GD Midea Refrigeration Equipment Co.,Ltd

SPLIT TYPE, HEAT PUMP AIR CONDITIONERS

Technical & service manual 2005

Corona Series(7000-18000BTU) R410a Wall Mounted

[Models]

MSC-07CRN1

MSC-07HRN1

MSC-09CRN1

MSC-09HRN1

MSC-12CRN1

MSC-12HRN1

MSC-18CRN1

MSC-18HRN1

Corona Series (R410A)

Contents

1.Features

1.1 Compact design

1.2 High efficiency and quiet operation

1.3 A class energy level

2.Specification

Model			MSC-07CRN1	MSC-07HRN1	MSC-09CRN1	MSC-09HRN1
Power supply		Ph-V-Hz	1, 220-240V~, 50Hz	1, 220-240V~, 50Hz	1, 220-240V~, 50Hz	1, 220-240V~, 50Hz
Cooling	Capacity	Btu/h	7000	7000	9000	9000
	Input	W	640	640	820	820
	Rated current	A	2.8	2.8	3.6	3.6
	EER	Btu/w.h, w/w	11,3.2	11,3.2	11,3.2	11,3.2
Heating	Capacity	Btu/h		8500		11000
	Input	W		690		890
	Rated current	A		3.0		3.9
	COP	W/W		3.6		3.6
Moisture Removal		L/h	0.7	0.7	1.0	1.0
Max. input consumption		W	850	1000	1000	1200
Max. current		A	3.8	4.5	4.5	5.3
Starting current		A				
Compressor	Model		PA82X1C-4DZDE	PA82X1C-4DZDE	PA108X1C-4FTDE	PA108X1C-4FTDE
	Type		Rotary	Rotary	Rotary	Rotary
	Brand		TOSHIBA	TOSHIBA	TOSHIBA	TOSHIBA
	Capacity	Btu/h	7000	7000	9000	9000
	Input	W	730	730	920	920
	Rated current(RLA)	A	3.3	3.3	4.1	4.1
	Locked rotor Amp(LRA)	A	16.0	16.0	18.7	18.7
	Thermal protector		MRA13408-9087	MRA13408-9087	MRA13430-9087	MRA13430-9087
	Capacitor	uF	25	25	25	25
	Refrigerant oil	ml	300	300	330	330
Indoor fan motor	Model		RPG13H	RPG13H	RPG13H	RPG13H
	Brand		Welling	Welling	Welling	Welling
	Input	W	36.5	36.5	39.5	39.5
	Capacitor	uF	1.2	1.2	1.2	1.2
	Speed(hi/mi/lo)	r/min	1050/920/820	1050/920/820	1200/950/850	1200/950/850
Indoor air flow (Hi/Mi/Lo)		m3/h	450/400/350	450/400/350	500/430/370	500/430/370
Indoor noise level (Hi/Mi/Lo)		dB(A)	35/32/30	35/32/30	37/34/31	37/34/31
Indoor unit	Dimension (W*H*D)	mm	710×250×190	710×250×190	710×250×195	710×250×195
	Packing (W*H*D)	mm	800×340×270	800×340×270	800×340×270	800×340×270
	Net/Gross weight	Kg	8/10	8/10	8/10	8/10
Outdoor fan motor	Model		YDK24-6T	YDK24-6T	YDK24-6F	YDK24-6F
	Brand		Welling	Welling	Welling	Welling
	Input	W	56	56	56	56
	Capacitor	uF	2.5	2.5	2.5	2.5
	Speed	r/min	800	800	800	800
Outdoor air flow		m3/h	1500	1500	1800	1800
Outdoor noise level		dB(A)	49	49	50	50
Outdoor unit	Dimension(W*H*D)	mm	700X535X235	700X535X235	780X540X250	780X540X250
	Packing (W*H*D)	mm	815X580X325	815X580X325	910X575X335	910X575X335
	Net/Gross weight	Kg	31/34	32/35	36/39	37/40
Refrigerant type R410A		g	800	820	900	920
Design pressure		MPa	4.2	4.2	4.2	4.2
Refrigerant piping	Liquid side/ Gas side	mm(inch)	Φ6.35/Φ9.53	Φ6.35/Φ9.53	Φ6.35/Φ9.53	Φ6.35/Φ9.53
	Max. refrigerant pipe length	m	10	10	10	10
	Max. difference in level	m	5	5	5	5
Connection wiring			No	No	No	No
Plug type			16A	16A	16A	16A
Thermostat type			Electrolic control	Electrolic control	Electrolic control	Electrolic control
Operation temp		℃	17-30	17-30	17-30	17-30
Ambient temp		℃	18~~45	-7 ~~ 45	18~~45	-7 ~~ 45
Application area		m2	10-14	10-14	14-21	14-21
Qty'per 20' /40' /40'HQ		set	126/272/298	126/272/298	113/238/274	113/238/274

★1 The noise date is base on hemi-anechoic chamber, during actual operation, these values are normally somewhat different as a result of ambient condition.

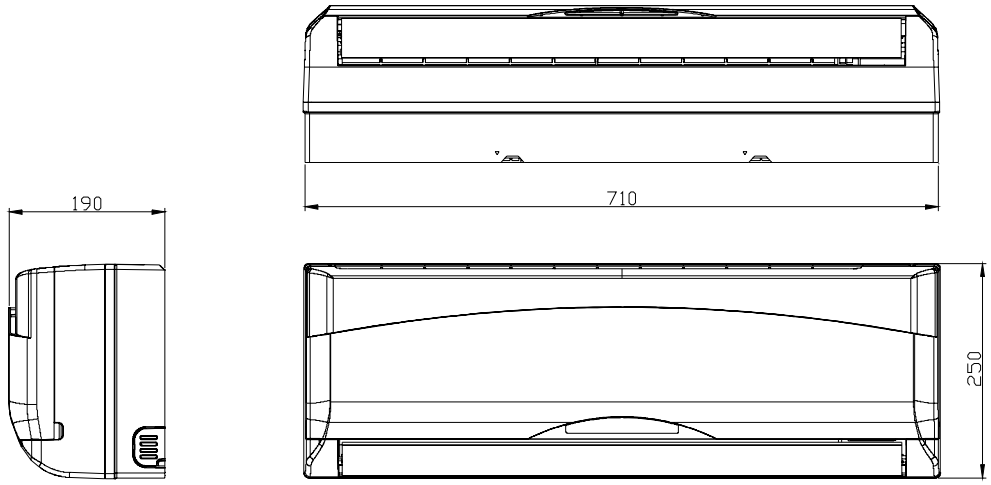
Model			MSC-12CRN1	MSC-12HRN1	MSC-18CRN1	MSC-18HRN1
Power supply		Ph-V-Hz	1, 220-240V~, 50Hz	1, 220-240V~, 50Hz	1, 220-240V~,50Hz	1, 220-240V~,50Hz
Cooling	Capacity	Btu/h	12000	12000	18000	18000
	Input	W	1120	1120	1720	1720
	Rated current	A	5.0	5.0	7.8	7.8
	EER	Btu/w.h, w/w	11,3.2	11,3.2	10.5,3.1	10.5,3.1
Heating	Capacity			15000		19000
	Input			1180		1650
	Rated current			5.3		8.0
	COP			3.6		3.4
Moisture Removal		L/h	1.2	1.2	1.6	1.6
Max. input consumption		W	1550	1550	2500	2500
Max. current		A	10	10	11.5	11.5
Starting current		A	30	30	42.5	42.5
Compressor	Model		PA140X2C-4FT	PA140X2C-4FT	PA200X2CS-4KU1	PA200X2CS-4KU1
	Type		rotary	rotary	Rotary	Rotary
	Brand		TOSHIBA	TOSHIBA	Toshiba	Toshiba
	Capacity	Btu/h	12000	12000	16910	16910
	Input	W	1200	1200	1720	1720
	Rated current(RLA)	A	5.4	5.4	7.50	7.50
	Locked rotor Amp(LRA)	A	29.9	29.9	34.5	34.5
	Thermal protector		UP3RE0591-T56	UP3RE0591-T56	Internal	Internal
	Capacitor	uF	35	35	45	45
	Refrigerant oil	ml	480	480	ESTER OIL VG74 ·750	ESTER OIL VG74 ·750
Indoor fan motor	Model		RPG13D	RPG13D	RPG28D	RPG28D
	Brand		Welling	Welling	Welling	Welling
	Input	W	44	44	53	53
	Capacitor	uF	1.2	1.2	1.5uF/450V	1.5uF/450V
	Speed(hi/mi/lo)	r/min	1220/1000/800	1220/1000/800	1180/1080/800	1180/1080/800
Indoor air flow (Hi/Mi/Lo)		m3/h	580/500/420	600/520/420	850/700/600	850/700/600
Indoor noise level (Hi/Mi/Lo)		dB(A)	40/37/34	40/37/34	42/39/37	42/39/37
Indoor unit	Dimension (W*H*D)	mm	790×265×193	790×265×193	920×292×225	1000×353×280
	Packing (W*H*D)	mm	875x285x375	875x285x375	1015×368×295	1015×368×295
	Net/Gross weight	Kg	9.0/11.5	9/11	13/15	13/15
Outdoor fan motor	Model		YDK24-6F	YDK24-6F	YDK53-6K	YDK53-6K
	Brand		Welling	Welling	Welling	Welling
	Input	W	56	56	125	125
	Capacitor	uF	2.5	2.5	3.5	3.5
	Speed	r/min	800	800	800	800
Outdoor air flow		m3/h	1800	1800	2500	2500
Outdoor noise level		dB(A)	50	50	52	52
Outdoor unit	Dimension(W*H*D)	mm	780X540X250	780X540X250	845X695X335	845X695X335
	Packing (W*H*D)	mm	910X575X335	910X575X335	970X770X395	970X770X395
	Net/Gross weight	Kg	37/40	38/41	52/56	52/56
Refrigerant type R410A		g	1050	1080	1690	1740
Design pressure		MPa	4.2	4.2	3.8	3.8
Refrigerant piping	Liquid side/ Gas side	mm(inch)	Φ6.35/Φ12.7	Φ6.35/Φ12.7	Φ6.35/Φ12.7	Φ6.35/Φ12.7
	Max. refrigerant pipe length	m	10	10	15	15
	Max. difference in level	m	5	5	8	8
Connection wiring			No	No	No	No
Plug type			16A	16A	NO PLUG	NO PLUG
Thermostat type			Electrolic control	Electrolic control	Electronic control	Electronic control
Operation temp		℃	17-30	17-30	17-30	17-30
Ambient temp		℃	18~-45	-7 ~~ 45	18-45	-7~45
Application area		m2	18-26	18-26	28~40	28~40
Qty'per 20' /40' /40'HQ		set	94/199/232	94/199/232	70 / 148 / 170	70 / 148 / 170

★1 The noise date is base on hemi-anechoic chamber, during actual operation, these values are normally somewhat different as a result of ambient condition.

