HITACHI

SERVICE MANUAL

TECHNICAL INFORMATION

REFER TO THE FOUNDATION MANUAL

FOR SERVICE PERSONNEL ONLY

RAK-25NH4
RAK-35NH4
RAK-50NH4

RAC-25NH4
RAC-35NH4
RAC-50NH4

CONTENTS

SPECIFICATIONS

TYPE		DC INVERTER (WALL TYPE)					
		INDOOR UNIT	OUTDOOR UNIT	INDOOR UNIT	OUTDOOR UNIT	INDOOR UNIT	OUTDOOR UNIT
MODEL		RAK-25NH4	RAC-25NH4	RAK-35NH4	RAC-35NH4	RAK-50NH4	RAC-50NH4
POWER SOURCE		1 PHASE, 50 Hz, 220-230V		1 PHASE, 50 Hz, 220-230V		1 PHASE, 50 Hz, 220-230V	
COOLING	TOTAL INPUT (W)	695 (155~1,050)		1,080 (155~1,280)		1,780 (155~2,200)	
	TOTAL AMPERES (A)	3.20-3.05		4.94-4.72		8.17-7.82	
	CAPACITY (kW)	2.50 (0.90 ~ 3.00)		3.50 (0.90 ~ 4.00)		5.00 (0.90 ~ 5.20)	
	(B.T.U./h)	8,540		11,950		17,070	
HEATING	TOTAL INPUT (W)	900 (115 ~ 1,400)		1,320 (115 ~ 1,920)		1,970 (115 ~ 2,100)	
	TOTAL AMPERES (A)	4.15-4.00		6.04-5.77		9.04-8.65	
	CAPACITY (kW)	3.50 (0.90 ~ 5.00)		4.80 (0.90 ~ 6.60)		6.50 (0.90 ~ 8.10)	
	(B.T.U./h)	11,950		16,390		22,200	
DIMENSIONS (mm)	W	860	750	860	750	860	850
	H	285	570	285	570	285	650
	D	183	280	183	280	183	298
NET WEIGHT (kg)		9.0	38	9.0	38	9.0	60

※ After installation

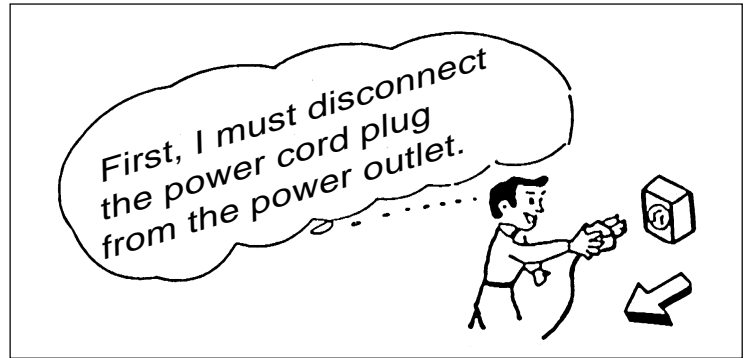## SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

ROOM AIR CONDITIONER

INDOOR UNIT + OUTDOOR UNIT

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.

    First, I must disconnect the power cord plug from the power outlet.

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.

    DANGER

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).
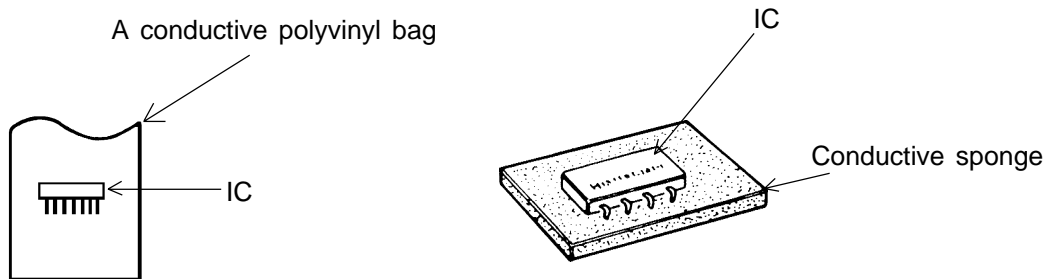

Fig. 1. Conductive Container

   (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.
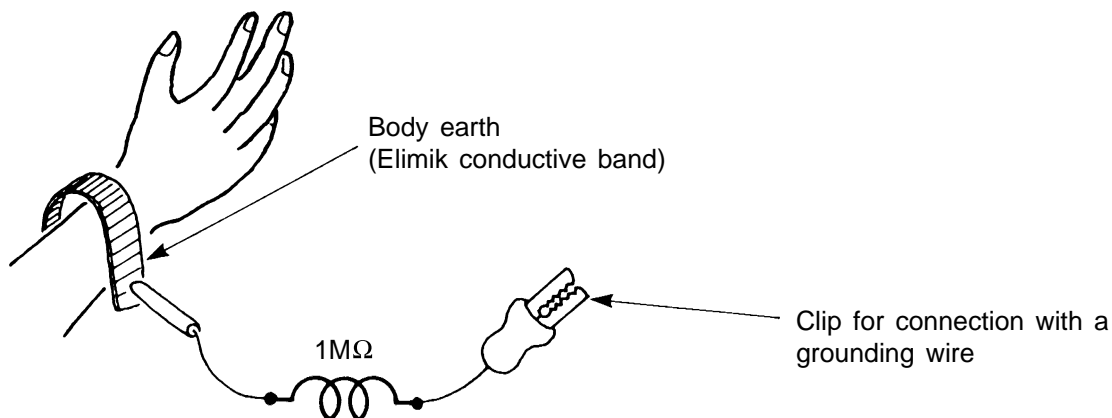
Fig. 2. Body Earth

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

Metal plate (of aluminium, stainless steel, etc.)

Working table

Resistor of 1 MΩ (1/2W)

Staple

Earth wire

Bare copper wire (for body earth)

Fig. 3. Grounding of the working table

Soldering iron

Grounding wire

Screw stop at the screwed part using a rag plate

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

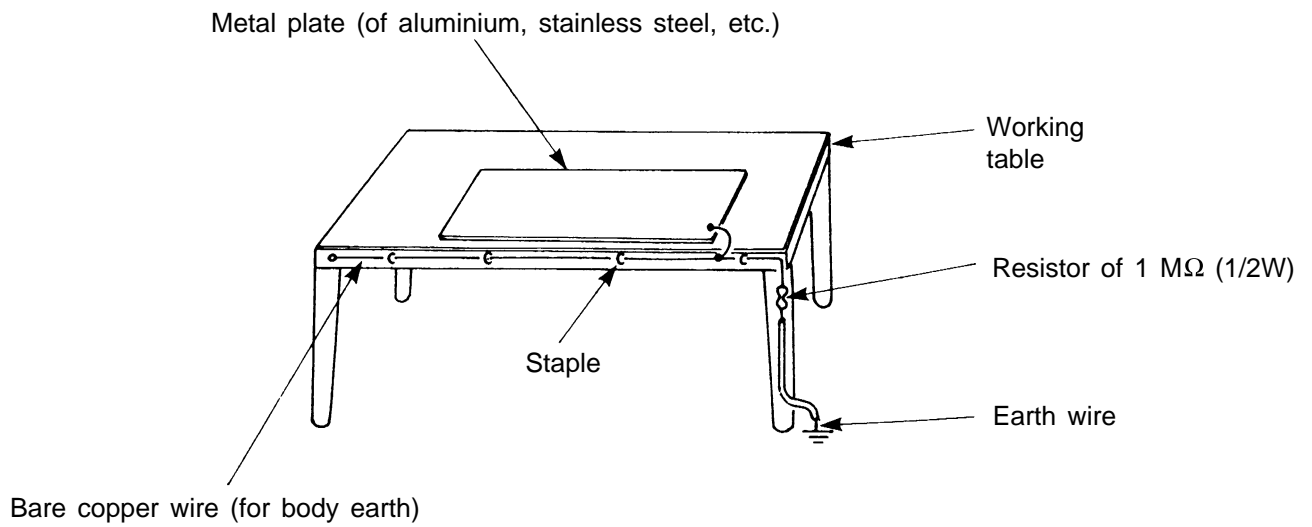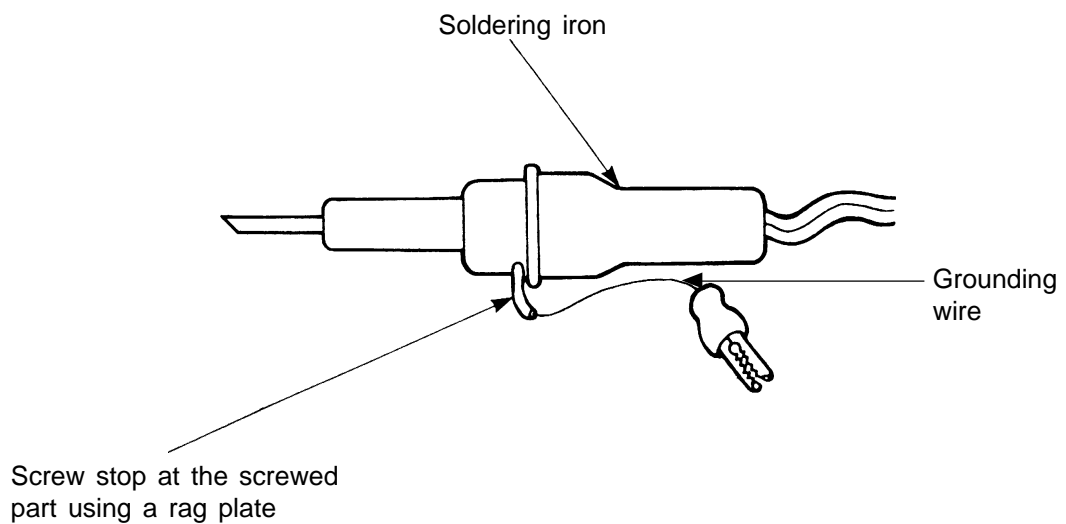1. In quiet operation or stopping the running, slight flowing noise of refrigerant in the refrigerating cycle is heard occasionally, but this noise is not abnormal for the operation.

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 adjusting thermostat, 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 (50°F).

6. This room air conditioner (the reverse cycle) should not be used when the outside temperature is below −10°C (14°F).
   If the reverse cycle is used under this condition, the outside heat exchanger is frosted and 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		RAK-25NH4 RAK-35NH4 RAK-50NH4	RAC-25NH4	RAC-35NH4	RAC-50NH4
FAN MOTOR		PWM DC35V	40 W		
FAN MOTOR CAPACITOR		NO	NO		
FAN MOTOR PROTECTOR		NO	NO		
COMPRESSOR		–	JU1012D		JU1013D
COMPRESSOR MOTOR CAPACITOR		NO	NO		
OVERLOAD PROTECTOR		NO	YES		
OVERHEAT PROTECTOR		NO	YES		
FUSE (for MICROPROCESSOR)		NO	3.0A		
POWER RELAY		NO	G4A		
POWER SWITCH		NO	NO		
TEMPORARY SWITCH		YES	NO		
SERVICE SWITCH		NO	YES		
TRANSFORMER		NO	NO		
VARISTOR		NO	450NR		
NOISE SUPPRESSOR		NO	YES		
THERMOSTAT		YES(IC)	YES(IC)		
REMOTE CONTROL SWITCH (LIQUID CRYSTAL)		YES	NO		
REFRIGERANT CHARGING VOLUME (Refrigerant 410A)	UNIT	----------	1150g	1150g	1400g
	PIPES (MAX. 20m)	WITHOUT REFRIGERANT BECAUSE COUPLING IS FLARE TYPE.			

The Length of Indoor Unit Power Cord

about 0.9m | about 1.6m
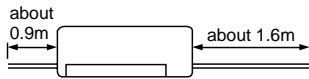
Do not alter the power cord.

Figure showing the Installation of Indoor and Outdoor unit.

⚠ **CAUTION** The installation height of indoor unit must be 2.3m or more in a non public area.

Direction of Piping

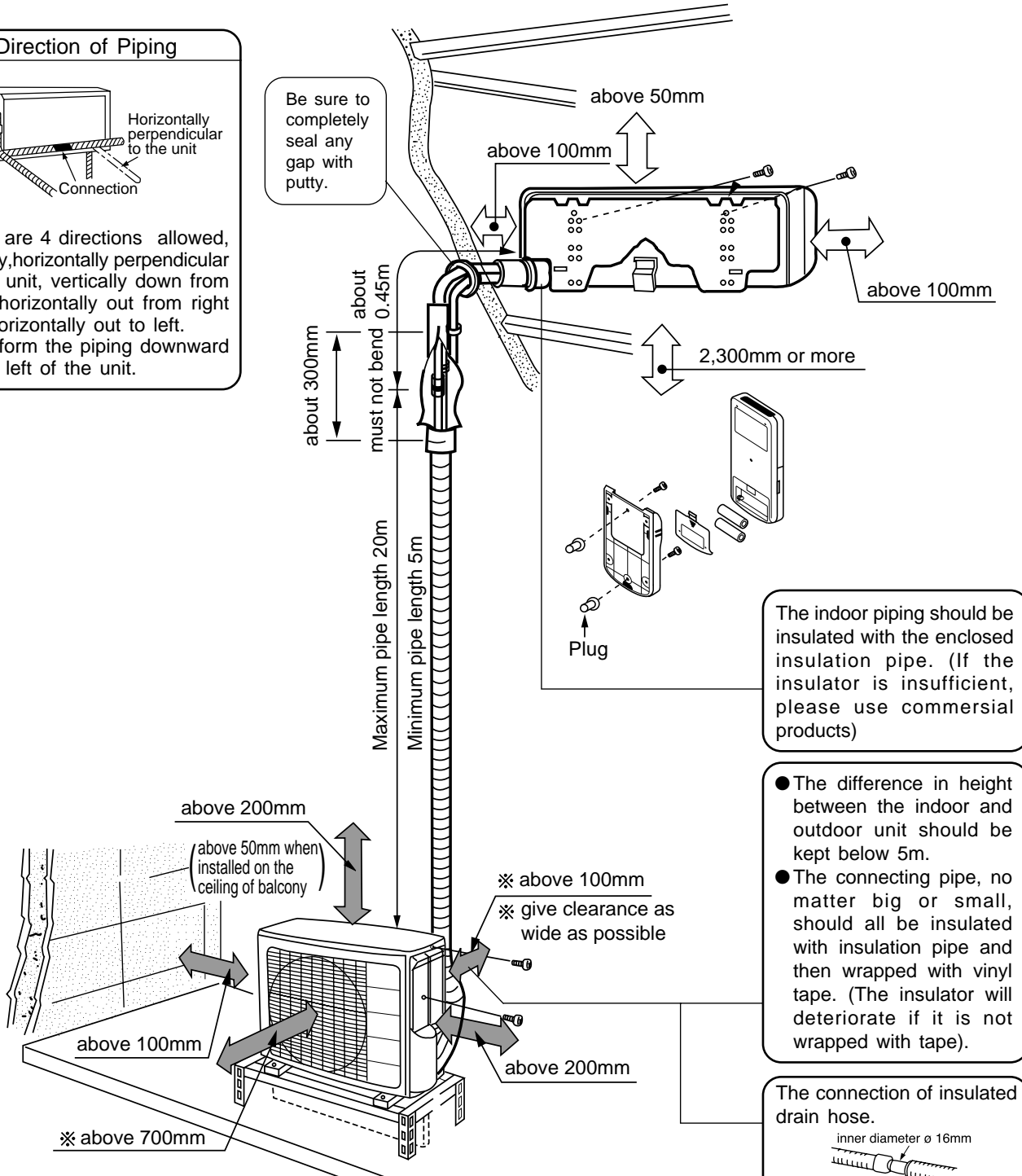Horizontally perpendicular to the unit

Connection
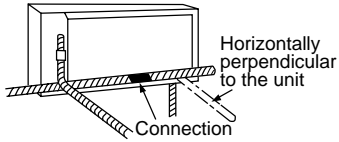
There are 4 directions allowed, namely, horizontally perpendicular to the unit, vertically down from right, horizontally out from right and horizontally out to left.
Don't form the piping downward at the left of the unit.

