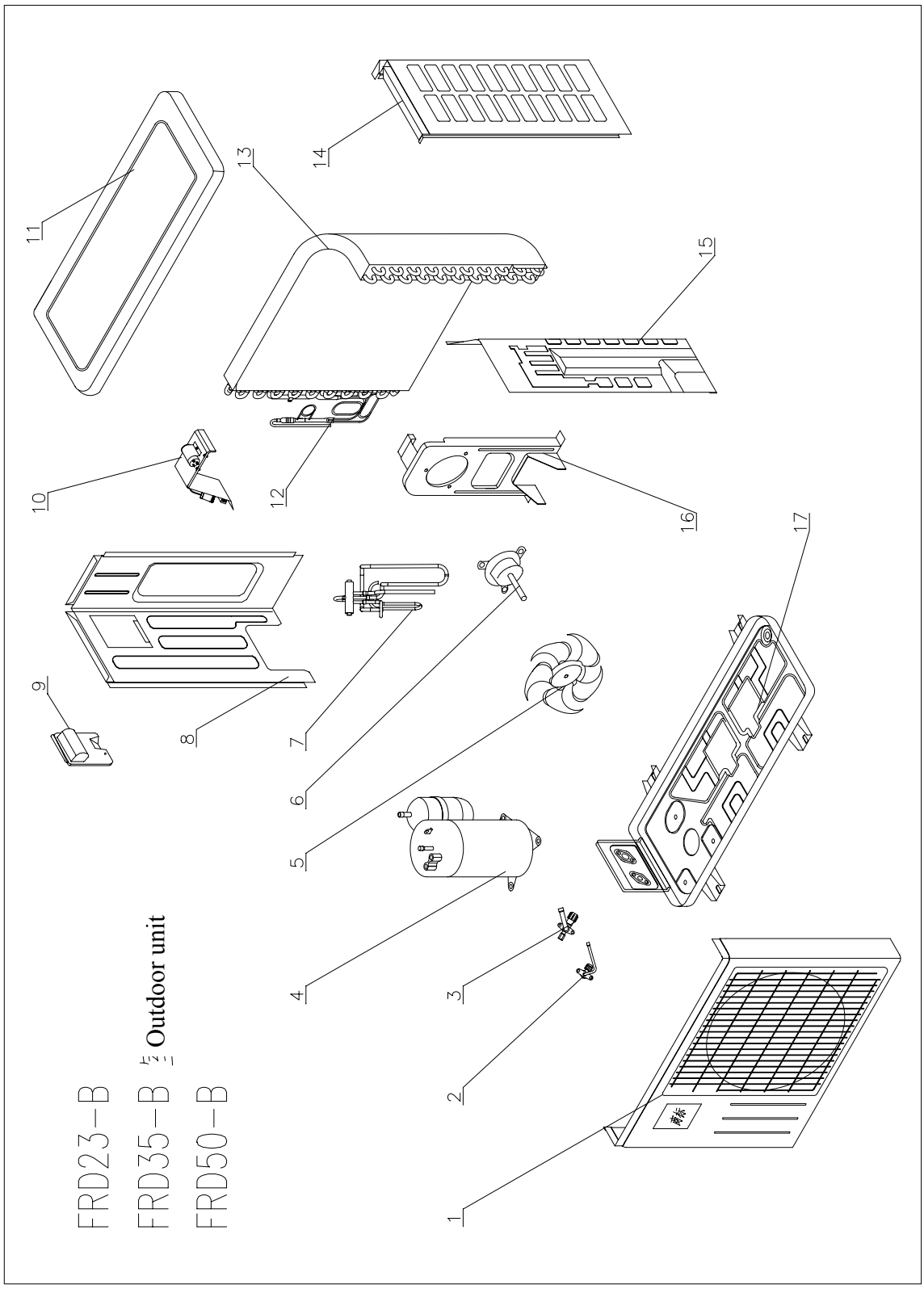
(4) Remove connecting plug from control board in electric box

(5) Remove motor 10 and capacitor.

Note: Return air box of FRD23-B, FRD35-B or FRD50-B indoor unit is optional. There are two modes of air return (lower air return and rear air return) and two modes of water discharge (left and right). This exploded view and dismantling sequence is based on lower air return and left water discharge.

II. Exploded view and dismantling sequence for outdoor unit of FRD23-B, FRD35-B & FRD50-B

1. Exploded view of outdoor unit of FRD23-B, FRD35-B and FRD50-B



Exploded view of outdoor unit of FRD23-B, FRD35-B and FRD50-B

2. Exploded view schedule of outdoor unit of FRD23-B, FRD35-B and FRD50-B

No.	Description	Remark
1	Front plate assembly	
2	Small shutoff valve	
3	Large shutoff valve	
4	Compressor	
5	Axial flow fan	
6	Motor	
7	Reversing valve assembly	
8	Left rear plate assembly	
9	Handle assembly	
10	Outdoor electric assembly	
11	Top cover assembly	
12	Capillary assembly	
13	Condenser assembly	
14	Right rear plate	
15	Middle baffle plate assembly	
16	Motor support assembly	
17	Chassis assembly	

3. Dismantling sequence of outdoor unit of RD23-B, FRD35-B and FRD50-B

(1) Remove 11

(2) Remove 8, 9

(3) Remove 14

(4) Remove 1

(5) Remove 10

(6) Remove 5, 6

(7) Remove 16

(8) Remove 2, 3

(9) Remove 15

(10) Remove 7

(11) Remove 12, 13

(12) Remove 4

(13) Remove 17

Annex: Dismantling sequence of typical parts

Outdoor electric assembly:

(1) Remove top cover assembly 11

(2) Remove handle assembly 9

(3) Remove left rear plate assembly 8

(4) Remove outdoor electric assembly 10.

Outdoors motor:

(1) Remove top cover assembly 11

(2) Remote handle assembly 9

(3) Remove front plate assembly 1

(4) Remove fan 5

(5) Remove connecting plug from motor 6 and remove the motor.

Outdoors compressor

(1) Remove top cover assembly 11

(2) Remove handle assembly 9 and left rear plate assembly 8

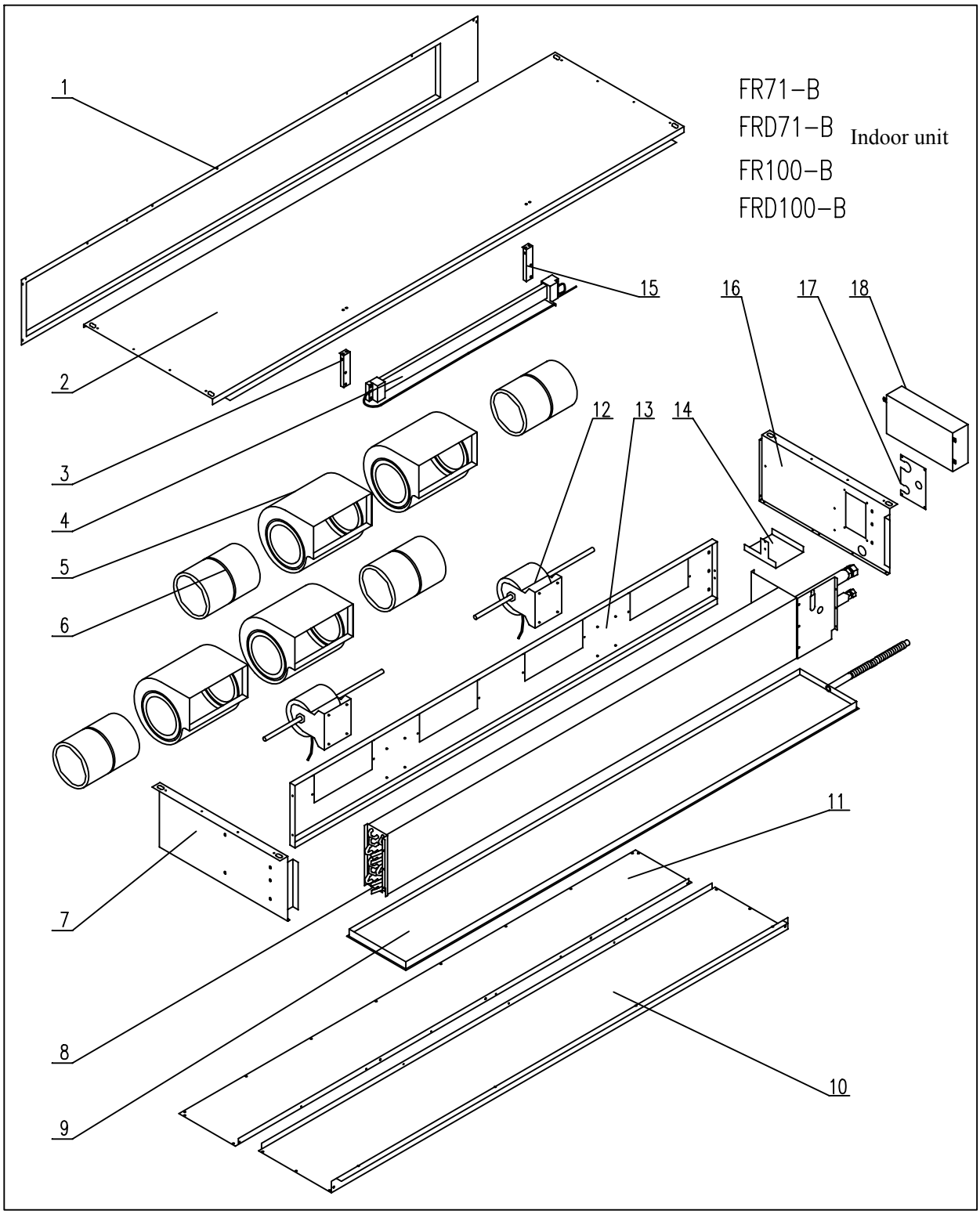
(3) Remove front plate assembly 1

(4) Remove large and small shutoff valves 3 and 2, and remove reversing valve 7

(5) Remove compressor cable and the compressor.

III. Exploded view and dismantling sequence of indoor unit of FR(D)71-B and FR(D)100-B

1. Exploded view of indoor unit of FR(D)71-B and FR(D)100-B



Exploded view of indoor unit of FR(D)71-B and FR(D)100-B

2. Exploded view schedule of indoor unit of FR(D)71-B and FR(D)100-B

No.	Description	Remark
1	Air intake plate	
2	Top plate assembly	
3	Left support	
4	PTC electric heater	Only for FRD71-B & FRD100-B
5	Spiral casing	
6	Impeller	
7	Left side plate assembly	
8	Evaporator assembly	
9	Condensate tray assembly	
10	Bottom plate assembly I	
11	Bottom plate assembly II	
12	Motor	
13	Fan support plate	
14	Manger board assembly	
15	Right support	
16	Right side plate assembly	
17	Right small hole cover plate	
18	Electric box assembly	

3. Dismantling sequence of indoor unit of FR(D)71-B and FR(D)100-B

(1) Remove 18

(2) Remove 17

(3) Remove 4, 3, 15

(4) Remove 2

(5) Remove 1

(6) Remove 5, 6

(7) Remove 12

(8) Remove 14

(9) Remove 13

(10) Remove 8

(11) Remove 9

(12) Remove 16, 17

(13) Remove 10, 11

Annex: Dismantling sequence of typical parts

Indoor capacitor

(1) Remove 1

(2) Remove capacitor.

Indoors motor:

(1) Remove electric box 18

(2) Remove plug of indoor motor from control board in electric box.

(3) Remove air intake plate 1

(4) Remove top plate assembly 2 with 3, 4 and 15

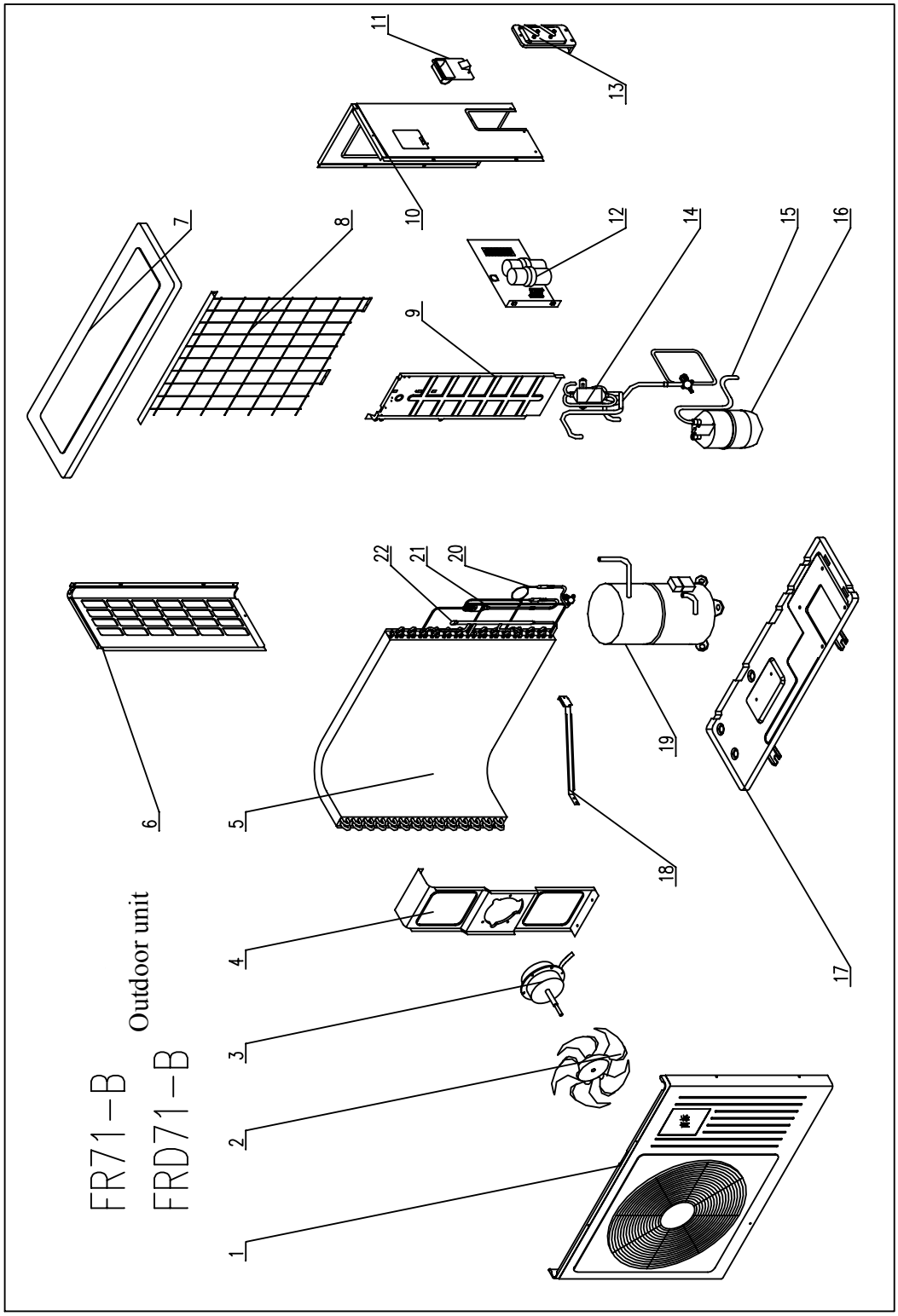
(5) Remove spiral casing 5 and impeller 6

(6) Remove motor 12 and capacitor.

Note: FR(D)71-B and FR(D)100-B have two air return modes: lower air return and rear air return. This exploded view and dismantling sequence is based on rear air return.

IV. Exploded view and dismantling sequence of outdoor unit of FR(D)71-B

1. FR(D)71-B outdoor unit exploded view



FR(D)71-B outdoor unit exploded view

2. Exploded view schedule for FR(D)71-B outdoor unit

No.	Description	Remark
1	Front panel assembly	
2	Axial flow fan	
3	Motor	
4	Motor support assembly	
5	Condenser	
6	Left panel	
7	Top cover assembly	
8	Air intake grating	
9	Baffle plate assembly	
10	Right panel assembly	
11	Handle	
12	Electric assembly	
13	Valve support assembly	
14	Reversing valve assembly	
15	Air suction pipe	
16	Steam/water separator	
17	Chassis assembly	
18	Fixing strip	
19	Piston type compressor	
20	Capillary assembly	
21	Strainer assembly	
22	4-way pipe assembly	

3. FR(D)71-B outdoor unit dismantling sequence

(1) Remove 7

(2) Remove 11, 13

(3) Remove 1

(4) Remove 10

(5) Remove 8, 6

(6) Remove 18

(7) Remove 2, 3

(8) Remove 4

(9) Remove 12

(10) Remove 14, 15

(11) Remove 16

(12) Remove 9

(13) Remove 20, 21, 22

(14) Remove 19

(15) Remove17

Annex: Dismantling sequence of typical parts

Outdoor electric assembly:

(1) Remove top cover assembly 7

(2) Remove front plate assembly 1

(3) Remove right panel assembly 10, 13

(4) Remove electric assembly 12.

Outdoors motor:

(1) Remove top cover assembly 7

(2) Remove front plate assembly 1

(3) Remove fan 2

(4) Unplug motor 3 and remove the motor.

Outdoors compressor:

(1) Remove top cover assembly 7

(2) Remove front plate assembly 1

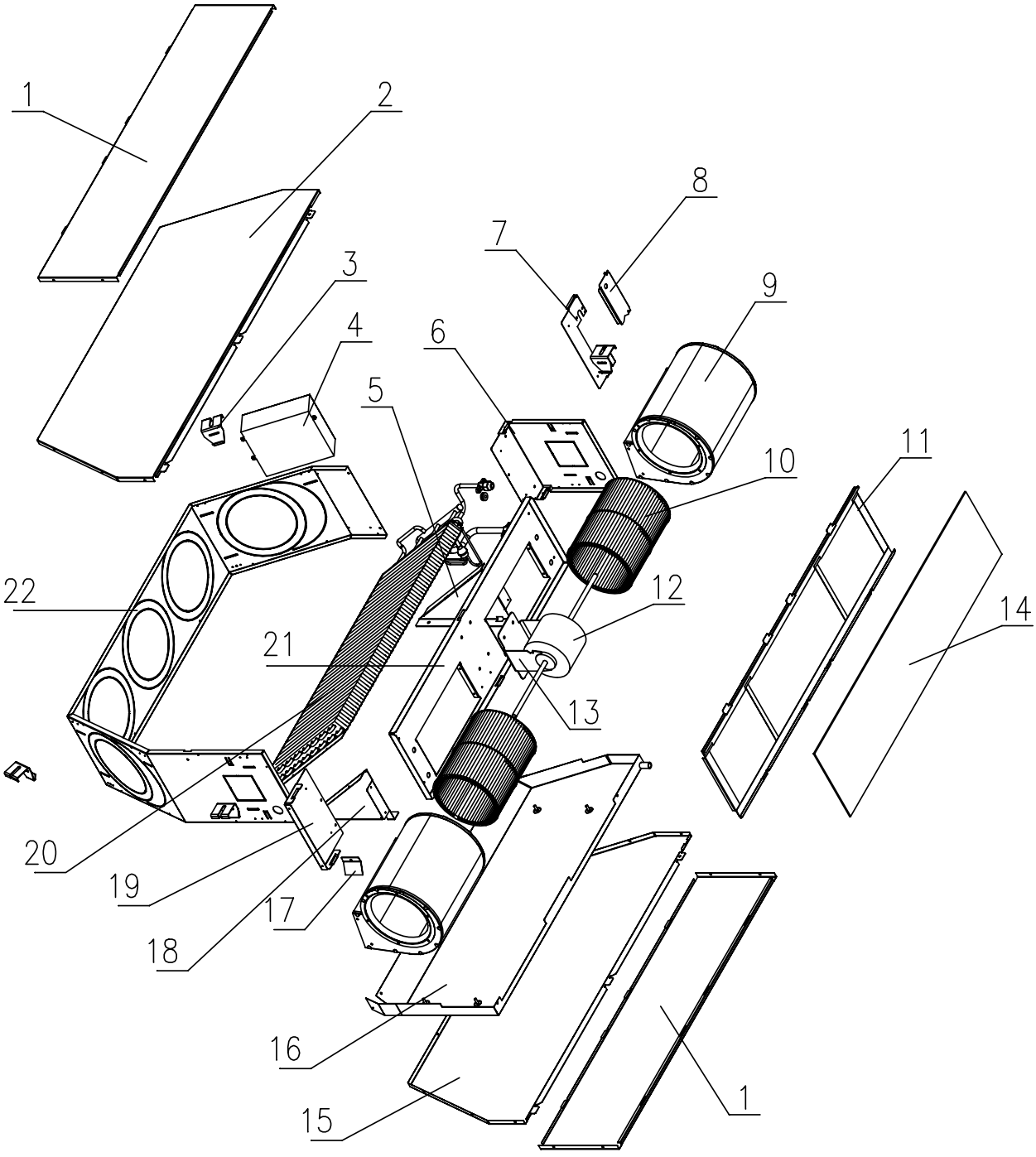
(3) Remove right side plate assembly 10

(4) Remove reversing valve assembly 14 and air suction pipe 15

(5) Remove compressor cable and take out the compressor.

V. Exploded view and dismantling sequence of indoor unit of FR95-C, FR125-C/S

1. Exploded view of indoor unit of FR95-C and FR125-C/S



2. Exploded view schedule of indoor unit of FR95-C and FR125-C/S

No.	Description	Remark
1	Cover plate assembly	
2	Top plate assembly	
3	Lifting hook	
4	Electric box assembly	
5	Left support plate	
6	Small side plate assembly	
7	Fixing support assembly	
8	Fixing support cover plate assembly	
9	Spiral casing assembly	
10	Centrifugal impeller	
11	Strainer frame	
12	Motor	
13	Motor support	
14	Strainer	
15	Bottom plate assembly	
16	Water tray assembly	
17	Small baffle plate	
18	Right support plate	
19	Connecting plate assembly	
20	Evaporator assembly	
21	Fan fixing plate	
22	Side plate assembly	

3. Dismantling sequence of indoor unit of FR95-C and FR125-C/S

(1) Remove 1

(2) Remove 11, 14

(3) Remove 2

(4) Remove 4, 3

(5) Remove 21

(6) Remove 9, 10

(7) Remove 12, 13

(8) Remove 8

(9) Remove 7

(10) Remove 22

(11) Remove 19

(12) Remove 20

(13) Remove 5, 18, 17

(14) Remove 15

Annex: Dismantling sequence of typical parts

Indoor capacitor:

(1) Remove 1

(2) Remove 11, 14

(3) Remove capacitor.

Indoors motor:

(1) Remove electric box 4

(2) Remove cover plate 2 and strainer frame 11

(3) Remove plug of indoor motor from control board in electric box

(4) Remove fan mounting plate 21

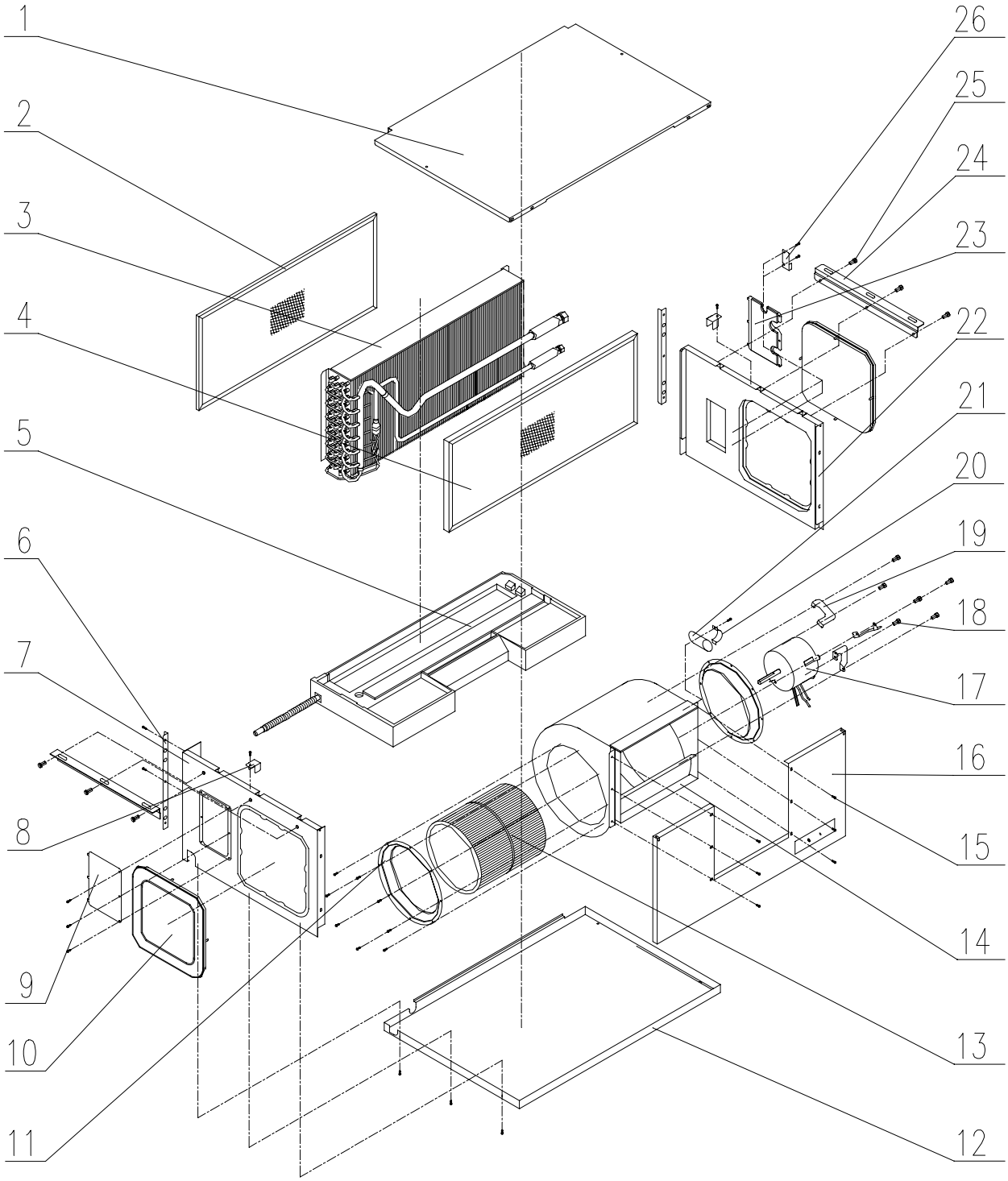
(5) Remove spiral casing 9 and impeller 10

(6) Remove motor support 13

(7) Remove motor 12 and capacitor.

VI. Exploded view and dismantling sequence of indoor unit of FR(D)95 and FR(D)125/S

1. Exploded view of indoor unit of FR(D)95 and FR(D)125/S



Exploded view of indoor unit of FR(D)95 and FR(D)125/S

2. Exploded view schedule of indoor unit of FR(D)95 and FR(D)125/S

No.	Description	Remark
1	Top plate assembly	
2	Strainer 1	
3	Evaporator assembly	
4	Strainer 2	
5	Water tray assembly	
6	Strainer retaining strip	
7	Left side plate assembly	
8	Fixing block	
9	Left small hole cover plate	
10	Square hole cover plate assembly	
11	Air intake	
12	Bottom plate assembly	
13	Impeller	
14	Spiral casing assembly	
15	Tapping screw ST4X12	
16	Front panel assembly	
17	Motor	
18	Bolt M6X16	
19	Motor fixing block	
20	Capacitor clip	
21	Capacitor	
22	Right side plate assembly	
23	Right small hole cover plate assembly	
24	Mounting strip	
25	Bolt with two washers	
26	Retainer	

3. Dismantling sequence of indoor unit of FR(D)95 and FR(D)125/S

(1) Remove 1;

(2) Remove 2;

(3) Remove 8, 4;

(4) Remove 14, 16;

(5) Remove 23;

(6) Remove 7;

(7) Remove 3;

(8) Remove 5;

(9) Remove 22

Annex: Dismantling sequence of typical parts

Indoor capacitor:

(1) Loosen tapping screws on retainer 26, rotate retainer 26;

(2) Remove right small hole cover plate assembly 10;

(3) Remove capacitor clip 20

Indoor motor:

(1) Loosen tapping screws on retainer 26, rotate retainer 26;

(2) Remove left and right small square hole cover plate assemblies 10 respectively;

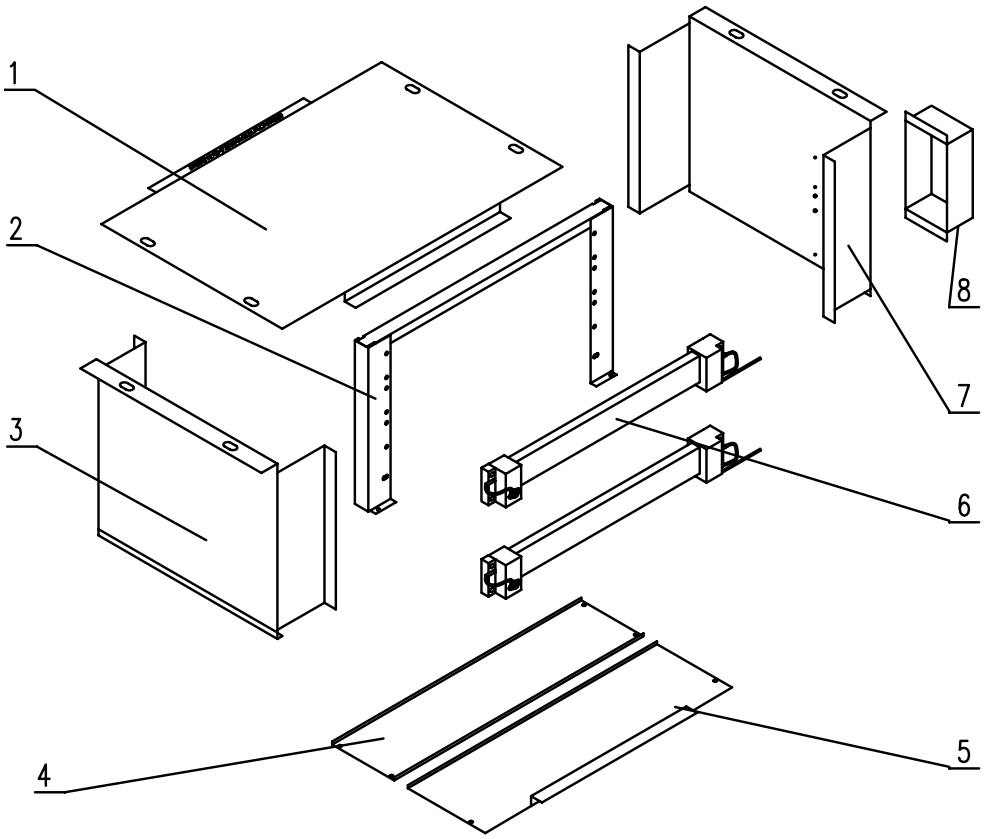
(3) Remove left air intake 11, remove impeller 13;

(4) Remove plugs of motor 17 and capacitor 21 from control board;

(5) Remove connecting bolt between motor fixing block 19 and fan spiral casing 14;

(6) Remove motor.