3.Dimensions

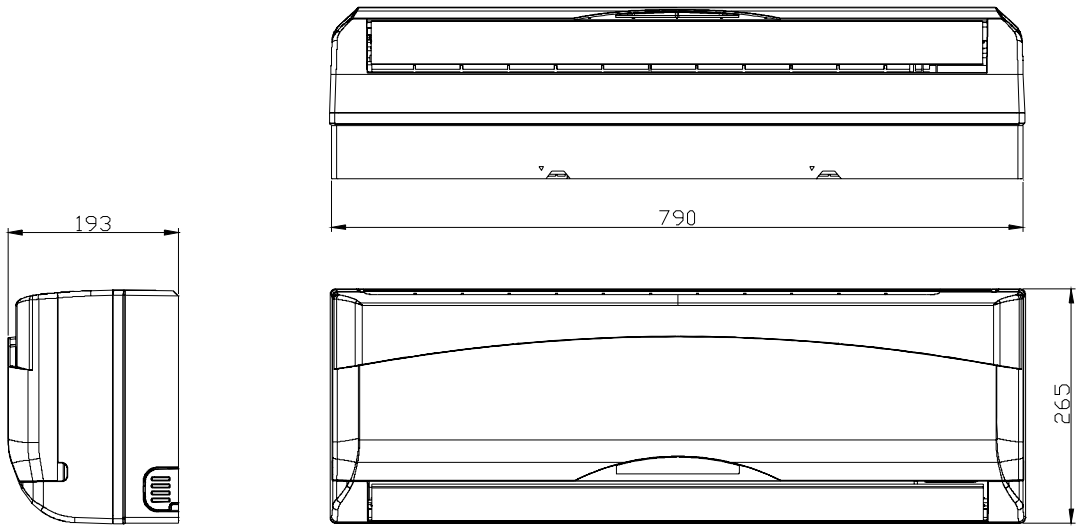
3.1 Indoor unit

MSC-07CRN1, MSC-07HRN1, MSC-09CRN1, MSC-09HRN1

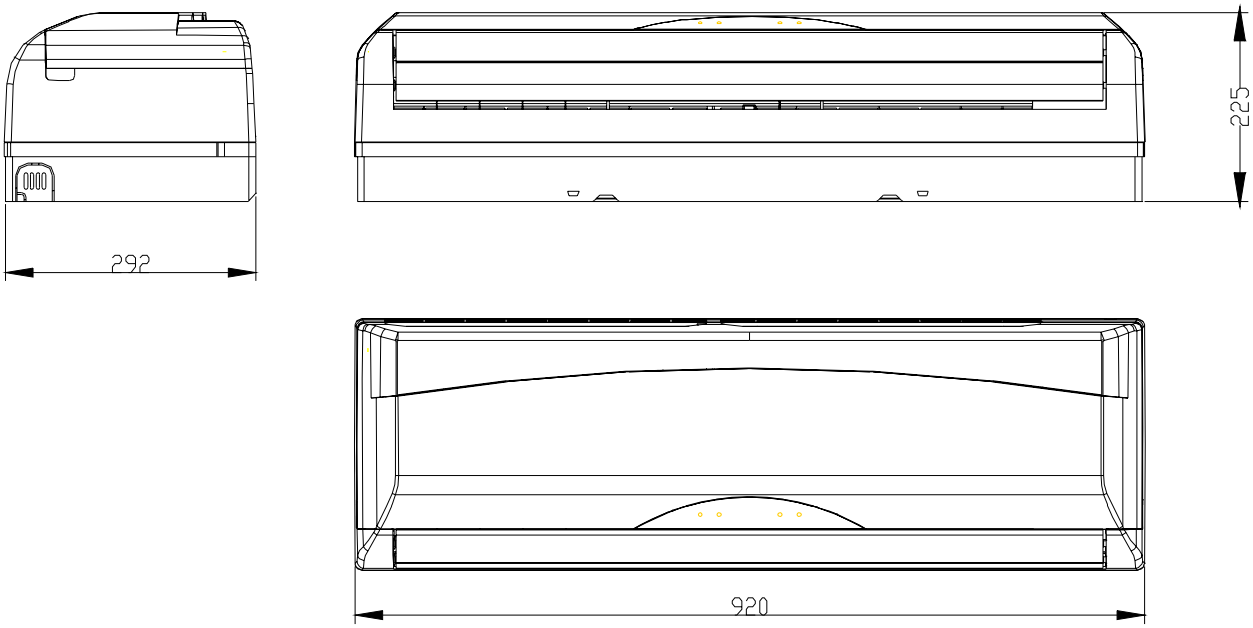


3.2 Indoor unit

MSC-12CRN1, MSC-12HRN1

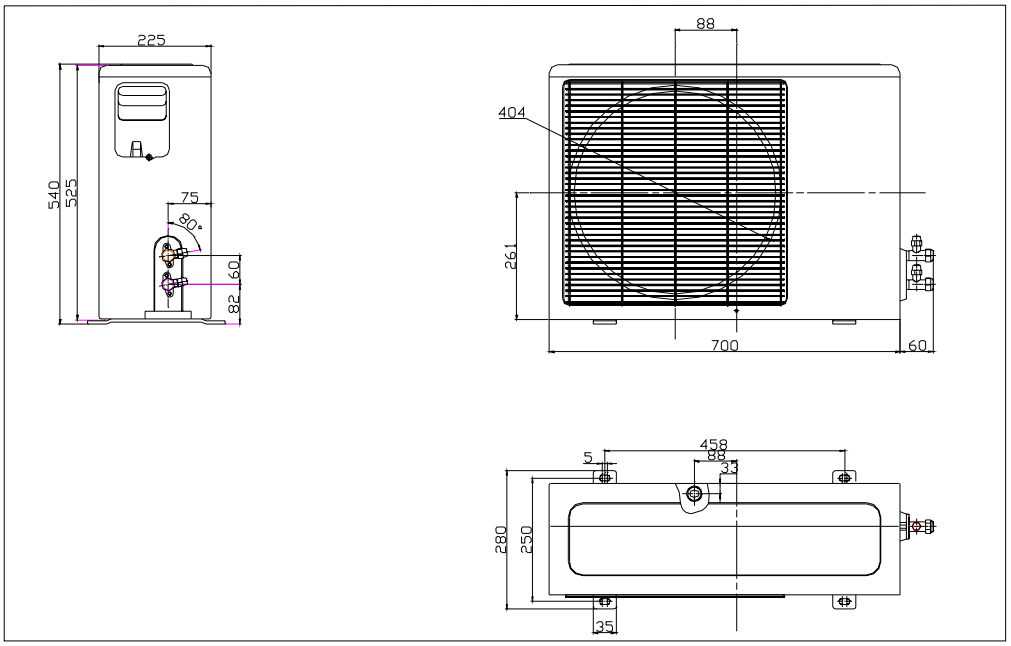


3.2 Indoor unit
MSC-18CRN1, MSC-18HRN1



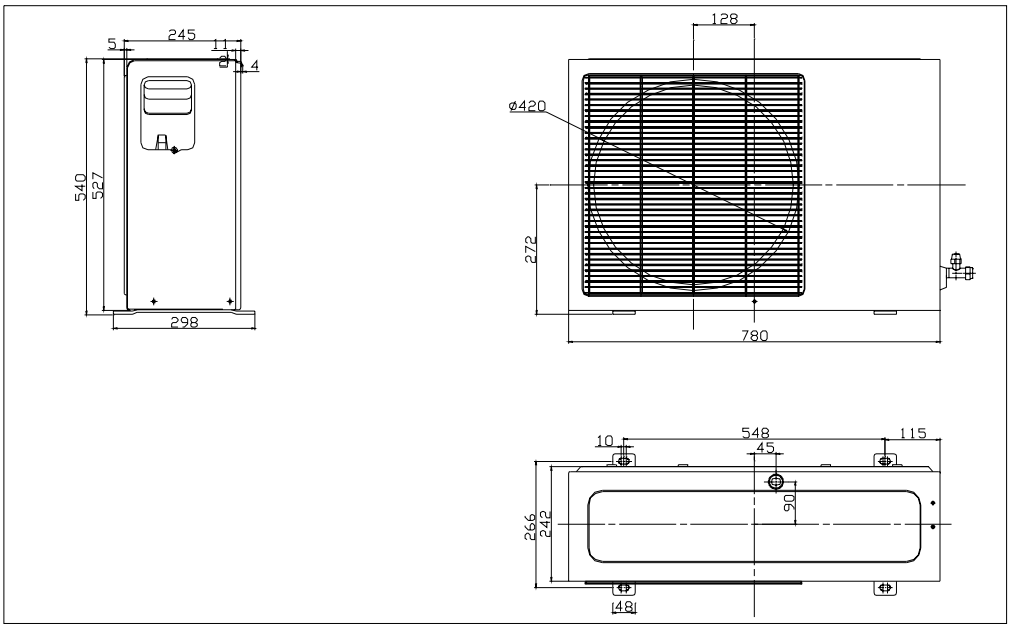
3.4 Outdoor unit

MSC-07CRN1, MSC-07HRN1

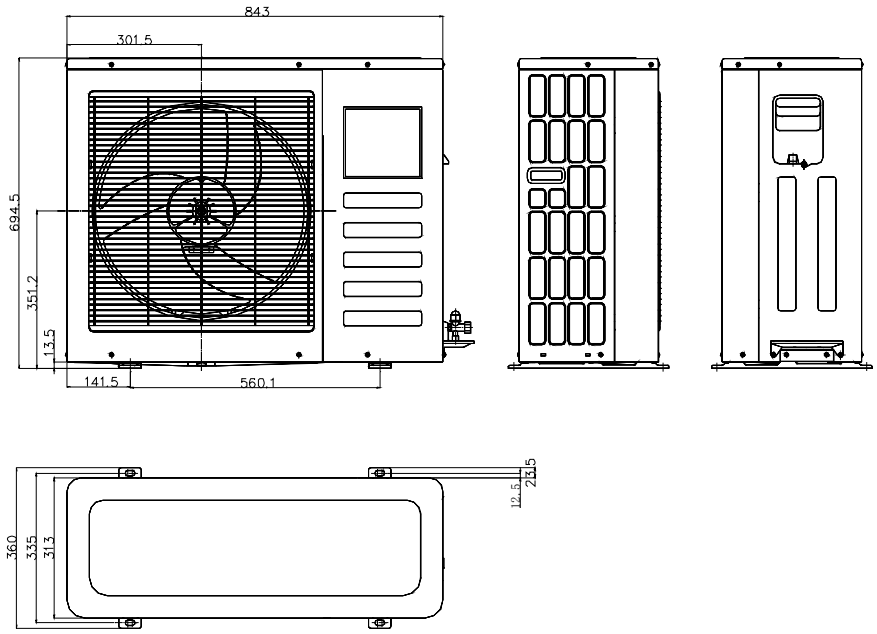


3.5 Outdoor unit

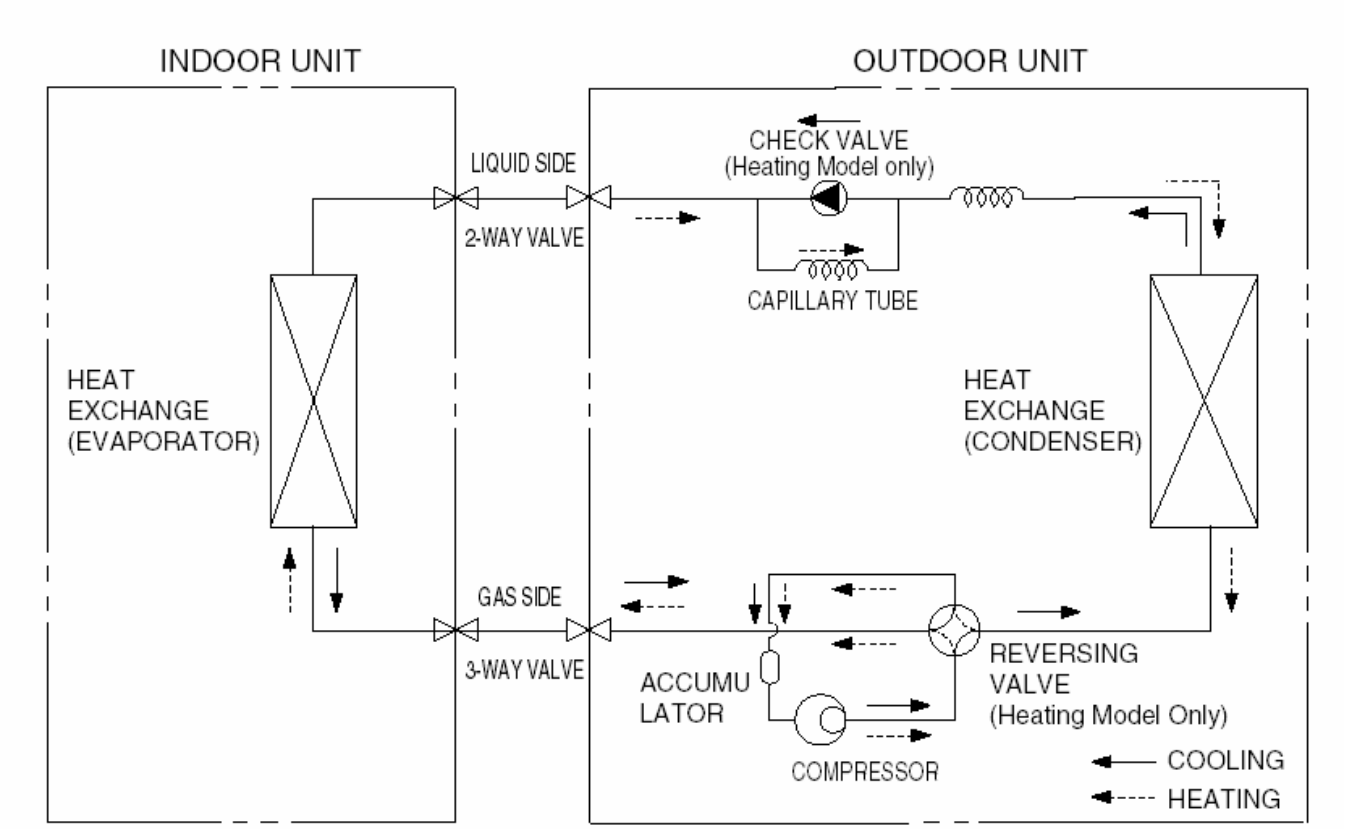
MSC-09CRN1, MSC-09HRN1, MSC-12CRN1, MSC-12HRN1



MSC-18CRN1, MSC-18HRN1



4.Refrigeration cycle diagram



5. Pressure table

Note:

*The pressure data is from 3 way valve, the pressure data are pressure above atmosphere.