Be sure to completely seal any gap with putty.

above 50mm

above 100mm

above 100mm

2,300mm or more

Plug

about 300mm

about 0.45m must not bend

Maximum pipe length 20m

Minimum pipe length 5m

The indoor piping should be insulated with the enclosed insulation pipe. (If the insulator is insufficient, please use commersial products)

● The difference in height between the indoor and outdoor unit should be kept below 5m.
● The connecting pipe, no matter big or small, should all be insulated with insulation pipe and then wrapped with vinyl tape. (The insulator will deteriorate if it is not wrapped with tape).

above 200mm

above 50mm when installed on the ceiling of balcony

※ above 100mm
※ give clearance as wide as possible

above 100mm

above 200mm

※ above 700mm

The connection of insulated drain hose.

inner diameter ø 16mm

Please use insulated drain hose for the indoor piping (commercial product).
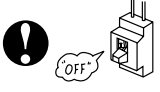
SAFETY PRECAUTION
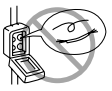
● Please read the "Safety Precaution" carefully before operating the unit to ensure correct usage of the unit.
● Pay special attention to signs of "⚠ **Warning**" and "⚠ **Caution**". The "Warning" section contains matters which, if not observed strictly, may cause death or serious injury. The "Caution" section contains matters which may result in serious consequences if not observed properly. Please observe all instructions strictly to ensure safety.
● The sign indicate the following meanings.

⏚ Make sure to connect earth line.	⊘ The sign in the figure indicates prohibition.
❶ Indicates the instructions that must be followed.	

● Please keep this manual after reading.

PRECAUTIONS DURING INSTALLATION

⚠ **WARNING**	● Do not reconstruct the unit. Water leakage, fault, short circuit or fire may occur if you reconstruct the unit by yourself.	⊘
	● Please ask your sales agent or qualified technician for the installation of your unit. Water leakage, short circuit or fire may occur if you install the unit by yourself.	
	● Please use earth line. Do not place the earth line near water or gas pipes, lightning-conductor, or the earth line of telephone. Improper installation of earth line may cause electric shock.	⏚
⚠ **CAUTION**	● A circuit breaker should be installed depending on the mounting site of the unit. Without a circuit breaker, the danger of electric shock exists.	
	● Do not install near location where there is flammable gas. The outdoor unit may catch fire if flammable gas leaks around it.	
	● Please ensure smooth flow of water when installing the drain hose.	

PRECAUTIONS DURING SHIFTING OR MAINTENANCE

⚠ **WARNING**	● Should abnormal situation arises (like burning smell), please stop operating the unit and turn off the circuit breaker. Contact your agent. Fault, short circuit or fire may occur if you continue to operate the unit under abnormal situation.	
	● Please contact your agent for maintenance. Improper self maintenance may cause electric shock and fire.	
	● Please contact your agent if you need to remove and reinstall the unit. Electric shock or fire may occur if you remove and reinstall the unit yourself improperly.	

PRECAUTIONS DURING OPERATION

⚠ **WARNING**	● Avoid an extended period of direct air flow for your health.	
	● Do not put objects like thin rods into the panel of blower and suction side because the high-speed fan inside may cause danger.	
	● Do not use any conductor as fuse wire, this could cause fatal accident.	
	● During thunder storm, disconnect and turn off the circuit breaker.	

PRECAUTIONS DURING OPERATION

● The product shall be operated under the manufacturer specification and not for any other intended use.
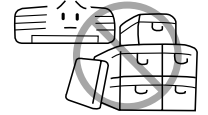
● Do not attempt to operate the unit with wet hands, this could cause fatal accident.

● When operating the unit with burning equipments, regularly ventilate the room to avoid oxygen insufficiency.
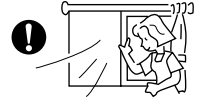
● Do not direct the cool air coming out from the air-conditioner panel to face household heating apparatus as this may affect the working of apparatus such as the electric kettle, oven etc.

● Please ensure that outdoor mounting frame is always stable, firm and without defect. If not, the outdoor unit may collapse and cause danger.

● Do not splash or direct water to the body of the unit when cleaning it as this may cause short circuit.

● Do not use any aerosol or hair sprays near the indoor unit. This chemical can adhere on heat exchanger fin and blocked the evaporation water flow to drain pan. The water will drop on tangential fan and cause water splashing out from indoor unit.
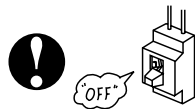
● Please switch off the unit and turn off the circuit breaker during cleaning, the high-speed fan inside the unit may cause danger.

● Turn off the circuit breaker if the unit is not to be operated for a long period.

● Do not climb on the outdoor unit or put objects on it.

● Do not put water container (like vase) on the indoor unit to avoid water dripping into the unit. Dripping water will damage the insulator inside the unit and causes short-circuit.
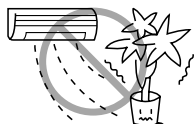
● Do not place plants directly under the air flow as it is bad for the plants.

● When operating the unit with the door and windows opened, (the room humidity is always above 80%) and with the air deflector facing down or moving automatically for a long period of time, water will condense on the air deflector and drips down occasionally. This will wet your furniture. Therefore, do not operate under such condition for a long time.

● If the amount of heat in the room is above the cooling or heating capability of the unit (for example: more people entering the room, using heating equipments and etc.), the preset room temperature cannot be achieved.

CAUTION

NAMES AND FUNCTIONS OF EACH PART

INDOOR UNIT
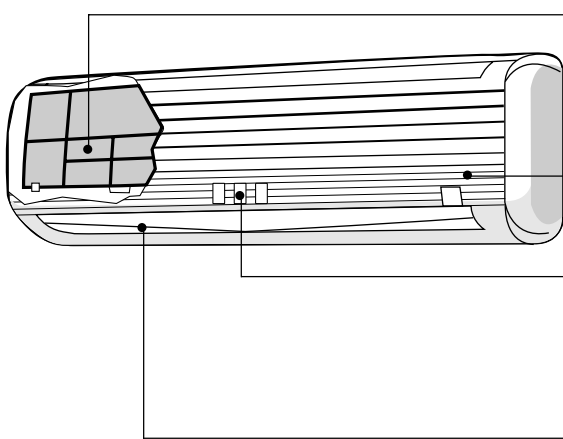
Air filter
To prevent dust from coming into the indoor unit.
(Refer page 25)

Front panel

Indoor unit indicators
Light indicator showing the operating condition.
(Refer page 9)

Horizontal deflector ● Vertical deflector
(Air Outlet)
(Refer page 20)

Remote controller
Send out operation signal to the indoor unit. So as to operate the whole unit.
(Refer page 10)

MODEL NAME AND DIMENSIONS

MODEL	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
RAK-25NH4, RAK-35NH4, RAK-50NH4	860	295	183

INDOOR UNIT INDICATORS
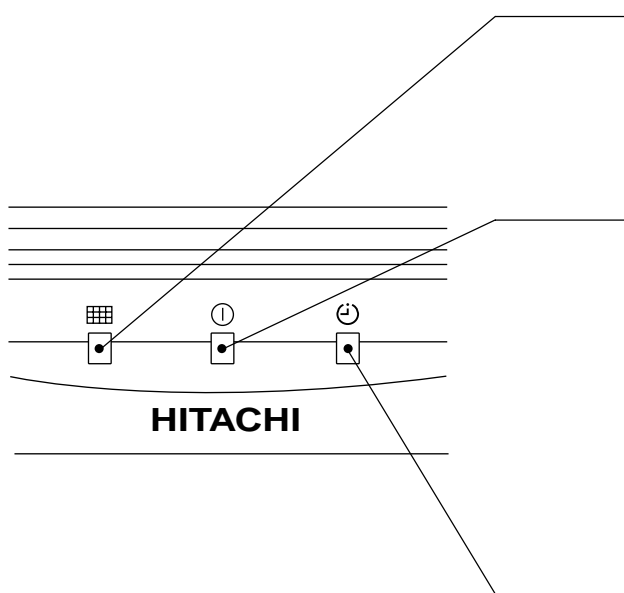
FILTER LAMP

When the device is operated for a total of about 200 hours, the FILTER lamp lights indicates that it is time to clean the filter. The lamp goes out when the POWER SWITCH set to OFF and ON again.

OPERATION LAMP

This lamp lights during operation.
The OPERATION LAMP flashes in the following cases during heating.

(1) During preheating

For about 2–3 minutes after starting up.

(2) During defrosting

Defrosting will be performed about once an hour when frost forms on the heat exchanger of the outdoor unit, for 5–10 minutes each time.

TIMER LAMP

This lamp lights when the timer is working.

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OPERATION INDICATOR

● This figure shows the opening condition of front panel. Refer to page 24 in relation to how to open or close the front panel.
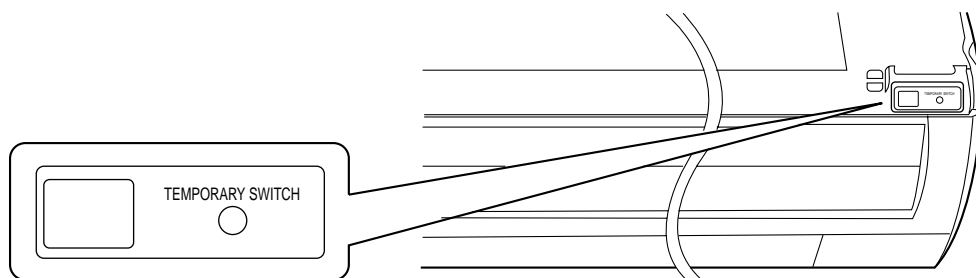
TEMPORARY SWITCH

TEMPORARY SWITCH

● Use this switch to start and stop when the remote controller does not work.

● By pressing the temporary switch, the operation is done in automatic mode.

NAMES AND FUNCTIONS OF REMOTE CONTROL UNIT

REMOTE CONTROLLER
● This controls the operation of the indoor unit. The range of control is about 7 meters. If indoor lighting is controlled electronically, the range of control may be shorter.
This unit can be fixed on a wall using the fixture provided. Before fixing it, make sure the indoor unit can be controlled from the remote controller.
● Handle the remote controller with care. Dropping it or getting it wet may compromise its signal transmission capability.
● After new batteries are inserted into the remote controller, the unit will initially require approximately 10 seconds to respond to commands and operate.
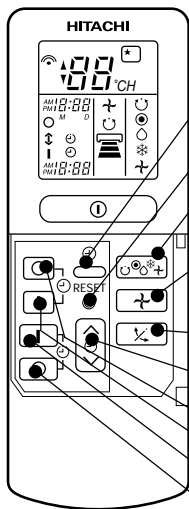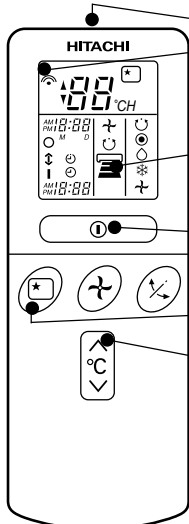
● **Signal emitting window/transmission sign**
Point this window toward the indoor unit when controlling it.
The transmission sign blinks when a signal is sent.

● **Display**
This indicates the room temperature selected, current time, timer status, function and intensity of circulation selected.

● **START/STOP button**
Press this button to start operation. Press it again to stop operation.

● **SLEEP button**
Use this button to set the sleep timer.

● **TEMPERATURE buttons**
Use these buttons to raise or lower the temperature setting. (Keep pressed, and the value will change more quickly.)

● **TIME button**
Use this button to set and check the time and date.

● **RESET buttons**

● **FUNCTION selector**
Use this button to select the operating mode. Every time you press it, the mode will change from ʊ (AUTO) to ◉ (HEAT) to ○ (DEHUMIDIFY) to ❄ (COOL) and to ⼋ (FAN) cyclically.

● **FAN SPEED selector**
This determines the fan speed. Every time you press this button, the intensity of circulation will change from ʊ (AUTO) to ☰ (HI) to ☰ (MED) to ☰ (LOW) (This button allows selecting the optimal or preferred fan speed for each operation mode).

● **AUTO SWING button**
Controls the angle of the horizontal air deflector.

● **TIMER control**
Use this button to set the timer.

● **OFF-TIMER button**   Select the turn OFF time.

● **ON-TIMER button**   Select the turn ON time.

● **RESERVE button**   Time setting reservation.

● **CANCEL button**   Cancel time reservation.