VII. Exploded view and dismantling sequence of auxiliary electric heating box of FRD95 and FRD125/S



Exploded view of auxiliary electric heating box of FRD95 and FRD125/S

Exploded view schedule of auxiliary electric heating box of FRD95 and FRD125/S

No.	Description	Remark
1	Top plate	
2	Frame assembly	
3	Left side plate assembly	
4	Bottom plate assembly II	
5	Bottom plate assembly I	
6	PTC electric heater	
7	Right side plate assembly	
8	Cover plate	

Dismantling sequence of aux. electric heating box PTC of FRD95 and FRD125/S

(1) Remove electric box cover 8 and remove PTC electric heating wire

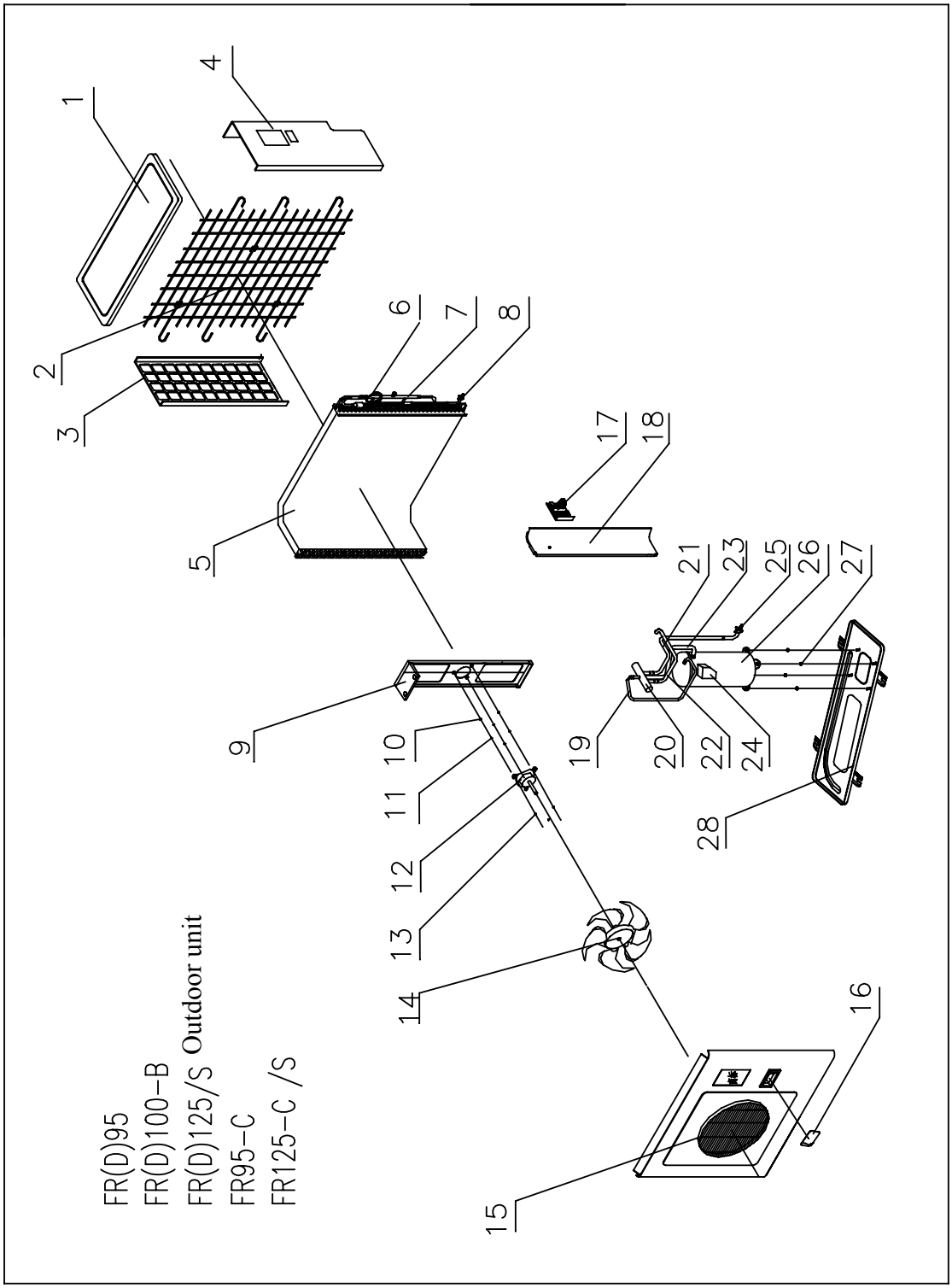
(2) Remove bottom plate assembly I (part 5)

(3) Remove side frame assembly 3

(4) Remove PTC electric heating wire

VIII. Exploded view and dismantling sequence of outdoor unit of FR(D)95, FR(D)125/S, FR(D)100-B, FR95-C and FR125-C/S

1. Exploded view of outdoor unit of FR(D)95, FR(D)125/S, FR(D)100-B, FR95-C & FR125-C/S



Exploded view of outdoor unit of FR(D)95, FR(D)100-B, FR(D)125/S, FR95-C, FR125-C/S (example of FR(D)95)

2. Exploded view schedule of outdoor unit of FR(D)95, FR(D)125/S, FR(D)100-B, FR95-C & FR125-C/S

No.	Description	Remark
1	Top cover assembly	
2	Air intake mesh assembly	
4	Right panel assembly	
5	Condenser	
6	Capillary assembly	
7	T-pipe assembly	
8	Valve Dg8	
9	Motor support	
10	Flat washer 5	
11	Spring washer 5	
12	Motor	
13	Nut M5	
14	Axial flow fan	
15	Front panel assembly	
16	Handle	
17	Electric assembly	
18	Baffle plate assembly	
19	Air exhaust pipe	
20	Reversing valve assembly	
21	Pipe (2)	
22	Pipe (1)	
23	Air suction pipe	
24	Compressor junction box cover	
25	Dg13(FR(D)95, FR95-C, FR(D)100-B), Dg16 (FR(D)125/S, FR125-C/S)	
26	Compressor	
27	Damper ring	
28	Chassis assembly	

3. Dismantling sequence of outdoor unit of FR(D)95, FR(D)125/S, FR(D)100-B, FR95-C、& FR125-C/S

(1) Remove 1;

(2) Remove 2;

(3) Remove 3 and 4 respectively;

(4) Remove 15;

(5) Remove 14 and 9 respectively;

(6) Remove 17;

(7) Remove 5 and 18 respectively

(8) Remove 20 and 26.

Annex: Dismantling sequence of typical parts

Outdoor electric assembly:

(1) Remove top cover 1;

(2) Remove right panel assembly 4;

(3) Remove cover plate on electric assembly 17.

Outdoor motor:

(1) Remove top cover assembly 1;

(2) Remove left panel assembly 3 and right panel assembly 4 respectively;

(3) Remove front panel assembly 15;

(4) Remove fan 14;

(5) Unplug motor 12 and remove motor.

Outdoor compressor:

(1) Remove top cover assembly 1;

(2) Remove right panel assembly 4;

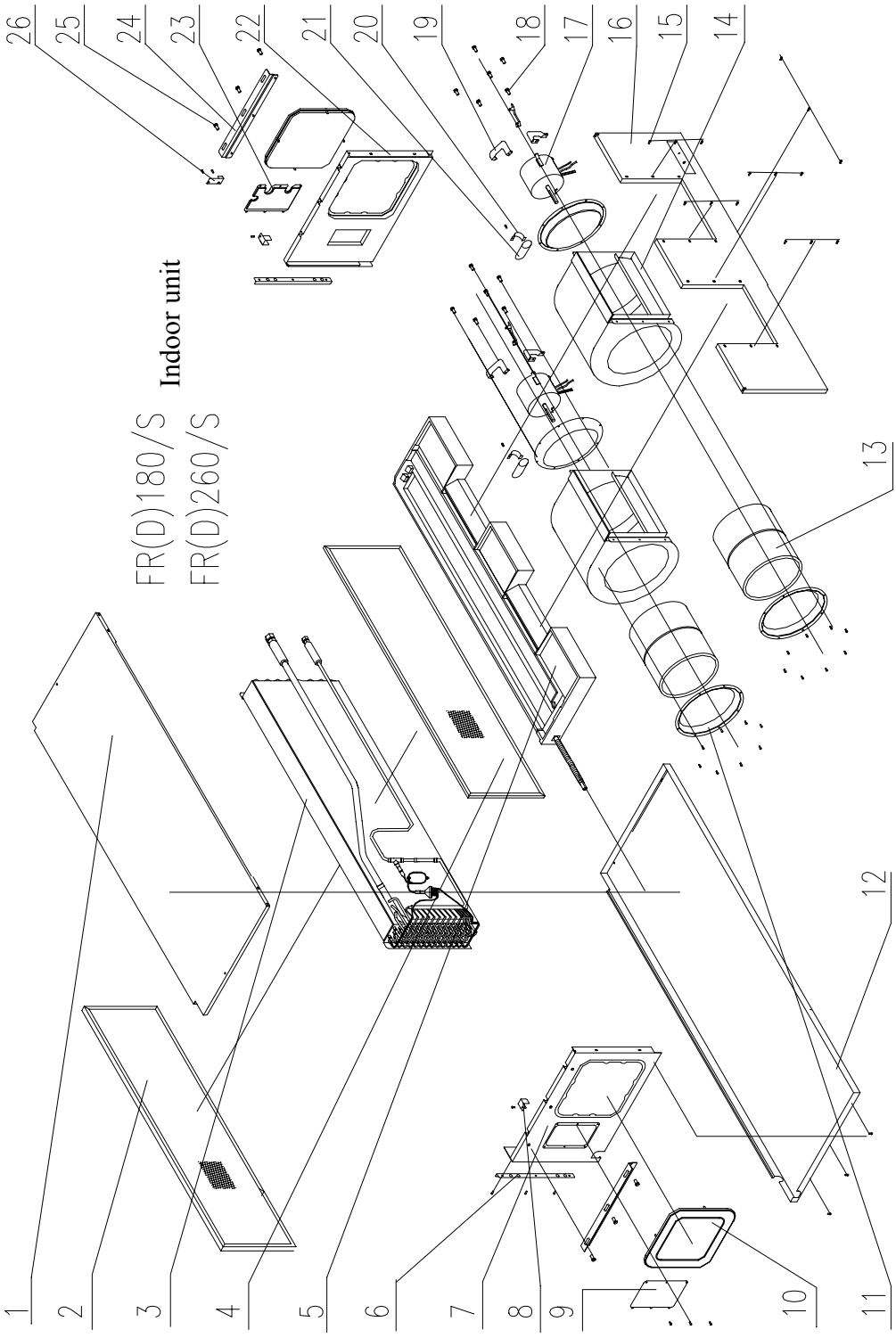
(3) Remove electric assembly 17;

(4) Remove reversing valve assembly 20;

(5) Remove compressor.

IX. Exploded view and dismantling sequence of indoor unit of FR(D)180/S and FR(D)260/S

1. Exploded view of indoor unit of FR(D)180/S and FR(D)260/S



Exploded view of indoor unit of FR(D)180/S and FR(D)260/S

2. Exploded view schedule of indoor unit of FR(D)180/S and FR(D)260/S

No.	Description	Remark
1	Top plate assembly	
2	Strainer I	
3	Evaporator assembly	
4	Strainer 2	
5	Water tray assembly	
6	Strainer retaining strip	
7	Left side plate assembly	
8	Fixing block	
9	Left small hole cover plate	
10	Square hole cover plate assembly	
11	Air intake	
12	Bottom plate assembly	
13	Impeller	
14	Spiral casing assembly	
15	Tapping screw ST4X12	
16	Front panel assembly	
17	Motor	
18	Bolt M6X16	
19	Motor fixing block	
20	Capacitor clip	
21	Capacitor	
22	Right side plate assembly	
23	Right small hole cover plate assembly	
24	Mounting strip	
25	Bolt with two washers	
26	Retainer	

3. Dismantling sequence of indoor unit of FR(D)180/S and FR(D)260/S

(1) Remove 1;

(2) Remove 2;

(3) Remove 8, 4;

(4) Remove 14, 16

(5) Remove 23;

(6) Remove 7;

(7) Remove 3;

(8) Remove 5;

(9) Remove 22.

Annex: Dismantling sequence of typical parts

Indoors right motor capacitor (seen from air exhaust):

(1) Loosen tapping screw on retainer 26, rotate retainer 26;

(2) Remove right small hole cover plate assembly 10

(3) Remove capacitor clip 20.

Indoors left motor capacitor (seen from air exhaust):

(1) Remove 1;

(2) Remove capacitor clip 20.

Indoor motor:

(1) Remove 1;

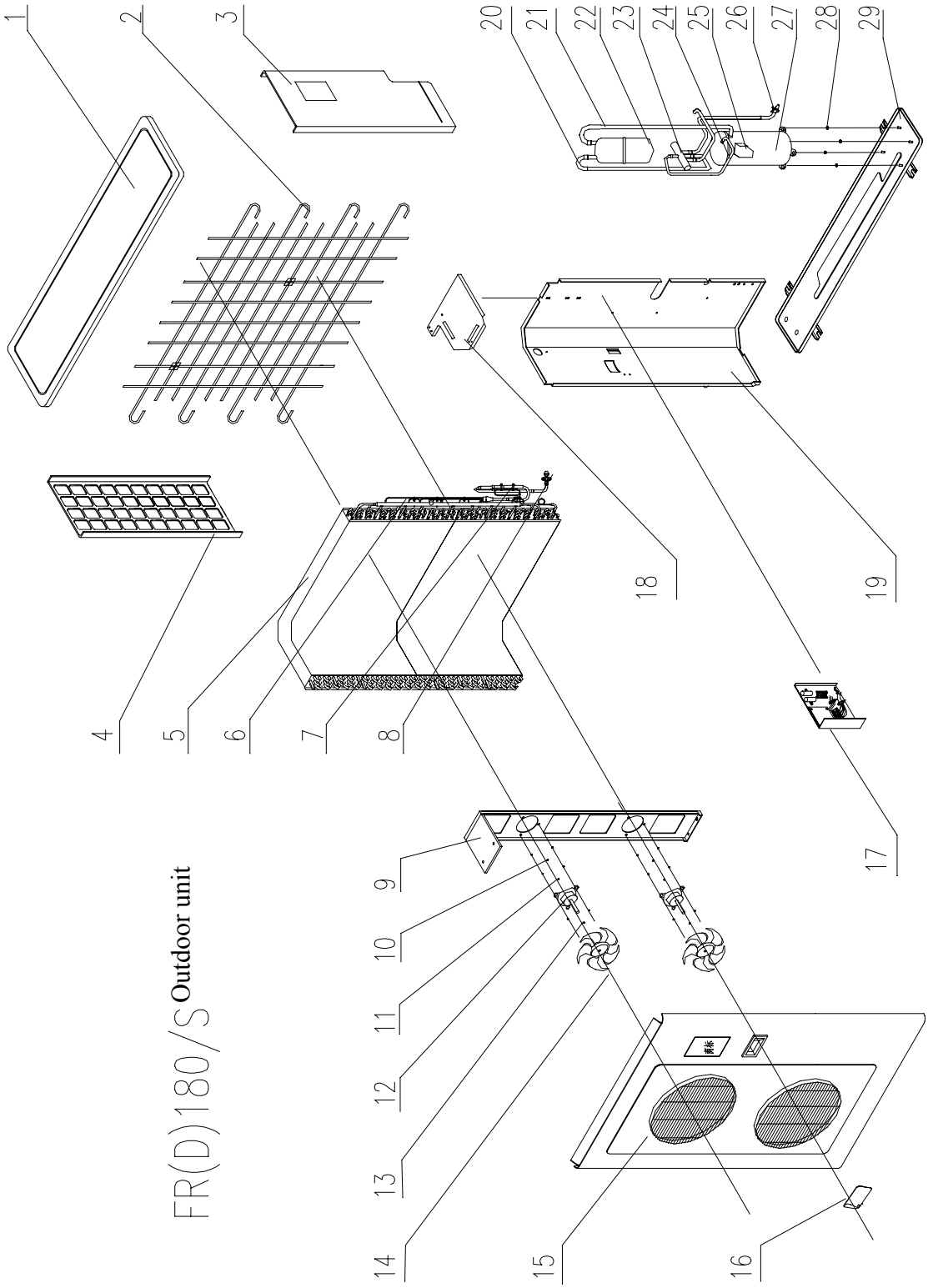
(2) Remove 14;

(3) Same method as for motor removal for FR(D)95 and FR(D)125/S.

Note: FRD180/S auxiliary electric heating box outline is the same as FRD95 auxiliary electric heating box; two such boxes are provided. FRD260/S auxiliary electric heating box outline is the same as FRD125/S auxiliary electric heating box; two such boxes are provided. Method of dismantling is the same as for FRD95 and FRD125/S auxiliary electric heating box.

X. Exploded view and dismantling sequence of outdoor unit of FR(D)180/S

1. FR(D)180/S outdoor unit exploded view



FR(D)180/S outdoor unit exploded view

2. FR(D)180/S outdoor unit exploded view schedule

No.	Description	Remark
1	Top cover assembly	
2	Air intake mesh assembly	
3	Left panel assembly	
4	Right panel assembly	
5	Condenser	
6	Capillary assembly	
7	Manifold assembly	
8	Valve Dg10	
9	Motor support	
10	Flat washer 5	
11	Spring washer 5	
12	Motor	
13	Nut M5	
14	Axial flow fan	
15	Front panel assembly	
16	Handle	
17	Electric assembly	
18	Cover plate	
19	Baffle plate	
20	Connecting pipe	
21	Air exhaust pipe	
22	Steam/water separator	
23	Reversing valve assembly	
24	Air suction pipe	
25	Compressor junction box cover	
26	Valve Dg19	
27	Compressor	
28	Damper ring	
29	Chassis assembly	

3. FR(D)180/S outdoor unit dismantling sequence

(1) Remove 1;

(2) Remove 2;

(3) Remove 3 and 4 respectively;

(4) Remove 15;

(5) Remove 14 and 9 respectively;

(6) Remove 18 and 17 respectively;

(7) Remove 5 and 19 respectively;

(8) Remove 20 and 27.

Annex: Dismantling sequence of typical parts

A. Outdoor electric assembly

(1) Remove top cover 1;

(2) Remove right panel assembly 4;

(3) Remove cover plate 18 on electric assembly 17.

B. 室外电机

(1) Remove top cover assembly 1;

(2) Remove left panel assembly 3 and right panel assembly 4 respectively;

(3) Remove front panel assembly 15;

(4) Remove fan 14;

(5) Unplug motor 12 and remove the motor.

C. Outdoor compressor

(1) Remove top cover assembly 1;

(2) Remove right panel assembly 4;

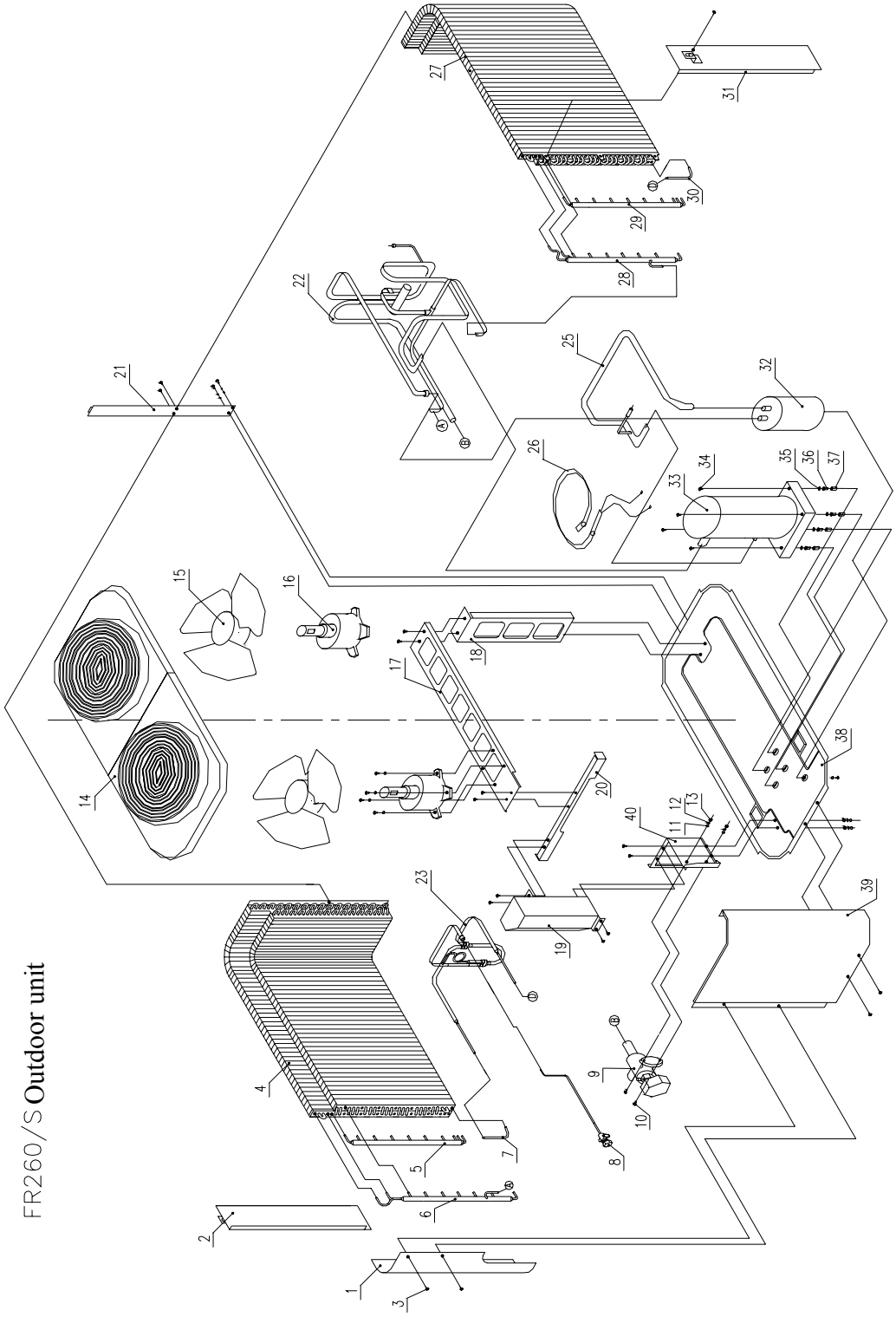
(3) Remove electric assembly 17;

(4) Remove reversing valve assembly 20;

(5) Remove compressor.

XI. FR(D)260/S outdoor unit exploded view and dismantling sequence

1. FR(D)260/S outdoor unit exploded view and dismantling sequence



FR(D)260/S outdoor unit exploded view

2. FR(D)260/S outdoor unit schedule

No.	Description	QTY	No.	Description	QTY
1	Maintenance plate	1	21	Support plate assembly	1
2	Left side plate	1	22	Reversing valve assembly	1
3	Tapping screw		23	One-way valve assembly	1
4	Left condenser	1	24	------	--
5	Left air intake assembly	1	25	Air suction pipe assembly	1
6	Left air exhaust pipe ASSY	1	26	Electric heating band	2
7	Connector assembly	1	27	Right condenser	1
8	HP valve assembly	1	28	Right air intake pipe assembly	1
9	LP valve assembly	1	29	Right air exhaust pipe assembly	1
10	Bolt M8×30	12	30	Connector assembly	1
11	Washer 8	12	31	Right side plate assembly	1
12	Spring washer	8	32	Air/water separator	1
13	Nut	8	33	Compressor	1
14	Air hood assembly	2	34	Bolt M8×50	4
15	Axial flow fan	2	35	Washer 8	4
16	Motor	2	36	Liner tube	4
17	Motor support	1	37	Damper	4
18	Support assembly	1	38	Chassis	1
19	Control box	1	39	Enclosing plate	1
20	Support strip assembly	1	40	Fixing plate	1

3. FR(D)260/S outdoor unit dismantling sequence

(1) Remove 14, 1 and 39;

(2) Remove 2, 31, 21, 20, 19;

(3) Remove fan assembly (15, 16, 17);

(4) Remove 4, 27, 18, 8;

(5) Remove 10, 22, 23, 25;

(6) Remove 33, 32 respectively.

Chapter III Main technical parameters

I. Main technical parameters of FRD23-B, FRD35-B and FRD50-B

Model		FRD23－B	FRD35－B	FRD50－B
Rated cooling capacity W		2300	3500	5000
Rated heating capacity W		2300(850)	3500(1200)	5000(1500)
Power supply		220V～50Hz		
Rated input Power/Curr	Cooling W/A	890/4.1	1340/6.2	1950/8.9
	Heating W/A	790(850)/3.6(4.0)	1320(1200)/6.0(5.5)	1850(1500)/8.4(6.8)
Air flow (indoor unit) m^3/h		420	600	800
Static exhaust air pressure Pa		20		
Mass	Indoor unit kg	24	25.5	28
	Outdoor unit kg	28	35	52
Noise	Indoor unit dB(A)	≤38	≤44	≤48
	Outdoor unit dB(A)	≤50	≤52	≤56
Refrigerant kg		R22/0.71	R22/1.24	R22/1.6
Connecting pipe size	Liquid pipe mm	φ6		
	Air pipe mm	φ10	φ12	
Air exhaust size mm		128×722		128×922
Return air port size mm		170×680		170×880
Fresh air port size mm		100×100		
Outline L×W×H	Indoor unit mm	888×466×234		1088×466×234
	Outdoor unit mm	650×250×551		800×252×646

Notes: 1. Experimental conditions:

(1) Length of connecting pipe for test: 5m;

(2) Refrigeration conditions (normal): indoor dry bulb 27℃, wet bulb 19℃; Outdoor dry bulb 35℃, wet bulb 24℃;

(3) Heating conditions (normal): indoor dry bulb 20℃, wet bulb 15℃; outdoor dry bulb 7℃, wet bulb 6℃;

(4) Static pressure is 20Pa

2. Operating environment (T):

Cooling: 15℃＜T＜32℃ (indoor) Heating: 12℃＜T＜27℃ (indoor)

18℃＜T＜43℃ (outdoor) -7℃＜T＜24℃ (outdoor)

3. Value in "( )" is nominal value of auxiliary electric heating;

4. Return air port size based on optional return air box size.

II. Main technical parameters for FR(D)71-B and FR(D)100-B

Model		FR71-B	FRD71-B	FR100-B	FRD100-B
Rated cooling capacity		7100W		10000W	
Rated heating capacity		7500W	7500（2300）W	10500W	10500（2300）W
Power supply		220V～50Hz			
Rated input power	Cooling	2760W		3900W	
	Heating	2420W		3100W	
Rated input current	Cooling	13.4A		17.8A	
	Heating	11.8 A	11.8(10.5) A	14.2 A	14.2(10.5) A
Air circulation flow		1500 m^3/h		2000 m^3/h	
Air exhaust static pressure		30Pa			
Indoor unit noise		54dB(A)		56dB(A)	
Outdoor unit noise		60 dB(A)		62dB(A)	
Mass	Indoor unit	44 Kg	46 Kg	60 Kg	62 Kg
	Outdoor unit	78 Kg		85 Kg	
Filling of refrigerant		R22/2.7 Kg		R22/3.3 Kg	
Conn. pipe size (user)	Liquid pipe	Liquid pipe Φ10×1			
	Steam pipe	Steam pipe Φ16×1			
Outline W×D×H	Ind. unit mm	1260×555×226 mm		1880×555×226 mm	
	Outd Unit mm	950×370×746 mm		950×420×853 mm	

Notes:

(1) Length of connecting pipe for test: 7.5m

(2) Operating environment (T):

Cooling: 15℃＜T＜32℃ (indoor)

18℃＜T＜43℃ (outdoor)

Heating: 12℃＜T＜27℃ (indoor)

-7℃＜T＜24℃ (outdoor)

(3) Value in “( )” is nominal value for auxiliary electric heating.

III. Main technical parameters of FR95-C and FR125-C/S

Model		FR95-C	FR125-C/S
Cooling capacity		9500W	12500W
Heating capacity		11000W	15000W
Power supply		220V～50Hz	380V 3N～50Hz
Rated input power	Cooling	3700W	4600W
	Heating	3500W	4200W
Rated input current	Cooling	18.1A	8.1A
	Heating	17.2A	7.4A
Air circulation (indoor unit)		2000m^3/h	2200m^3/h
Exhaust air static pressure		50Pa	50Pa
Indoor unit noise		52dB(A)	54dB (A)
Outdoor unit noise		62dB(A)	64dB(A)
R22 filling amount		2.95Kg	3.2Kg
Climate type		T1	
Remote control		Yes	
Mass	Indoor unit	47Kg	52Kg
	Outdoor unit	85Kg	95Kg
Size of ID/OD connecting pipe (user supplied)		Liquid pipe φ10×1	Liquid pipe φ10×1
		Steam pipe φ16×1	Steam pipe φ19×1.5
Connecting nut		LP M16×1.5m SP M22×1.5	LP M16×1.5 SP M27×2
Outline W×D×H	Indoor unit mm	1150×750×285mm	1150×750×285mm
	Outdoor unit	950×360×853mm	950×360×853mm

Notes:

(1) Length of connecting pipe for test: 7.5m

(2) Operating environment (T):

Cooling: 15℃＜T＜32℃ (indoor)

18℃＜T＜43℃ (outdoor)

Heating: 12℃＜T＜27℃ (indoor)

-7℃＜T＜24℃ (outdoor)

IV. Main technical parameters of FR(D)95 and FR(D)125/S

Model		FR95	FRD95	FR125/S	FRD125/S
Cooling capacity		9500W		12500W	
Heating capacity		11000W	11000(3000)W	15000W	15000(4500)W
Power supply		220V～50Hz		380V 3N～50Hz	
Rated input power	Cooling	3950W		4900W	
	Heating	3500W	3500(3000)W	4500W	4500(4500)W
Rated input current	Cooling	18.2A		8.6A	
	Heating	16A	16(13.7A)	8A	8(6.9A)
Air circulation (indoor unit)		1900m^3/h		2700m^3/h	
Exhaust air static pressure		76Pa		127Pa	
Indoor unit noise		61dB(A)		64dB(A)	
Outdoor unit noise		62dB(A)		64dB(A)	
R22 filling amount		2.95Kg		3.2Kg	
Climate type		T1			
Remote control		Yes			
Mass	Indoor unit	35Kg		43Kg	
	Outdoor unit	85Kg		95Kg	
Size of ID/OD connecting pipe (user supplied)		Liquid pipe φ10×1		Liquid pipe φ10×1	
		Steam pipe φ16×1		Steam pipe φ19×1.5	
Connecting nut		LP M16×1.5 SP M22×1.5		LP M16×1.5 SP M27×2	
Outline W×D×H	Indoor unit mm	655×618×400mm		865×618×400mm	
	Outdoor unit	950×360×853mm		950×360×853mm	

Notes:

(1) Length of connecting pipe for test: 7.5m

(2) Operating environment (T):

Cooling: 15℃＜T＜32℃ (indoor)

18℃＜T＜43℃ (outdoor)

Heating: 12℃＜T＜27℃ (indoor)

-7℃＜T＜24℃ (outdoor)

(3) Value in "( )" is nominal value for auxiliary electric heating.