*D: Dry bulb temp.

*W: Wet bulb temp.

5.1 MSC-07CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Pressure (kg/cm^2)	6.2	6.7	7.2	8.0	8.5	9.4
24ºC D 17ºC W	Pressure (kg/cm^2)	6.3	6.5	7.5	8.1	8.7	9.5
27ºC D 19ºC W	Pressure (kg/cm^2)	6.1	6.8	7.7	8.2	9.0	10.0
32ºC D 23ºC W	Pressure (kg/cm^2)	7.0	7.3	7.8	8.4	9.2	10.1

.2 MSC-07HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	Pressure	25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Pressure (kg/cm^2)	6.2	6.7	7.2	8.0	8.5	9.4
24ºC D 17ºC W	Pressure (kg/cm^2)	6.3	6.5	7.5	8.1	8.7	9.5
27ºC D 19ºC W	Pressure (kg/cm^2)	6.1	6.8	7.7	8.2	9.0	10.0
32ºC D 23ºC W	Pressure (kg/cm^2)	7.0	7.3	7.8	8.4	9.2	10.1

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	Pressure	12ºC D 11ºC W	7ºC D 6ºC W	0ºC D -1ºC W	-4ºC D -6ºC W	-7ºC D -9ºC W	-15ºC D -xºC W
15ºC	Pressure (kg/cm^2)	24.0	23.0	21.5	21.0	20..5	/
18ºC	Pressure (kg/cm^2)	24.6	23.5	23.0	22.6	20.8	/
20ºC	Pressure (kg/cm^2)	25.0	24.2	24.0	23.0	21.0	/
22ºC	Pressure (kg/cm^2)	25.3	24.6	24.5	23.8	21.7	/

5.3 MSC-09CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	**Pressure**	**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Pressure (kg/cm^2)	7.8	8.1	8.4	9.0	9.3	10.0
24ºC D 17ºC W	Pressure (kg/cm^2)	7.9	8.2	8.7	9.0	9.5	10.1
27ºC D 19ºC W	Pressure (kg/cm^2)	8.0	8.5	9.2	9.9	10.2	10.8
32ºC D 23ºC W	Pressure (kg/cm^2)	8.8	9.1	9.2	10.0	10.5	11.2

5.4 MSC-09HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	**Pressure**	**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Pressure (kg/cm^2)	7.8	8.1	8.4	9.0	9.3	10.0
24ºC D 17ºC W	Pressure (kg/cm^2)	7.9	8.2	8.7	9.0	9.5	10.1
27ºC D 19ºC W	Pressure (kg/cm^2)	8.0	8.5	9.2	9.9	10.2	10.8
32ºC D 23ºC W	Pressure (kg/cm^2)	8.8	9.1	9.2	10.0	10.5	11.2

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	**Pressure**	**12ºC D 11ºC W**	**7ºC D 6ºC W**	**0ºC D -1ºC W**	**-4ºC D -6ºC W**	**-7ºC D -9ºC W**	**-15ºC D -xºC W**
15ºC	Pressure (kg/cm^2)	26.5	25.0	22.0	21.5	20.5	/
18ºC	Pressure (kg/cm^2)	27.0	26.0	23.5	22.5	20.8	/
20ºC	Pressure (kg/cm^2)	27.5	26.5	25.0	23.0	21.0	/
22ºC	Pressure (kg/cm^2)	28.5	27.0	25.5	23.9	21.5	/

5.5 MSC-12CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	**Pressure**	**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Pressure (kg/cm^2)	8.4	8.5	8.8	8.9	9.4	9.9
24ºC D 17ºC W	Pressure (kg/cm^2)	8.6	8.8	9.2	9.4	10.0	10.4
27ºC D 19ºC W	Pressure (kg/cm^2)	8.8	9.2	9.4	9.8	10.3	10.9
32ºC D 23ºC W	Pressure (kg/cm^2)	9.2	9.6	9.9	10.4	10.8	11.2

5.6 MSC-12HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	**Pressure**	**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Pressure (kg/cm^2)	8.4	8.5	8.8	8.9	9.4	9.9
24ºC D 17ºC W	Pressure (kg/cm^2)	8.6	8.8	9.2	9.4	10.0	10.4
27ºC D 19ºC W	Pressure (kg/cm^2)	8.8	9.2	9.4	9.8	10.3	10.9
32ºC D 23ºC W	Pressure (kg/cm^2)	9.2	9.6	9.9	10.4	10.8	11.2

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	**Pressure**	**12ºC D 11ºC W**	**7ºC D 6ºC W**	**0ºC D -1ºC W**	**-4ºC D -6ºC W**	**-7ºC D -9ºC W**	**-15ºC D -xºC W**
15ºC	Pressure (kg/cm^2)	27.4	25.9	22.2	21.4	20.0	/
18ºC	Pressure (kg/cm^2)	29.8	27.2	23.8	22.0	21.1	/
20ºC	Pressure (kg/cm^2)	30.2	29.1	24.2	23.6	22.1	/
22ºC	Pressure (kg/cm^2)	32.4	30.1	25.4	24.0	22.7	/

5.7 MSC-18CRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	**Pressure**	**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Pressure (kg/cm^2)	8.5	8.6	8.9	9.0	9.4	9.9
24ºC D 17ºC W	Pressure (kg/cm^2)	8.7	8.9	9.3	9.5	10.0	10.5
27ºC D 19ºC W	Pressure (kg/cm^2)	8.9	9.2	9.5	9.9	10.4	10.9
32ºC D 23ºC W	Pressure (kg/cm^2)	9.3	9.7	9.9	10.5	10.9	11.3

5.8 MSC-18HRN1

Cooling mode		Outdoor temperature (Dry bulb temp)					
Indoor Conditions	**Pressure**	**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Pressure (kg/cm^2)	8.5	8.6	8.9	9.0	9.4	9.9
24ºC D 17ºC W	Pressure (kg/cm^2)	8.7	8.9	9.3	9.5	10.0	10.5
27ºC D 19ºC W	Pressure (kg/cm^2)	8.9	9.2	9.5	9.9	10.4	10.9
32ºC D 23ºC W	Pressure (kg/cm^2)	9.3	9.7	9.9	10.5	10.9	11.3

Heating mode		OUTDOOR CONDITIONS					
Indoor Conditions	**Pressure**	**12ºC D 11ºC W**	**7ºC D 6ºC W**	**0ºC D -1ºC W**	**-4ºC D -6ºC W**	**-7ºC D -9ºC W**	**-15ºC D -xºC W**
15ºC	Pressure (kg/cm^2)	28.2	27.0	21.4	20.6	20.2	/
18ºC	Pressure (kg/cm^2)	30.6	28.2	24.6	22.8	22.1	/
20ºC	Pressure (kg/cm^2)	31.2	29.9	25.2	24.6	23.1	/
22ºC	Pressure (kg/cm^2)	33.3	31.1	26.2	25.2	23.8	/

6. Capacity table

6.1 MSC-07CRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Total capacity kW	2.04	1.94	1.7	1.61	1.53	1.41
	Sensitive capacity kW	1.52	1.41	1.39	1.32	1.19	1.07
	Input kW.	0.53	0.58	0.6	0.67	0.73	0.8
24ºC D 17ºC W	Total capacity kW	2.14	2.05	1.93	1.81	1.73	1.51
	Sensitive capacity kW	1.61	1.46	1.45	1.54	1.23	1.15
	Input kW.	0.54	0.6	0.62	0.7	0.74	0.82
27ºC D 19ºC W	Total capacity kW	2.31	2.24	**2.1**	1.95	1.7	1.65
	Sensitive capacity kW	1.78	1.65	**1.56**	1.43	1.26	1.28
	Input kW.	0.57	0.62	**0.64**	0.71	0.75	0.83
32ºC D 23ºC W	Total capacity kW	2.33	2.36	2.31	2.25	2.15	2.03
	Sensitive capacity kW	1.83	1.67	1.65	1.64	1.57	1.52
	Input kW.	0.58	0.64	0.66	0.73	0.8	0.86

6.2 MSC-07HRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Total capacity kW	2.04	1.94	1.7	1.61	1.53	1.41
	Sensitive capacity kW	1.52	1.41	1.39	1.32	1.19	1.07
	Input kW.	0.53	0.58	0.6	0.67	0.73	0.8
24ºC D 17ºC W	Total capacity kW	2.14	2.05	1.93	1.81	1.73	1.51
	Sensitive capacity kW	1.61	1.46	1.45	1.54	1.23	1.15
	Input kW.	0.54	0.6	0.62	0.7	0.74	0.82
27ºC D 19ºC W	Total capacity kW	2.31	2.24	**2.1**	1.95	1.7	1.65
	Sensitive capacity kW	1.78	1.65	**1.56**	1.43	1.26	1.28
	Input kW.	0.57	0.62	**0.64**	0.71	0.75	0.83
32ºC D 23ºC W	Total capacity kW	2.33	2.36	2.31	2.25	2.15	2.03
	Sensitive capacity kW	1.83	1.67	1.65	1.64	1.57	1.52
	Input kW.	0.58	0.64	0.66	0.73	0.8	0.86

WINTER		OUTDOOR CONDITIONS					
Indoor Conditions		12ºC D 11ºC W	7ºC D 6ºC W	4ºC D 3ºC W	0ºC D -1ºC W	-4ºC D -6ºC W	-7ºC D -8ºC W
15ºC	Capacity kW	3.01	2.73	2.47	1.76	1.65	1.58
	Input kW.	0.76	0.66	0.6	0.58	0.5	0.45
18ºC	Capacity kW	2.86	2.64	2.34	1.69	1.53	1.41
	Input kW.	0.78	0.67	0.62	0.59	0.62	0.47
20ºC	Capacity kW	2.77	**2.3**	2.22	1.62	1.59	1.33
	Input kW.	0.81	**0.65**	0.64	0.59	0.53	0.48
22ºC	Capacity kW	2.61	2.23	2.13	1.58	1.26	1.17
	Input kW.	0.83	0.68	0.65	0.6	0.56	0.51