ʊ	AUTO
◉	HEAT
○	DEHUMIDIFY
❄	COOL
⼋	FAN
☰	FAN SPEED LOW MED HI
★	SLEEPING
○	STOP (CANCEL)
I	START (RESERVE)
①	START/STOP
⊕	TIME
⊙	TIMER SET
⊕ ⊖	TIMER SELECTOR ON TIMER OFF TIMER
✕	AUTO SWING

Precautions for Use
● Do not put the remote controller in the following places.
  ● Under direct sunlight.
  ● In the vicinity of a heater.
● Handle the remote controller carefully. Do not drop it on the floor, and protect it from water.
● Once the outdoor unit stops, it will not restart for about 3 minutes (unless you turn the power switch off and on or unplug the power cord and plug it in again).
  This is to protect the device and does not indicate a failure.
● If you press the FUNCTION selector button during operation, the device may stop for about 3 minutes for protection.

VARIOUS FUNCTIONS
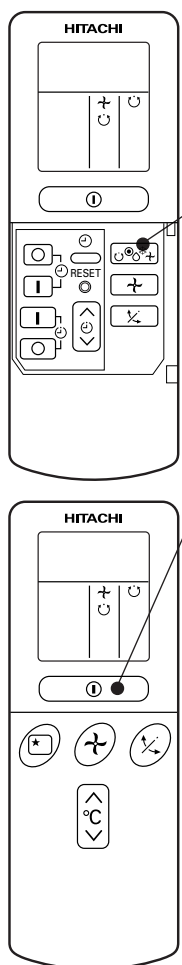
■ Auto Restart Control

● If there is a power failure, operation will be automatically restarted when the power is resumed with previous operation mode and airflow direction.
(As the operation is not stopped by remote controller.)
● If you intend not to continue the operation when the power is resumed, switch off the power supply.
When you switch on the circuit breaker, the operation will be automatically restarted with previous operation mode and airflow direction.
Note: 1. If you do not require Auto Restart Control, please consult your sales agent or OFF by remote control.
      2. Auto Restart Control is not available when Timer or Sleep Timer mode is set.

AUTOMATIC OPERATION

The device will automatically determine the mode of operation, HEAT, COOL or DEHUMIDIFY depending on the current room temperature. The selected mode of operation will change when the room temperature varies. However the mode of operation will not change when indoor unit connected to multi type outdoor unit.

1 Press the FUNCTION selector so that the display indicates the ↻ (AUTO) mode of operation.

● When AUTO has been selected, the device will automatically determine the mode of operation, HEAT, COOL or DEHUMIDIFY depending on the current room temperature. However the mode of operation will not change when indoor unit connected to multi type outdoor unit.
● If the mode automatically selected by the unit is not satisfactory, manually change the mode setting (heat, dehumidify, cool or fan).

START STOP Press the ① (START/STOP) button.
Operation starts with a beep.
Press the button again to stop operation.

■ As the settings are stored in memory in the remote controller, you only have to press the ① (START/STOP) button next time.

You can raise or lower the temperature setting as necessary by maximum of 3°C.

Press the temperature button and the temperature setting will change by 1°C each time.

● The preset temperature and the actual room temperature may vary somewhat depending on conditions.
● The display does not indicate the preset temperature in the AUTO mode. If you change the setting, the indoor unit will produce a beep.

Press the ✦ (FAN SPEED) button, AUTO and LOW is available.

■ Condition of Automatic Operation

Initial room temperature (approx.)	Function	Temperature setting	FAN SPEED
Over 27°C	COOL	27°C	HI at start, MED or LOW after the preset temperature is reached
23~27°C	DEHUMIDIFY	Slightly lower than the room temperature	LOW
Under 23°C	HEAT	23°C	HI at start, MED or LOW after the preset temperature is reached

– 11 –

HEATING OPERATION

● Use the device for heating when the outdoor temperature is under 21°C.
When it is too warm (over 21°C), the heating function may not work in order to protect the device.
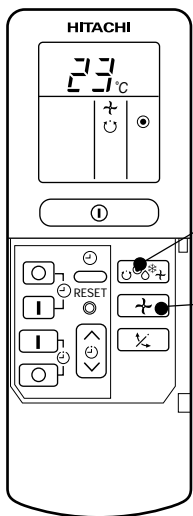
1 Press the FUNCTION selector so that the display indicates ◉ (HEAT).

2 Set the desired FAN SPEED with the Ⳁ (FAN SPEED) button (the display indicates the setting).
- ↻ (AUTO): The fan speed is HI at first and varies to MED automatically when the preset temperature has been reached.
- ☰ (HI) : Economical as the room will become warm quickly.
  But you may feel a chill at the beginning.
- ☰ (MED) : Fan speed slow.
- ☰ (LOW) : Fan speed slower.

3 Set the desired room temperature with the TEMPERATURE buttons (the display indicates the setting).

The temperature setting and the actual room temperature may vary somewhat depending on conditions.

START STOP Press the ① (START/STOP) button. Heating operation starts with a beep. Press the button again to stop operation.

■ As the settings are stored in memory in the remote controller, you only have to press the ① (START/STOP) button next time.
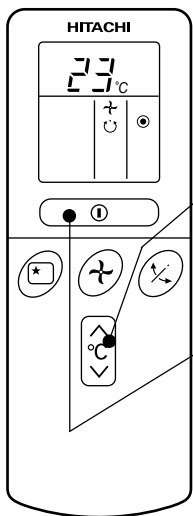
DEHUMIDIFYING OPERATION

Use the device for dehumidifying when the room temperature is over 16°C.
When it is under 15°C, the dehumidifying function will not work.
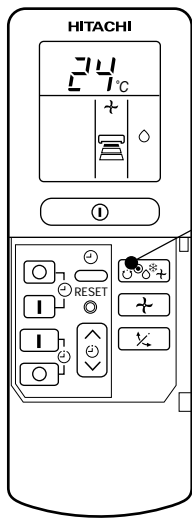
1 Press the FUNCTION selector so that the display indicates ◇ (DEHUMIDIFY).
The FAN SPEED is set at LOW automatically.
The FAN SPEED button does not work.

2 Set the desired room temperature with the TEMPERATURE button (the display indicates the setting).

The range of 20-26°C is recommended as the room temperature for dehumidifying.

START STOP Press the ① (START/STOP) button. Dehumidifying operation starts with a beep. Press the button again to stop operation.

■ As the settings are stored in memory in the remote controller, you only have to press the ① (START/STOP) button next time.
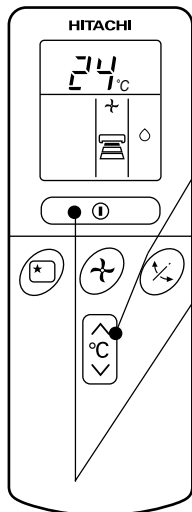
■ Dehumidifying Function

When the room temperature is higher than the temperature setting: The device will dehumidify the room, reducing the room temperature to the preset level.
When the room temperature is lower than the temperature setting: Dehumidifying will be performed at the temperature setting slightly lower than the current room temperature, regardless of the temperature setting. The function will stop (the indoor unit will stop emitting air) as soon as the room temperature becomes lower than the setting temperature.

COOLING OPERATION

Use the device for cooling when the outdoor temperature is 22-42°C.
If in doors humidity is very high (80%), some dew may form on the air outlet grille of the indoor unit.
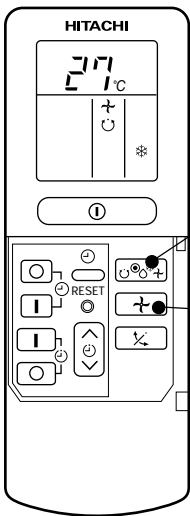
1 Press the FUNCTION selector so that the display indicates ❄ (COOL).
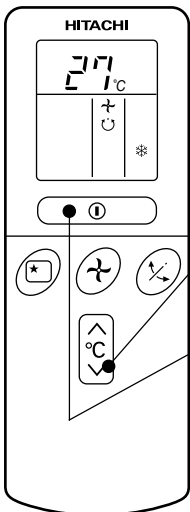
2 Set the desired FAN SPEED with the ⊁ (FAN SPEED) button (the display indicates the setting).

    ↻ (AUTO): The FAN SPEED is HI at first and varies to MED automatically when the preset temperature has been reached.

    ☰ (HI)   : Economical as the room will become cool quickly.

    ☰ (MED) : Fan speed slow.

    ☰ (LOW) : Fan speed slower.

3 Set the desired room temperature with the TEMPERATURE button (the display indicates the setting).

The temperature setting and the actual room temperature may vary some how depending on conditions.

START STOP Press the ① (START/STOP) button. Cooling operation starts with a beep. Press the button again to stop operation. The cooling function does not start if the temperature setting is higher than the current room temperature (even though the ① (OPERATION) lamp lights). The cooling function will start as soon as you set the temperature below the current room temperature.

■ As the settings are stored in memory in the remote controller, you only have to press the ① (START/STOP) button next time.

– 14 –

FAN OPERATION

You can use the device simply as an air circulator. Use this function to dry the interior of the indoor unit at the end of summer.

1 Press the FUNCTION selector so that the display indicates ⊹ (FAN).

2 Press the ⊹ (FAN SPEED) button.

**START STOP** Press the ① (START/STOP) button. Fan operation starts with a beep. Press the button again to stop operation.
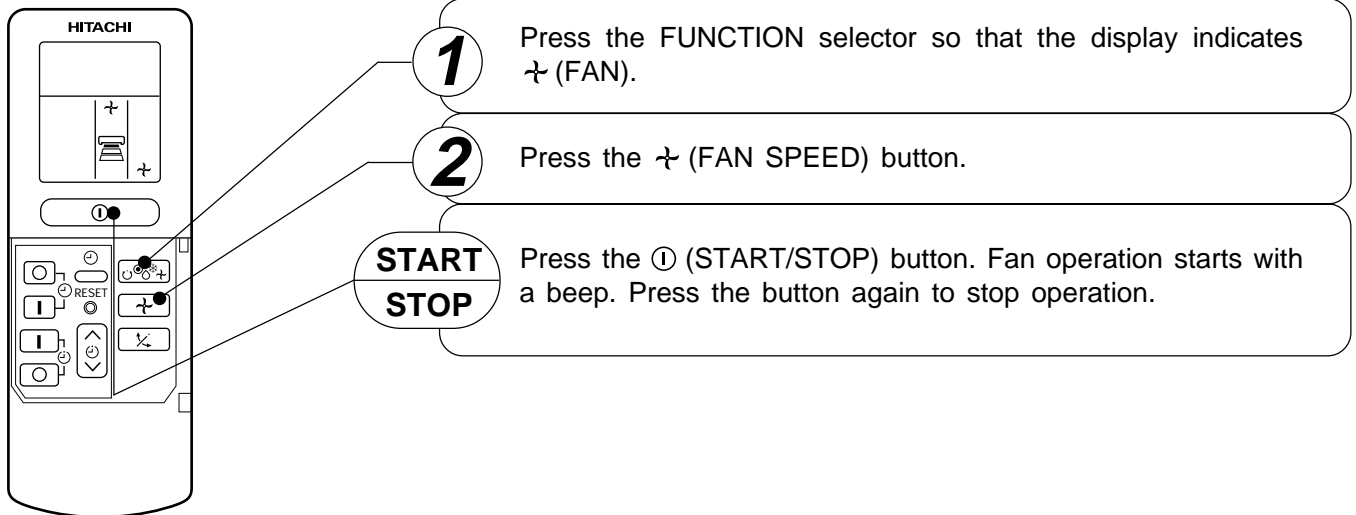
FAN SPEED (AUTO) ····· When the AUTO fan speed mode is set in the cooling/heating operation:

For the heating operation	● The fan speed will automatically change according to the temperature of discharged air. ● When the difference of room temperature and setting temperature is large, fan starts to run at HI speed. ● When the room temperature reaches setting temperature, fan speed changes to LOW automatically.
For the cooling operation	● When the difference of room temperature and setting temperature is large, fan starts to run at HI speed. ● After room temperature reaches the preset temperature, the cooling operation, which changes the fan speed and room temperature to obtain optimum conditions for natural healthful cooling will be performed.

HOW TO SET THE TIMER

TIME, DAY, MONTH (current time, day, month)

OFF TIMER

ON TIMER

RESERVE

CANCEL
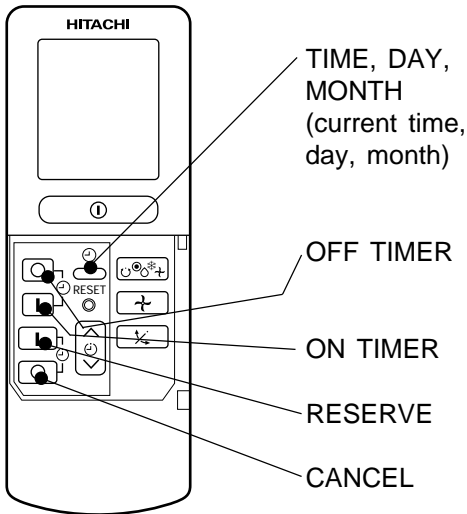
Time, Day, Month

After you change the batteries;
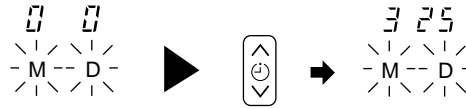
1 Set the current month and day with the TIMER control button.

OFF-Timer

Start ➡ STOP
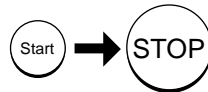
You can set the device to turn off at the present time.

1 Press the ○ (OFF-TIMER) button. The ○ (OFF) mark blinks on the display.

ON-Timer

Stop ➡ Start
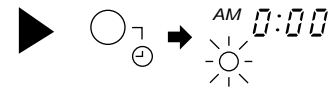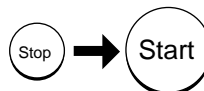
● The device will turn on at the designated times.

1 Press the (ON-TIMER) button the | (ON) mark blinks on the display.

AM 6:00

ON/OFF-Timer

Start ➡ Stop
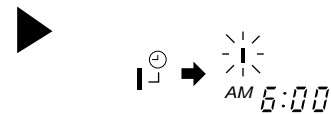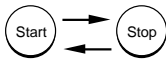
● The device will turn on (off) and off (on) at the designated times.
● The switching occurs first at the preset time that comes earlier.
● The arrow mark appearing on the display indicates the sequence of switching operations.

