HITACHI
Inspire the Next

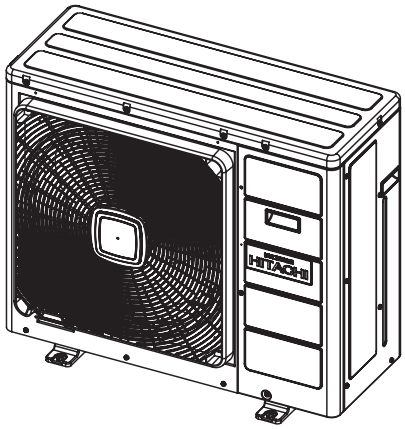
PM | NO. 0371E

RAM-90QH5

SERVICE MANUAL
TECHNICAL INFORMATION

REFER TO THE FOUNDATION MANUAL

FOR SERVICE PERSONNEL ONLY



RAM-90QH5

NOTE:
This manual describes only points that differ from PM No. 0322E, PM No. 0355E and PM No. 0366E for items not described in this manual.

CONTENTS

SPECIFICATIONS ---- 5
INSTALLATION ---- 16
CONSTRUCTION AND DIMENSIONAL DIAGRAM ---- 20
WIRING DIAGRAM ---- 21
MAIN PARTS COMPONENT ---- 24
CIRCUIT DIAGRAM ---- 25
BLOCK DIAGRAM ---- 29
BASIC MODE ---- 31
REFRIGERATING CYCLE DIAGRAM ---- 51
DESCRIPTION OF MAIN CIRCUIT OPERATION ---- 52
TROUBLE SHOOTING ---- 88
PARTS LIST AND DIAGRAM ---- 94

SPECIFICATIONS

TYPE		DC INVERTER FIVE SYSTEM MULTI
		OUTDOOR UNIT
MODEL		RAM-90QH5
POWER SOURCE		1ø, 220 - 240V, 50/60Hz
TOTAL INPUT	(W)	REFER TO THE SPECIFICATIONS PAGE
TOTAL AMPERES	(A)	
COOLING CAPACITY	(kW)	
HEATING CAPACITY	(B.T.U.)	
DIMENSIONS (mm)	W	950
	H	800
	D	370
NET WEIGHT	(kg)	71

※ After installation

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

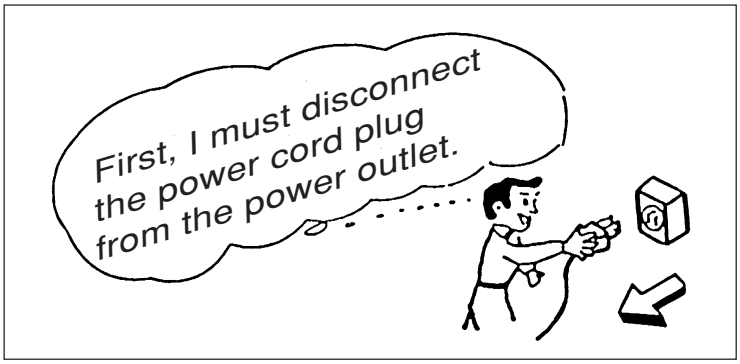
ROOM AIR CONDITIONER

OUTDOOR UNIT

APRIL 2007 Refrigeration & Air-Conditioning Division

SAFETY DURING REPAIR WORK

1. In order to disassemble and repair the unit in question, be sure to disconnect the power cord plug from the power outlet before starting the work.



2. If it is necessary to replace any parts, they should be replaced with respective genuine parts for the unit, and the replacement must be effected in correct manner according to the instructions in the Service Manual of the unit.

> If the contacts of electrical parts are defective, replace the electrical parts without trying to repair them.

3. After completion of repairs, the initial state should be restored.
4. Lead wires should be connected and laid as in the initial state.
5. Modification of the unit by user himself should absolutely be prohibited.
6. Tools and measuring instruments for use in repairs or inspection should be accurately calibrated in advance.
7. In installing the unit having been repaired, be careful to prevent the occurence of any accident such as electrical shock, leak of current, or bodily injury due to the drop of any part.
8. To check the insulation of the unit, measure the insulation resistance between the power cord plug and grounding terminal of the unit. The insulation resistance should be 1MΩ or more as measured by a 500V DC megger.
9. The initial location of installation such as window, floor or the other should be checked for being and safe enough to support the repaired unit again.
   If it is found not so strong and safe, the unit should be installed at the initial location reinforced or at a new location.
10. Any inflammable thing should never be placed about the location of installation.
11. Check the grounding to see whether it is proper or not, and if it is found improper, connect the grounding terminal to the earth.

WORKING STANDARDS FOR PREVENTING BREAKAGE OF SEMICONDUCTORS

1. Scope
   The standards provide for items to be generally observed in carrying and handling semiconductors in relative manufacturers during maintenance and handling thereof. (They apply the same to handling of abnormal goods such as rejected goods being returned).

2. Object parts

   (1) Micro computer
   (2) Integrated circuits (IC)
   (3) Field-effect transistors (FET)
   (4) P.C. boards or the like on which the parts mentioned in (1) and (2) of this paragraph are equipped.

3. Items to be observed in handling

   (1) Use a conductive container for carrying and storing of parts. (Even rejected goods should be handled in the same way).

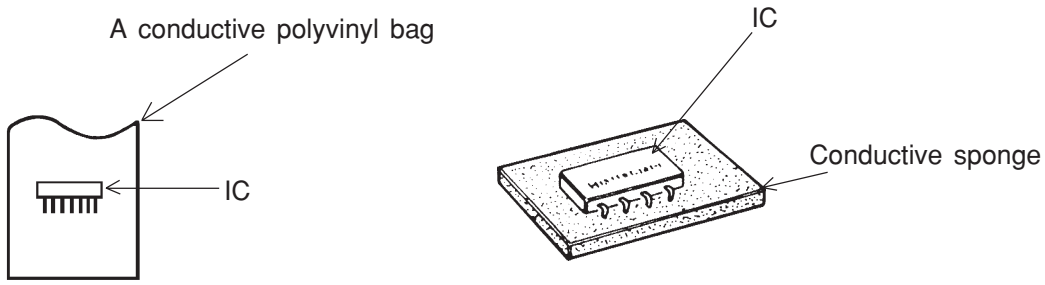


Fig. 1. Conductive Container

   (2) When any part is handled uncovered (in counting, packing and the like), the handling person must always use himself as a body earth. (Make yourself a body earth by passing one M ohm earth resistance through a ring or bracelet).

   (3) Be careful not to touch the parts with your clothing when you hold a part even if a body earth is being taken.

   (4) Be sure to place a part on a metal plate with grounding.

   (5) Be careful not to fail to turn off power when you repair the printed circuit board. At the same time, try to repair the printed circuit board on a grounded metal plate.

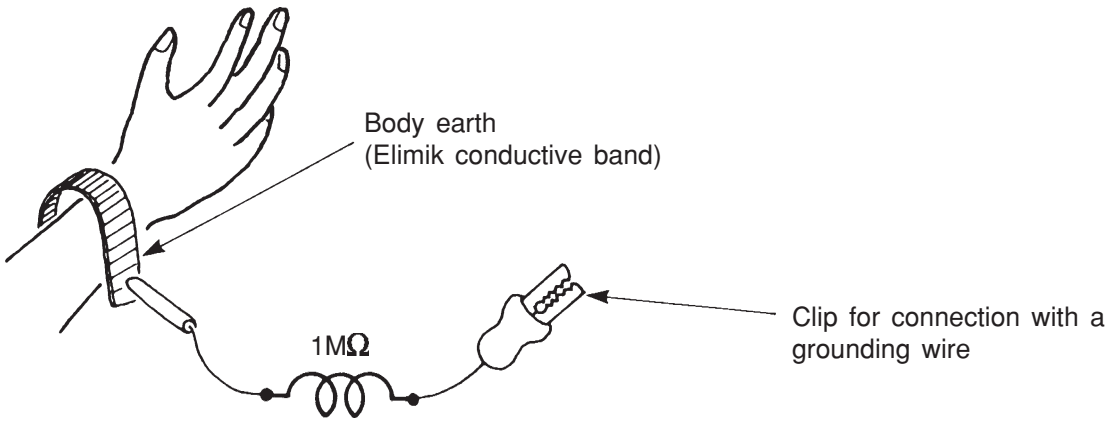


Fig. 2. Body Earth

(6) Use a three wire type soldering iron including a grounding wire.

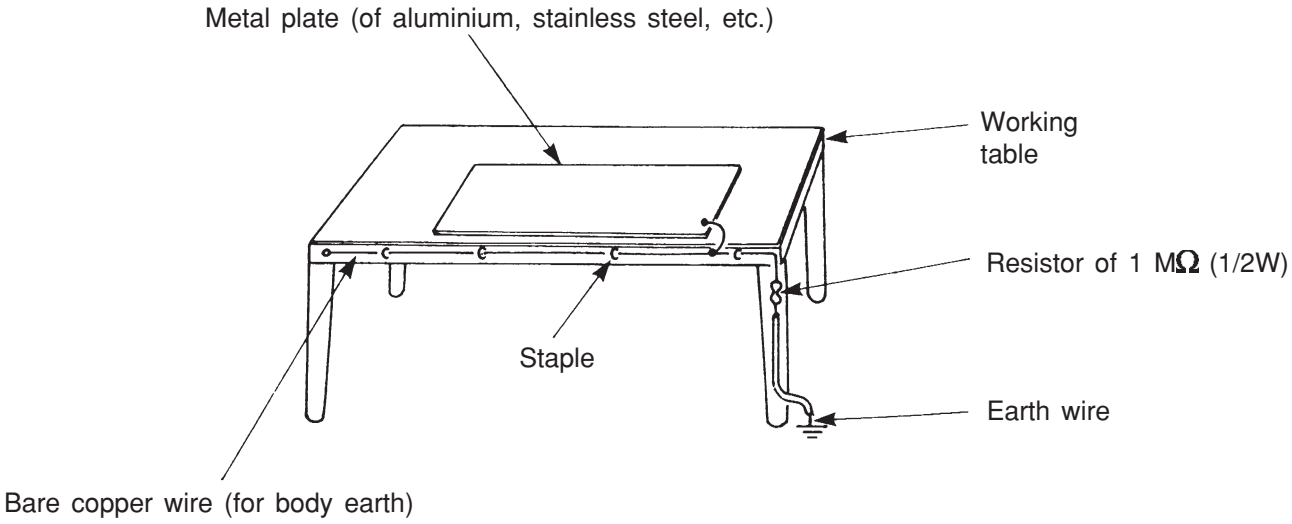


Fig. 3. Grounding of the working table

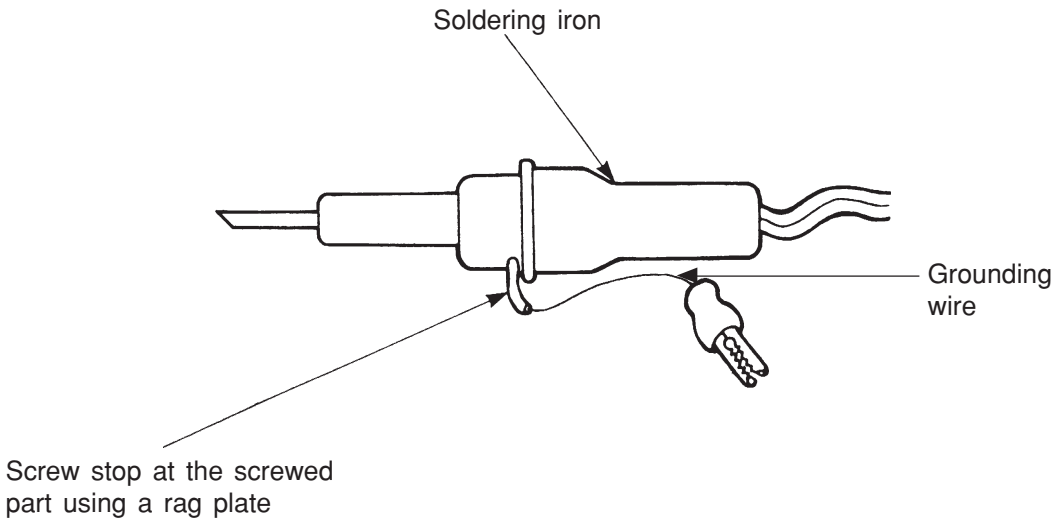


Fig. 4. Grounding a soldering iron

Use a high insulation mode (100V, 10MΩ or higher) when ordinary iron is to be used.

(7) In checking circuits for maintenance, inspection or some others, be careful not to have the test probes of the measuring instrument shortcircuit a load circuit or the like.

⚠ CAUTION

1. In quiet operation or stopping the operation, slight flowing noise of refrigerant in the refrigerating cycle is heard occasionally, but this noise is not abnormal for the operation.

2. When it thunders near by, it is recommend to stop the operation and to disconnect the power cord plug from the power outlet for safety.

3. The room air conditioner does not start automatically after recovery of the electric power failure for preventing fuse blowing. Re-press START/STOP button after 3 minutes from when unit stopped.

4. If the room air conditioner is stopped by setting the temperature, or missoperation, and re-start in a moment, there is occasion that the cooling and heating operation does not start for 3 minutes, it is not abnormal and this is the result of the operation of IC delay circuit. This IC delay circuit ensures that there is no danger of blowing fuse or damaging parts even if operation is restarted accidentally.

5. This room air conditioner should not be used at the cooling operation when the outside temperature is below –10°C (14°F).

6. This room air conditioner (the reverse cycle) should not be used when the outside temperature is below –15°C (5°F).
   If the reverse cycle is used under this condition, the outside heat exchanger will be frosted and its efficiency falls.

7. When the outside heat exchanger is frosted, the frost is melted by operating the hot gas system, it is not trouble that at this time fan stops and the vapour may rise from the outside heat exchanger.

SPECIFICATIONS

MODEL		RAM-90QH5
FAN MOTOR		138 W
FAN MOTOR CAPACITOR		NO
FAN MOTOR PROTECTOR		NO
COMPRESSOR		JU1318D1
COMPRESSOR MOTOR CAPACITOR		NO
OVERLOAD PROTECTOR		YES
OVERHEAT PROTECTOR		YES
FUSE (for MICROPROCESSOR)		5.0A
POWER RELAY		G4A
POWER SWITCH		NO
TEMPORARY SWITCH		NO
SERVICE SWITCH		YES
TRANSFORMER		NO
VARISTOR		450NR
NOISE SUPPRESSOR		YES
THERMOSTAT		YES(IC)
REMOTE CONTROL SWITCH (LIQUID CRYSTAL)		NO
REFRIGERANT CHARGING VOLUME (Refrigerant 410A)	UNIT	2700g
		WITHOUT REFRIGERANT BECAUSE COUPLING IS FLARE TYPE.
	PIPES	MAX. 75m

In case the pipe length is more than 30m, add refrigerant R410 at 15gram per every meter exceeds.

SPECIFICATIONS FOR INDOOR UNITS COMBINATION

TYPE		DC INVERTER FIVE SYSTEM MULTI COOLING AND HEATING
MODEL	OUTDOOR UNIT	RAM-90QH5
PHESE/VOLTAGE/FREQUENCY		1ø, 220 - 240V, 50/60Hz
CIRCUIT AMPERES TO CONNECT (A)		30
COOLING (FIVE UNITS)	CAPACITY (kW) (B.T.U./h)	9.00 (3.20 - 9.90)
		30,720 (10,920 - 33,780)
	TOTAL INPUT (W)	2,360 (600 - 3,040)
	EER (B.T.U./hW)	13.02
	TOTAL AMPERES (A)	10.8 - 9.9
	POWER FACTOR (%)	99
HEATING (FIVE UNITS)	CAPACITY (kW) (B.T.U./h)	11.00 (3.40 - 12.10)
		37,540 (11,610 - 41,290)
	TOTAL INPUT (W)	2,460 (610 - 2,910)
	EER (B.T.U./hW)	15.26
	TOTAL AMPERES (A)	11.3 - 10.4
	POWER FACTOR (%)	99
MAXIMUM LENGTH OF PIPING		MAX. 75m (FIVE UNIT TOTAL)
STANDARD		CE (EMC&LVD)

MODEL		RAM-90QH5
PACKING (mm)	W	1,073
	H	867
	D	510
	cu.ft.	16.61
GROSS WEIGHT (kg)		78
FLARENUTSIZE (SMALL/LARGE)		6.35DX5/9.52DX3/12.70X2

OPERATION SCOPE

	INDOOR SUCTION TEMPERATURE (˚C)	OUTDOOR SUCTION TEMPERATURE (˚C)	INDOOR SUCTION HUMIDITY (%)
COOLING OPERATION SCOPE	16 - 32	–10 ~ 43	BELOW 80
DEHUMIDIFYING OPERATION	16 - 32	–10 ~ 43	BELOW 80
HEATING OPERATION SCOPE	BELOW 27	–15 ~ 23	—

DC INVERTER SYSTEM MULTI R.A.C. *RAM-90QH5*
COOL / HEAT CAPACITY SPEC. FOR INDOOR UNITS COMBINATIONS TO BE ABLE TO OPERATE SIMULTANEOUSLY

Whichever indoor units are installed, cooling and heating capacity depends on how many and which indoor units are operating at that time.

5 ROOM MULTI-SPLIT INVERTER TYPE ROOM AIR CONDITIONER POSSIBLE COMBINATION TO OPERATE (SAME TIME OPERATION)

(Reference value)

	POSSIBLE COMBINATIONS TO OPERATE	COOLING					HEATING				
		CAPACITY RATING (kW) (RANGE)	TOTAL	OUTDOOR UNIT POWER CONSUMPTION (W)	OUTDOOR UNIT AMPERE (A) at 220 - 240V	COP	CAPACITY RATING (kW) (RANGE)	TOTAL	OUTDOOR UNIT POWER CONSUMPTION (W)	OUTDOOR UNIT AMPERE (A) at 220 - 240V	COP
ONE UNIT	1.8	1.80	1.80	500	2.3 - 2.1	3.60	2.50	2.50	780	3.6 - 3.3	3.21
	2.5	2.50	2.50	700	3.2 - 2.9	3.57	3.40	3.40	1140	5.2 - 4.8	2.98
	3.5	3.50	3.50	1040	4.8 - 4.4	3.37	4.30	4.30	1420	6.5 - 6.0	3.03
	5.0	5.00	5.00	1540	7.1 - 6.5	3.25	6.50	6.50	2300	10.6 - 9.7	2.83
	6.0	6.00	6.00	1880	8.6 - 7.9	3.19	7.30	7.30	2630	12.1 - 11.1	2.78
TWO UNITS	1.8+1.8	1.80+1.80	3.60	710	3.3 - 3.0	5.07	2.50+2.50	5.00	1240	5.7 - 5.2	4.03
	1.8+2.5	1.80+2.50	4.30	1000	4.6 - 4.2	4.30	2.50+3.40	5.90	1530	7.0 - 6.4	3.86
	1.8+3.5	1.80+3.50	5.30	1590	7.3 - 6.7	3.33	2.50+4.30	6.80	1870	8.6 - 7.9	3.64
	1.8+5.0	1.80+5.00	6.80	2470	11.3 - 10.4	2.75	2.39+6.21	8.60	2470	11.3 - 10.4	3.48
	1.8+6.0	1.80+5.90	7.70	2590	11.9 - 10.9	2.97	2.40+7.00	9.40	2770	12.7 - 11.7	3.39
	2.5+2.5	2.50+2.50	5.00	1370	6.3 - 5.8	3.65	3.40+3.40	6.80	1810	8.3 - 7.6	3.76
	2.5+3.5	2.50+3.50	6.00	2000	9.2 - 8.4	3.00	3.40+4.30	7.70	2160	9.9 - 9.1	3.56
	2.5+5.0	2.50+5.00	7.50	2880	13.2 - 12.1	2.60	3.16+6.04	9.20	2720	12.5 - 11.4	3.38
	2.5+6.0	2.40+5.60	8.00	2750	12.6 - 11.6	2.91	3.08+6.62	9.70	2940	13.5 - 12.4	3.30
	3.5+3.5	3.50+3.50	7.00	2490	11.4 - 10.5	2.81	4.30+4.30	8.60	2460	11.3 - 10.4	3.50
	3.5+5.0	3.30+4.70	8.00	2730	12.5 - 11.5	2.93	3.86+5.84	9.70	2940	13.5 - 12.4	3.30
	3.5+6.0	3.10+5.20	8.30	2860	13.1 - 12.0	2.90	3.78+6.42	10.20	3130	14.4 - 13.2	3.26
	5.0+5.0	4.20+4.20	8.40	2900	13.3 - 12.2	2.90	5.10+5.10	10.20	2860	13.1 - 12.0	3.57
	5.0+6.0	4.00+4.70	8.70	3080	14.1 - 13.0	2.82	4.90+5.50	10.40	3140	14.4 - 13.2	3.31
	6.0+6.0	4.50+4.50	9.00	3350	15.4 - 14.1	2.69	5.50+5.50	11.00	3520	16.2 - 14.8	3.13
THREE UNITS	1.8+1.8+1.8	1.80+1.80+1.80	5.40	1480	6.8 - 6.2	3.65	2.50+2.50+2.5	7.50	2020	9.3 - 8.5	3.71
	1.8+1.8+2.5	1.80+1.80+2.50	6.10	1780	8.2 - 7.5	3.43	2.38+2.38+3.24	8.00	2210	10.1 - 9.3	3.62
	1.8+1.8+3.5	1.80+1.80+3.50	7.10	1910	8.8 - 8.0	3.72	2.37+2.37+4.06	8.80	2370	10.9 - 10.0	3.71
	1.8+1.8+5.0	1.80+1.80+5.00	8.60	2680	12.3 - 11.3	3.21	2.20+2.20+5.70	10.10	2730	12.5 - 11.5	3.70
	1.8+1.8+6.0	1.69+1.69+5.62	9.00	2700	12.4 - 11.4	3.33	2.11+2.11+6.18	10.40	3060	14.0 - 12.9	3.40
	1.8+2.5+2.5	1.80+2.50+2.50	6.80	1860	8.5 - 7.8	3.66	2.30+3.15+3.15	8.60	2370	10.9 - 10.0	3.63
	1.8+2.5+3.5	1.80+2.50+3.50	7.80	2190	10.1 - 9.2	3.56	2.30+3.13+3.97	9.40	2530	11.6 - 10.6	3.72
	1.8+2.5+5.0	1.75+2.40+4.85	9.00	2700	12.4 - 11.4	3.33	2.10+2.85+5.45	10.40	2890	13.3 - 12.2	3.60
	1.8+2.5+6.0	1.58+2.18+5.24	9.00	2740	12.6 - 11.5	3.28	1.97+2.68+5.75	10.40	2990	13.7 - 12.6	3.48
	1.8+3.5+3.5	1.80+3.50+3.50	8.80	2690	12.4 - 11.3	3.27	2.34+4.03+4.03	10.40	2750	12.6 - 11.6	3.78
	1.8+3.5+5.0	1.55+3.05+4.40	9.00	2740	12.6 - 11.5	3.28	1.95+3.36+5.09	10.40	2990	13.7 - 12.6	3.48
	1.8+3.5+6.0	1.43+2.79+4.78	9.00	2740	12.6 - 11.5	3.28	1.84+3.17+5.39	10.40	2990	13.7 - 12.6	3.48
	1.8+5.0+5.0	1.38+3.81+3.81	9.00	2740	12.6 - 11.5	3.28	1.68+4.36+4.36	10.40	2990	13.7 - 12.6	3.48
	1.8+5.0+6.0	1.27+3.52+4.21	9.00	2710	12.4 - 11.4	3.32	1.61+4.19+4.70	10.50	2990	13.7 - 12.6	3.51
	1.8+6.0+6.0	1.18+3.91+3.91	9.00	2740	12.6 - 11.5	3.28	1.60+4.70+4.70	11.00	3040	14.0 - 12.8	3.62
	2.5+2.5+2.5	2.50+2.50+2.50	7.50	2120	9.7 - 8.9	3.54	3.00+3.00+3.00	9.00	2540	11.7 - 10.7	3.54
	2.5+2.5+3.5	2.50+2.50+3.50	8.50	2560	11.8 - 10.8	3.32	3.06+3.06+3.88	10.00	2730	12.5 - 11.5	3.66
	2.5+2.5+5.0	2.25+2.25+4.50	9.00	2780	12.8 - 11.7	3.24	2.66+2.66+5.08	10.40	2990	13.7 - 12.6	3.48
	2.5+2.5+6.0	2.05+2.05+4.90	9.00	2780	12.8 - 11.7	3.24	2.51+2.51+5.38	10.40	2990	13.7 - 12.6	3.48
	2.5+3.5+3.5	2.36+3.32+3.32	9.00	2750	12.6 - 11.6	3.27	2.94+3.73+3.73	10.40	2890	13.3 - 12.2	3.60
	2.5+3.5+5.0	2.05+2.85+4.10	9.00	2770	12.7 - 11.7	3.25	2.49+3.15+4.76	10.40	2990	13.7 - 12.6	3.48
	2.5+3.5+6.0	1.88+2.62+4.50	9.00	2780	12.8 - 11.7	3.24	2.38+3.01+5.11	10.50	2990	13.7 - 12.6	3.51
	2.5+5.0+5.0	1.80+3.60+3.60	9.00	2780	12.8 - 11.7	3.24	2.18+4.16+4.16	10.50	2990	13.7 - 12.6	3.51
	2.5+5.0+6.0	1.67+3.33+4.00	9.00	2780	12.8 - 11.7	3.24	2.08+3.97+4.45	10.50	2990	13.7 - 12.6	3.51
	2.5+6.0+6.0	1.56+3.72+3.72	9.00	2770	12.7 - 11.7	3.25	2.08+4.46+4.46	11.00	2890	13.3 - 12.2	3.81
	3.5+3.5+3.5	3.00+3.00+3.00	9.00	2740	12.6 - 11.5	3.28	3.47+3.47+3.47	10.40	2990	13.7 - 12.6	3.48
	3.5+3.5+5.0	2.65+2.65+3.70	9.00	2780	12.8 - 11.7	3.24	2.99+2.99+4.52	10.50	2990	13.7 - 12.6	3.51
	3.5+3.5+6.0	2.40+2.40+4.20	9.00	2780	12.8 - 11.7	3.24	2.84+2.84+4.82	10.50	2990	13.7 - 12.6	3.51
	3.5+5.0+5.0	2.30+3.35+3.35	9.00	2780	12.8 - 11.7	3.24	2.60+3.95+3.95	10.50	2990	13.7 - 12.6	3.51
	3.5+5.0+6.0	2.18+3.10+3.72	9.00	2850	13.1 - 12.0	3.16	2.61+3.95+4.44	11.00	2890	13.3 - 12.2	3.81
	3.5+6.0+6.0	2.04+3.48+3.48	9.00	2850	13.1 - 12.0	3.16	2.50+4.25+4.25	11.00	2890	13.3 - 12.2	3.81
	5.0+5.0+5.0	3.00+3.00+3.00	9.00	2850	13.1 - 12.0	3.16	3.67+3.67+3.67	11.00	2890	13.3 - 12.2	3.81

FOUR UNITS	1.8+1.8+1.8+1.8	1.80+1.80+1.80+1.80	7.20	1800	8.3 - 7.6	4.00	2.40+2.40+2.40+2.40	9.60	2400	11.0 - 10.1	4.00
	1.8+1.8+1.8+2.5	1.80+1.80+1.80+2.50	7.90	2090	9.6 - 8.8	3.78	2.25+2.25+2.25+3.05	9.80	2700	12.4 - 11.4	3.63
	1.8+1.8+1.8+3.5	1.80+1.80+1.80+3.50	8.90	2530	11.6 - 10.6	3.52	2.16+2.16+2.16+3.72	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+1.8+5.0	1.55+1.55+1.55+4.35	9.00	2530	11.6 - 10.6	3.56	1.82+1.82+1.82+4.74	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+1.8+6.0	1.40+1.40+1.40+4.8	9.00	2530	11.6 - 10.6	3.56	1.72+1.72+1.72+5.04	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+2.5+2.5	1.80+1.80+2.50+2.50	8.60	2350	10.8 - 9.9	3.66	2.12+2.12+2.88+2.88	10.00	2700	12.4 - 11.4	3.70
	1.8+1.8+2.5+3.5	1.69+1.69+2.34+3.28	9.00	2530	11.6 - 10.6	3.56	2.01+2.01+2.73+3.45	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+2.5+5.0	1.45+1.45+2.00+4.10	9.00	2530	11.6 - 10.6	3.56	1.71+1.71+2.33+4.45	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+2.5+6.0	1.35+1.35+1.85+4.45	9.00	2530	11.6 - 10.6	3.56	1.62+1.62+2.21+4.75	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+3.5+3.5	1.53+1.53+2.97+2.97	9.00	2530	11.6 - 10.6	3.56	1.88+1.88+3.22+3.22	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+3.5+5.0	1.35+1.35+2.60+3.70	9.00	2530	11.6 - 10.6	3.56	1.61+1.61+2.78+4.20	10.20	2700	12.4 - 11.4	3.78
	1.8+1.8+3.5+6.0	1.25+1.25+2.40+4.10	9.00	2530	11.6 - 10.6	3.56	1.57+1.57+2.69+4.57	10.40	2700	12.4 - 11.4	3.85
	1.8+1.8+5.0+5.0	1.20+1.20+3.30+3.30	9.00	2510	11.5 - 10.6	3.59	1.44+1.44+3.76+3.76	10.40	2700	12.4 - 11.4	3.85
	1.8+1.8+5.0+6.0	1.10+1.10+3.10+3.70	9.00	2510	11.5 - 10.6	3.59	1.46+1.46+3.80+4.28	11.00	2630	12.1 - 11.1	4.18
	1.8+2.5+2.5+2.5	1.80+2.40+2.40+2.40	9.00	2530	11.6 - 10.6	3.56	2.01+2.73+2.73+2.73	10.20	2700	12.4 - 11.4	3.78
	1.8+2.5+2.5+3.5	1.60+2.20+2.20+3.00	9.00	2530	11.6 - 10.6	3.56	1.88+2.55+2.55+3.22	10.20	2700	12.4 - 11.4	3.78
	1.8+2.5+2.5+5.0	1.40+1.90+1.90+3.80	9.00	2530	11.6 - 10.6	3.56	1.61+2.19+2.19+4.21	10.20	2700	12.4 - 11.4	3.78
	1.8+2.5+2.5+6.0	1.30+1.75+1.75+4.20	9.00	2530	11.6 - 10.6	3.56	1.54+2.09+2.09+4.48	10.20	2700	12.4 - 11.4	3.78
	1.8+2.5+3.5+3.5	1.40+2.00+2.80+2.80	9.00	2530	11.6 - 10.6	3.56	1.76+2.39+3.02+3.03	10.20	2700	12.4 - 11.4	3.78
	1.8+2.5+3.5+5.0	1.30+1.75+2.45+3.50	9.00	2530	11.6 - 10.6	3.56	1.53+2.08+2.63+3.96	10.20	2700	12.4 - 11.4	3.78
	1.8+2.5+3.5+6.0	1.20+1.60+2.30+3.90	9.00	2530	11.6 - 10.6	3.56	1.57+2.14+2.70+4.59	11.00	2800	12.9 - 11.8	3.93
	1.8+2.5+5.0+5.0	1.15+1.55+3.15+3.15	9.00	2510	11.5 - 10.6	3.59	1.46+1.98+3.78+3.78	11.00	2630	12.1 - 11.1	4.18
	1.8+2.5+5.0+6.0	1.10+1.50+2.90+3.50	9.00	2510	11.5 - 10.6	3.59	1.40+1.90+3.63+4.07	11.00	2630	12.1 - 11.1	4.18
	1.8+3.5+3.5+3.5	1.35+2.55+2.55+2.55	9.00	2530	11.6 - 10.6	3.56	1.65+2.85+2.85+2.85	10.20	2700	12.4 - 11.4	3.78
	1.8+3.5+3.5+5.0	1.15+2.30+2.30+3.25	9.00	2530	11.6 - 10.6	3.56	1.56+2.69+2.69+4.06	11.00	2800	12.9 - 11.8	3.93
	1.8+3.5+3.5+6.0	1.10+2.10+2.10+3.70	9.00	2530	11.6 - 10.6	3.56	1.49+2.57+2.57+4.37	11.00	2630	12.1 - 11.1	4.18
	1.8+3.5+5.0+5.0	1.05+2.05+2.95+2.95	9.00	2510	11.5 - 10.6	3.59	1.39+2.39+3.61+3.61	11.00	2630	12.1 - 11.1	4.18
	2.5+2.5+2.5+2.5	2.25+2.25+2.25+2.25	9.00	2530	11.6 - 10.6	3.56	2.55+2.55+2.55+2.55	10.20	2700	12.4 - 11.4	3.78
	2.5+2.5+2.5+3.5	2.05+2.05+2.05+2.85	9.00	2530	11.6 - 10.6	3.56	2.39+2.39+2.39+3.03	10.20	2700	12.4 - 11.4	3.78
	2.5+2.5+2.5+5.0	1.80+1.80+1.80+3.60	9.00	2530	11.6 - 10.6	3.56	2.12+2.12+2.12+4.04	10.40	2700	12.4 - 11.4	3.85
	2.5+2.5+2.5+6.0	1.67+1.67+1.67+4.00	9.00	2530	11.6 - 10.6	3.56	2.02+2.02+2.02+4.34	10.40	2700	12.4 - 11.4	3.85
	2.5+2.5+3.5+3.5	1.88+1.88+2.63+2.63	9.00	2530	11.6 - 10.6	3.56	2.25+2.25+2.85+2.85	10.20	2700	12.4 - 11.4	3.78
	2.5+2.5+3.5+5.0	1.67+1.67+2.33+3.33	9.00	2530	11.6 - 10.6	3.56	2.01+2.01+2.54+3.84	10.40	2700	12.4 - 11.4	3.85
	2.5+2.5+3.5+6.0	1.55+1.55+2.20+3.70	9.00	2530	11.6 - 10.6	3.56	2.03+2.03+2.57+4.37	11.00	2630	12.1 - 11.1	4.18
	2.5+2.5+5.0+5.0	1.50+1.50+3.00+3.00	9.00	2510	11.5 - 10.6	3.59	1.89+1.89+3.61+3.61	11.00	2630	12.1 - 11.1	4.18
	2.5+3.5+3.5+3.5	1.74+2.42+2.42+2.42	9.00	2530	11.6 - 10.6	3.56	2.18+2.74+2.74+2.74	10.40	2700	12.4 - 11.4	3.85
	2.5+3.5+3.5+5.0	1.56+2.17+2.17+3.10	9.00	2530	11.6 - 10.6	3.56	2.02+2.56+2.56+3.86	11.00	2630	12.1 - 11.1	4.18
	2.5+3.5+3.5+6.0	1.46+2.03+2.03+3.48	9.00	2530	11.6 - 10.6	3.56	1.94+2.45+2.45+4.16	11.00	2630	12.1 - 11.1	4.18
	3.5+3.5+3.5+3.5	2.25+2.25+2.25+2.25	9.00	2530	11.6 - 10.6	3.56	2.75+2.75+2.75+2.75	11.00	2630	12.1 - 11.1	4.18
	3.5+3.5+3.5+5.0	2.03+2.03+2.03+2.91	9.00	2530	11.6 - 10.6	3.56	2.44+2.44+2.44+3.68	11.00	2630	12.1 - 11.1	4.18
FIVE UNITS	1.8+1.8+1.8+1.8+1.8	1.80+1.80+1.80+1.80+1.80	9.00	2360	10.8 - 9.9	3.81	2.20+2.20+2.20+2.20+2.20	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+1.8+2.5	1.67+1.67+1.67+1.67+2.32	9.00	2360	10.8 - 9.9	3.81	2.05+2.05+2.05+2.05+2.80	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+1.8+3.5	1.51+1.51+1.51+1.51+2.96	9.00	2360	10.8 - 9.9	3.81	1.92+1.92+1.92+1.92+3.32	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+1.8+5.0	1.33+1.33+1.33+1.33+3.68	9.00	2360	10.8 - 9.9	3.81	1.67+1.67+1.67+1.67+4.32	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+1.8+6.0	1.23+1.23+1.23+1.23+4.08	9.00	2360	10.8 - 9.9	3.81	1.60+1.60+1.60+1.60+4.60	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+2.5+2.5	1.56+1.56+1.56+2.16+2.16	9.00	2360	10.8 - 9.9	3.81	1.92+1.92+1.92+2.62+2.62	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+2.5+3.5	1.42+1.42+1.42+1.97+2.77	9.00	2360	10.8 - 9.9	3.81	1.81+1.81+1.81+2.46+3.11	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+2.5+5.0	1.26+1.26+1.26+1.74+3.48	9.00	2360	10.8 - 9.9	3.81	1.58+1.58+1.58+2.15+4.11	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+2.5+6.0	1.17+1.17+1.17+1.62+3.87	9.00	2360	10.8 - 9.9	3.81	1.51+1.51+1.51+2.05+4.42	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+3.5+3.5	1.30+1.30+1.30+2.55+2.55	9.00	2360	10.8 - 9.9	3.81	1.70+1.70+1.70+2.95+2.95	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+3.5+5.0	1.17+1.17+1.17+2.27+3.22	9.00	2360	10.8 - 9.9	3.81	1.60+1.60+1.50+2.58+3.92	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+3.5+6.0	1.09+1.09+1.09+2.11+3.62	9.00	2360	10.8 - 9.9	3.81	1.44+1.44+1.44+2.48+4.20	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+1.8+5.0+5.0	1.06+1.06+1.06+2.91+2.91	9.00	2360	10.8 - 9.9	3.81	1.34+1.34+1.34+3.49+3.49	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+2.5+2.5+2.5	1.47+1.47+2.02+2.02+2.02	9.00	2360	10.8 - 9.9	3.81	1.81+1.81+2.46+2.46+2.46	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+2.5+2.5+3.5	1.34+1.34+1.86+1.86+2.6	9.00	2360	10.8 - 9.9	3.81	1.71+1.71+2.32+2.32+2.94	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+2.5+2.5+5.0	1.19+1.19+1.65+1.65+3.32	9.00	2360	10.8 - 9.9	3.81	1.50+1.50+2.04+2.04+3.92	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+2.5+2.5+6.0	1.11+1.11+1.54+1.54+3.70	9.00	2360	10.8 - 9.9	3.81	1.44+1.44+1.96+1.96+4.20	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+2.5+3.5+3.5	1.24+1.24+1.72+2.40+2.40	9.00	2360	10.8 - 9.9	3.81	1.62+1.62+2.2+2.78+2.78	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+2.5+3.5+5.0	1.11+1.11+1.54+2.16+3.08	9.00	2360	10.8 - 9.9	3.81	1.43+1.43+1.95+2.46+3.72	11.00	2460	11.3 - 10.4	4.47
	1.8+1.8+3.5+3.5+3.5	1.17+1.17+2.22+2.22+2.22	9.00	2360	10.8 - 9.9	3.81	1.54+1.54+2.64+2.64+2.64	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+2.5+2.5+2.5	1.36+1.91+1.91+1.91+1.91	9.00	2360	10.8 - 9.9	3.81	1.80+2.30+2.30+2.30+2.30	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+2.5+2.5+3.5	1.26+1.76+1.76+1.76+2.46	9.00	2360	10.8 - 9.9	3.81	1.60+2.20+2.20+2.20+2.80	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+2.5+2.5+5.0	1.14+1.57+1.57+1.57+3.15	9.00	2360	10.8 - 9.9	3.81	1.45+1.95+1.95+1.95+3.70	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+2.5+2.5+6.0	1.06+1.47+1.47+1.47+3.53	9.00	2360	10.8 - 9.9	3.81	1.40+1.85+1.85+1.85+4.05	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+2.5+3.5+3.5	1.18+1.63+1.63+2.28+2.28	9.00	2360	10.8 - 9.9	3.81	1.54+2.09+2.09+2.64+2.64	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+2.5+3.5+5.0	1.06+1.47+1.47+2.06+2.94	9.00	2360	10.8 - 9.9	3.81	1.37+1.86+1.86+2.35+3.56	11.00	2460	11.3 - 10.4	4.47
	1.8+2.5+3.5+3.5+3.5	1.09+1.52+2.13+2.13+2.13	9.00	2360	10.8 - 9.9	3.81	1.45+1.9+2.55+2.55+2.55	11.00	2460	11.3 - 10.4	4.47
	2.5+2.5+2.5+2.5+2.5	1.80+1.80+1.80+1.80+1.80	9.00	2360	10.8 - 9.9	3.81	2.20+2.20+2.20+2.20+2.20	11.00	2460	11.3 - 10.4	4.47
	2.5+2.5+2.5+2.5+3.5	1.67+1.67+1.67+1.67+2.32	9.00	2360	10.8 - 9.9	3.81	2.09+2.09+2.09+2.09+2.64	11.00	2460	11.3 - 10.4	4.47
	2.5+2.5+2.5+2.5+5.0	1.50+1.50+1.50+1.50+3.00	9.00	2360	10.8 - 9.9	3.81	1.86+1.86+1.86+1.86+3.56	11.00	2460	11.3 - 10.4	4.47
	2.5+2.5+2.5+3.5+3.5	1.56+1.56+1.56+2.16+2.16	9.00	2360	10.8 - 9.9	3.81	2.00+2.00+2.00+2.50+2.50	11.00	2460	11.3 - 10.4	4.47
	2.5+2.5+3.5+3.5+3.5	1.47+1.47+2.02+2.02+2.02	9.00	2360	10.8 - 9.9	3.81	1.90+1.90+2.40+2.40+2.40	11.00	2460	11.3 - 10.4	4.47

* Two indoor units should be connected at least

<REMARKS>

* ONE UNIT INDICATED ARE ONLY FOR ONE UNIT OPERATION WHEN TWO OR MORE INDOOR UNITS ARE CONNECTED.
* TWO UNITS INDICATED ARE ONLY FOR TWO UNITS OPERATION WHEN TWO OR MORE INDOOR UNITS ARE CONNECTED.
* THREE UNITS INDICATED ARE ONLY FOR THREE UNITS OPERATION WHEN THREE OR MORE INDOOR UNITS ARE CONNECTED.
* FOUR UNITS INDICATED ARE ONLY FOR FOUR UNITS OPERATION WHEN FOUR OR FIVE INDOOR UNITS ARE CONNECTED.