6.3 MSC-09CRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Total capacity kW	2.42	2.41	2.24	2.03	1.87	1.75
	Sensitive capacity kW	1.72	1.69	1.65	1.53	1.43	1.36
	Input kW.	0.72	0.75	0.8	0.84	0.89	0.97
24ºC D 17ºC W	Total capacity kW	0.65	2.55	2.45	2.24	2.11	1.98
	Sensitive capacity kW	1.83	1.73	1.7	1.63	1.63	1.57
	Input kW.	0.68	0.76	0.81	0.88	0.93	1.02
27ºC D 19ºC W	Total capacity kW	2.89	2.8	**2.6**	2.45	2.23	2.05
	Sensitive capacity kW	1.99	1.95	**1.81**	1.78	1.66	1.63
	Input kW.	0.65	0.78	**0.82**	0.92	0.96	1.03
32ºC D 23ºC W	Total capacity kW	3.03	2.98	2.92	2.83	2.69	2.46
	Sensitive capacity kW	2.05	1.88	1.96	1.87	1.87	1.85
	Input kW.	0.65	0.8	0.86	0.95	0.99	1.08

6.4 MSC-09HRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Total capacity kW	2.42	2.41	2.24	2.03	1.87	1.75
	Sensitive capacity kW	1.72	1.69	1.65	1.53	1.43	1.36
	Input kW.	0.72	0.75	0.8	0.84	0.89	0.97
24ºC D 17ºC W	Total capacity kW	0.65	2.55	2.45	2.24	2.11	1.98
	Sensitive capacity kW	1.83	1.73	1.7	1.63	1.63	1.57
	Input kW.	0.68	0.76	0.81	0.88	0.93	1.02
27ºC D 19ºC W	Total capacity kW	2.89	2.8	**2.6**	2.45	2.23	2.05
	Sensitive capacity kW	1.99	1.95	**1.81**	1.78	1.66	1.63
	Input kW.	0.65	0.78	**0.82**	0.92	0.96	1.03
32ºC D 23ºC W	Total capacity kW	3.03	2.98	2.92	2.83	2.69	2.46
	Sensitive capacity kW	2.05	1.88	1.96	1.87	1.87	1.85
	Input kW.	0.65	0.8	0.86	0.95	0.99	1.08

	WINTER	OUTDOOR CONDITIONS					
Indoor Conditions		**12ºC D 11ºC W**	**7ºC D 6ºC W**	**4ºC D 3ºC W**	**0ºC D -1ºC W**	**-4ºC D -6ºC W**	**-7ºC D -8ºC W**
15ºC	Capacity kW	3.75	3.38	3.02	1.97	1.59	1.52
	Input kW.	0.97	0.84	0.73	0.65	0.62	0.63
18ºC	Capacity kW	3.52	3.26	2.94	1.84	1.6	1.49
	Input kW.	0.98	0.86	0.78	0.7	0.65	0.68
20ºC	Capacity kW	3.4	**3**	2.85	1.82	1.56	1.5
	Input kW.	1.02	**0.82**	0.8	0.74	0.68	0.67
22ºC	Capacity kW	3.11	2.93	2.72	1.73	1.58	1.42
	Input kW.	1.06	0.93	0.82	0.77	0.71	0.65

6.5 MSC-12CRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Total capacity kW	3.276	3.187	3.105	2.821	2.746	2.621
	Sensitive capacity kW	2.567	2.457	2.413	2.287	2.21	2.087
	Input kW.	0.89	1.01	1.082	1.188	1.243	1.337
24ºC D 17ºC W	Total capacity kW	3.663	3.503	3.315	3.148	3.076	2.932
	Sensitive capacity kW	2.918	2.766	2.725	2.557	2.453	2.334
	Input kW.	0.915	1.033	1.121	1.228	1.278	1.367
27ºC D 19ºC W	Total capacity kW	3.86	3.7	**3.5**	3.371	3.215	3.125
	Sensitive capacity kW	3.039	2.913	**2.832**	2.645	2.567	2.419
	Input kW.	0.944	1.048	**1.1**	1.253	1.312	1.426
32ºC D 23ºC W	Total capacity kW	4.215	4.1	3.845	3.601	3.501	3.313
	Sensitive capacity kW	3.12	2.939	2.891	2.715	2.589	2.503
	Input kW.	0.969	1.088	1.189	1.302	1.349	1.455

6.6 MSC-12HRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Total capacity kW	3.276	3.187	3.105	2.821	2.746	2.621
	Sensitive capacity kW	2.567	2.457	2.413	2.287	2.21	2.087
	Input kW.	0.89	1.01	1.082	1.188	1.243	1.337
24ºC D 17ºC W	Total capacity kW	3.663	3.503	3.315	3.148	3.076	2.932
	Sensitive capacity kW	2.918	2.766	2.725	2.557	2.453	2.334
	Input kW.	0.915	1.033	1.121	1.228	1.278	1.367
27ºC D 19ºC W	Total capacity kW	3.86	3.7	**3.5**	3.371	3.215	3.125
	Sensitive capacity kW	3.039	2.913	**2.832**	2.645	2.567	2.419
	Input kW.	0.944	1.048	**1.1**	1.253	1.312	1.426
32ºC D 23ºC W	Total capacity kW	4.215	4.1	3.845	3.601	3.501	3.313
	Sensitive capacity kW	3.12	2.939	2.891	2.715	2.589	2.503
	Input kW.	0.969	1.088	1.189	1.302	1.349	1.455

	WINTER	OUTDOOR CONDITIONS					
Indoor Conditions		**12ºC D 11ºC W**	**7ºC D 6ºC W**	**4ºC D 3ºC W**	**0ºC D -1ºC W**	**-4ºC D -6ºC W**	**-7ºC D -8ºC W**
15ºC	Capacity kW	4.446	4.264	4.132	3.838	3.335	3.305
	Input kW.	1.141	1.106	1.059	1.035	0.895	0.812
18ºC	Capacity kW	4.38	4.248	3.954	3.761	3.258	2.948
	Input kW.	1.188	1.153	1.142	1.082	0.953	0.918
20ºC	Capacity kW	4.261	**4.1**	3.877	3.683	3.189	2.871
	Input kW.	1.224	**1.14**	1.129	1.082	0.976	0.941
22ºC	Capacity kW	4.106	3.989	3.761	3.567	3.045	2.876
	Input kW.	1.259	1.212	1.153	1.106	1	0.836

6.7 MSC-18CRN1

SUMMER		**OUTDOOR TEMPERATURE DRY**					
Indoor Conditions		**25ºC**	**30ºC**	**35ºC**	**40ºC**	**45ºC**	**50ºC**
21ºC D 15ºC W	Total capacity kW	4.914	4.781	4.658	4.232	4.119	3.932
	Sensitive capacity kW	3.851	3.686	3.620	3.431	3.315	3.131
	Input kW.	1.335	1.515	1.623	1.782	1.865	2.006
24ºC D 17ºC W	Total capacity kW	5.495	5.255	4.973	4.722	4.614	4.398
	Sensitive capacity kW	4.377	4.149	4.088	3.836	3.680	3.501
	Input kW.	1.373	1.550	1.682	1.842	1.917	2.051
27ºC D 19ºC W	Total capacity kW	5.790	5.550	5.250	5.057	4.823	4.688
	Sensitive capacity kW	4.559	4.370	4.248	3.968	3.851	3.629
	Input kW.	1.416	1.572	1.720	1.880	1.968	2.139
32ºC D 23ºC W	Total capacity kW	6.323	6.150	5.768	5.402	5.252	4.970
	Sensitive capacity kW	4.680	4.409	4.337	4.073	3.884	3.755
	Input kW.	1.454	1.632	1.824	1.953	2.024	2.183

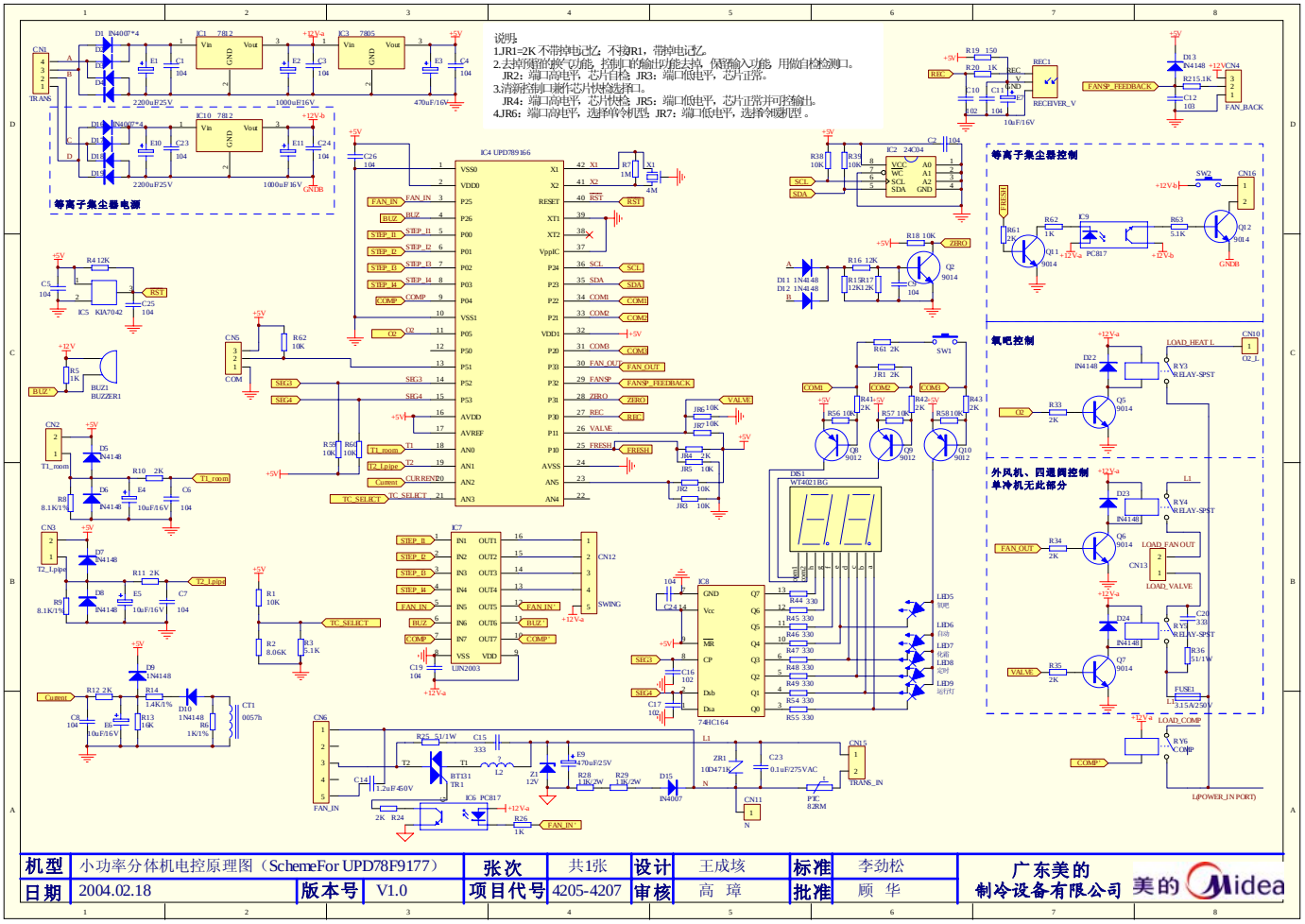
6.8 MSC-18HRN1

SUMMER		OUTDOOR TEMPERATURE DRY					
Indoor Conditions		25ºC	30ºC	35ºC	40ºC	45ºC	50ºC
21ºC D 15ºC W	Total capacity kW	4.914	4.781	4.658	4.232	4.119	3.932
	Sensitive capacity kW	3.851	3.686	3.620	3.431	3.315	3.131
	Input kW.	1.335	1.515	1.623	1.782	1.865	2.006
24ºC D 17ºC W	Total capacity kW	5.495	5.255	4.973	4.722	4.614	4.398
	Sensitive capacity kW	4.377	4.149	4.088	3.836	3.680	3.501
	Input kW.	1.373	1.550	1.682	1.842	1.917	2.051
27ºC D 19ºC W	Total capacity kW	5.790	5.550	5.250	5.057	4.823	4.688
	Sensitive capacity kW	4.559	4.370	4.248	3.968	3.851	3.629
	Input kW.	1.416	1.572	1.720	1.880	1.968	2.139
32ºC D 23ºC W	Total capacity kW	6.323	6.150	5.768	5.402	5.252	4.970
	Sensitive capacity kW	4.680	4.409	4.337	4.073	3.884	3.755
	Input kW.	1.454	1.632	1.824	1.953	2.024	2.183