1 Press the ○ (ON-OFF) button so that the ○ (OFF) mark blinks.

PM 0:00
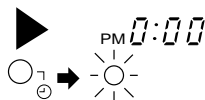
2 Set the turn-off time with the TIMER control button.
Press the | (RESERVE) button.

PM 10:30
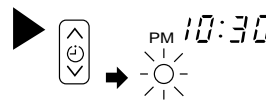
3 Press the (ON-TIMER) button so that the ○ (OFF) mark lights and the | (ON) mark blinks.
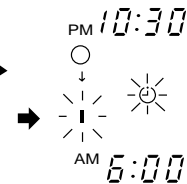
PM 10:30

AM 6:00

How to Cancel Reservation

Point the signal window of the remote controller toward the indoor unit, and press the ○ (CANCEL) button.
The (RESERVED) sign goes out with a beep and the (TIMER) lamp turns off on the indoor unit.

NOTE

You can set only one of the OFF-timer, ON-timer and ON/OFF-timer.

2 Press the ⏲ (TIME) button.
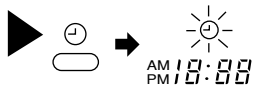
3 Set the current time with the TIMER control button.
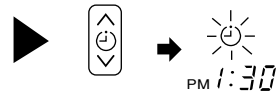
4 Press the ⏲ (TIME) button again. The time indication starts lighting instead of flashing.

AM PM `10:88` ➤ PM `1:30`
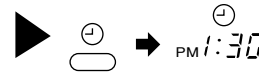
- The time indication will disappear automatically in 10 second.
- To check the current time setting, press the ⏲ (TIME) button twice.

PM `1:30`

Example: The current time is 1:30 p.m.
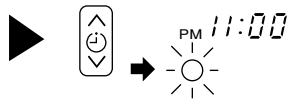
The setting of the current time is now complete.

---

2 Set the turn-off time with the TIMER control button.

PM `11:00`

3 Point the signal window of the remote controller toward the indoor unit, and press the ▌ (RESERVE) button.
The ◯ (OFF) mark starts lighting instead of flashing and the sign ⏲ (RESERVED) lights. A beep occurs and the ⏲ (TIMER) lamp lights on the indoor unit.

PM `11:00`
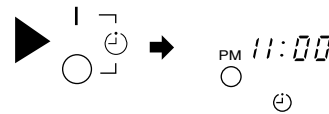
Example: The device will turn off at 11:00p.m.

The setting of turn-off time is now complete.

---

2 Set the turn-on time with the TIMER control button.
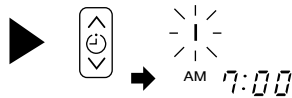
AM `7:00`

3 Point the signal window of the remote controller toward the indoor unit, and press the ▌ (RESERVE) button.
The ▌ (ON) mark starts lighting instead of flashing and the ⏲ (RESERVED) sign lights. A beep occurs and the ⏲ (TIMER) lamp lights on the indoor unit.

AM `7:00`
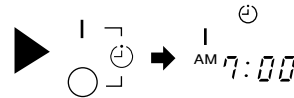
Example:
The device will turn on at 7:00 a.m.
The setting of the turn-on time is now complete.

---

4 Set the turn-on time with the TIMER control button.

PM `10:30`
AM `7:00`
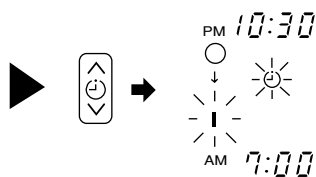
5 Point the signal window of the remote controller toward the indoor unit, and press the ▌ (RESERVE) button.
The ▌ (ON) mark starts lighting instead of flashing and the ⏲ (RESERVED) sign lights. A beep occurs and the ⏲ (TIMER) lamp lights on the indoor unit.

PM `10:30`
AM `7:00`
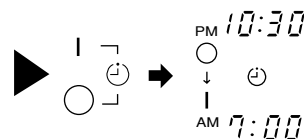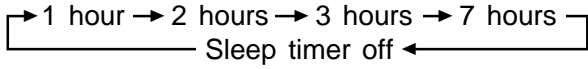
Example:
The device will turn off at 10:30 p.m. and it will be turned on at 7:00 a.m.
The settings of the turn-on/off times are now complete.

- The timer may be used in three ways: off-timer, on-timer, and ON/OFF (OFF/ON)-timer. Set the current time at first because it serves as a reference.

- As the time settings are stored in memory in the remote controller, you only have to press the ▌ (RESERVE) button in order to use the same settings next time.

HOW TO SET THE SLEEP TIMER

Set the current time at first if it is not set before (see the pages for setting the current time). Press the ⋆ (SLEEP) button, and the display changes as shown below.
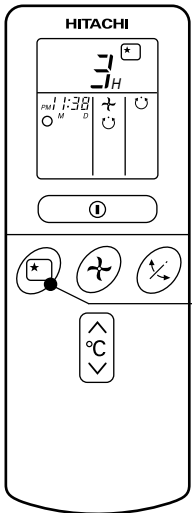
Mode	Indication
Sleep timer	→ 1 hour → 2 hours → 3 hours → 7 hours → ⌐ Sleep timer off ←

Sleep Timer: The device will continue working for the designated number of hours and then turn off.

Point the signal window of the remote controller toward the indoor unit, and press the SLEEP button.

The timer information will be displayed on the remote controller. The TIMER lamp lights with a beep from the indoor unit. When the sleep timer has been set, the display indicates the turn-off time.

AM 2:38
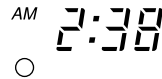
Example: If you set 3 hours sleep time at 11:38 p.m., the turn-off time is 2:38 a.m.

Sleep timer → Start
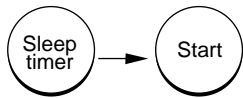
The device will be turned off by the sleep timer and turned on by on-timer.

1 Set the ON-timer.

2 Press the ⋆ (SLEEP) button and set the sleep timer.

AM 1:38

AM 6:00
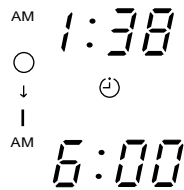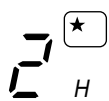
For heating:

In this case, the device will turn off in 2 hours (at 1:38 a.m.) and turn on early so that the preset temperature will be almost reached at 6:00 next morning.

How to Cancel Reservation

Point the signal window of the remote controller toward the indoor unit, and press the ○ (CANCEL) button.
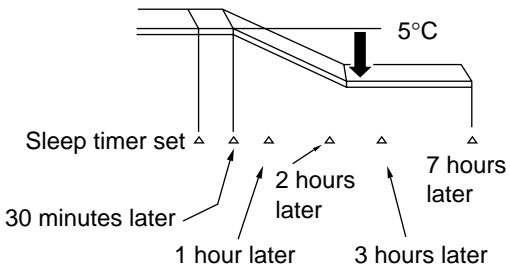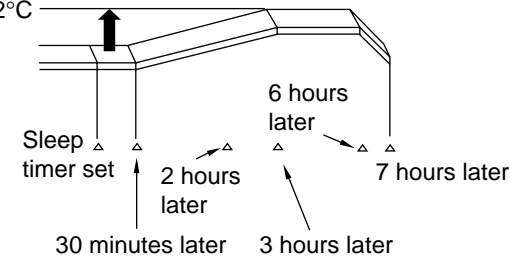
The ⏲ (RESERVED) sign goes out with a beep and the ⏲ (TIMER) lamp turns off on the indoor unit.

Explanation of the sleep timer

The device will control the FAN SPEED and room temperature automatically so as to be quiet and good for people's health.
You can set the sleep timer to turn off after 1, 2, 3 or 7 hours. The FAN SPEED and room temperature will be controlled as shown below.

Operation with the sleep timer

Function	Operation
Heating " ◉ "	The room temperature will be controlled 5°C below the temperature and the FAN SPEED will be set to LOW setting 30 minutes after the setting of the sleep timer.
Cooling " ❄ " and dehumidifying " ◯ "	The room temperature will be controlled 2°C above the temperature and the FAN SPEED will be set to LOW setting 30 minutes after the setting of the sleep timer.
Fan " ⚙ "	The settings of room temperature and circulation are varied.

NOTE

● If date or current time is not set, sleep timer can not be set.
● If you set the sleep timer after the off-, on/off- or off/on-timer has been set, the sleep timer becomes effective instead of the off-, on/off- or off/on-timer set earlier.
● You can not set other timer during sleep timer operation.
● After sleep timer time is up and when press sleep button again, the sleep timer will be set as last setting.
● Sleep timer effective only once.

ADJUSTING THE AIR DEFLECTOR

1 Adjustment of the conditioned air in the upward and downward directions.

The horizontal air deflector is automatically set to the proper angle suitable for each operation. The deflector can be swung up and down continuously and also set to the desired angle using the " $\boxed{\times}$ (AUTO SWING)" button.
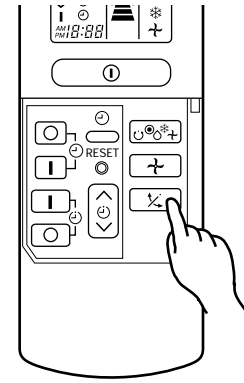
● If the " $\boxed{\times}$ (AUTO SWING)" button is pressed once, the horizontal air deflector swings up and down. If the button is pressed again, the deflector stops in its current position. Several seconds (about 6 seconds) may be required before the deflector starts to move.

● Use the horizontal air deflector within the adjusting range shown on the right.

● When the operation is stopped, the horizontal air deflector moves and stops at the position where the air outlet closes.
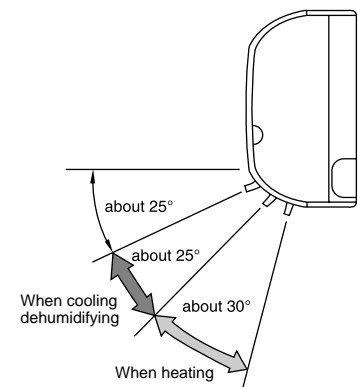
⚠ CAUTION

● In "Cooling" operation, do not keep the horizontal air deflector swinging for a long time. Some dew may form on the horizontal air deflector and dew may drop.

about 25°

about 25°

When cooling dehumidifying

about 30°

When heating

2 Adjustment of the conditioned air to the left and right.

Hold the vertical air deflector as shown in the figure and adjust the conditioned air to the left and right.
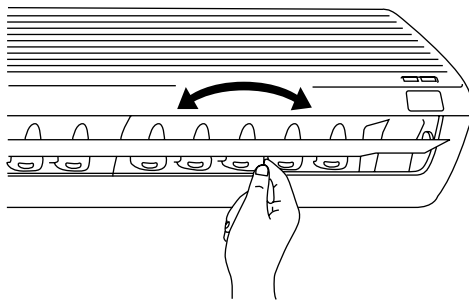
HOW TO EXCHANGE THE BATTERIES IN THE REMOTE CONTROLLER

1 Remove the cover as shown in the figure and take out the old batteries.

2 Install the new batteries.
The direction of the batteries should match the marks in the case.

Push and pull to the direction of arrow

⚠ CAUTION

1. Do not use new and old batteries, or different kinds of batteries together.
2. Take out the batteries when you do not use the remote controller for 2 or 3 months.
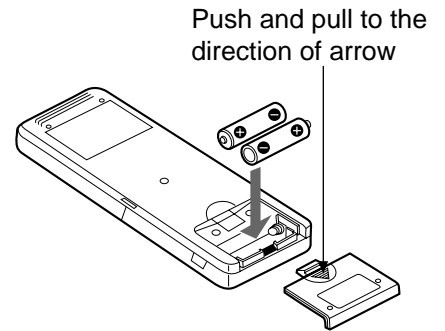
THE IDEAL WAYS OF OPERATION

Suitable Room Temperature

⚠ Warning
Freezing temperature is bad for health and a waste of electric power.

Install curtain or blinds
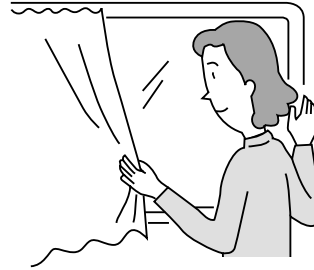
It is possible to reduce heat entering the room through windows.

Ventilation

⚠ Caution
Do not close the room for a long period of time. Occasionally open the door and windows to allow the entrance of fresh air.

Effective Usage Of Timer

At night, please use the "OFF or ON timer operation mode", together with your wake up time in the morning. This will enable you to enjoy a comfortable room temperature. Please use the timer effectively.
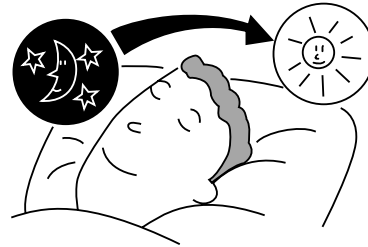
Do Not Forget To Clean The Air Filter

Dusty air filter will reduce the air volume and the cooling efficiency. To prevent from wasting electric energy, please clean the filter every 2 weeks.
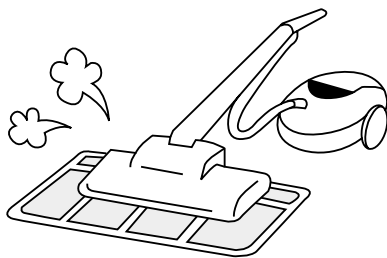
Please Adjust Suitable Temperature For Baby And Children

Please pay attention to the room temperature and air flow direction when operating the unit for baby, children and old folks who have difficulty in movement.
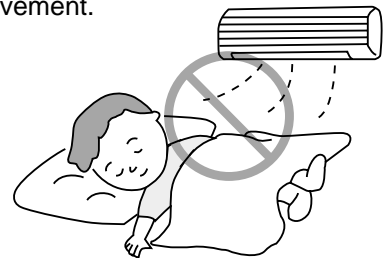
The Air Conditioner And The Heat Source In The Room

⚠ Caution

If the amount of heat in the room is above the cooling capability of the air conditioner (for example: more people entering the room, using heating equipments and etc.), the preset room temperature cannot be achieved.
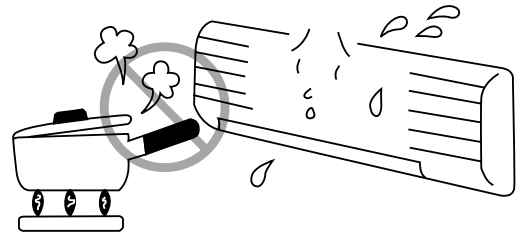
Not Operating For A Long Time

When the indoor unit is not to be used for a long period of time, please switch off the power from the mains. If the power from mains remains "ON", the indoor unit still consumes about 8W in the operation control circuit even if it is in "OFF" mode.