V. Main technical parameters of FR(D)180/S and FR(D)260/S

Model		FR180/S	FRD180/S	FR260/S	FRD260/S
Cooling capacity		18000W		26000W	
Heating capacity		20000W	20000(6000)W	28000W	28000(9000)W
Power supply		380V 3N～50Hz 380V 3N-50Hz			
Operating voltage range		342-418V			
Rated input power	Cooling	6500W		11000W	
	Heating	6200W	6200(6000)W	9500W	9500(9000)W
Rated input current	Cooling	11.5A		18.9A	
	Heating	11A	11(9)A	16.4A	16.4(13.6)A
Air circulation (indoor U)		3700m^3/h		4600m^3/h	
Exhaust air static pressure		76Pa		127Pa	
Indoor unit noise		63dB(A)		66dB(A)	
Outdoor unit noise		65dB(A)		68dB(A)	
R22 filling amount		5.8Kg		11.5Kg	
Climate type		T1			
Remote control		Yes			
Mass	Indoor unit	65Kg 46		85Kg 62	
	Outdoor unit	150Kg		190Kg	
Size of ID/OD connecting pipe (user supplied)		Liquid pipe Φ12×1		Liquid pipe Φ16×1	
		Steam pipe Φ22×1.5		Steam pipe Φ28×1.5	
Connecting nut		LP M18×1 SP M30×2		LP M22×1.5 SP M36×2	
Outline W×D×H	Ind. unit mm	1309×618×400mm		1800×618×400mm	
	OD unit mm	950×392×1160mm		1450×750×964mm	

Notes:

(1) Length of connecting pipe for test: 7.5m

(2) Operating environment (T):

Cooling: 15℃＜T＜32℃ (indoor)

18℃＜T＜43℃ (outdoor)

Heating: 12℃＜T＜27℃ (indoor)

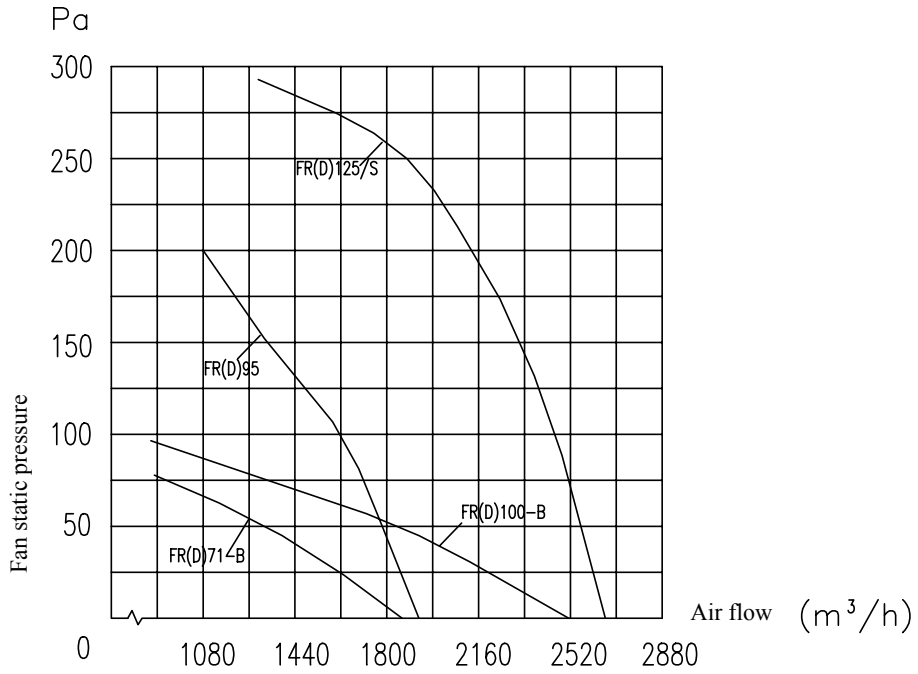
-7℃＜T＜24℃ (outdoor)

(3) Value in "( )" is nominal value for auxiliary electric heating

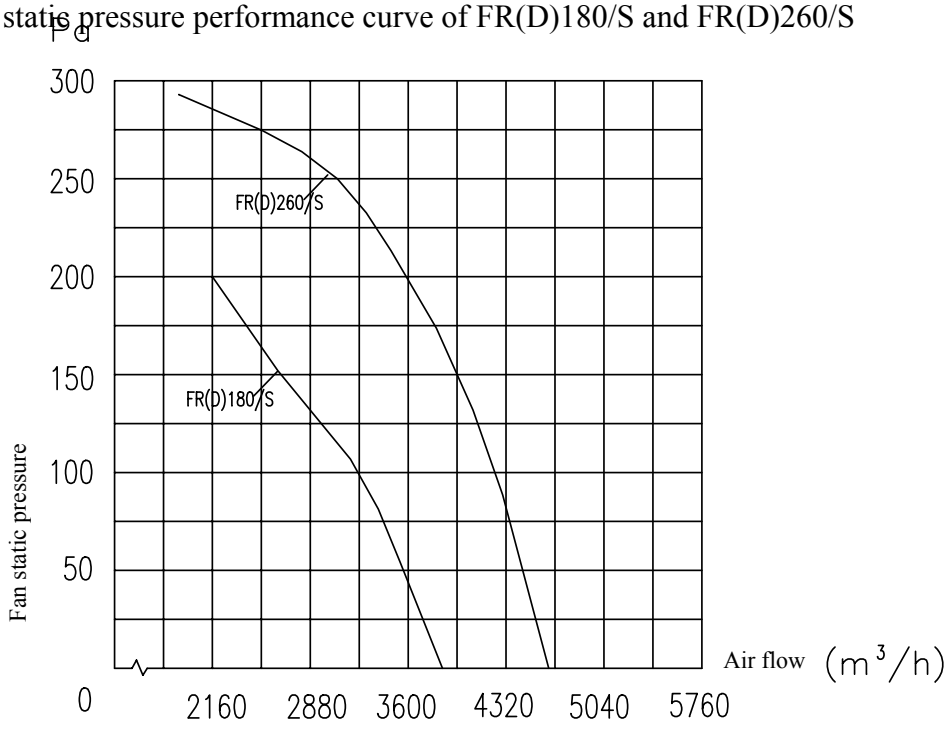
Chapter IV Performance curve

I. Air flow static pressure performance curve

1. Air flow static pressure performance curve for FR(D)71-B, FR(D)100-B, FR(D)95 and FR(D)125/S

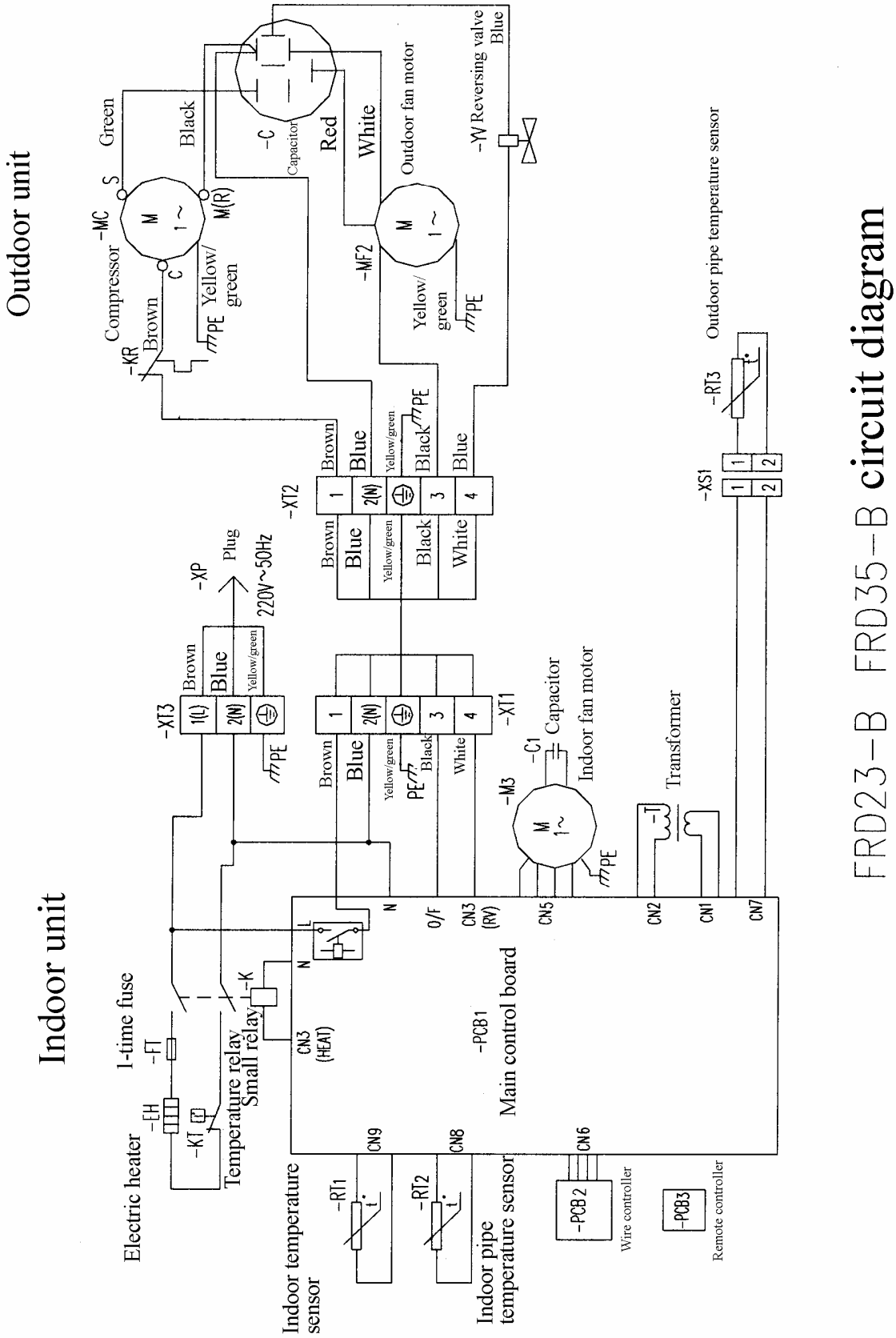


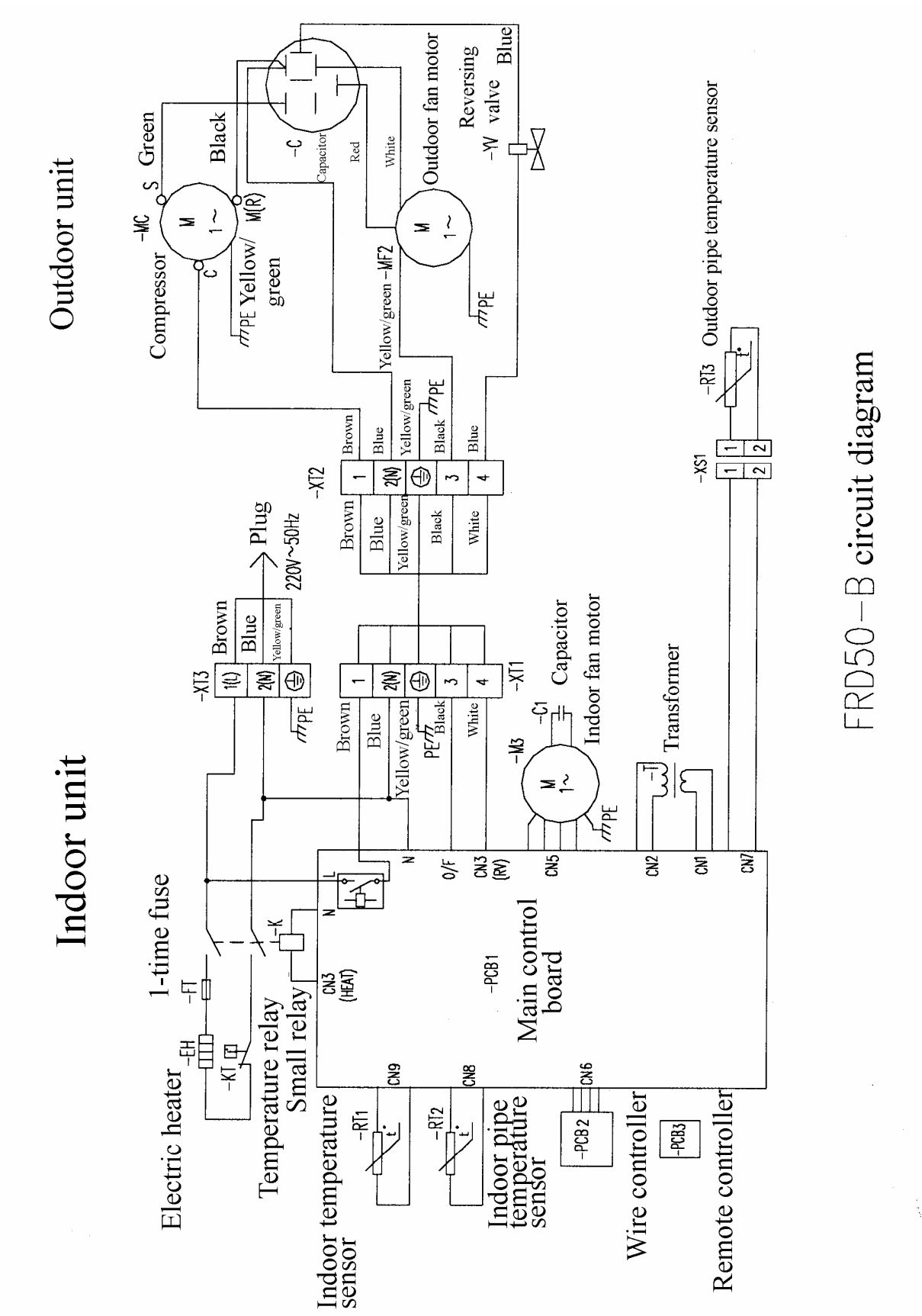
2. Air flow static pressure performance curve of FR(D)180/S and FR(D)260/S