RATING CONDITON (DRY BLUB / WET BULB)

	INDOOR	OUTDOOR
COOLING	27 / 19 ˚C	35 / 24˚C
HEATING	20 / –˚C	7 / 6˚C

FIVE INVERTER SYSTEM MULTI R.A.C. *RAM-90QH5* INDOOR UNITS COMBINATIONS TO BE ABLE TO INSTALL

Two, three, four or five indoor units can be installed with one outdoor unit.
And total nominal cooling capacity should not be more than 15.5kW

INDOOR UNIT MODEL	NOMINAL COOLING CAPACITY (kW)	CAPACITY (kW) at one unit operation		SUITABLE ROOM SIZE (m^2) at one unit operation	
		COOLING	HEATING	COOLING	HEATING
RAK-18NH5 RAK-18NH6	1.8	1.00 - 2.50	1.10 - 3.20	8 - 12	9 - 11
RAK-25NH5 RAK-25NH6	2.5	1.00 - 2.80	1.10 - 4.70	11 - 17	14 - 18
RAF-25NH5	2.5	1.00 - 2.80	1.10 - 4.70	11 - 17	14 - 18
RAD-25NH5 RAD-25NH7	2.5	1.00 - 2.80	1.10 - 4.70	11 - 17	14 - 18
RAI-25NH5	2.5	1.00 - 2.80	1.10 - 4.70	11 - 17	14 - 18
RAK-35NH5 RAK-35NH6	3.5	1.00 - 3.90	1.10 - 5.80	16 - 24	17 - 22
RAF-35NH5	3.5	1.00 - 3.90	1.10 - 5.80	16 - 24	17 - 22
RAD-35NH5 RAD-35NH7	3.5	1.00 - 3.90	1.10 - 5.80	16 - 24	17 - 22
RAI-35NH5	3.5	1.00 - 3.90	1.10 - 5.80	16 - 24	17 - 22
RAK-50NH5 RAK-50NH6	5.0	1.00 - 5.60	1.10 - 7.20	23 - 34	23 - 29
RAF-50NH5	5.0	1.00 - 5.60	1.10 - 7.20	23 - 34	23 - 29
RAI-50NH5	5.0	1.00 - 5.60	1.10 - 7.20	23 - 34	23 - 29
RAD-50NH7	5.0	1.00 - 5.60	1.10 - 7.50	23 - 34	23 - 29
RAK-65NH5	6.0	1.00 - 6.50	1.10 - 9.00	27 - 41	25 - 32

Be sure to connect two or more indoor units to this outdoor unit. If not, condensed water may drop, resulting in trouble.

QUADRUPLE SYSTEM MULTI R.A.C. *RAM-90QH5*
INDOOR UNITS COMBINATIONS TO BE ABLE TO INSTALL

POSSIBLE COMBINATIONS TO INSTALL (kW)		SUITABLE ROOM SIZE TO INSTALL [m²]	CONNECTING POSITION ON OUTDOOR UNIT (VALVE DIAMETER) (mm)				
			No. 1	No. 2	No. 3	No. 4	No. 5
			6.35/9.52D	6.35/9.52D	6.35/9.52D	6.35/12.7D	6.35/12.7D
TWO UNITS	1.8+1.8	(8 ~ 12) + (8 ~ 12)	1.8	1.8			
	1.8+2.5	(8 ~ 12) + (11 ~ 17)	1.8	2.5			
	1.8+3.5	(8 ~ 12) + (16 ~ 24)	1.8	3.5			
	1.8+5.0	(8 ~ 12) + (23 ~ 34)	1.8			5.0	
	1.8+6.0	(8 ~ 12) + (27 ~ 41)	1.8			6.0	
	2.5+2.5	(11 ~ 17) + (11 ~ 17)	2.5	2.5			
	2.5+3.5	(11 ~ 17) + (16 ~ 24)	2.5	3.5			
	2.5+5.0	(11 ~ 17) + (23 ~ 34)	2.5			5.0	
	2.5+6.0	(11 ~ 17) + (25 ~ 39)	2.5			6.0	
	3.5+3.5	(16 ~ 24) + (16 ~ 24)	3.5	3.5			
	3.5+5.0	(15 ~ 23) + (21 ~ 32)	3.5			5.0	
	3.5+6.0	(14 ~ 21) + (24 ~ 36)	3.5			6.0	
	5.0+5.0	(19 ~ 29) + (19 ~ 29)				5.0	5.0
	5.0+6.0	(18 ~ 28) + (21 ~ 32)				5.0	6.0
	6.0+6.0	(20 ~ 31) + (20 ~ 31)				6.0	6.0
THREE UNITS	1.8+1.8+1.8	(8 ~ 12) + (8 ~ 12) + (8 ~ 12)	1.8	1.8	1.8		
	1.8+1.8+2.5	(8 ~ 12) + (8 ~ 12) + (11 ~ 17)	1.8	1.8	2.5		
	1.8+1.8+3.5	(8 ~ 12) + (8 ~ 12) + (16 ~ 24)	1.8	1.8	3.5		
	1.8+1.8+5.0	(8 ~ 12) + (8 ~ 12) + (23 ~ 34)	1.8	1.8		5.0	
	1.8+1.8+6.0	(8 ~ 12) + (8 ~ 12) + (26 ~ 39)	1.8	1.8		6.0	
	1.8+2.5+2.5	(8 ~ 12) + (11 ~ 17) + (11 ~ 17)	1.8	2.5	2.5		
	1.8+2.5+3.5	(8 ~ 12) + (11 ~ 17) + (16 ~ 24)	1.8	2.5	3.5		
	1.8+2.5+5.0	(8 ~ 12) + (11 ~ 17) + (22 ~ 33)	1.8	2.5		5.0	
	1.8+2.5+6.0	(7 ~ 11) + (10 ~ 15) + (24 ~ 36)	1.8	2.5		6.0	
	1.8+3.5+3.5	(8 ~ 12) + (16 ~ 24) + (16 ~ 24)	1.8	3.5	3.5		
	1.8+3.5+5.0	(7 ~ 11) + (14 ~ 21) + (20 ~ 30)	1.8	3.5		5.0	
	1.8+3.5+6.0	(7 ~ 10) + (13 ~ 19) + (22 ~ 33)	1.8	3.5		6.0	
	1.8+5.0+5.0	(6 ~ 10) + (17 ~ 26) + (17 ~ 26)	1.8			5.0	
	1.8+5.0+6.0	(6 ~ 9) + (16 ~ 24) + (19 ~ 29)	1.8			5.0	
	1.8+6.0+6.0	(5 ~ 8) + (18 ~ 27) + (18 ~ 27)	1.8			6.0	
	2.5+2.5+2.5	(11 ~ 17) + (11 ~ 17) + (11 ~ 17)	2.5	2.5	2.5		
	2.5+2.5+3.5	(11 ~ 17) + (11 ~ 17) + (16 ~ 24)	2.5	2.5	3.5		
	2.5+2.5+5.0	(10 ~ 16) + (10 ~ 16) + (20 ~ 31)	2.5	2.5		5.0	
	2.5+2.5+6.0	(9 ~ 14) + (9 ~ 14) + (22 ~ 34)	2.5	2.5		6.0	
	2.5+3.5+3.5	(11 ~ 16) + (15 ~ 23) + (15 ~ 23)	2.5	3.5	3.5		
	2.5+3.5+5.0	(9 ~ 14) + (13 ~ 20) + (19 ~ 28)	2.5	3.5		5.0	
	2.5+3.5+6.0	(9 ~ 13) + (12 ~ 18) + (20 ~ 31)	2.5	3.5		6.0	
	2.5+5.0+5.0	(8 ~ 12) + (16 ~ 25) + (16 ~ 25)	2.5			5.0	5.0
	2.5+5.0+6.0	(8 ~ 12) + (15 ~ 23) + (18 ~ 28)	2.5			5.0	6.0
	2.5+6.0+6.0	(7 ~ 11) + (17 ~ 26) + (17 ~ 26)	2.5			6.0	6.0
	3.5+3.5+3.5	(14 ~ 21) + (14 ~ 21) + (14 ~ 21)	3.5	3.5	3.5		
	3.5+3.5+5.0	(12 ~ 18) + (12 ~ 18) + (17 ~ 26)	3.5	3.5		5.0	
	3.5+3.5+6.0	(11 ~ 17) + (11 ~ 17) + (19 ~ 29)	3.5	3.5		6.0	
	3.5+5.0+5.0	(10 ~ 16) + (15 ~ 23) + (15 ~ 23)	3.5			5.0	5.0
	3.5+5.0+6.0	(10 ~ 15) + (14 ~ 21) + (17 ~ 26)	3.5			5.0	6.0
	3.5+6.0+6.0	(9 ~ 14) + (16 ~ 24) + (16 ~ 24)	3.5			6.0	6.0
	5.0+5.0+5.0	(14 ~ 21) + (14 ~ 21) + (14 ~ 21)	◉ 5.0			5.0	5.0
FOUR UNITS	1.8+1.8+1.8+1.8	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12)	1.8	1.8	1.8	◎ 1.8	
	1.8+1.8+1.8+2.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (11 ~ 17)	1.8	1.8	1.8	◎ 2.5	
	1.8+1.8+1.8+3.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (16 ~ 24)	1.8	1.8	1.8	◎ 3.5	
	1.8+1.8+1.8+5.0	(7 ~ 11) + (7 ~ 11) + (7 ~ 11) + (20 ~ 30)	1.8	1.8	1.8	5.0	
	1.8+1.8+1.8+6.0	(6 ~ 10) + (6 ~ 10) + (6 ~ 10) + (22 ~ 33)	1.8	1.8	1.8	6.0	
	1.8+1.8+2.5+2.5	(8 ~ 12) + (8 ~ 12) + (11 ~ 17) + (11 ~ 17)	1.8	1.8	2.5	◎ 2.5	
	1.8+1.8+2.5+3.5	(8 ~ 12) + (8 ~ 12) + (11 ~ 16) + (15 ~ 23)	1.8	1.8	2.5	◎ 3.5	
	1.8+1.8+2.5+5.0	(7 ~ 10) + (7 ~ 10) + (9 ~ 14) + (19 ~ 28)	1.8	1.8	2.5	5.0	
	1.8+1.8+2.5+6.0	(6 ~ 9) + (6 ~ 9) + (8 ~ 13) + (20 ~ 31)	1.8	1.8	2.5	6.0	
	1.8+1.8+3.5+3.5	(7 ~ 11) + (7 ~ 11) + (14 ~ 20) + (14 ~ 20)	1.8	1.8	3.5	◎ 3.5	
	1.8+1.8+3.5+5.0	(6 ~ 9) + (6 ~ 9) + (12 ~ 18) + (17 ~ 26)	1.8	1.8	3.5	5.0	
	1.8+1.8+3.5+6.0	(6 ~ 9) + (6 ~ 9) + (11 ~ 17) + (19 ~ 28)	1.8	1.8	3.5	6.0	
	1.8+1.8+5.0+5.0	(5 ~ 8) + (5 ~ 8) + (15 ~ 23) + (15 ~ 23)	1.8	1.8		5.0	5.0
	1.8+1.8+5.0+6.0	(5 ~ 8) + (5 ~ 8) + (14 ~ 21) + (17 ~ 26)	1.8	1.8		5.0	6.0
	1.8+2.5+2.5+2.5	(8 ~ 12) + (11 ~ 17) + (11 ~ 17) + (11 ~ 17)	1.8	2.5	2.5	◎ 2.5	
	1.8+2.5+2.5+3.5	(7 ~ 11) + (10 ~ 15) + (10 ~ 15) + (14 ~ 21)	1.8	2.5	2.5	◎ 3.5	
	1.8+2.5+2.5+5.0	(6 ~ 10) + (9 ~ 13) + (9 ~ 13) + (17 ~ 26)	1.8	2.5	2.5	5.0	
	1.8+2.5+2.5+6.0	(6 ~ 9) + (8 ~ 12) + (8 ~ 12) + (19 ~ 29)	1.8	2.5	2.5	6.0	
	1.8+2.5+3.5+3.5	(6 ~ 10) + (9 ~ 14) + (13 ~ 19) + (13 ~ 19)	1.8	2.5	3.5	◎ 3.5	
	1.8+2.5+3.5+5.0	(6 ~ 9) + (8 ~ 12) + (11 ~ 17) + (16 ~ 24)	1.8	2.5	3.5	5.0	
	1.8+2.5+3.5+6.0	(5 ~ 8) + (7 ~ 11) + (10 ~ 16) + (18 ~ 27)	1.8	2.5	3.5	6.0	
	1.8+2.5+5.0+5.0	(5 ~ 8) + (7 ~ 11) + (14 ~ 22) + (14 ~ 22)	1.8	2.5		5.0	5.0
	1.8+2.5+5.0+6.0	(5 ~ 8) + (7 ~ 10) + (13 ~ 20) + (16 ~ 24)	1.8	2.5		5.0	6.0
	1.8+3.5+3.5+3.5	(6 ~ 9) + (12 ~ 18) + (12 ~ 18) + (12 ~ 18)	1.8	3.5	3.5	◎ 3.5	
	1.8+3.5+3.5+5.0	(5 ~ 8) + (10 ~ 16) + (10 ~ 16) + (15 ~ 22)	1.8	3.5	3.5	5.0	
	1.8+3.5+3.5+6.0	(5 ~ 8) + (10 ~ 14) + (10 ~ 14) + (17 ~ 26)	1.8	3.5	3.5	6.0	
	1.8+3.5+5.0+5.0	(5 ~ 7) + (9 ~ 14) + (13 ~ 20) + (13 ~ 20)	1.8	3.5		5.0	5.0
	2.5+2.5+2.5+2.5	(10 ~ 16) + (10 ~ 16) + (10 ~ 16) + (10 ~ 16)	2.5	2.5	2.5	◎ 2.5	
	2.5+2.5+2.5+3.5	(9 ~ 14) + (9 ~ 14) + (9 ~ 14) + (13 ~ 20)	2.5	2.5	2.5	◎ 3.5	
	2.5+2.5+2.5+5.0	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (16 ~ 25)	2.5	2.5	2.5	5.0	
	2.5+2.5+2.5+6.0	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (18 ~ 28)	2.5	2.5	2.5	6.0	
	2.5+2.5+3.5+3.5	(9 ~ 13) + (9 ~ 13) + (12 ~ 18) + (12 ~ 18)	2.5	2.5	3.5	◎ 3.5	
	2.5+2.5+3.5+5.0	(8 ~ 12) + (8 ~ 12) + (11 ~ 16) + (15 ~ 23)	2.5	2.5	3.5	5.0	
	2.5+2.5+3.5+6.0	(7 ~ 11) + (7 ~ 11) + (10 ~ 15) + (17 ~ 26)	2.5	2.5	3.5	6.0	
	2.5+2.5+5.0+5.0	(7 ~ 10) + (7 ~ 10) + (14 ~ 21) + (14 ~ 21)	2.5	2.5		5.0	5.0
	2.5+3.5+3.5+3.5	(8 ~ 12) + (11 ~ 17) + (11 ~ 17) + (11 ~ 17)	2.5	3.5	3.5	◎ 3.5	
	2.5+3.5+3.5+5.0	(7 ~ 11) + (10 ~ 15) + (10 ~ 15) + (14 ~ 21)	2.5	3.5	3.5	5.0	
	2.5+3.5+3.5+6.0	(7 ~ 10) + (9 ~ 14) + (9 ~ 14) + (16 ~ 24)	2.5	3.5	3.5	6.0	
	3.5+3.5+3.5+3.5	(10 ~ 16) + (10 ~ 16) + (10 ~ 16) + (10 ~ 16)	3.5	3.5	3.5	◎ 3.5	
	3.5+3.5+3.5+5.0	(9 ~ 14) + (9 ~ 14) + (9 ~ 14) + (13 ~ 20)	3.5	3.5	3.5	5.0	

FIVE UNITS	1.8+1.8+1.8+1.8+1.8	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12)	1.8	1.8	1.8	◎ 1.8	◎ 1.8
	1.8+1.8+1.8+1.8+2.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (11 ~ 16)	1.8	1.8	1.8	◎ 1.8	◎ 2.5
	1.8+1.8+1.8+1.8+3.5	(7 ~ 10) + (7 ~ 10) + (7 ~ 10) + (7 ~ 10) + (13 ~ 20)	1.8	1.8	1.8	◎ 1.8	◎ 3.5
	1.8+1.8+1.8+1.8+5.0	(6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (17 ~ 25)	1.8	1.8	1.8	◎ 1.8	5.0
	1.8+1.8+1.8+1.8+6.0	(6 ~ 8) + (6 ~ 8) + (6 ~ 8) + (6 ~ 8) + (19 ~ 28)	1.8	1.8	1.8	◎ 1.8	6.0
	1.8+1.8+1.8+2.5+2.5	(7 ~ 11) + (7 ~ 11) + (7 ~ 11) + (10 ~ 15) + (10 ~ 15)	1.8	1.8	1.8	◎ 2.5	◎ 2.5
	1.8+1.8+1.8+2.5+3.5	(6 ~ 10) + (6 ~ 10) + (6 ~ 10) + (9 ~ 14) + (13 ~ 19)	1.8	1.8	1.8	◎ 2.5	◎ 3.5
	1.8+1.8+1.8+2.5+5.0	(6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (8 ~ 12) + (16 ~ 24)	1.8	1.8	1.8	◎ 2.5	5.0
	1.8+1.8+1.8+2.5+6.0	(5 ~ 8) + (5 ~ 8) + (5 ~ 8) + (7 ~ 11) + (18 ~ 27)	1.8	1.8	1.8	◎ 2.5	6.0
	1.8+1.8+1.8+3.5+3.5	(6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (12 ~ 18) + (12 ~ 18)	1.8	1.8	1.8	◎ 3.5	◉ 3.5
	1.8+1.8+1.8+3.5+5.0	(5 ~ 8) + (5 ~ 8) + (5 ~ 8) + (10 ~ 16) + (15 ~ 22)	1.8	1.8	1.8	◎ 3.5	5.0
	1.8+1.8+1.8+3.5+6.0	(5 ~ 8) + (5 ~ 8) + (5 ~ 8) + (10 ~ 15) + (16 ~ 25)	1.8	1.8	1.8	◎ 3.5	6.0
	1.8+1.8+1.8+5.0+5.0	(5 ~ 7) + (5 ~ 7) + (5 ~ 7) + (13 ~ 20) + (13 ~ 20)	1.8	1.8	1.8	5.0	5.0
	1.8+1.8+2.5+2.5+2.5	(7 ~ 10) + (7 ~ 10) + (9 ~ 14) + (9 ~ 14) + (9 ~ 14)	1.8	1.8	2.5	◎ 2.5	◎ 2.5
	1.8+1.8+2.5+2.5+3.5	(6 ~ 9) + (6 ~ 9) + (8 ~ 13) + (8 ~ 13) + (12 ~ 18)	1.8	1.8	2.5	◎ 2.5	◎ 3.5
	1.8+1.8+2.5+2.5+5.0	(5 ~ 8) + (5 ~ 8) + (8 ~ 11) + (8 ~ 11) + (15 ~ 23)	1.8	1.8	2.5	◎ 2.5	5.0
	1.8+1.8+2.5+2.5+6.0	(5 ~ 8) + (5 ~ 8) + (7 ~ 11) + (7 ~ 11) + (17 ~ 26)	1.8	1.8	2.5	◎ 2.5	6.0
	1.8+1.8+2.5+3.5+3.5	(6 ~ 9) + (6 ~ 9) + (8 ~ 12) + (11 ~ 17) + (11 ~ 17)	1.8	1.8	2.5	◎ 3.5	◎ 3.5
	1.8+1.8+2.5+3.5+5.0	(5 ~ 8) + (5 ~ 8) + (7 ~ 11) + (10 ~ 15) + (14 ~ 21)	1.8	1.8	2.5	◎ 3.5	5.0
	1.8+1.8+3.5+3.5+3.5	(5 ~ 8) + (5 ~ 8) + (10 ~ 15) + (10 ~ 15) + (10 ~ 15)	1.8	1.8	3.5	◎ 3.5	◎ 3.5
	1.8+2.5+2.5+2.5+2.5	(6 ~ 9) + (9 ~ 13) + (9 ~ 13) + (9 ~ 13) + (9 ~ 13)	1.8	2.5	2.5	◎ 2.5	◎ 2.5
	1.8+2.5+2.5+2.5+3.5	(6 ~ 9) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (11 ~ 17)	1.8	2.5	2.5	◎ 2.5	◎ 3.5
	1.8+2.5+2.5+2.5+5.0	(5 ~ 8) + (7 ~ 11) + (7 ~ 11) + (7 ~ 11) + (14 ~ 22)	1.8	2.5	2.5	◎ 2.5	5.0
	1.8+2.5+2.5+2.5+6.0	(5 ~ 7) + (7 ~ 10) + (7 ~ 10) + (7 ~ 10) + (16 ~ 24)	1.8	2.5	2.5	◎ 2.5	6.0
	1.8+2.5+2.5+3.5+3.5	(5 ~ 8) + (7 ~ 11) + (7 ~ 11) + (10 ~ 16) + (10 ~ 16)	1.8	2.5	2.5	◎ 3.5	◎ 3.5
	1.8+2.5+2.5+3.5+5.0	(5 ~ 7) + (7 ~ 10) + (7 ~ 10) + (9 ~ 14) + (13 ~ 20)	1.8	2.5	2.5	◎ 3.5	5.0
	1.8+2.5+3.5+3.5+3.5	(5 ~ 8) + (7 ~ 10) + (10 ~ 15) + (10 ~ 15) + (10 ~ 15)	1.8	2.5	3.5	◎ 3.5	◎ 3.5
	2.5+2.5+2.5+2.5+2.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12)	2.5	2.5	2.5	◎ 2.5	◎ 2.5
	2.5+2.5+2.5+2.5+3.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (11 ~ 16)	2.5	2.5	2.5	◎ 2.5	◎ 3.5
	2.5+2.5+2.5+2.5+5.0	(7 ~ 10) + (7 ~ 10) + (7 ~ 10) + (7 ~ 10) + (14 ~ 21)	2.5	2.5	2.5	◎ 2.5	5.0
	2.5+2.5+2.5+3.5+3.5	(7 ~ 11) + (7 ~ 11) + (7 ~ 11) + (10 ~ 15) + (10 ~ 15)	2.5	2.5	2.5	◎ 3.5	◎ 3.5
	2.5+2.5+3.5+3.5+3.5	(7 ~ 10) + (7 ~ 10) + (9 ~ 14) + (9 ~ 14) + (9 ~ 14)	2.5	2.5	3.5	◎ 3.5	◎ 3.5

2.5, 3.5, 4.0, 5.0 & 6.0 means indoor units cooling capacity class.

(1) Marking
◉: needs flare adapter (9.52 → 12.7D): Part No. TA261D-4 001
◎: needs flare adapter (12.7 → 9.52D): Part No. TA261D-6 002

(2) Suitable room size is determined based on the conditions below:
- Climate is in the temperate zone like Tokyo, Japan.
- For usual residential use.
- Smaller figure is for light construction which means light thermally sealed.
- Larger figure is for heavy constructions, which means well thermally sealed.

FEATURES

1. NEW REFRIGERANT

(1) New refrigerant R410A with no harmful effect on the ozone layer

Refrigerant R410A, which does not damage the ozone layer, was adopted instead of HCFC-22 which is planned to be phased out globally by 2020.

(2) New refrigerating oil

The new refrigerant HFC-R410A is not compatible with conventional mineral oils and no lubrication can be expected with those oils. To solve this, the artificial synthetic ester oil is newly adopted.

NEW TECHNOLOGY

Cautions in relation to HFC (R410A)

1. Safety during Servicing

This air conditioner uses the new refrigerant HFC (R410A) for protecting the ozone layer. R410A has several different characteristic features from HCFC-22. Therefore keep the following care items during servicing for safety.

(1) Since the working pressure of R410A model is about 1.6 times higher than that of HCFC-22 models, it becomes necessary to use part of piping materials and servicing tools exclusive for R410A model.

(2) It is necessary to exercise more care to prevent the foreign matters (oil, moisture, etc.) from mixing into the piping than in the case of HCFC-22 model. Also, when storing the piping, securely seal its openings with pinching and taping, etc..

(3) Be sure to charge the refrigerant from the liquid-phase side, as the liquid-phase/gas-phase-composition changes a little in the case of R410A model.

(4) Never use refrigerant other than R410A in an air conditioner which is designed to operate with R410A.

(5) If a refrigeration gas leakage occurs during servicing, be sure to ventilate fully.
If the refrigerant gas comes into contact with fire, a poisonous gas may occur.

(6) When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.

(7) After completion of service work, check to make sure that there is no refrigeration gas leakage.
If the refrigerant gas leaks into the room, coming into contact with fire in the fandriven heater, space heater, etc., a poisonous gas may occur.

2. Refrigerant Piping Materials

(1) Thickness of Refrigerant Piping
Although the thickness is same as that for HCFC-22 model, as R410A model features higher pressure, be sure to confirm the thickness prior to use.

※Do not use thin pipes (thinner than 0.7 mm).

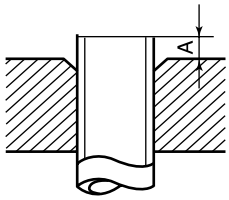
Nominal diameter	Outside diameter (mm)	Thickness (mm)
1/4	6.35	0.8
1/2	12.70	0.8

(2) Flare's Expansion Pipe
The projection when the new flare tool is used, is as follows. When using the conventional flare tool, be sure to secure the following projection by using a gauge for projection adjustment.

※When using the conventional flare tool, use a gauge for projection adjustment.

Projection "A"(mm) for Flare Tool for R410A (Clutch Type)

1/4: 0-0.5
1/2: 0-0.5



(3) Flare Nut Dimensions
Along with changes in the expansion pipe dimensions, the opposite side dimensions of flare nuts whose nominal diameter is 1/2 change so that different torque wrenches must be used.

※Figures in ( ) denote those for HCFC-22.

Nominal diameter	Opposite Side Dimensions (mm) of Flare Nuts for R410A
1/4	17 (17)
3/8	22 (22)
1/2	26 (24)

3. Servicing Tools

(Changes in the Product and Components)

- In order to prevent any other refirigerant from being charged, R410A model is provided with the outdoor unit whose control valve has a different service port diameter (port size: 7/16 UNF 20 threads per inch → 1/2 UNF 20 threads per inch).
- In order to secure larger pressure resisting strength, flare expansion pipe dimensions and flare nut dimensions have been changed.

(New Tools for R410A)

New tools for R410A	Applicable to HCFC-22 Model	Changes
Gauge manifold	×	As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter has been changed.
Charge hose	×	In order to increase pressure resistance, hose materials and port size have been changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to confirm the port size.
Electronic balance for refrigerant charging	○	As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench	× (nominal diam. 1/2, 5/8)	The opposite side dimensions of flare nuts increase. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	○	By increasing the clamp bar's receiving hole, strengh of spring in the tool has been improved.
Gauge for projection adjustment	–	Used when performing flare processing by means of conventional flare tool.
Vacuum pump adapter	○	Connected to conventional vacuum pump.
Gas leakage detector	×	Exclusive for HFC refrigerant.

- Incidentally, the "refrigerant cylinder" comes with the refrigerant designation (R410A) and protector coating in the U.S.'s ARI specified rose color (ARI color code: PMS 507).
- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

4. Air purging by using vacuum pump

Remove the valve cap from the service valves located at both the large and small pipe rims

↓

Connect the charging hose A to the large service valve.

↓

After connecting the vacuum suction pump adaptor, connect the charging hose B to the adaptor.

↓

During relocation or re-installed, there is a possibility of electric-powered valve to be closed. Should the electric-powered valve be closed, even with air purging being conducted, certain amount of air is still trapped within that area, hence, there is a need to open up the electric-powered valve to do an air purging. Under such circumstances, before using the vacuum-suction pump, the main power supply (LN terminal) should be connected to enable a complete opening up of the valve. After connecting the power supply for approximately 90 seconds, the valve will be fully opened, after which disconnect the power supply and start using the vacuum suction pump.
(Refer to "Power Supply Terminal Connections" in regards to the LN terminal)
CAUTION: Ingress of air during the operating cycle may cause increase in pressure and other breakdowns.

↓

Switch off the outdoor unit's power supply

↓

Shut the manifold valve handle Hi, handle Lo need to be open and operate the vacuum pump for approximately 60 minutes.

↓

Upon a full shut of manifold valve handle Lo, the vacuum pump can be stopped.

↓

Check to ensure that there is no gas leakage.

↓

After removing the charging hose A, rotate the service valve spindles in an anti-clockwise direction to fully open for both valves.

↓

Reinstall the cap nuts to their original positions and tighten them to their specified torque.

↓

Disconnect the charge hose from the service valve.

↓

Tighten the valve cap of valve core.
[Torque 12.3 - 15.7 N·m (125 - 160 kgf·cm)]

↓

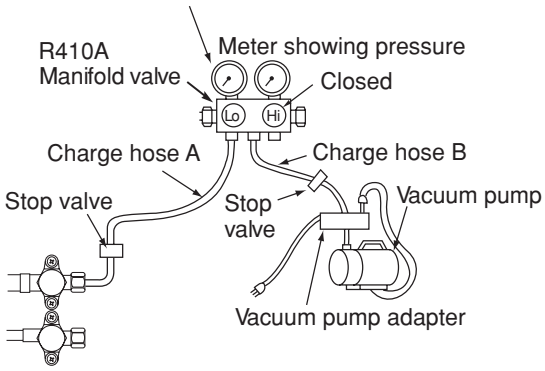
Fix the valve cap to the spindles of each large and small dia. pipe side service valves.

↓

Tighten the valve cap of the spindle.
[Torque 19.6 - 24.5 N·m (200 - 250 kgf·cm)]

Air purging by vacuum pump

When the meter reaches -101KPa (-76cmHg) during pumping, fully tighten the shuttle.



Be sure the stop valve is always fully opened.

Fig. 6-1

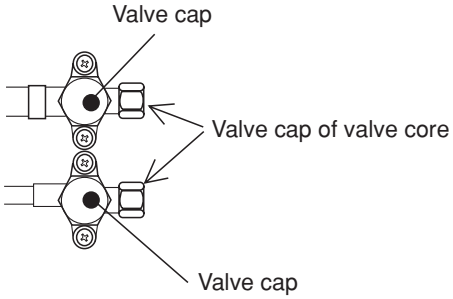


Fig. 6-2

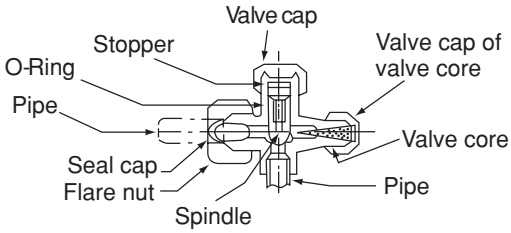


Fig. 6-3

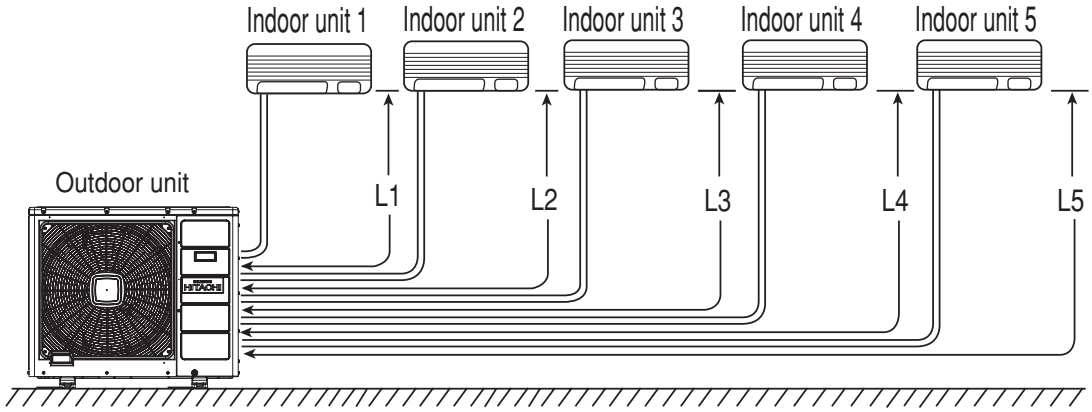
The refrigerant channel is opened so that the refrigerant will flow from the outdoor unit into the indoor unit.

⚠ CAUTION

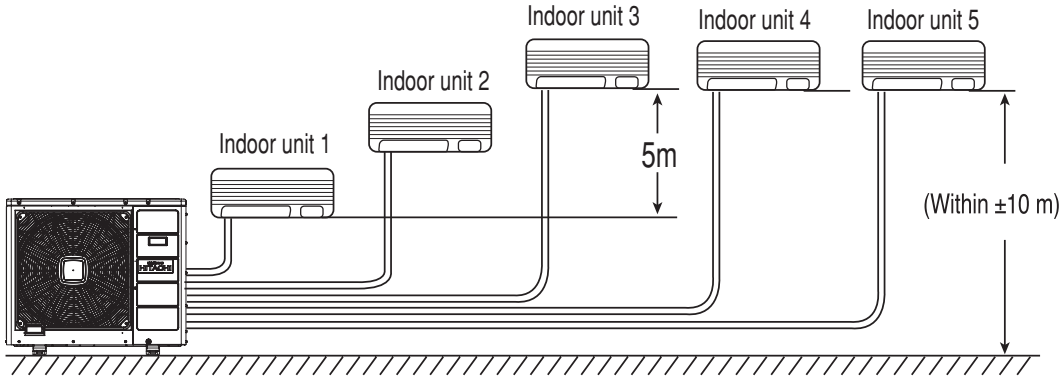
1. Be sure to use the vacuum pump, vacuum pump adapter and manifold gauge and refer to their instruction manuals beforehand.
2. Ascertain that the vacuum pump is filled with oil to the level designated on the oil gauge.
3. After closed the ball valve of charge hose, it should be disconnected at service port side and refrigerant cylinder side at first. Next, after discharging the remained gas in the charge hose by opening the ball valve a little, disconnect it at manifold gauge side. You can prevent sudden release of refrigerant by connecting the ball valve to service port. And you can work more safety.

INSTALLATION

PIPE LENGTH
(1) Total 75m maximum pipe length.
(2) Pipe length for one indoor unit : maximum 25m.
: minimum 5m.

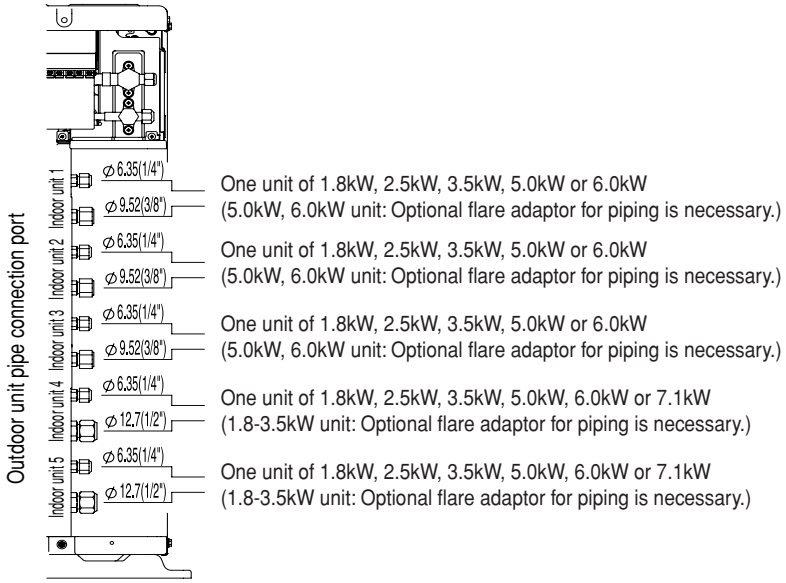


HIGHT DIFFERENCE
(1) Height : maximum ± 10m
(2) Height difference between each indoor unit ≤ 5m.



- To the outdoor unit, up to five indoor units can be connected until the total value of capacity to 15.5kW.
- Make sure to connect two or more indoor units.

MODEL: RAM-90QH5

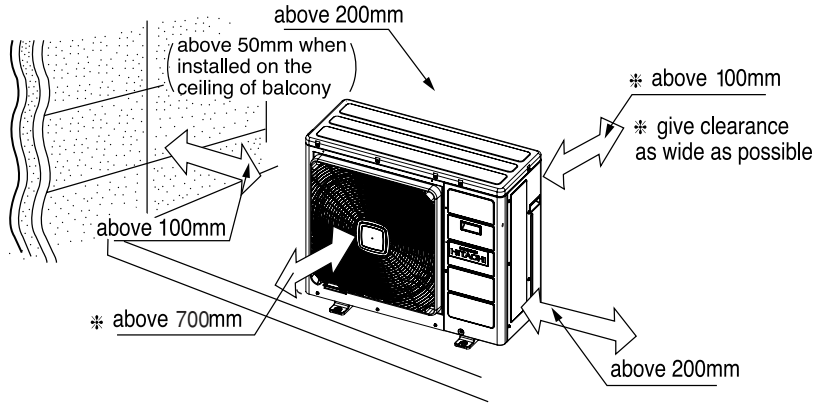


Flare adaptor for piping

The flare adaptor for piping is required depending on combination of indoor units.

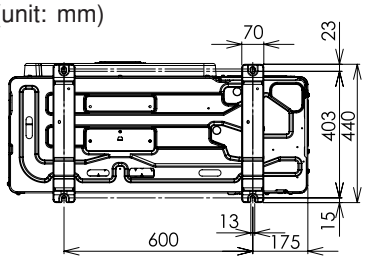
- ø9.52 (3/8") → ø 12.7 (1/2")
  Parts number TA261D-4 001
- ø12.7(1/2") → ø 9.52 (3/8")
  Parts number TA261D-6 002
- ø12.7(1/2") → ø 15.88(5/8")
  Parts number TA261D-6 003

- Remove the side cover.
- For installation, refer as shown below.
- The space indicated with a ⇔ mark is required to guarantee the air conditioner's performance. Install the airconditioner in a place big enough to provide ample space for servicing and repairs later on.



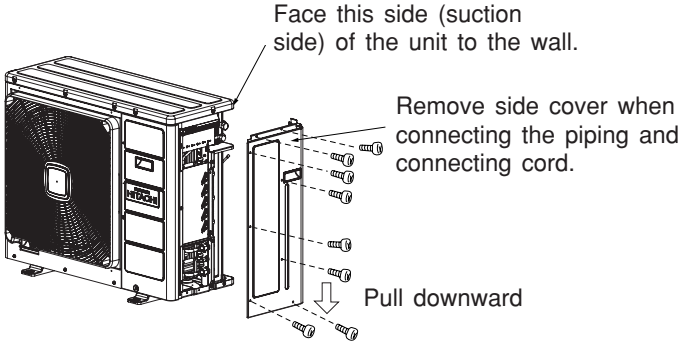
Dimension of Mounting Stand of the Outdoor unit

(unit: mm)



Connecting the pipe

- Install the unit in a stable place to minimize vibration or noise.
- After arranging the cord and pipes, secure them inplace.



- Hold the handle of the side cover. Slide down and takeoff the corner hook, then pull. Reverse these steps when installing.

1. Remove flare nut from service valve.
2. Apply refrigerant oil to flare nut sections of servicevalve and pipings.
3. Match center of piping to large diameter side service valve and tank assembly, and tighten flarenut first by hand, then securely tighten using torque wrench.
4. Perform air purge and gas leak inspection.
5. Wrap the provided insulating material around sidepiping using vinyl tape.

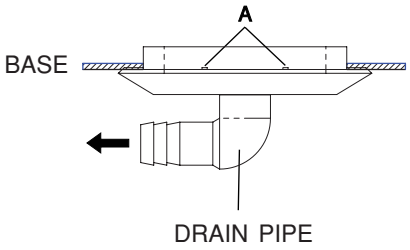
Condensed water disposal of outdoor unit

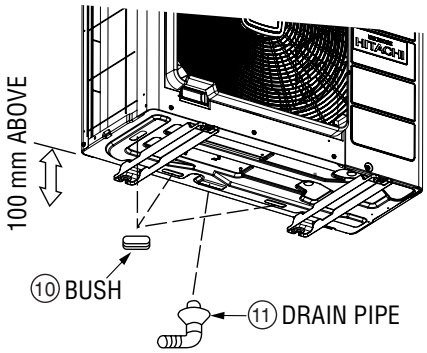
- There is holes on the base of outdoor unit for condensed water to exhaust.
- To lead condensed water to the drain hole, place the outdoor unit on the mounting stand (optional) or on blocks to raise its level more than 100mm from the ground surface. Connect the drain pipe as shown in the figure. Cover two other water drain holes with the bushings included. (To insall a bushing, push in both ends of the bushing so that it aligns with the drain hole.)
- When connecting the drain pipe, make sure that the bushing does not lift off or deviate from the base.
- Install the outdoor unit on a stable, flat surface and check to see that the condensed water drains.