OFF
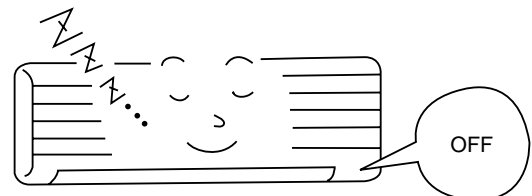
When Lightning Occurs

⚠ Warning

To protect the whole unit during lightning, please stop operating the unit and remove the plug from the socket.
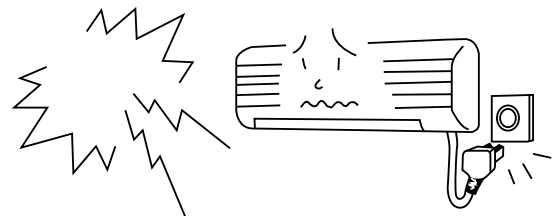
Interference From Electrical Products

⚠ Caution

To avoid noise interference, please place the indoor unit and its remote controller at least 1m away from electrical products.

Inverter-type fluorescent lamp.

To prevent interference, place at least 1m away.

TV

ATTACHING THE AIR CLEANSING AND DEODORIZING FILTERS

1 **Open the front panel.**
- Pull up the front panel by holding it at both sides with both hands.
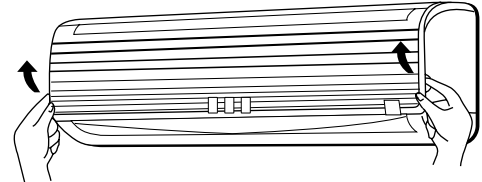
2 **Remove the filter.**
- Push upward to release the claws and pull out the filter.
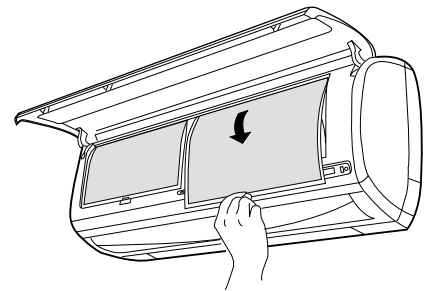
3 **Attaching the air cleansing and deodorizing filters to the filter.**
- Attach the air cleansing and deodorizing filters to the frame by gently compress its both sides and release after insertion into filter frame.

Claws (4 places)
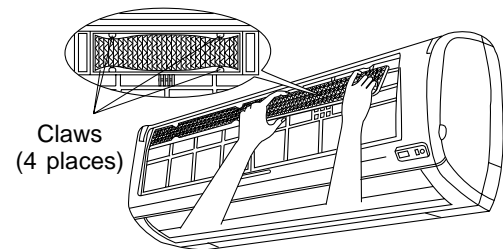
⚠ CAUTION

Do not bend the air cleansing and deodorizing filter as it may cause damage to the structure.
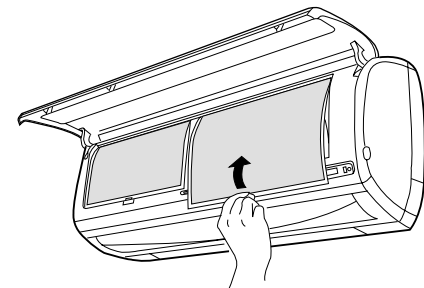
4 **Attach the filters.**
- Attach the filters by ensuring that the surface written "FRONT" is facing front.
- After attaching the filters, push the front panel at three arrow portion as shown in figure and close it.
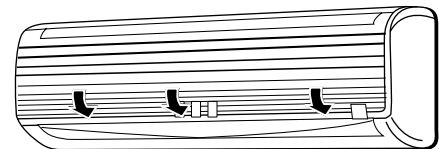
NOTE

- In case of removing the air cleansing and deodorizing filters, please follow the above procedures.
- The cooling capacity is slightly weakened and the cooling speed becomes slower when the air cleansing and deodorizing filters are used. So, set the fan speed to "HIGH" when using it in this condition.
- Air cleansing and deodorizing filters are washable and reusable up to 20 times by using vacuum cleaner or water rinse under running tap water. Type number for this air cleansing filter is <SPX-CFH7>. Please use this number for ordering when you want to renew it.
- Do not operate the air conditioner without filter. Dust may enter the air conditioner and fault may occur.

MAINTENANCE

⚠ CAUTION

Cleaning and maintenance must be carried out only by qualified service personal. Before cleaning, stop operation and switch off the power supply.

---

1. AIR FILTER ▦

Clean the air filter, as it removes dust inside the room. In case the air filter is full of dust, the air flow will decrease and the cooling capacity will be reduced. Further, noise may occur. Be sure to clean the filter following the procedure below.

PROCEDURE

1 Open the front panel and remove the filter
- Gently lift and remove the air cleansing and deodorizing filter from the air filter frame.
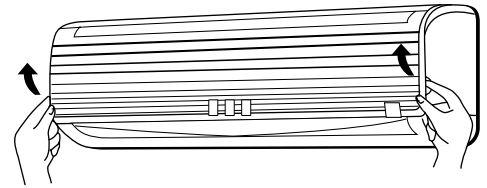
2 Vacuum dust from the air filter and air cleansing and deodorizing filter using vacuum cleaner. If there is too much dust, rinse under running tap water and gently brush it with soft bristle brush. Allow filters to dry in shade.
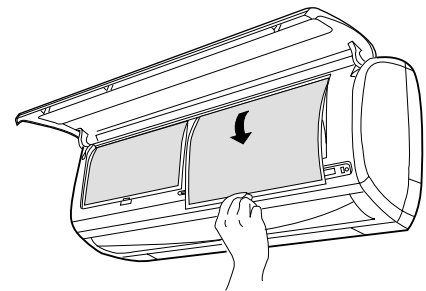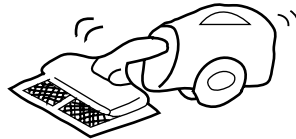
3
- Re-insert the air cleansing and deodorizing filter to the filter frame. Set the filter with "FRONT" mark facing front, and slot them into the original state.
- After attaching the filters, push the front panel at three arrow portions as shown in figure and close it.
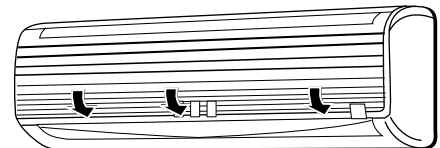
NOTE:
- Air cleansing and deodorizing filter should be cleaned every month or sooner if noticeable loading occurs. When used overtime, it may loose its deodorizing function. For maximum performance, it is recommended to replace it every 3-6 months depending on application requirements.

⚠ CAUTION

- Do not wash with hot water at more than 40°C. The filter may shrink.
- When washing it, shake off moisture completely and dry it in the shade; do not expose it directly to the sun. The filter may shrink.
- Do not use detergent on the air cleansing and deodorizing filter as some detergent may deteriorate the filter electrostatic performance.

2. Washable Front Panel

● Remove the front panel and wash with clean
  water.
  Wash it with a soft sponge.
  After using neutral detergent, wash thoroughly
  with clean water.

● When front panel is not removed, wipe it with
  a soft dry cloth. Wipe the remote controller
  thoroughly with a soft dry cloth.

● Wipe the water thoroughly.
  If water remains at indicators or signal
  receiver of indoor unit, it causes trouble.
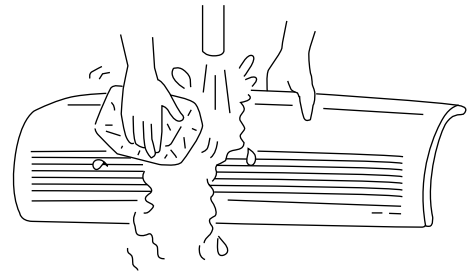
  Method of removing the front panel.
  Be sure to hold the front panel with both hands
  to detach and attach it.

Removing the Front Panel	Attaching the Front Panel

Arm

Projection
Hole
Flange
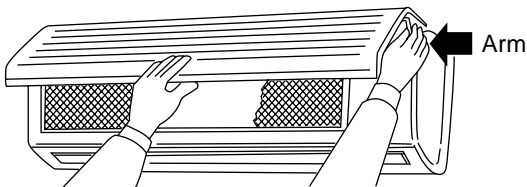
● When the front panel is fully opened with
  both hands, push the right arm to the inside
  to release it, and while closing the front panel
  slightly, put it out forward.
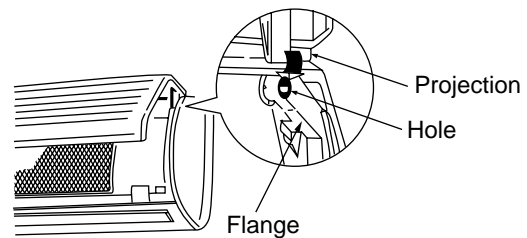
● Move the projections of the left and right
  arms into the **Flanges** in the unit and
  securely insert them into the holes.

⚠ CAUTION

● Do not splash or direct water to the body of the unit when cleaning
  it as this may cause short circuit.
● Never use hot water (above 40°C), benzine, gasoline, acid, thinner or
  a brush, because they will damage the plastic surface and the coating.

BENZINE   ACID   THINNER

3.   MAINTENANCE AT BEGINNING OF LONG OFF PERIOD

● Run the unit by setting the operation mode to ❄ (COOL), the temperature to 32°C and the fan speed to HI for about half a day on a fine day, and dry the whole of the unit.

● Switch off the power plug.

Air Blow
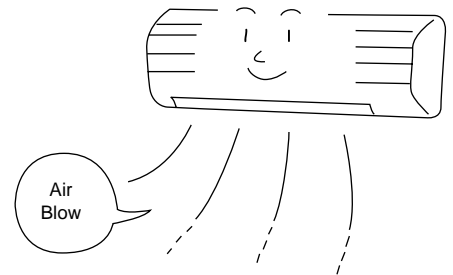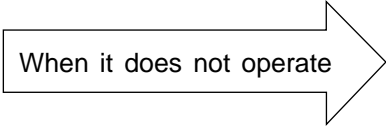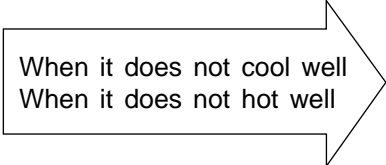
REGULAR INSPECTION

PLEASE CHECK THE FOLLOWING POINTS BY QUALIFIED SERVICE PERSONAL EITHER EVERY HALF YEARLY OR YEARLY. CONTACT YOUR SALES AGENT OR SERVICE SHOP.

1		Is the earth line disconnected or broken?
2		Is the mounting frame seriously affected by rust and is the outdoor unit tilted or unstable?
3	Confirm	Is the plug of power line firmly plugged into the socket? (Please ensure no loose contact between them).

AFTER SALE SERVICE AND WARRANTY

WHEN ASKING FOR SERVICE, CHECK THE FOLLOWING POINTS.

CONDITION	CHECK THE FOLLOWING POINTS
When it does not operate	● Is the fuse all right? ● Is the voltage extremely high or low? ● Is the circuit breaker "ON"?
When it does not cool well When it does not hot well	● Was the air filter cleaned? ● Does sunlight fall directly on the outdoor unit? ● Is the air flow of the outdoor unit obstructed? ● Are the doors or windows opened, or is there any source of heat in the room? ● Is the set temperature suitable?

Notes
● In quiet operation or stopping the operation, the following phenomena may occassionally occur, but they are not abnormal for the operation.
  (1)　Slight flowing noise of refrigerant in the refrigerating cycle.
  (2)　Slight rubbing noise from the fan casing which is cooled and then gradually warmed as operation stops.
● The odor will possibly be emitted from the room air conditioner because the various odor, emitted by smoke, foodstuffs, cosmetics and so on, sticks to it. So the air filter and the evaporator regularly must be cleaned to reduce the odor.

● Please contact your sales agent immediately if the air conditioner still fails to operate normally after the above inspections. Inform your agent of the model of your unit, production number, date of installation. Please also inform him regarding the fault.

● Power supply shall be connected at the rated voltage, otherwise the unit will be broken or could not reach the specified capacity.

Please note:
On switching on the equipment, particularly when the room light is dimmed, a slight brightness fluctuation may occur. This is of no consequence.
The conditions of the local Power Supply Companies are to be observed.