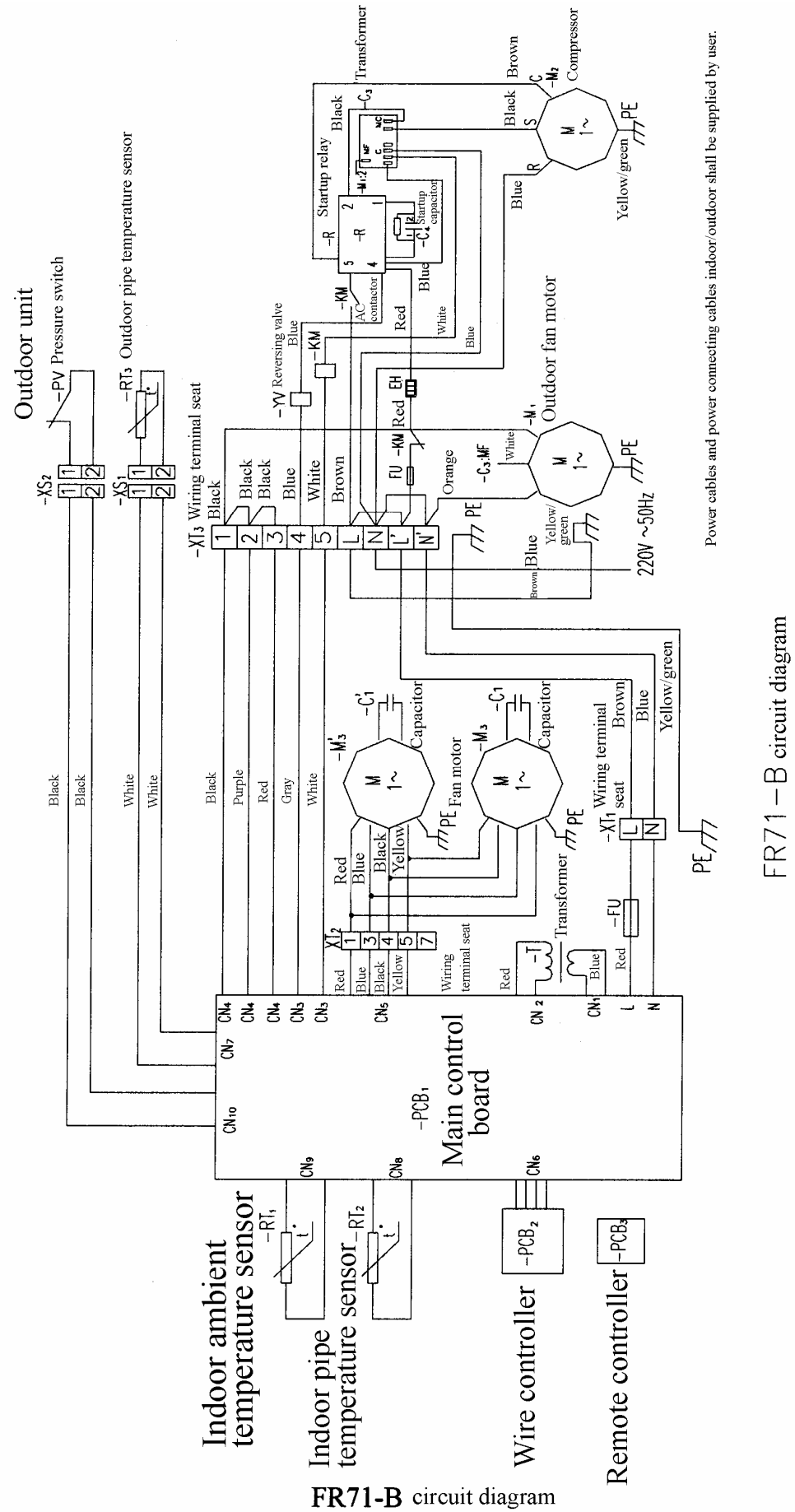
Chapter V Circuit diagrams

I. Circuit diagrams



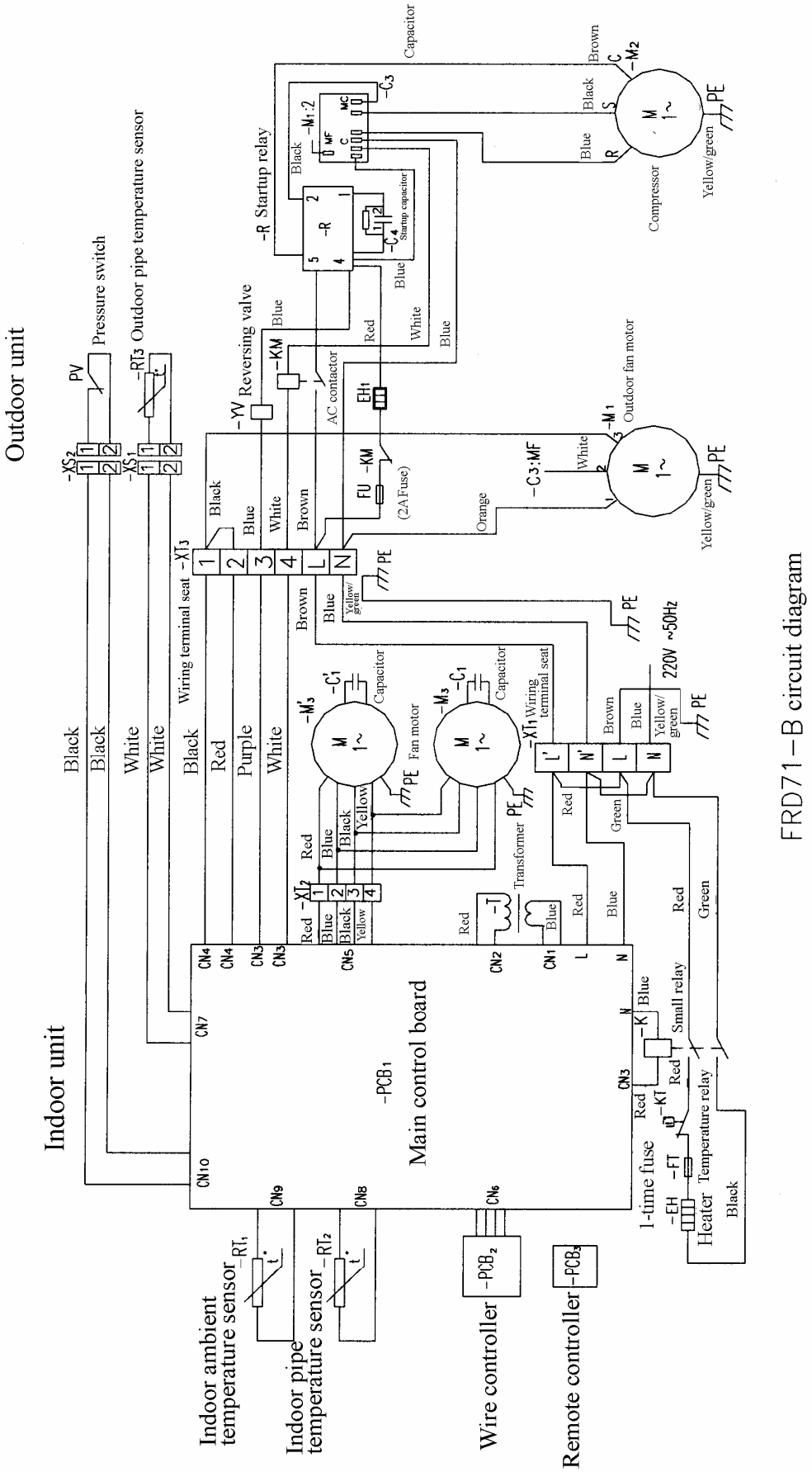


FRD50-B circuit diagram

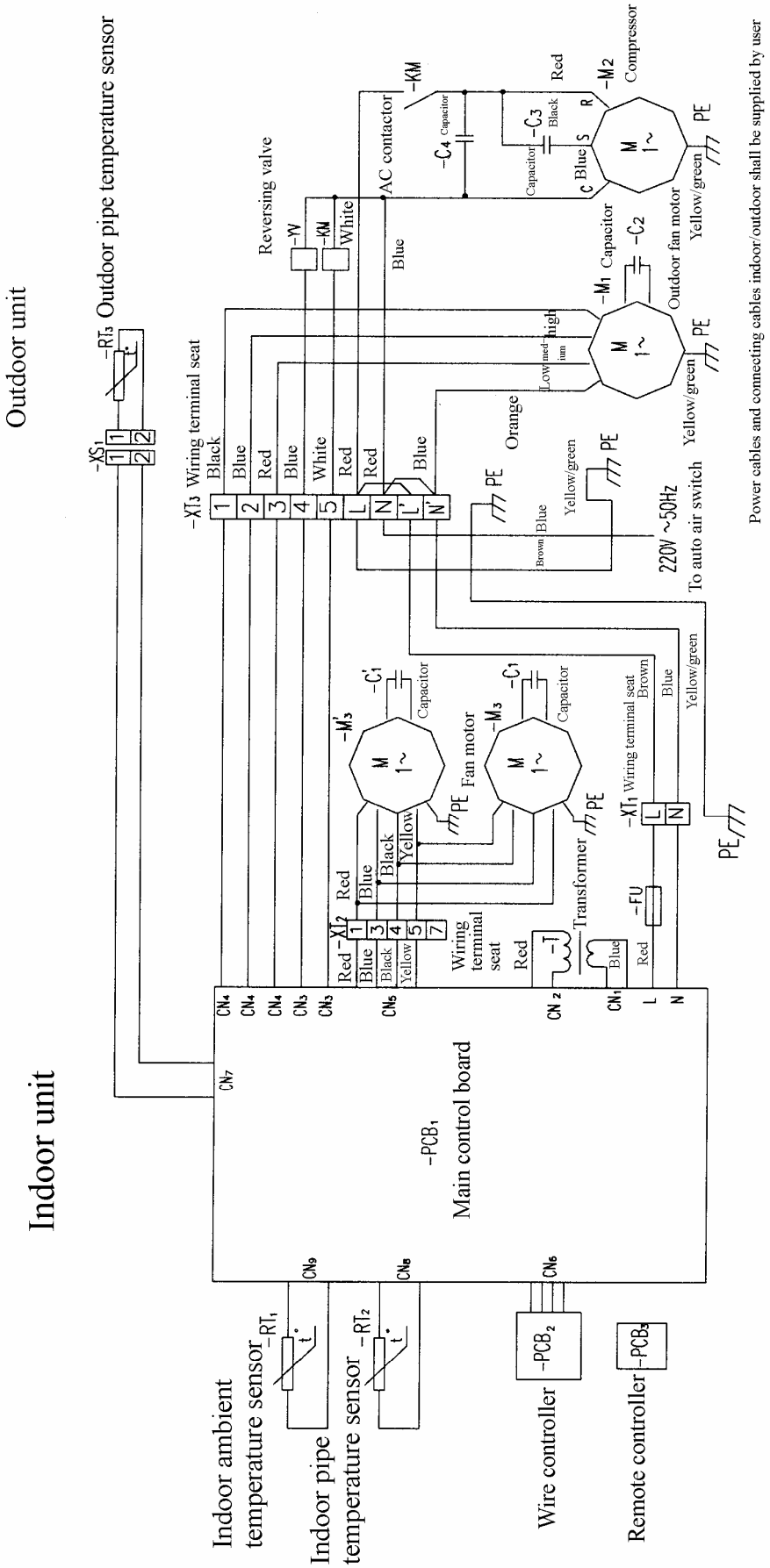


FR71－B circuit diagram

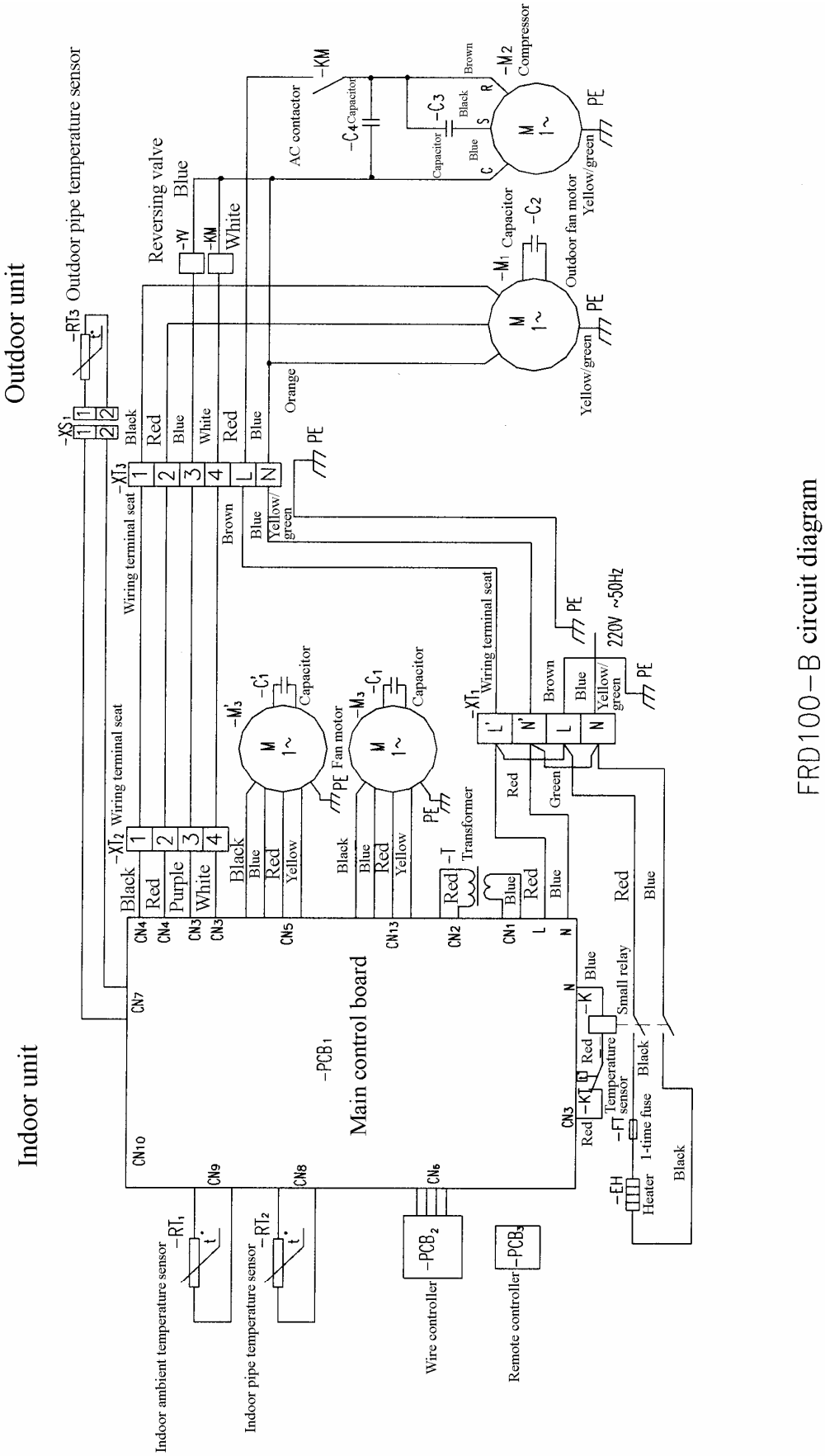
FR71-B circuit diagram



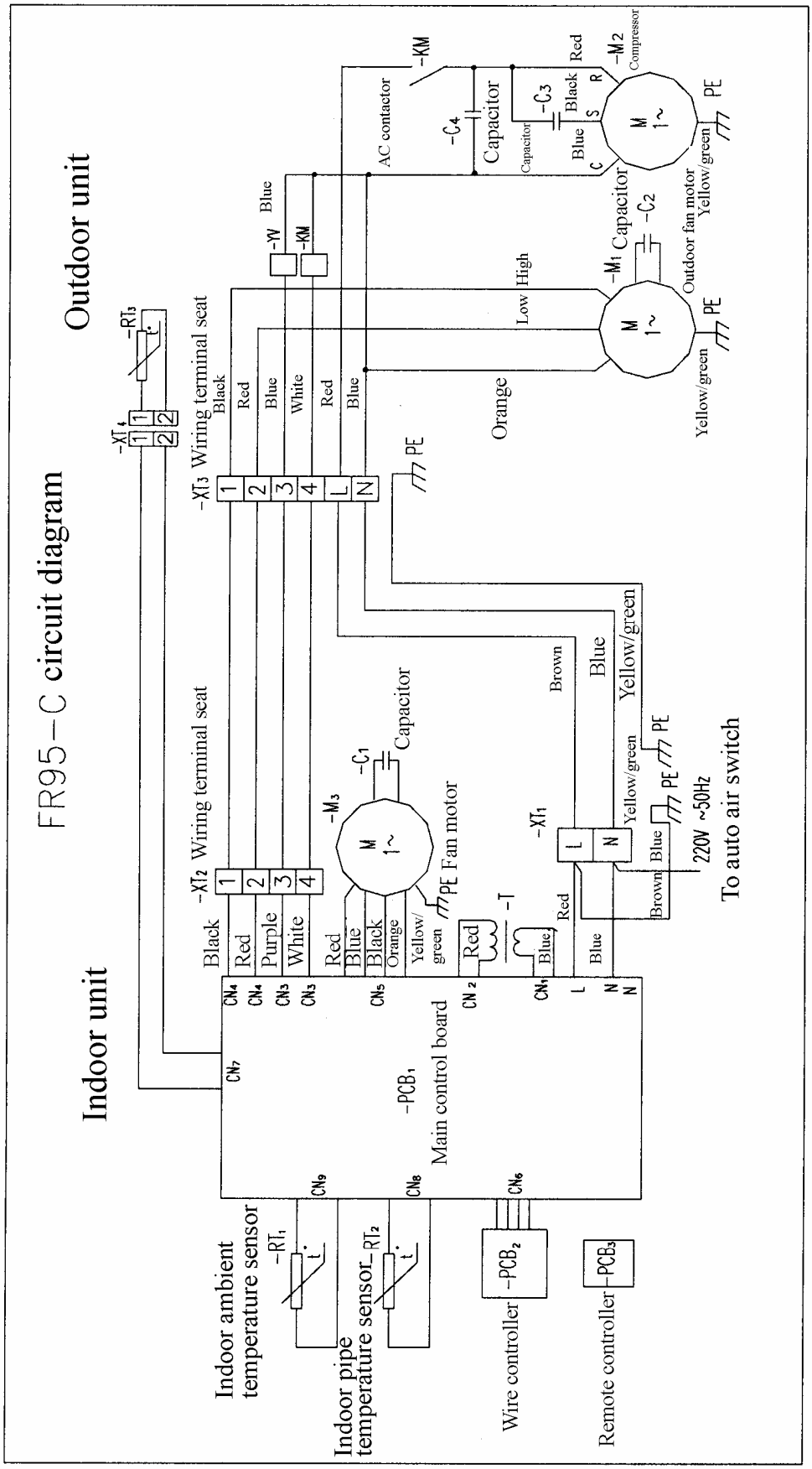
FRD71-B circuit diagram



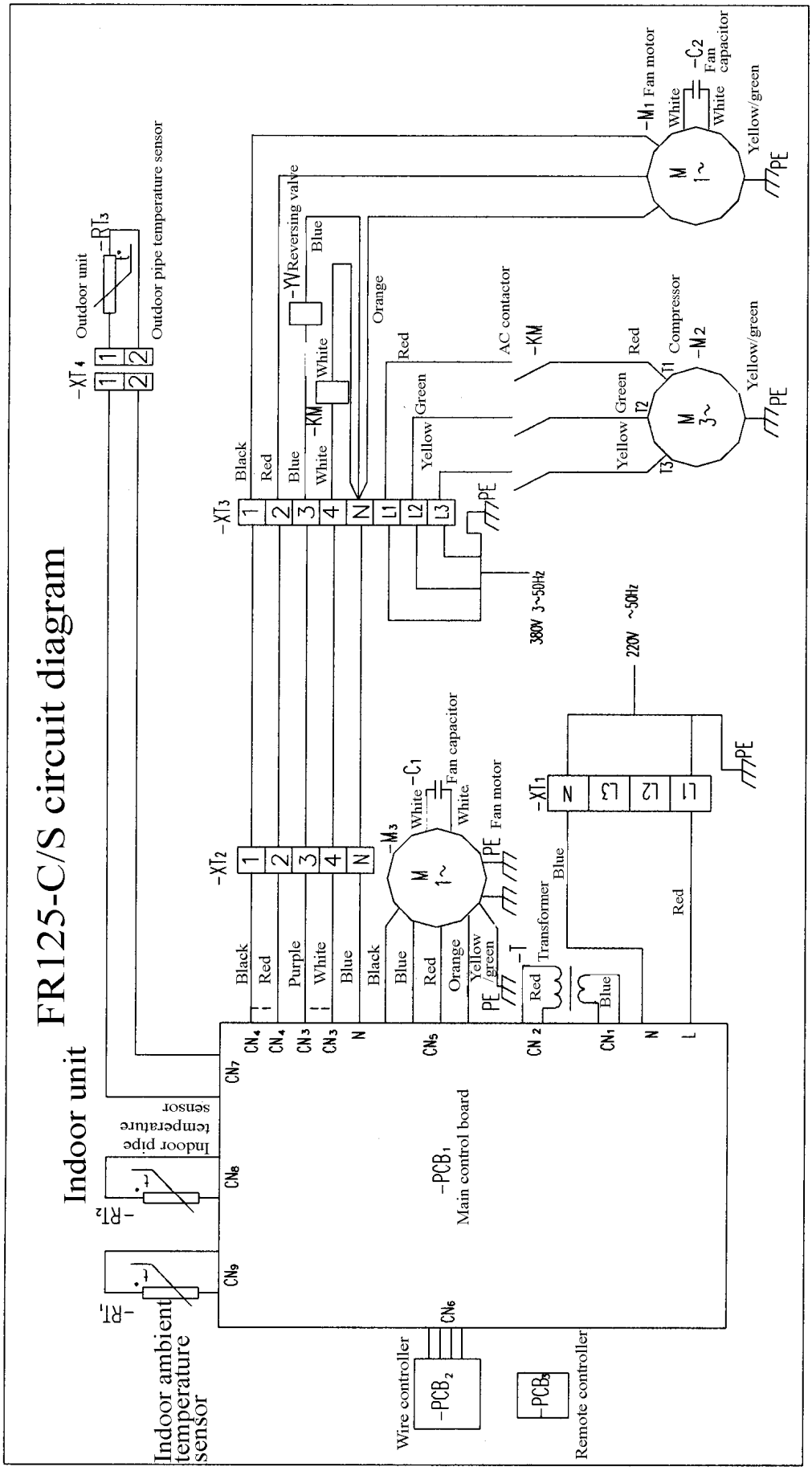
FR100-B circuit diagram

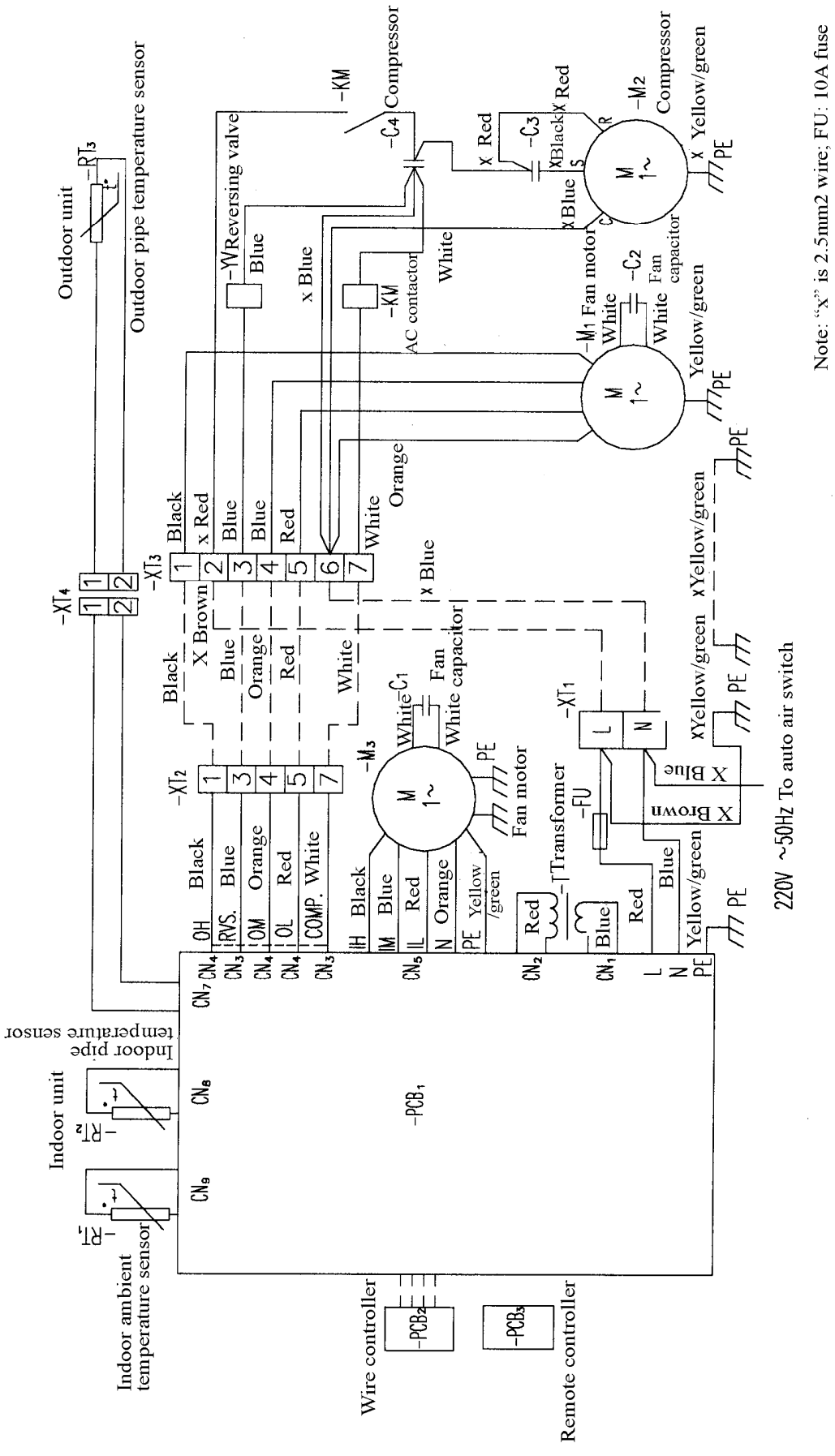


FRD100-B circuit diagram



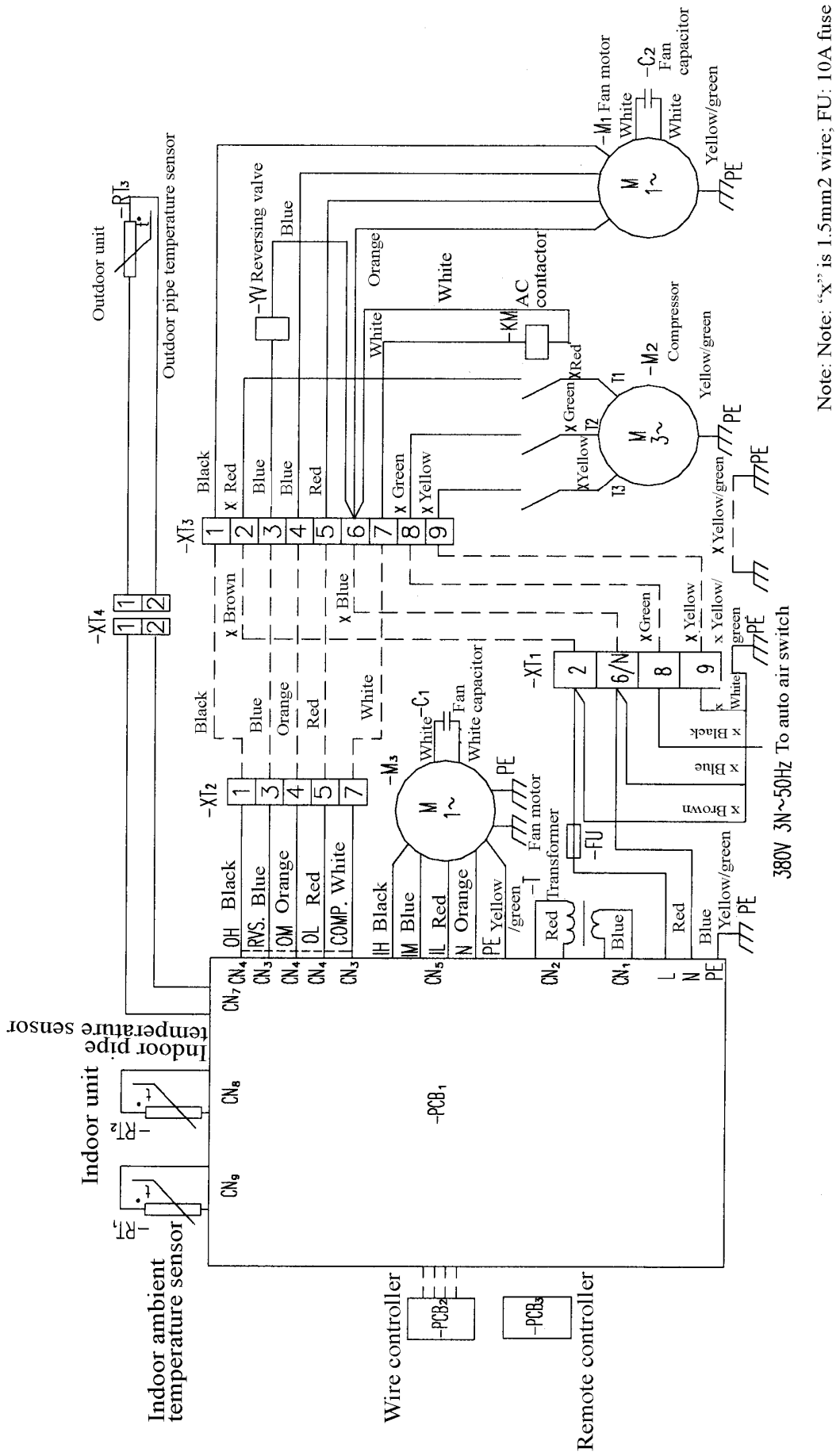
FR95-C circuit diagram


FR125-C/S circuit diagram
Indoor unit
Outdoor unit
Outdoor pipe temperature sensor
Indoor pipe temperature sensor
Indoor ambient temperature sensor
Main control board
Wire controller
Remote controller
Reversing valve
AC contactor
Compressor
Fan motor
Fan capacitor
Transformer
380V 3~50Hz
220V ~50Hz



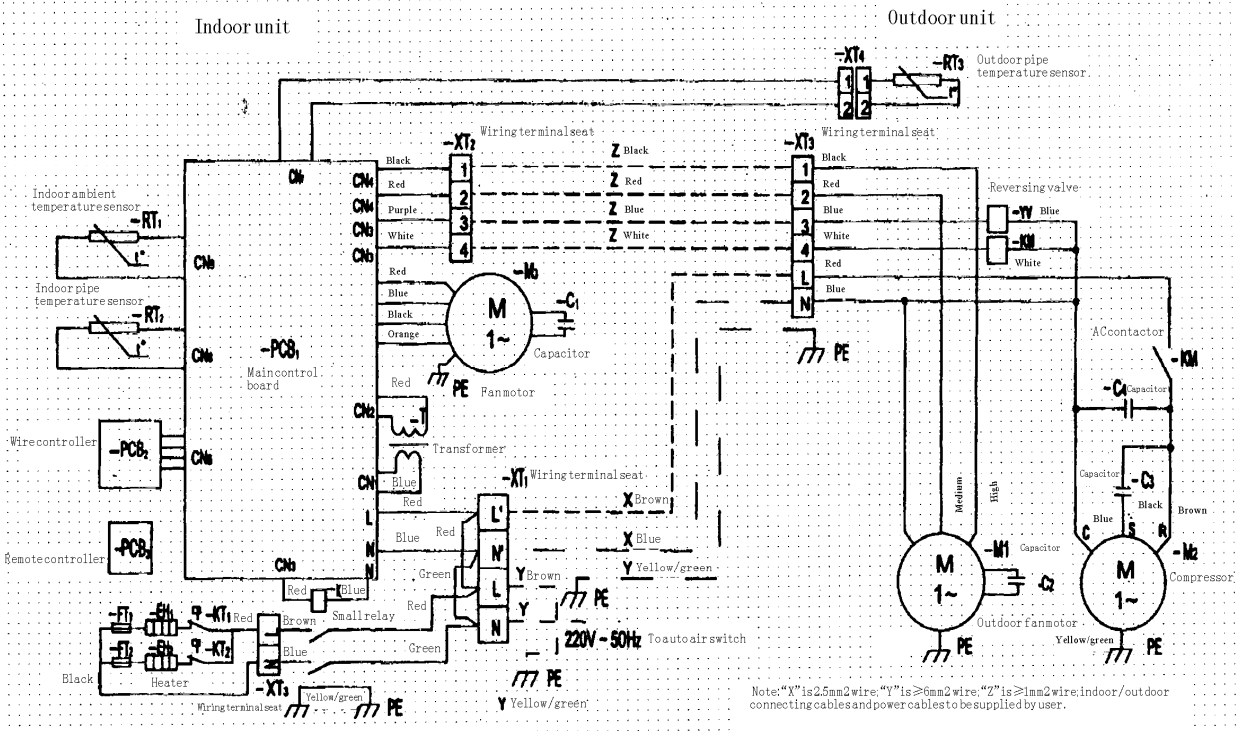
FR95 circuit diagram

Note: "x" is 2.5mm2 wire; FU: 10A fuse



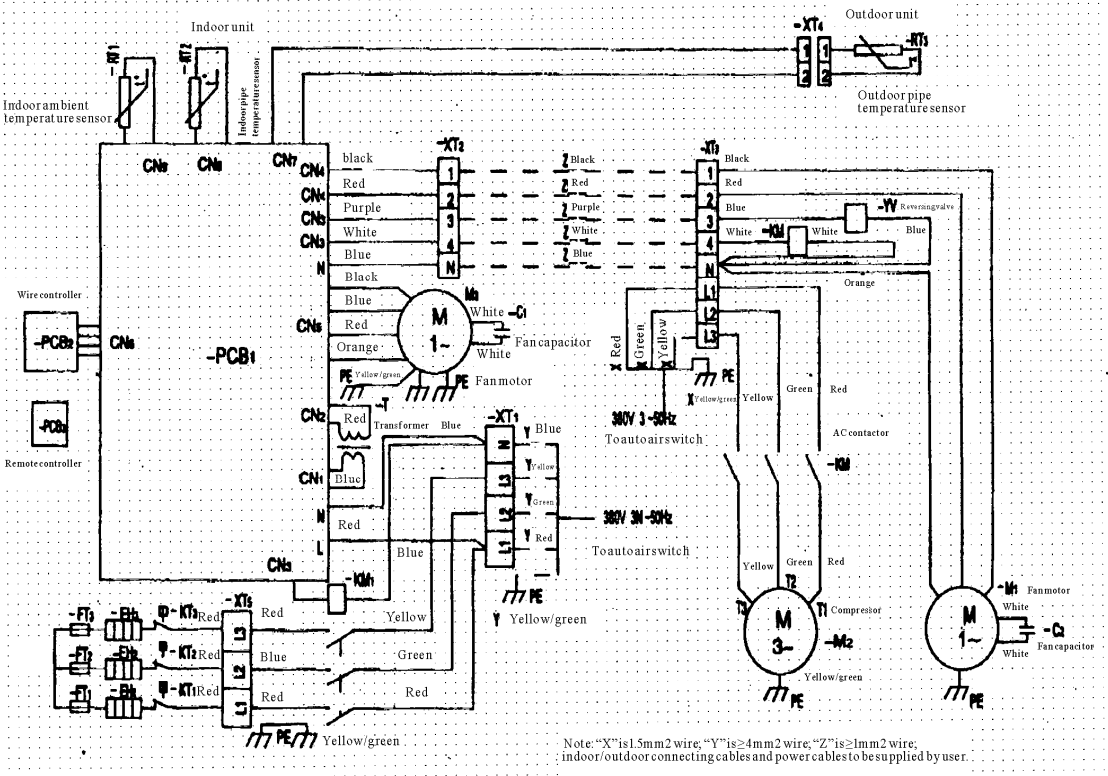
FR125/S circuit diagram

Note: Note: "x" is 1.5mm2 wire; FU: 10A fuse

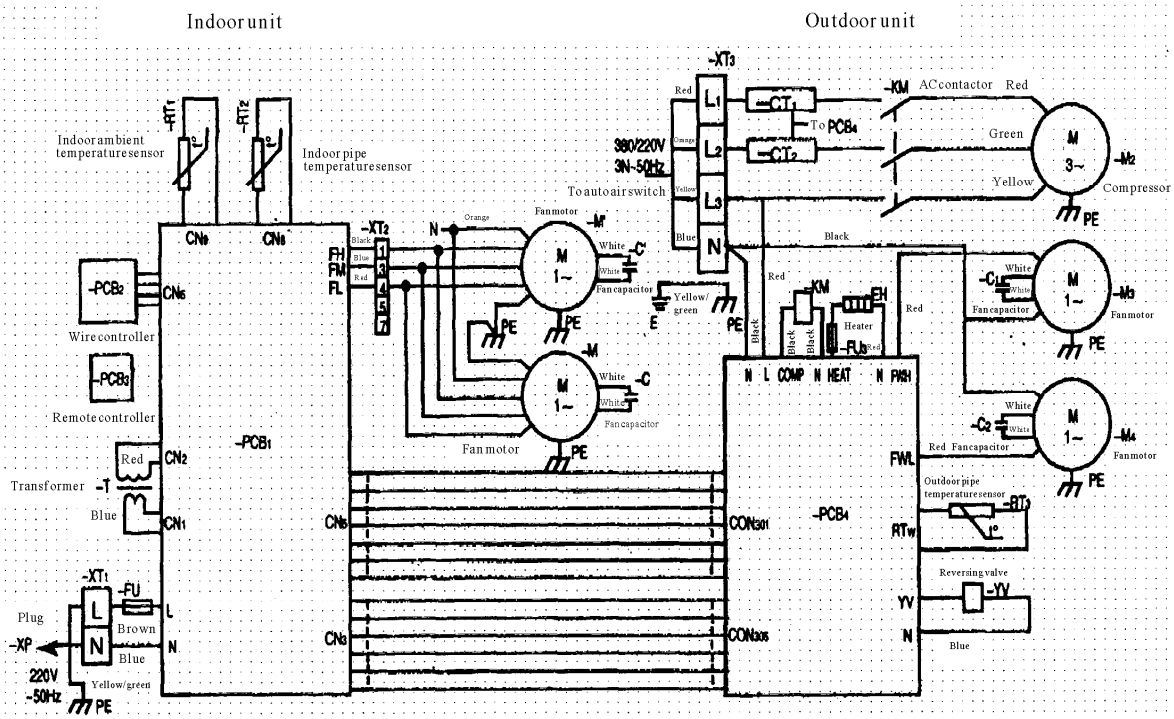


FRD95 circuit diagram

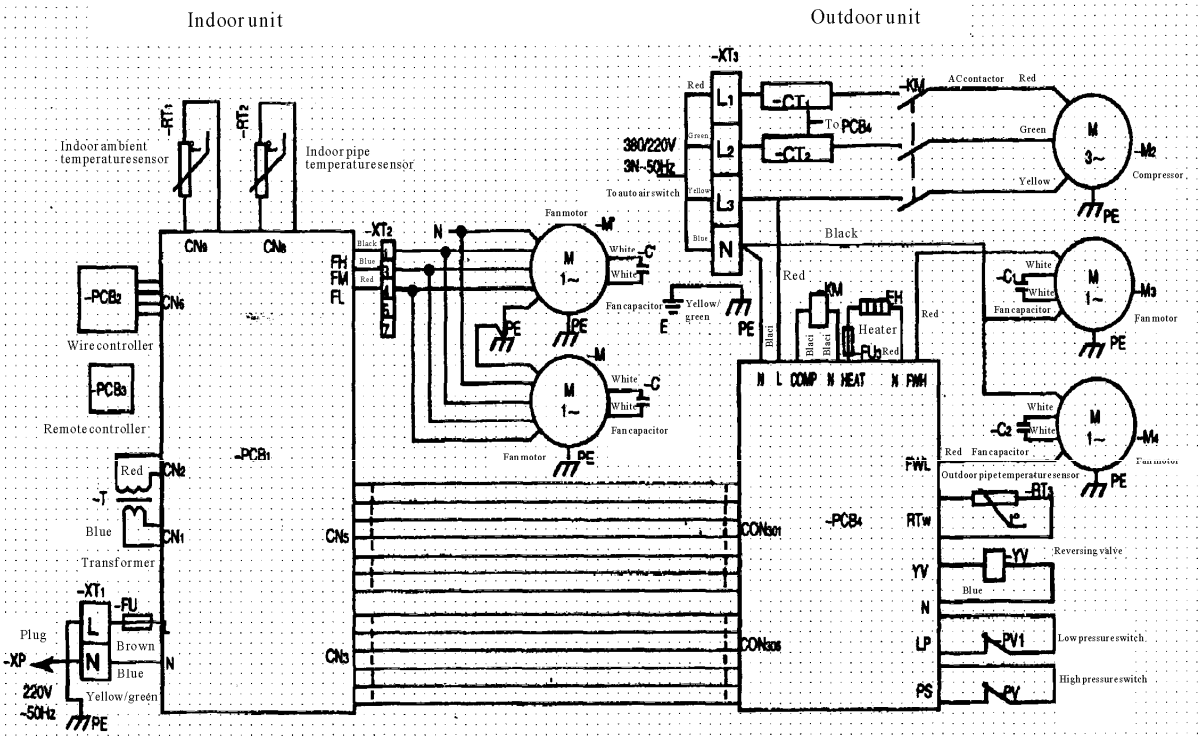
Note: Rated current of FRD95 unit is 30A. Please select single pole auto air switch of 100A rated current of 40A setting.



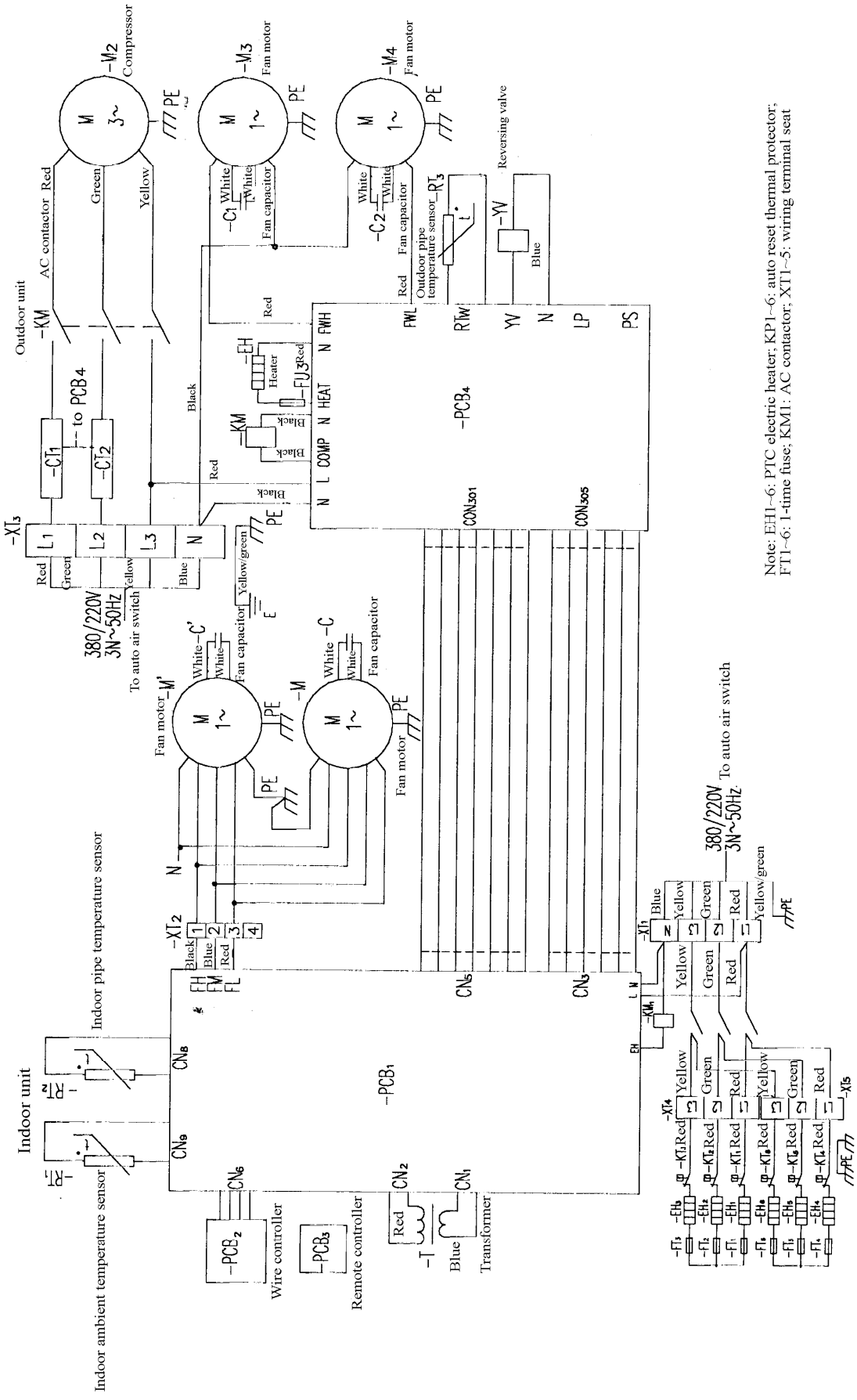
FRD125/Sc circuit diagram



FR180/S circuit diagram

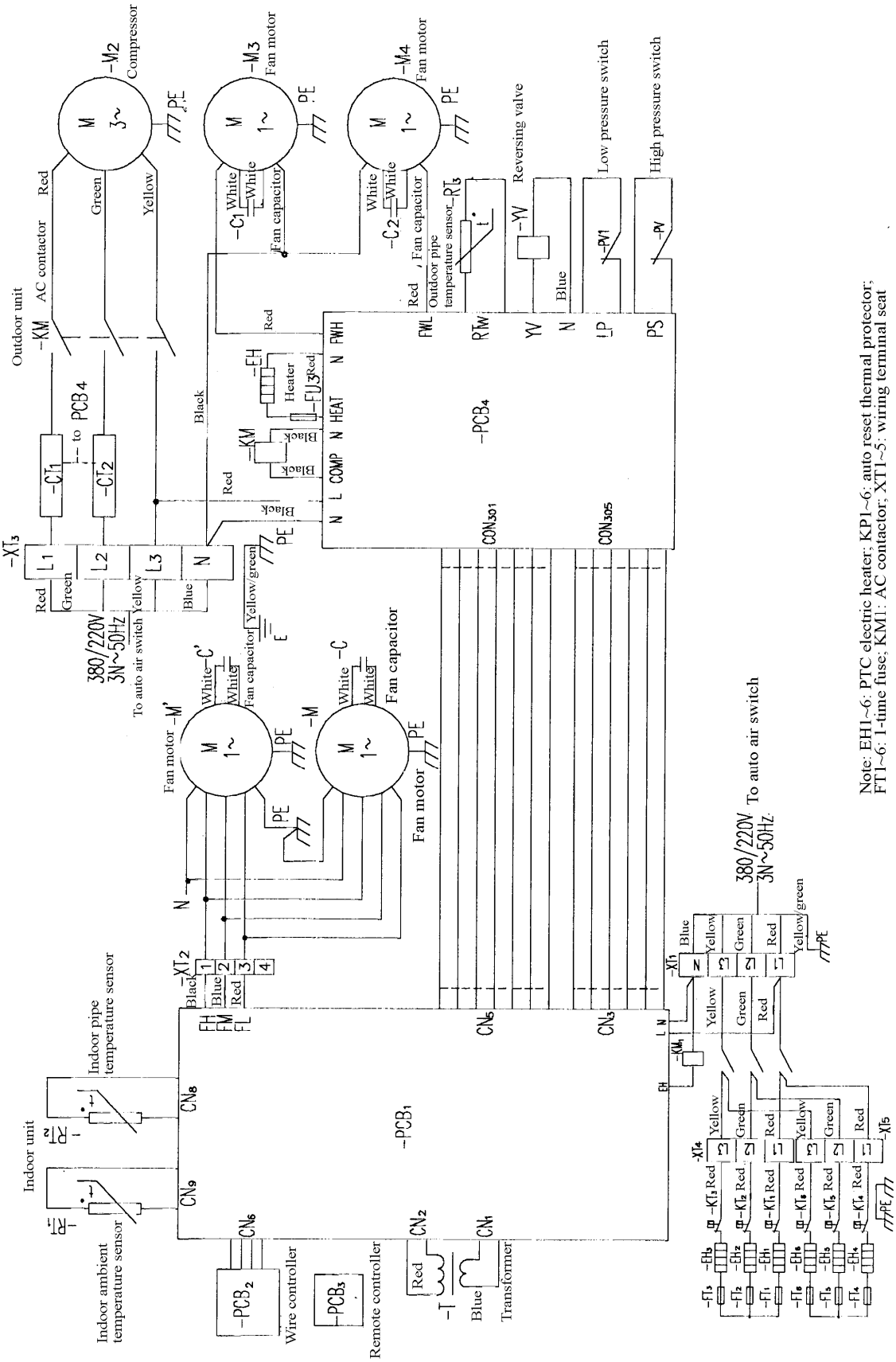


FR260/S circuit diagram



Note: EH1~6: PTC electric heater; KP1~6: auto reset thermal protector;
FT1~6: 1-time fuse; KM1: AC contactor; XT1~5: wiring terminal seat

FRD180/S circuit diagram



Note: EH1~6: PTC electric heater; KP1~6: auto reset thermal protector;
FT1~6: 1-time fuse; KM1: AC contactor; XT1~5: wiring terminal seat

FRD260/S circuit diagram

II. Numbers and meanings of each signal line & terminal

1. Signal line terminals for FRD23-B and FRD35-B

(1) Brown	Compressor
(2) Blue	Power supply line N
(3) Yellow/green	Earthing line
(4) Black	Outdoor motor
(5) White	Reversing valve coil

2. FRD50-B signal line terminals

(1) Brow	Compressor
(2) Blue	Power supply line N
(3) Yellow/green	Earthing line
(4) Black	Outdoor motor
(5) Red	Reversing valve coil

3. FR71-B signal line terminals

(1) Black	Outdoor fan motor
(2) Purple	Outdoor fan motor
(3) Red	Outdoor fan motor
(4) Gray	Reversing valve coil
(5) White	Compressor AC contactor coil

L: Phase line feedline of power cable (user supplied)

N: Zero line feedline of power cable (user supplied)

L': Phase line of indoor-outdoor connecting cable of power connecting cable (user supplied)

N': Zero line of indoor-outdoor connecting cable of power connecting cable (user supplied)