	WINTER	OUTDOOR CONDITIONS					
Indoor Conditions		12ºC D 11ºC W	7ºC D 6ºC W	4ºC D 3ºC W	0ºC D -1ºC W	-4ºC D -6ºC W	-7ºC D -8ºC W
15ºC	Capacity kW	6.669	6.396	6.198	5.757	5.003	4.958
	Input kW.	1.712	1.659	1.589	1.553	1.343	1.218
18ºC	Capacity kW	6.570	6.372	5.931	5.642	4.887	4.422
	Input kW.	1.782	1.730	1.713	1.623	1.430	1.377
20ºC	Capacity kW	6.392	6.150	5.816	5.525	4.784	4.307
	Input kW.	1.836	1.780	1.694	1.623	1.464	1.412
22ºC	Capacity kW	6.159	5.984	5.642	5.351	4.568	4.314
	Input kW.	1.889	1.818	1.730	1.659	1.500	1.254

7. Schematic diagram and wiring diagram

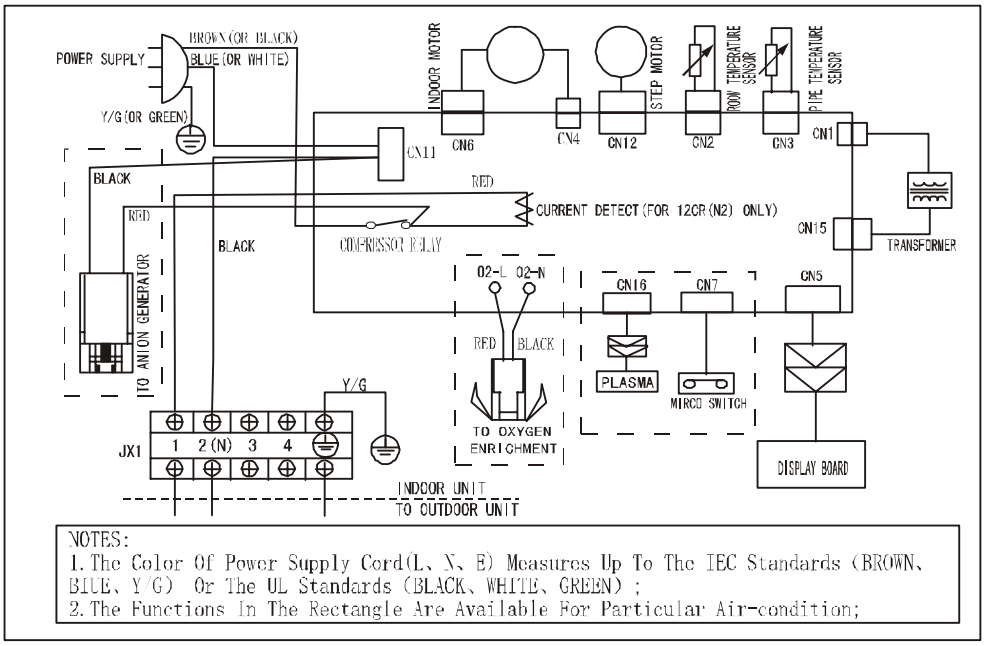
7.1 Schematic diagram

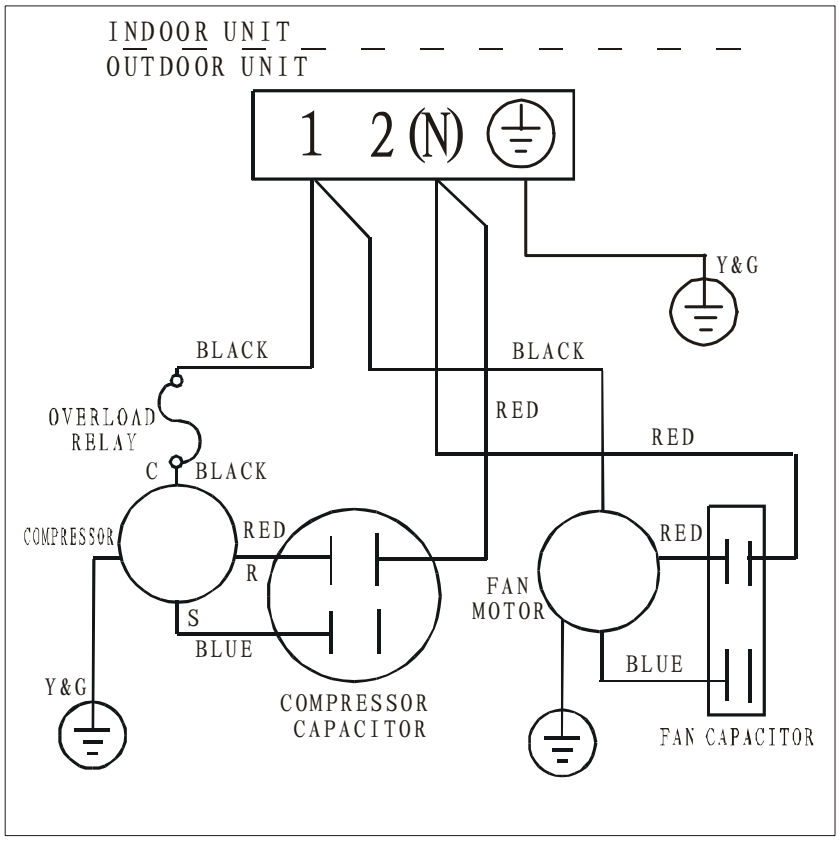


7.2 Wiring diagram

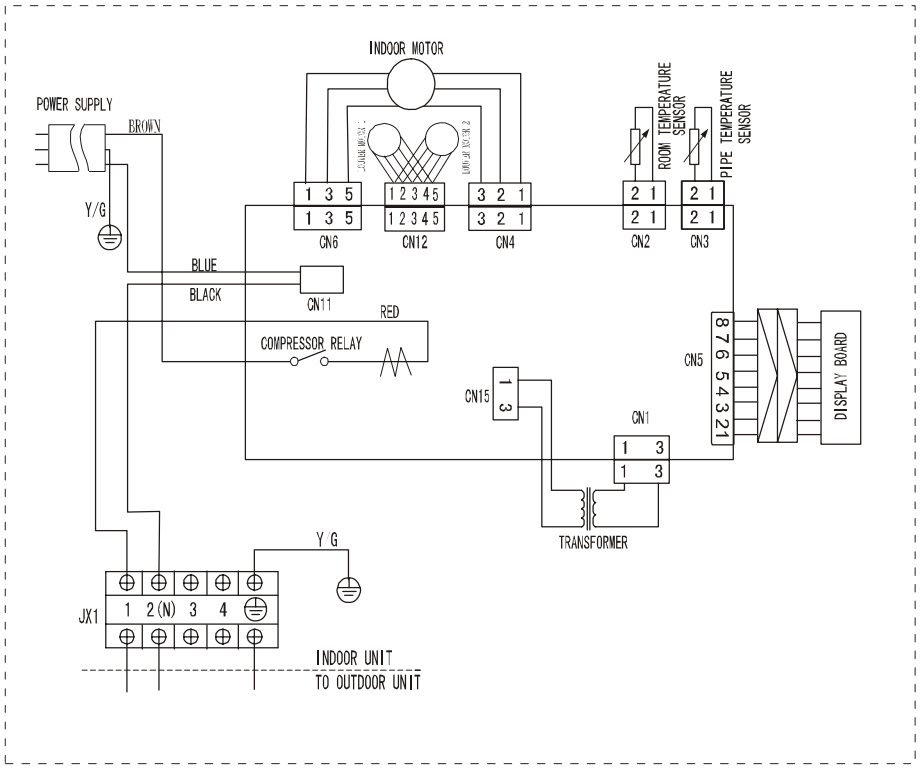
7.2.1 Cooling only

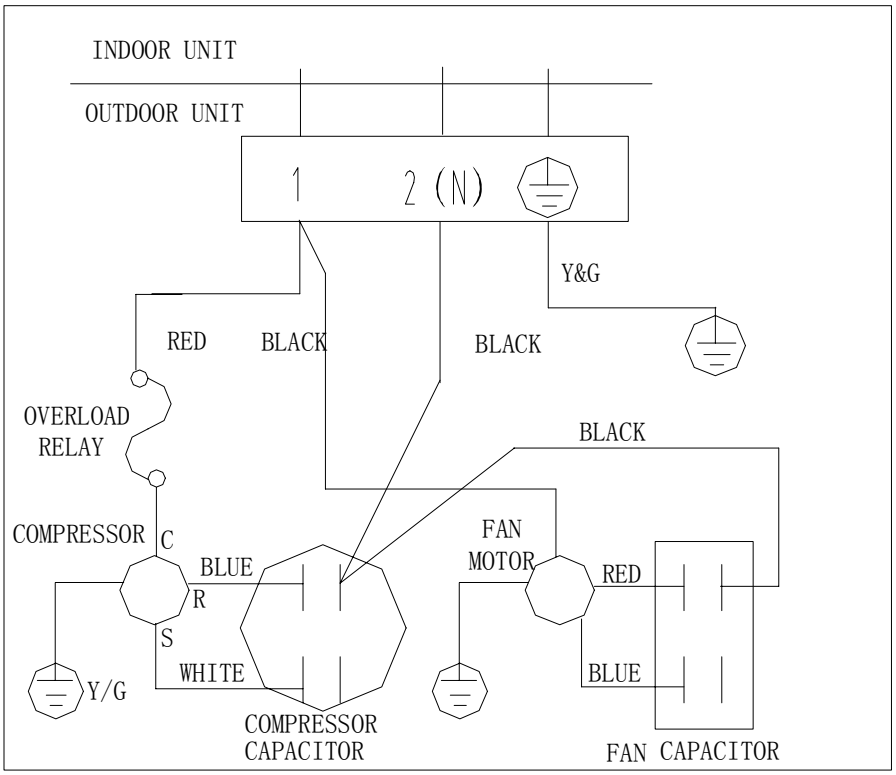
7.2.1.1 MSC-07CRN1, MSC-09CRN1 MSC-12CRN1