Note
● Avoid to use the room air conditioner for cooling operation when the outside temperature is below 21°C (70°F).
The recommended maximum and minimum operating temperatures of the hot and cold sides should be as below:

		Cooling		Heating	
		Minimum	Maximum	Minimum	Maximum
Indoor	Dry bulb °C	21	32	20	27
	Wet bulb °C	15	23	12	19
Outdoor	Dry bulb °C	21	43	2	21
	Wet bulb °C	15	26	1	15

CONSTRUCTION AND DIMENSIONAL DIAGRAM

MODEL RAK-25NH4, RAK-35NH4, RAK-50NH4

Air suction grill

Top air suction grill

Front panel

Mounting plate

Cabinet

183

860

285

60

6.5

47

Discharge grill

Horizontal deflector

Vertical deflector

47

60

6.5

P

About
380

About
350

View from back
(Pipe lead-out)

47

47

31

60

60

120.5

147

56

17.5

240

450

170

140

70

70

28

Drain hose

Drain

Drain outlet

Hole on the wall
for ø 65mm pipe

Drain cap
connection port

Narrow pipe

Connecting cable

Wide pipe

※ When piping is
drawn horizontally,
exchange the drain
hose for the drain cap

CONSTRUCTION AND DIMENSIONAL DIAGRAM FOR OUTDOOR

MODEL RAC-25NH4, RAC-35NH4

MODEL RAC-50NH4

Handle

Air suction
grille

Air outlet

Handle

Holes for anchor bolt
(2-ø12)

Fixing hole

Notch for anchor bolt
(2-ø12 Notchs)

More than
700

More than
100

More than
100

More than
100

Service space
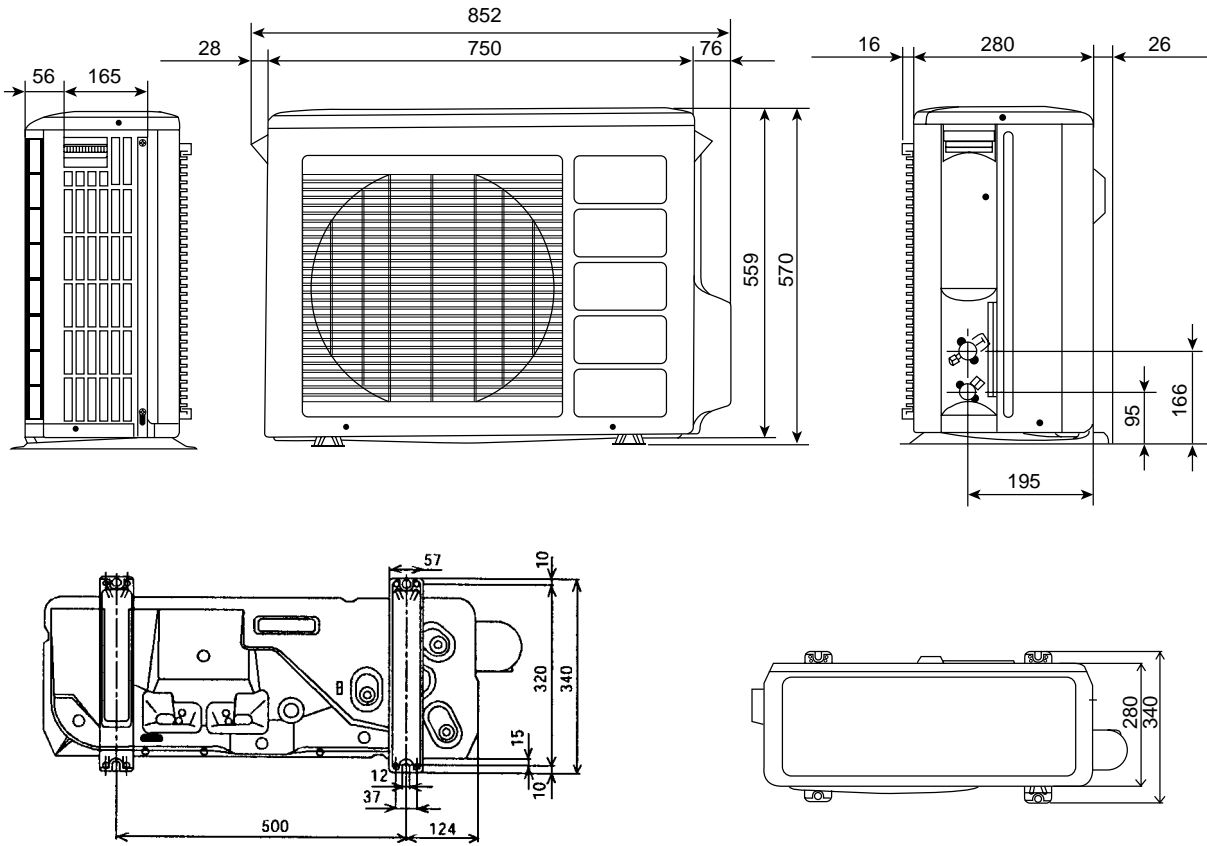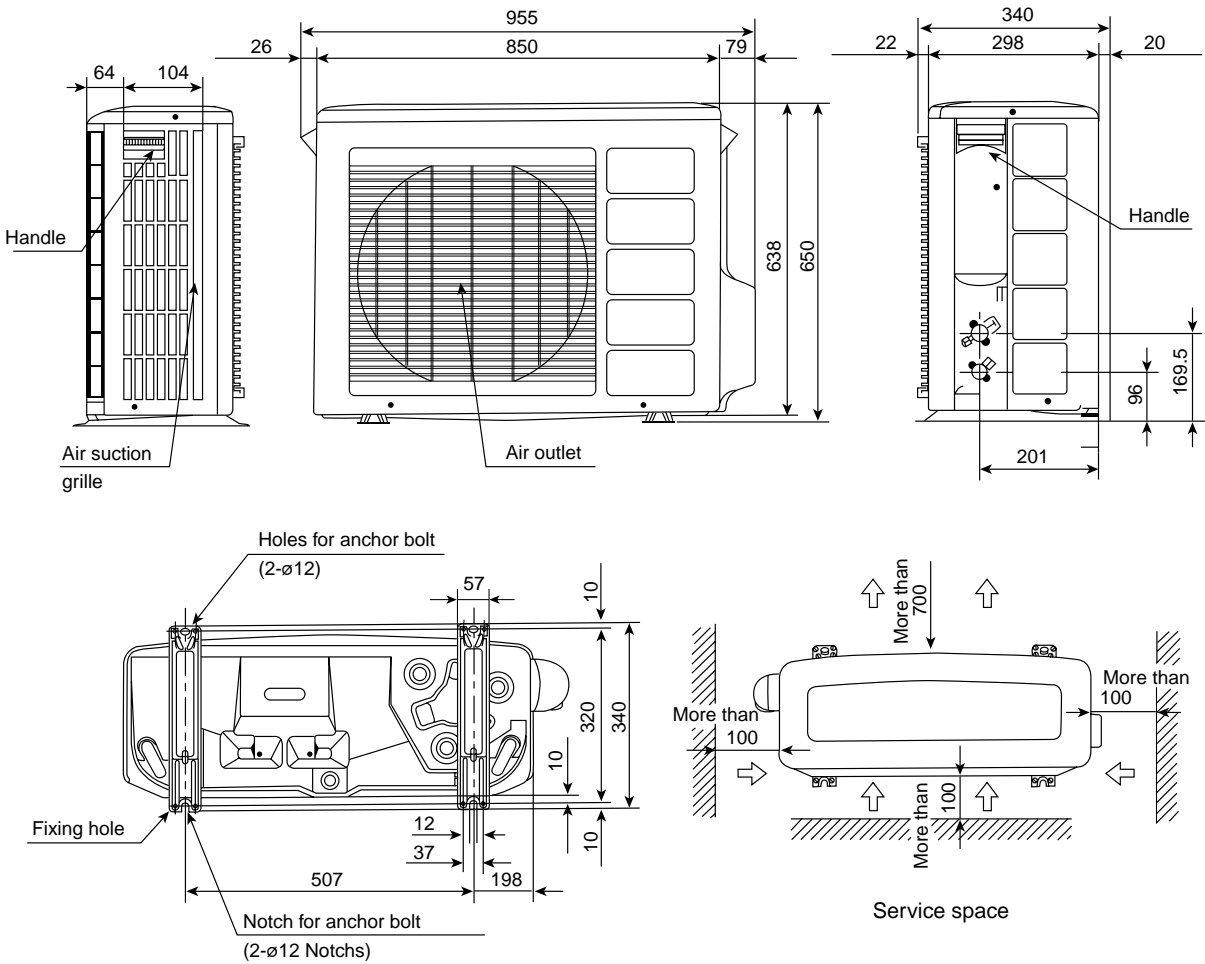
MAIN PARTS COMPONENT

THERMOSTAT

Thermostat Specifications

MODEL			RAK-25NH4, RAK-35NH4, RAK-50NH4	
THERMOSTAT MODEL			IC	
OPERATION MODE			COOL	HEAT
TEMPERATURE °C (°F)	INDICATION 16	ON	15.6 (60.1)	20.0 (68.0)
		OFF	15.3 (59.5)	20.7 (69.3)
	INDICATION 24	ON	23.6 (74.5)	28.0 (82.4)
		OFF	23.3 (73.9)	28.7 83.7)
	INDICATION 32	ON	31.6 (88.9)	36.0 (96.8)
		OFF	31.3 (88.3)	36.7 (98.1)

FAN MOTOR

Fan Motor Specifications

MODEL	RAK-25NH4, RAK-35NH4, RAK-50NH4	RAC-25NH4, RAC-35NH4, RAK-50NH4
POWER SOURCE	DC: 0 ~ 35V	DC360V
OUTPUT	23W	40W
CONNECTION	35V — RED 0V — BLK 5V — WHT 0 ~ 5V — YEL FG — BLU M (Control circuit built in)	360V — RED 0V — BLK 15V — WHT 0~6V — YEL 0~15V — BLU M

BLU : BLUE	YEL : YELLOW	BRN : BROWN	WHT : WHITE
GRY : GRAY	ORN : ORANGE	GRN : GREEN	RED : RED
BLK : BLACK	PNK : PINK	VIO : VIOLET	

COMPRESSOR MOTOR

Compressor Motor Specifications

MODEL		RAC-25NH4	RAC-35NH4	RAC-50NH4
COMPRESSOR MODEL		JU1012D		JU1013D
PHASE		SINGLE		
RATED VOLTAGE		AC 220 ~ 230 V		
RATED FREQUENCY		50 Hz		
POLE NUMBER		4		
CONNECTION				
RESISTANCE VALUE (Ω)	20°C (68°F)	2M = 1.05		
	75°C (167°F)	2M = 1.28		
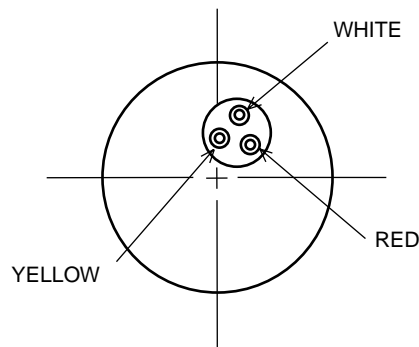
⚠CAUTION

When the refrigerating cycle has been operated for a long time with the capillary tubes clogged or crushed or with too little refrigerant, check the color of the refrigerating machine oil inside the compressor. If the color has been changed conspicuously, replace the compressor.

WIRING DIAGRAM

MODEL   RAK-25NH4 / RAC-25NH4
          RAK-35NH4 / RAC-35NH4
          RAK-50NH4 / RAC-50NH4

THERE ARE SOME LEAD WIRES
WHICH HAVE SPIRAL STRIPES
WITH WHITE IN ADDITION TO
THE ORIGINAL COLOR

SINGLE PHASE
AC220~230V
50Hz
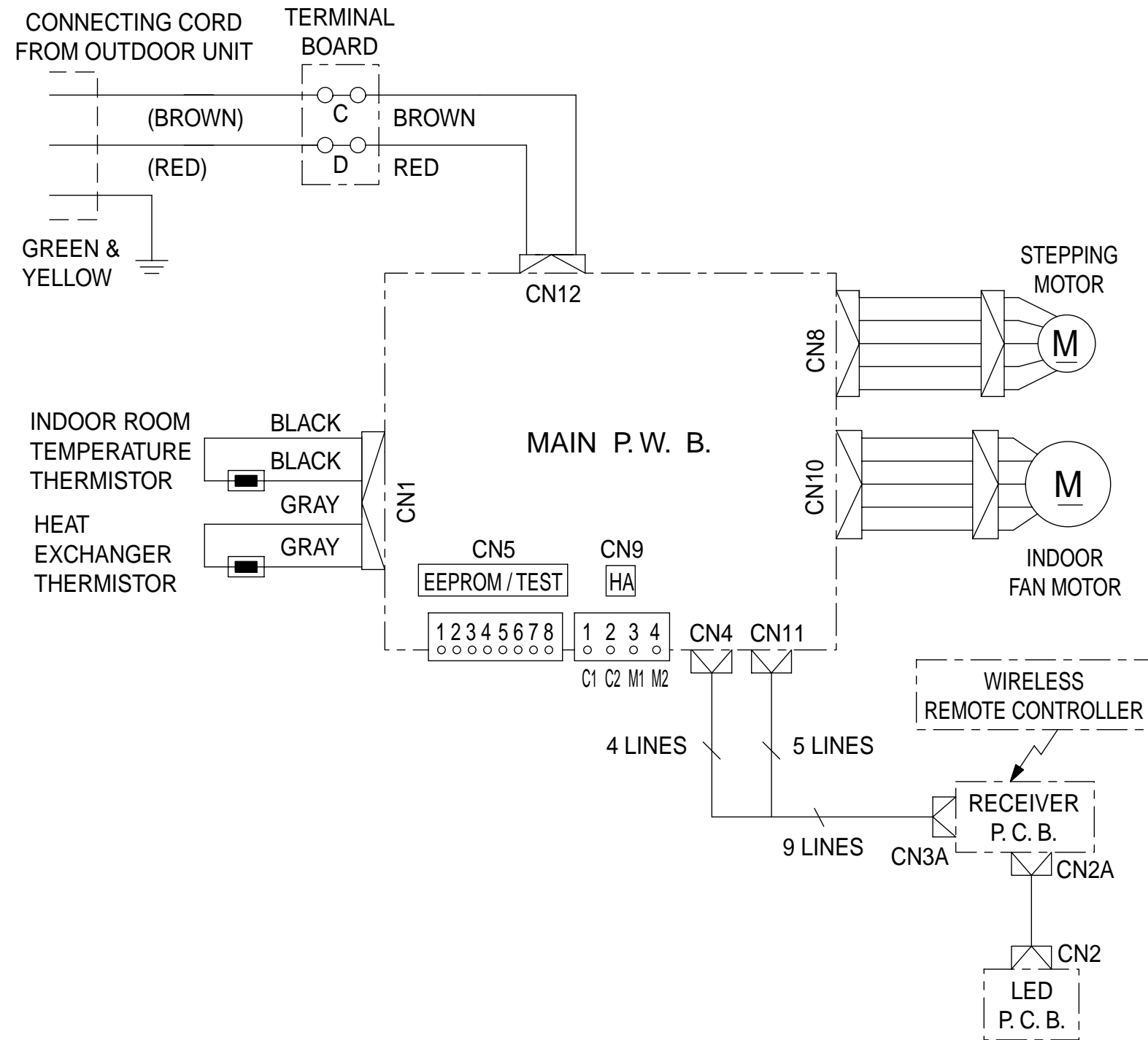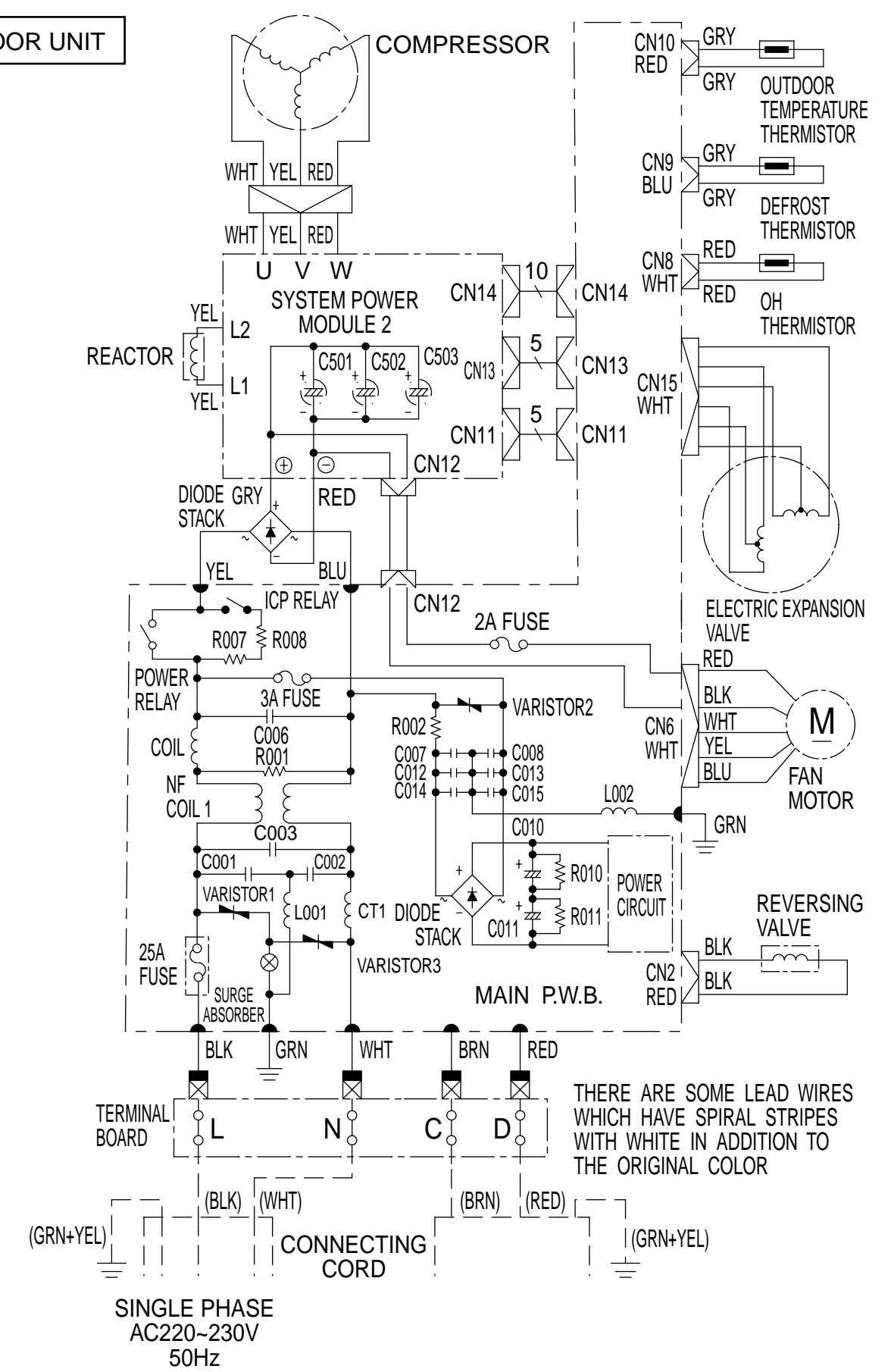
CIRCUIT DIAGRAM