4. FRD71-B signal line terminals

(1) Indoor-outdoor connecting cable (user supplied) for outdoor fan motor

(2) Indoor-outdoor connecting cable (user supplied) for outdoor fan motor

(3) Indoor-outdoor connecting cable (user supplied) for reversing valve coil

(4) Indoor-outdoor connecting cable (user supplied) for compressor AC contactor coil

L: Indoor-outdoor connecting cable (user supplied) power supply phase line

N: Indoor-outdoor connecting cable (user supplied) power supply zero line

5. FR100-B signal line terminals

(1) Black Outdoors fan motor high speed

(2) Purple Outdoors fan motor medium speed

(3) Red Outdoors fan motor low speed

(4) Gray Reversing valve coil

(5) White Compressor AC contactor coil

L: Power supply connecting cable (user supplied) power phase line feedline

N: Power supply connecting cable (user supplied) power zero line feedline

L': Power supply connecting cable (user supplied) indoor-outdoor connecting line power phase line

N': Power supply connecting cable (user supplied) indoor-outdoor connecting line power zero line

6. FRD100-B signal line terminals

(1) Indoor-outdoor connecting cable (user supplied) outdoor fan motor high speed

(2) Indoor-outdoor connecting cable (user supplied) outdoor fan motor medium speed

(3) Indoor-outdoor connecting cable (user supplied) reversing valve coil

(4) Indoor-outdoor connecting cable (user supplied) compressor AC contactor coil

L: Indoor-outdoor connecting cable (user supplied) power phase line

N: Indoor-outdoor connecting cable (user supplied) power zero line

7. FR95 signal line terminals

(1) Outdoor fan motor (high speed)

(2) Power supply phase line

(3) Reversing valve coil

(4) Outdoor fan motor (medium speed)

(5) Outdoor fan motor (low speed)

(6) Power supply zero line

(7) Compressor AC contactor coil

8. FR95-C and FRD95 signal line terminals

(1) Outdoor fan motor (high speed)

(2) Outdoor fan motor (medium speed)

(3) Reversing valve coil

(4) Compressor AC contactor coil

L: Power supply phase line

N: Power supply zero line

9. FR125/S signal line terminals

(1) Outdoor fan motor (high speed)

(2) 3-phase power supply phase A

(3) Reversing valve coil

(4) Outdoor fan motor (medium speed)

(5) Outdoor fan motor (low speed)

(6) Power supply zero line

(7) Compressor AC contactor coil

(8) 3-phase power supply phase B

(9) 3-phase power supply phase C

10. FR125-C/S and FRD125/S signal line terminals

(1) Outdoor fan motor (high speed)

(2) Outdoor fan motor (medium speed)

(3) Reversing valve coil

(4) Compressor AC contactor coil

N: Power supply zero line

L1: 3-phase power supply phase A

L2: 3-phase power supply phase B

L3: 3-phase power supply phase C

11. FR(D)180/S and FR(D)260/S signal line/terminal numbers and meanings

A. 6-core wire

(1) Red	Compressor small relay coil
(2) Gray	Reversing valve small relay coil
(3) Purple	Small relay coil of outdoor fan 1
(4) Orange	Small relay coil of outdoor fan 2
(5) Brown	DC+12V
(6) White	GND

B. 7-core wire

(1) Red	DC+5V

(2) Gray	Outdoors tube temperature sensor
(3) Purple	HP pressure controller
(4) Orange	LP pressure controller
(5) Black	Phase sequence 1
(6) White	Phase sequence 2
(7) Brown	Overcurrent

Chapter VI List of main parts and wear parts

1. List of main parts and wear parts for FRD23-B, FRD35-B and FRD50-B

Symbol	Description	Size/Model		
		FRD23-B	FRD35-B	FRD50-B
PCB1	Main control board	FRD35(23)-B		FRD50-B
PCB2	Wire Ctrlr	LCD		
PCB3	Remote Ctrlr	Normal		
RT1	ID AT sensor	RF10A/FG.000.05 (model 3324) 053324		
RT2	ID PT sensor	RF10A/FG.000.05 (model 3324)		
RT3	OD PT sensor	RF10W/FG.000.00JL-01WX (model 3324)		
C1	Capacitor	CBB61A 0.6μF/AC 450V	CBB61A 1.5μF/AC 450V	CBB61A 2.5μF/AC 450V
C	Composite capacitor	FRD23W.110.01 (25/1.5μF AC 450V)	FRD35W.110.02 (30/1.5μF AC 450V)	FRD50W.020.07 (50/2.5μF AC 450V)
	Comm line	RF10W/FG.000.01		
	OD PT probe wire	FRD35-D.000.01		
MC	Compressor	YZG-25RT1	YZG-39RCT1	SHX33SC4-U
MF2	OD fan motor	FRD35W.100.00WX		FRD50W.080.01WX
	Axial flow fan	FRD35W.000.01WX		FRD50W.000.05
M3	ID fan motor	FRD23N.021.00WX	FRD35N.041.00WX	FRD50N.041.00WX
	Impeller	FRD23N.070.05WX	FR100N.070.04WX	
XT1	Wiring TB	FRD35W.110.03		
XT2	Wiring TB	FRD35W.110.03		
XT3	Wiring TB	FRD35N.070.03		
T	Transformer	Z371		
YV	Reversing VV	DHF-2、STF-0101	STF-0202	DHF-3D(STF-0202)
EH	PTC El heater	MZFR 850W	FRD35N.080.00	FRD50N.080.00WX
K	Small relay	JQX-116F-2/220AL-2HS		
FT	1-time fuse	139℃ 15A	139℃ 15A	139℃ 15A
KT	Temp relay	KSD-A 125℃ 10A	KSD-A 125℃ 10A	KSD-A 125℃ 10A
	Liquid valve	FRD23W.000.03WX	FRD35W.000.06WX	FRD50W.040.04WX
	Steam valve	FRD23W.000.04WX	FRD35W.000.08WX	FRD50W.063.01WX

2. List of main parts and wear parts of FR(D)71-B and FR(D)100-B

Symbol	Description	Size/Model	
		FR(D)71-B	FR(D)100-B
PCB1	Main control board	------	------
PCB2	Wire controller	------	------
PCB3	Remote controller	------	------
RT1	Temperature sensor	3324	3324
RT2	Temperature sensor	3324	3324
RT3	Temperature sensor	3324	3324
C1	Capacitor	2.5 μ F/AC 450V	Indoor fan capacitance C1, C1', 3 μ F/AC 450V
C1'	Capacitor	3 μ F/AC 450V	------
C3, C3'	Composite capacitor	35/3 μ F/AC 450V	Startup capacitance 60 μ F/AC 450V
C4	Startup capacitor	100 μ F/AC 450V	Parallel capacitance 50 μ F/AC 450V
PV	Pressure switch	YK-3.1/2.25	------
M1	Outdoor fan motor	$YDK_5$120/30-6	$YDK_1$120/45-6
C2	Capacitor	------	Startup capacitance 6 μ F/AC 450V
M2	Compressor	Q2.2	ZR47K3-PFJ
M, M'	Indoor fan motor	YDK110/30-4	$YDK_5$110/30-4
FU	Indoor fuse	5A	10A
FU	Outdoor fuse	2A	------
YV	Reversing solenoid valve	DHF-6	STF-0408
KM	AC contactor	3TF34	3TF3100 (single phase)
EH	Heating band	40W	------

3. List of special main parts & wear parts of FRD71-B & FRD100-B aux. electric heating

Symbol	Description	Size/Model	
		FRD71-B	FRD100-B
PCB1	Main control board	------	------
$FT_{1,2,3}$	1-time fuse	139℃ 15A	139℃ 15A
$KT_{1,2,3}$	Auto-reset thermal protector	KSD-A135℃ 10A	KSD-A135℃ 10A
$EH_{1,2,3}$	PTC heater	MZFR 2.3KW	MZFR 2.3KW
XT1	Wiring terminal	JXO-AB(600V 60A)	JXO-AB(600V 60A)
XT4	Wiring terminal	------	------
XT5	Wiring terminal	------	------
K	Small relay	JQX-116F-L/220AL-2HS	JQX-116F-L/220AL-2HS

4. List of main parts & wear parts of FR95-C and FR125/S-C

Symbol	Description	Size/Model	
		FR95-C	FR125-C/S
PCB1	Main control board	------	------
PCB2	Wire controller	------	------
PCB3	Remote controller	------	------
RT1	Temperature sensor	3324	3324
RT2	Temperature sensor	3324	3324
RT3	Temperature sensor	3324	3324
C1	Capacitor	CBB61A 5μF/AC 450V	CBB61A 8μF/AC 450V
C2	Capacitor	CBB611A 6μF/AC 450V	CBB611A 8μF/AC 450V
C3	Capacitor	CBB65A 60μF/AC 450V	------
C4	Capacitor	CBB65A-1K 50μF/AC450V	------
	Communication line	RF10AW/FG.000.01	RF10AW/FG.000.01
	OD pipe temp probe line	RF10AW/FG.000.02	RF10AW/FG.000.02
M1	Outdoor fan motor	$YDK_3$120/45-6	$YDK_2$120/45-6
M2	Compressor	ZR47K3-PFJ	ZR61KC-TFD
M3	Indoor fan motor	YSK139/35-6	YSK139/35-4
T	Transformer	Z371	Z371
FU	Fuse	10A	10A
YV	Reversing solenoid valve	STF-0408	STF-0408
KM	AC contactor	B30-10-10(220V) or 3TF3100	EB16-30-00(230V) (220V)3TF3100
	Valve	Dg8	Dg8
	Valve	Dg13	Dg16
	Axial flow fan	RF10W/FG.000.04WX	RF10W/FG.000.04WX
	Impeller	FR95-CN.062.00	FR95-CN.062.00

5. List of main parts/wear parts of FR(D)95 and FR(D)125/S

Symbol	Description	Size/Model	
		FR（D）95	FR（D）125/S
PCB1	Main control board	------	------
PCB2	Wire controller	------	------
PCB3	Remote controller	------	------
RT1	Temperature sensor	3324	3324
RT2	Temperature sensor	3324	3324
RT3	Temperature sensor	3324	3324
C1	Capacitor	CBB60F 10μF/AC 450V	CBB65A-1 15μF/AC 450V
C2	Capacitor	CBB611A 6μF/AC 450V	CBB611A 8μF/AC 450V
C3	Capacitor	CBB65A 60μF/AC 450V	------
C4	Capacitor	CBB65A-1K 50μF/AC450V	------
	Communication line	RF10AW/FG.000.01	RF10AW/FG.000.01
	OD pipe temp. probe line	RF10AW/FG.000.02	RF10AW/FG.000.02
M1	Outdoor fan motor	$YDK_3$120/45-6	$YDK_2$120/45-6
M2	Compressor	ZR47K3-PFJ	ZR61KC-TFD
M3	Indoor fan motor	YDK128/35-4	YDK128/45-4
XT1	Wiring terminal seat	JXW-2P	JXW-4P
XT2	Wiring terminal seat	JXW-05	JXW-05
XT3	Wiring terminal seat	JXO-07	JXO-09
T	Transformer	Z371	Z371
FU	Fuse	10A	10A
YV	Reversing solenoid valve	STF-0408	STF-0408
KM	AC contactor	B30-10-10(220V)/3TF3100	EB16-30-00(230V)
	Valve	Dg8	Dg8
	Valve	Dg13	Dg16
	Axial flow fan	RF10W/FG.000.04WX	RF10W/FG.000.04WX
	Impeller	RF10A/FG.062.00	RF12A/FG.032.00

6. List of special main parts/wear parts for FRD95 & FRD125/S aux. electric heating

Symbol	Description	Size/Model	
		FRD95	FRD125/S
PCB1	Main control board	------	------
$FT_{1,2,3(4,5,6)}$	1-time fuse	153℃ 10A	153℃ 10A
$KT_{1,2,3(4,5,6)}$	Auto-reset thermal protector	KSD-A135℃ 10A	KSD-A135℃ 10A
$EH_{1,2,3(4,5,6)}$	PTC heater	MZFR 1.5KW	MZFR 1.5KW
XT1	Wiring terminal	JXO-AB(600V 60A)	JXO-AB(600V 60A)
XT4	Wiring terminal	------	------
XT5	Wiring terminal	JXW-Z_{11}-02	JXW-Z_{11}-03
KM1	AC contactor	------	3TF3000
K	Small relay	JQX-116F-Z/220AL-2HS	

7. List of main parts/wear parts of FR180/S and FR260/S

Symbol	Description	Size/Model	
		FR(D)180/S	FR(D)260/S
PCB1	Main control board	------	------
PCB2	Wire controller	------	------
PCB3	Remote controller	------	------
RT1	Temperature sensor	3324	3324
RT2	Temperature sensor	3324	3324
RT3	Temperature sensor	3324	3324
C1, C2	Capacitor	CBB611A 6μF/AC 450V	CBB65A-1 10μF/AC 450V
C, C'	Capacitor	CBB60F 10μF/AC 450V	CBB65A-1 15μF/AC 450V
	Communication line	RF10AW/FG.000.01	------
M3, M4	Outdoor fan motor	$YDK_{5(6)}$120/45-6	YDK145/60-8
M2	Compressor	ZR81KC-TFD-522	ZR125KC-TFD-522
M, M'	Indoor fan motor	$YDK_{2(3)}$128/35-4	$YDK_{2,3}$128/35-4
XT1	Wiring terminal seat	JXW-2P	JXW-2P
XT2	Wiring terminal seat	JXW-05	JXW-05
XT3	Wiring terminal seat	JXO-AB 600V 60A	PBT660VAC 6mm^2 (4-place)

Symbol	Description	Size/Model	
		FR(D)180/S	FR(D)260/S
T	Transformer	Z371	------
FU	Fuse	10A	10A
FU3	Fuse	AC380 2A	------
YV	Reversing solenoid valve	STF-0408	STF-0714
KM	AC contactor	3TF34	3TF34
	Valve	Dg10	------
	Valve	Dg19	------
	Axial flow fan	RF180W/S.000.01WX	------
	Impeller	RF10A/FG.062.00	------

8. List of special main parts/wear parts for FRD180/S & FRD260/S aux. electric heating

Symbol	Description	Size/Model	
		FRD180/s	FRD260/S
PCB1	Main control board	------	------
$FT_{1,2,3,4,5,6}$	1-time fuse	153℃ 10A	153℃ 10A
$KT_{1,2,3,4,5,6}$	Auto-reset thermal protector	KSD-A135℃ 10A	KSD-A135℃ 10A
$EH_{1,2,3,4,5,6}$	PTC heater	MZFR 1KW	MZFR 1.5KW
XT1	Wiring terminal	JXO-AB(600V 60A)	JXO-AB (600V 60A)
XT4	Wiring terminal	JXW-Z_{11}-03	JXW-Z_{11}-03
XT5	Wiring terminal	JXW-Z_{11}-03	JXW-Z_{11}-03
KM1	AC contactor	3TF3000	3TF3200

Chapter VII Type selection

I. Application scope

Air duct type air conditioners of our company include card type low static pressure series (FRD23-B, FRD35-B and FRD50-B), low static pressure series (FR(D)71-B and FR(D)100-B), medium static pressure series (FR95-C and FR125-C/S), and high static pressure series (FR(D)95, FR(D)180/S, FR(D)125/S and FR(D)260/S). These models have similar but different features and applications: card type low static pressure models adopt extra low noise design and are suitable for homes, offices and other small areas; low and medium static pressure air duct air conditioners have low noise and relatively low exhaust air static pressure, hence suitable for houses, villa and other sites with shorter air delivery distance and high noise requirement; high static pressure air duct air conditioners have relatively high exhaust air static pressure and noise, hence suitable for supermarkets, department stores, concert and other sites requiring long air delivery distance and tolerating noise.

※Dealers and users shall reasonably select low, medium or high static pressure air duct air conditioners according to characteristics of application sites.

※In case an installer or designer is unaware of the relation between static pressure and noise level, and fails to select proper model, user may think that high static pressure air duct type air conditioner has low noise.

II. Applicable areas of various models of air duct type air conditioners (based on 3m ceiling height)

FR23-B	FR35-B	FR50-B	FR71-B FRD71-B	FR100-B FRD100-B	FR95(-C) FRD95	FR125(-C)/S FRD125/S	FR180/S FRD180/S	FR260/S FRD260/S
16-25 ㎡	25-38 ㎡	35-55 ㎡	50-60 ㎡	70-80 ㎡	70-80 ㎡	80-100 ㎡	120-140 ㎡	170-200 ㎡

Notes: ① Office: 90～140W/㎡ ② Restaurant & bar: 200～350W/㎡

③ Shop: 150～250W/㎡ ④ Recreation: 200～350W/㎡

In case careful calculation of air conditioning loads is not carried out according to detailed cooling/heating load calculation method or rough calculation method specified in “Air conditioning design manual” and “Centralized air conditioning” standard etc. in combination with application site information, so that 5HP model is selected where 4HP or even 3HP shall be used, **higher noise will occur due to small space and short delivery distance.**

Solution:

Carefully calculate cooling/heating loads according to “Air conditioning design manual” and “Centralized air conditioning” standard etc. and select proper model.

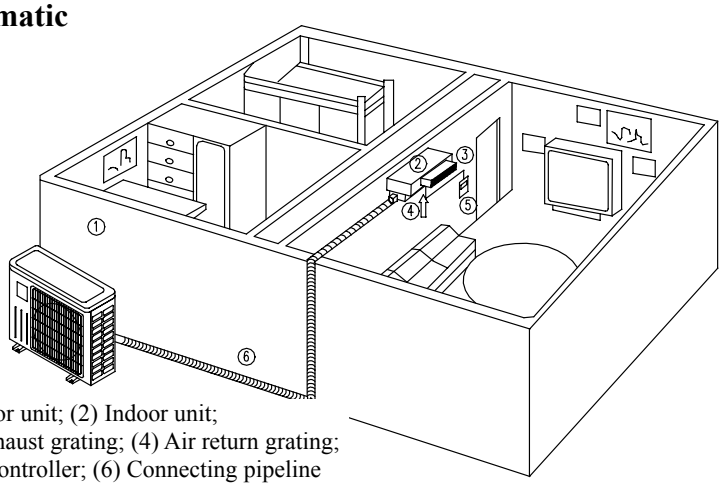
Certain margin shall be left in type selection; otherwise user may complain of bad cooling or heating effect.

In case heating effect must be ensured at low temperature, models with auxiliary electric heating are preferred.

Chapter VIII Installation

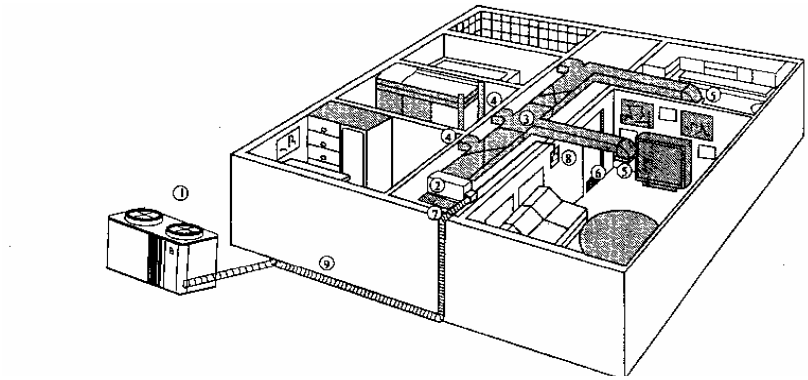
Installation of air duct type air conditioners must be carried out by qualified personnel.

I. Installation schematic



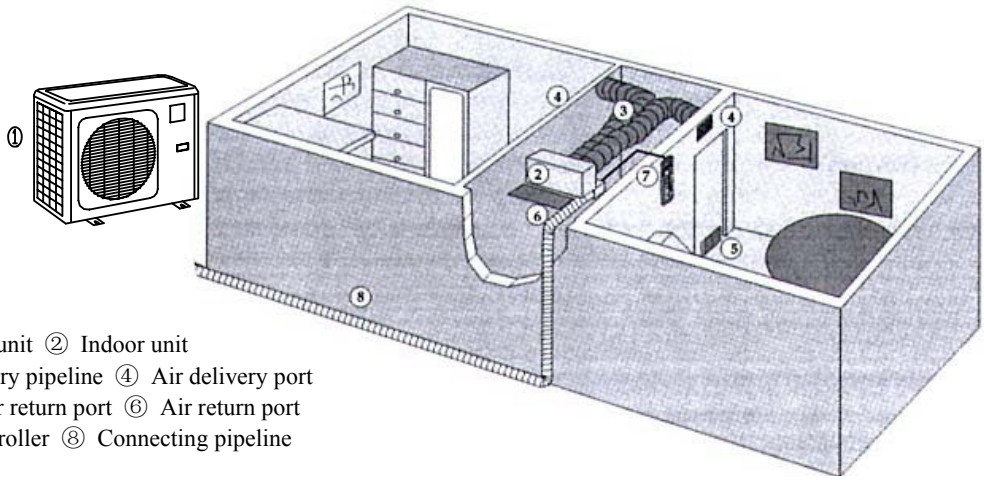
(1) Outdoor unit; (2) Indoor unit;
(3) Air exhaust grating; (4) Air return grating;
(5) Wire controller; (6) Connecting pipeline

Low static pressure air duct air conditioner installation schematic (based on FRD35-B)



(1) Outdoor unit; (2) Indoor unit; (3) Air delivery pipe; (4) Air delivery branch pipe;
(5) Air delivery port; (6) Branch air return port; (7) Air return port; (8) Controller
(9) Connecting pipeline

High static pressure air duct air conditioner installation schematic (based on FR260/S)



① Outdoor unit ② Indoor unit
③ Air delivery pipeline ④ Air delivery port
⑤ Branch air return port ⑥ Air return port
⑦ Wire controller ⑧ Connecting pipeline

Medium static pressure air duct air conditioner installation schematic

II. Installation of indoor unit

1. Selection of installation position

● At or near application site with stringent requirement on noise, indoor unit shall be installed as far away as possible. When the machine is near rooms with high silencing requirement, sound insulating doors and windows shall be used for air conditioner equipment room (subject to Owner agreement);

● The machine shall be installed in special equipment room, water closet, store room or ancillary room as much as possible;

● Site of installation shall be able to withstand weight of the machine; reinforcing measures shall be taken for mounting floor/beam subject to potential hazard before installation;

● Position of installation shall ensure shortest connecting hose between indoor and outdoor units and length of indoor air duct shall be suitable;

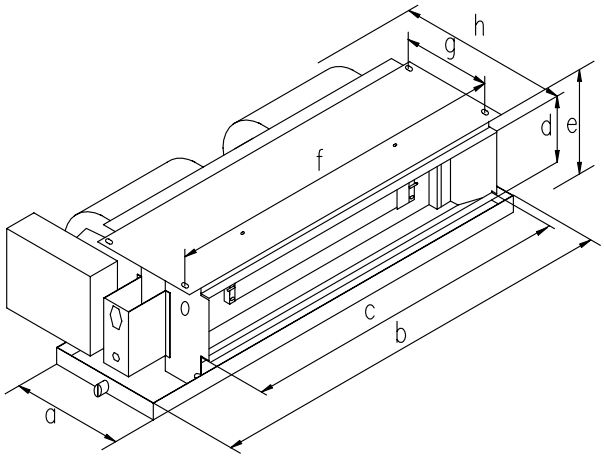
● Sufficient air delivery/return space shall be available to facilitate air delivery/return. Distance between main unit air return face and wall shall exceed 800mm to ensure no right angle bend of return air;

● Drainage of indoor unit condensate shall be provided;

● Keep the machine away from heat source, inflammables, corrosive gas, strong magnetic field, dust and heavy oily smoke.

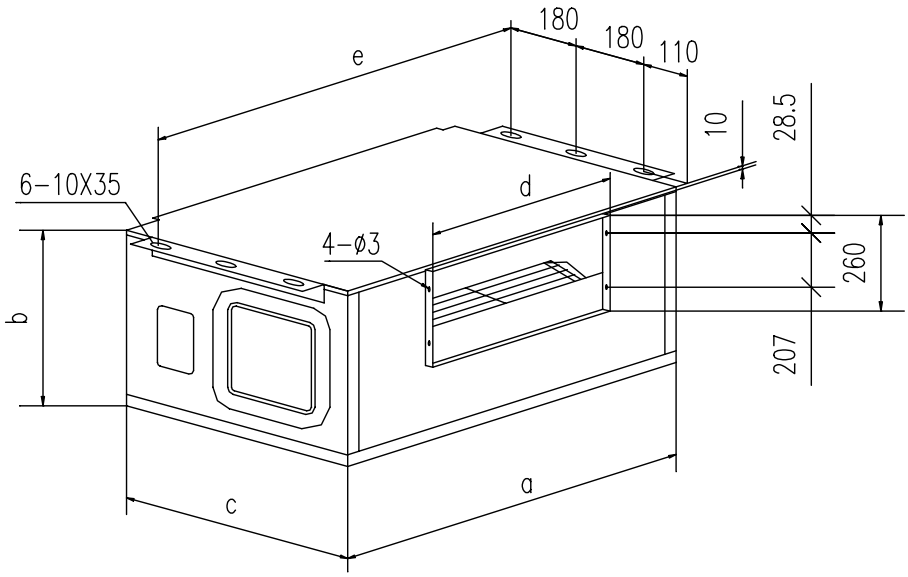
2. Indoor unit installation dimensions

Refer to the following figure and table for indoor unit installation dimensions.



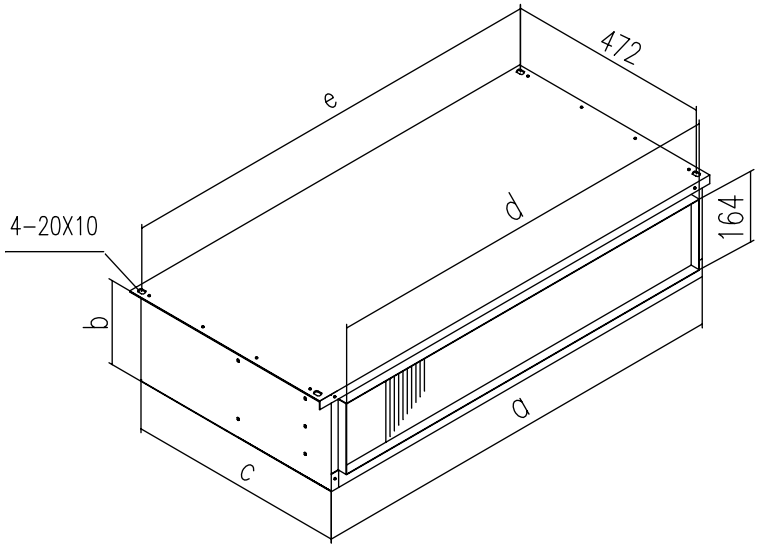
FRD23-B, FRD35-B, FRD50-B

Parameter / Model	a(mm)	b(mm)	c(mm)	d(mm)	e(mm)	f(mm)	g(mm)	h(mm)
FRD23-B	252	888	722	128	234	750	190	465
FRD35-B								
FRD50-B		1088	922			950		



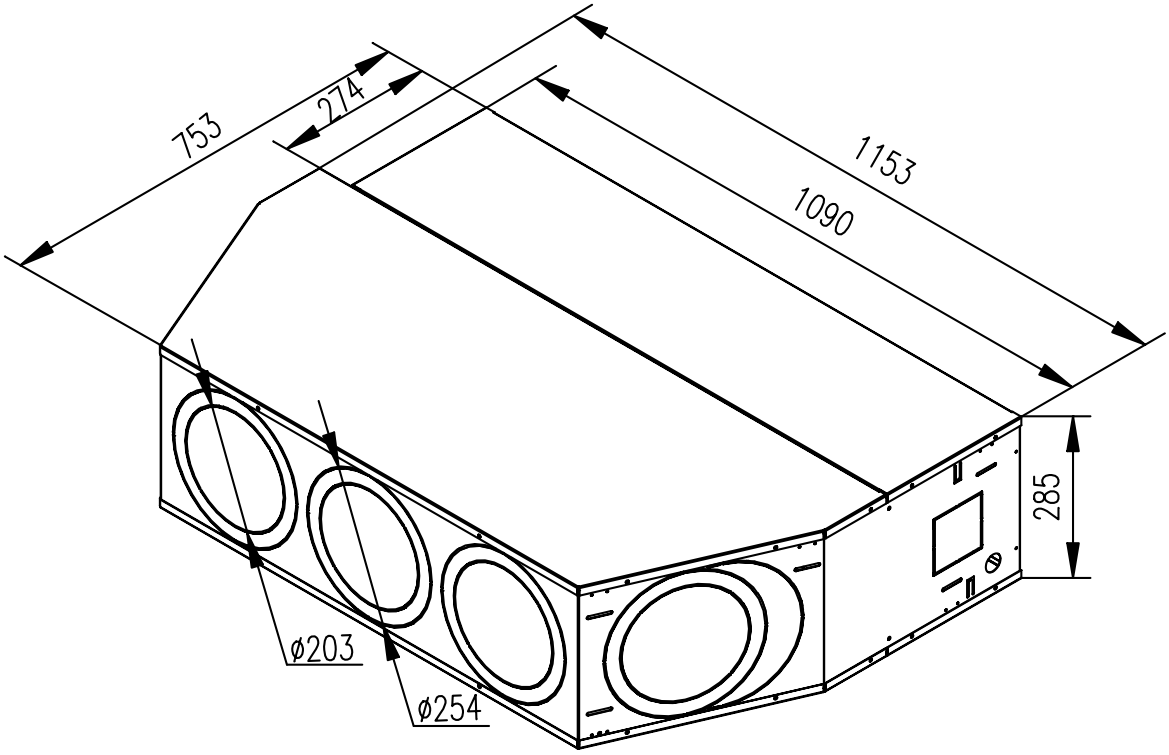
FR(D)95, FR(D)125/S

	a(mm)	b(mm)	c(mm)	d(mm)	e(mm)
FR(D)95	655	400	618	300	698
FR(D)125/S	865			330	908

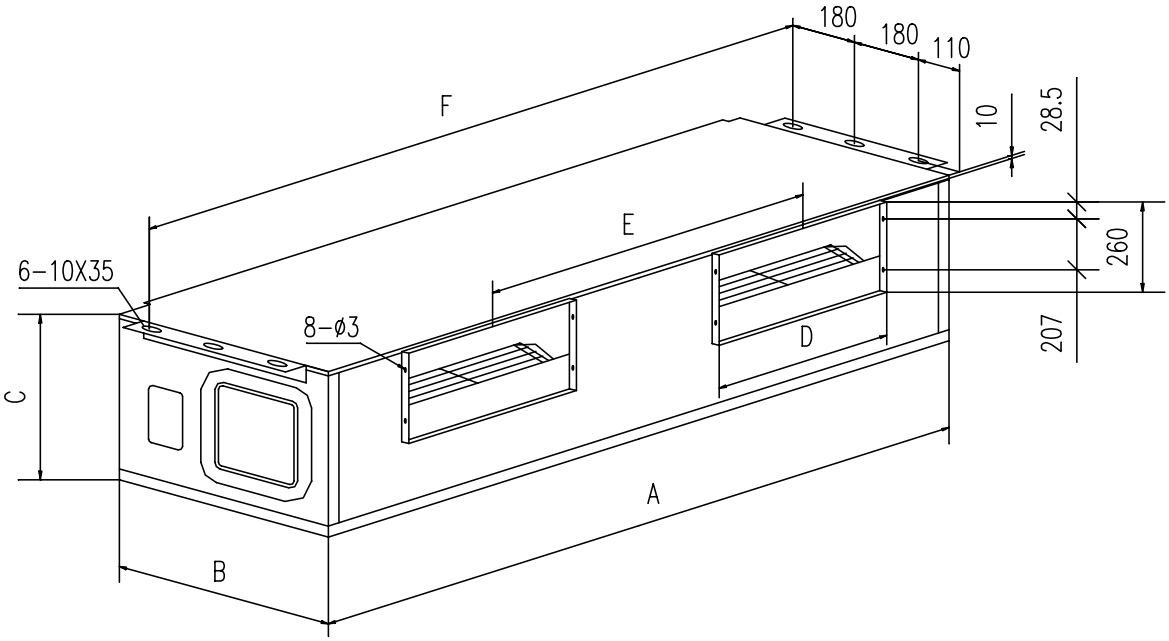


FR(D)71-B, FR(D)100-B

Code / Model	a(mm)	b(mm)	c(mm)	d(mm)	e(mm)
FR(D)71-B	1200	226	515	1160	1230
FR(D)100-B	1820			1780	1850



FR95-C, FR125-C/S

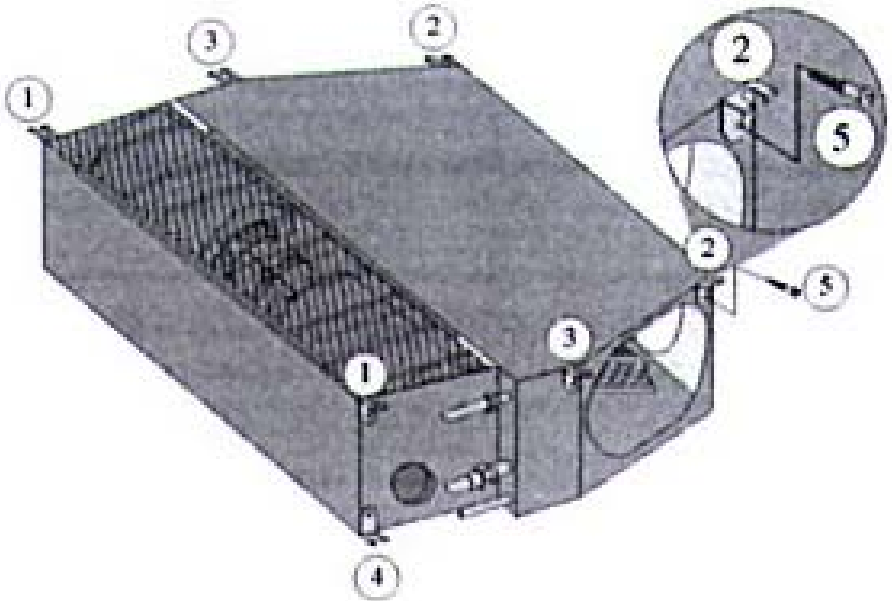


FR(D)180/S, FR(D)260/S

Code / Model	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)
FR(D)180/S	1309	618	400	300	654	1352
FR(D)260/S	1800			330	888	1843

3. Installation mode for indoor unit

(1) Installation mode for FR95-C and FR125-C/S (based on upper return air)



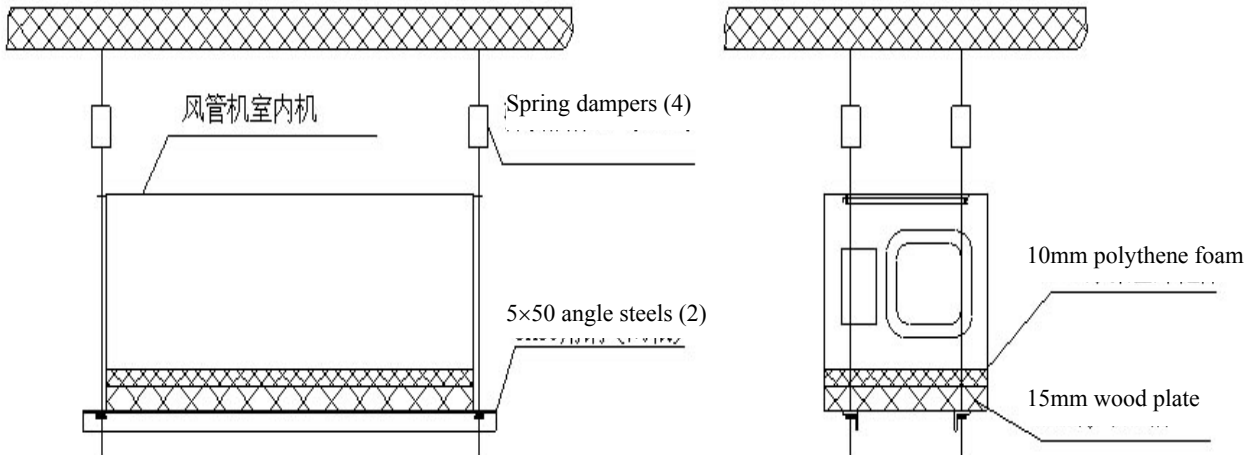
● Determine positions of lifting hooks

As shown above, ①, ②, ③ and ④ are lifting hook installation positions for FR95-C and FR125-C/S. Suitable positions can be selected to needs. Just select one out of ② and ③. ⑤ refers to the tapping screw to fix lifting hook on indoor unit.