When Using and Installing in Cold Areas

When the air conditioner is used in low temperature and in snowy conditions, water from the heat exchanger may freeze on the base surface to cause poor drainage. When using the air conditioner in such areas, do not install the bushings. Keep a minimum of 250mm between the drain hole and the ground. When using the drain pipe, consult your sales agent.

※ For more details, refer to the Installation Manual for Cold Areas.

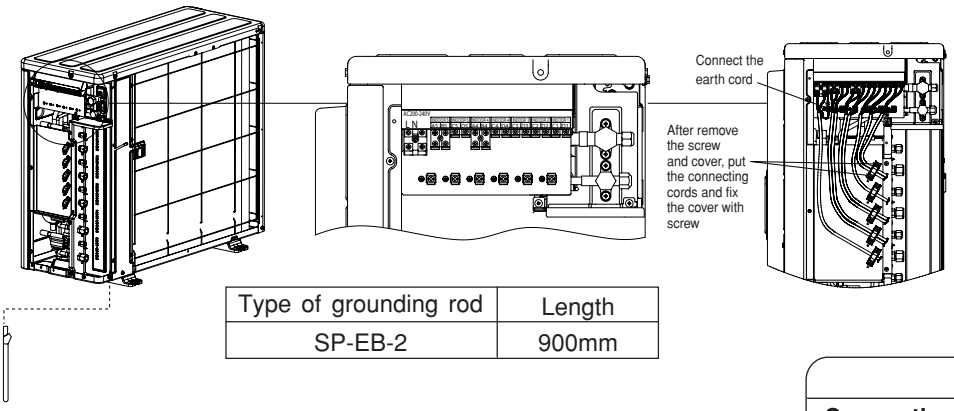




Connection of the connecting cords and power cord. (Outdoor unit)
RAM-90QH5

⚠ WARNING

- Connecting cord should be connected according to Fig.1, that the Indoor unit No. shall match with terminal board No. of Outdoor unit.
- Be sure to fix the connecting cord with the band as shown below. Otherwise water leakage causes short circuit or faults.



Type of grounding rod	Length
SP-EB-2	900mm

Grounding rod (optional)
(Earth wire and grounding rod are not supplied. Please use optional items below.)

⚠ CAUTION

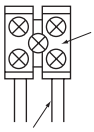
Arrange power cord so they do not touch service valve.

⚠ CAUTION

- To prevent a connection error, connecting cords should be bundled and taped to each respective pipe. If connecting cords are mixed with other indoor units, a refrigeration cycle abnormality may occur, causing dripping.

⚠ WARNING

Connection of the power cord and connecting cord



Securely screw in the power cord and connecting cord so that it will not get loose or disconnect.

Tightening torque reference value: 1.2 to 1.6 N•m (12 to 16 kgf•cm)

Excessive tightening may damage the interior of the cord requiring replacement.

Wiring Pattern

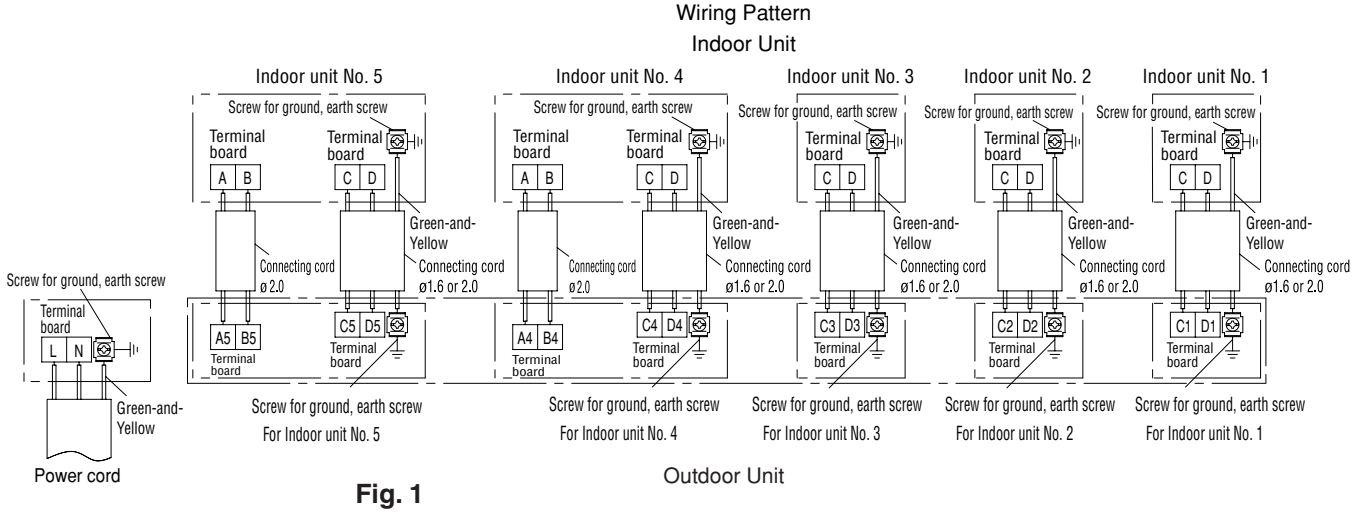
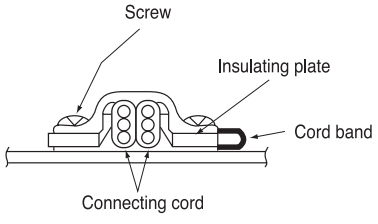


Fig. 1

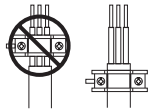
- Terminal A and B at Indoor unit 4 and 5 is for 7 kw and 8 kw indoor which using high voltage motor.

- When putting two connecting cords through the band.



⚠ WARNING

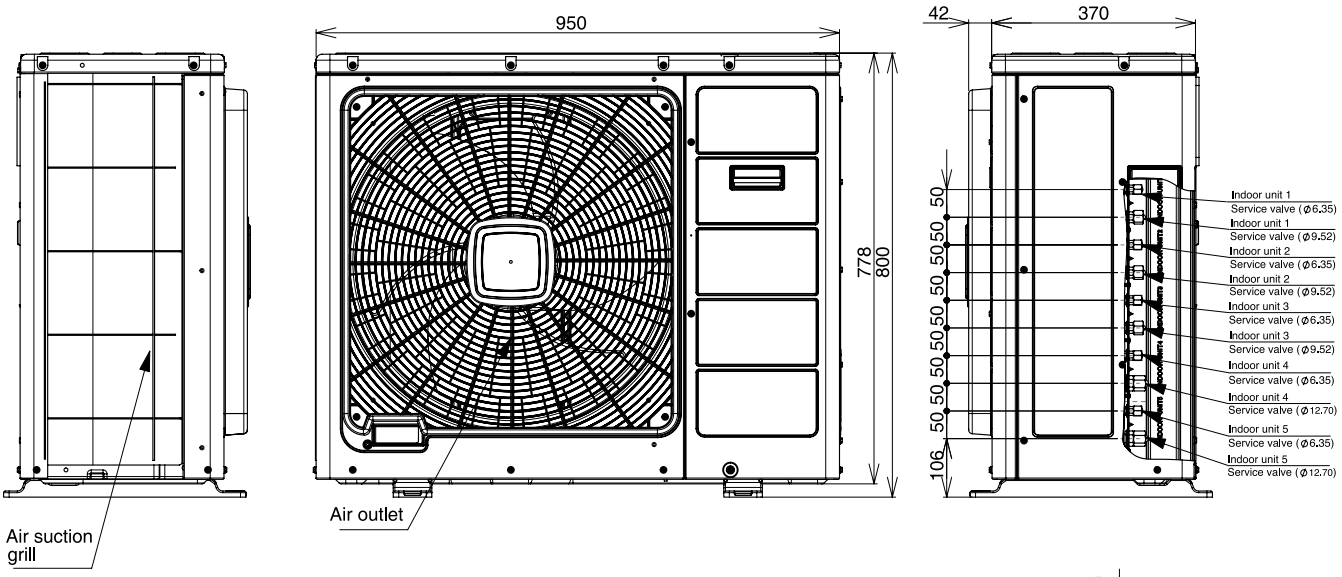
- Leave some space in the connecting cord for maintenance purpose and be sure to secure it with the cord band.
- Secure the connecting cord along the coated part of the wire using the cord band. Do not exert pressure on the wire as this may cause overheating or fire.

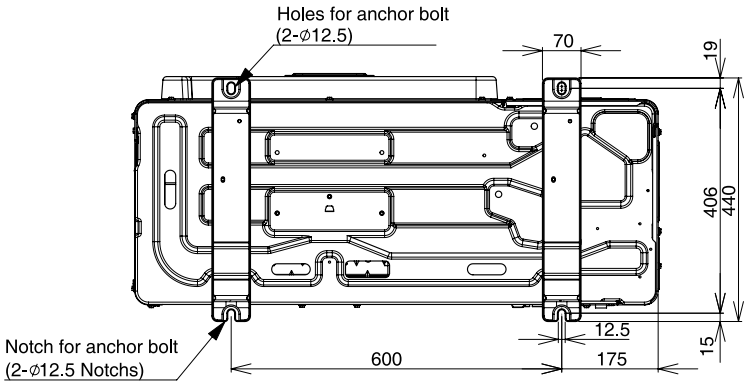


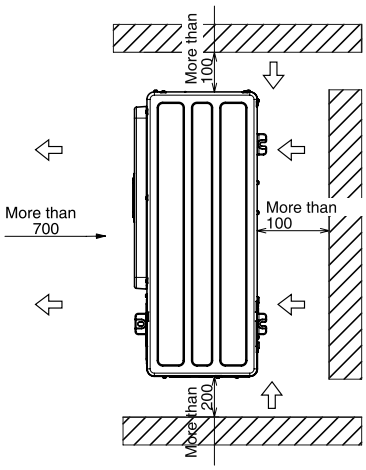
- Hold the handle of the side cover, slide down and take off the corner hook, then pull. Reverse these steps when installing.

CONSTRUCTION AND DIMENSIONAL DIAGRAM

MODEL RAM-90QH5



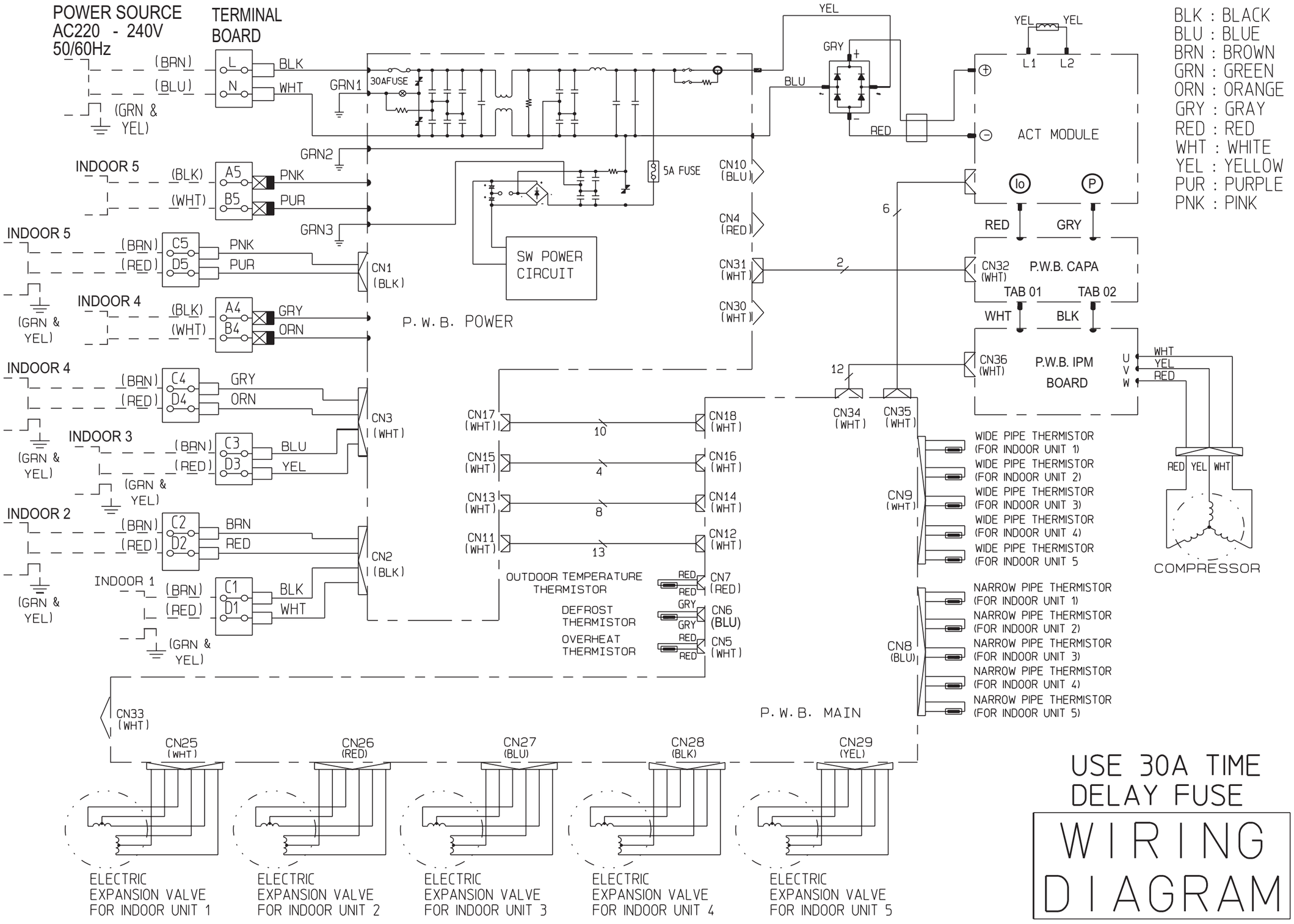




Service space

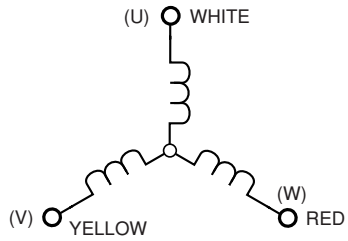
WIRING DIAGRAM

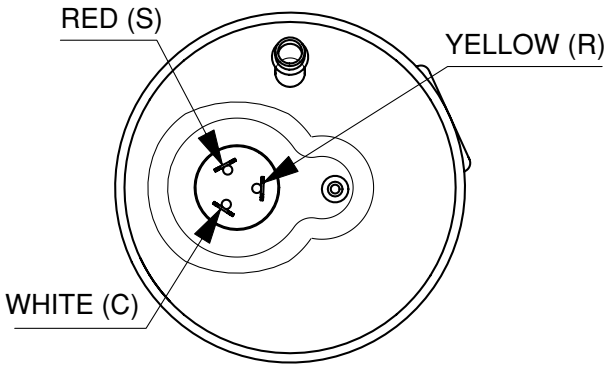
MODEL RAM-90QH5



COMPRESSOR MOTOR

Compressor Motor Specifications

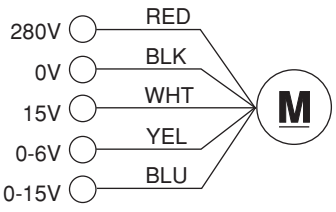
<table>
<tr><td colspan="3">MODEL</td><td>RAM-90QH5</td></tr>
<tr><td colspan="3">COMPRESSOR MODEL</td><td>JU1318D1</td></tr>
<tr><td colspan="3">PHASE</td><td>SINGLE</td></tr>
<tr><td colspan="3">RATED VOLTAGE</td><td>AC 220 ~ 240 V</td></tr>
<tr><td colspan="3">RATED FREQUENCY</td><td>50/60 Hz</td></tr>
<tr><td colspan="3">POLE NUMBER</td><td>4</td></tr>
<tr><td colspan="3">CONNECTION</td><td> 
</td></tr>
<tr><td rowspan="6">RESISTANCE VALUE
(Ω)</td><td rowspan="3">20°C
(68°F)</td><td>U-V</td><td>0.410</td></tr>
<tr><td>V-W</td><td>0.397</td></tr>
<tr><td>W-U</td><td>0.390</td></tr>
<tr><td rowspan="3">75°C
(167°F)</td><td>U-V</td><td>0.499</td></tr>
<tr><td>V-W</td><td>0.483</td></tr>
<tr><td>W-U</td><td>0.474</td></tr>
</table>



MAIN PARTS COMPONENT

FAN MOTOR

Fan Motor Specifications

MODEL		RAM-90QH5
POWER SOURCE		DC : 280V
OUTPUT		138W
CONNECTION		 (Control circuit built in)
RESISTANCE VALUE (Ω)	20˚C (68˚F)	—
	75˚C (167˚F)	—

BLU : BLUE YEL : YELLOW BRN : BROWN WHT : WHITE

GRY : GRAY ORN : ORANGE GRN : GREEN RED : RED

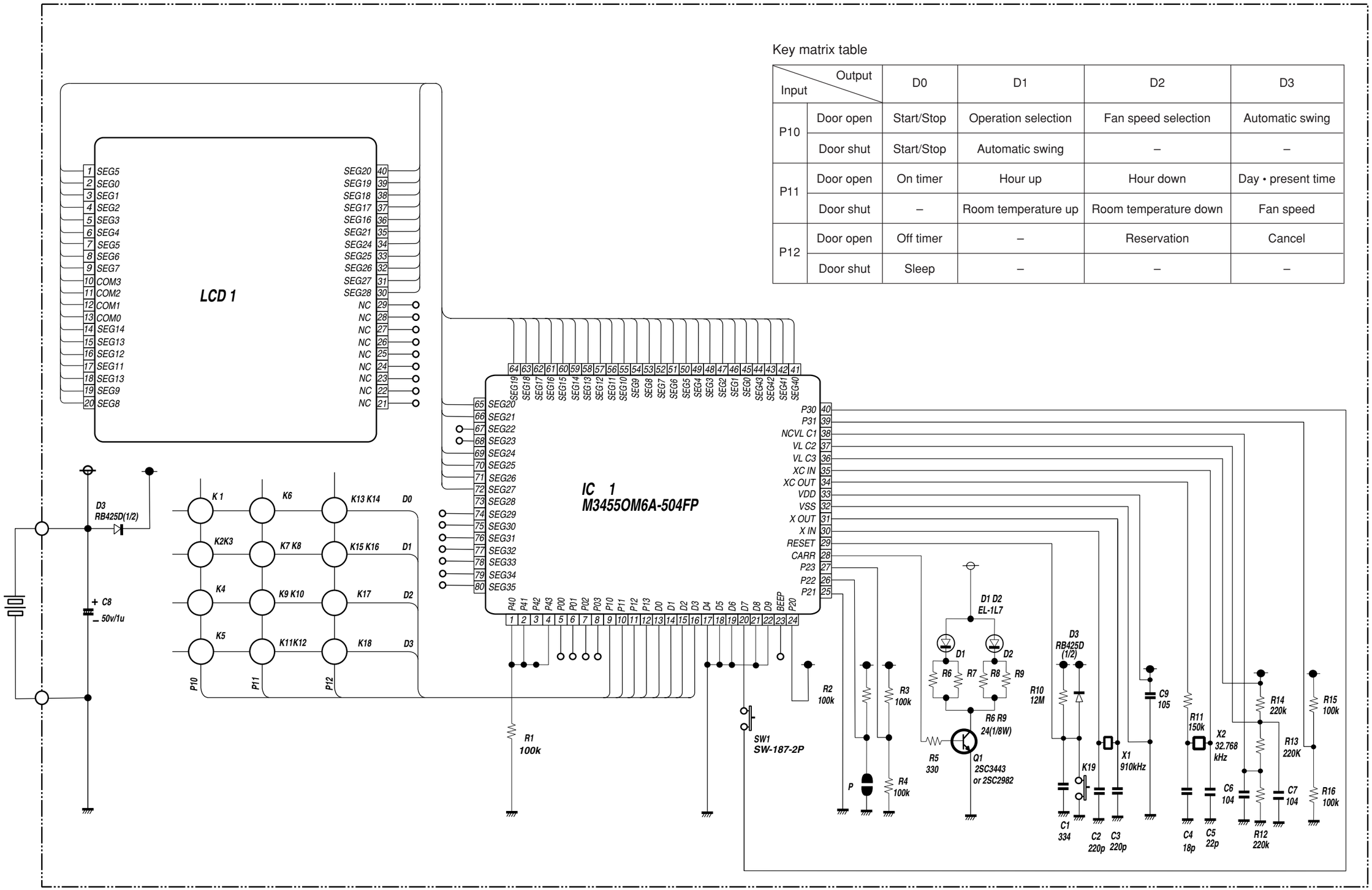
BLK : BLACK PNK : PINK VIO : VIOLET

CIRCUIT DIAGRAM

Remote Control

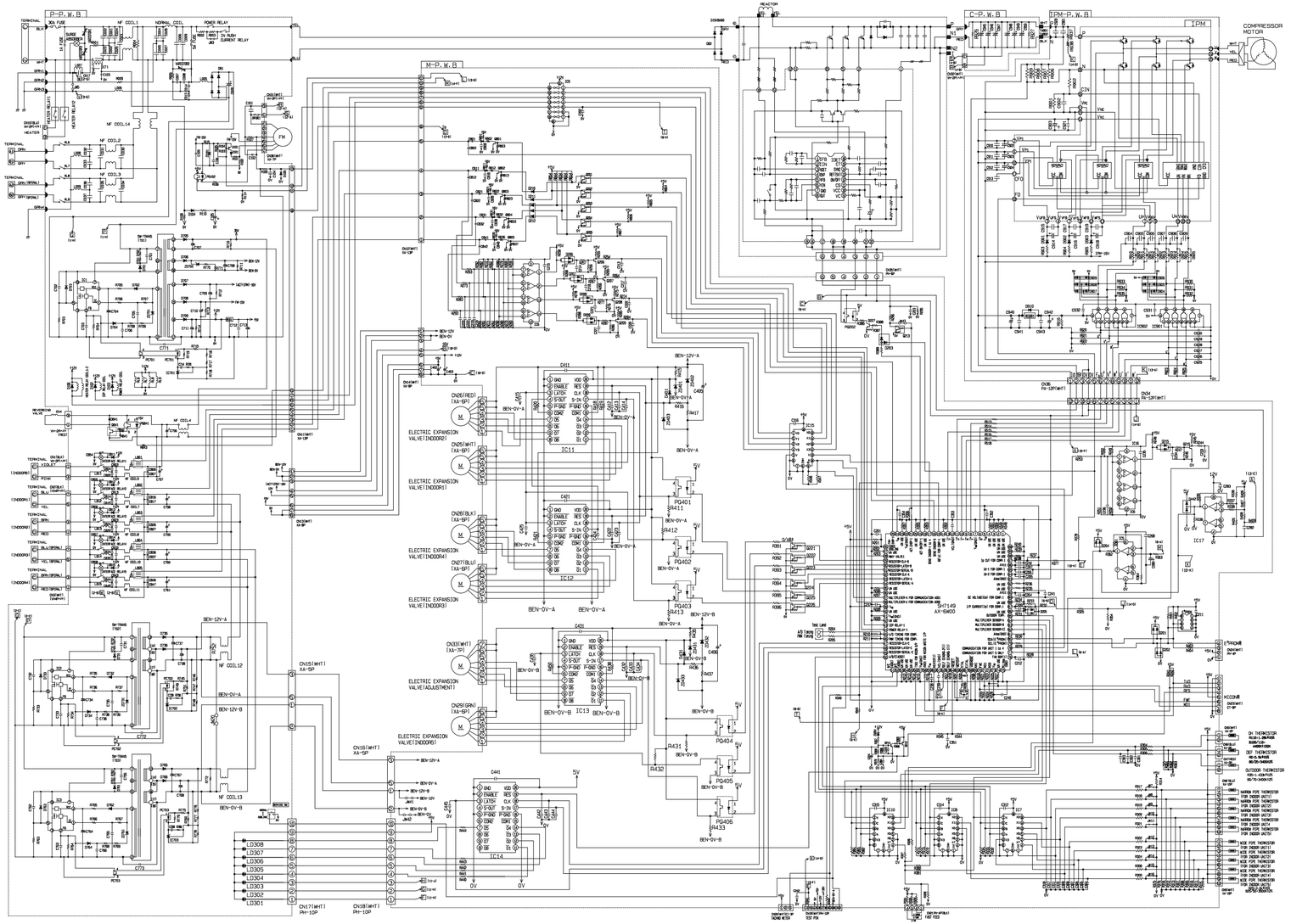
Key matrix table

Input \ Output		D0	D1	D2	D3
P10	Door open	Start/Stop	Operation selection	Fan speed selection	Automatic swing
	Door shut	Start/Stop	Automatic swing	–	–
P11	Door open	On timer	Hour up	Hour down	Day • present time
	Door shut	–	Room temperature up	Room temperature down	Fan speed
P12	Door open	Off timer	–	Reservation	Cancel
	Door shut	Sleep	–	–	–



CIRCUIT DIAGRAM

MODEL RAM-90QH5



PCB SET
P: P-P.W.B
C: CAPA-P.W.B
M: M-P.W.B(PARTS SIDE) ⊕1A: IPM-P.W.B(PARTS SIDE)
M: M-P.W.B(SOLDER SIDE) ⊕1B: IPM-P.W.B(SOLDER SIDE)

Mounting form
A:Axial insertion
R:Radial insertion
P:Radial insertion (7.5mmpitch)

H:Hand insertion
C:Chip surface mounting
S:Inadhibition surface mounting

RESISTOR

MARK	RATING				MOUNTING FORM	ASS'Y NO.	REMARK
	R	%	W				
R001	JUMPER WIRE			A	P		
R002	100	5%	1/8	A	P		
R003				A	P		
R004	470k	5%	1/4	A	P		
R005	2.2	5%	1/8	A	P		
R009	JUMPER WIRE			A	P		
R101	3.6k	1%	1/8	A	P		
R102	3k	1%	1/8	A	P		
R103	30k	1%	1/8	A	P		
R104	3.3k	5%	1/8	A	P		
R105	7.5k	5%	1/8	A	P		
R106	2.4k	5%	1/8	A	P		
R107	0.24	1%	2	P	P		
R108	1k	1%	1/8	A	P		
R109	510	5%	1/8	A	P		
R110	10k	1%	1/8	A	P		
R114	1k	5%	1/8	A	P		
R115	JUMPER WIRE			A	P		
R201	2k	5%	1/16	C	Mai	3605	
R202	100	5%	1/16	C	Mai	3605	
R203	10k	5%	1/16	C	Mai	3605	
R204	100	5%	1/16	C	Mai	3605	
R205	100	5%	1/16	C	Mai	3605	
R206	100	5%	1/16	C	Mai	3605	
R207	10k	5%	1/16	C	Mai	3605	
R208	10k	5%	1/16	C	Mai	3605	
R209	10k	5%	1/16	C	Mai	3605	
R210	10k	5%	1/16	C	Mai	3605	
R212	10k	5%	1/16	C	Mai	3605	
R213	10k	5%	1/16	C	Mai	3605	
R214	10k	5%	1/16	C	Mai	3605	
R215	390	5%	1/16	C	Mai	3605	
R216	390	5%	1/16	C	Mai	3605	
R217	2k	5%	1/16	C	Mai	3605	
R218	2k	5%	1/16	C	Mai	3605	
R219	0			C	Mai	3605	
R220	1M	5%	1/16	C	Mai	3605	
R221	39k	5%	1/16	C	Mai	3605	
R222	10k	5%	1/16	C	Mai	3605	
R223	39k	5%	1/16	C	Mai	3605	
R224	20k	5%	1/16	C	Mai	3605	
R225	39k	5%	1/16	C	Mai	3605	
R226	20k	5%	1/16	C	Mai	3605	
R227	10k	5%	1/16	C	Mai	3605	
R228	10k	5%	1/16	C	Mai	3605	
R229	100	5%	1/16	C	Mai	3605	
R230	100	5%	1/16	C	Mai	3605	
R231	10k	5%	1/16	C	Mai	3605	
R232	510	5%	1/16	C	Mai	3605	
R233	10k	5%	1/16	C	Mai	3605	
R234	10k	5%	1/16	C	Mai	3605	
R235	10k	5%	1/16	C	Mai	3605	
R236	10k	5%	1/16	C	Mai	3605	
R237	5.1k	5%	1/16	C	Mai	3605	
R238	10k	5%	1/16	C	Mai	3605	
R239	10k	5%	1/16	C	Mai	3605	
R240	10k	5%	1/16	C	Mai	3605	
R241	10k	5%	1/16	C	Mai	3605	
R242	10k	5%	1/16	C	Mai	3605	
R244	100	5%	1/16	C	Mai	3605	
R245	2k	5%	1/16	C	Mai	3605	
R246	10k	5%	1/16	C	Mai	3605	
R248	1k	5%	1/16	C	Mai	3605	
R249	B-25k	1%	1/16	C	Mai	3605	
R250	10k	1%	1/16	C	Mai	3605	
R251	10k	1%	1/16	C	Mai	3605	
R252	10k	1%	1/16	C	Mai	3605	
R253	470	5%	1/16	C	Mai	3605	
R254	2k	5%	1/16	C	Mai	3605	
R255	10k	1%	1/16	C	Mai	3605	
R256	2k	5%	1/16	C	Mai	3605	
R257	3k	5%	1/16	C	Mai	3605	
R258	1k	5%	1/16	C	Mai	3605	
R259	B-25k	1%	1/16	C	Mai	3605	
R260	10k	1%	1/16	C	Mai	3605	
R261	10k	1%	1/16	C	Mai	3605	
R262	10k	1%	1/16	C	Mai	3605	
R263	470	5%	1/16	C	Mai	3605	
R264	2k	5%	1/16	C	Mai	3605	
R265	2k	5%	1/16	C	Mai	3605	
R266	10k	1%	1/16	C	Mai	3605	
R267	3k	5%	1/16	C	Mai	3605	
R268	1k	5%	1/16	C	Mai	3605	
R269	B-25k	1%	1/16	C	Mai	3605	
R270	10k	1%	1/16	C	Mai	3605	
R271	10k	1%	1/16	C	Mai	3605	
R272	10k	1%	1/16	C	Mai	3605	
R273	470	5%	1/16	C	Mai	3605	
R274	100	5%	1/16	C	Mai	3605	
R275	2k	5%	1/16	C	Mai	3605	
R276	10k	1%	1/16	C	Mai	3605	
R277	3k	5%	1/16	C	Mai	3605	
R278	1k	5%	1/16	C	Mai	3605	
R279	B-25k	1%	1/16	C	Mai	3605	
R280	10k	1%	1/16	C	Mai	3605	
R281	10k	1%	1/16	C	Mai	3605	
R282	10k	1%	1/16	C	Mai	3605	
R283	470	5%	1/16	C	Mai	3605	
R284	100	5%	1/16	C	Mai	3605	
R285	2k	5%	1/16	C	Mai	3605	
R286	3k	5%	1/16	C	Mai	3605	
R288	1k	5%	1/16	C	Mai	3605	
R289	B-25k	1%	1/16	C	Mai	3605	
R290	10k	1%	1/16	C	Mai	3605	
R291	10k	1%	1/16	C	Mai	3605	
R292	10k	1%	1/16	C	Mai	3605	
R293	470	5%	1/16	C	Mai	3605	
R295	910	1%	1/16	C	Mai	3605	
R296				C	Mai	3605	
R297	10k	5%	1/16	C	Mai	3605	
R298	10k	5%	1/16	C	Mai	3605	
R299	330	5%	1/16	C	Mai	3605	
R301	3.74k	1%	1/16	C	Mai	3605	
R302	5.11k	1%	1/16	C	Mai	3605	
R303	5.11k	1%	1/16	C	Mai	3605	
R304	100	5%	1/16	C	Mai	3605	
R305	100	5%	1/16	C	Mai	3605	
R306	10k	5%	1/16	C	Mai	3605	
R307	2k	1%	1/16	C	Mai	3605	
R308	2k	1%	1/16	C	Mai	3605	
R309	2k	1%	1/16	C	Mai	3605	

RESISTOR

MARK	RATING				MOUNTING FORM	ASS'Y NO.	REMARK
	R	%	W				
R310	2k	1%	1/16	C	Mai	3605	
R311	2k	1%	1/16	C	Mai	3605	
R312	2k	1%	1/16	C	Mai	3605	
R313	2k	1%	1/16	C	Mai	3605	
R314				C	Mai	3605	
R315	2k	1%	1/16	C	Mai	3605	
R316	2k	1%	1/16	C	Mai	3605	
R317	1k	5%	1/16	C	Mai	3605	
R318	1k	5%	1/16	C	Mai	3605	
R319	1k	5%	1/16	C	Mai	3605	
R320	1k	5%	1/16	C	Mai	3605	
R321	1k	5%	1/16	C	Mai	3605	
R322	1k	5%	1/16	C	Mai	3605	
R323	1k	5%	1/16	C	Mai	3605	
R324	1k	5%	1/16	C	Mai	3605	
R325	150	5%	1/16	C	Mai	3605	
R326				C	Mai	3605	
R327	1k	5%	1/16	C	Mai	3605	
R328	2.7k	5%	1/16	C	Mai	3605	
R329	470	5%	1/16	C	Mai	3605	
R330	1.6k	5%	1/16	C	Mai	3605	
R331	4.7k	5%	1/16	C	Mai	3605	
R332	10k	5%	1/16	C	Mai	3605	
R333	10k	5%	1/16	C	Mai	3605	
R334	10k	5%	1/16	C	Mai	3605	
R335	12.1k	1%	1/16	C	Mai	3605	
R336	2k	1%	1/16	C	Mai	3605	
R337	0	5%	1/16	C	Mai	3605	
R338	0	5%	1/16	C	Mai	3605	
R339	5.11k	1%	1/16	C	Mai	3605	
R340	100	5%	1/16	C	Mai	3605	
R341	100	5%	1/16	C	Mai	3605	
R342	100	5%	1/16	C	Mai	3605	
R343	100	5%	1/16	C	Mai	3605	
R344	100	5%	1/16	C	Mai	3605	
R345	5.1k	5%	1/16	C	Mai	3605	
R346	10k	5%	1/16	C	Mai	3605	
R347	10k	5%	1/16	C	Mai	3605	
R348	10k	5%	1/16	C	Mai	3605	
R349	10k	5%	1/16	C	Mai	3605	
R350	10k	5%	1/16	C	Mai	3605	
R351	10k	5%	1/16	C	Mai	3605	
R352	10k	5%	1/16	C	Mai	3605	
R353	10k	5%	1/16	C	Mai	3605	
R354	3.32k	1%	1/16	C	Mai	3605	
R355	10k	5%	1/16	C	Mai	3605	
R356	10k	5%	1/16	C	Mai	3605	
R358	10k	5%	1/16	C	Mai	3605	
R359	1k	5%	1/16	C	Mai	3605	
R360	1k	5%	1/16	C	Mai	3605	
R361	B-39k	1%	1/16	C	Mai	3605	
R362	2k	5%	1/16	C	Mai	3605	
R363	1k	5%	1/16	C	Mai	3605	
R364	1k	5%	1/16	C	Mai	3605	
R365	10k	5%	1/16	C	Mai	3605	
R366	4.7k	5%	1/16	C	Mai	3605	
R367	3k	5%	1/16	C	Mai	3605	
R368	1.6k	5%	1/16	C	Mai	3605	
R369	27k	5%	1/16	C	Mai	3605	
R370	5.1k	5%	1/16	C	Mai	3605	
R372	10k	5%	1/16	C	Mai	3605	
R373	390	5%	1/16	C	Mai	3605	
R374	10k	5%	1/16	C	Mai	3605	
R375	2k	5%	1/16	C	Mai	3605	
R376	2k	5%	1/16	C	Mai	3605	
R377	390	5%	1/16	C	Mai	3605	
R378	510	5%	1/16	C	Mai	3605	
R380				C	Mai	3605	
R381	10k	5%	1/16	C	Mai	3605	
R382	10k	5%	1/16	C	Mai	3605	
R383	10k	5%	1/16	C	Mai	3605	
R384	10k	5%	1/16	C	Mai	3605	
R386	750	5%	1/16	C	Mai	3605	
R388	3.9k	5%	1/16	C	Mai	3605	
R390	1k	5%	1/16	C	Mai	3605	
R391	1k	5%	1/16	C	Mai	3605	
R393	1k	5%	1/16	C	Mai	3605	
R394	1k	5%	1/16	C	Mai	3605	
R395	B-25k	1%	1/16	C	Mai	3605	
R396	1k	5%	1/16	C	Mai	3605	
R401	5.1k	5%	1/16	C	Mai	3605	
R402	5.1k	5%	1/16	C	Mai	3605	
R403	390	5%	1/16	C	Mai	3605	
R404	390	5%	1/16	C	Mai	3605	
R405	5.1k	5%	1/16	C	Mai	3605	
R406	24	5%	1/16	C	Mai	3605	
R407	5.1k	5%	1/16	C	Mai	3605	
R408	5.11k	1%	1/16	C	Mai	3605	
R409	24	5%	1/16	C	Mai	3605	
R410	5.1k	5%	1/16	C	Mai	3605	
R412	5.1k	5%	1/16	C	Mai	3605	
R413	430	5%	1/16	C	Mai	3605	
R414	430	5%	1/16	C	Mai	3605	
R415	510	5%	1/16	C	Mai	3605	
R416	2k	5%	1/16	C	Mai	3605	
R417	100	5%	1/16	C	Mai	3605	
R418	100	5%	1/16	C	Mai	3605	
R419	100	5%	1/16	C	Mai	3605	
R420	100	5%	1/16	C	Mai	3605	
R421	100	5%	1/16	C	Mai	3605	
R431	5.1k	5%	1/16	C	Mai	3605	
R432	5.1k	5%	1/16	C	Mai	3605	
R433	5.1k	5%	1/16	C	Mai	3605	
R434	510	5%	1/16	C	Mai	3605	
R435	100	5%	1/16	C	Mai	3605	
R436	2k	5%	1/16	C	Mai	3605	
R437	100	5%	1/16	C	Mai	3605	
R438	100	5%	1/16	C	Mai	3605	
R439	100	5%	1/16	C	Mai	3605	
R440	100	5%	1/16	C	Mai	3605	
R441	100	5%	1/16	C	Mai	3605	
R442	100	5%	1/16	C	Mai	3605	
R443	100	5%	1/16	C	Mai	3605	
R444	5k	5%	1/16	C	Mai	3605	
R450	100	5%	1/4	A	Mai	3605	
R513	390	5%	1/16	C	Mai	3605	
R514	390	5%	1/16	C	Mai	3605	
R515	390	5%	1/16	C	Mai	3605	
R516	390	5%	1/16	C	Mai	3605	
R518	390	5%	1/16	C	Mai	3605	