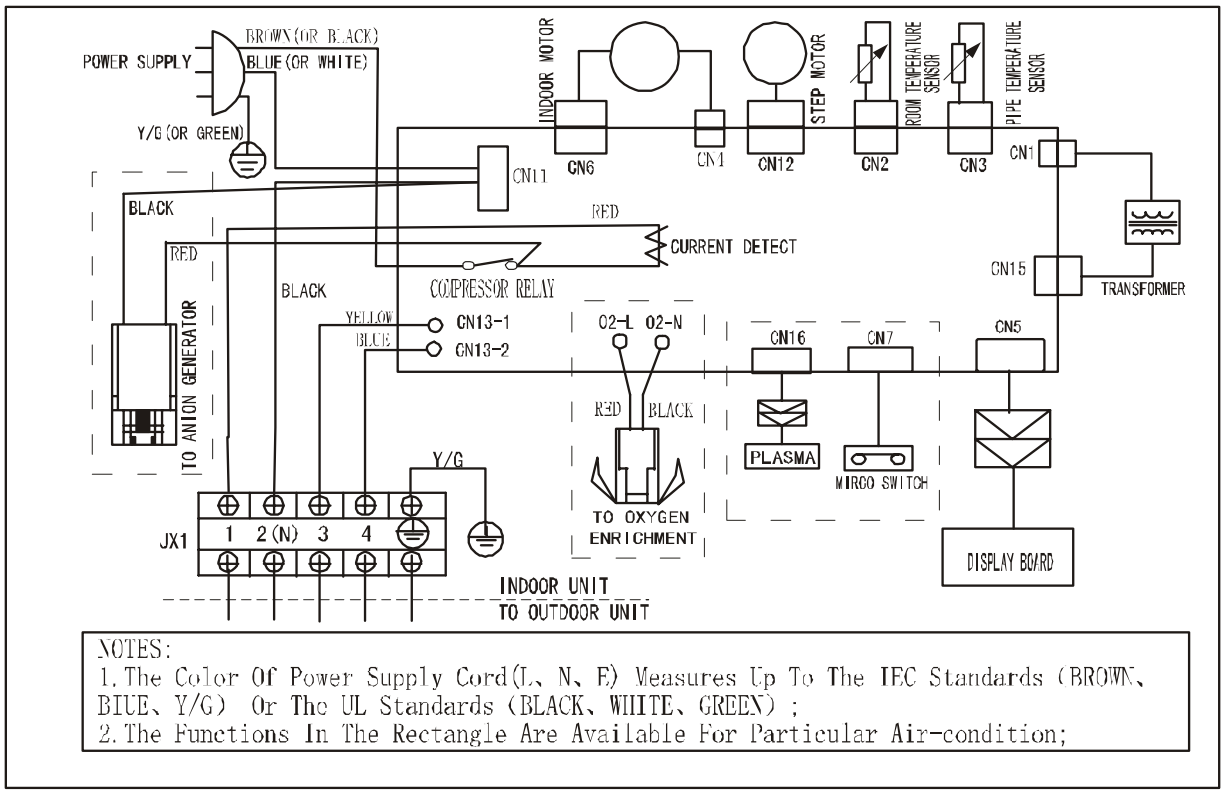
7.2.1.2 MSC-18CRN1

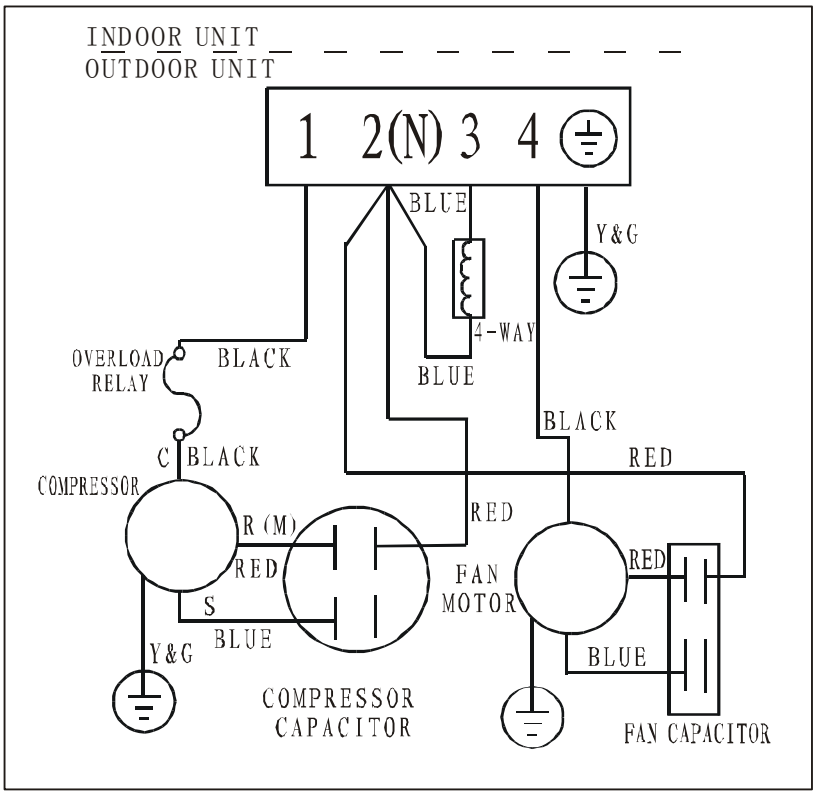




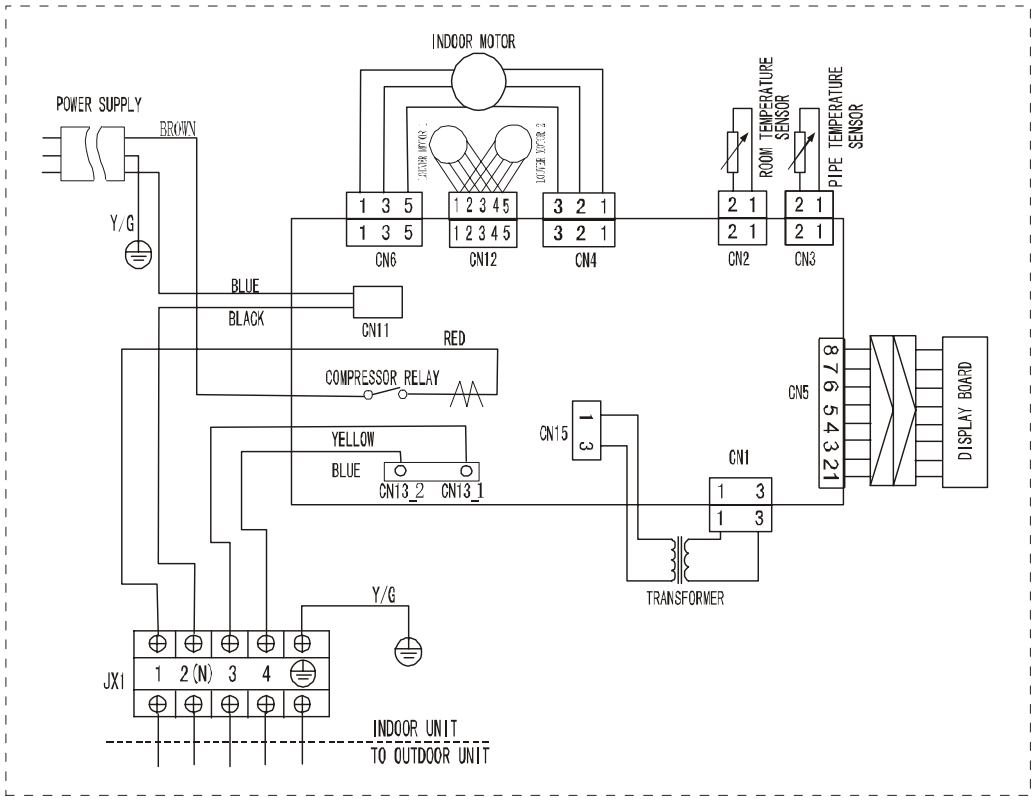
7.2.2 Heating/cooling

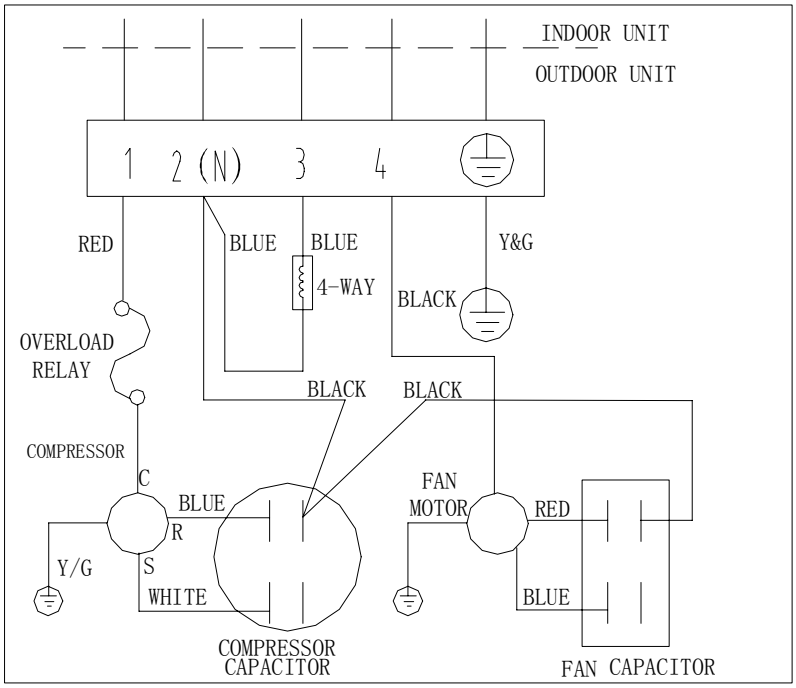
7.2.2.1 MSC-07HRN1, MSC-09HRN1 MSC-12HRN1





7.2.2.2 MSC-18HRN1





8 Electronic function

8.1 Electric Control working environment

8.1.1 input voltage: 175~253V

8.1.2 Input power frequency:50Hz

8.1.3 Ambient temperature: -7°C~+43°C

8.1.4 Indoor fan normal working amp is less than 1A,

8.1.5 Outdoor fan. Normal working amp is less than 1.5A

8.1.6 Four-way valve normal working amp is less than 1A.

8.1.7 Swing motor: DC12V.

8.1.8 Compressor: single-phase power supply. Its normal working amp is less than 15A

8.2 Proper symbols and their meanings:

TA: Indoor ambient temperature

TE: Indoor evaporator temperature

TS: Setting temperature through the remote controller

I_{3sec}: Self-protection amp of compressor, continue three seconds until turns off the compressor.

I_{5MIN}: Self-protection amp of compressor, continue five minutes until turns off the compressor.

I_{FAN}: Self-protection amp of outdoor fan/indoor fans when they change from higher wind to lower wind.

$I_{RESTORE}$: Amp self-protection return value

$TH_{DEFROST}$: High wind, defrosting temperature difference

$TM_{DEFROST}$: Middle wind, defrosting temperature difference

$TL_{DEFROST}$: Low wind, defrosting temperature difference

TE1: Anti-cold wind, from Fan Off to Breeze temperature

TE2: Anti-cold wind, from Breeze to Setting Fan Speed temperature

TE3: Anti-cold wind, from Setting Fan Speed to Breeze temperature

TE4: Anti-cold wind, from Breeze to Fan Off temperature

TE5: Evaporator low temperature protection entering temperature

TE6: Evaporator low temperature protection restoring temperature

TE7: Evaporator high temperature protection, compressor off temperature

TE8: Evaporator high temperature protection, fan off temperature

TE9: Evaporator high temperature protection, restoring temperature

8.3 Functions

Remote receiving

Testing and forced running

Position set for indoor unit wind vane

LED displaying and alarm

On or off Timer

Protection for the compressor

Current protection

High temperature protection of indoor heat exchanger at heating mode

Auto defrosting and heating recovery at heating mode

Anti cold air at heating mode

Anti frozen at cooling mode

8.4 Protection

8.4.1 3 minutes delay at restart for compressor.

8.4.2 Sensor protection at open circuit and breaking disconnection

8.4.3 Fan Speed is out of control. When Indoor Fan Speed is too high(higher than High Fan+300RPM)or too low(lower than 400RPM), the unit stops and LED displays failure information and can't returns to normal operation automatically.

8.4.4 Cross Zero signal error warning. If there is no Cross Zero signals in 4 minutes, the unit stops and LED displays failure information and can't returns to normal operation automatically.

8.4.5 The current protection of the compressor

	Condition	Indoor fan	Compressor	Outdoor fan	Remark
Current up	$I< I_{RESTORE}$	On	On	On	
	$I_{RESTORE} <I< I_{FAN}$	On	On	Off	Heating mode
		Low speed	On	On	Cooling mode
	$I_{FAN} <I<I_{5MIN}$		Off	Off	After 5 Minutes
	$I_{5MIN}<I< I_{3SEC}$		Off	Off	After 3 Seconds
Current down	$I_{5MIN}<I< I_{3SEC}$		Off	Off	After 3 Seconds
	$I_{FAN} <I<I_{5MIN}$		Off	Off	After 5 Minutes
	$I_{RESTORE} <I< I_{FAN}$	On	On	Off	Heating mode
		Low speed	On	On	Cooling mode
	$I< I_{RESTORE}$	On	On	On	

If compressor turns off for continuously 4 times due to current protection in 5 minutes from Compressor On, the unit stops and LED displays failure information and can't returns to normal operation automatically.