● Use 4 M10 expansion bolts to fix lifting hook on bearing mounting face.

(2) Installation mode for other models (based on FR180/S and FR260/S)

The following is an ideal installation mode.



● According to size of machine, use 4 or 6 M10 bolts and associated nuts, flat washers and spring washers to fix installation support on indoor unit mounting strip;

● According to size of machine, use 4 or 6 M10 expansion bolts to fix the installation support on bearing mounting face;

● A damper block of the same size as the angle steel and thickness greater than 10mm shall be used on top of the angle steel to reduce vibration;

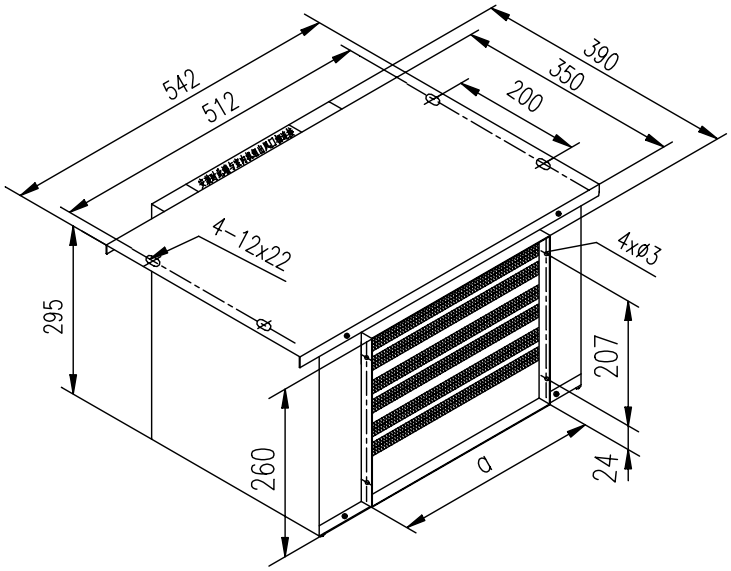
● The machine must have 2% slope in drainage connector direction.

4. Installation of auxiliary electric heating

This is limited to FRD95, FRD125/S, FRD180/S and FRD260/S. For FRD71-B and FRD100-B, auxiliary electric heater is installed at exhaust air port inside the machine.

(1) Auxiliary electric heater installation dimensions

● Refer to the following figure and table for installation dimensions of FRD95, FRD125/S, FRD180/S and FRD260/S auxiliary electric heater.

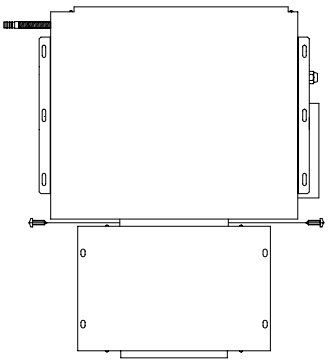


Model / Code	FRD95	FRD180/S	FRD125/S	FRD260/S
a	300		330	

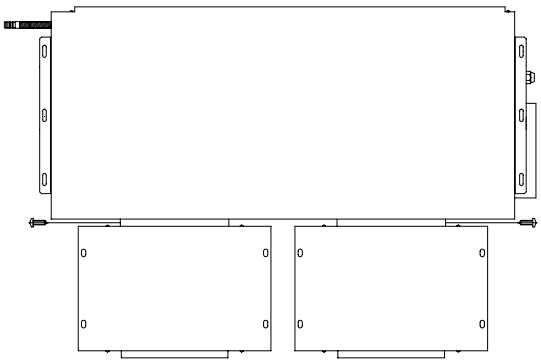
(2) Installation of auxiliary electric heater

● Put the side of auxiliary electric heater with label “Connect this end to indoor unit air exhaust for installation” on indoor unit air exhaust port and fix with 8 ST4×12 tapping screws;

● Fix the heater on foundation and stick insulation material on its outer surface and interface.



FR(D)95, FR(D)125/S



FR(D)180/S, FR(D)260/S

Notes:
1. 2 aux. electric heaters shall be provided for each FRD180/S or FRD260/S;
2. After installing the heaters, fit insulation material to avoid thermal dissipation and water leakage caused by condensing on outer surfaces.

III. Installation of outdoor unit

1. Selection of installation position

(1) Installation base on which outdoor unit can be fixed and that can withstand 3 times the weight of this unit shall be selected;

(2) A location where outdoor unit air intake/exhaust flow will not be interfered shall be selected;

(3) A location away from direct sunshine, rain and other direct radiating heat source shall be selected. If not, effective sunshade or rain (snow) shelter shall be used and lowest point of such shade/shelter shall not be lower than required in the figure below. Avoid low place where water can accumulate;

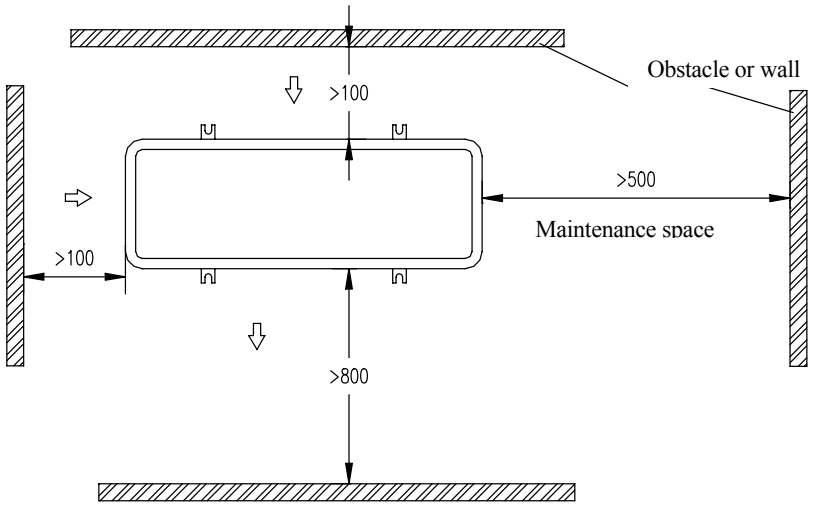
(4) A location where piping of indoor and outdoor units and power cables can be easily arranged to facilitate installation and maintenance shall be selected;

(5) A location where ventilation is near indoor unit shall be selected and avoid extension of pipeline;

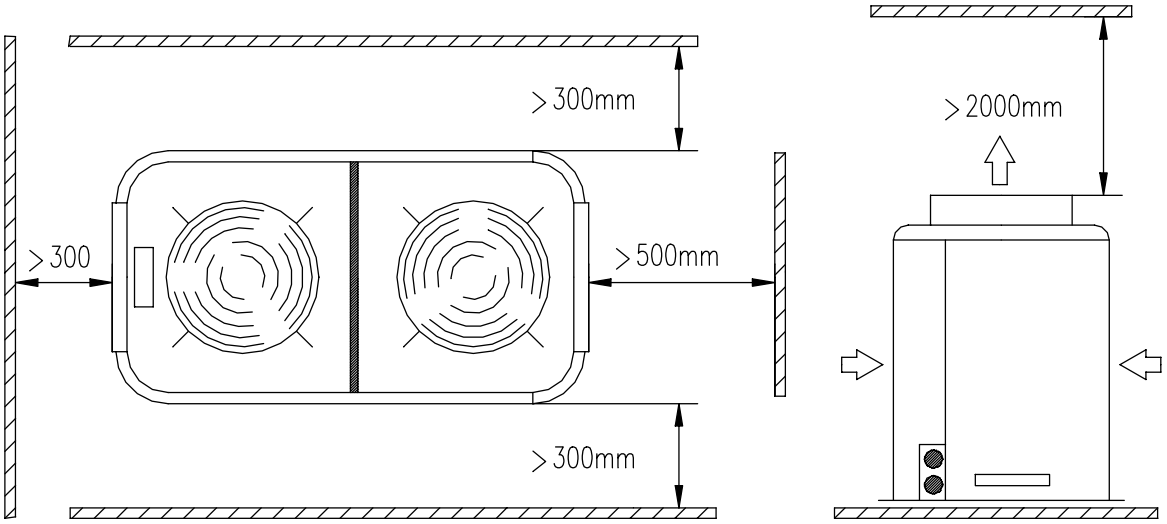
(6) Avoid inflammables, explosives or leakage of these;

(7) Avoid corrosive gas, dust, salty mist and other pollutants;

(8) Refer to the following figure for space required for installation of outdoor unit.



Space normally required by installation of outdoor unit (based on FR(D)125/S)

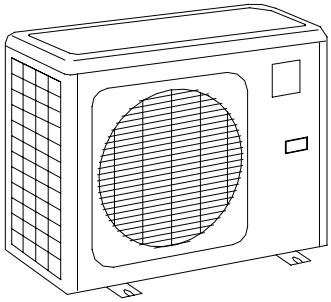


Space required for FR(D)260/S outdoor unit installation

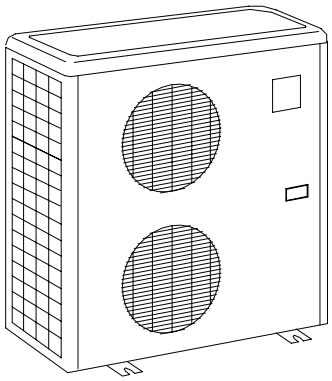
2. Installation of outdoor unit

(1) To avoid center of gravity offset and protect compressor, never tilt the machine by more than 45 degrees during transportation;

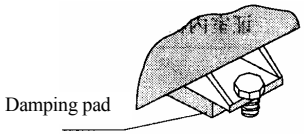
(2) Use M12 bolts to fix machine chassis. Fixing shall be firm and reliable, and damping measures shall be taken when necessary. Refer to figure below.



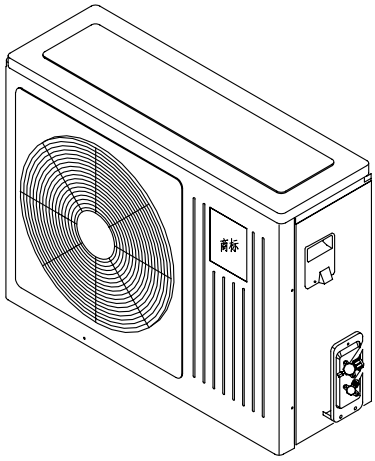
FR(D)95、FR(D)125/S, FR(D)100-B



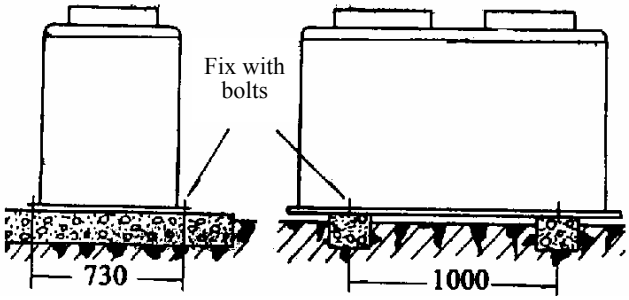
FR(D)180/S



FR95-C, FR125-C/S



FR(D)71-B



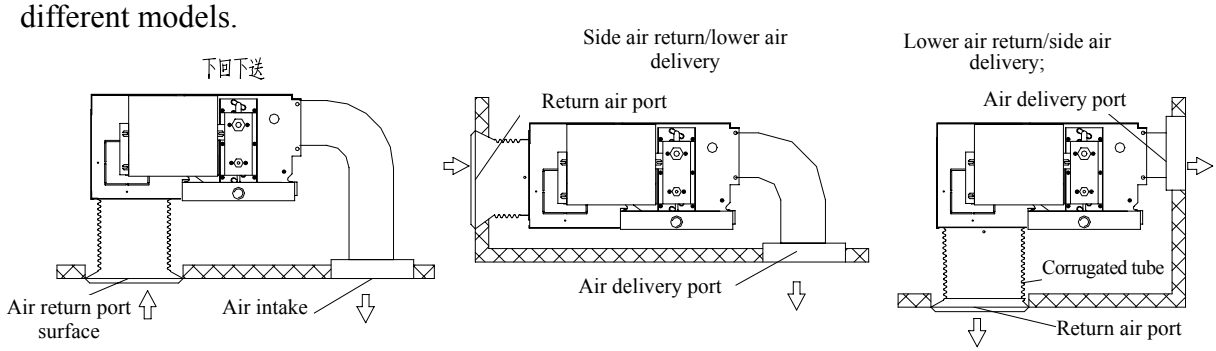
FR(D)260/S

● When two or more outdoor units are installed together, it is necessary to select suitable positions to avoid one unit sucking exhaust air from another.

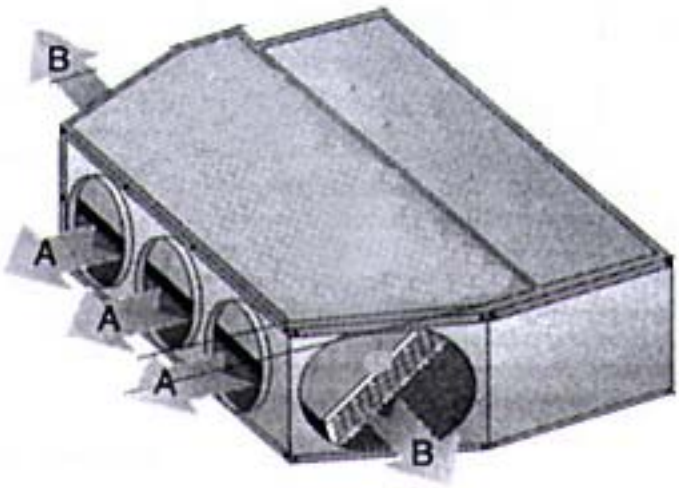
● Reasonable installation space required by air conditioner must strictly follow instruction manual. When arranging rain shelter, do not affect heat dissipation of the machine.

IV. Installation of air duct

1. The following shows a number of typical installation modes for air duct air conditioners of different models.

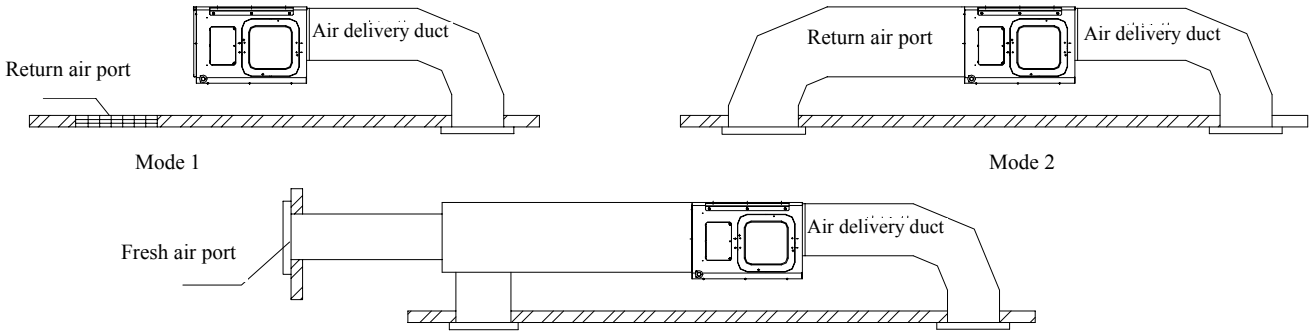


FRD23-B, FRD35-B, FRD50-B (with return air box)



FR95-C, FR125-C/S

Refer to above figure for air exhaust mode of FR95-C and FR125-C/S. User can open corresponding air exhaust port as required and select air exhaust strip of correct length according to size of the port selected, round it to a ring and snap it on the port. Then connect air duct and lead it to required position.



Typical installation modes of FR(D)95, FR(D)125/S, FR(D)71-B, FR(D)100-B, FR(D)180/S and FR(D)260/S are shown above:

(1) Select reasonable installation mode according to site characteristics, user requirements and machine performance;

(2) Cross sectional area of air duct shall meet specification. In case of noise requirement by user, follow relevant requirements described in air duct design and noise reduction sections of this manual;

(3) Recommended distance from main unit air return port edge to wall is above 800mm. For FRD23-B, FRD35-B and FRD50-B, this is above 150mm;

(4) If there are many air delivery ports, to ensure even air delivery at such ports, in addition to reducing air ducts and static pressure box installed for even flow, adjustment damper should be provided at each branch air duct or air delivery ports with adjustment damper be selected.

(5) Air delivery and return ducts shall be fixed on prefabricated floor slab via iron support;

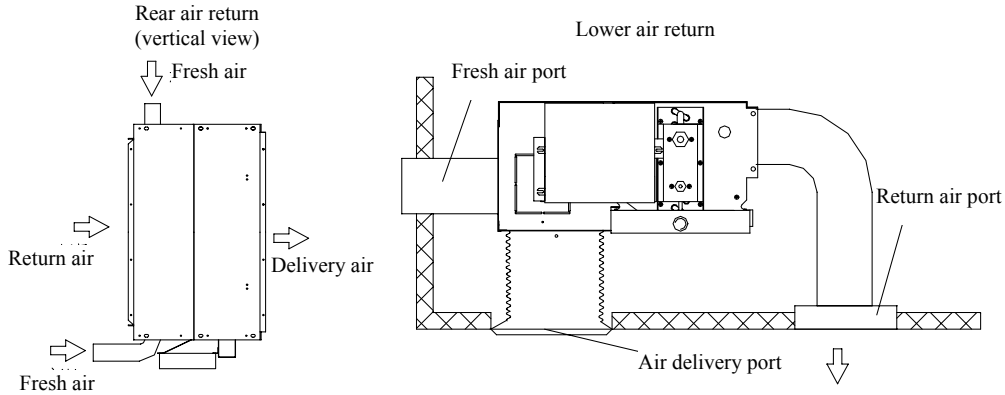
(6) Thermal insulation layer shall be stuck on air delivery ducts and no leakage shall exist at connections.

2. Recommended cross sectional area of air ducts

Model	FR(D)95	FR(D)125/S	FR(D)180/S	FR(D)260/S	FR(D)71-B	FR(D)100-B
Return air duct CS area (m^2)	≥0.3	≥0.4	≥0.6	≥0.7	≥0.225	≥0.3
Air delivery duct CS area (m^2)	≥0.135	≥0.15	≥0.27	≥0.325	≥0.101	≥0.135

Note: FRD23-B, FRD35-B and FRD50-B can be directly connected to air delivery/return ports via soft connection. Refer to indoor unit installation dimensions for size of air delivery/return ports.

3. Arrangement of fresh air port



One fresh air port at left side, right side and rear (bottom) side

Based on FRD23-B, FRD35-B and FRD50-B

One 100×100 bottom fresh air port is provided at side and bottom face of FRD23-B, FRD35-B and FRD50-B respectively.

Arrangement of fresh air port in FR95-C and FR125-C/S is the same as in FRD23-B, FRD35-B and FRD50-B, and one fresh air port is provided at each side of the unit and can be open to needs.

Refer to installation mode 3 for fresh air port arrangement for FR(D)95, FR(D)125/S, FR(D)71-B, FR(D)100-B, FR(D)180/S and FR(D)260/S.

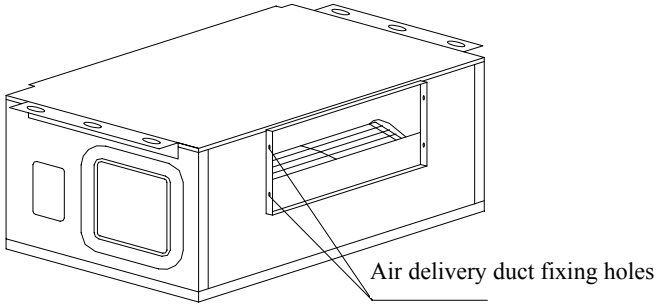
Precautions for arrangement of fresh air ports:

a. Requirement on fresh air damper: Closing of fresh air damper shall be tight and fresh air flow shall be adjustable;

b. Requirements on fresh air port: Fresh air port shall be arranged upstream of air exhaust port as much as possible, and lower than air exhaust port. Fresh air port shall be arranged on north wall as much as possible and height of its bottom above outdoor floor should be not smaller than 2m, and not smaller than 1m when arranged in afforestation area. Strainer shall be provided at inlet of fresh air to purify outdoor air and improve indoor air quality.

4. Connection of air delivery duct with the unit

Soft connection (canvas etc.) shall be used between air delivery duct and the unit. Refer to indoor unit installation dimensions for air delivery port dimensions.



Based on FR(D)95

5. Connection of return air duct with the unit

(1) Soft connection (e.g. canvas) shall be used between return air duct and the unit;

(2) For FR(D)95, FR(D)125/S, FR(D)180/S and FR(D)260/S, it is necessary to remove retaining strips on both sides of indoor unit return air port strainer;

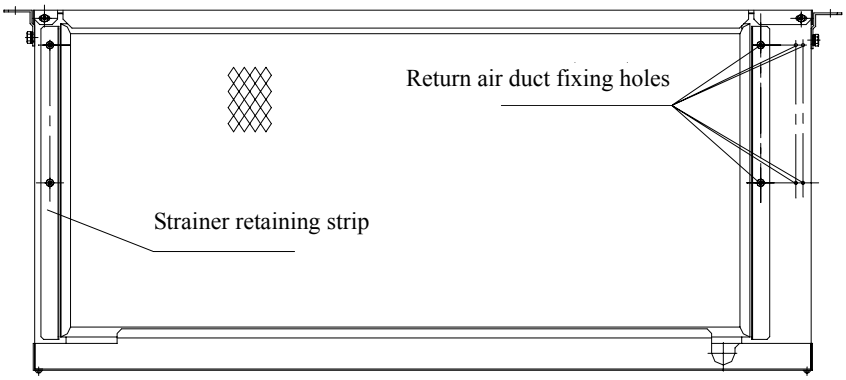
(3) Use tapping screws or rivets to connect return air duct to indoor unit return air port. Control depth of drilling for tapping screws to avoid penetrating evaporator copper tube or condensate tray;

(4) For FRD23-B, FRD35-B, FRD50-B, FR(D)71-B and FR(D)100-B, a segment of canvas air duct can be fabricated and reinforced by 8# iron wire. This shall be folded, and have one end connected to indoor unit air exhaust via rivet and the other end connected to return air louver or strip return air port, so that free adjustment can be made according to height of indoor ceiling. Return air grating with washable air strainer must be installed to prevent dust from entering the unit. Recommended distance between return air port edge and wall is above 150mm.

(5) Return air duct installation mode for FR95-C and FR125-C/S is the same as for FRD23-B, FRD35-B, FRD50-B, FR(D)71-B and FR(D)100-B. 3 return air modes can be adopted: upper air return, lower air return and rear air return. Return air mode selection depends on unit installation mode and return air duct installation mode;

(5) Canvas soft connection is adopted for air delivery port, air return port and main unit. No tensile force shall exist between air duct and main unit; otherwise noise level will be higher.

⑥ **Note**: For FR(D)95, FR(D)125/S, FR(D)180/S and FR(D)260/S, strainer with mesh similar to unit strainer shall be fitted at end return air grating; otherwise a 70~100mm wide area on lower side face at connection between return air duct and indoor unit shall be removable, so that user can directly withdraw unit strainer for cleaning (as shown in the figure below). If return air port is complete with strainer, we recommend that indoor unit strainer be removed.



Notes:

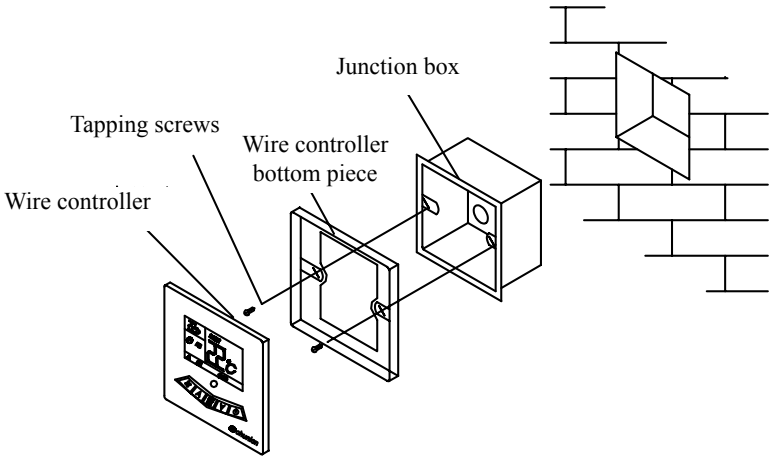
(1) Before closing ceiling decoration, it is necessary to turn on the machine to check air flow at each port, noise level, connecting pipeline leakage, cooling (heating) effect, air duct insulation and condensate pipe drainage etc. Close ceiling only when acceptance is OK.

(2) In case of no cooling (heating) effect, first check power supply phase sequence. Z6 protection display is provided on FR(D)125/S display panel.

(3) Installation team shall timely coordinate with decoration team to avoid change of position and installation mode of installed indoor unit, keep indoor unit & condensate pipe clean, and reserve maintenance openings for future maintenance.

V. Installation of LCD wire controller (for FRD23-B, FRD35-B and FRD50-B)

Refer to following figure for installation mode of LCD wire controller. Install junction box at a position in the wall easy to operate. Lead in signal line via wall-penetrating tube. Remove bottom of wire controller box, use tapping screws to fit it on the junction box. Then fit the wire controller on the bottom piece.



VI. Connection of indoor unit with outdoor unit

1. Installation of wall-penetrating tube

(1) Wall-penetrating tube shall be hard polythene tube of about Φ90;

(2) Determine drilling position on wall by referencing indoor unit installation position and connecting pipe position. Hole size shall be Φ95~100mm and outdoor side of the hole shall be lower than indoor side by 5~10mm.

(3) Determine length of wall-penetrating tube according to wall thickness (longer than wall thickness by about 10mm). Insert the tube in the hole drilled on wall for threading of connecting tube, connecting cable and drainage tube.

Note: Use sealing putty to seal clearances between penetrating tube and hole, between penetrating tube and connecting tube, and between connecting cable and drain pipe, so as to prevent ingress of rainwater and air.

2. Installation of condensate drain pipe

(1) Condensate drain pipe shall be normal PVC pipe of Φ16~17 inner diameter (FR95-C, FR125-C/S water discharge pipe inner diameter is Φ17 while FRD23-B, FRD35-B, FRD50-B water pipe inner diameter is Φ20~21).

(2) Install user supplied drain pipe on indoor unit drain pipe outlet, and seal with glue;

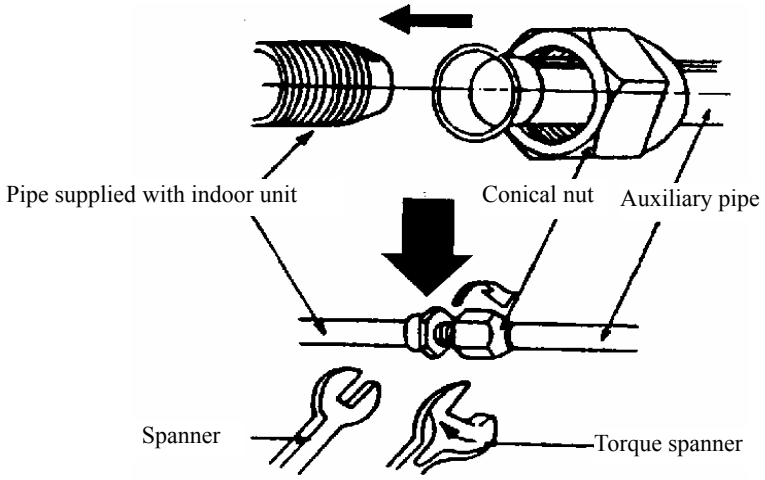
(3) Condensate drain pipe shall have 1/50~1/100 down slope, be supported by hard frame, not bent as return water type, and its tip shall not be dipped in water;

(4) Drain pipe shall be wrapped with thermal insulation material to avoid water leak due to dewing.