RESISTOR

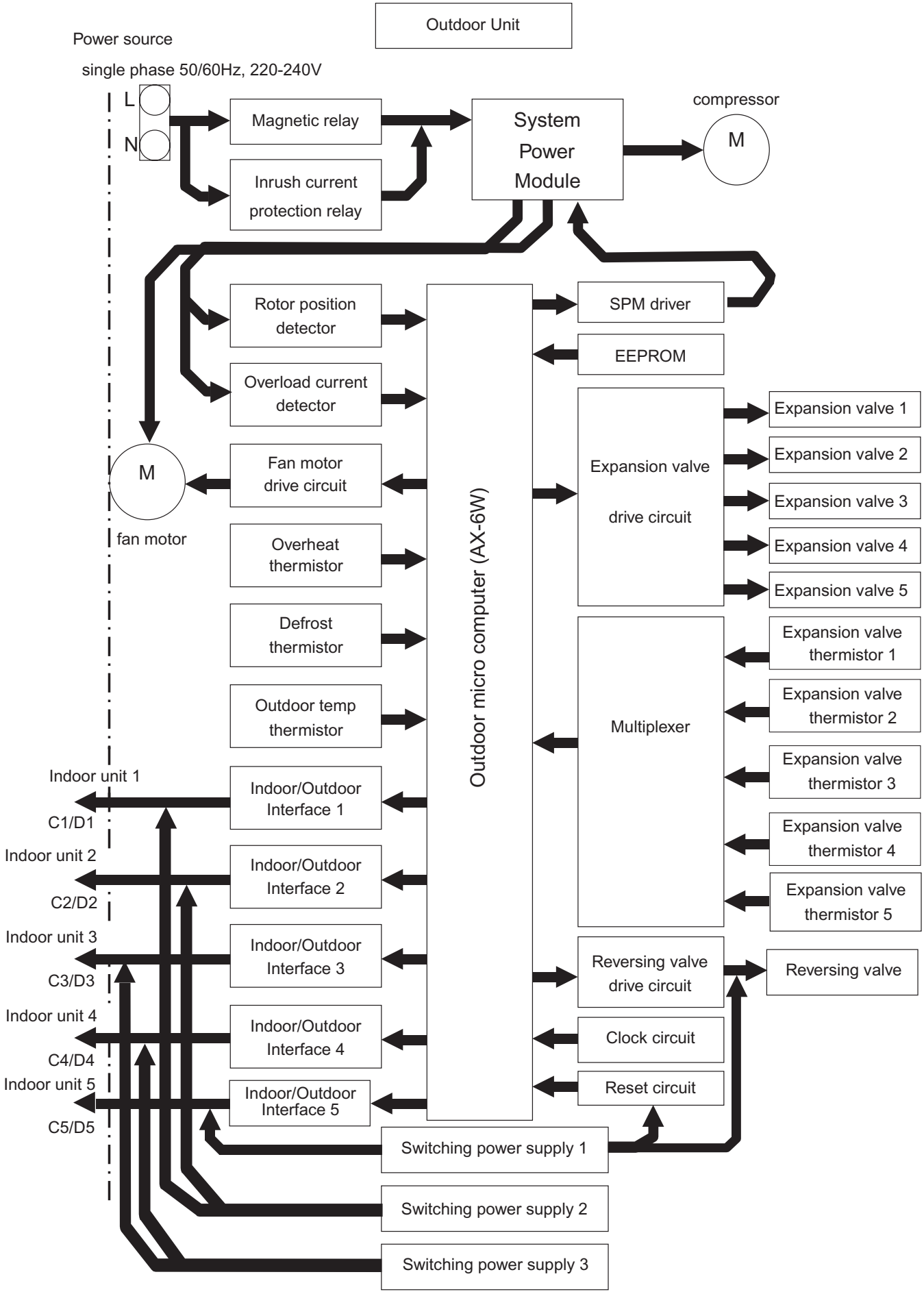
MARK	RATING				MOUNTING FORM	ASS'Y NO.	REMARK
	R	%	W				
R701	82k	5%	1	P	P	MOS	
R702	82k	5%	1	P	P	MOS	
R703	0.27	5%	1	P	P		
R704	18k	1%	1/4	A	P		
R705	4.7	5%	1/4	A	P		
R706	10k	5%	1/4	A	P		
R707	10k	5%	1/4	A	P		
R708	1k	1%	1/4	A	P		
R709	510	1%	1/4	A	P		
R710	B-2k	1%	1	P	P		
R711	100k	5%	1/4	A	P		
R712	3.3k	5%	1/4	A	P		
R713	3.3k	5%	1/4	A	P		
R714	3.3k	5%	1/4	A	P		
R715	1.5k	5%	1/4	A	P		
R716	100	1%	1/4	A	P		
R717	5.1k	1%	1/4	A	P		
R718	2.4k	1%	1/4	A	P		
R719	1k	5%	1/4	A	P		
R720	10k	5%	1/4	A	P		
R730	10k	5%	1/4	A	P		
R731	100k	5%	1	P	P	MOS	
R732	100k	5%	1	P	P	MOS	
R733	0.18	5%	1	P	P		
R734	10k	1%	1/4	A	P		
R735	4.7	5%	1/4	A	P		
R736	10k	5%	1/4	A	P		
R737	3.9k	5%	1/4	A	P		
R738	11k	1%	1/4	A	P		
R739	510	1%	1/4	A	P		
R745	1.8k	5%	1/4	A	P		
R746	3.3k	1%	1/4	A	P		
R747	30k	1%	1/4	A	P		
R748	2.4k	1%	1/4	A	P		
R749	1k	5%	1/4	A	P		
R750	49.9k	1%	1/4	A	P		
R751	100k	5%	1/4	A	P		
R752	100k	5%	1	P	P	MOS	
R753	0.18	5%	2	P	P		
R754	10k	5%	1/4	A	P		
R755	4.7	5%	1/4	A	P		
R756	10k	5%	1/4	A	P		
R757	3.9k	5%	1/4	A	P		
R758	10k	5%	1/4	A	P		
R759	510	5%	1/4	A	P		
R760	59	1%	1/4	A	P		
R771	59	1%	1/4	A	P		
R772	100k	5%	1/4	A	P		
R801	39	5%	1/4	C	Mai	3205	
R802	39	5%	1/4	C	Mai	3205	
R803	39	5%	1/4	C	Mai	3205	
R804	4.7k	5%	1/4	C	Mai	3205	
R805	4.7k	5%	1/4	C	Mai	3205	
R806	4.7k	5%	1/4	C	Mai	3205	
R807	4.7k	5%	1/4	C	Mai	3205	
R811	39	5%	1/4	C	Mai	3205	
R812	39	5%	1/4	C	Mai	3205	
R813	39	5%	1/4	C	Mai	3205	
R814	3k	5%	1/4	C	Mai	3205	
R821	39	5%	1/4	C	Mai	3205	
R822	3k	5%	1/4	C	Mai	3205	
R823	3k	5%	1/4	C	Mai	3205	
R824	3k	5%	1/4	C	Mai	3205	
R831	39	5%	1/4	C	Mai	3205	
R832	39	5%	1/4	C	Mai	3205	
R833	3k	5%	1/4	C	Mai	3205	
R834	3k	5%	1/4	C	Mai	3205	
R835	39	5%	1/4	C	Mai	3205	
R836	3k	5%	1/4	C	Mai	3205	
R837	3k	5%	1/4	C	Mai	3205	
R841	10k	5%	1/6	A	P		
R842	7.5k	5%	1/4	A	P		
R843	10k	5%	1/4	A	P		
R844	3k	5%	1/4	C	Mai	3205	
R901	150	5%	1/4	C	1a	3010	
R902	200	5%	1/4	C	1a	3010	
R903	10	5%	1/4	C	1a	3010	
R904	10	5%	1/4	C	1a	3010	
R905	10	5%	1/4	C	1a	3010	
R906	100k	5%	1/4	C	1a	3010	
R907	100k	5%	1/4	C	1a	3010	
R908	100k	5%	1/4	C	1a	3010	
R909	100k	5%	1/4	C	1a	3010	
R910	910	1%	1/4	C	1a	3005	
R911	910	1%	1/4	C	1a	3005	
R912	910	1%	1/4	C	1a	3005	
R913	910	1%	1/4	C	1a	3005	
R914	910	1%	1/4	C	1a	3005	
R915	910	1%	1/4	C	1a	3005	
R916	1k	1%	1/4	C	1a	3005	
R920	5.1k	5%	1/4	C	1a	3005	
R921	5.1k	5%	1/4	C	1a	3005	
R922	5.1k	5%	1/4	C	1a	3005	
R923	5.1k	5%	1/4	C	1a	3005	
R924	5.1k	5%	1/4	C	1a	3005	
R925	5.1k	5%	1/4	C	1a	3005	
R926	470k	5%	1/2	MHC			
R927	5.1k	5%	1/4	C	1a	3005	
R930	5.1k	5%	1/4	C	1a	3005	
R931	5.1k	5%	1/4	C	1a	3005	
R932	5.1k	5%	1/4	C	1a	3005	
R933	5.1k	5%	1/4	C	1a	3005	
R934	5.1k	5%	1/4	C	1a	3005	
R935	5.1k	5%	1/4	C	1a	3005	
R936	180k	0.5%	1/2	A	1a		
R938	180k	0.5%	1/2	A	1a		

CAPACITOR

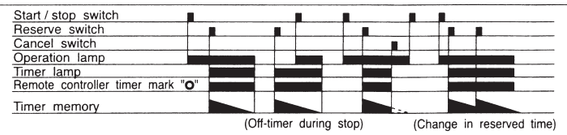
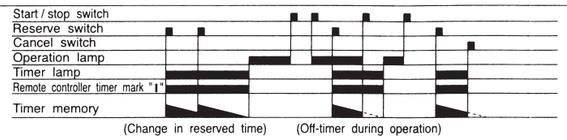
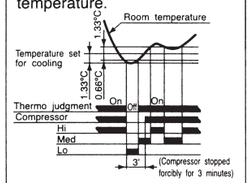
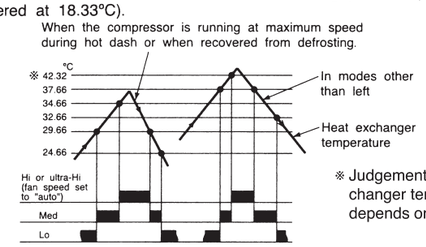
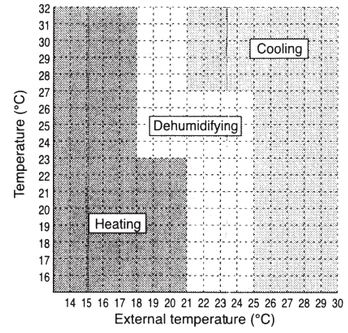
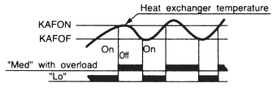
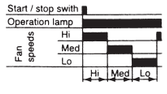
MARK	RATING					MOUNTING FORM	ASS'Y NO.	REMARK
	CAP	%	WV					
C001	0.01	M	250	P	P			
C002	0.01	M	250	C	P	P		
C003	0.68	K	630	F	P	P		
C004	0.001	M	250	C	P	P		
C005	0.01	M	250	C	P	P		
C006	3.3	K	250	F	P	P		
C007	0.01	M	250	C	P	P		
C008	0.01	M	250	C	P	P		
C009	3.3	M	250	F	P	P		
C010	0.01	M	250	C	P	P		
C011	0.01	M	250	C	P	P		
C012	270	J	450	C	P	P		
C013	0.01	M	250	C	P	P

BLOCK DIAGRAM

MODEL RAM-90QH5



BASIC MODE

Operation mode		Fan	Cooling	Dehumidifying	Heating	Auto
Basic operation of start / stop switch						
Timer functions	Off-timer					
	On-timer					
Fan speed mode (indoor fan)	Auto		Changes from "Hi" to "Med" or "Lo" depending on room temperature.  1. Runs at "Hi" until first thermo off after operation is started. 2. Runs at "Lo" when thermo is off.		Set to "Ultra-Lo", "Lo", "Med", "Hi", "Ultra-Hi" or "stop" depending on the room temperature, time and heat exchange temperature. Set to "stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C). When the compressor is running at maximum speed during hot dash or when recovered from defrosting.  ※ Judgement of heat-ex changer temperature depends on the model.	(Operation mode) ○ Judgment based on the room temperature and external temperature: Cooling: external temperature ≧ 25°C, or 21°C ≦ external temperature < 25°C and room temperature > 27°C Heating: external temperature < 18°C, or 18°C ≦ external temperature < 21°C and room temperature ≦ 23°C Dehumidifying: 21°C ≦ external temperature < 25°C and room temperature ≦ 27°C, or 18°C ≦ external temperature < 21°C and room temperature > 23°C ○ Set to the mode of the indoor unit that has previously been operating. If, when one indoor unit is heating, the other unit is set to auto, the other unit will also enter the heating operation. If, when one indoor unit is cooling or dehumidifying, the other unit is set to auto, the other unit will enter the cooling or dehumidifying operation.  ※ Operation mode stays uncharged even if the room or ambient temperature changes during operation. (Set room temperature) ○ All the following temperatures can be compensated for ±3°C using the remote control: (EXCEPT wired remote model) Cooling: 27°C Heating: 23°C Dehumidifying: Current room temperature (upper limit: 27°C, lower limit: 23°C) ※ Operates at a target of set temperature minus 2°C.
	Hi	Operates at "Hi" regardless of the room temperature.	Set to "Ultra-Hi" when the compressor runs at maximum speed, and to "Hi" in other modes.		Set to "Ultra-Lo", "Lo", "Med", "Hi", "Ultra-Hi" or "Stop" depending on the room temperature and time. Set to "Stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C). Set to "Ultra-Hi" when the compressor is running at maximum speed during hot dash or when recovered from defrosting.	
	Med	Operates at "Med" regardless of the room temperature.	Same as at left.		Set to "Ultra-Lo", "Lo", "Med" or "Stop" depending on the room temperature and time. Set to "Stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C).	
	Lo	Operates at "Lo" regardless of the room temperature.	Same as at left.	Set to "Lo" in modes other than when the compressor stops.	Set to "Ultra-Lo", "Lo", or "Stop" depending on the room temperature and time. Set to "Stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C). The fan speed is controlled by the heat exchanger temperature; the overload control is executed as in the following diagram: 	
Basic operation of temperature controller		Performs only fan operation at the set speed regardless of the room temperature. 	See page 53.	See page 95.	See page 99.	
Sleep operation (with sleep button ON)		Enters sleep operation after set as on the left. Action during sleep operation silent (sleep) operation	·Same as at left. ·See page 55.	·Same as at left. ·See page 97.	·Same as at left. ·See page 99.	·Same as at left. ·Performs the sleep operation of each operation mode.

Combination of operations:

(When operation mode is selected:)

·You cannot operate the indoor units in the following combinations.
·The indoor unit which is switched on first continues to operate, but other indoor units which is switched on later, does not operate while the lamp lights.

One unit	Other unit
Heating	Cooling
	Dehumidifying
	Circulating (fan)

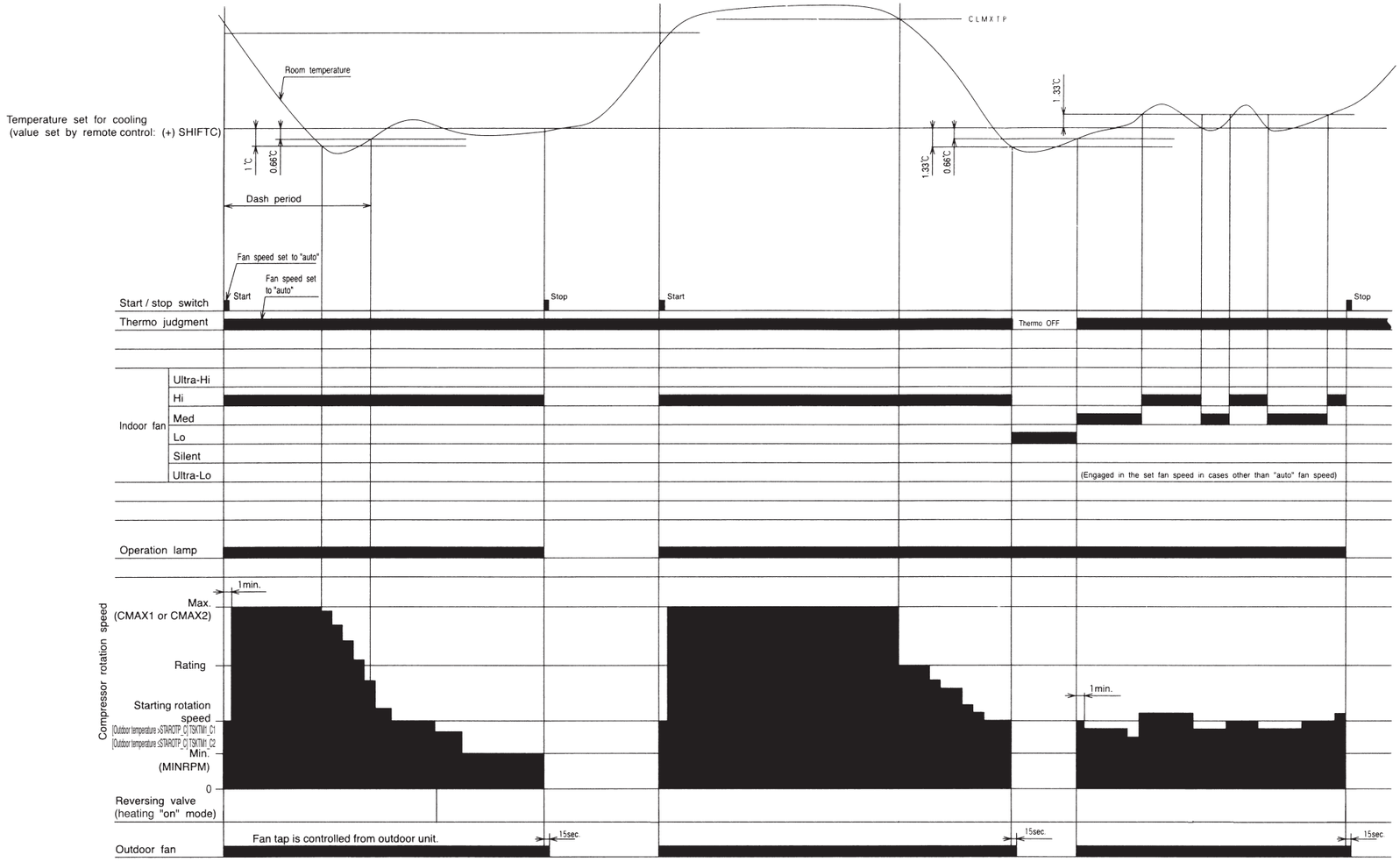
(During automatic operation:)

·When heating operation is automatically selected for the first indoor unit, the next indoor unit will then start to heat. Also, if cooling or dehumidifying is automatically selected for the first indoor unit, the next indoor unit will also start to cool or dehumidify.

Notes:
1. Refer to the PWRITE-ZU data for the constants expressed by capital alphabet letters in the drawing.
2. The speed set of rotaion for the fan motor in each operation mode are as shown in Table 1.
3. The set room temperatures in the diagram include the shift values in Table 2.

MODEL		RAM-90QH5
PROM NO.	LABEL NAME	REQUIRED VALUE OF UNIT SIDE
OAE	OH_ON_C	118.2 °C
OAF	OH_OFF_C	104.7 °C
OB6	OH_ON_W	100.0 °C
OB7	OH_OFF_W	86.5 °C
108	PSTARTC1_d	250
109	PSTARTC1K_d	300
10A	PSTARTC2_d	150
10B	PSTARTC2K_d	300
10C	PSTARTC3_d	150
10D	PSTARTC3K_d	300
10E	PSTARTC4_d	150
10F	PSTARTC4K_d	300
110	PSTARTC5_d	150
111	PSTARTC5K_d	300
112	PSTARTH1_d	200
113	PSTARTH1S_d	250
114	PSTARTH2_d	150
115	PSTARTH2S_d	200
116	PSTARTH3_d	150
117	PSTARTH3S_d	200
118	PSTARTH4_d	150
119	PSTARTH4S_d	200
11A	PSTARTH5_d	160
11B	PSTARTH5S_d	200
124	DFCTPS_d	100
125	DFCTPN_d	240
126	DFSPPS_d	44
127	DFPSMX_d	480
12B	PCLOSH_d	86
238	STAROTP_C	25.0 °C
239	SDRCT1_C1	2500 min^{-1}
23A	TSKTM1_C1	60 sec
2B	SDRCT1_C2	2500 min^{-1}
23C	TSKTM1_C2	60 sec
23D	STAROTP_W	4.8 °C
23E	SDRCT1_W1	2500 min^{-1}
23F	TSKTM1_W1	60 sec
240	SDRCT1_W2	2500 min^{-1}
241	TSKTM1_W2	60 sec
242	SDSTEP	500 min^{-1}
243	TSKSPT	30 sec
24E	CMAX1	5300 min^{-1}
24F	CMAX2	5400 min^{-1}
251	CMAX3	5500 min^{-1}
253	CMAX4	5150 min^{-1}
255	CMAX5	4950 min^{-1}
25B	WMAX1	5500 min^{-1}
25C	WMAX2	6600 min^{-1}
25F	WMAX3	7000 min^{-1}
264	WMAX4	7000 min^{-1}
26B	WMAX5	7000 min^{-1}
3C2	TDF414	90 sec
3C3	TDF415	90 sec
3C4	DFMXTM	12 min
3C5	SDRCT2	2000 min^{-1}
3C6	TSKTM2	60 sec
3C7	DFSTEP	1000 min^{-1}
3C8	TDFSPT	90 sec
3C9	DEFMAX	6000 min^{-1}
3CC	DFSTMB	50 min
3CD	DFSTMB2	60 min

Basic Cooling Operation



Notes:

(1) Cool dash is started when the operation is started at fan speed “AUTO” or “HI” or when the fan speed is changed to “AUTO” or “HI” during cooling operation, and when the compressor speed (P item) reaches (CMAX1 ro CMAX2) or higher.

(2) The maximum compressor speed period during cool dash is finished.
   ① When 25 minutes have elapsed after cool dash was started.
   ② When the room temperature reaches the cooling set temperature -1°C (including cooling shift) and then becomes lower than the preset temperature by 0.66°C after the steady speed period
   ③ When thermo is OFF.
   (If cool dash finished in the above ①, the compressor does not go through the steady speed period but it starts fuzzy control.)

(3) The thermo OFF temperature during cool dash is cooling set temperature (including cooling shift) -3°C. After thermo OFF, cool dash is finished and fuzzy control starts.

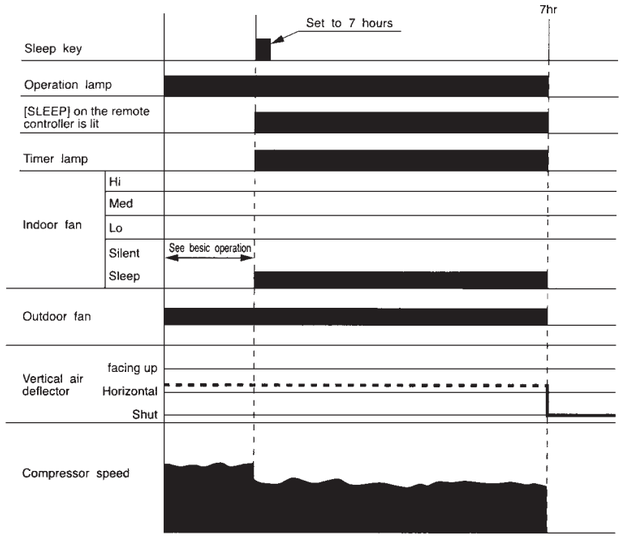
(4) The compressor minimum ON time and minimum OFF time is 3 minutes.

(5) The time limit for which the maximum compressor speed (CMAX1 or CMAX2) during normal cooling can be maintained is less than 60 minutes when the room temperature is less than CLMXTP: it is not provided when the room temperature is CLMXTP or more.

(6) Compressor speed is determined by instruction sent from indoor unit and corrected by outdoor unit according to such factors as capacity, fan speed, number of units being operated, outdoor temperature, etc.

(7) If another indoor unit is doing heating operation, cooling operation cannot be done.

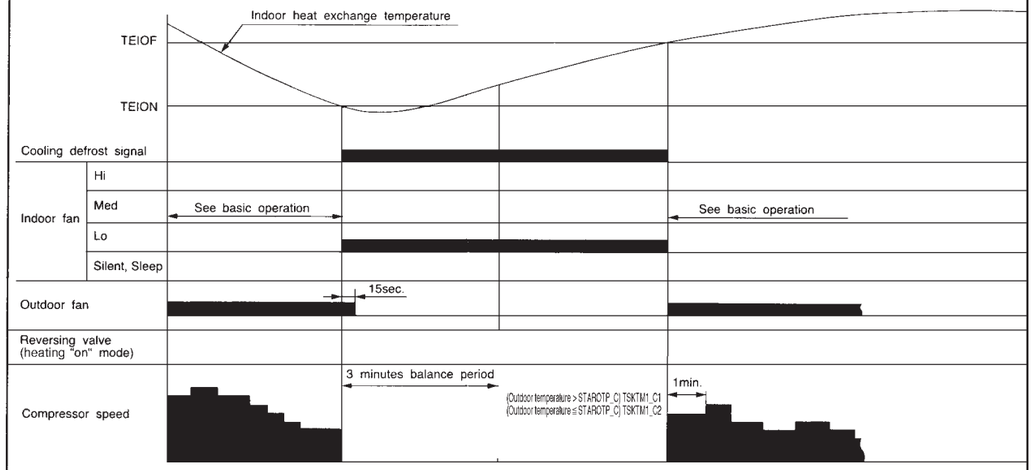
Cooling Sleep Operation



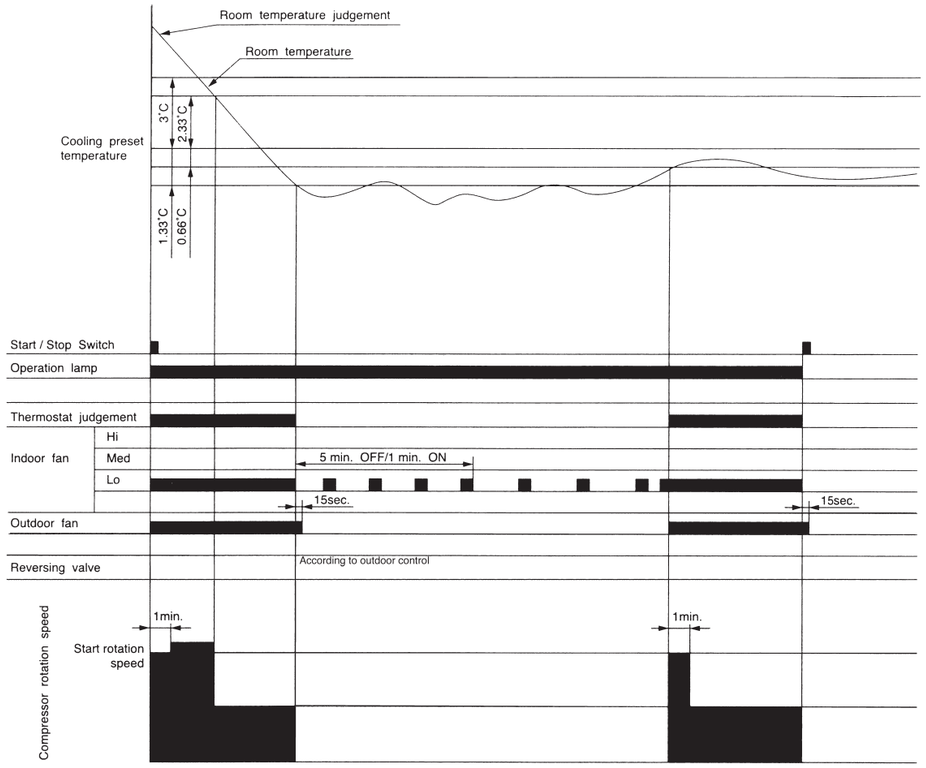
Notes:
(1) The sleep operation starts when the sleep key is pressed.
(2) When the sleep key is set, the indoor fan is set to "sleep silent" (FCSOY_M or AFCSOY).
(3) The indoor fan speed does not change even when the fan speed mode is changed.
(4) If the set time is changed during sleep operation, all data including set temperature, time, etc. is cleared and restarted.
(5) If sleep operation is canceled by the cancel key or sleep key, all data is cleared.
(6) If the position of air deflector is being operated using remote control, the operation will be performed at any desired position of air deflector.

Note:
1. Refer to the PWRITE-ZU data for the constants expressed by capital alphabet letters in the drawing.

Cooling Defrost



Dehumidifying



Notes:

(1) The indoor fan is operated in the "Lo" mode, OFF for 5 minutes and ON for 1 minute, repeatedly according to the humidity judgement when the thermostat is turned OFF.

(2) The commpressor is operated forcedly for 3 minutes after operation is started.

(3) The minimum ON time and OFF time of the compressor are 3 minutes.

(4) At the start of operation, the thermostat will be off when room temperature ≦ setting temperature –1.33°C; the thermostat will be on when room temperature ≧ setting temperature –0.66°C.

(5) The following procedure is performed to prevent excessive cooling during operation other than start. However, this procedure applies only when the thermostat is intermittent:

· Whether THERMO ON is to continue or not depends on the thermal condition when the 3-minute forced operation ceases.

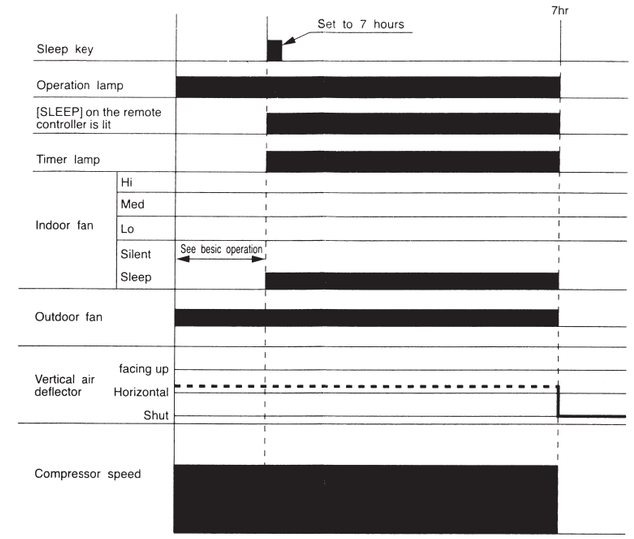
① "THERMO ON continues" when room temperature ≧ setting temperature +1°C: (The THERMO operation value is usually the same as that at "start of operation")

② "Forced THERMO OFF" when room temperature < setting temperature +1°C: (The same THERMO operation value as that at "start of operation" is usually used for recovery)

Therefore, if the air-conditioner is stabilized under this thermal condition, it will enter intermittent operation, which is "3-minute operation/3-minute stop".

(6) Compressor speed is determined by instruction sent from indoor unit and corrected by outdoor unit according to such factors as capacity, fan speed, number of units being operated, outdoor temperature, etc.

Dehumidifying Sleep Operation



Notes:

(1) The sleep operation starts when the sleep key is pressed.

(2) When the sleep key is set, the indoor fan is set to "sleep silent" (FDOY_M or AFDOY).

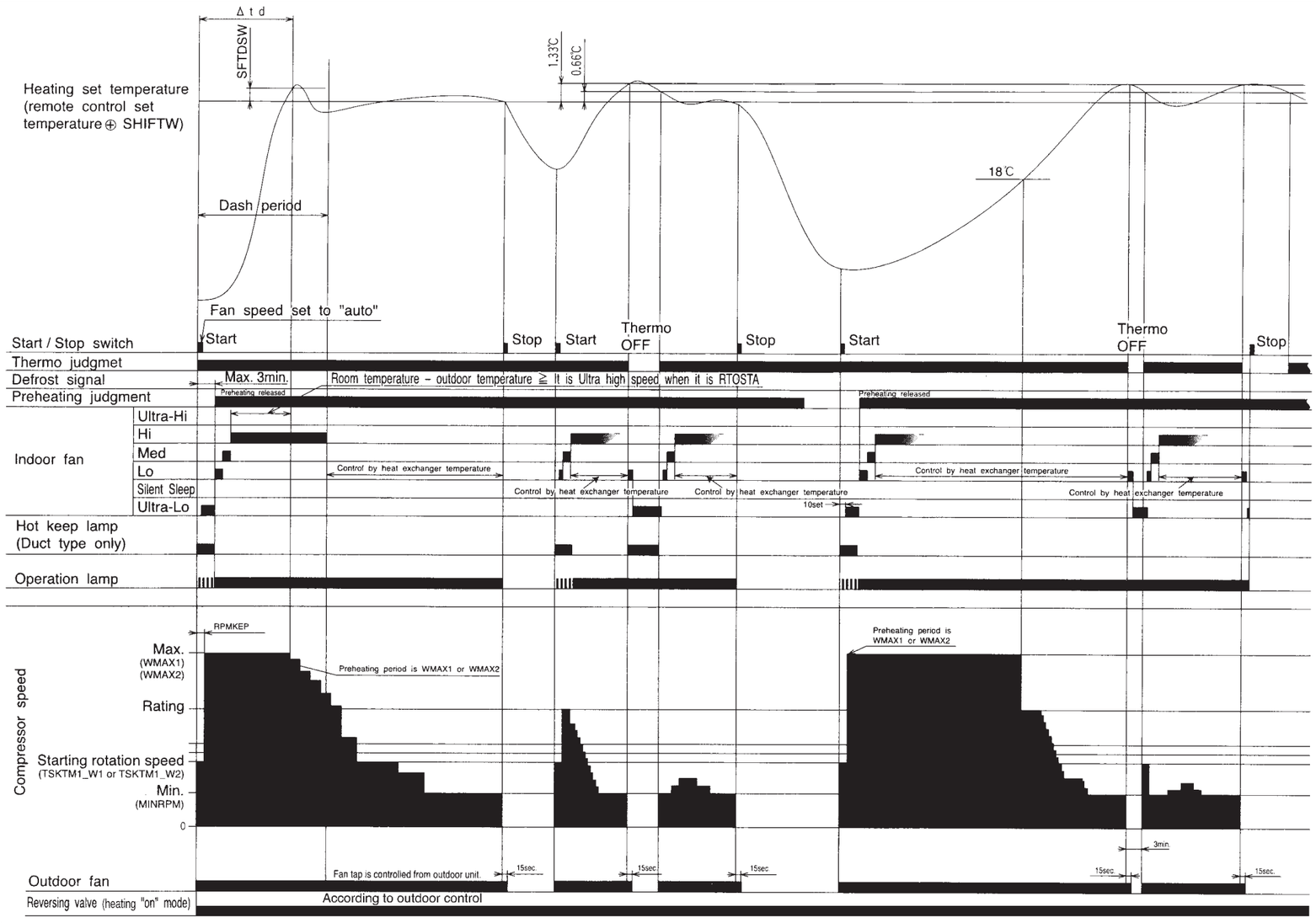
(3) The indoor fan speed does not change even when the fan speed mode is changed.

(4) If the set time is changed during sleep operation, all data including set temperature, time, etc. is cleared and restarted.

(5) If sleep operation is canceled by the cancel key or sleep key, all data is cleared.

(6) If the position of air deflector is being operated using remote control, the operation will be performed at any desired position of air deflector.

Heating Basic Operation



Notes:

(1) Hot Dash is started when the operation is started at fan speed “AUTO” or “HI” or when the fan speed is changed to “AUTO” or “HI” during heating operation, and when the compressor speed (P item) reaches (WMAX1 or WMAX2) or higher with the room temperature at 8℃ or less and outdoor temperature at 10℃ or less.

(2) The maximum compressor speed period during hot dash is finished

① when the room temperature reaches the heating set temperature (including heating shift) plus SFTDSW or

② when the thermo is off.

(3) The thermo OFF temperature during hot dash is heating set temperature (including heating shift) plus 3℃. After thermo OFF, hot dash finishes, and PI control starts.

(4) The compressor minimum ON time and minimum OFF time is 3 minutes.

(5) The time limit for which the maximum compressor speed (WMAX1 or WMAX2) during normal heating (except for hot dash) can be maintained is less than 120 minutes when the room temperature is 18℃ or more; it is not provided when the room temperature is less than 18℃ and outdoor temperature is less than 4℃.

(6) The operation indicator will blink every second during initial cycle operation, preheating, defrosting (including balance time after defrost is finished), or auto fresh defrosting. However, with duct type models, operation indicator does not blink, but Hot Keep indicator will light.

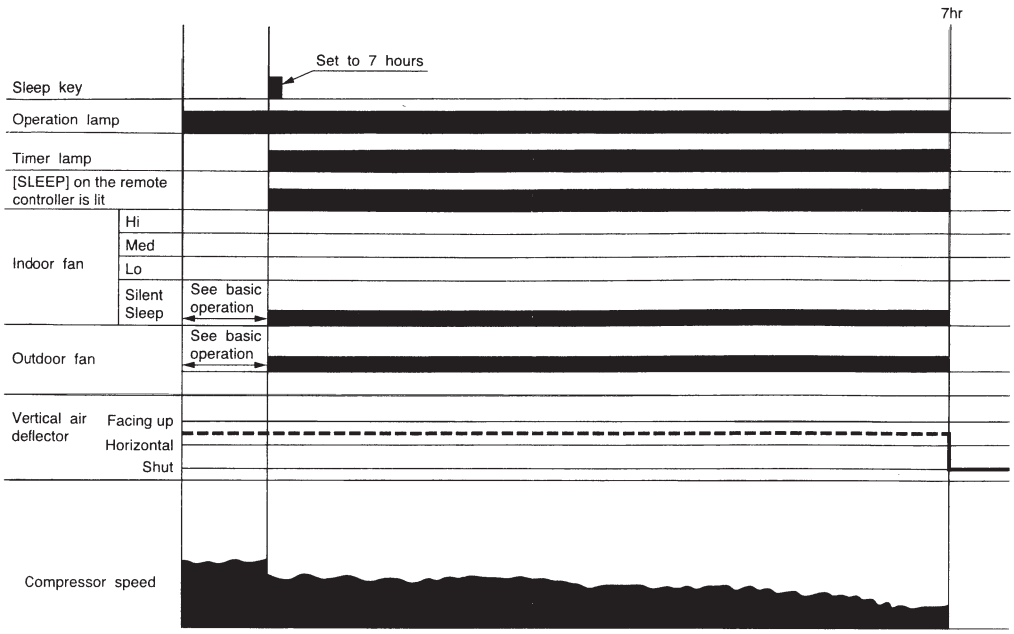
(7) For preheating judgment, preheating starts if the heat exchange temperature is lower than YNEOFC and is cancelled if the heat exchange temperature is YNEOF plus 0.33℃ or higher at the start of operation using the START / STOP button.

(8) If the room temperature falls to less than 18℃ in the "Ultra-Lo" mode, the indoor fan stops. When the room temperature is 18℃+0.33℃ or more, the ultra-Lo operation restarts. However, the ultra-Lo operation during preheating or preheating after defrosting does not stop if the room temperature is less than 18℃.

(9) Compressor speed is determined by instruction sent from indoor unit and corrected by outdoor unit according to such factors as capacity, fan speed, number of units being operated, outdoor temperature, etc.

(10) If another indoor unit is doing cooling operation, dehumidifying operation or fan operation, heating operation cannot be done.

Heating Sleep Operation



Notes:

(1) The sleep operation starts when the sleep key is pressed.

(2) When the sleep key is set, the indoor fan is set to "Sleep Silent" (FWSOY_M or AFWSOY).

(3) The indoor fan speed does not change even when the fan speed mode is changed.

(4) When defrosting is to be set during sleep operation, defrosting is engaged and sleep operation is restored after defrosting.

(5) If the set time is changed during sleep operation, all data including set temperature, time, etc. is cleared and restarted.

(6) If sleep operation is canceled by the cancel key or sleep key all data is cleared.

(7) If the position of air deflector is being operated using remote control, the operation will be performed at any desired position of air deflector.

NOTE:

1. Refer to the PWRITE-ZU data for the constats expressed by capital alphabet letters in the drawing.

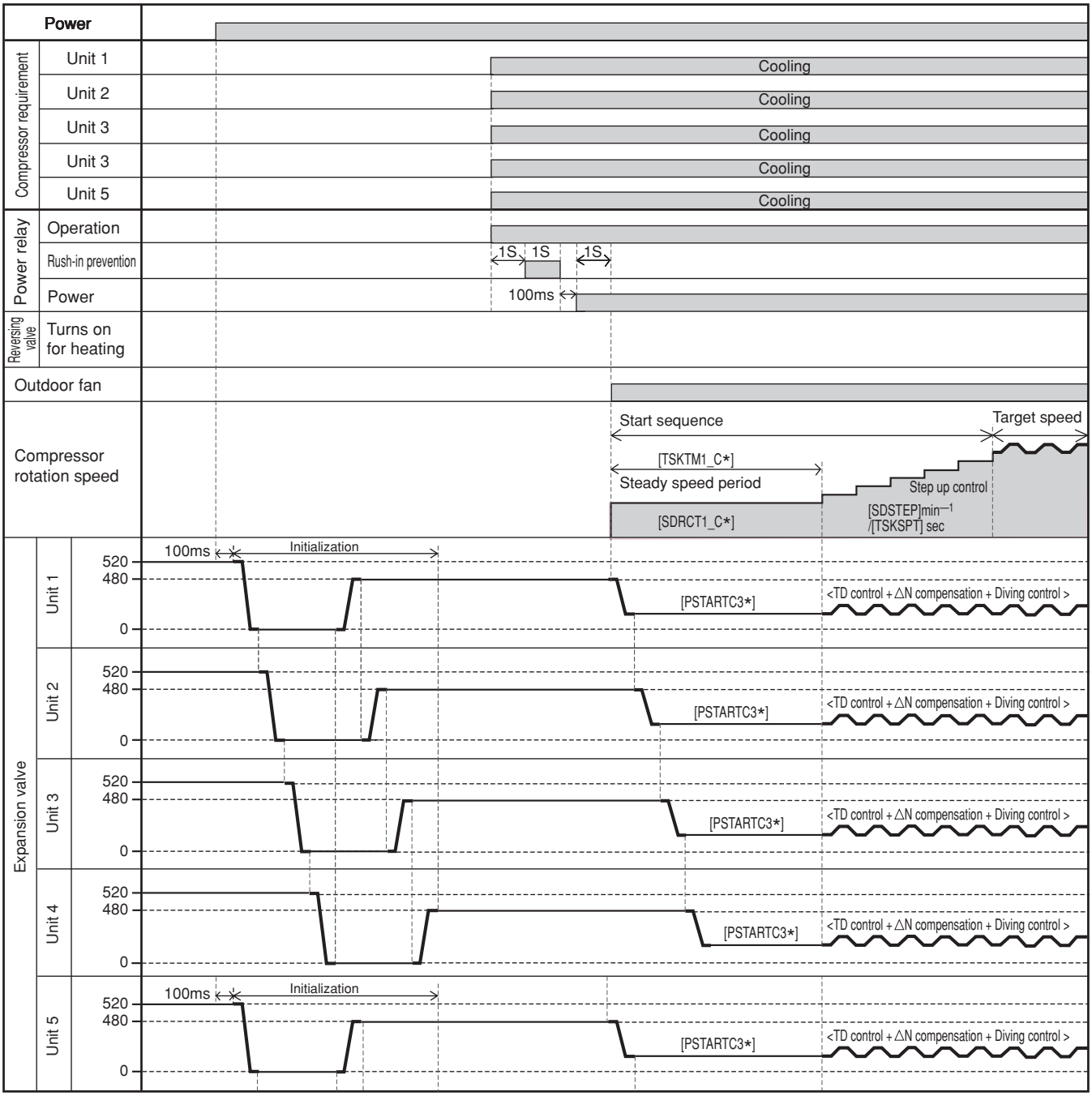
MODEL RAM-90QH5

◇ Expansion valves

- The expansion valves are initialized when power is supplied. The valve for unit 1 is fully closed (–520 pulses), and then that for unit 2 is fully opened (480 pulses). The valve for unit 2 is fully closed (–520 pulses), and then that for unit 3 is fully opened (480 pulses). The valve for unit 3 is fully closed (–520 pulses), and then that for unit 4 is fully opened (480 pulses). The valve for unit 4 is fully closed (–520 pulses), and then that for unit 5 is fully opened (480 pulses). When the valve for unit 1, 2, 3, 4, 5 is fully closed (0 pulse), start-up is possible.
- The start openings are held during the steady speed period when the compressor is started. After the steady speed period is finished, the TD control is entered. The start openings are set to PSTARTH when the outdoor temperature at start 40°C or more, and to PSTART when it is less than 40°C. PSTART C3 is used for 3 rooms and 4 rooms operation.