Remote Control
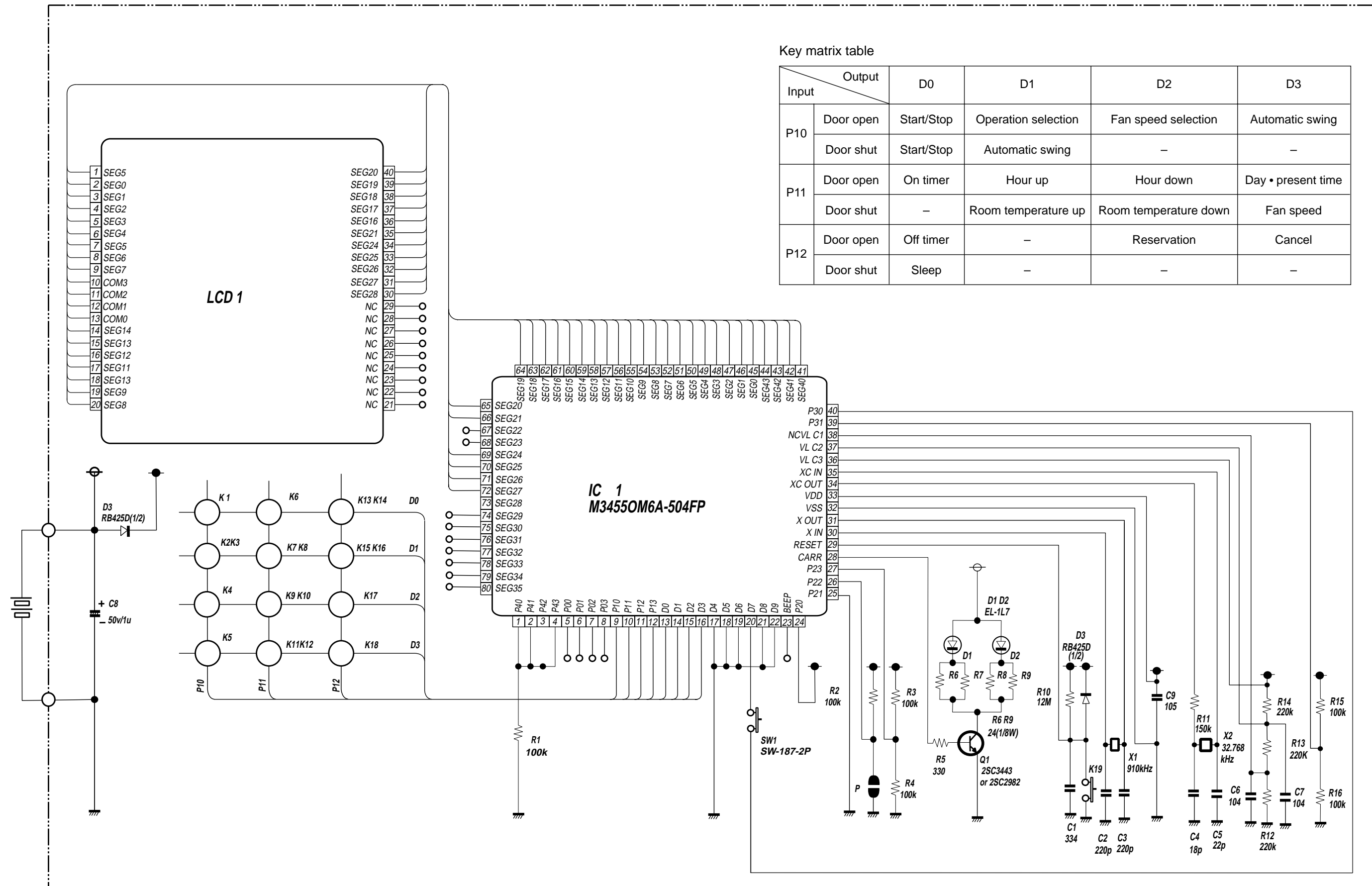
Key matrix table

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   RAK-25NH4, RAK-35NH4, RAK-50NH4
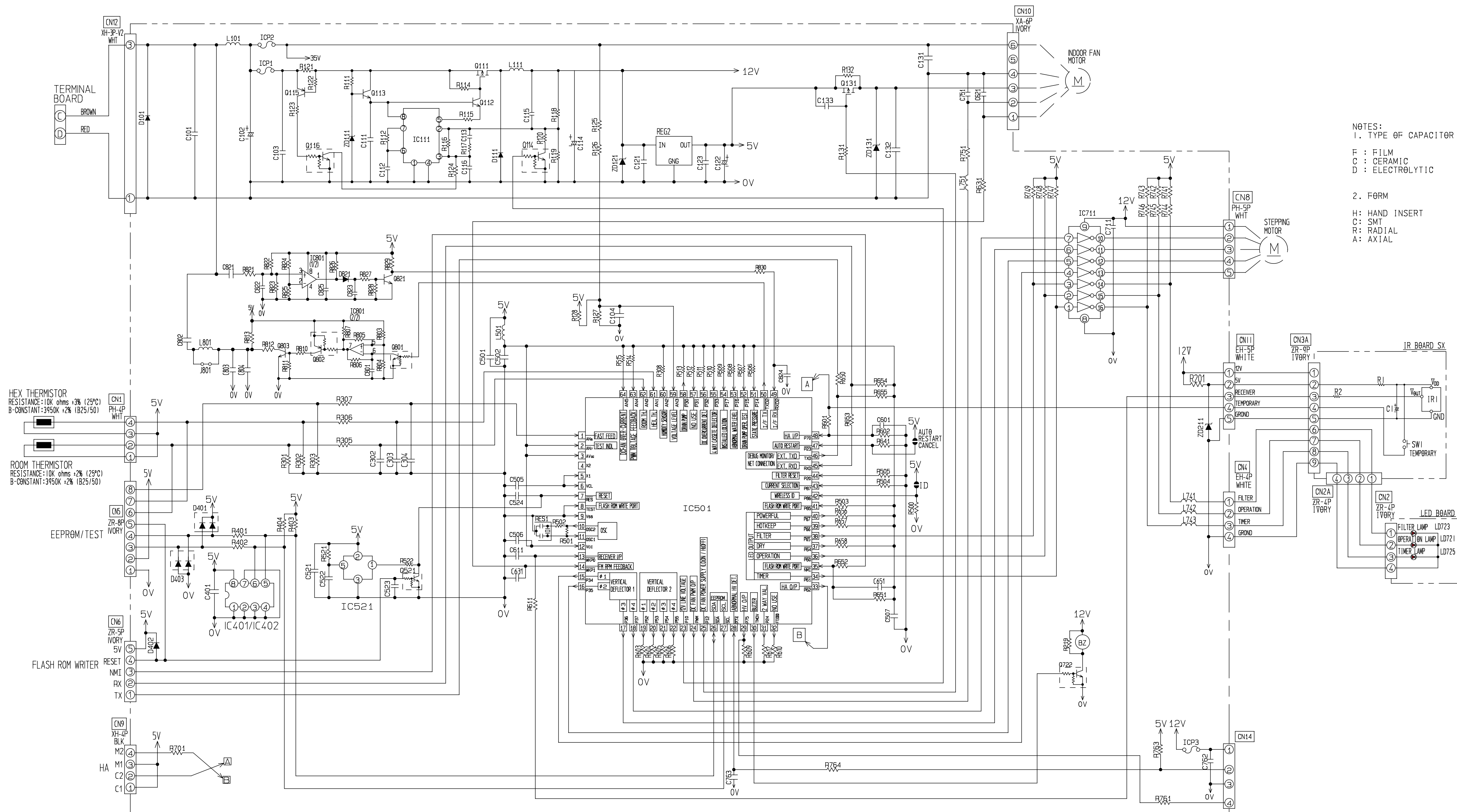
NOTES:
1. TYPE OF CAPACITOR

F : FILM
C : CERAMIC
D : ELECTROLYTIC

2. FORM

H: HAND INSERT
C: SMT
R: RADIAL
A: AXIAL

RESISTOR

SYMBOL	RESISTANCE	TOL.	POWER	FORM
R111	27K		1/10W	C
R112	30K		1/10W	C
R114	750	5%	1/6W	C
R115	560	5%	1/6W	C
R116				
R117	68K		1/16W	C
R118	75K	1/2%	1/16W	C
R119	6.48K	±2%	1/16W	C
R120				
R121	0.56		1/4W	C
R122	100	5%	1/16W	C
R123	33K		1/16W	C
R124	100	5%	1/16W	C
R125				
R126				
R127				
R128	10K	5%	1/16W	C
R131				
R132	JUMPER	–		C
R201	1K	5%	1/10W	C
R219	3.3K	5%	1/6W	C
R301	12.7K		1/16W	C
R302	12.7K		1/16W	C
R303	1K	5%	1/16W	C
R305	1K	5%	1/16W	C
R306	1K	5%	1/16W	C
R307	1K	5%	1/16W	C
R308	10K	5%	1/16W	C
R401	390	5%	1/16W	C
R402	390	5%	1/16W	C
R403	5.1K		1/16W	C
R404	5.1K		1/16W	C
R500	10K		1/16W	C
R501	1M		1/16W	C
R502	0		1/16W	C
R503	10K	5%	1/16W	C
R504	10K	5%	1/16W	C
R505	10K	5%	1/16W	C
R506	10K	5%	1/16W	C
R507	10K	5%	1/16W	C
R508	10K	5%	1/16W	C
R509	10K	5%	1/16W	C
R510	10K	5%	1/16W	C
R511	10K	5%	1/16W	C
R512	10K	5%	1/16W	C
R513	10K	5%	1/16W	C
R514	10K	5%	1/16W	C
R515	10K	5%	1/16W	C
R521	1M	5%	1/16W	C
R522	1K	5%	1/16W	C
R601	10K	5%	1/16W	C
R602	10K	5%	1/16W	C
R603	10K	5%	1/16W	C
R604	10K	5%	1/16W	C
R605	10K	5%	1/16W	C
R606	10K	5%	1/16W	C
R609				
R610	10K		1/16W	C
R611	10K		1/16W	C
R612	10K		1/16W	C
R631	1K	5%	1/16W	C
R641	10K		1/16W	C
R650	1K	5%	1/16W	C
R651	1K	5%	1/16W	C
R652	100	5%	1/16W	C
R653	1K	5%	1/16W	C
R654	10K	5%	1/16W	C
R655	10K	5%	1/16W	C
R656	10K	5%	1/16W	C
R657	10K	5%	1/16W	C
R658	10K	5%	1/16W	C
R701	1K	5%	1/16W	C
R741	110	5%	1/10W	C
R742	110	5%	1/10W	C
R743	110	5%	1/10W	C
R744	130	5%	1/10W	C
R745	130	5%	1/10W	C
R746	130	5%	1/10W	C
R747	5.1K	5%	1/16W	C
R748	5.1K	5%	1/16W	C
R749	5.1K	5%	1/16W	C
R751	2.7K	5%	1/16W	C
R761				
R763	10K	5%	1/16W	C
R764	1K	5%	1/16W	C
R803	120K	5%	1/16W	C
R804	120K	5%	1/16W	C
R805	120K	5%	1/16W	C
R806	120K	5%	1/16W	C
R807	4.3K	5%	1/16W	C
R810	680	5%	1/10W	C
R811	2K	5%	1/16W	C
R812	39	5%	1/8W	C
R813	39	5%	1/8W	C
R821	1K	5%	1/16W	C
R822	10K	±1%	1/16W	C
R823	10K	±1%	1/16W	C
R824	8.25K	±1%	1/16W	C
R825	10K	5%	1/16W	C
R826	1K	5%	1/16W	C
R827	3K	5%	1/16W	C
R828	1K	5%	1/16W	C
R829	5.1K	5%	1/16W	C
R830	1K	5%	1/16W	C
R1	47	5%	1/10W	C
R2	1K	5%	1/16W	C