3. Connections

(1) Unscrew nuts on shutoff (or ball) valves on indoor unit pipeline and outdoor unit;

(2) Drip small amount of frozen oil at 2 bell mouths of connecting pipe, align bell mouth center with pipe connector, then tighten nut with spanner.



Notes:

(1) Ensure quality of user supplied connecting pipe. Before connection, clean inside of pipe and prepare bell mouths. You can order these from our factory.

(2) Site fabrication of bell mouths must use special pipe-expander to avoid F22 leak after installed.

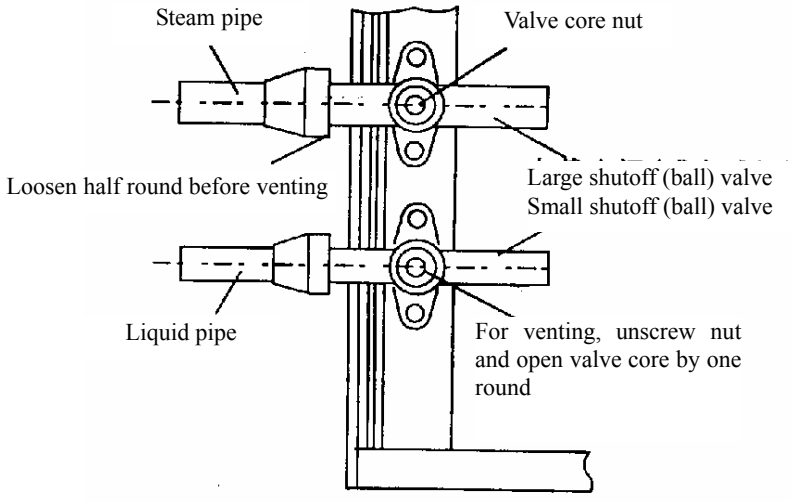
(3) Use two spanners to tighten connection between indoor unit and connecting pipe; otherwise indoor unit tubing may twist, deform or even break.

4. Venting of system

(1) Loosen nut on upper air pipe (large pipe) of outdoor unit large shutoff (ball) valve by half a round;

(2) Unscrew valve core nut on the two valves;

(3) Open small shutoff (or ball) valve core by one round. When you feel that air coming out of air pipe nut on the large shutoff (or ball) valve is cold, this means that air is basically vent. Immediately tighten air pipe nut with spanner. Then open both shutoff (ball) valve cores, put on valve core nuts and tighten.



Note: Use of the unit without opening all valve cores will cause failure or poor performance. When ball valve core is rotated parallel to pipeline axis, the valve is open.

5. System leakage detection

(1) Fully open large and small shutoff (or ball) valve cores to detect leakage; confirm no refrigerant leakage;

(2) Halogen mutual detection meter shall be used for detection, or apply soapy water at connections and valve cores etc.;

(3) In case of slight leakage, use spanner to tighten leaking connection till the leak vanishes; otherwise it is necessary to correct threaded connector and bell mouth jointing face and

reconnect the parts, and again vent air and detect leakage.

(4) After detection, use dry cloth to wipe out soapy water. Sort all connecting pipes.

6. Precautions

(1) After sorting of connecting pipes, wrap them and indoor unit connectors with thermal insulation material to avoid water leakage due to dewing.

(2) When connecting pipe is too long, both unit performance and reliability will deteriorate. With increased number of pipeline bends, refrigerant flow resistance will increase and cooling/heating performance fall.

Product series/models	FRD23-B FRD35-B FRD50-B	FR(D)71-B FR(D)100-B	FR(D)95 FR(D)125/S FR95-C FR125-C/S	FR(D)180/S	FR(D)260/S
Recommended max length (m)	15	20	20	20	20
Recommended max HGT diff (m)	5	8	8	8	10
Recommended max elbows	3	5	5	5	5

When length and height exceed above values, consult us for suitable measures.

(3) If FRD23-B, FRD35-B, FRD50-B connecting pipe length exceeds 5m, add 20g/m refrigerant.

(4) If FR(D)71-B, FR(D)100-B connecting pipe length exceeds 8m, add 30g/m refrigerant and 10g/m frozen oil.

(5) If FR(D)95, FR(D)125/S, FR95-C, FR125-C/S connecting pipe length exceeds 8m, add 30g/m refrigerant and 10g/m frozen oil.

(6) If FR(D)180/S connecting pipe length exceeds 8m, add 80g/m refrigerant.

(7) Amount of refrigerant filled inside FR260/S is for 5m connecting pipe. For extended length of connecting pipe, add 170g/m refrigerant.

Notes:

1. Use T valve filling port to add refrigerant;

2. Add refrigerant during cooling operation;

3. Do not directly pour liquid refrigerant;

4. Model of frozen oil: Sontex200LT white oil or 3GS oil.

7. Electric wiring

(1) Electric wiring shall be carried out by electricians with qualification certificates. State electric wiring code shall be followed;

(2) Electric box must be fixed on indoor unit casing; earthing must be reliable;

(3) According to requirements by electric wiring diagram, connect wire controller to indoor electric box. Connect indoor/outdoor connecting cable and outdoor pipe temperature probe connecting cable to outdoor electric box. Plugs shall be firmly and reliably in place and held tight by wire clamp.

(4) Special power supply cables must be used for the units. For FRD23-B, 250V 10A power plug shall be used, 250V 15A plug for FRD35-B, and 250V 25A for FRD50-B. User must select sockets corresponding to these plugs. For other models of air duct air conditioners, we will not supply power plug and user must adopt special power lines.

(5) Units with auxiliary electric heating must connect an electric heating power cable on the electric box (YZ3X1.5+1X1 cable for FRD125/S, RVV3X2.5 sheathed cable for FRD95, 2 YZ3X1.5+1X1 cables for FRD180, and 2 YZ3X1.5+1X1 cables for FRD260) to wiring terminal seat on electric heating box in a corresponding manner, connect earthing line, hold tight with wire clamp, and fix cover plate on the seat. Only turn on machine with wires connected; otherwise short circuit can occur.

Notes:

1. For FR(D)125/S, FR(D)180/S and FR(D)260/S, check for correct rotation direction of compressor before system installation and operation. Compared with normal operation, reverse compressor rotation can cause high noise and small current. FR(D)180/S and FR(D)260/S wire controller will indicate E6 (confirm no absent phase) for reverse compressor rotation. Shutoff the unit at once, disconnect power and swap 2 any phases.

2. Indoor/outdoor connecting cable must be sheathed cable meeting state standards. Signal lines shall be $\geqslant 1mm^2$ sheathed cable.

FR95, FR95-C power cable shall be $\geqslant 2.5mm^2$ cable (with yellow/green earthing line); indoor/outdoor power connecting cable shall be $\geqslant 2.5\ mm^2$ cable (with yellow/green earthing line).

FRD95 power cable shall be $\geqslant 6mm^2$ cable (with yellow/green earthing line); indoor/outdoor power connecting cable shall be $\geqslant 2.5\ mm^2$ cable (with yellow/green earthing line).

FR125/S, FR125-C/S power cable shall be $\geqslant 1.5mm^2$ cable (with yellow/green earthing line); indoor/outdoor power connecting cable shall be $\geqslant 1.5mm^2$ cable (with yellow/green earthing line.

FRD125/S power cable shall be $\geqslant 4mm^2$ cable (with yellow/green earthing line); indoor/outdoor power connecting cable shall be $\geqslant 1.5mm^2$ cable (with yellow/green earthing line).

FRD71-B, FR100-B power cable (with yellow/green earthing line) and indoor/outdoor power connecting cable shall be $\geqslant 2.5\ mm^2$ cable (with yellow/green earthing line).

FRD71-B, FRD100-B indoor power cable shall be $\geqslant 4mm^2$ cable (with yellow/green earthing line). Indoor/ outdoor power connecting cable shall be $\geqslant 2.5mm^2$ cable (with yellow/green earthing line). Indoor and outdoor signal cables shall be $\geqslant 1mm^2$ cable.

Chapter IX Air duct design & noise reduction

I. Air duct design and its effect on noise

(1) Noise of air conditioning system mainly consists of aerodynamic noise, mechanic noise and electric current noise. Among them, aerodynamic noise makes main contribution.

(2) Noise reduction measures

Installation of air duct type air conditioner is system engineering. Noise reduction includes that in indoor unit installation and that in air duct design and installation. Refer to introduction of indoor unit installation for details of noise reduction in indoor unit installation. Air duct design and noise reduction methods are described below:

Design air duct and air port air speed according to state codes and standards, "Product installation and operation manual" and "Chunlan design code for home (commercial) centralized air conditioning system". Data in following tables can be referenced for design. (These data may have slight deviations that do not affect functioning as design reference).

Table 1: Air speed in low speed air duct (m/s)

Permitted indoor noise dB (m/s)	Main duct air speed	Branch duct air speed	Fresh air entrance
25—35	3—4	≤2	3
35—50	4—7	2—3	3.5
50—65	6—9	2—5	4—4.5
65—85	8—12	5—8	5

Table 2: Max. air delivery speed at lateral delivery louver port (m/s)

Building	Max air delivery speed	Building	Max air delivery speed
Studio	1.5—2.5	Personal office	2.5—5.0
Residence	2.5—3.8	Personal office (no sound insulation)	4.0—6.3
Hotel room	2.5—3.8	Ordinary office	2.5—3.8
Theatre	2.5—3.8	Cinema	2.5—3.8
Hall	2.5—3.8	Department store	7.5

Table 3: Maximum air delivery speed of diffuser (m/s)

Building	Permitted noise /dB (A)	Net indoor height /m				
		3	4	5	6	7
Broadcasting	32	3.9	4.2	4.3	4.4	4.5
Theatre, residence, operation room	33—39	4.4	4.6	4.8	5.0	5.2
Hotel, personal office	40—46	5.2	5.4	5.7	5.9	6.1
Shop, bank, restaurant, department store	47—53	6.2	6.6	7.0	7.2	7.4
Public building; office, department store bottom floor	54—60	7.4	7.9	8.3	8.7	8.9

Table 4: Max. air delivery speed at orifice, strip seam and spout (m/s)

Air port	Max air delivery speed	Remark
Orifice	3—5	Upper limit is preferred for high even delivery requirement or hot air, for high installed position of port, or higher air speed is allowed in area of personnel activities.
Seam port	2—4	
Spout	4—10	

Table 5: Air suction speed at return air port (m/s)

Position of return air port		Air suction speed
Room upper part		4—5
Room lower part	Near points of stay of personnel	1.5—2

Table 6: Recommended criteria for indoor noise control (referencing "High building air conditioning design" published by China Architectural Industry Publishing House).

Type of room		Noise level
Guest room	Grade I	30
	Grade II	35
	Grade III	40
	Grade IV	55
Restaurant Banquet hall Multifunction hall	Grade I	（35）
	Grade II	40
	Grade III	45
	Grade IV	55

Type of room		Noise level
Commercial Service	Grade I	45
	Grade II	45
	Grade III	55
	Grade IV	55
Vestibule Seasons hall	Grade I	45
	Grade II	45
	Grade III	45
Hairdressing/Barber's room		45
Recreation facilities		45
Meeting room Office	Grade I	（30）
	Grade II	40
	Grade III	45
	Grade IV	55
Ballroom, non-operating time		40
Operating time		—

Note: In short, air duct/port design/type selection shall follow the 3 steps below:

1. Roughly calculate air duct cross sectional area and air port air delivery/return areas according to rated unit air flow and suitable air speed;

2. According to "National common ventilating pipeline calculation table", preliminarily determine air duct size and dimensions; preliminarily determine air port size by referencing relevant manufacturer product samples;

3. Calculate air resistance in air delivery/return system; further verify air duct by referencing unit air exhaust static pressure; select correct type of air ports. When necessary, repeat these 3 steps.

Note: For higher user requirement on noise, silencers shall be installed on air delivery/return ducts;

a. Resistive silencer. By means of sound absorbing material stuck on inner wall of air duct, sound energy propagating along air duct is partly converted to thermal energy to reduce noise. This type of silencer has good performance for medium and high frequency noise and relatively poor effect on low frequency noise.

b. Reactive silencer. By means of sudden expansion, contraction and bypassing (resonance cavity) of air duct cross section, noise propagating along air duct at specific frequencies and frequency bands is reflected at points of sudden change. The type of silencers has good performance for low and medium frequency noise.

c. Combined resistive and reactive silencer (wide frequency band silencer). This type of silencer integrates advantages of above types and has good performance at low, medium and high frequencies. Reduction of noise at low frequencies and some medium frequencies makes use of reactive silencing by sudden change of pipeline cross sectional area and resonance sound absorption by cavity. Reduction of noise at high frequencies and most medium frequencies makes use of sound absorbing materials.

II. Existing problems in air duct noise control and measures of solution

- Main equipment

Problem 1: Too large size of unit selected

Careful air conditioning load is not carried out according to cooling/heating load detailed calculation method or rough calculation method specified in relevant standard or book, or in combination with application site information. For instance, 5HP unit is selected where 4HP or 3HP should have been selected. This will cause higher noise due to limited space if air conditioning and small distance between indoor unit and conditioned space.

Solution:

By referencing relevant standard, book or experience, carefully calculate air conditioning cooling/heating load and select correct type.

Problem 2: Improper installation

Proper installation position is not selected according to installation key points described in "Product installation and operation manual" and "Chunlan home (commercial) centralized air conditioning system design code: (e.g.: indoor unit is too near conditioned area or in such area), or proper fixing, damping and sound insulation is not carried out.

Solution:

(1) Indoor unit shall be installed away from environment and rooms that require quietness. The unit can be can be installed in special equipment room, toilet, storeroom or other ancillary rooms. If this is not feasible, make sure to contact our quality management section to obtain proper noise reduction solution as soon as possible to avoid rework and loss.

(2) Use elastic material to fill air delivery/return dust penetrations through enclosure and gap around holes;

(3) Suitable sound insulation measures shall be taken in equipment room according to permitted noise level of nearby rooms and buildings. If the equipment room is near room(s) with high requirement, sound insulating doors and windows shall be used for equipment room (this clause is subject to Owner agreement).

(4) Lifting and installation method shown in the figure below is preferred. In the figure, at lower end of unit are two angle steels, on top of which is a 15mm wood plate of the same size as that of unit bottom size. 10mm thick PE board is mated on the wood plate.

- Air duct system

Problem 1: Flexible connection is not used for unit air delivery/return ports

Air delivery/return duct is directly connected with unit and no flexible hose connection is used, causing unit vibration being transmitted by pipeline and excessive noise in conditioned area.

Solution:

Use 200mm-300mm long canvas, 3-proof cloth or soft metal insulating tube between unit air

delivery/return port and air delivery/return hose, for isolation of vibration.

Problem 2: Unreasonable design of air speed

Careful design of air speed at air delivery/return main duct, branch duct and ports according to conditioned area noise requirement and unit air delivery static pressure is not carried out, causing higher air speed and higher noise caused thereby.

Solution:

Design air duct and air port air speed according to national standard, “Product installation and operation manual” and “Chunlan hole (commercial) centralized air conditioning system design code”. Data in Tables 1 to 6 in this manual can be used for design reference (slight deviations will not affect design). Design and type selection of air ducts and air ports shall follow the following 3 steps:

(1) Roughly calculate air duct cross sectional area and areas of air delivery/return ports according to unit rated air flow and suitable air speed;

(2) Reference “National common ventilating air duct calculation table” for preliminary determination of air duct size and dimensions; reference manufacturer product samples for preliminary determination of air port size;

(3) Calculate air resistance in air delivery/return systems. Further verify correct type selection of air duct and ports by referencing unit air exhaust static pressure. When necessary, repeat above 3 steps.

Problem 3: Local high resistance in air duct

Improper design of local resistance members such as air duct elbow, reducing pieces and T branches etc. causing large eddy current and hence high air flow noise.

Solution:

(1) Avoid sharp turning of pipeline at indoor unit entrance/exit;

(2) Arrange diffuser or reducing tube of suitable length at reducing segment of air duct to avoid sudden expansion or reducing of air duct;

(3) At elbows and T branches etc., take even-flow measures such as transition arc or flow guide piece;

(4) Reduce or eliminate regulating valves.

Problem 4: Proper silencing measures not taken for pipeline system

In case of high noise requirement, silencing devices such as static pressure box, return air box, silencing straight tube, silencing branch tube, silencing elbow or silencing air port are not provided or incorrect or unreasonable.

Solution:

(1) When permitted by installation space, static pressure box and return air box (designed section air speed not exceeding 2-2.5m/s) to requirements as much as possible. Inside these

boxes, stick 50mm thick sagging sponge or other sound absorption material to form silencing static pressure box or return air box, for substantial reduction of noise at unit air delivery port/exhaust;

(2) Note: Ceiling space accommodating the unit is itself a large static pressure box. If material of ceiling cover plate is mineral wool or other sound absorbing material, equipment room walls are brick masonry instead of glass, and wall tightness is good, noise radiated by unit casing will be greatly reduced;

(3) Design correct and reasonable silencing straight tube, branch tube, elbow or air port (for particular type selection, reference manufacturer product samples);

(4) Increase thickness of air duct wall and wrap ultra-fine glass wool (or other sound absorbing material) of suitable thickness on exterior of air duct;

(5) Due to limited sound absorption performance of traditional galvanized air duct and fiberglass reinforced plastics air duct, stretching metal (non-metal) flexible hose, polyurethane composite air duct, super air duct and other new type of sound absorption/thermal insulating air duct can be considered.

III. How to avoid poor cooling/heating effect

(1) Carry out correct type selection;

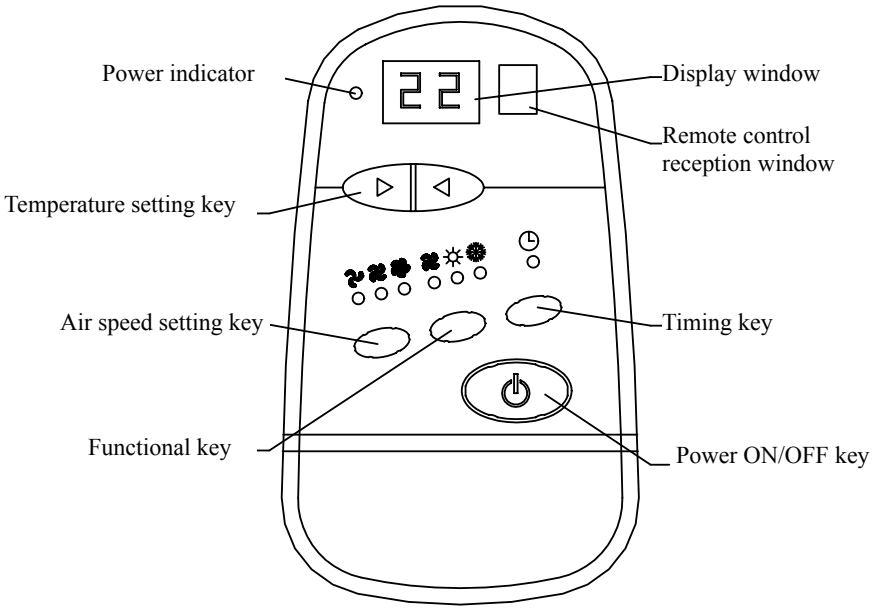
(2) To extend pipeline, add freon to requirement by manual.

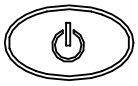
(3) For higher user requirement on heating, unit with auxiliary electric heating is recommended.

Chapter X Method of operation

I. Description of wire controller

1. Ordinary wire controller



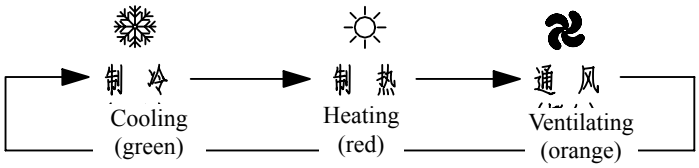


Power ON/OFF key

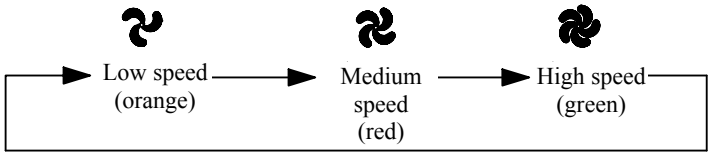
- When power is turned on, power indicator (red) lights up and the unit is in stop status.
- Press power ON/OFF key, the unit will be in ventilating status (high air flow) and temperature is set at 22℃. At this time, use functional key to select operating status. With unit in operating status, press power ON/OFF key will stop the unit and place it in standby status.
- After pressing power ON/OFF key, if power supply is interrupted and resumed, the unit will be restored to the status before power interruption.

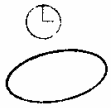
Functional key

- Press this key and the unit will cycle through following modes and displays:



Air speed setting key





Timing key

● After pressing this key, indoor unit air delivery status will cycle as follows:

● When the air conditioner is in ON status, you can select timed shutdown. Before such shutdown, press timing key to display remaining time in the display window; temperature display will resume after 5s. When the timing expires, the air conditioner is shutdown, and all display contents on wire controller vanish except for power supply indicator.

● When the air conditioner is in OFF status, you can select timed turn-on. Before such turn-on, press timing key to display remaining time in the display window; this display will vanish after 5s. When this timing expires, the air conditioner will operate in set mode and timing status automatically changes to normal operation.

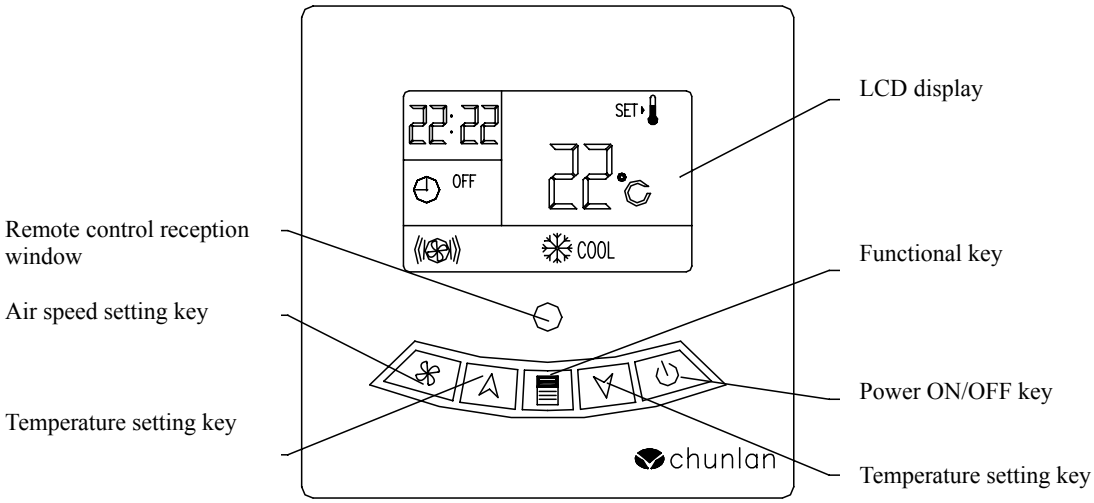
● Time setting is 01~24h. Initial value is 01, interval is 1h and this setting will increase 1h every time the timing key is pressed. Holding down this key will cycle this setting to 24h and then to 01h again.

Temperature setting keys

● A temperature increase key and a temperature decrease key are provided. Press the former to increase temperature by 1 degree and press the latter to decrease temperature by 1 degree.

● Temperature setting range is 12℃~30℃. When temperature display is 12℃, temperature decrease key is not functional; and when temperature display is 30℃, temperature increase key is not functional.

2. LCD wire controller



Power ON/OFF key

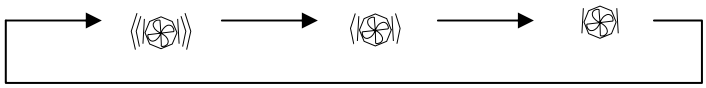
- Turn on main unit power, the LCD only displays clock and the unit is in stop status.
- Press power ON/OFF key, the unit is in ventilating status at high air speed and 22℃. At this time, use functional key to select operating mode. Press power ON/OFF key with unit in operating status, the unit will not stop and enter stop status.
- After pressing power ON/OFF key, if power is interrupted and resumed later, the unit will be restored to the status before power interruption.

Functional key (also timing key and clock setting key)

- Press this key and the unit will cycle as follow:

Air speed setting key

- Press this key and indoor unit air delivery status will cycle as follows.



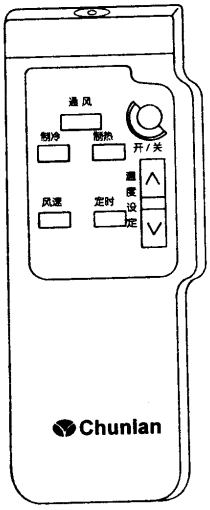
Temperature setting key

- is temperature increase key and press this key to increase temperature by 1 degree; is temperature decrease key and press this key to decrease temperature by 1 degree.
- Temperature setting range is 12℃～32℃; when temperature display is 12℃, temperature decrease key is not functional; when temperature display is 32℃, temperature increase key is not functional.
- Entering timing function:

Hold down functional key for about 5s to enter timing status and will be displayed. If the unit is ON at this time, "OFF" will flash; if the unit is OFF at this time, "ON" will flash. Press to change hour setting (increase 1 hour every time this key is pressed) and press to change minute setting (increase 15min every time this key is pressed). Press "Timing" key on remote controller can also enter timing status.

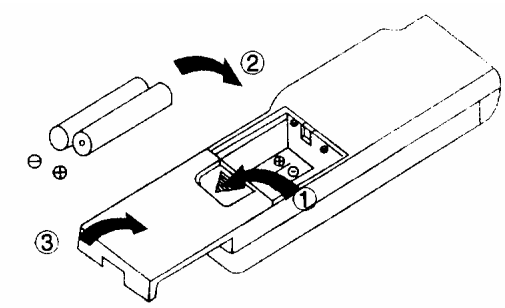
- Setting of clock: After entering timing status, continue holding functional key for about 6s and then release to enter clock setting status. At this time, will flash and press can change hour setting (increase 1 hour every time this key is pressed) and press to change minute setting (increase 1min every time this key is pressed). Continue setting till the clock is 24h system Beijing time.

II. Description of remote controller



The remote controller has 8 keys of the same functions as those of corresponding keys on wire controller. When timing key is pressed, the unit enters timing status and press ∧ to change hour setting (increase 1 hour every time this key is pressed) and press ∨ to change minute setting (increase 15 min every time this key is pressed).

III. Installation of remote controller batteries



① Remove batteries cover in direction shown by the arrow;

② Fit 2 valid 5# batteries to +/- polarity requirement in battery chamber;

③ Close batteries cover by pushing upward.

Notes:

(1) Use 2 5#1.5V batteries; do not mix different batteries;

(2) Remove batteries if the remote controller will not be used for a long time (>2 months);

(3) Replace batteries when remote control signal is weak;

(4) Batteries supplied with equipment are valid for 6 months.

IV. Method of operation

(1) Precautions

a. Before startup of air conditioner, connect power to requirements and ensure reliable earthing.

b. After shutdown of air conditioner, it is necessary to wait at least 3min before restart or change of operating mode, so as to protect compressor.

c. In normal operating status of air conditioner, shutdown the machine by power ON/OFF key.

Never shutdown the machine by unplugging power cord.

(2) Cooling

Prep	Turn on power
Turn on	Press ON/OFF key to start
	Use func'n key to select cooling
	Use AS key to air speed
	Use temp key to set room temp.
Off	Press power ON/OFF key

Notes:
a. When cooling is selected, temperature shall be set lower than current indoor temperature; otherwise the unit will be in ventilating mode;
b. If ambient is too high, cooling load will be too high so that set temperature won't be met;
c. For your health and power saving, proposed set room temperature is 25℃～30℃.

(3) Heating

Prep	Connect power supply
Turn on	Press power ON/OFF to start
	Use func'n key to select heating
	Use AS key to select air speed
	Use TS key to set room temp.
Off	Press power ON/OFF key

Notes:
a. When heating is selected, set temperature shall be higher than current room temperature; otherwise the unit won't work;
b. To prevent cold air at startup, indoor unit will operate later than outdoor unit;
c. During heating, the computer will control the unit for auto defrosting, during which no fan will operate and the compressor will operate, and after which heating will start.

(4) Ventilating

Pre	Connect power
Turn on	Press power ON/OFF key
	Use F key to select ventilating
	Use AS key to select air speed
Off	Press power ON/OFF key

Warning: When the unit is not to be used for a long time, use "ventilating" function for 3~4 hours to completely dry up the air conditioner.

Chapter XI Maintenance

● To place the unit in outage, first stop the air conditioner and then turn off power switch.

● After long operation of outdoor unit, dust will accumulate on surface of heat exchanger, lowering heat transfer efficiency and hence unit performance. Use long hair brush or compressor air to clean such surface.

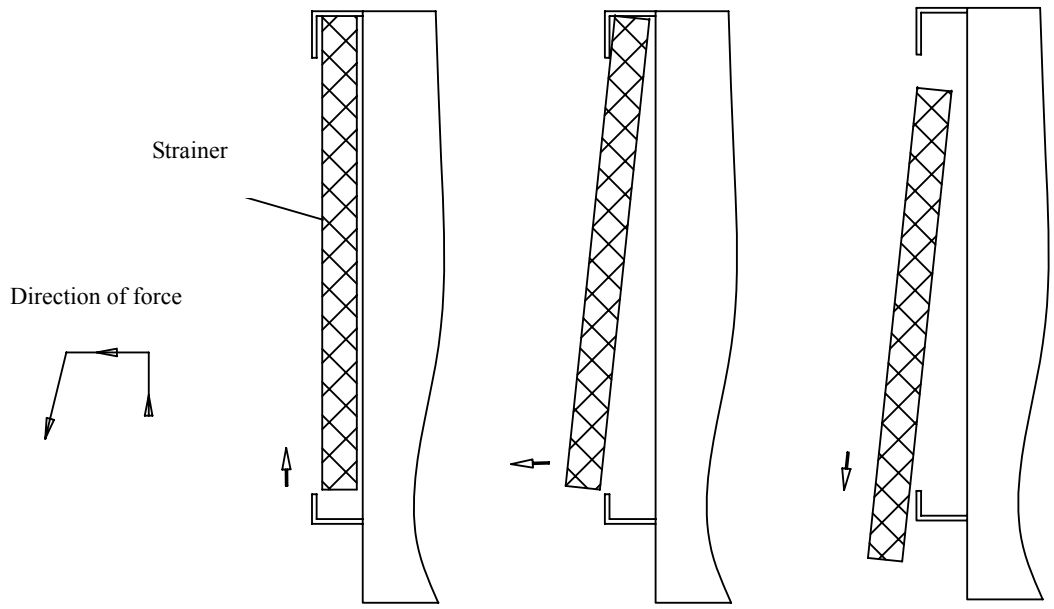
● Cleaning cycle of indoor strainer depends on installation position and environment. Frequently clean indoor strainer to avoid failure.

Indoor units of FR(D)95, FR(D)125/S, FR(D)180/S, FR(D)260/S, FR95-C and FR125-C/S are complete with strainer. Indoor units of other models are not complete with strainer; hence return air grating with strainer must be used.

Method to remove strainer of indoor units of FR(D)95, FR(D)125/S, FR(D)180/S, FR(D)260/S, FR95-C and FR125-C/S:

① Remove reserved seal plate on return air duct;

② Lightly push strainer upward, move limiting chute out, and lightly remove strainer from under.