◇ Compressor rotation speed

- When the compressor is started, the SDRCT1 speed / TSTKTM1 second is held. (Steady speed period) After the steady speed period is finished, the speed increases at the rate of SDSTEP speed / TSKSPT second until the target speed is reached.



※ TSKTM1, SDRCT1, SDSTEP, TSKSPT, CMAX2, PSTART and PSTARTH are EEPROM data.

DEFROST

• Reversing valve defrost system is employed: it consists of balancing period→ reversing cycle period→ balancing period.

(1) Defrost start condition

- When all the following conditions are established defrost is executed:
  - ① Normal operation
  - ② Heat exchange temperature is within defrost range specified by outdoor temperature and heat exchange temperature. (Defrost signal occured).
  - ③ Defrost inhibit period linked to outdoor temperature has passed.

(2) Defrost release condition

- If any one of the following conditions is established, defrost is released:
  - ① Heat exchange temperature returns (heat exchange temperarure ≥ DEFOFF).
  - ② Defrost max time of 12 minutes has elapsed.
- Released by condition ① during balancing period: When remaining balancing period has elapsed, returned to initial condition (ASTUS=0).
- Released by condition ① or ② during reversing cycle period: [TDF415] Shifted to balancing period.

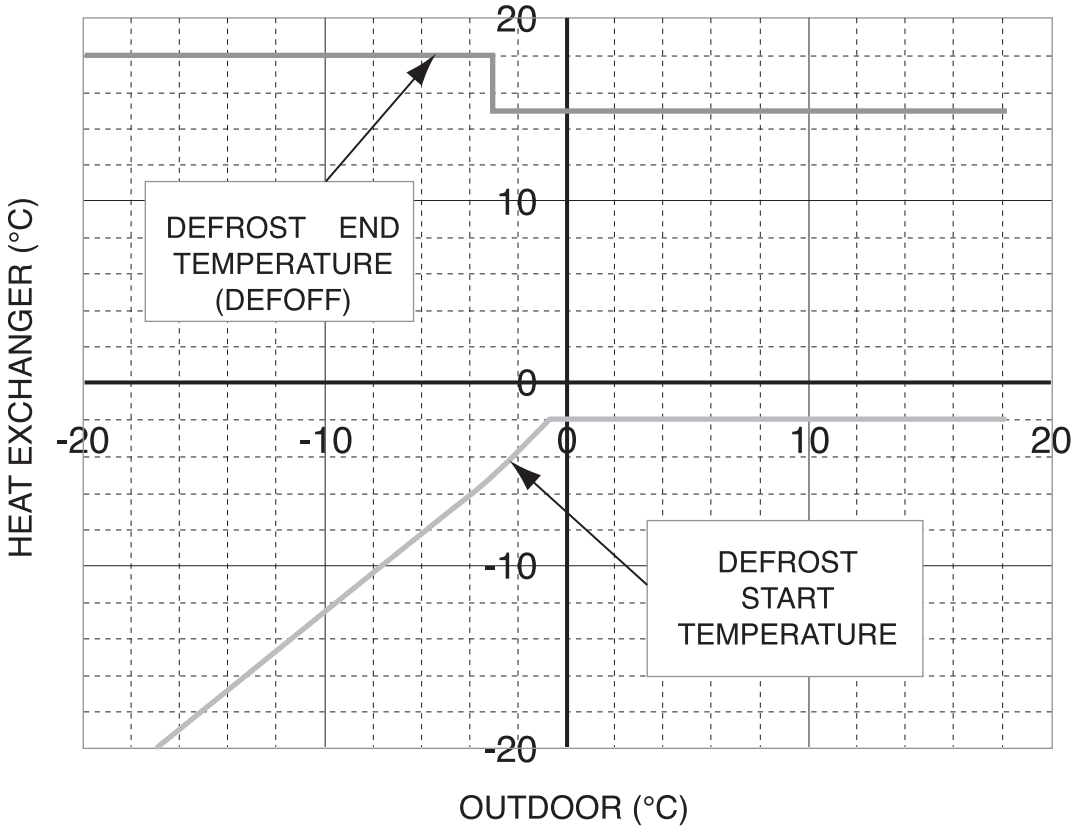
(3) Outputs during defrost

- Indoor defrost request: Transmitted to all units being operated in heating mode.
- Compressor : Balancing period for [TDF414] seconds→ Starting of reversing cycle period by [SDRCT2] min^{-1} for [TSKTM2] seconds →Accelerating by [DFSTEP]min^{-1}/[TDFSPT] seconds in remaining reversing cycle period until defrost MAX speed [DEFMAX] is reached →Balancing period for [TDF415] seconds
- Electric expansion valve

  Unit being stopped : [FULL CLOSE] 30 seconds after balancing period has passed →[FULL CLOSE] during reversing cycle period→ [PCLOSH$] 15 seconds before balancing period is finished

  Unit being operated : [DFCTPS] 30 seconds before balancing period is finished→ Synchronized with step-up of rotation speed of compressor, opened by [DFSPPS] pulses and reaches MAX opening degree [DEFSMX] when rotation speed of compressor reaches [DEFMAX].

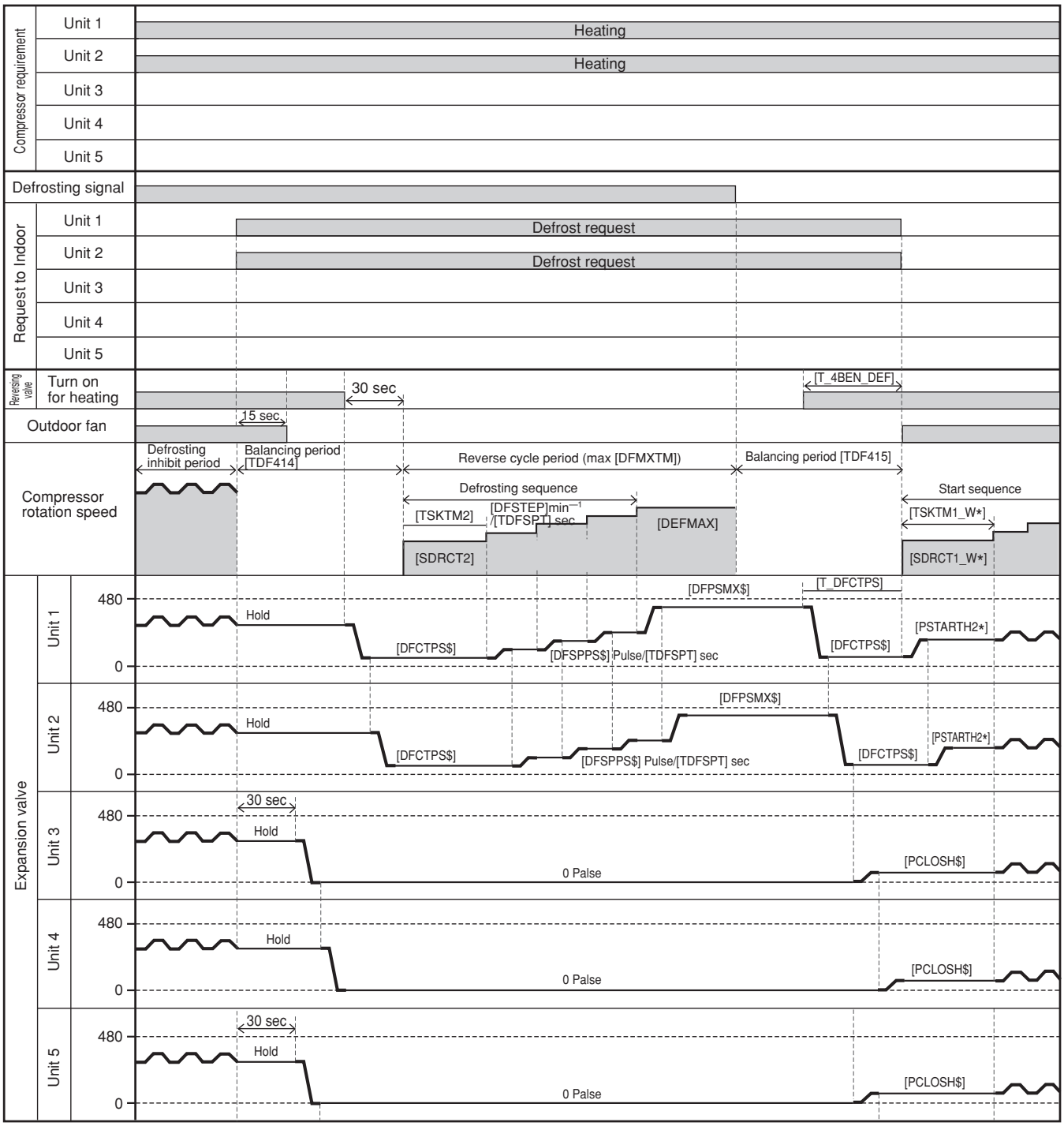
RAM-90QH5 DEFROST TEMPERATURE



* above graph is showing the ideal value by micon program.
* guaranteed temperature range of this model is –15˚C to +23˚C at heating.

MODEL RAM-90QH5

• Time chart when executing defrost (Unit 1 and Unit 2 operated, Unit 3, Unit 4 and Unit 5 stopped)



AUTO-FRESH DEFROST

• During heating operation is stopped, and when auto-fresh condition is established, defrost operation will be performed while operation is stopped.
Auto-fresh consists of balancing period at start of defrost for [TDF414] seconds → Reverse cycle period for MAX 12 minutes.

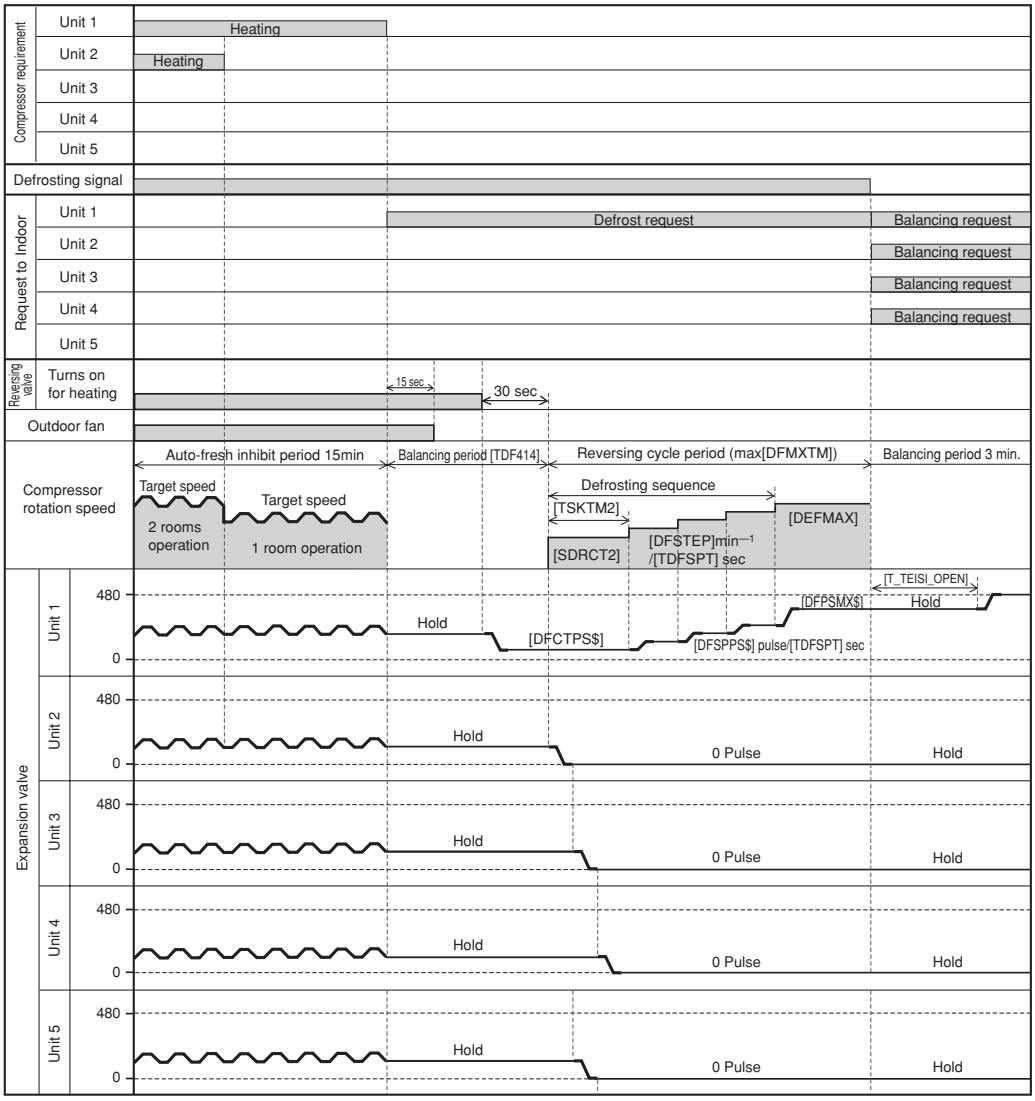
(1) Start conditions for auto-fresh
- When all the following conditions are established, auto-fresh is executed:
  ① Defrost request signal is present.
  ② All indoor units are stopped.
  ③ 15 minutes of auto-fresh inhibit period has elapsed.
  ④ Compressor is ON when operation is stopped.
  ⑤ Compressor delay command is sent from indoor unit when operation is stopped.

(2) Release condition of auto-fresh
- If any one of following conditions is established, auto-fresh is released:
  ① Heat exchange temperature returns (heat exchange temperature ≥ DEFOFF)
  ② 12 minutes of defrost MAX time has elapsed.
  ③ Failure occurred.
  ④ Either unit 1 or unit 2 or unit 3 or unit 4 started operation.
  ※ Released during start of balancing period : Stopped or started after remaining balancing period has elapsed.
  Released during reverse cycle period : Stopped or started after balancing for 3 minutes.

(3) Outputs during auto-fresh
[Indoor unit defrost request]: Transmitted only to unit to which auto-fresh is applied (indoor unit stopped last).
[Compressor]: Accelerated by DFSTEP min^{-1}/TDFSPT seconds and reaches defrost MAX speed [DEFMAX].
[Electric expansion valve]:
Unit auto-fresh not applied: FULL CLOSE when balancing for 30 seconds has elapsed at start of defrost.
Unit auto-fresh applied : Synchronized with step-up of rotation speed of compressor, opened by [DFSPPS] pulses and reaches MAX opening degree [DEFSMX] when rotation speed of compressor reaches [DEFMAX].

(4) Note
- Shifted to auto-fresh in defrost mode when operation is stopped.
- All indoor units must be stopped to fulfill condition for auto-fresh.
If signal is delayed, auto-fresh condition will not be established.

MODEL RAM-90QH5



MODEL RAM-90QH5

FORCED COOLING

• In order to accumulate refrigerant, units operate in cooling cycle.
  Execution condition and operation status are shown below.

[Execution condition]

• With neither indoor unit 1, 2, 3, 4 and 5 not operated, when service switch is turned ON, forced cooling will be performed.

• Always operation status of indoor units are monitored and forced cooling is inhibited when operation of any unit is detected.

[Operation status]

• Outdoor unit fan: Fixed in LO.

• Compressor rotation speed: Fixed in 3000min^{-1}.

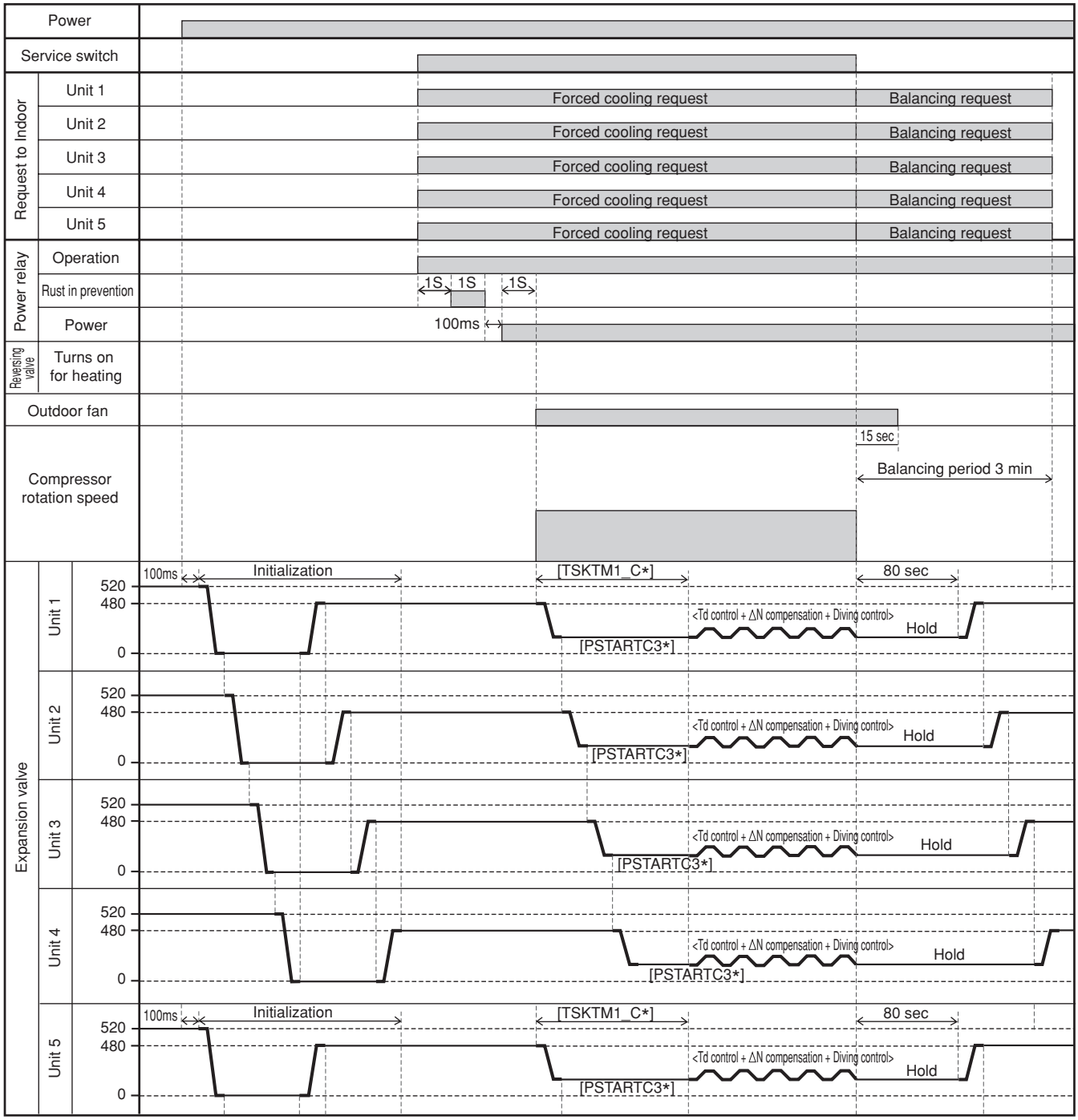
• Expansion valve/reversing valve : Set in normal conditions.

[Note]

• During forced cooling, if failure occurs in outdoor unit, thermostat is turned off. However, it is not counted.

• Since rotation speed of compressor is fixed in 3000min^{-1} during forced cooling, steady speed period of compressor at start is not performed.

• The following shows the operation state of forced cooling.



※ TSKTM1_C and PSTARTC2$ are EEPROM data.

MODEL RAM-90QH5

PROCESSING AT OVERHEAT THERMISTOR (OH) HIGH TEMPERATURE

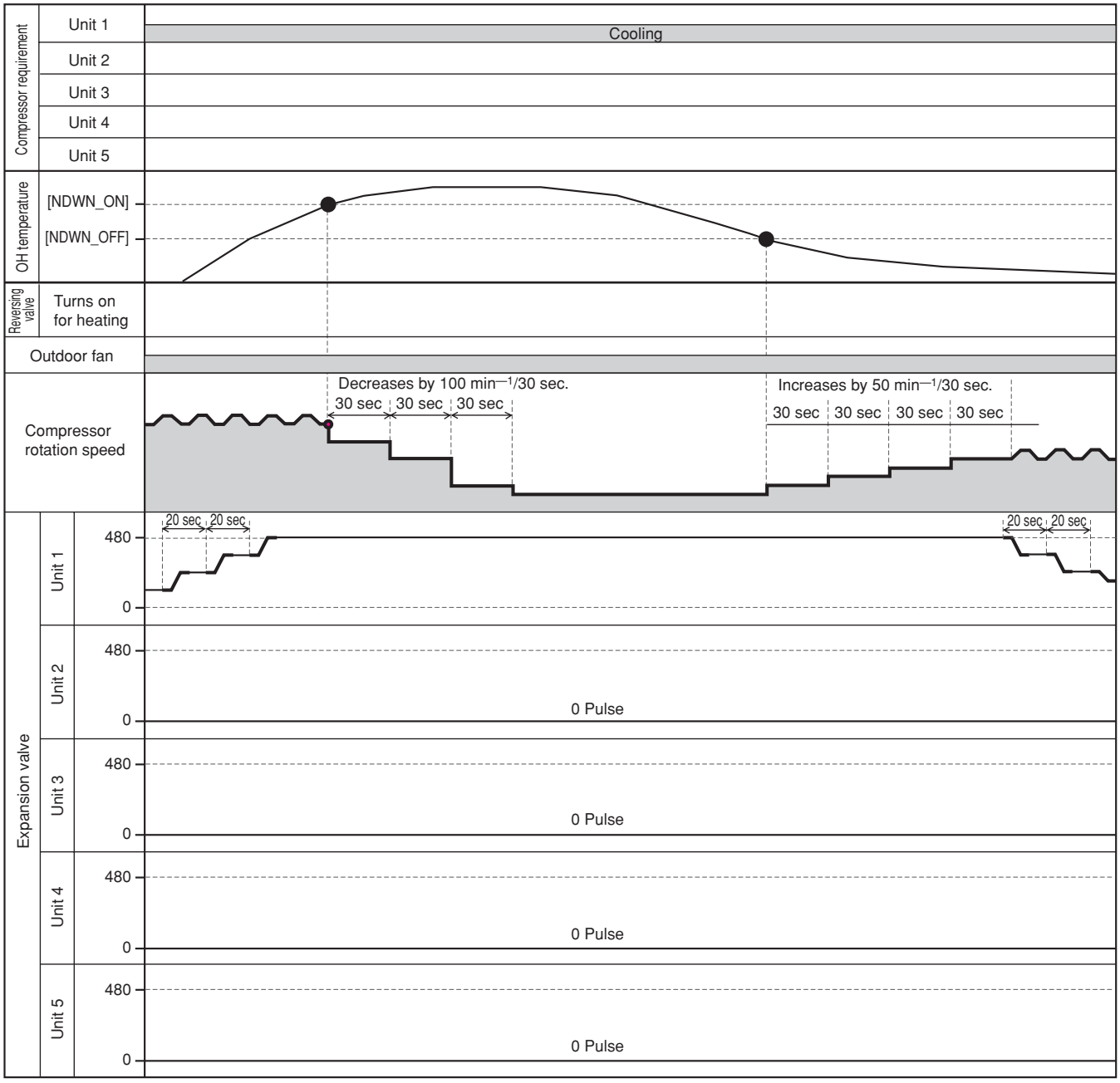
◇ Restriction Start Conditions

- If any expansion valve is operated at 480 pulses and the OH temperature > [NDOWN_ON], the compressor speed will be reduced at a rate of 100 min^{-1}/30 seconds.
- This reduced rotation speed is based on the speed when the reduction started, and will be maintained until the reduction is finished. However, the reference speed will be exchanged only if the target speed is lower than the speed when the reduction started.
- If [NDOWN_OFF] ≤ OH temperature ≤ [NDOWN_ON] and the OH temperature does not rise from that 20 seconds before, the reduction of compressor speed will not occur.

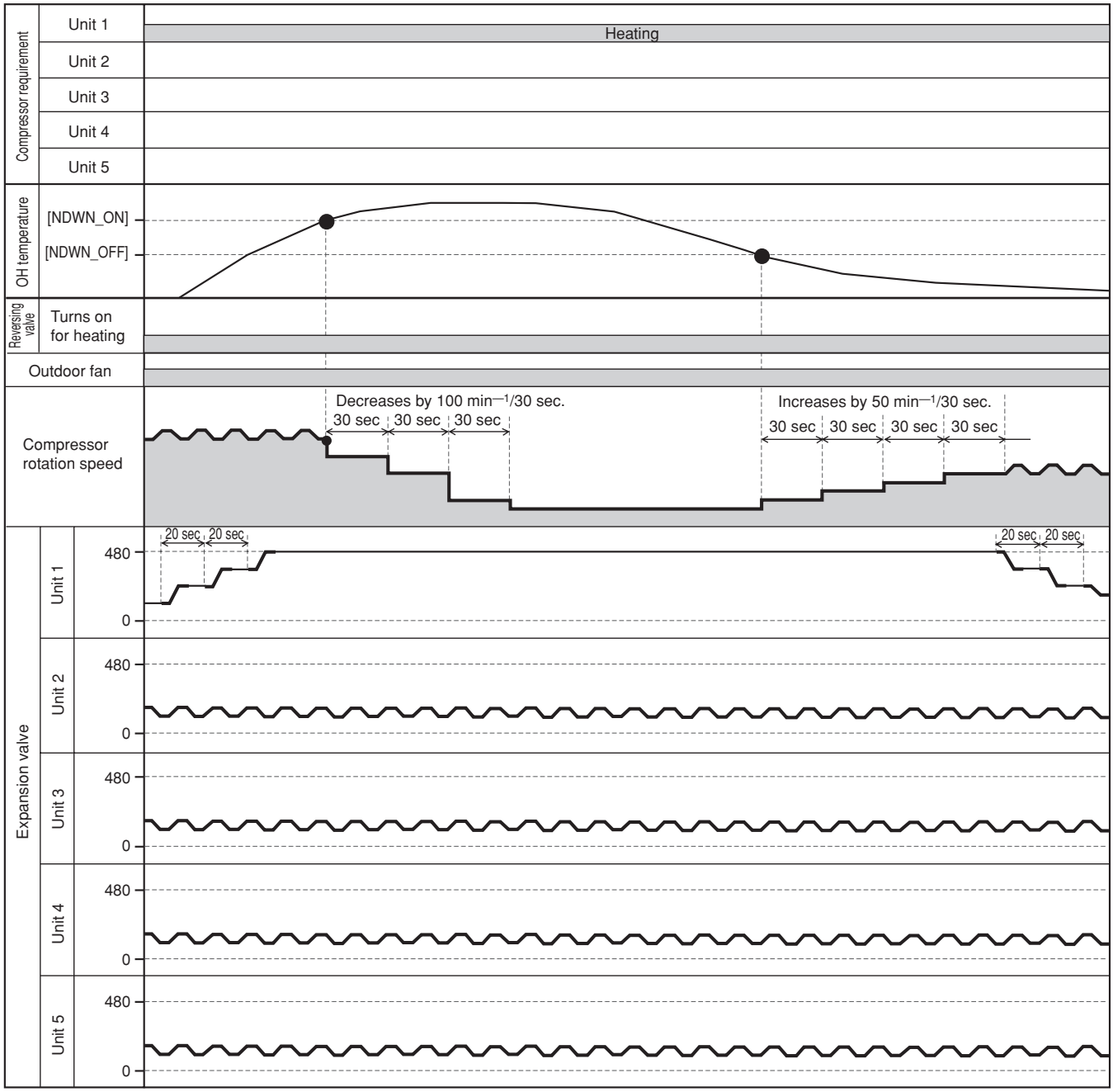
◇ Restriction Release Condition (in common for all)

- The restriction will be released when OH temperature < [NDOWN_OFF], and the compressor speed will be increased at a rate of 50 min^{-1}/30 seconds to restore the target speed.

When one unit is operated for cooling

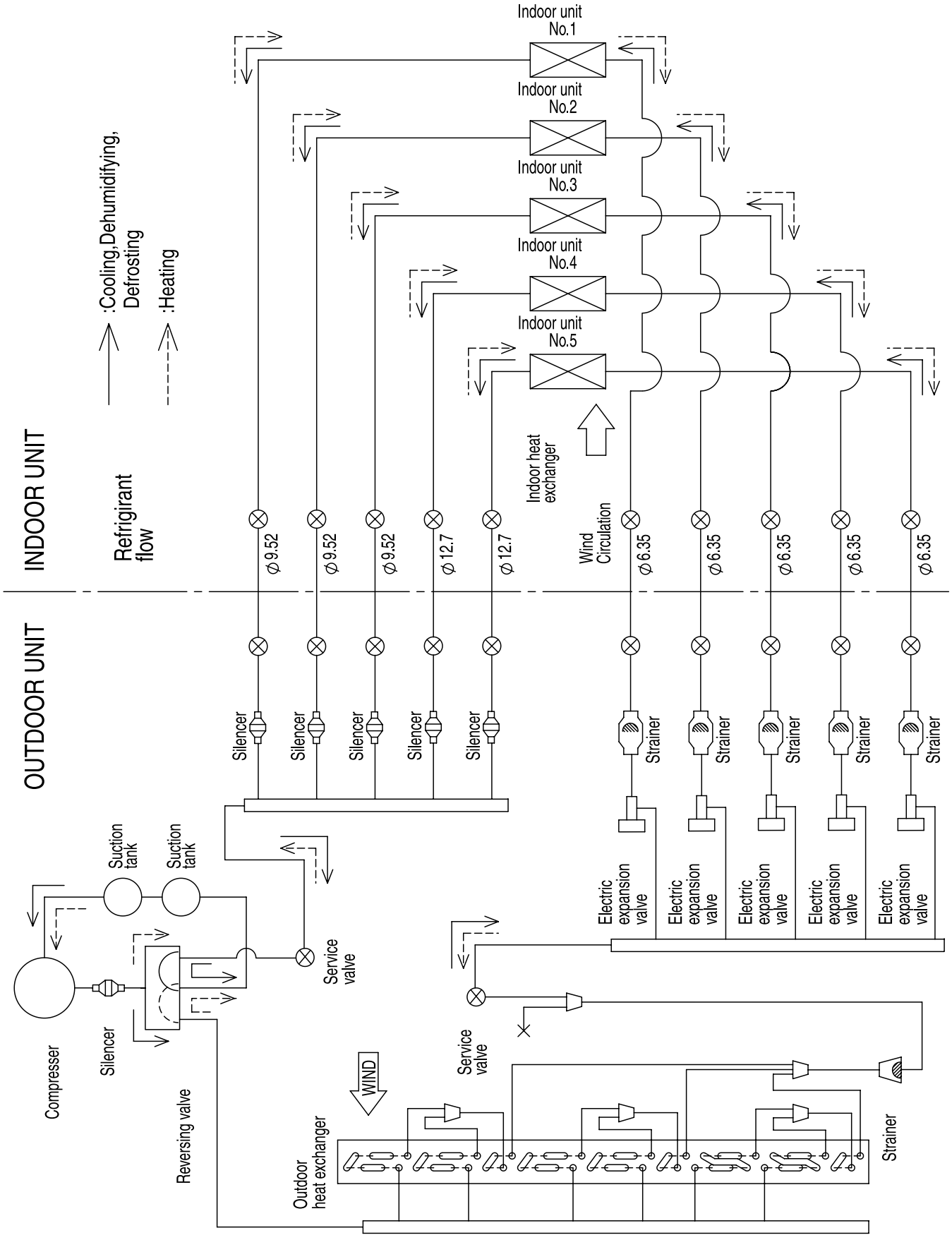


When one unit is operated for heating



REFRIGERATING CYCLE DIAGRAM

MODEL RAM-90QH5



DESCRIPTION OF MAIN CIRCUIT OPERATION

MODEL RAM-90QH5

1. Power Circuit

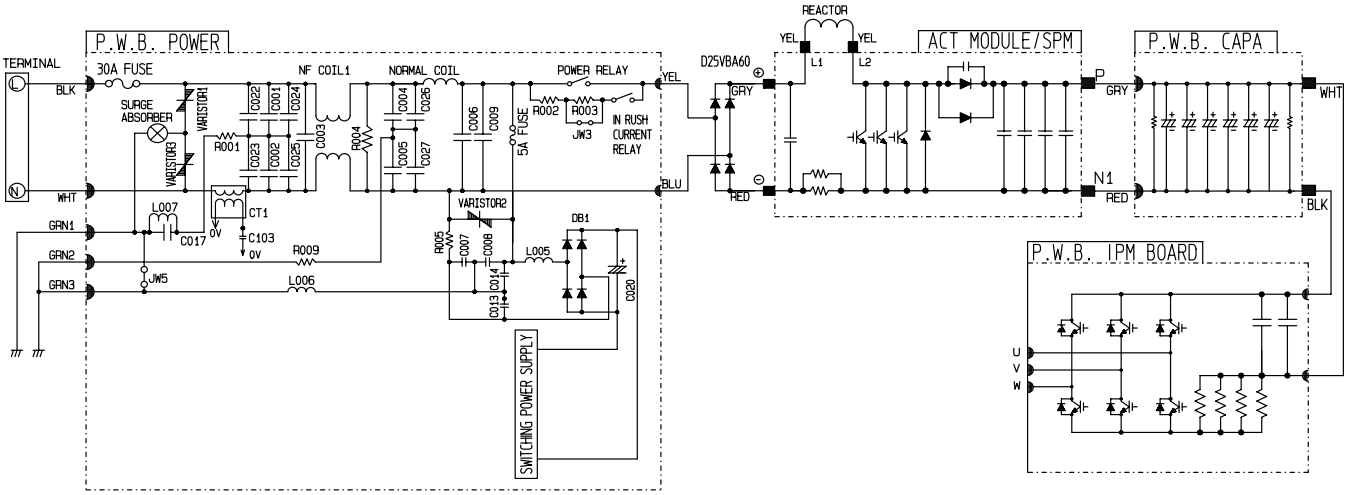


Fig. 1-1

- This circuit full-wave rectifies 220-240 AC applied between terminals L and N, and boosts it to a required voltage with the active module, to create a DC voltage.

The voltage becomes 320-360V when the compressor is operated.

- Main Parts
  (1) Intelligent Power module (IPM)
  This is an inverter configuration module.

  (2) Active module
  The active filter, consisting of a reactor and switching element, eliminates higher harmonic components contained in the current generated when the compressor is operated, and improves the power-factor. Smoothing capacitor smoothes voltage, which has been rectified by diode stack and boosted at ACT section.

  (3) Diode stacks
  These rectify the 220-240V AC from terminals L and N to a DC power supply.

< Reference >

- In case of IPM malfunction or defective connection:
  Immediately after the compressor starts, it may stop due to “abnormally low speed” IP error, etc.

- In case of active module faulty or defective connection:
  Although the compressor continues to operate normally, the power-factor will decrease, the operation current will increase, and the overcurrent breaker of the household power board will probably activate.

< Reference >

- If D25VB60 is faulty, the compressor may stop due to “Ip”, “abnormally low speed”, etc. immediately after is starts, or it may not operate at all because no DC voltage is generated between the positive e and negative d terminals.

  If diode bridge 1 is faulty, be aware that the 25A fuse might also have blown.

- If diode stack is faulty, DC voltage may be not generated and the compressor may not operate at all. Also, be aware that the 5A fuse might have blown.

(4) Smoothing capacitor (C945 to C950, 400μF, 450V)
This smoothes (averages) the voltage rectified by the diode stacks.

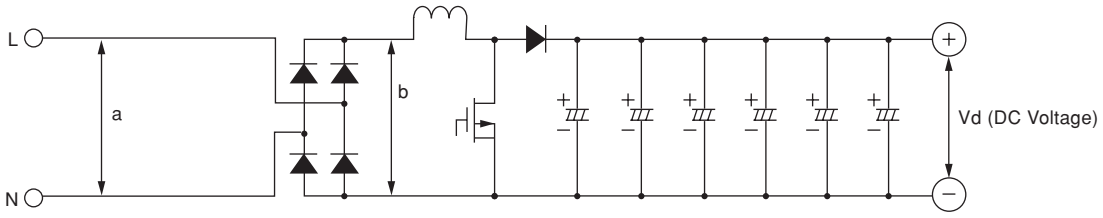


Fig. 1-2

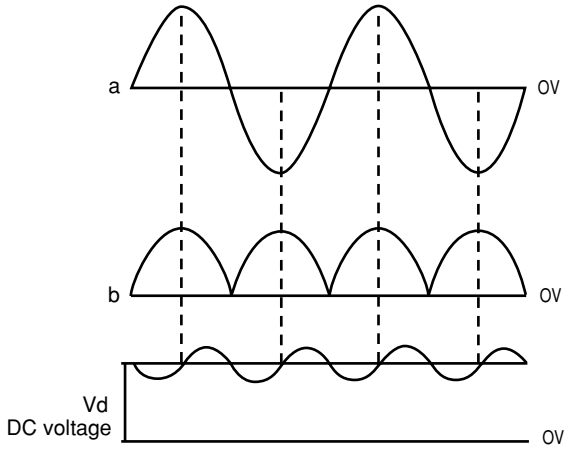


Fig. 1-3

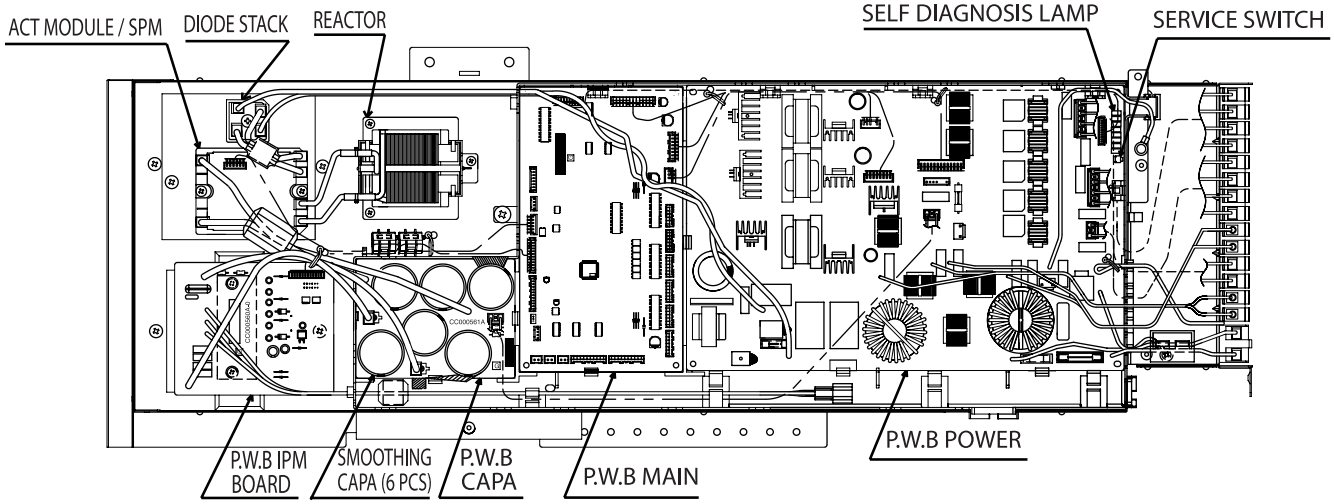


Fig. 1-4

- Be careful to avoid an electric shock as a high voltage is generated. Also take care not to cause a short-circuit through incorrect connection of test equipment terminals. The circuit board could be damaged.

(5) Smoothing capacitor (C020, 270μF, DC 450V)
This smoothes (averages) the voltage rectified by the diode stacks.
A DC voltage is generated in the same way as in Fig. 1-3. Voltage between C020 ⊕ side and ⊖ side is about 330V.

(6) C001 to C014, C022 to C027, NF COIL1 to NF COIL3, NF COIL4. These absorb electrical noise generated during operation of compressor, and also absorb external noise entering from power line to protect electronic parts.

(7) Surge absorber, Varistor 1, 2, 3,
These absorbs external power surge.

(8) Inrush protective resistor (R002)
This works to protect from overcurrent when power is turned on.

※ Be sure to ground outdoor unit.
If not grounded, noise filter circuit does not operate correctly.

※ If outdoor unit is not grounded, “surge absorber”, “varistors 1 and 3” do not operate.
Be sure to perform grounding.

< Reference >

- When inrush protective resistor is defective, D25VB60 may malfunction. As a result, DC voltage is not generated and no operation can be done. In this case, 5A fuse may have been blown. Take care.

There is using a multiplexer (IC15) between the microcomputer and the transmiting/receiving circuit for indoor unit 1 to 4.

2. Indoor/Outdoor Interface Circuit

- The interface circuit superimposes an interface signal on the 35V DC line supplied from the outdoor unit to perform communications between indoor and outdoor units. This circuit consists of a transmiting circuit which superimposes an interface signal transmit from the microcomputer on the 35V DC line and a transmiting circuit which detects the interface signal on the 35V DC line and outputs it to the microcomputer.

- Communications are performed by mutually transmiting and receiving the 4-frame outdoor request signal one frame of which consists of a leader of approx. 100 ms., start bit, 8-bit data and stop bit and the command signal with the same format transmit from the indoor unit.