8.5 Fan-only mode

Fan speed is high/mid/low/ Auto

8.6 Cooling mode

The 4-way valve is closed at cooling mode.

The action of the compressor and the outdoor fan:

	Condition T=Indoor Temp. Ts=Setting Temp.	Compressor	Outdoor fan
Room temp. up	T> Ts+1	On	On
	T<Ts+1	Off	Off
Room temp. down	T> Ts	On	On
	T<Ts	Off	Off

Auto fan at cooling mode:

	Condition T=Indoor Temp.-Setting Temp.	Indoor fan speed
Room temp. up	T<4℃	Low
	4℃<T<5℃	Med.
	T>5℃	High
Room temp. down	T> 4℃	High
	1℃<T<4℃	Med.
	T<1℃	Low

Anti-freezing control to indoor evaporator at cooling mode(T: evaporator temp.)

	Condition		Compressor	Outdoor fan
	Temp.	Time		
Evaporator Temp. up	T> TE6		On	On
	T< TE6	>5 Minutes	Off	Off
Evaporator Temp. down	T> TE5		On	On
	T< TE5	>5 Minutes	Off	Off

8.7 Dehumidifying mode

8.7.1 The 4-way valve is off in dehumidifying mode

8.7.2 Compressor and Indoor Fan actions in dehumidifying mode

NO	Conditions	Indoor Fan	Compressor and Outdoor Fan
1	TA ≥ TS+2	LOW BREEZE	ON 6minutes OFF 4minutes
2	TS ≤TA<TS+2	LOW BREEZE	ON 5minutes OFF 5minutes
3	TA < TS	LOW BREEZE	ON 4minutes OFF 6minutes

Repeat on and off cycle.

8.7.3 Low room temperature protection:

When room temperature decreases to below 10℃, compressor and outdoor fan will stop(indoor fan is Breeze). Dehumidifying operation will be resumed when room temperature restores to over 13℃.

8.7.4 At dehumidifying mode, the anti-freezing function of the indoor heat exchanger is the same as that of cooling mode.

8.7.5 At dehumidifying mode, the action of fans of indoor is the same as that of air-only mode.

8.8 Heating mode

8.8.1 Generally, the 4-way valve is open in heating mode, but it is closed in defrosting mode. 4-way valve must delay 2 minutes compared with compressor if the compressor changed into non-heating mode or turned off. 4-way valve doesn't delay in dehumidifying mode.

8.8.2 Generally, the outdoor fan is turned off with the on-off action of compressor in heating mode, except for the defrosting mode or the end of defrost.

8.8.3 Action of compressor and outdoor fan motor at heating mode: compressor must run for 7 minutes after starting and then judge temperature. Meanwhile other protections are still valid.

	Condition	Compressor	Outdoor fan
Room temp. up	T> Ts+3*	Off	Off
	T<Ts+3*	On	On
Room temp. down	T< Ts+2*	On	On
	T>Ts+2*	Off	Off

* This parameter can be changed from 0 to 3.

8.8.4 Indoor Fan actions at heating mode

Indoor Fan can be set at HIGH/MID/LOW/AUTO by using a remote controller, but Anti-cold wind function prevails.

Optional 1:

Anti-cold wind control function at heating mode

	Condition T= Indoor exchanger temp.	Indoor fan speed
Indoor exchanger temp. up	T<TE1	Off
	TE1<T<TE2	Breeze
	T>TE2	Setting fan speed
Indoor exchanger temp. down	T> TE3	Setting fan speed
	TE3<T<TE4	Breeze
	T<TE4	Off

Option 2:

Indoor fan changes breeze when compressor stop, after 127 second, indoor fan stop.

8.8.5 Auto wind at heating mode

	Condition T=Indoor Temp.-Setting Temp.	Indoor fan speed
Room temp. up	T<2℃	High
	T>2℃	Med.
Room temp. down	T> 0℃	Med.
	T<0℃	High

8.8.6 Indoor evaporator high-temperature protection at heating mode

	Condition T= Indoor exchanger temp.	Compressor	Outdoor fan
Indoor exchanger temp. up	T<TE8	On	On
	TE8<T<TE7	On	Off
	T>TE7	Off	Off
Indoor exchanger temp. down	T>TE9	Off	Off
	T<TE9	On	On

8.8.7. The louver opens to Standard Angle ANGLHEAT when power is on for the first time

8.9 Defrosting operation (Available for heating only).

8.9.1 Defrosting condition: Defrosting starts when either of the following ①&②:

① A and B are satisfied:

A: The compressor keeps running for 40 minutes or more.

B: The temperature difference of evaporator and room temperature meets one of the following:

℃	Temp. of evaporator---room temp.
Fan speed is high	≤$TH_{DEFROST}$
Fan speed is mid	≤$TM_{DEFROST}$
Fan speed is low	≤$TL_{DEFROST}$
Breeze	Meet only if it is Breeze

② Calculate from the end of latest defrost, evaporator high temp. protection only closes outdoor fan with the compressor still running. Add up to 90 minutes.

8.9.2 Defrosting time

(a) For defrosting condition ① leading to frost——both condition A and B are satisfied, if B is satisfied before A, this can be regarded as severe frosting, and the defrosting time is 10 minutes, or the defrosting time is 7.5 minutes.

(b) For defrosting condition ② leading to frost, the defrosting time is 10 minutes.

(c) For any case leading to frost, if A/C defrosts for 7.5 minutes three times, the forth defrosting time is 10 minutes.

→7.5-minute defrost → 7.5-minute defrost→7.5-minute defrost→10-minute defrost→

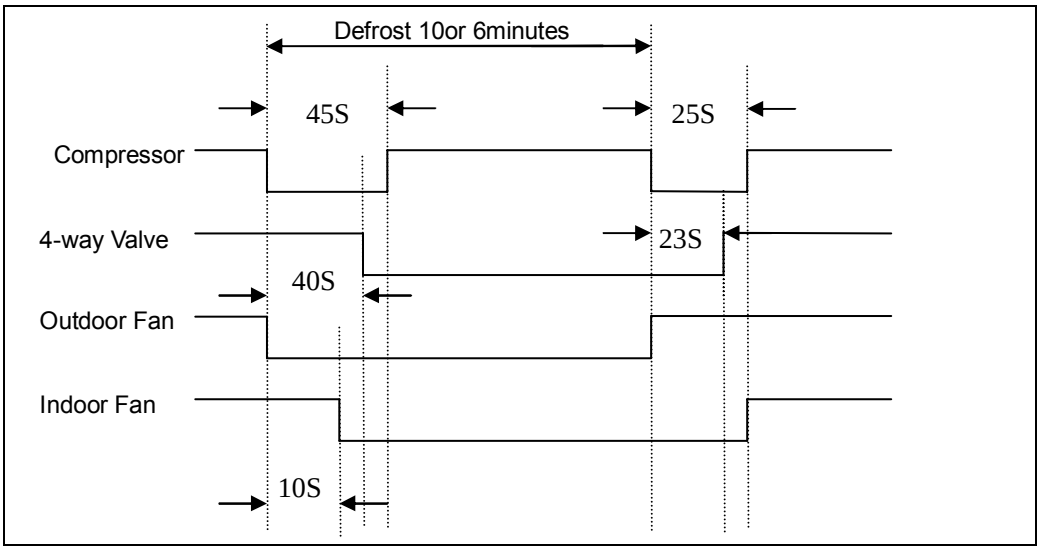
8.9.3 Ending condition of defrosting

If one of following conditions is satisfied, end the defrost and turn into heating mode:

A. The defrost time has reached to 7.5 or 10 minutes.

B. The compressor current has reached to $I_{DEFROST}$ or above, I_{DEROST} differs in different models.

8.9.4 Defrosting Actions:



8.10 Automatic operation mode

8.10.1 The air conditioner automatically selects one of the following operation modes: cooling, heating or fan only according to the temp. difference between room temp. (TA) and set temp. (TS).

TA—TS	Operation mode
TA—TS>2℃	Cooling
-1℃≤TA-TS≤+2℃	Fan-only
TA-TS<-1℃	Heating (air-only for cooling only type)

8.10.2 The indoor fan blows automatically in corresponding selected mode.

8.10.3 The motion of indoor fan's blade should accord with the selected operation mode.

8.10.4 One mode should be carried out for at least 15 minutes once selected. If the compressor cannot start for 15 minutes, reselect the operation mode according to the room temp. and set temp., or reselect when the set temp. varies.

8.11 Forced cooling function

8.11.1 Select forced cooling function with the forced cooling button or the switch.

8.11.2 The compressor is unconditionally turned on, after 30 minutes cooling operation whose fan mode is set as low, the A/C operates at the DRY mode with a set temp. of 24℃.

8.11.3 All protections of remote control cooling are available at forced cooling operation.

8.12 Forced Auto function

Select forced auto function with the forced auto button or the switch.

In forced auto status the A/C operates at remote control mode with a set temp. of 24℃.

8.13 Timer Function

8.14 Sleep mode

8.14.1 The sleep function is available at cooling, heating or auto mode.

8.14.2 Cooling:

The set temperature rise 1℃ per hour. Two hours later, the set temperature will maintain as a

constant and the fan speed is kept at low speed.

The total time is 7 hours, after 7 hours the unit stops.

8.14.3 Heating:

The set temperature decrease 1℃ per hour. Two hours later, the set temperature will maintain as a constant and the air circulation is kept at low speed (Cold air proof function takes precedence over all).

The total time is 7 hours, after 7 hours the unit stops.

8.14.4 Auto:

The economic running function operates in accordance with selected running mode by auto mode.

The total time is 7 hours, after 7 hours the unit stops.

8.15 Auto restart function

In case of a sudden power failure, this function automatically sets the unit to previous settings before the power failure when power returns.

8.16 PLASMA (optional):

Starts with indoor fan.

Note: Plasma and Anion can be use together.

8.17 Anion (optional)

Starts with indoor fan.

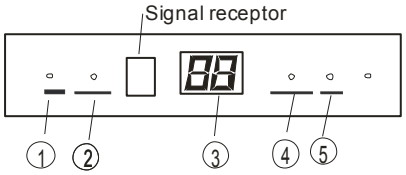
Note: Plasma and Anion can be use together.

8.18 Models and Parameters

Model	MSC-07CRN1	MSC-07HRN1	MSC-09CRN1	MSC-09HRN1	MSC-12CRN1	MSC-12HRN1
I3SEC	7.5A	7.5A	10.0A	10.0A	12.0A	12.0A
I5MIN	6.2A	6.2A	7.5A	7.5A	8.5A	8.5A
IFAN	5.2A	5.2A	5.5A	5.5A	7.5A	7.5A
IRESTORE	4.2A	4.2A	4.5A	4.5A	6.5A	6.5A
IDEFROST		3.2A		3.5A		5.0A
TE1		28℃		28℃		34℃
TE2		32℃		32℃		37℃
TE3		30℃		30℃		33℃
TE4		26℃		26℃		22℃
TE5	4℃	4℃	4℃	4℃	3℃	3℃
TE6	10℃	10℃	10℃	10℃	10℃	10℃
TE7		60℃		60℃		63℃
TE8		53℃		53℃		53℃
TE9		50℃		50℃		50℃
ANGLCOOL	200°	200°	200°	200°	155°	155°
ANGLHEAT		0°		0°		10°
ANGLOFF	124°	124°	124°	124°	124°	124°
$TH_{DEFROST}$		17°C		17°C		20°C
$TM_{DEFROST}$		18°C		18°C		23°C
$TL_{DEFROST}$		19°C		19°C		26°C

9.Troubleshooting

9.1 Display board



① **AUTO indicator**
This indicator illuminates when the air conditioner is in AUTO operation.