Chapter XII Troubleshooting

I. Failure codes

Microprocessor-based controller of this unit features troubleshooting and protection display functions.

Failure category	Display code			
	FRD23-B, FRD50-B FRD50-B	FR(D)71-B FR(D)100-B	FR(D)95, FR95-C FR(D)125/S, FR125-C/S	FR(D)180/S FR(D)260/S
High pressure protection	---	E0	---	E0
Antifreeze protection	E1	E1	E1	E1
ID ambient temp probe short circuit	E2	E2	E2	E2
ID pipe temp probe short circuit	E3	E3	E3	E3
OD pipe temp probe short circuit	E4	E4	E4	E4
Communication failure	E5	E5	E5	E5
Phase sequence protection	---	---	---	E6
Overcurrent protection	---	---	---	E7
Load relief protection	E8	E8	E8	E8
Low pressure protection	---	---	---	E9

In case of repeated protections of air conditioner, cut off power supply and have failure corrected by specialty maintenance personnel, before restarting the machine.

II. Common troubleshooting

In case of AC failure, immediately cut off power supply. Check the following before requesting maintenance:

Failure	Causes	Correction measures
Machine not operating	Power off	Use when power is resumed
	Power not meeting requirement	Check power supply before use
	Molten fuse or open CB	Replace fuse or close circuit breaker
Machine operating at poor cooling/heating efficiency, or not cooling or heating	Clogged air strainer	Clean air strainer
	ID or OD unit air intake clogged	Remove obstacles
	Improper temp control setting	Reset temperature control
	Open door/window	Close doors/windows

Failure	Causes	Correction measures
	Direct sunshine ID (in cooling)	Use window curtain for shading
	Heat sources in room	Reduce heat sources
Molten fuse in operation	Line short circuit	Notify appointed maintenance dept.
Failed controller	Microprocessor interfered	Reconnect power and start machine
Not receiving RC signal	RC batteries old or not properly installed	Replace batteries and correct installation
Failed communication	Bad contact between wire controller and main board	Properly connect cables between them

If the failure is still not cleared, turn off air conditioner, cut off power and contact appointed maintenance department.

Do not repair the air conditioner on yourself.

Note: This unit features innovative and unique program design capable of automatic control of number of operating outdoor fans and motor speed according to change of outdoor ambient temperature etc. to obtain optimum system load configuration.

(I) Unit system and structure troubleshooting

(1) Neither indoor unit nor outdoor unit operating

Phenomena	Possible causes		Correction method
Neither indoor unit nor outdoor unit operating	Power outage		Restore power supply
	Transformer burnt down		Locate fault, repair/replace transformer
	Molten fuse	Short circuit between lines	Clear short circuit, replace fuse
		Line earth fault (bad insulation)	Clear earth fault, replace wire
	Power plug not in place or bad contact		Correct bad contact, plug in socket
	Indoor/outdoor wiring mistake		Follow electric diagram in correct wiring
	Molten controller fuse		Replace controller fuse
	Controller burnt down		Replace controller
	Unit failure protection activated		Check per failure characteristics/display

(2) Display of remote controller or wire controller indicates air delivery position, but fans are not operating.

Phenomena	Possible causes	Correction method
Display of remote controller or wire controller indicates air delivery position, but fans are not operating	Indoor fan burnt or broken wire	Repair or replace fan
	Damaged fan capacitor	Replace capacitor
	Bad contact in main ctrl board relay or coil broken wire	Replace main control board relay
	Fan card contact open	Repair bad contact

Note: During heating, defrosting or prevention of cold air, remote controller indicating air speed but fans not operating is normal and not failure.

(3) Troubleshooting for failure of outdoor fan or compressor operation at “Cooling” or “Heating”:

Phenomena	Possible causes	Correction method
Neither outdoor fan nor compressor operating at “Cooling” or “Heating”	OD control board relay coil broken wire or bad contact	Replace relay
Compressor operating but outdoor fan not operating at “Cooling” or “Heating”	OD fan motor failure or damaged fan capacitor	Replace motor or capacitor
	OD control board relay failed	Replace relay
Outdoor fan operating but compressor not operating	Compressor failure	Replace compressor
	OD control board relay failure	Replace relay
	AC contact unreliable/damaged	Replace AC contactor
	Compressor operating capacitor damaged	Replace this capacitor

(4) Compressor shutdown shortly after startup

Phenomena	Possible causes	Correction method
Compressor shutdown shortly after startup	During cooling, sunshine or blocked ventilation can cause higher condensation pressure; and when this is serious, compressor overload protection will act to stop compressor.	Remove obstruction and use rain shelter

Phenomena	Possible causes	Correction method
	During heating, small openness of or closed air delivery port in air conditioned room can cause higher condensation pressure, and when serious, compressor overload protection will act to shutdown compressor	Check and adjust air port openness
	Power voltage is low and less than 10% rated voltage, causing increased current and action of overload protection	Use AC voltage regulator
	Insufficient power grid capacitance	Increase power grid capacitance
	Compressor “jammed”, causing sharp increase of current and action of protection	Replace compressor

(5) Bad or no cooling in cooling mode

Phenomena	Possible causes	Correction method
Bad or no cooling in cooling mode	Improper OD unit installation position, e.g. direct sunshine on unit, bad ventilation or obstruction	Reinstall, remove obstacle or use rain shelter
	Damaged or failed temperature sensor	Replace temperature sensor
	Dust accumulated on air strainer in long operation will reduce air cycle and lower evaporator heat exchange efficiency, hence cooling effect	Clean strainer to remove dust and let it dry in cool air before reinstallation
	Dust accumulated on air conditioner fins can cause insufficient cold air cycle or bad heat dissipation, hence lowering cooling effect	Use long hair brush or compressed air to remove dust
	Clogged capillary in cooling cycling system causing sudden failure of this system or lowered cooling effect	Again pump vacuum, fill refrigerant or replace capillary (strainer etc.)
	Refrigerant leakage due to bad welding of system pipeline or damaged copper tube, bad sealing of shutoff valve filling port sometimes	Carry out repair weld or replace shutoff valve and fill refrigerant after detection
	Excessive refrigerant that cannot be totally evaporated in evaporator, causing lowered heat absorption capability and cooling effect	Drain excess refrigerant
	Air mixed in system affecting heat exchange, causing higher condensation pressure and lowered cooling effect	Drain refrigerant, re-pump vacuum and fill new refrigerant

Phenomena	Possible causes	Correction method
	Damaged fan capacitor, bad contact, damaged fan motor, or failure of fan power supply line, causing indoor fan not operating or operating at lower speed, hence no cold air out or poor cooling	Check power line, each switch, temperature controller, terminal board, replace capacitor/motor
	High (low) voltage or wrong power supply wiring or broken circuit causing compressor not operating; or failure of compressor (e.g. motor burnt down, jammed, damaged valve disc etc.)	Use AC voltage regulator, replace damaged parts
	Excessive cooling load	Check expected cooling load
	Set temperature too high	Lower set temperature
	Leaking refrigerant or closed shutoff valve, clogged system	Check and repair leakage, or open shutoff valve
	Compressor failure (connecting HP and LP) etc.	Replace compressor
	Bad thermal insulation of indoor/outdoor unit connecting pipe	Apply separate thermal insulation for bid and small pipes
	Reversing valve failure	Replace reversing valve
	Improper air delivery pipeline design, installation or user operation, causing reduced indoor air delivery amount	Re-design or re-install air delivery path; proper use of air conditioning unit by user

(6) Poor or no heating in heating mode

Phenomena	Possible causes	Correction method
Poor or no heating in heating mode	Excessive heating load	Check expected heating load
	Improper outdoor unit installation position	Re-install & ensure good ventilation
	Set temperature too low	Increase set temperature
	Clogging in heating cycling system	Again pump vacuum, fill refrigerant or replace dirt/clogged parts
	Clogged air strainer	Clean strainer periodically
	Excessive dust accumulated on heat exchanger	Clean by long hair brush or compressed air
	Small air flow in indoor heat exchanger	Increase fan speed

Phenomena	Possible causes	Correction method
	Compressor failure	Replace compressor
	Reversing valve failure	Replace reversing valve
	Leaking refrigerant or shutoff valve not open, clogging system	Detect and repair leakage or open shutoff valve
	Insufficient or excessive refrigerant	Add (discharge) refrigerant
	Poor thermal insulation of indoor unit connecting pipe	Separate thermal insulation for big and small pipes
	Defrosting controller failed	Replace defrosting controller
	Poor air delivery duct design, installation or user operation causing reduced indoor air delivery	Re-design or re-install air delivery duct, proper use of unit by user

(7) Water leakage on indoor unit

Phenomena	Possible causes	Correction method
Indoor unit water leakage	Dewing of drain pipe	Replace with insulated pipe or wrap drain pipe with insulation
	Clogged or broken drain pipe	Clean or replace drain pipe
	Wrapping of pipe connector not tight, dewing	Wrap tight
	Water leakage in indoor condensate tray	Replace condensate tray
	Serious inclination of indoor unit	Re-install indoor unit

(II) Electrics and control troubleshooting

1. Maintenance prompts

In case of abnormity of air conditioner, do not remove circuit board; check the following:

a. Failure in power supply line: power input must be safe and reliable;

b. Correct operation of air conditioner and operating conditions of each operating mode (refer to operation manual for method of operation);

c. Good contact of cards and reliable installation of indoor/outdoor connecting cable;

d. Normal status of compressor, fans and sensors (refer to instruction manual for electric wiring);

e. Functional protection caused by external environment is normal protection and no servicing

is required.

2. Electrics and control protections and functions for FR23-B, FRD35-B, FRD50-B, FR(D)95, FR(D)125/S, FR(D)71-B and FR(D)100-B

A. Unit control objectives

a. Indoor fan (one for all models except FR(D)100-B, which has two 3-speed fans)

b. Outdoor fan (one for all models; 1-speed for FR23-B, FRD35-B, FRD50-B, 2-speed for others)

c. Compressor

d. Reversing valve

e. Indoor PTC auxiliary electric heater

B. Electrics and control troubleshooting

Failure	Phenomena	Failure analysis
3 occurrences of anti-freeze protection	When 3 consecutive such protection signals are detected in 1h, AC unit stops, wire controller displays E1, you can only put it into operation after re-powerup	**Check for normal cooling system; check for bad contact at ID pipe temperature sensor connection; check for broken wire or short circuit at sensor; if normal, check if R6 on indoor board is 10K**
ID ambient temp probe broken wire (short circuit)	Wire controller displays E2, put it into operation after re-powerup	First check ID ambient temperature sensor connection for bad contact, check for broken wire or short circuit in sensor; if normal, check if R7 on ID board is 10K
ID pipe temp probe broken wire (short circuit)	Wire controller displays E3, put it into operation after re-powerup	First check ID pipe temperature sensor connection for bad contact, check for broken wire or short circuit in sensor; if normal, check if R6 on ID board is 10K
OD pipe temp probe broken wire (short circuit)	Wire controller displays E4, put it into operation after re-powerup	First check OD pipe temperature sensor connection for bad contact, check for broken wire or short circuit in sensor; if normal, check if R5 on ID board is 10K
Communication failure	In case of communication failure between main control board and wire controller, the latter displays E5, and you can only put it into operation after re-powerup	Check for reliable welding on main control board CN6 and wire controller CN1 needle seat, reliable insertion of cards and broken or short circuit of communication line; Check for DC12V input on wire controller, DC5V output on main control board 7805-3 pin, and DC5V on RG1-3 of wire controller; Check normal voltage on main control board 2003 driving block; Check for normal voltage on crystal oscillator pin of main control board and wire controller; Check for normal voltage at communication input/output of main control board and wire controller

Schedule of other common failures of FRD23-B, FRD35-B, FRD50-B, FR(D)95, FR(D)125/S, FR(D)71-B and FR(D)100-B air conditioner PCB board:

Failure phenomena	Method of correction
Remote control failure	Check for normal remote control receiver; Check for normal remote control transmitter; Check for normal remote controller
Remote controller failure	Check for normal 3V batteries; Check crystal oscillator circuit; Check for normal transmitter; Check for displaced or bad contact in conducting rubber
No cooling function	Check for normal temperature sensor RT1; Check for normal DC12V, DC5V power supply; Check for reliable connection of output ports of compressor, ID/OD fans; Check for main control board damage
No heating function	Check for normal temperature sensor RT1; Check for normal DC12V, DC5V power supply; Check for reliable output port connection of compressor, reversing valve, ID fans and OD fans; Check for main control board damage
Reversing valve failure	Check for intact connection of outdoor unit wiring terminal; Check for damaged main control board; Check for intact reversing valve
Indoor fan failure	Check for intact connection of indoor unit wiring terminal and damage of main control board; Check for intact indoor fans; Check for intact fan capacitors
Outdoor fan failure	Check for intact connection of outdoor unit wiring terminal; Check for damaged main control board; Check for intact outdoor fans; Check for intact fan capacitor

3. FR180/S and FR260/S electric control, protections and functions (refer to contents of FRD95 and FRD125/S for electric heating type).

A. Unit control objectives

a. Indoor fans (2 sets, 3-speed)

b. Outdoor fans (2 sets, 1-speed)

c. Compressor

d. Reversing valve

B. Troubleshooting

Failure	Phenomena	Failure analysis
HV switch protection	Wire controller displays E0, only put it to operation after re -powerup	HV switch shall be ON and card connection shall have good contact; Check for bad contact at indoor/outdoor connecting cable card
3 occurrences of antifreeze protection	When 3 consecutive antifreeze protection signals are received in 1 hour, AC unit stops and wire controller displays E1, only put it to operation after re -powerup	Check for normal cooling system; Check for drifting of indoor pipe temperature sensor resistance
ID ambient temp probe broken wire (short circuit)	Wire controller displays E2, only put it to operation after re -powerup	First check for bad contact in indoor ambient temperature sensor connection; Check for broken wire or short circuit of sensor
ID pipe temp probe broken wire (short circuit)	Wire controller displays E3, only put it to operation after re -powerup	First check for bad contact in indoor pipe temperature sensor connection; Check for broken wire or short circuit of sensor
OD pipe temp probe broken wire (short circuit)	Wire controller displays E4, only put it to operation after re -powerup	First check for bad contact in outdoor pipe temperature sensor connection; Check for broken wire or short circuit of sensor
Communication failure	In case of communication failure between main control board and wire controller, wire controller displays E5, only put it to operation after re -powerup	Check for reliable welding at main control board CN6 and wire controller CN1 needle seat, reliable connection of corresponding cards, and broken wire or short circuit of communication line; Check for DC12V input at wire controller, DC5V output at main control board 7805-3 pin, and DC5V at wire controller RG1-3; Check for normal voltage at main control board 2003 driving block; Check for normal voltage at crystal oscillator pin of main control board and wire controller; Check for normal input/output voltages of main control board and wire controller

Failure	Phenomena	Failure analysis
Phase sequence (absence) protection	Wire controller displays E6, only put it to operation after re-powerup	Check for correct compressor power phase sequence; Check for protection action in compressor; Check for phase absence in compressor power line; Check for damaged compressor; Check for damaged triode on main control board; Check for damaged LM339N on outdoor board; Check for bad connection of ID/OD connecting cable; Check for damaged OD board current transformer
Overcurrent protection	Wire controller displays E7, only put it to operation after re-powerup	Check if 8HP compressor current exceeds 18A; Check if 10HP compressor current exceeds 28A; Check for damaged OD board LM339N; Check for damaged triode on main control board; Check for bad contact at ID/OD connecting cable; Check for damaged OD board current transformer
Load relief protection	Wire controller displays E8, only put it to operation after re-powerup	Check for normal cooling system; During cooling, check if OD pipe temperature sensor exceeds 70℃ During heating, check if ID pipe temperature sensor exceeds 68℃
LV switch protection	Wire controller displays E9, only put it to operation after re-powerup	LV switch shall be ON; check for bad contact at card connection; Check for bad contact at ID?OD connecting cable card connection

Schedule of other common failures of FR180/S and FR260/S air conditioner PCB board:

Phenomena	Method of correction
Remote control failure	Check for normal remote control receiver; Check for normal remote control transmitter; Check for normal remote controller
Remote controller failure	Check for normal 3V batteries; Check crystal oscillator circuit; Check for normal transmitter; Check for displaced or bad contact in conducting rubber

Phenomena	Method of correction
No heating function	Check for normal temperature sensor RT1; Check for normal DC12V, DC5V power supply; Check for reliable output port connection of compressor, reversing valve, ID fans and OD fans; Check for main control board damage Check for correct reversing of reversing valve
Reversing valve failure	Check for intact connection of outdoor unit wiring terminal; Check for damaged main control board; Check for bad contact at ID/OD connecting cable cards
Indoor fan failure	Check for intact connection of indoor unit wiring terminal and damage of main control board; Check for intact indoor fans; Check for intact fan capacitors
Outdoor fan failure	Check for intact connection of outdoor unit wiring terminal; Check for damaged main control board; Check for intact outdoor fans; Check for intact fan capacitor

In FRD23-B, FRD35-B, FRD50-B, FR(D)95, FR(D)125/S, FR(D)71-B and FR(D)100-B air conditioners, program controlled PCB board consists of main control board PCB1, wire controller PCB2 and remote controller PCB3. Refer to following table for their universality:

	FRD23-B FRD35-B	FRD50-B	FR95-C FR125-C/S	FR71-B FR100-B FR95 FR125	FR180/S FR260/S	FRD71-B FRD100-B FRD95 FRD125/S	FRD180/S FRD260/S
MCB PCB1	FRD35-B	FRD50-B	FRD95	FR95	FR180/S	FRD95	FRD260/S
WC PCB2	LCD			Normal			FR(D)180(260/S)
RC PCB3	Universal PCB3						

Outdoor electric part is shared by FR180/S and FRD180/S, by FR260/S and FRD260/S, and by FRD95 and FRD100-B. Others have different outdoor electric part.

Under following conditions, program controlled electric system will automatically detect failure. Wire controller will display failure codes:

Failure	Failure phenomena	Failure analysis
3 occurrences of anti-freeze protection	When 3 consecutive such protection signals are detected in 1h, AC unit stops, wire controller displays E1, you can only put it into operation after re-powerup	Check for normal cooling system; check for bad contact at ID pipe temperature sensor connection; check for broken wire or short circuit at sensor; if normal, check if R6 on indoor board is 10K
ID ambient temp probe broken wire (short circuit)	Wire controller displays E2, put it into operation after re-powerup	First check ID ambient temperature sensor connection for bad contact, check for broken wire or short circuit in sensor; if normal, check if R7 on ID board is 10K
ID pipe temp probe broken wire (short circuit)	Wire controller displays E3, put it into operation after re-powerup	First check ID pipe temperature sensor connection for bad contact, check for broken wire or short circuit in sensor; if normal, check if R6 on ID board is 10K
OD pipe temp probe broken wire (short circuit)	Wire controller displays E4, put it into operation after re-powerup	First check OD pipe temperature sensor connection for bad contact, check for broken wire or short circuit in sensor; if normal, check if R5 on ID board is 10K
Communication failure	In case of communication failure between main control board and wire controller, the latter displays E5, and you can only put it into operation after re-powerup	Check for reliable welding on main control board CN6 and wire controller CN1 needle seat, reliable insertion of cards and broken or short circuit of communication line; Check for DC12V input on wire controller, DC5V output on main control board 7805-3 pin, and DC5V on RG1-3 of wire controller; Check normal voltage on main control board 2003 driving block; Check for normal voltage on crystal oscillator pin of main control board and wire controller; Check for normal voltage at communication input/output of main control board and wire controller

C. Other failures

Failure	Method of correction
Main control board PCB1 not operating	Check for molten FU fuse; Check for normal DC12V, DC12V output on main control board 7812-3 pin, and DC12V input on wire controller; Check for normal DC5V, DC5V output at main control board 7805-3 pin, and DC5V on wire controller RG1-3; Check crystal circuit on main control board and for normal voltage at crystal oscillator pins of chips 1 and 2; Check for normal resetting circuit 7042 on main control board
Remote control failure	Check for normal remote control receiver; Check for normal remote control transmitter; Check for normal remote controller
Remote controller failure	Check for normal 3V batteries; Check crystal oscillator circuit; Check for normal transmitter; Check for displaced or bad contact in conducting rubber
No cooling function	Check for normal temperature sensor RT1; Check for normal DC12V, DC5V power supply; Check for reliable connection of output ports of compressor, ID/OD fans; Check for main control board damage
No heating function	Check for normal temperature sensor RT1; Check for normal DC12V, DC5V power supply; Check for reliable output port connection of compressor, reversing valve, ID fans and OD fans; Check for main control board damage
Reversing valve failure	Check for intact connection of outdoor unit wiring terminals; ‘19’ pin output on main control board MCU chip shall be high level; relay RL1 shall close by suction; Check for intact reversing valve
Indoor fan failure	Check for intact connection of indoor unit wiring terminal and damage of main control board;

Failure	Method of correction
	Check for intact indoor fans; Check for intact fan capacitors
Outdoor fan failure	Check for intact connection of outdoor unit wiring terminal; Check for damaged main control board; Check for intact outdoor fans; Check for intact fan capacitor

Chapter XIII Typical case analysis

Case I: A user installed a number of FR125/S air duct type air conditioners and complained about poor heating effect. Pressure measurement showed that indoor unit and outdoor unit systems were normal without clogging or leakage, and indoor area and thermal insulation met requirements.

Analysis: (1) The indoor unit was installed in ceiling layer of toilet with ventilating windows. Fresh air leaked into return air so that indoor unit return air temperature in winter was lower than 0℃; (2) Insulation on air delivery hose and static pressure box was merely 5mm thick sticky sponge.

Solution: (1) Fabricate fresh air duct plus air damper control and seal for insulation; or block fresh air window and cancel fresh air duct; (2) Increase air duct thermal insulation to above 15mm.

Case II: A user installed more than 10 sets of FR125/S air duct air conditioners and complained of poor heating effect. For this reason, user installed auxiliary electric heating of sufficient power, so that indoor air delivery temperature was as high as 52℃. However, even at high air speed setting, air delivery was very small and room temperature was low.

Analysis: (1) Space surrounding indoor unit was small and natural return air was used. Distance between unit return air face to obstacle was only 5cm and return air was seriously blocked; (2) Air delivery main hose was only 0.8m long, i.e. a branch hose leading 2 lines of right angle bends. This branch hose was 20cm diameter round corrugated plastic hose and total air delivery cross sectional area was less than 0.1 m^2, hence air delivery side was seriously blocked.

Solution: (1) Reinstall indoor unit and change its orientation; also ensure certain space to allow free air return; (2) Increase air delivery branch hose cross sectional area or increase number of such branch hoses, so that total air delivery cross sectional area at any section is larger than 0.15 m^2; avoid local flattening and short distance right angel sharp turning.

Case III: A user recently installed two FR95 air duct type air conditioners and found poor heating effect and small air delivery. Measured indoor unit air intake temperature was 21.7℃, indoor unit air delivery temperature was 34℃, room air delivery port temperature was 28℃, outdoor ambient was 8.2℃, operating current was 11.5A and heating pressure was 1.4Mpa.

Analysis: (1) Under nominal operating condition, rated operating current was 16A and heating pressure was 1.8Mpa; amount of freon in the unit was apparently small; (2) There was no return air port in any room and air return depended on side doors; (3) The static pressure box had an air delivery hole and was too near indoor unit air return, causing air short circuit and affecting air delivery in other rooms.

Solution: (1) Add freon to specified value and carry out overall leakage detection of pipeline; (2) Provide effective air return twice the size of air delivery port area to ensure favorable energy cycling and no loss; (3) Block static pressure box air delivery hole and provide thermal

insulation.

Case IV: A user installed 11 sets of Chunlan FR260/S, FR180/S and FR125/S air duct type air conditioners. During test run, it was found that heating effect was poor and highest air delivery temperature in rooms was only 28℃. Measurement showed that current, voltage and system pressure were all normal.

Analysis: (1) Design of air return was not reasonable. Air return ports provided were as small as half a book and in some rooms, even no such port is provided; (2) Fresh air port was normally open and not controlled by air damper; (3) Room area/space was too large.

Solution: (1) Provide effective air return with sufficient area; (2) Fabricate effective air damper to control fresh air port or block fresh air port; (3) Increase number of air conditioning units or add auxiliary heating.

Case V: A user installed 26 sets of Chunlan air duct type air conditioners, in which 23 were FR260/S. Now the user complains high noise in many units beyond what he can accept.

Analysis: (1) All units adopt air duct return air to ensure efficiency. Air delivery hose of each unit adopts 3 Φ120mm round plastic air ducts and return air duct adopts 5 Φ180mm round plastic air ducts. Calculation shows that total air delivery area is 0.0989m^2, less than 0.135 m^2 recommended by instruction manual; and total return air cross sectional area is 0.127 m^2, also less than 0.3 m^2 recommended by instruction manual. Calculated air speed in air delivery branch hose and air return branch hose are 5.3/s and 4.15m/s respectively. By consulting tables, noise level is apparently high; (2) Unit installed on support angle steel by hard contact causes resonance and hard contact between metal air duct and ceiling running water pipe aggravates the resonance; (3) Some indoor units are directly installed in operating environment, e.g. ceiling of offices, and rooms in which the units operate are too near sound sources, hence higher noise.

Solution: (1) Increase air delivery/return branch hose cross sectional areas or number of such branch hoses so that sum of cross sectional area of air delivery/return hoses meets instruction manual specification; (2) Avoid hard contact at unit support faces, add wood or rubber pads to isolate vibration; (3) Rooms where air conditioners are used shall be at a longer distance from indoor unit, outdoor unit and other sound sources; if this is not feasible, wrap a 5cm thick sound absorbing sponge plus plastic cloth on indoor unit (except air return port).

Case 6: A user installed two sets of FR180/S air duct type air conditioners early 2003. These share an air system. In summer of the year, it was found that cooling effect was not good and room temperature cannot be brought under 26℃.

Analysis: Measurement showed that one unit was not operating and further inspection showed that there was no display on wire controller of this unit. After replacement of wire controller, there was still no display on wire controller. By swapping wire controller cards on indoor main control boards of two units, the originally failed unit now operated normally while there was no display on the originally normal unit. Measurement of wire controller connecting cable showed that there were m any extension connections on it and the cable had been wetted and had large resistance.

Solution: Replace with complete wire controller connecting cable of sufficient length.

Case VII: A user installed two sets of FR180/S Chunlan air duct type air conditioners. After a period of use, it was found that cooling effect was not good, no cold air was blown out, and air suction hose was frosting.

Analysis: One fan motor was found not operating. Measurement showed that this motor was damaged. After replacing the motor, air delivery was still small and hose side was frosting. Return air strainer was checked for clogging. After cleaning, air delivery was still small. Finally, it was found that return air duct was leaking and indoor unit strainer was seriously blocked.

Solution: Repair leakage in return air duct and remove indoor unit strainer for cleaning.

Case VIII: A user installed two sets of FR260/S Chunlan air duct type air conditioners in 2001. Shortly afterward, it was found that E6 protection occurred on one of them. Our Jinan service agent went on site for inspection. Measurement showed that each parameter of power supply was normal. After re-poweron and operation for 2 hours, E6 protection occurred again. Later, E2 and E7 protections occurred sometimes, but after re-poweron, normal operation lasted for a period and no abnormity was found in voltage, current or pressure. Bizarre enough, after swapping indoor/outdoor main control boards and wire controllers of two units, the same protections occurred on the same unit.

Analysis: According to past maintenance experience, main control board manufactured before 2002 and used in humid environment can cause such wrong protections sometimes.

Solution: Replace with new indoor/outdoor main control boards.

Case IX: An installation company installed more than 10 air duct type air conditioners in Dafeng, Jiangsu. For commissioning, when wire controller was plugged on, it was found that wire controllers of several units displayed E5 protection and some even had no display. After replacing with good wire controllers, the same failure occurred. This fault was not cleared after replacing main control board.

Analysis: Bad connection on wire controller socket due to being covered by coating and paint used for room decoration.

Solution: Use needle to remove covering material at wire controller socket and reconnect.

Case X: 9 sets of FR260/S air duct type air conditioners were installed in a ballroom. User complained about high temperature in rooms (29℃) that cannot be brought down and poor cooling and heating effect. Site inspection showed that current system and pressure were normal. Area of application was about 150m^2/unit. Unit type selection was correct and room thermal insulation was good.

Analysis: (1) Poor sealing between return air duct and air delivery port diffuser. Clearance was between 2mm and 15mm. That return air duct only returned ceiling hot air was the main cause of te phenomena.

(2) Air delivery in each room was not even, hence poor effect.

Solution: (1) Use canvas flexible connection for sealing between return air duct and air delivery port so that good circulation of indoor air is permitted.

(2) Adjust guide damper in air delivery hose of each room so that air delivery in each room is basically equal. After correction, room temperature dropped from 29℃ to 25℃.

Case XI: 9 sets of FR260/S and 3 sets of FR180/S air conditioners were installed in an office building. Installation personnel found during commissioning that indoor noise was too high and beyond the level acceptable by user.

Analysis: (1) In installation, instruction manual requirement was not followed in fixing of indoor unit by angle steel at bottom;

(2) Flexible connection was not used between return air box and static pressure box.

Solution: (1) Follow instruction manual to transform the installation, i.e. use angle steel to fix indoor unit at bottom and add damping measures.

(2) Use canvas flexible connection between return air box and static pressure box;

(3) Increase length of return air duct; noise was apparently reduced.

Case XII: One set of FR100/S air duct type air conditioner was in a hairdressing center. User complained about poor cooling and heating effect.

Analysis: (1) There were a total of 3 air delivery ports: one was too near and the other two had small delivery speed;

(2) Incorrect air delivery angle.

Solution: (1) Change air delivery port area of the first port from $30\times30mm^2$ to $10\times10mm^2$ to reduce air delivery amount and increase air speed.

(2) Change area of the other 2 ports from $20\times80mm^2$ to $20\times60mm^2$ to apparently increase air speed;

(3) Change air delivery grating angle.

Case XIII: An installation company installed 12 sets of FR125/S air duct type air conditioners. Main units were installed in office area and user complained of high noise preventing work.

Analysis: Flexible connection was not used for air delivery/return box, cross sectional areas of return air box and static pressure box were small, and silencing measure was taken inside.

Solution:

(1) Remove return air box and adopt ceiling natural air return;

(2) Increase cross sectional area of static pressure box, adopt flexible connection between static pressure box and main unit, and use sagging sponge in static pressure box to reduce noise;

(3) Re-fix main unit as follows: Use 2 pieces of 4×40 angle steels for fixing at bottom. Add wood plate (15mm thick) on these angle steels and stick PE plates (10mm thick) on such wood plate. Size of wood plate and PE plate shall be the same as that of indoor unit bottom

face.

Case XIV: In installation company installed one FR71-B air duct type air conditioner. Main unit was installed in office. As limited by decoration structure, no air duct was used for indoor unit and direct lateral air exhaust was used. Noise of air flow was too high.

Analysis:

(1) Sectional size of return air box was too small and air speed too high;

(2) Right angle bent connection used between main unit and air delivery hose.

Solution:

(1) Remove return air box, increase air return cross sectional area and lower air speed;

(2) Use arc transition connection between air delivery hose and main unit to reduce resistance.

Case XV: A user installed one FR260/S air duct type air conditioner. Main unit air delivery port had high noise.

Analysis:

(1) Fixing of indoor unit did not follow instruction manual requirements;

(2) Distance between return air box and ceiling was only 12cm and return air space was too small.

(3) Static pressure box was not installed.

Solution:

(1) Re-fix indoor unit to instruction manual requirements;

(2) Remove return air box to increase return air space;

(3) Install static pressure box and use sagging sponge inside for noise reduction;

(4) Use cotton felt for noise reduction of indoor unit.

Note:

1. For relevant models and parameters provided in this manual, actual products and nameplate information shall govern;

2. This manual has been carefully checked. In case of printing error, our company shall not bear responsibility for the consequences.

3. Our company is in constant technology advancement and product series and sizes will be adjusted from time to time. Please note information of our new products.