- From outdoor microcomputer to indoor microcomputer.
The request signal output from microcomputer pin ⑯, ⑰ is input to the transmitting circuit. The transmitting circuit modulates this signal by approx. 38kHz high-frequency. This high-frequency signal is amplified by a transistor, superimposed on the DC 35V line via C801 (or C811, C821, C831, C841) and L801 (or L802, L803, L804, L805) and supplied to the indoor unit.
To prevent erroneous reception, the outdoor microcomputer is designed so that it cannot receive a signal while it is outputting a request signal.
The receiving circuit in the indoor unit consists of a comparator and transistor. The interface signal from the outdoor unit on the DC 35V line is supplied to C821, where DC components are eliminated, and is then shaped by the comparator. The shaped signal is detected by diode, amplified by amp, and supplied to receiving input of the indoor microcomputer.
Fig. 2-2 shows the voltages at each component when data is transferred from the outdoor microcomputer to the indoor microcomputer.

- Indoor microcomputer to outdoor microcomputer.
The communications from the indoor microcomputer to the outdoor micro computer are the same. Fig. 2-3 shows the voltages and waveforms at each circuit.

- Fig. 2-1 shows the interface circuit used for the indoor and outdoor microcomputers to communicate with each other.

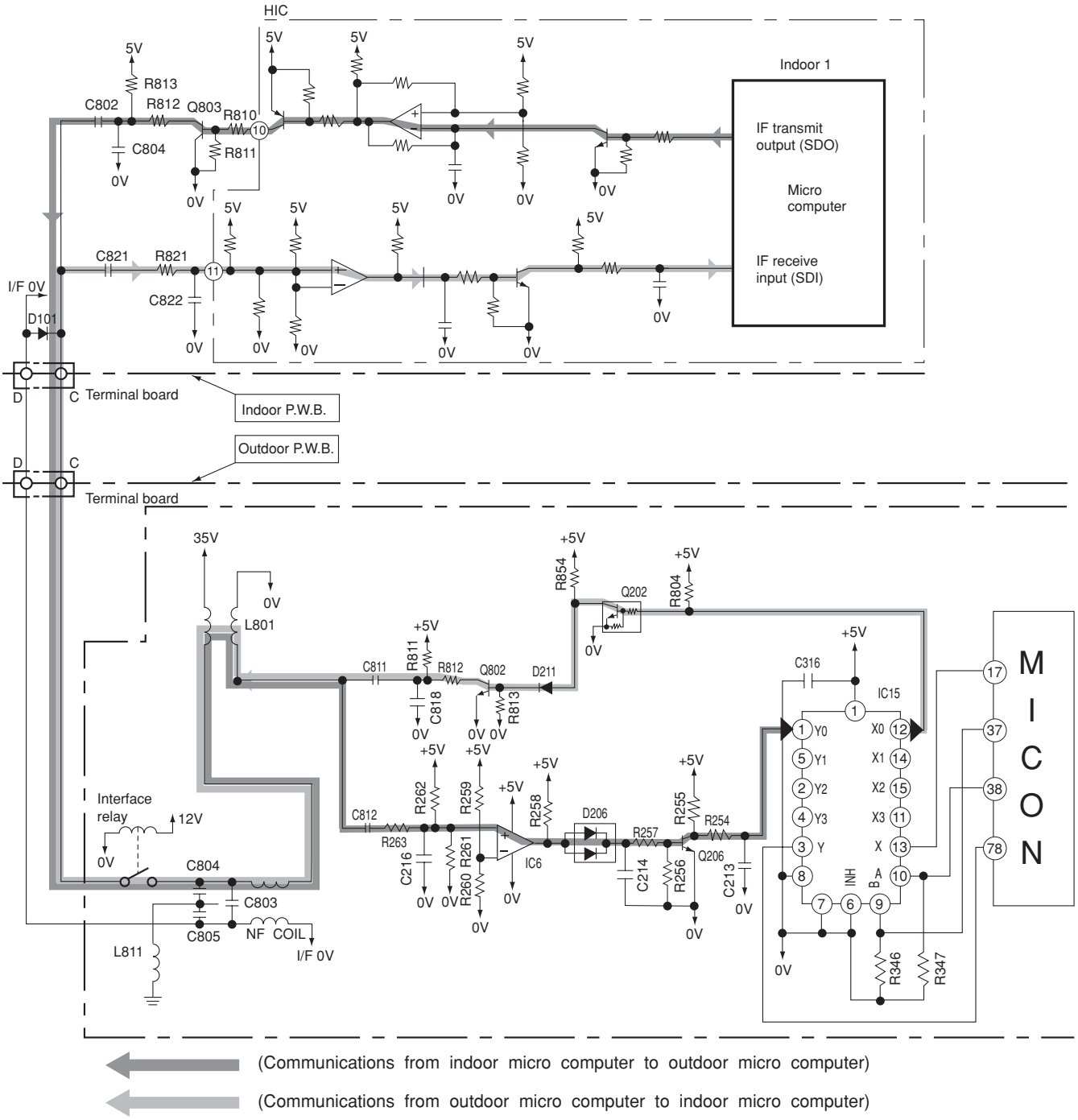
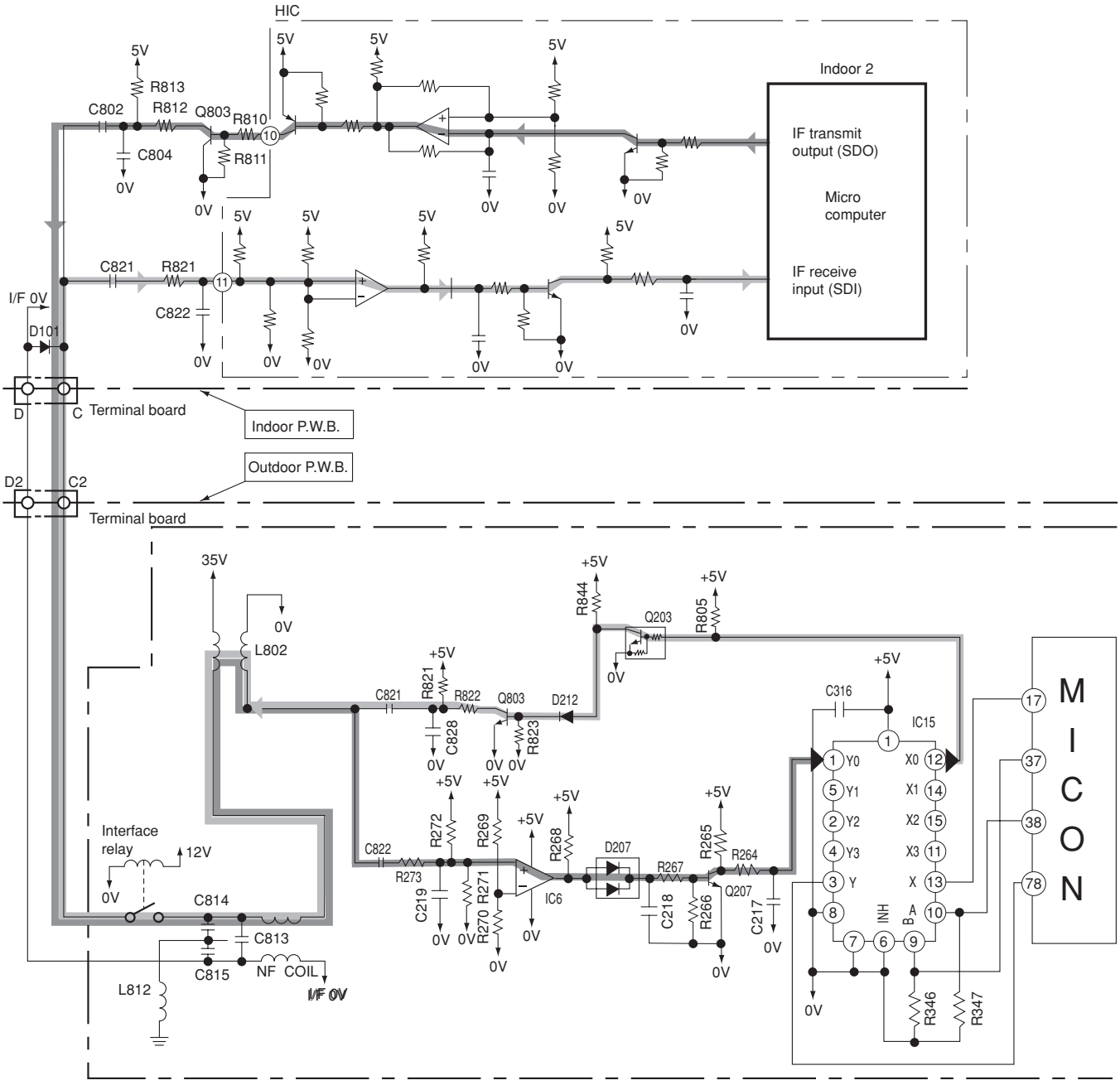


Fig. 2-1 Indoor / Outdoor interface Circuit 1

- Fig. 2-1 shows the interface circuit used for the indoor and outdoor microcomputers to communicate with each other.

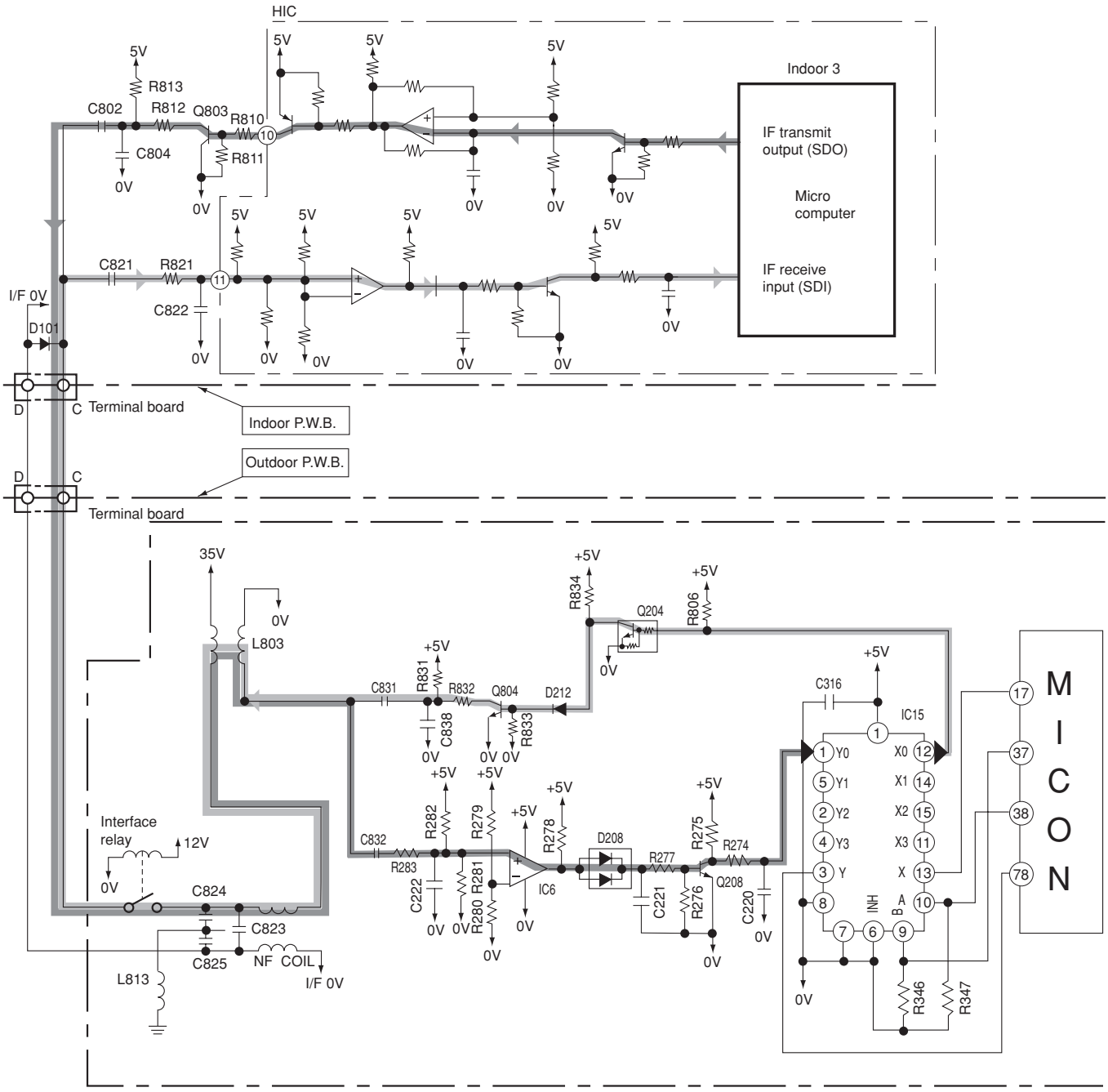


(Communications from indoor micro computer to outdoor micro computer)

(Communications from outdoor micro computer to indoor micro computer)

Fig. 2-1 Indoor / Outdoor interface Circuit 2

- Fig. 2-1 shows the interface circuit used for the indoor and outdoor microcomputers to communicate with each other.

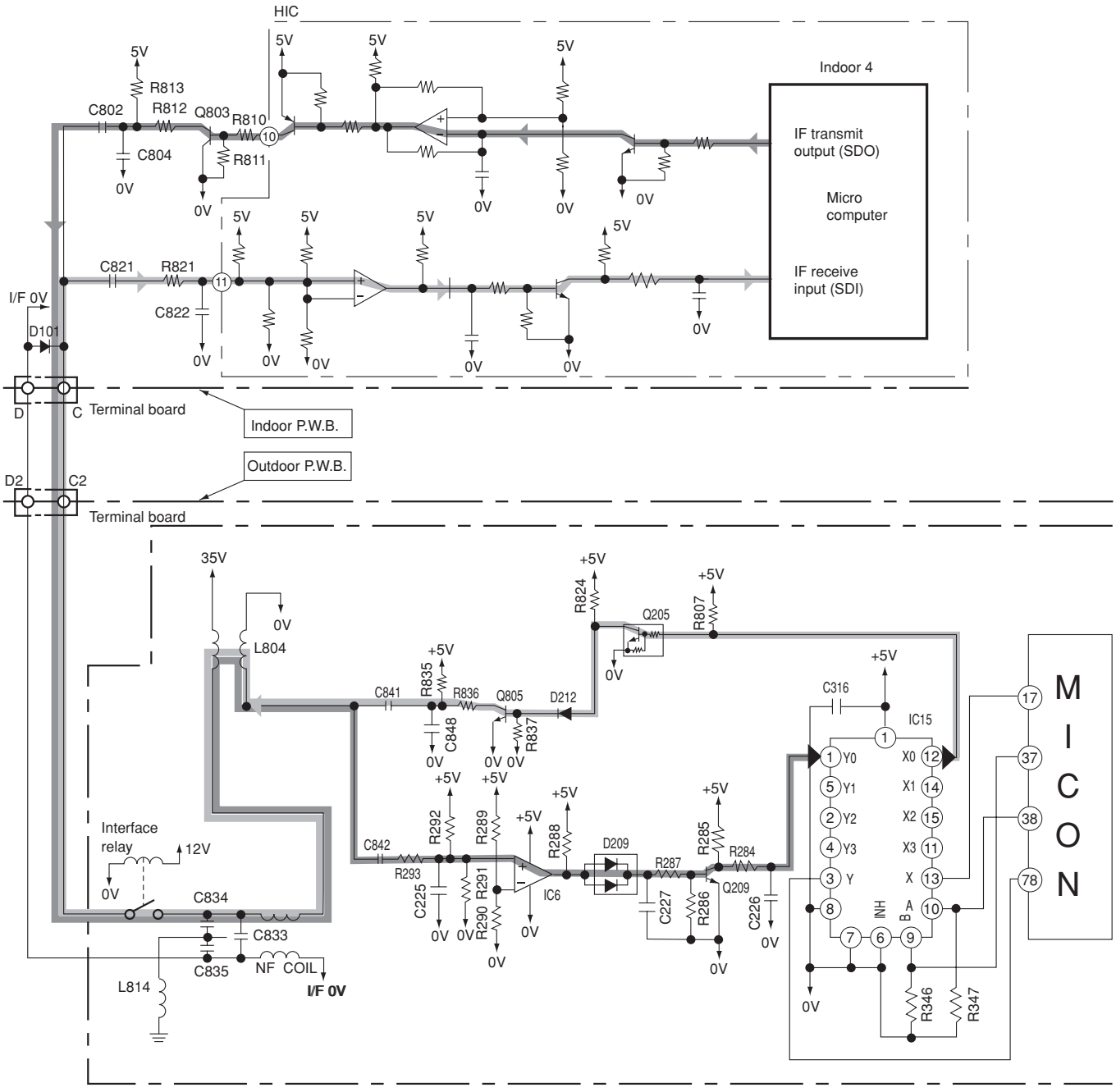


(Communications from indoor micro computer to outdoor micro computer)

(Communications from outdoor micro computer to indoor micro computer)

Fig. 2-1 Indoor / Outdoor interface Circuit 3

- Fig. 2-1 shows the interface circuit used for the indoor and outdoor microcomputers to communicate with each other.

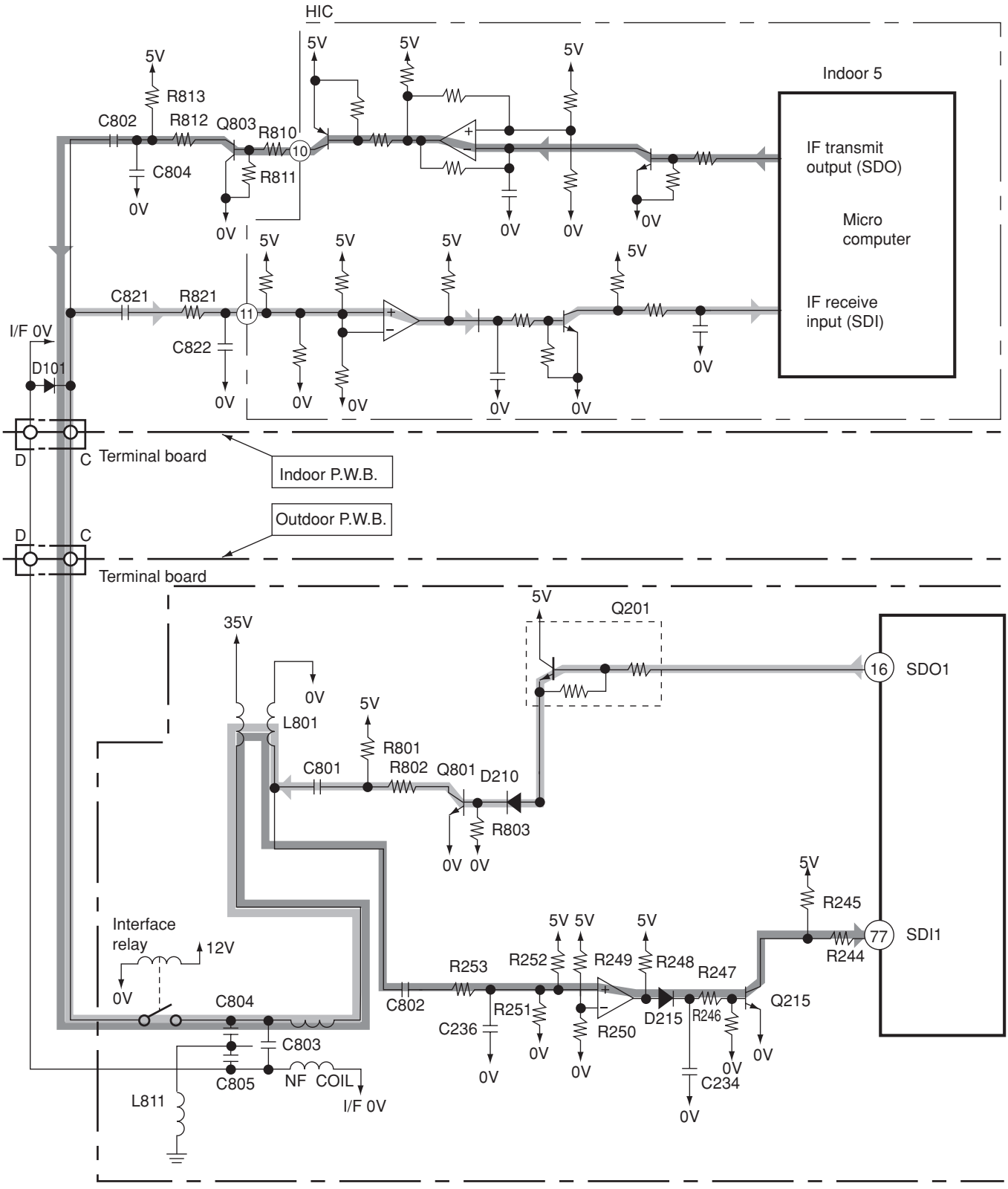


(Communications from indoor micro computer to outdoor micro computer)

(Communications from outdoor micro computer to indoor micro computer)

Fig. 2-1 Indoor / Outdoor interface Circuit 4

- Fig. 2-1 shows the interface circuit used for the indoor and outdoor microcomputers to communicate with each other.



(Communications from indoor micro computer to outdoor micro computer)

(Communications from outdoor micro computer to indoor micro computer)

Fig. 2-1 Indoor / Outdoor interface Circuit 5

3. System power Module Circuit

- Fig. 3-1 shows the system power module and its peripheral circuits. (Current ACT module and power module are combined into one unit.)
  The three transistors on the positive ⊕ side are called the upper arm, and the three transistors on the negative ⊖ side, the lower arm.

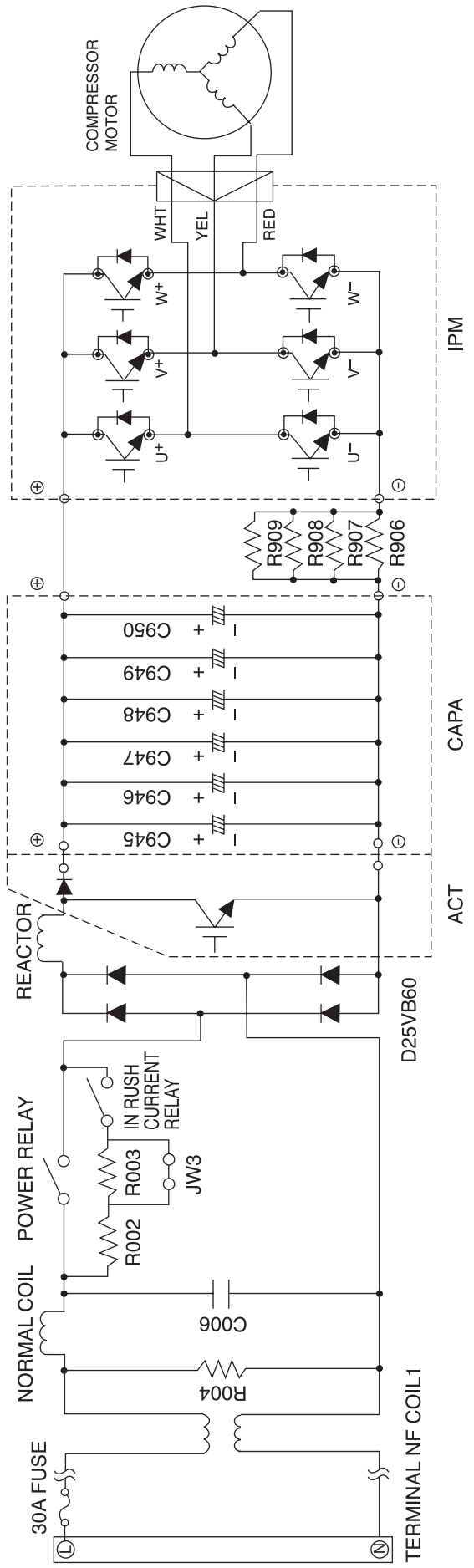


Fig. 3-1 System power module circuit (U^+ is ON, V^- is ON)

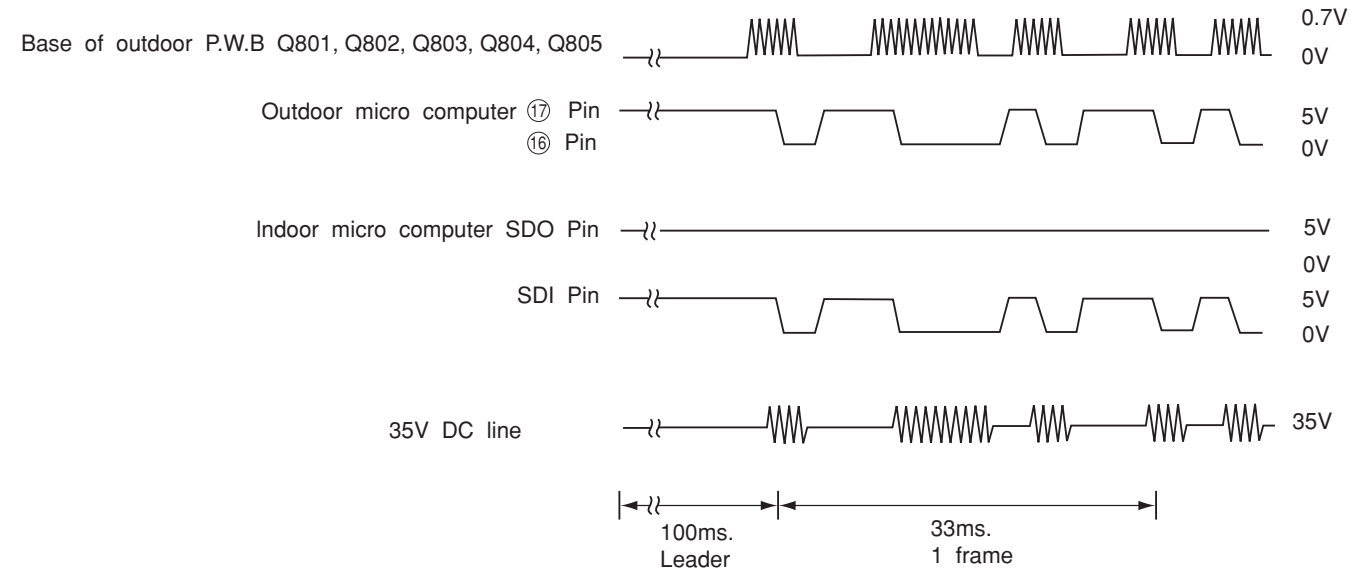


Fig. 2-2 Voltages Waveforms of indoor / Outdoor Micro computers (Outdoor to Indoor Communications)

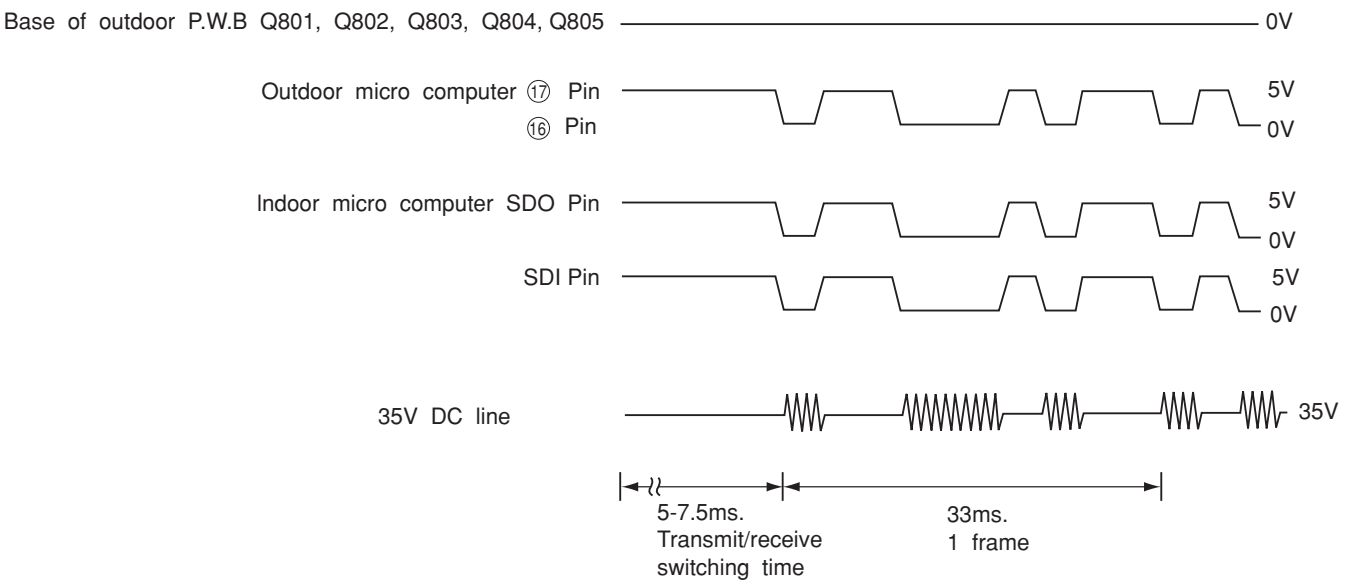


Fig. 2-3 Voltages Waveforms of indoor / Outdoor Micro computers (Indoor to Outdoor Communications)

4. Power Supply Circuit

- Fig. 4-1 shows the power circuit.

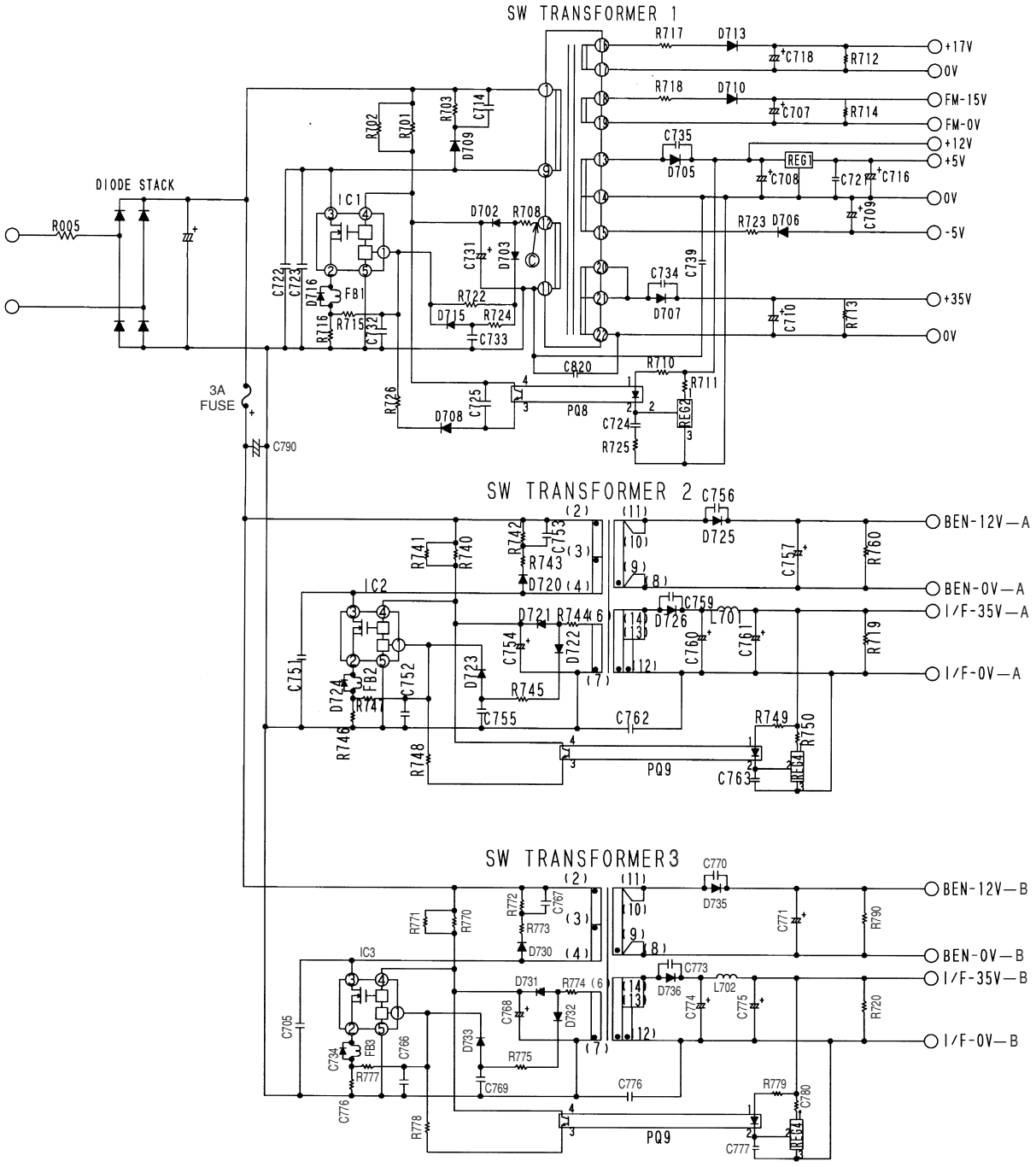


Fig. 4-1 Power circuit for P.W.B.

- There are two switching power supply in Power PWB.
- Switching power supply 1 is generating the secondary power for control circuits and DC35V for indoor unit no. 5.
- Switching power supply 2 is generating the DC12V for expansion valve and DC35V for indoor unit 1 and 2.
- Switching power supply 3 is generating the DC12V for expansion valve and DC35V for indoor unit 3 and 4.
- Switching power supply performs voltage conversion effectively by switching transistor IC1 to convert DC330V to high frequency of approximately 20kHz to 200kHz.
- Transistor IC1 operates as follows:

(1) Shifting from OFF to ON

- DC about 330V is applied from smoothing capacitors C020 ⊕ and ⊖ in the control power circuit. With this power, current flows to pin ⑦ of IC1 and IC1 starts to turn ON. Since voltage in the direction of arrow generates at point ⓒ at the same time, current passing through R705 and D702 is positive-fed back to IC1.

(2) During ON

- The drain current at IC1 increases linearly. During this period, the gate voltage and current become constant because of the saturation characteristics of the transformer.

(3) Shifting from ON to OFF

- This circuit applies a negative feedback signal from the 12V output. When the voltage across C711 reaches the specified value, current flows to PC701 ①-②. This turns the secondary circuit on, sets IC1 pin ② to "LO", and turns IC1 off.

(4) During OFF

- While IC1 is on, the following energy charges the primary windings of the transformer:

  Energy=$LI^2/2$. Here, L : Primary inductance

  I : Current when IC1 is off

  This energy discharges to the secondary windings during power off. That is, C707-C711 is charged according to the turn ratio of each winding.

- At the start, an overcurrent flows to IC1 because of the charged current at C707-C711.
- The drain current at IC1 generates a voltage across R703. If it exceeds the IC1 base voltage, it sets the IC gate voltage to "Hi".
- R706 limits the gate voltage to prevent excessive collector current from flowing to IC1.
- This SW power circuit uses a frequency as low as 20 kHz. especially at a low load (when both the indoor and outdoor units stop): This reduces power loss in standby status.

< Reference >

- If the power circuit for P.W.B. seems to be faulty:

(1) Make sure that 5V, 12V, 15V and 16V on the control P.W.B. power voltage are the specified values.

(2) When only the 5V output is low:
REG 1 (regulator) faulty, 5V-0V shorted, output is too high, or REG 1 is abnormal.

(3) When 12V and 5V are abnormal:
The following defects can be considered:
① Fan, operation, power, rush prevention relay (shorting in relay, etc.)
② REG 1 (regulator is abnormal), etc.
Shorting on primary circuits.
When shorting occurs in the secondary circuits, there is no abnormality in the primary circuits because of overcurrent protection.
The voltage rises when an opening occurs in the primary circuits, or the feedback system is abnormal.

(4) When 15V and 16V power supply is abnormal:
D708, D707 or Drive circuit is abnormal.

(5) When all voltage are abnormal:
IC1, R703, may possibly be defective. Also D cable may possibly be reverse connected.
If IC1 is abnormal, be aware that other components, such as the power module, REG (regulator), etc. are possibly defective.

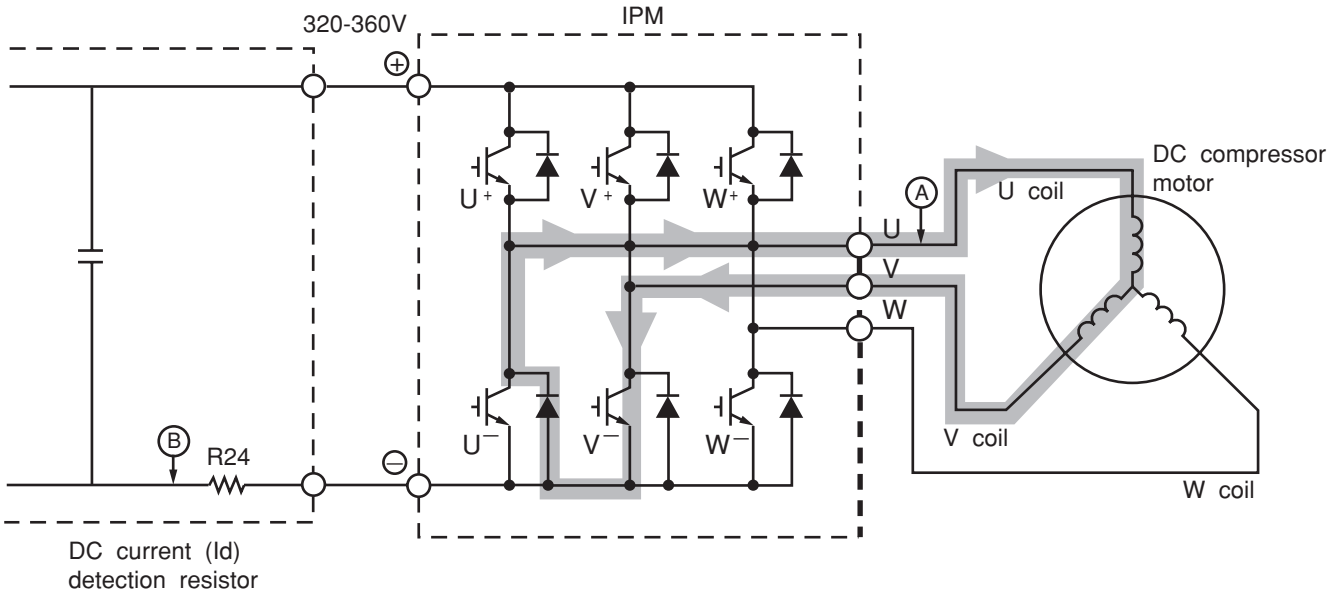


Fig. 4-2 System Power module circuit (U^+ is OFF, V^- is ON)

- Since current flows at point Ⓑ only when U+ transistor and V^- transistor is ON, the current waveform at point Ⓑ becomes intermittent waveform as shown in Fig. 4-2. Since current at point Ⓑ is approximately proportional to the input current of the air conditioner, input current is controlled by using DC current (Id) detection resistor.

< Reference >

If active module or IPM is defective, self diagnosis lamps on the power P.W.B. may indicate as shown below:

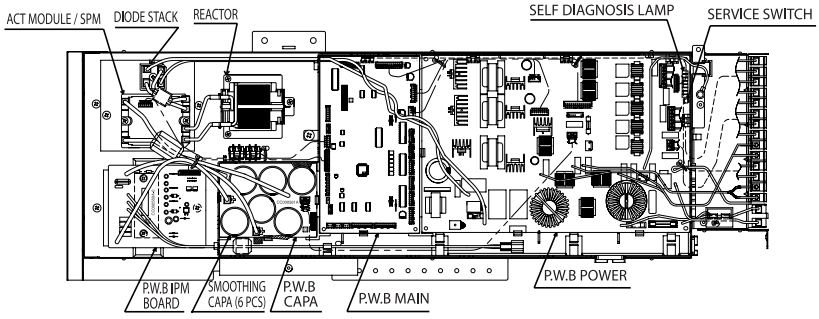


Fig. 4-5

Table 4-1

Self-diagnosis	Self-diagnosis lamp and mode	
Ip (peak current cut)	LD301	Blinks 2 times
Abnormal low speed rotation	LD301	Blinks 3 times
Switching incomplete	LD301	Blinks 4 times

※ From results of power module simple inspection (inspection mode when operated with compressor lead disconnected), LD301 blinks four times about 2 seconds later: Unit has not entered the normal operation.

5. Reversing valve control circuit

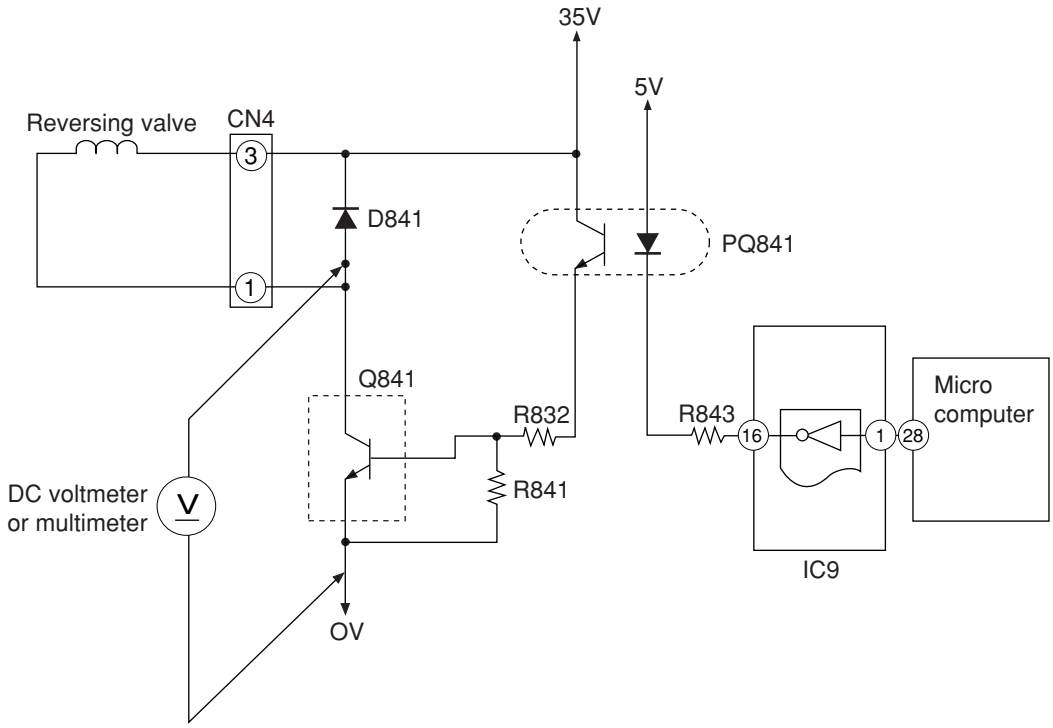


Fig. 5-1

Since the reversing valve is differential pressure system, even when reversing valve is ON (collector of Q841 is about 0.8V normally), compressor rotation speed instructed by indoor microcomputer exceeds 3300min^{-1}, signal at pin of ㉘ microcomputer changes, and collector voltage of Q841 will be about 35V. This does not indicate trouble. When rotation speed is reduced under 2700min^{-1}, collector voltage of Q841 will fall to about 0.8V again. To measure voltage, connect ⊕ terminal of tester to D841 anode and ⊖ terminal to D line on the terminal board.