② **DEFROST indicator (For Cooling & Heating models only)**
This indicator illuminates when the air conditioner starts defrosting automatically or when the warm air control feature is activated in heating operation.

③ **TEMPERATURE indicator**
Displays the temperature settings when the air conditioner is operational.

④ **OPERATION indicator**
This indicator flashes after power is on and illuminates when the unit is in operation.

⑤ **TIMER indicator**
This indicator illuminates when TIMER is set ON/OFF.

9.2 Malfunction display

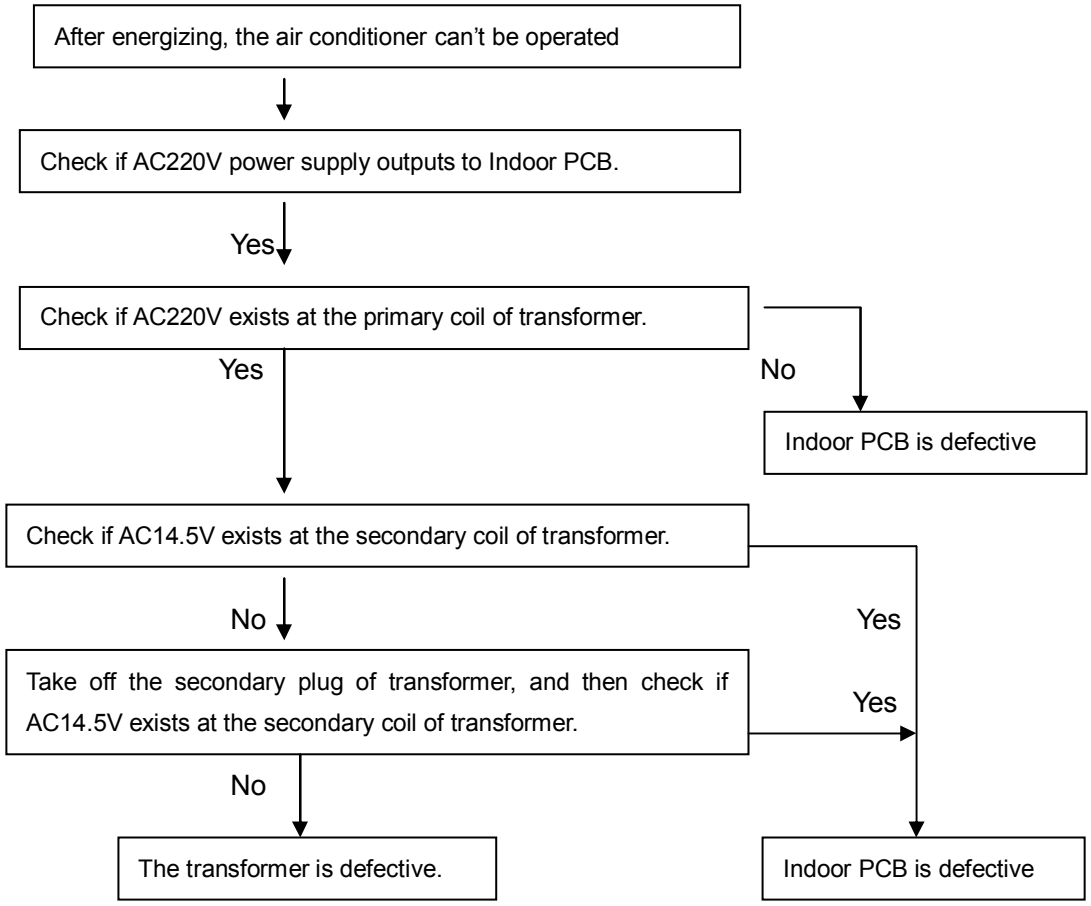
Failure phenomenon	Operation lamp	Timer lamp
Indoor fan speed has been out of control for over 1 minute	☆	X
Indoor room temp. or evaporator sensor is open circuit or short circuit	☆	On
Over current protection of the compressor occurs 4 times	X	☆
EEROM error	On	☆
No over-zero signal	☆	☆

✕ Extinguish

☆ Flash at 5Hz

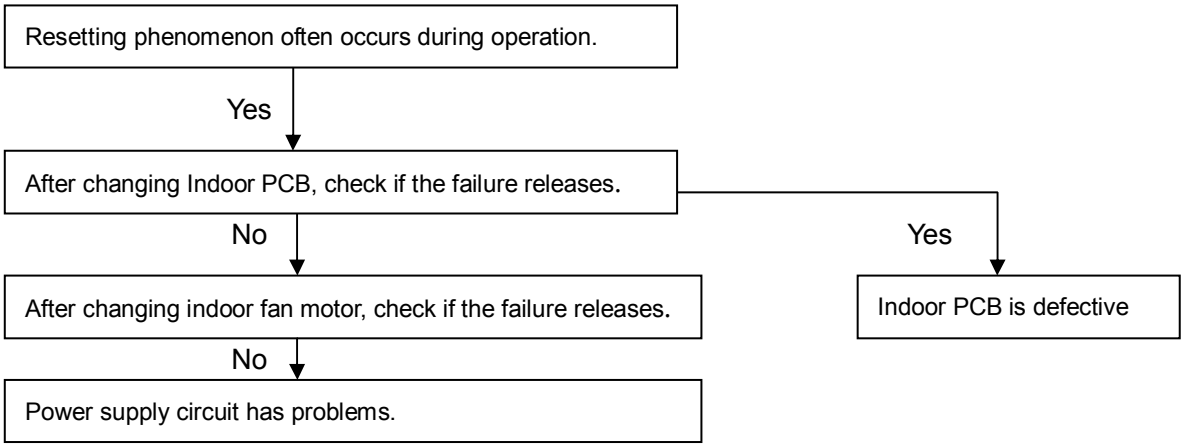
9.3 Diagnostic Chart

9.3.1 After energizing, no indicator is lighted and the air conditioner can't be operated.



9.3.2 Resetting phenomenon often occurs during operation. (That is automatically entering to the status when power is on.)

The reason is that the instantaneous voltage of main chip is less than 4.5V. Check according to the following procedure:



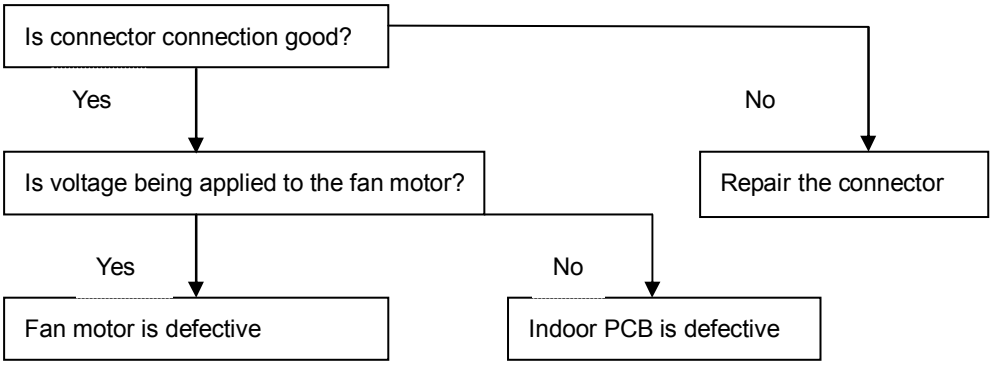
9.3.3 Failure phenomenon

Failure phenomenon	Operation lamp	Timer lamp
Indoor fan speed has been out of control for over 1 minute	☆	X
Indoor room temp. or evaporator sensor is open circuit or short circuit	☆	On
Over current protection of the compressor occurs 4 times	X	☆
EEROM error	On	☆
No over-zero signal	☆	☆

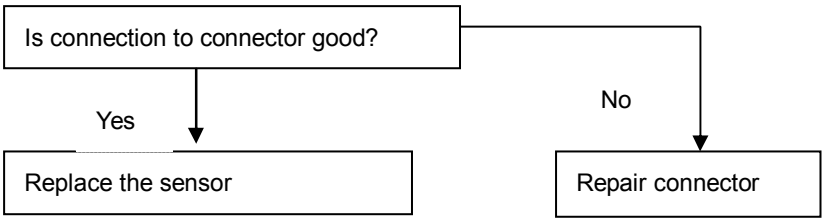
✕ Extinguish

☆ Flash at 5Hz

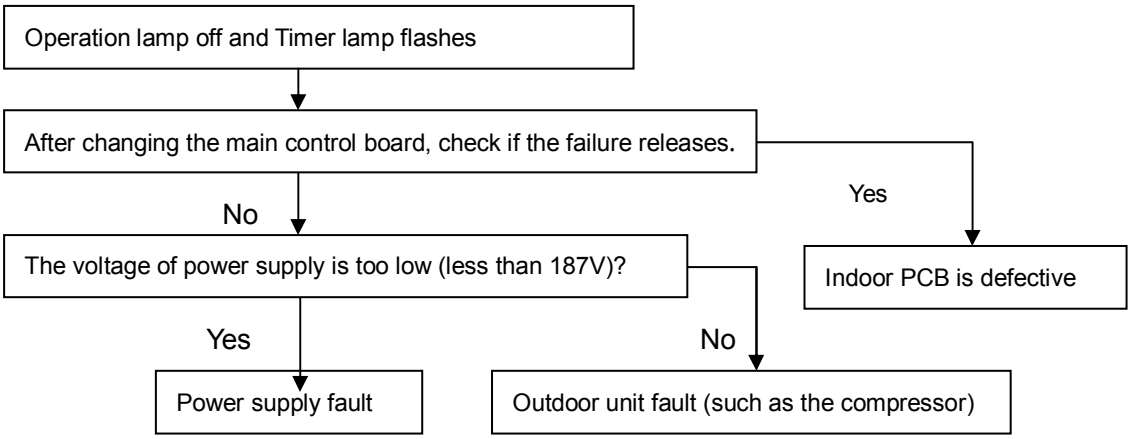
9.3.3.1 Operation lamp flashes and Timer lamp off.



9.3.3.2 Operation lamp flashes and Timer lamp on.



9.3.3.3 Operation lamp off and Timer lamp flashes



9.3.3.4 Operation lamp on and Timer lamp flashes

EEROM error, indoor PCB is defective.

9.3.3.5 Operation lamp flashes, Timer lamp flashes .

This is alarm signal when the main chip can't detect over-zero signal. When such failure occurs, the main control board must have fault.

10. Characteristic of temp. sensor

Temp.℃	Resistance KΩ		Temp.℃	Resistance KΩ		Temp.℃	Resistance KΩ
-10	62.2756		17	14.6181		44	4.3874
-9	58.7079		18	13.918		45	4.2126
-8	56.3694		19	13.2631		46	4.0459
-7	52.2438		20	12.6431		47	3.8867
-6	49.3161		21	12.0561		48	3.7348
-5	46.5725		22	11.5		49	3.5896
-4	44		23	10.9731		50	3.451
-3	41.5878		24	10.4736		51	3.3185
-2	39.8239		25	10		52	3.1918
-1	37.1988		26	9.5507		53	3.0707
0	35.2024		27	9.1245		54	2.959
1	33.3269		28	8.7198		55	2.8442
2	31.5635		29	8.3357		56	2.7382
3	29.9058		30	7.9708		57	2.6368
4	28.3459		31	7.6241		58	2.5397
5	26.8778		32	7.2946		59	2.4468
6	25.4954		33	6.9814		60	2.3577
7	24.1932		34	6.6835		61	2.2725
8	22.5662		35	6.4002		62	2.1907
9	21.8094		36	6.1306		63	2.1124
10	20.7184		37	5.8736		64	2.0373
11	19.6891		38	5.6296		65	1.9653
12	18.7177		39	5.3969		66	1.8963
13	17.8005		40	5.1752		67	1.830
14	16.9341		41	4.9639		68	1.7665
15	16.1156		42	4.7625		69	1.7055
16	15.3418		43	4.5705		70	1.6469