- By reversing valve control circuit you can switch reversing valve ON/OFF (cooling ON) according to instruction from indoor microcomputer and depending on operation condition.

  Voltage at each point in each operation condition is approximately as shown below when measured by tester. (When collector voltage of Q831 is measured)

Table 5-1

Operation condition		Collector voltage of Q841
Cooling	General operation of cooling	About 0.8V
Heating	In normal heating operation	About 35V
	MAX. rotation speed instructed by indoor microcomputer after defrost is completed	About 35V
	Defrosting	About 0.8V
Dehumidifying	Sensor dry	About 0.8V

6. Overload control circuit (OVL control circuit)

- Overload control is to decrease the speed of the compressor and reduce the load when the load on the air conditioner increases to an overload state, in order to protect the compressor, electronic components and power breaker.
- Overloads are judged by comparing the DC current level and set value.
- Fig. 6-1 shows the overload control system configuration and Fig. 6-2 is a characteristic diagram of overload judgement values. There are two judgement methods-external judgement which mompares the externally set value with the DC current value regardless of the rotation speed and internal judgement which compares the set value that according to the rotation speed programmed in the micro computer software with the DC current value.

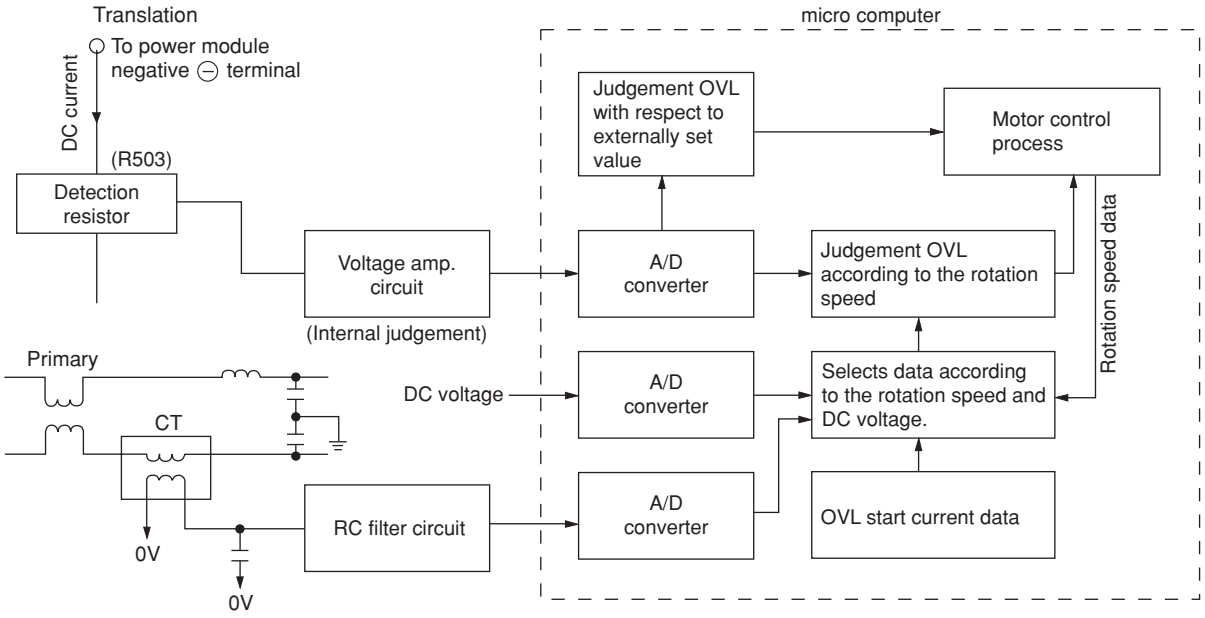


Fig. 6-1 Overload Control System Configuration

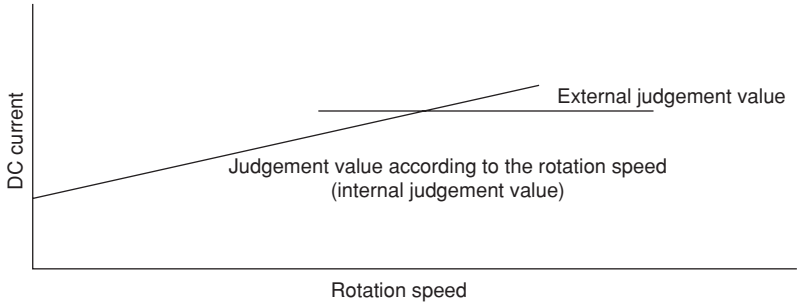


Fig. 6-2

7. Reset circuit

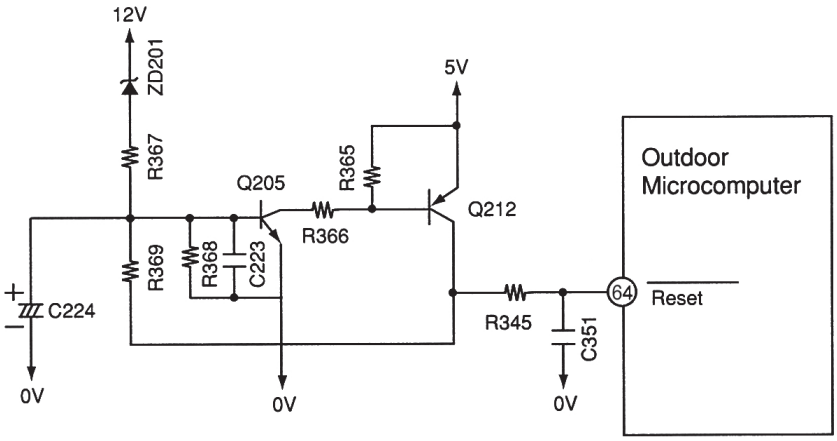


Fig. 7-1

- Reset circuit performs initial setting of microcomputer program when power is turned on.
- Microcomputer resets program with reset voltage set to Lo, to enable operation at Hi level.
- Fig. 7-1 shows reset circuit, and Fig. 7-2 shows waveforms at each point when power is turned on and off.
- After power is turned on, 12V line and 5V line voltages rise: When 12V line voltage reaches 7.2V (Zener voltage of ZD201) ZD201 turns ON and Q212 and Q205 turn on, and reset voltage becomes Hi. Reset voltage is not set to Hi until VDD of microcomputer rises to 5V, enabling operation, due to ZD201.
- After power turns off, when 12V line voltage drops, ZD201 also turns OFF.

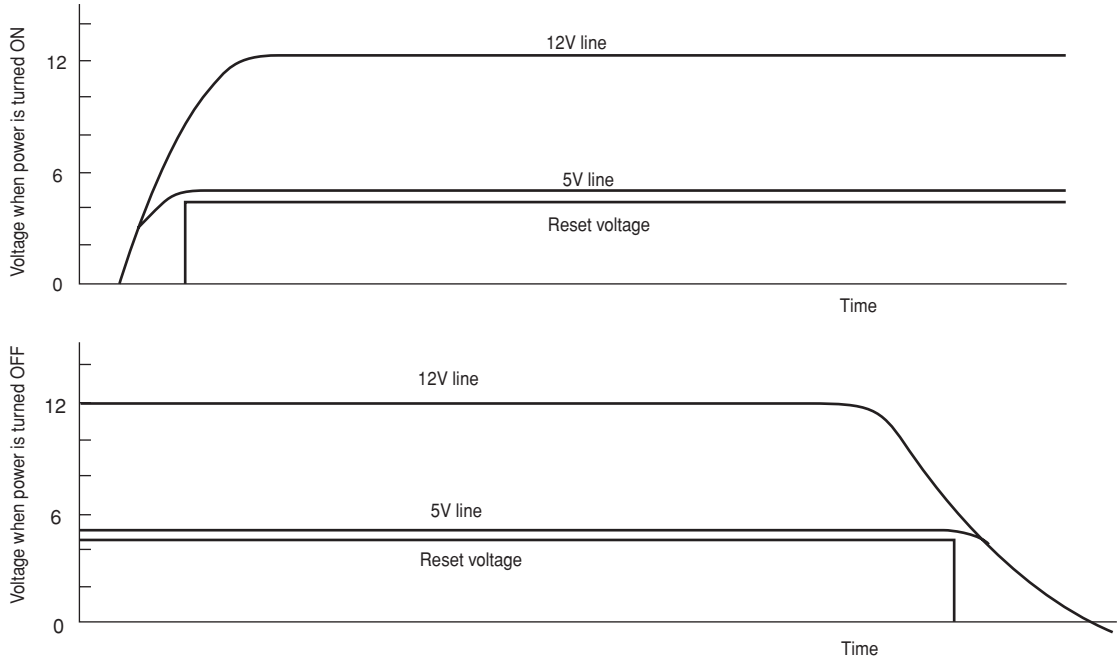


Fig. 7-2

8. Temperature Detection Circuit

- The outdoor units (this model) provides with the outdoor temperature thermistor, DEF (defrost) thermistor, OH (overheat) thermistor and electric expansion valve thermistor so that they detect the temperatures of the unit and control the system.
- The circuit of the thermistors is shown as Fig. 8-1 for model RAM-90QH5 and their roles and temperature measuring points are shown as Table 8-1.

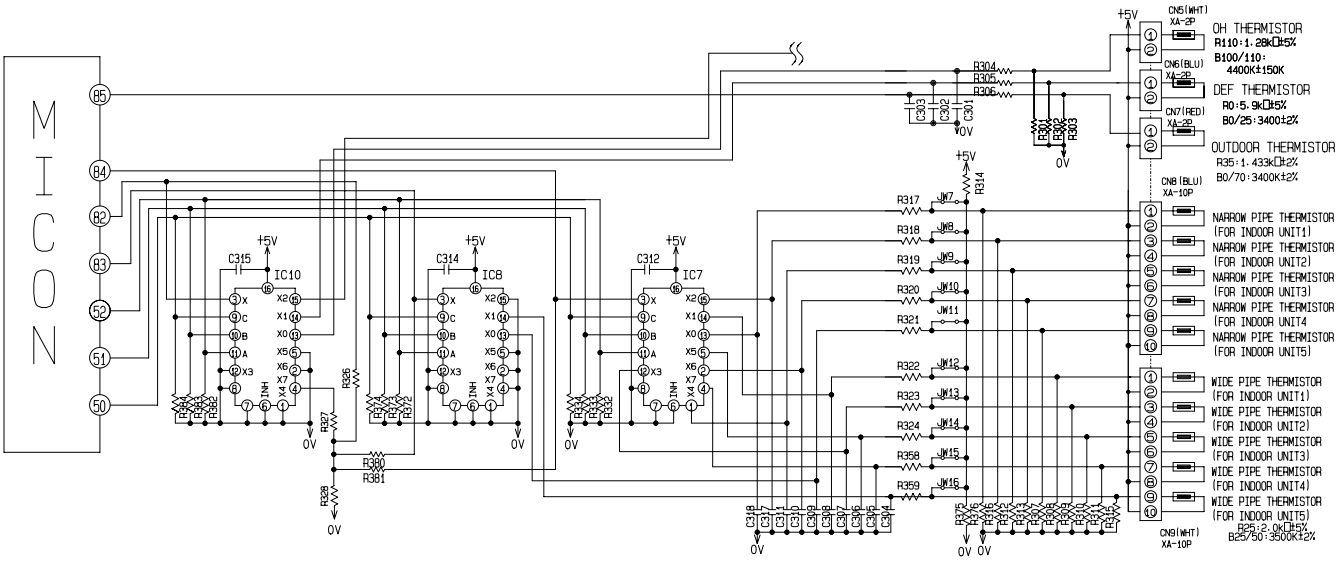


Fig. 8-1 Temperature Detection Circuit

Table 8-1 Name and Role of each thermistor

Name	Connector No	Measuring Point	Role
OH thermistor	CN5	Compressor head	If the temperature of the compressor rises abnormally (118˚C), the compressor will be stopped. The temperature is used to decide the operation of the valve.
DEF thermistor	CN6	Heat exchanger	The thermistors decide the defrost operation during heating combined the data of the outside temperature and its data.
Outdoor temperature thermistor	CN7	Outside temperature	Outdoor temperature is used to decide the various operations of the air conditioner.
Electric expansion valve thermistor (NARROW PIPE 1)	CN8	Indoor unit 1 (NARROW PIPE)	The thermistors detect the temperatures of the piping to the indoor units. The temperatures are used to decide how much the expansion valve is opened.
Electric expansion valve thermistor (NARROW PIPE 2)		Indoor unit 2 (NARROW PIPE)	
Electric expansion valve thermistor (NARROW PIPE 3)		Indoor unit 3 (NARROW PIPE)	
Electric expansion valve thermistor (NARROW PIPE 4)		Indoor unit 4 (NARROW PIPE)	
Electric expansion valve thermistor (NARROW PIPE 5)		Indoor unit 5 (NARROW PIPE)	
Electric expansion valve thermistor (WIDE PIPE 1)	CN9	Indoor unit 1 (WIDE PIPE)	
Electric expansion valve thermistor (WIDE PIPE 2)		Indoor unit 2 (WIDE PIPE)	
Electric expansion valve thermistor (WIDE PIPE 3)		Indoor unit 3 (WIDE PIPE)	
Electric expansion valve thermistor (WIDE PIPE 4)		Indoor unit 4 (WIDE PIPE)	
Electric expansion valve thermistor (WIDE PIPE 5)		Indoor unit 5 (WIDE PIPE)	

- Table 8-2 shows the correspondence between the thermistor's resistance and the temperature. They should be used as reference values. The value, which you measure, may be slightly difference from that in the table. It depends on the instrument.
- When you measure the resistance, pull out the connector after turning off the power supply. Pulling out the connector while the power supply is turned on will cause troubles.

Table 8-2 Correspondence between each thermistor's resistance and temperature (reference value)

Electric expansion valve thermistor DEF thermistor	Temperature	Resistance	Microcomputer pin potential
	-15˚C	12.6kΩ	1.0V
	0˚C	6.1kΩ	1.7V
	25˚C	2.2kΩ	3.0V
	50˚C	860Ω	3.9V
	75˚C	400Ω	4.4V
Outdoor temperature thermistor	Temperature	Resistance	Potential
	-15˚C	12.6kΩ	1.0V
	0˚C	6.1kΩ	1.7V
	15˚C	3.2kΩ	2.4V
	30˚C	2kΩ	3.1V
OH thermistor	Temperature	Resistance	Potential
	25˚C	33.9kΩ	0.5V
	50˚C	10.8kΩ	1.3V
	75˚C	4.1kΩ	2.4V
	100˚C	1.7kΩ	3.4V
	105˚C	1.5kΩ	3.6V
	118˚C	1kΩ	3.9V

- When the connectors of the thermistors are disconnected or the thermistors is open or short, LD301 (red) lights and LD302 (red) blinks so that they indicate troubled parts. Combinations of LD301 and LD302 are set up for indicating troubled thermistors. The correspondences between the number of blink time and troubled parts are shown as Table 8-3. Look in the table (LD301 and LD302 blink) for troubled parts, and if the disconnections of them are checked out, they are replaced.

- If you can see two or more troubled thermistors, a small number of blink takes precedence of others.

- The electric expansions valve thermistor is put togrther with 3 pieces, when replacing the thermistor, replace one set of 3 pieces as taking care of positioning. If you don't do so, the unit may not operate normally and its cooling and heating performance may drop.

- Be ware that only an open-circuit for OH thermistor has to be checked in 5 minutes after the compressor starts.

- If the unit operates abnormally after replacing the thermistor, replace the control P.W.B. because it malfunctions.

Table 8-3 LED lighting mode at the thermistors troubled

LED lighting mode		Troubled thermistor	Judgement	
LD301	LD302		Open	Short
Lights	1 blink	OH thermistor	0.04V or less	4.96V or more
Lights	2 blinks	DEF thermistor		
Lights	3 blinks	Outdoor temperature thermistor		
Lights	4 blinks	Electric expansion value thermistor (narrow pipe 1)		
Lights	5 blinks	Electric expansion value thermistor (wide pipe 1)		
Lights	6 blinks	Electric expansion value thermistor (narrow pipe 2)		
Lights	7 blinks	Electric expansion value thermistor (wide pipe 2)		
Lights	8 blinks	Electric expansion value thermistor (narrow pipe 3)		
Lights	9 blinks	Electric expansion value thermistor (wide pipe 3)		
Lights	10 blinks	Electric expansion value thermistor (narrow pipe 4)		
Lights	11 blinks	Electric expansion value thermistor (wide pipe 4)		
Lights	12 blinks	Electric expansion value thermistor (narrow pipe 5)		
Lights	13 blinks	Electric expansion value thermistor (wide pipe 5)		

- The OH thermistors are detecting the compressor head temperatures. If the temperature rises over 118°C, the compressor in the cycle will be stopped to protect itself and LD301 will blink 6 times (OH STOP). When the compressor temperature fells under 105°C, the compressor will restart. During OH STOP, the fan continues to spin. The other cycles without a trouble operates normally.

- If OH STOP often occurs, the refrigerant may be leaking.

9. Electric expansion valve

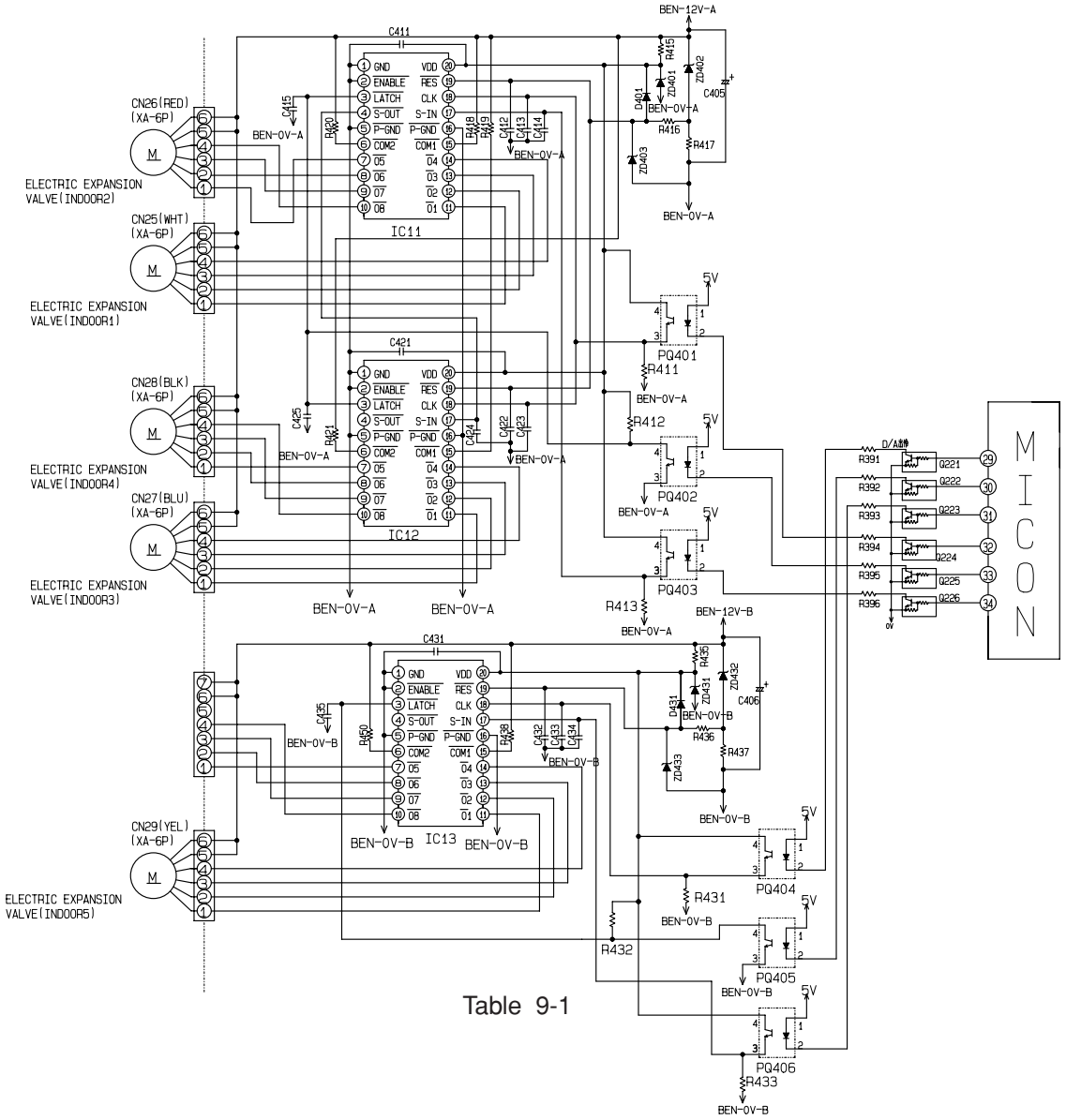


Table 9-1

- The electric expansion valve is driven by DC 12V. Power is supplied to 1 or 2 phases of 4-phase winding to switch magnetic pole of winding in order to control opening degree.
- Relationship between power switching direction of phase and open/close direction is shown below.
  When power is supplied, voltages at pins 4 to 1 of CN25~CN29 are about 0.9V; they are about 12V when no power is supplied. When power is reset, initialization is performed for 10 or 20 seconds.
  During initialization, measure all voltages at pins 4 to 1 of CN25~CN29 using mutimeter. If there is any pin with voltage that has not changed from around 0.9V or 12V, expansion valve or microcomputer is defective.
- Fig. 9-2 shows logic waveform when expansion valve is operating.

Table 9-2

Pin phase No.	Lear wire	Drive status							
		1	2	3	4	5	6	7	8
④	White	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
③	Yellow	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
②	Orange	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
①	Blue	OFF	OFF	OFF	OFF	OFF	ON	ON	ON

Operation mode
1→2→3→4→5→6→7→8 VALVE CLOSE
8→7→6→5→4→3→2→1 VALVE OPEN

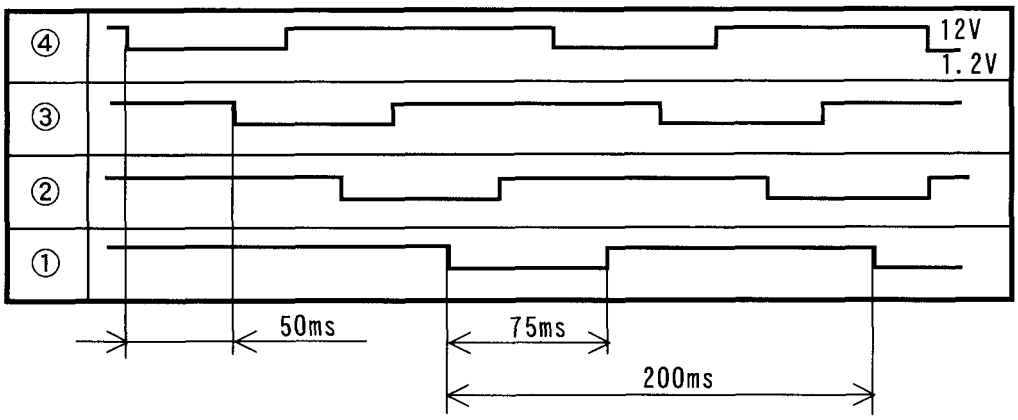


Fig. 9-2

With expansion valve control, opening degree is adjusted to stabilize target temperature, by detecting temperature of compressor head.
The period of control is about once per 20 seconds, and output a few pulses.

- 3 pices (IC11-IC13) of 8 bit type shift resistor latching driver IC is using in this circuit, which convert the serial input in to parallel output.
- Explain the circuit operation of the electric expansion valve using the Fig. 11-3, 4 time chart

① Clock signal (750μs/12cycle) output from Micon pin (32), (29)
(1cycle of clock signal = off : 500μs, on : 250μs)
② Driving serial signal #1 output from Micon pin (34), (31) same phase as clock signal
#1.... Serial signal is the method of current conducting only 1 or 2 phase out of 4 phase of windings of the electric expansion valve.

Due to the above ①, ② operation the internal shifting resistor value be updated.
After 250μs of the output ON signal of 12th cycle of clock signal.
③ Latch signal from the Micon pin (33), (30) be OFF (LOW level 500μs), and again be ON (HI level)
④ After the necessary current conducting time if the electric expansion valve operation is necessary return to ① and repeat this operation.

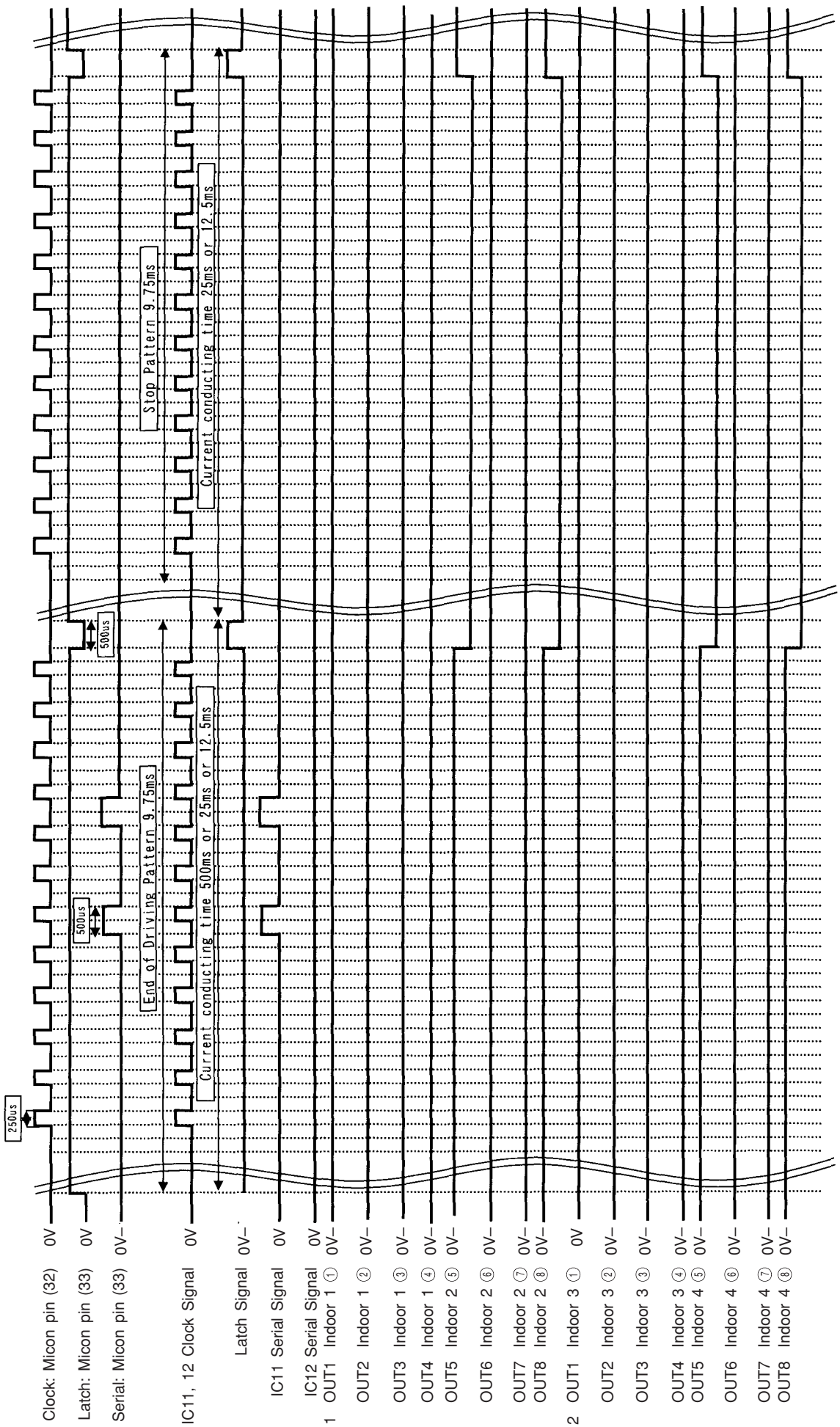


Fig. 9-3 Time Chart

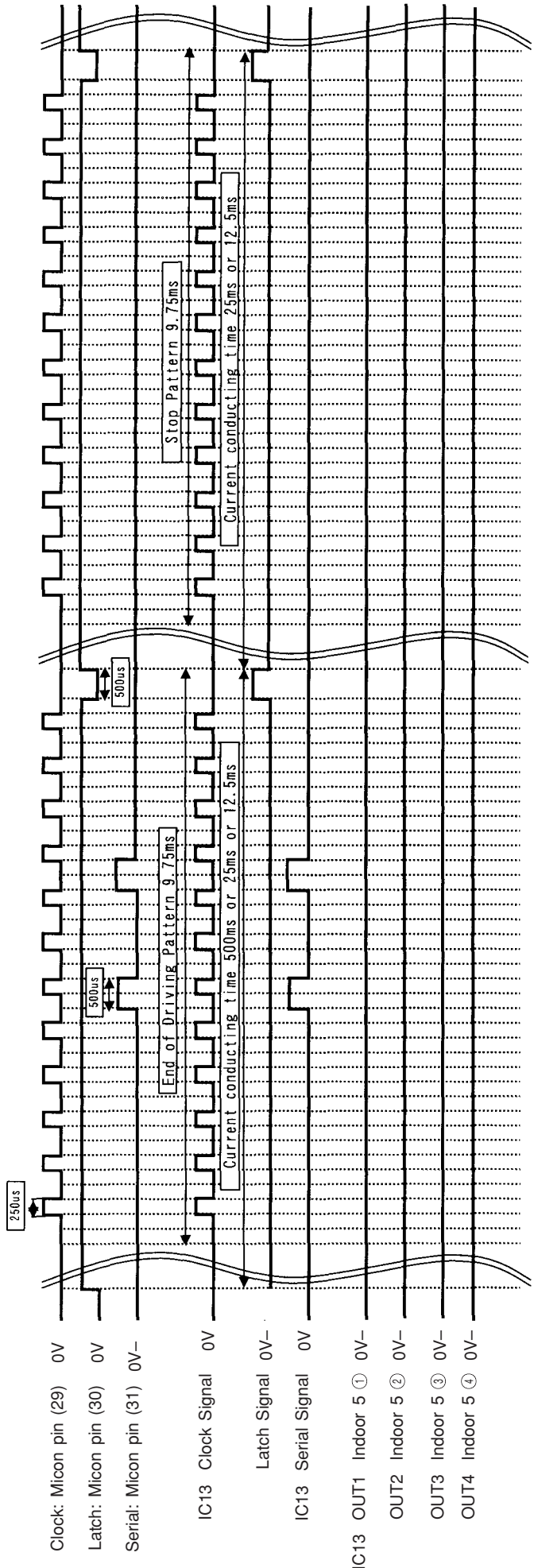
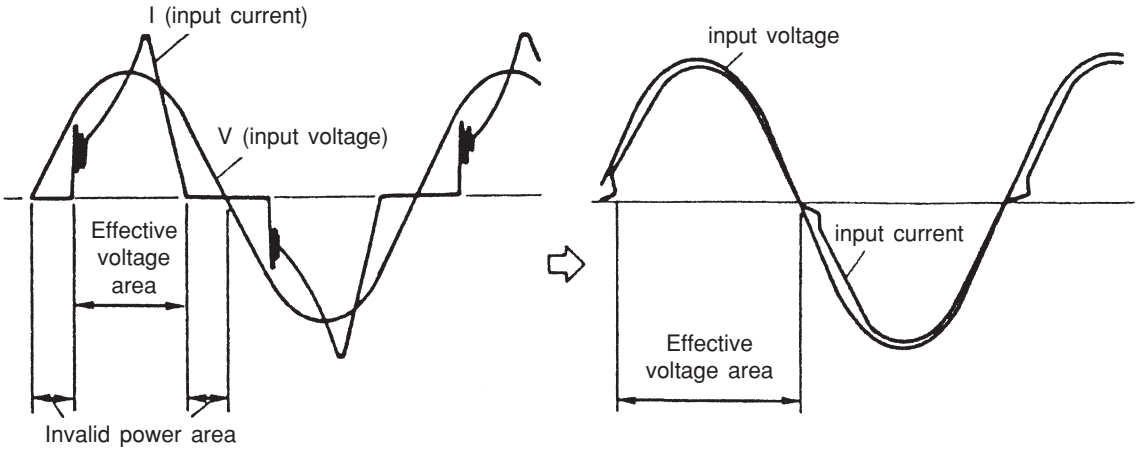


Fig. 9-4 Time Chart

10. Power Factor Control Circuit

Power factor is controlled by almost 100%. (Effective use of power)
With IC in ACT module, control is performed so that input current waveform will be similar to waveform of input voltage.



*Assuming the same current capacity (20A), power can be used about 10% effective, comparing with curent use (power factor of 90%), and maximum capacity is thereby improved.

INSPECTING OUTDOOR ELECTRICAL PARTS

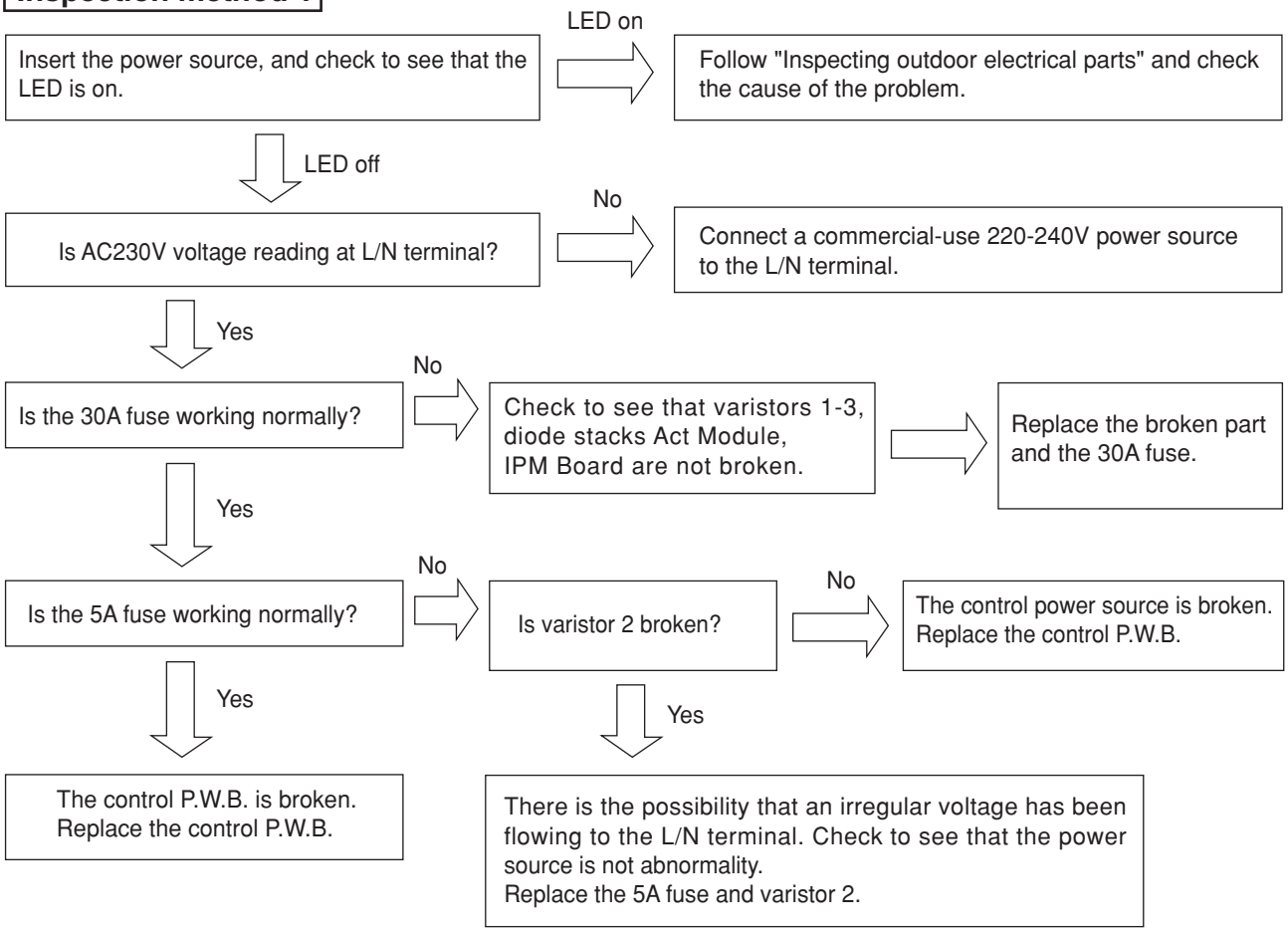
• Check to see that the LED is either on or blinking.
• Carry out inspections by examining the on/blinking status of LEDs 301-303.

LED number	LD301	LD302	LD303	Status	Checkpoints
Name	Diagnosis lamp 1	Diagnosis lamp 2	Communications lamp		
Case 1	Off	Off	Off	Normal off status or unconnected microcomputer power source	If the LED is not on even when the power source is connected the microcomputer power source is unconnected. → Inspection method 1
Case 2	Blinks once	Off	Off	Microcomputer reset status (immediately after inserting power source or immediately after power source abnormally)	If is normal for LD301 to blink once after the power source has been inserted. If the unit stops when it is in operation and LD301 blinks once, it is possible that the power source has been temporarily interrupted by lightning or for some other reason. Replace the control PCB if this occurs frequently.
Case 3	Blinks	Off	Off	Abnormally stop	Abnormally stop is shown by the number of times the LED blinks. → Inspection method 2
Case 4	On	Blinks	Off	Thermistor abnormally	Thermistor abnormally is shown by the number of times the LED blinks. → Inspection method 3
Case 5	Off	Off	On	Normal operation	Normal operation
Case 6	On	Off	On	OVL1 operation	Normal operation
Case 7	Off	On	On	OVL2 operation	Normal operation
Case 8	On	On	On	OVL3 operation	Normal operation

● Carry out inspections by examining the on/blinking status of LEDs 304-308.

LED NO.	LD304	LD305	LD306	LD307	LD308	Status	Checkpoint
Name	Communication Lamp	Communication Lamp	Communication Lamp	Communication Lamp	Communication Lamp		→ Inspection methody 4
Case 9	Off	On	On	On	On	Communication error	Check the connection of indoor unit 1 (C1, D1)
Case 10	On	Off	On	On	On	Communication error	Check the connection of indoor unit 2 (C2, D2)
Case 11	On	On	Off	On	On	Communication error	Check the connection of indoor unit 3 (C3, D3)
Case 12	On	On	On	Off	On	Communication error	Check the connection of indoor unit 4 (C4, D4)
Case 13	On	On	On	On	Off	Communication error	Check the connection of indoor unit 5 (C5, D5)

Inspection method 1



Inspection method 2

Check the number of times LD301 blinks.

LD301: Blinks once / Reset stop — Yes → The power source or some other reason may have caused the microcomputer to reset. Replace the control P.W.B. if the LED blinks once and then stops frequently during operation.
* The LED blinks once after the power source has been inserted.

No

LD301: Blinks twice / Peak current cut — Yes → Is LD302 blinking?

Blinks twice → The IPM board is broken. Replace the IPM board.

Doesn't work even after the IPM board is replaced. → If the unit doesn't work even after the IPM board is replaced, the drive circuit may be broken or the CN34 cable may be cut. Check to see that an electrical current is flowing through the CN34 cable.

Cable abnormally → Replace the CN34 cable.

No cable abnormally → Replace the MAIN P.W.B..

Doesn't blink → Check to see the approximate length of time it takes for the compressor to stop after switching on and operating two or three times.
* Wait for three minutes or more before operating.

Restarts quickly every time. → The IPM board is broken. Replace the IPM board.

Takes several minutes to restart. → There is the possibility that the cycle load has become heavy and the compressor has come loose. Check the compressor.
* In this case the LED may blink three times before stopping.

No

LD301: Blinks three times / Low speed — Yes → Check to see the approximate length of time it takes for the compressor to stop after switching on and operating two or three times.
* Wait for three minutes or more before operating.

Restarts quickly every time. → The wire from the IPM board to the compressor loose or broken, or has it been connected improperly?

Cable abnormally → In the case that one of the compressor cables has become loose (or broken), the compressor may work even if it is missing a phase. The compressor occasionally operates in reverse if one of the compressor cables has been connected improperly. Replace the cable or rewire as appropriate.

No abnormally → The IPM board may be broken. Replace the IPM board.

Doesn't work even after the IPM board is replaced. → If the unit doesn't work even after replacing the IPM board, the drive circuit may be broken. Replace the MAIN P.W.B..

Takes several minutes to restart. → There is the chance that the cycle load has become heavy and the compressor has come loose. Check the compressor.
* In this case the LED may blink twice before stopping.

No

LD301: Blinks four times / Switch failure — Yes → Check to see that the MAIN P.W.B. has 16V.
* Be sure to check the correct points for measuring.

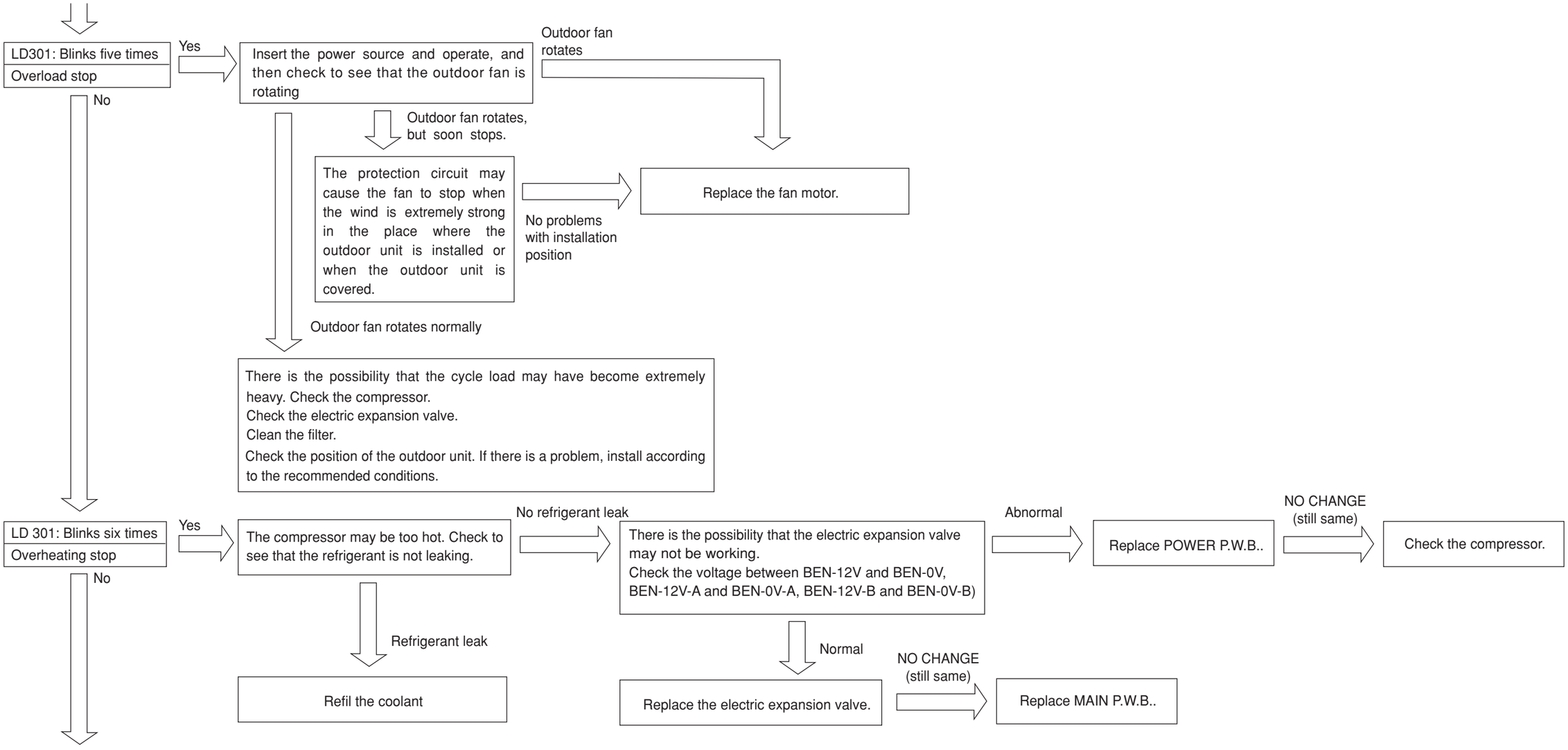
O.K. (15-17.5V) → Check the connecting wire between compressor - IPM board, Capa board. IPM board and Capa board - Act module, has it been connected properly?

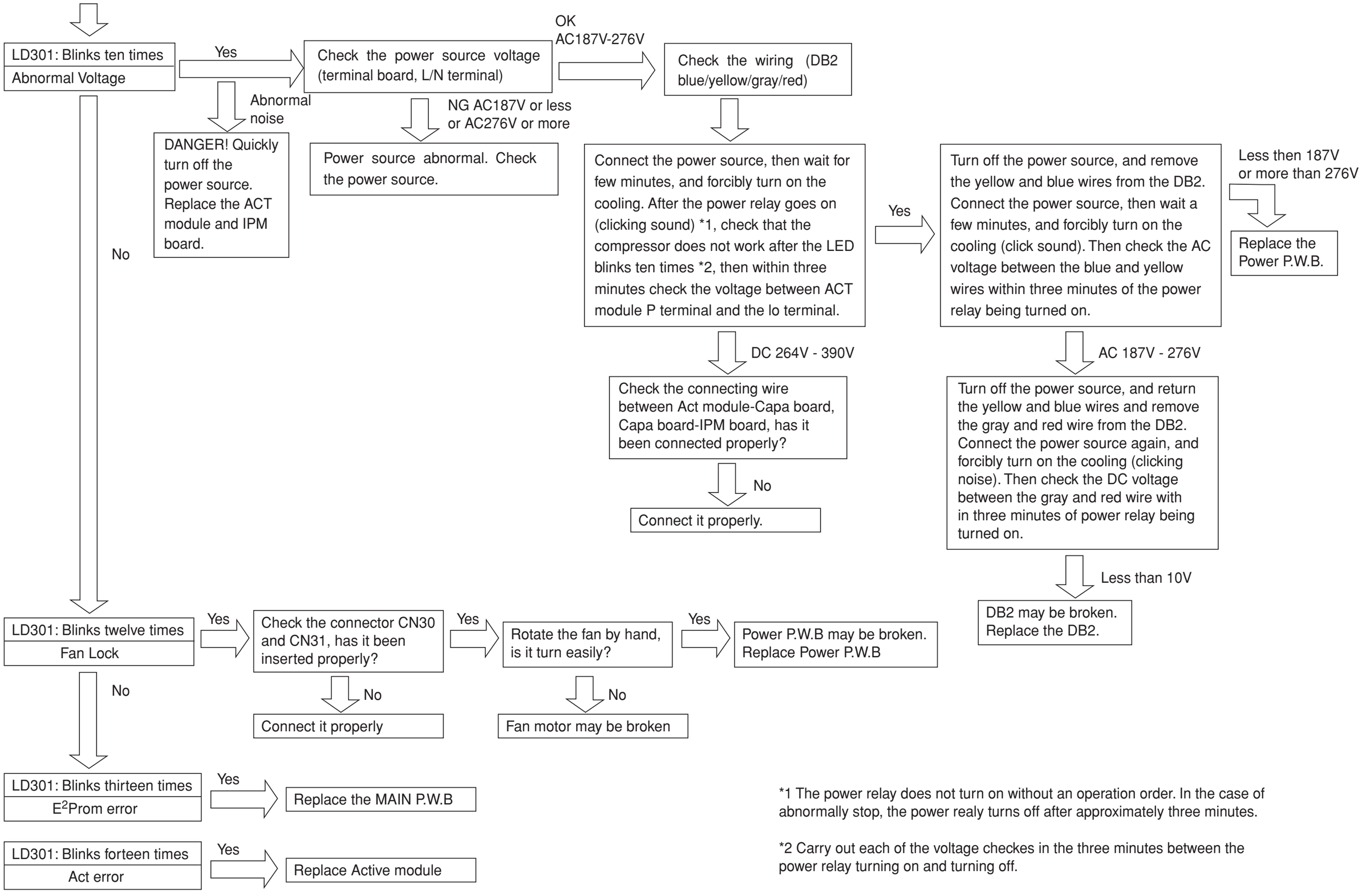
Cable abnormally → The compressor switch fails if two or more compressor cables are loose (or broken).
There is the possibility that the compressor will not operate if the compressor cables have been connected improperly.
Replace the cable or rewire as appropriate.

No abnormally → The IPM board may be broken. Replace the IPM board.

Doesn't work even after the IPM board is replaced. → If the unit doesn't work even after replacing the IPM board, the position detection circuit may be broken. Replace the MAIN P.W.B..

abnormally → The power source circuit is broken. Replace the control P.W.B..

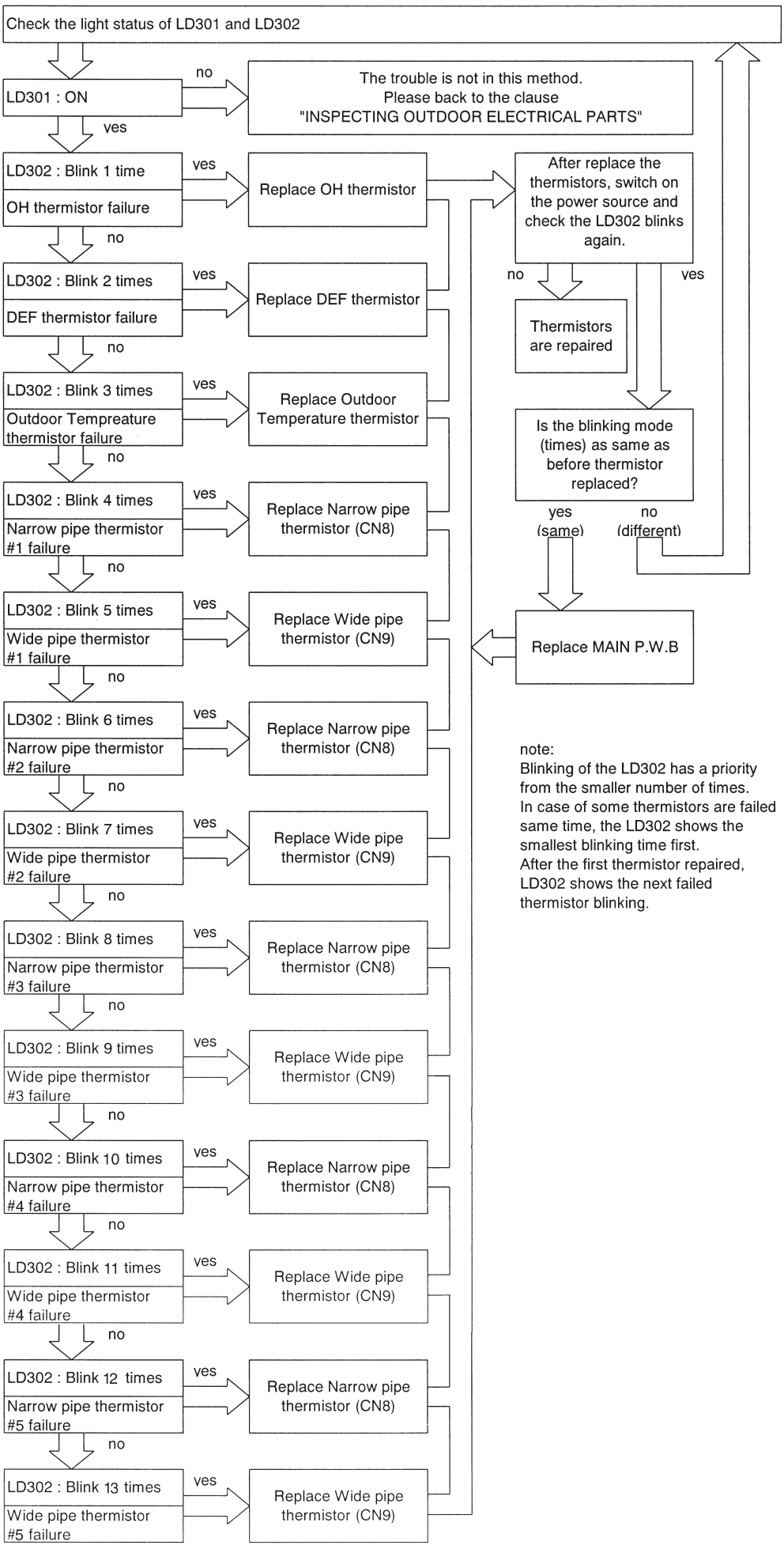

LD301: Blinks five times
Overload stop
Yes
Insert the power source and operate, and then check to see that the outdoor fan is rotating
Outdoor fan rotates
Outdoor fan rotates, but soon stops.
The protection circuit may cause the fan to stop when the wind is extremely strong in the place where the outdoor unit is installed or when the outdoor unit is covered.
No problems with installation position
Replace the fan motor.
Outdoor fan rotates normally
There is the possibility that the cycle load may have become extremely heavy. Check the compressor.
Check the electric expansion valve.
Clean the filter.
Check the position of the outdoor unit. If there is a problem, install according to the recommended conditions.
No
LD 301: Blinks six times
Overheating stop
Yes
The compressor may be too hot. Check to see that the refrigerant is not leaking.
Refrigerant leak
Refil the coolant
No refrigerant leak
There is the possibility that the electric expansion valve may not be working.
Check the voltage between BEN-12V and BEN-0V, BEN-12V-A and BEN-0V-A, BEN-12V-B and BEN-0V-B)
Normal
Replace the electric expansion valve.
NO CHANGE (still same)
Replace MAIN P.W.B..
Abnormal
Replace POWER P.W.B..
NO CHANGE (still same)
Check the compressor.



*1 The power relay does not turn on without an operation order. In the case of abnormally stop, the power realy turns off after approximately three minutes.

*2 Carry out each of the voltage checkes in the three minutes between the power relay turning on and turning off.

Inspection method 3



note:
Blinking of the LD302 has a priority from the smaller number of times.
In case of some thermistors are failed same time, the LD302 shows the smallest blinking time first.
After the first thermistor repaired, LD302 shows the next failed thermistor blinking.

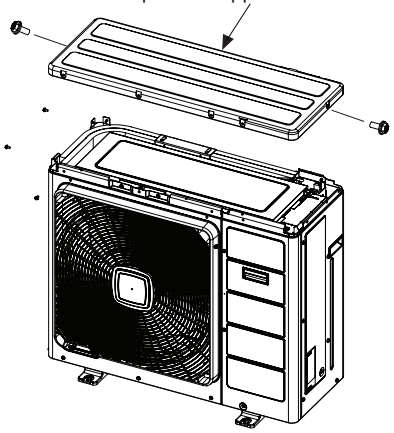
HOW TO OPERATE USING THE SERVICE SWITCH THE OUTDOOR UNIT

MODEL RAM-90QH5

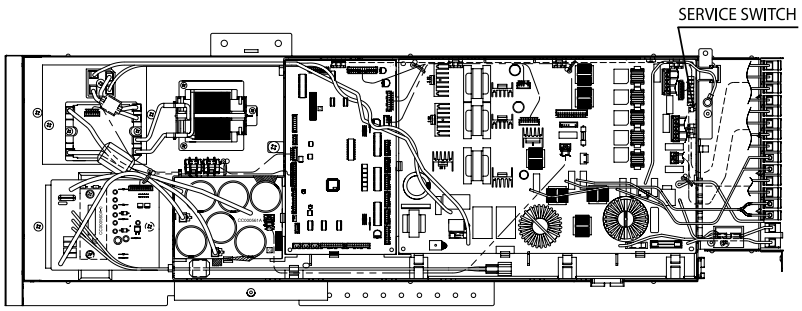
1. Turn the Power switch off and then turn on again.
2. Remove the electrical parts cover.
3. Press the service switch for one second or more (wait for at least 30 seconds after turning the power source switch on).

Never operate the unit in this state for more than 5 minutes.

Open the upper cover



Service switch
(forced-cooling mode is set by pressing for 1 second or more, and stopped by pressing again.)



(Cautions)

(1) If interface signal (35V DC) terminals C1D1-C5D5 are not connected when the outdoor unit service switch is used for checking, the outdoor unit defects indicator (LD304-LD308) will blink to indicate communication error.

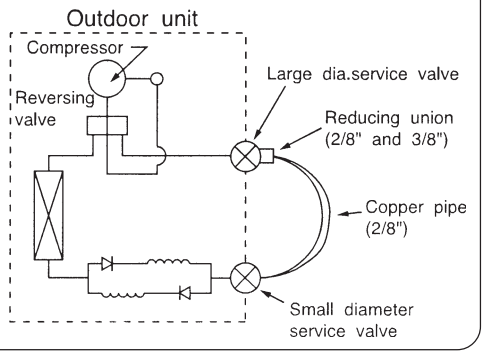
(2) If you do this with the compressor connector in a removed state, LD301 will blink four times, and the unit will not work.

HOW TO OPERATE THE OUTDOOR UNIT INDEPENDENTLY

1. Connect the large dia. pipe side and small dia. pipe side service valves using a pipe.

Connect the small diameter service value and the large diameter service valve using the reducing union and copper pipe as shown on the right.

Charge refrigerant of 300g after vacuuming (※1)



Parts to be prepared

(1) Reducing union
2/8" (6.35mm)
3/8" (9.52mm)

(2) Copper pipe (2/8" and 3/8")

Do not operate for 5 minutes or more

The operation method is the same as "How to operate using the connector to servicing the outdoor unit"

※ 1 The charging amount of 300g is equivalent to the load in normal operation.

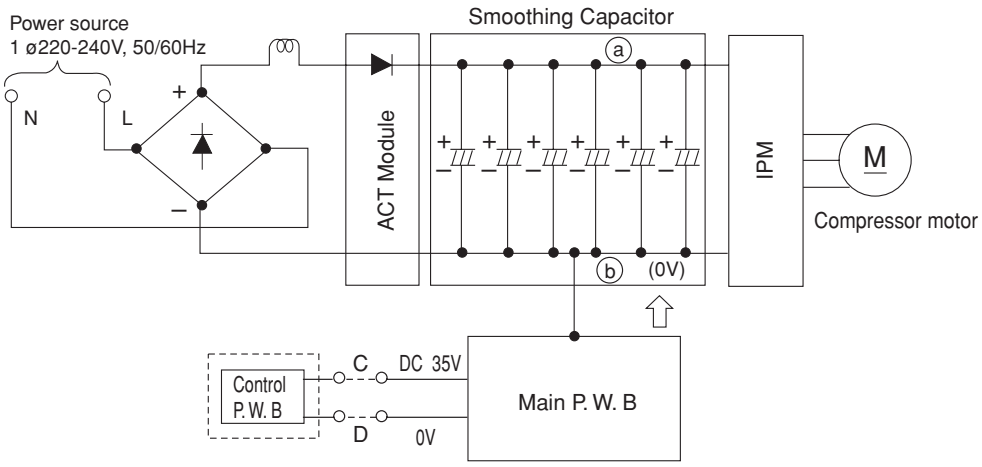
TROUBLE SHOOTING

Model RAM-90QH5

PRECAUTIONS FOR CHECKING

DANGER

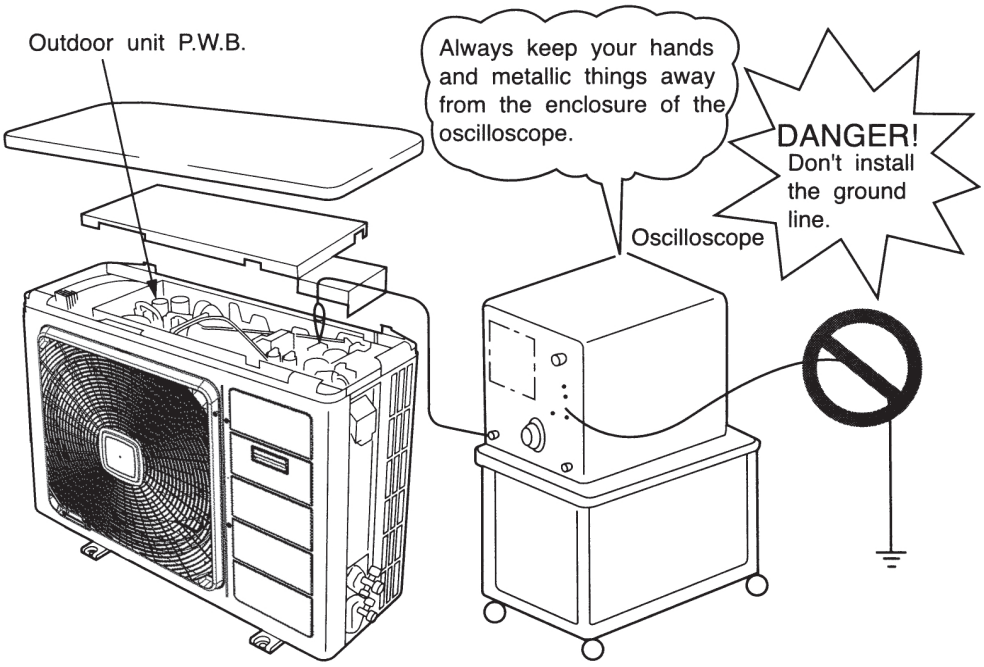
1. Remember that the 0V line is biased to 162V in reference to the ground level.
2. Also note that it takes about 10 minutes until the voltage fall after the power switch is turned off.



Across ⓐ – ⓑ (0V line)..... approx 360V
Across ⓐ – ground..... approx 155-170V
Across ⓑ (0V line)– ground..... approx 155-170V

DANGER

When using an oscilloscope, never ground it. Don't forget that high voltages as noted above may apply to the oscilloscope.



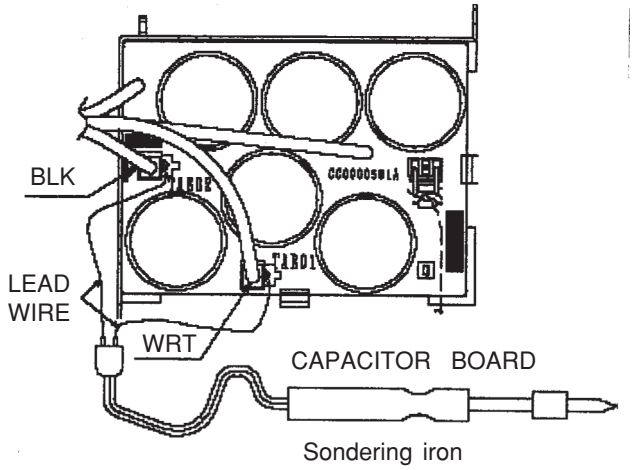
Discharge procedure and how to cut off power to power circuit

WARNING

Caution

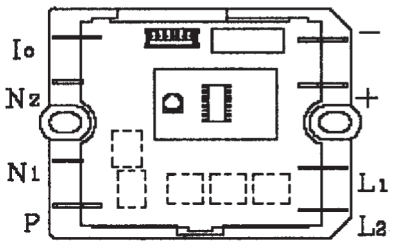
- Voltage of about 360V is charged at both ends of smoothing capacitor 330μF x 6.
- High voltage (DC 360V) is also charged at terminal sections of ACT module and power module.
- During continuity check of each circuit of electrical parts in outdoor unit is performed, to prevent secondary trouble, disconnect red/gray wire connected to ACT module from diode stack. (Also be sure to perform discharging of smoothing capacitor.)

1. Disconnect power plug.
2. Wait for 10 minutes or more after power is turned off and then remove electrical parts box lid. As shown below. Apply soldering iron of 30-75W for 15 seconds or more to P1 and N1 black/white lead receptacles on Capa board to discharge voltage from smoothing capacitor.
   Do not loosen or remove screws of system power module: If screw is loose, voltage will not be discharged.
3. Before operation check of each part of circuit, remove receptacle of red/gray lead connected to ACT module from diodde stack.

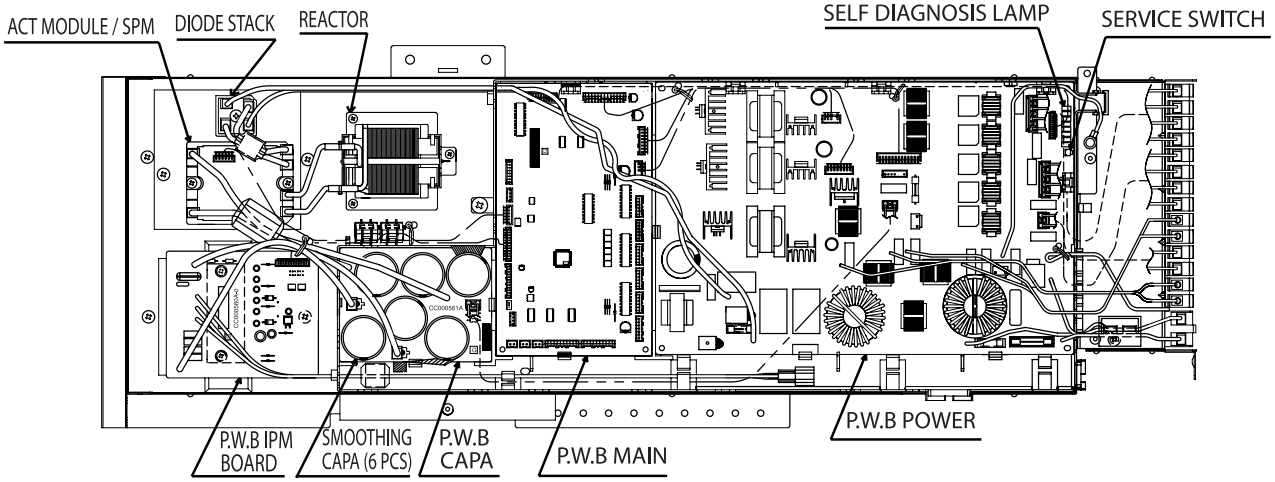


Do not use soldering iron with transformer: Doing so will blow thermal fuse inside transformer.

As shown left, apply soldering iron to metal parts TAB 01 P and TAB 02 terminals of Capa board.



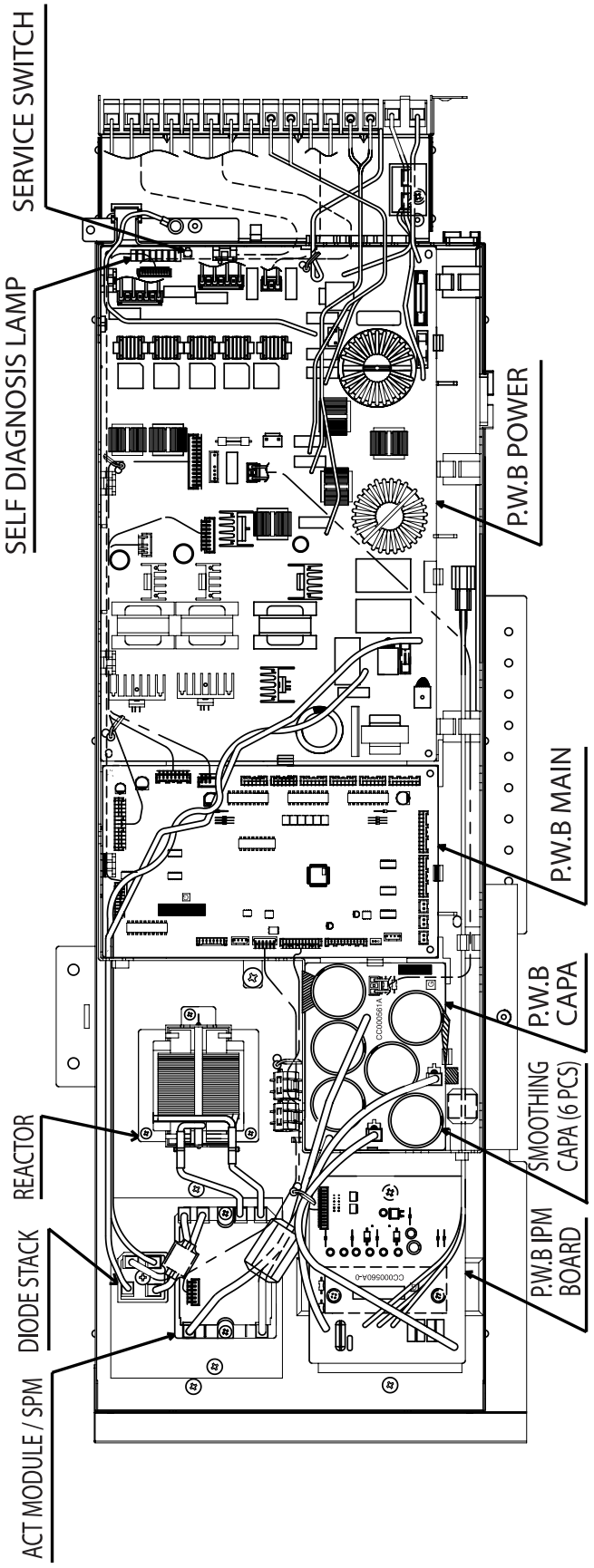
Terminals of ACT module



Lighting mode self-diagnosis lamp

RAM-90QH5

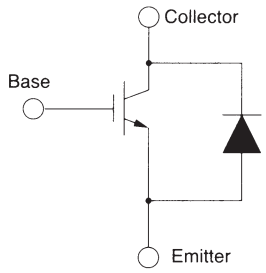
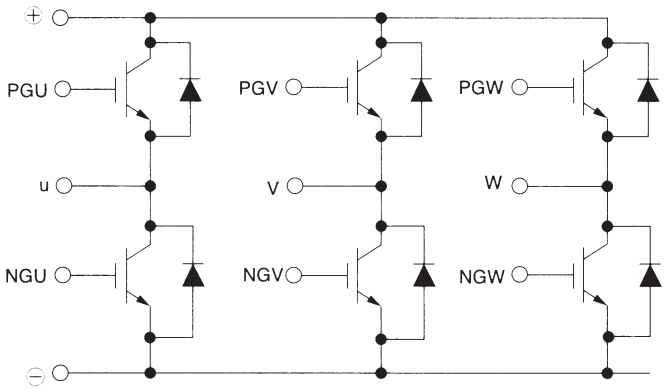
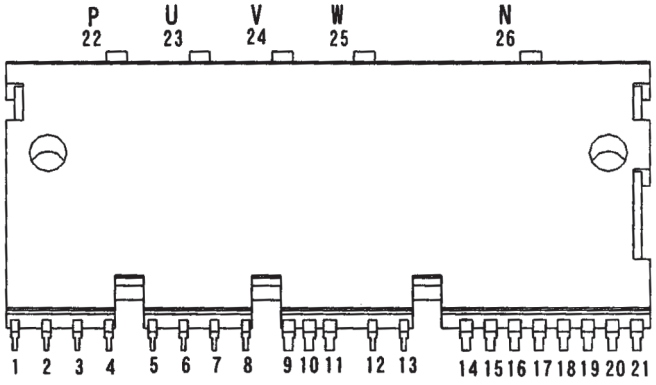
1 Location of self-diagnosis lamp



2 Lighting mode self-diagnosis lamp

RAM-90QH5

TROUBLESHOOTING OF THE INTELLIGENT POWER MODULE (IPM)

Type	PS21869-P
Element circuit	
Internal circuit of the module	
Terminal Intelligent Power Module (IPM) ※See next page for values measured by tester	

※ Do not disassemble the IPM when troubleshooting is performed.

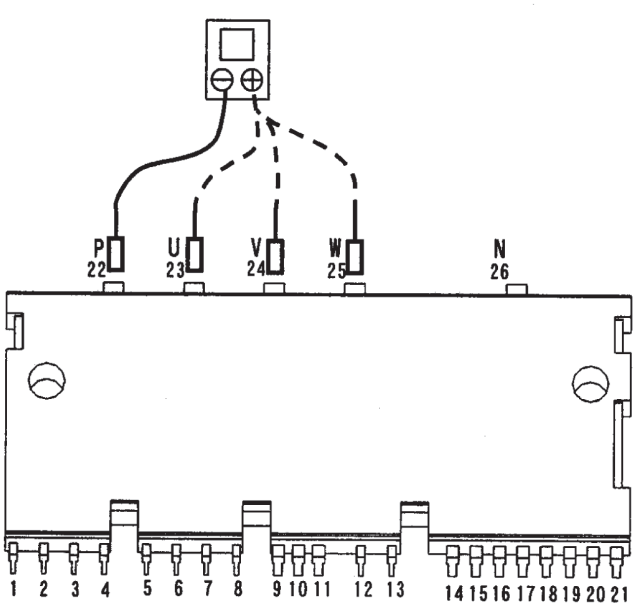
HOW TO CHECK POWER MODULE

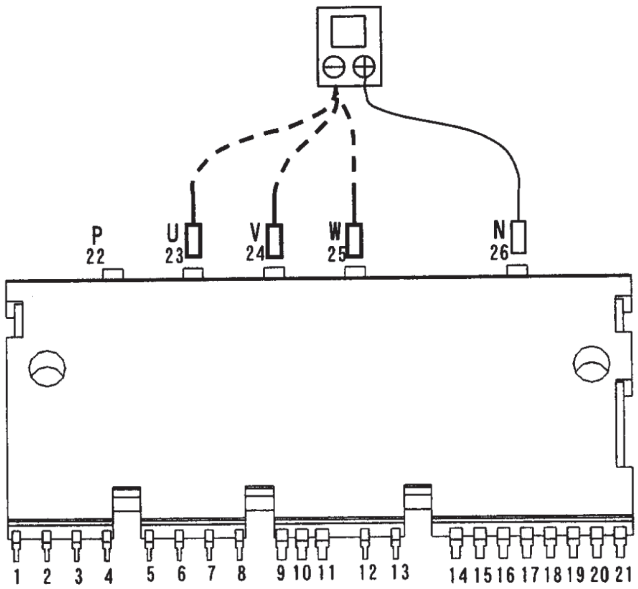
Checking power module using tester

Set tester to resistance range (X 100)
If indicator does not swing in the following conductivity check, the power module is normal.
(In case of digital tester, since built-in battery is set in reverse direction, ⊕ and ⊖ terminals are reversed.)

⚠ CAUTION

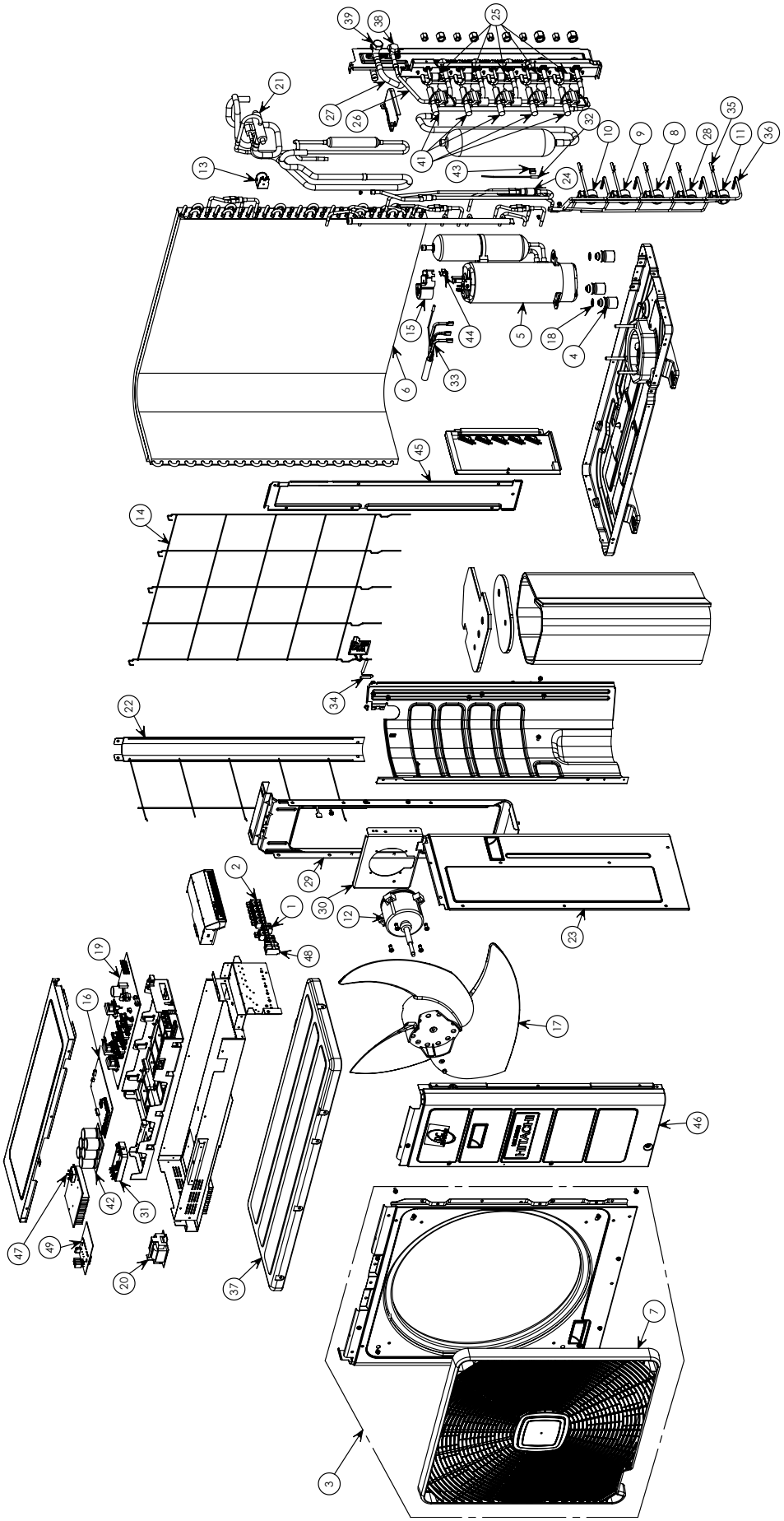
If inner circuit of power module (IPM) is disconnected (open), the indicator of tester will not swing and this may assumed as normal. In this case, if indicator swings when ⊕ and ⊖ terminals are connected in reverse of diagram below, it is normal. Furthermore, compare how indicator swings at U, V and W phases. If indicator swings the same way at each point, it is normal.





PARTS LIST AND DIAGRAM

OUTDOOR UNIT
MODEL : RAM-90QH5



MODEL RAM-90QH5

NO.	PART N0.	Q'TY / UNIT	PARTS NAME
1	PMRAC-07CV1 006	2	2P TERMINAL
2	PMRAM-90QH5 901	5	2P TERMINAL
3	PMRAM-90QH5 902	1	CABINET
4	RAC-2226HV 805	3	COMPRESSOR RUBBER
5	PMRAM-90QH5 903	1	COMPRESSOR
6	PMRAM-90QH5 904	1	CONDENSER
7	PMRAM-90QH5 905	1	D-GRILL
8	PMRAM-65QH4 906	1	EXPANSION VALVE COIL (B)
9	PMRAM-65QH4 905	1	EXPANSION VALVE COIL (R)
10	PMRAM-65QH4 904	1	EXPANSION VALVE COIL (W)
11	PMRAM-90QH5 906	1	EXPANSION VALVE COIL (BLK)
12	PMRAM-90QH5 908	1	FAN MOTOR
13	PMRAC-60YHA1 902	1	MG-COIL (REVERSING VALVE)
14	PMRAC-70YHA 906	1	NET
15	PMRAC-25NH4 910	1	OLR COVER
16	PMRAM-90QH5 909	1	P.W.B (MAIN)
17	PMRAM-90QH5 910	1	PROPELLER FAN
18	KPNT1 001	3	PUSH NUT
19	PMRAM-90QH5 911	1	PWB (POWER)
20	PMRAM-90QH5 912	1	REACTOR
21	PMRAC-50YHA1 905	1	REVERSING VALVE
22	PMRAM-90QH5 913	1	PLATE
23	PMRAM-90QH5 914	1	SIDE PLATE R
24	PMRAM-90QH5 915	1	STRAINER (CO-PIPE-AS 1)
25	PMRAM-90QH5 916	1	STRAINER (ST-PIPE-AS)
26	PMRAM-90QH5 917	1	3S PIPE-AS
27	PMRAM-90QH5 918	1	5S PIPE-AS
28	PMRAM-90QH5 907	1	EXPANSION VALVE COIL Y
29	PMRAM-90QH5 919	1	SUPPORT (FAN MOTOR)
30	PMRAM-90QH5 920	1	FAN MOTOR BRACKET
31	PMRAM-90QH5 921	1	SYSTEM POWER MODULE
32	PMRAM-90QH5 922	1	THERMISTOR (DEFROST)

NO.	PART N0. RAM-90QH5	Q'TY / UNIT	PARTS NAME
33	PMRAC-80YHA 914	1	THERMISTOR (OH)
34	PMRAM-90QH5 923	1	THERMISTOR (OUTSIDE TEMPERATURE)
35	PMRAM-90QH5 924	1	THERMISTOR-PIPE (W)
36	PMRAM-90QH5 925	1	THERMISTOR-PIPE (N)
37	PMRAM-90QH5 926	1	TOP COVER
38	PMRAM-90QH5 927	1	VALVE (3S)
39	PMRAM-90QH5 928	1	VALVE (5S)
41	PMRAM-90QH5 929	5	EXPANSION VALVE
42	PMRAM-90QH5 930	1	PWB (CAPA)
43	PMRAM-65QH4 907	1	SUPPORT (DEF-THERMISTOR)
44	PMRAC-25NH4 909	1	SUPPORT (OH-THERMISTOR)
45	PMRAM-90QH5 932	1	BACKPLATE
46	PMATRIX590MXN 901	1	FRONTPLATE
47	PMRAC-40CNH2 902	1	DIODE STACK
48	PMRAC-18CVP2 901	1	2P TERMINAL
49	PMRAM-90QH5 931	1	IPM-BOARD

HITACHI

RAM-90QH5

PM NO. 0371E

Printed in Malaysia