CAPACITOR

SYMBOL	CAPACITANCE	TOL.	TYPE	FORM
C101	0.22µ	50V	F	H
C102	330µ	63V	D	H
C103	470P	630V	C	C
C111	2.2µ	10V	C	C
C112	1000P	50V	C	C
C113	0.047µ		C	C
C114	220µ	35V	D	C
C115				
C116				
C121	0.1µ	25V	C	C
C122	100µ	10V	D	H
C123	0.1µ	25V	C	C
C131	0.22µ	50V	C	C
C132	0.1µ	25V	C	C
C133				
C302	0.1µ	25V	C	C
C303	0.1µ	25V	C	C
C304	0.1µ	25V	C	C
C401	0.1µ	25V	C	C
C501	0.1µ	25V	C	C
C502	0.1µ	25V	C	C
C505	0.1µ	25V	C	C
C506	0.1µ	25V	C	C
C507	0.1µ	25V	C	C
C521	0.1µ	25V	C	C
C522	0.22µ	10V	C	C
C523	0.1µ	25V	C	C
C524	0.1µ	25V	C	C
C601	0.1µ	25V	C	C
C611	1000P	50V	C	C
C621				
C631	1000P	50V	C	C
C651	0.1µ	25V	C	C
C711	0.1µ	25V	C	C
C751	1µ	16V	C	C
C762	0.1µ	25V	C	C
C763	0.1µ	25V	C	C
C801	150P	50V	C	C
C802	0.22µ	50V	F	H
C803	0.1µ	25V	C	C
C804				
C821	0.01µ	16V	C	C
C822	1000P	50V	C	C
C823	0.047µ	25V	C	C
C824	0.1µ	50V	C	C
C825	0.1µ	25V	C	C
C1	33µ	10V	D	H

TRANSISTOR

SYMBOL	MODEL	FORM
Q111	2SJ51B	C
Q112	2SC5209H	C
Q113	2SC5209H	C
Q114		
Q115	2SA1162Y	C
Q116	RN1102	C
Q131		
Q521	RN1102	C
Q722	RN1102	C
Q801	RN1102	C
Q802	RN2102	C
Q803	2SC3441E	C
Q821	2SC4738GRY	C

IC

SYMBOL	MODEL	FORM
IC111	NJM2340M	C
REG2	MC7805CT	H
IC401	BR24C02F	C
IC402	S24C02BOP	H
IC501	AX-7R11	C
IC521	RN5VD42C	C
IC711	ULN2003ANS	C
IC801	NJM2903W	C
IR1	RPM6938-V4	H

LED

SYMBOL	MODEL	COLOR	FORM
LD721	SEL6914A	YEL	H
LD723	SEL6214S	RED	H
LD725	SEL6414E	GRN	H

ICPS

SYMBOL	MODEL	COLOR	FORM
ICP1	CCP2E-20	0.8A	C
ICP2	CCP2E-50	2.0A	C
ICP3			

OSCILLATOR

SYMBOL	MODEL	FREQ.	FORM
RES1	CSTLS10MHZ	10MHz	H

ZENER DIODE

SYMBOL	MODEL	FORM
ZD111	RD6.2UJN2	C
ZD121	PTZ20A	C
ZD131	RLZ6.8A	C
ZD211	RD5.1UJN2	C

DIODE

SYMBOL	MODEL	FORM
D101	G4DL-6140	H
D111	D1FS6	C
D401		C
D403		C
D402	1SS355	C
D821	1SS355	C

INDUCTOR

SYMBOL	INDUCTANCE	C. RATING	FORM
L101	82µ	1.3A	H
L111	560µ	0.4A	H
L501	CHIP JUMPER		C
L741	CHIP JUMPER	–	C
L742	CHIP JUMPER	–	C
L743	CHIP JUMPER	–	C
L751	CHIP JUMPER	–	C
L801	100µ	55mA	C

CHIP JUMPER

SYMBOL	USAGE	FORM
J801	NONE	C

BUZZER

SYMBOL	MODEL	FORM
BZ	PKM13EPY	H

SWITCH

SYMBOL	MODEL	FORM
SW1	EVQP09K	H

CONNECTORS

SYMBOL	MODEL NO.	COLOR	FORM	REMARK
CN1	PH-4P (TOP ENTRY)	WHITE	H	ROOM,HEAT EXING THERMISTOR
CN2	ZR-4P (SIDE ENTRY)	IVORY		LED BOARD
CN2A	ZR-4P (SIDE ENTRY)	IVORY		LED BOARD (IR BOARD)
CN3A	ZR-9P (SIDE ENTRY)	IVORY		IR BOARD
CN4	EH-4P (TOP ENTRY)	WHITE		LED BOARD (MAIN BOARD)
CN5	ZR-8P (SIDE ENTRY)	IVORY		EEPROM / TEST
CN6	ZR-5P (TOP ENTRY)	IVORY		FLASH ROM
CN8	PH-5P (TOP ENTRY)	WHITE	H	STEPPING MOTOR
CN9	XH-4P (TOP ENTRY)	BLACK	H	HA
CN10	XA-6P (TOP ENTRY)	IVORY		INDOOR PWM FAN
CN11	EH-5P (TOP ENTRY)	WHITE	H	IR BOARD
CN12	XH-3P-V2 (TOP ENTRY)	WHITE	H	35V SUPPLY
CN14				

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CIRCUIT DIAGRAM

MODEL   RAC-25NH4/RAC-35NH4/RAC-50NH4

MAIN BOARD

SPM 2

MOUNTING
A: AXIAL
R: RADIAL (R1,R2)
P: RADIAL (7.5mm PITCH)
H: MANUAL INSERT

BOARD
HIC: HYBRID IC
M: MAIN BOARD

COMPONENT TYPE
C: CERAMIC
F: FILM
D: ELECTROLYTIC

PRINTED WIRING BOARD LOCATION DIAGRAM

MODEL RAK-25NH4, RAK-35NH4, RAK-50NH4

MAIN P.W.B.

Marking on P.W.B.

COMPONENT SIDE

SOLDERING SIDE

RECEIVING P.W.B.

Marking on P.W.B.

COMPONENT SIDE

SOLDERING SIDE

MODEL RAC-25NH4, RAC-35NH4, RAC-50NH4

MAIN P.W.B. Marking on P.W.B

COMPONENT SIDE

PCBHA010JA
U09PA-SE200780A

BLOCK DIAGRAM

MODEL   RAK-25NH4 / RAC-25NH4
        RAK-35NH4 / RAC-35NH4
        RAK-50NH4 / RAC-50NH4

INDOOR UNIT

OUTDOOR UNIT

FM Outdoor DC fan motor

Power source
1ø, 50Hz, 220~230V

L
N

Magnetic relay

Outdoor unit Terminal board

Inrush current Protection circuit

SPM2

ACT Power circuit

Power module

M DC compressor motor

DC current signal

LCD wireless

Wireless receive circuit

Buzzer circuit

Room temperature thermistor

Indicating lamp

Filter.
Operation.
Timer.

Rotor magnetic pole position detection circuit

Peak current cut off circuit

Trip signal synthesis circuit

Upper arm drive circuit

Peak current cut off

Indoor microcomputer (AX-7R11)

Overload control circuit

Outdoor microcomputer / HIC (AX-8N00)

Lower arm drive circuit

Heat exchanger thermistor

M Auto sweep motor for Air deflector

Voltage amplification circuit

Over heat thermistor

Defrost thermistor

Self-diagnosis circuit

Electric Expansion valve

Temporary switch

Outdoor temperature thermistor

Indoor/Outdoor interface circuit

C C

D D

Indoor/Outdoor interface circuit

Electric Expansion valve drive circuit

M

Initial setting circuit

DC fan motor drive circuit

Clock circuit

Relay drive circuit

Reset circuit

DC35V

Microcomputer clock circuit

FM Indoor DC fan motor

Reversing valve coil

Power circuit (Indoor unit)

Power circuit (P.W.B.)

Reset circuit

BASIC MODE

Operation mode		Fan	Cooling	Dehumidifying (dehumidifying operation by the function select button only, not including that engaged by the dehumidify button)	Heating	Auto
Basic operation of start/stop switch				Start/stop switch — Start Stop Start Stop / Operation tamp		
Timer functions	Off-timer			Start/stop switch / Operation tamp / Cancel switch / Operation temp / Timer tamp / Timer memory — (Off-timer during stop) (Change in reserved time)		
	On-timer			Srart/stop switch / Reserve switch / Cancel switch / Operation temp / Timer tamp / Timer memory — (Change in reserved time) (On-timer during operation)		
	Off -> On / On -> Off timer			Start/stop switch / Reserve switch / Cancel switch / Operation lamp / Timer lamp / Timer memory — OFF ON ON OFF ON OFF OFF ON (Off->On timer) (On->Off timer) (On->Off timer) during operation) (Off->On timer) during stop)		
Fan speed mode (indoor fan)	Auto	Changes from "Hi" to "Med" or "Lo" depending on room temperature. / Temperature set for cooling / Thermo judgment / Compressor / Hi Med Lo / (Compressor stopped forcibly for 3 minutes) / 1. Runs at "Hi" until first thermo off after operation is started. / 2. Runs at "Lo" when thermo is off.	Changes between "Lo" and "Med" depending on the room temperature. 	Temperature division	Fan speed	 Division 1	Lo	 Division 2	Lo	 Division 3	Med	 Division 4	Med	 1. The indoor fan also stops when the compressor is in stop status.	Set to "ultra-Lo", "Lo", "Med", "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. In modes other than left / 42.66 37.66 32.66 29.66 ˚C / Heat exchanger temperature / Hi or ultra-HI (fan speed set to "auto") Med Lo	Operating mode is judged by room temperature and outdoor temperature. (1) Judging by outdoor temperature • Operating mode is judged by outdoor temperature. Only when the mode is not restricted by this judgment, the judgment by room temperature in the next paragraph will be performed. (a) Outdoor temperature ≧ 30°C : Restricted to cooling (b) Outdoor temperature ≦ 9°C : Restricted to heating (2) Judging by room temperature Operating mode at start up is judged (initial judgment) (a) Conditions for judgment (any of the followings) • When auto operation is started after 1 hour has elapsed since the operation was stopped. • When auto operation is started after the previous manual mode operation. • When the operating mode is switched to auto while operating at manual mode. (b) Judging method • Room temperature ≧ 23°C ±3°C : Cooling • Room temperature < 23°C ±3°C : Heating ※ ±3°C is the fine adjustment value from the remote controller.

Fan speed mode (indoor fan) — detail rows

Hi
- Fan: Operates at "Hi" regardless of the room temperature.
- Cooling: Set to "ultra-Hi" when the compressor runs at maximum speed, and to "Hi" in other modes.
- Dehumidifying: Set to "Hi" in modes other than when the compressor stops.
- Heating: 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
- Fan: Operates at "Med" regardless of the room temperature.
- Cooling: Same as at left.
- Dehumidifying: Set to "Med" in modes other than when the compressor stops.
- Heating: 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 preseating (cooling is recovered at 18.33˚C).

Lo
- Fan: Operates at "Lo" regardless of the room temperature.
- Cooling: Same as at left.
- Dehumidifying: Set to "Lo" in modes other than when the compressor stops.
- Heating: 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 preseating (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: KAFON KAFOF "Med" with overload "Lo"

Auto (right column continued):
Judging operating mode change during operation (Continuous judgment)
(a) Conditions for judgment (any of the followings)
• The mode is reviewed at every interval time.
• When auto operation is started again before 1 hour has elapsed since the operation was stopped.
(b) Judging method
• Judge by setting the hysteresis on the final preset temperature.
The final preset temperature is the actually targeted preset temperature which is the sum of the basic preset temperature and each type of shift value (e.g. ±3°C by remote controller, preset temperature correction value, powerful shift value, etc.).
[Currently cooling]
• Room temperature ≦ Final preset temperature −3°C Change to heating
• Room temperature > Final preset temperature −3°C Continue cooling
[Currently heating]
• Room temperature ≧ Final preset temperature +2°C Change to cooling
• Room temperature < Final preset temperature +2°C Continue heating

Room-temperature: Cooling 22°C Heating / 9°C 30°C Outdoor temperature

−3°C Cooling / Heating / final preset temperature +2°C

Basic operation of temperature controller

- Fan: Performs only fan operation at the set speed regardless of the room temperature. Start/stop switch / Operation lamp / Fan Speed Hi Med Lo / Hi Med Lo
- Cooling: See page 49.
- Dehumidifying: See page 53.
- Heating: See page 55.

Sleep operation (with sleep button ON)

- Fan: • Enters sleep operation after set as on the left. • Action during sleep operation Lo (sleep) operation
- Cooling: • Same as at left • See page 51.
- Dehumidifying: • Same as at left • See page 53.
- Heating: • Same as at left • See page 57.
- Auto: • Same as at left. • Performs the sleep operation of each operation mode.

Table 1 Mode data file

LABEL NAME	RAK-25NH4	RAK-35NH4	RAK-50NH4
	VALUE		
WMAX	4500 min^{-1}	5500 min^{-1}	6200 min^{-1}
WMAX2	4600 min^{-1}	5600 min^{-1}	6250 min^{-1}
WSTD	3250 min^{-1}	4350 min^{-1}	5200 min^{-1}
WBEMAX	2600 min^{-1}	2800 min^{-1}	2600 min^{-1}
CMAX	2900 min^{-1}	3700 min^{-1}	5700 min^{-1}
CMAX2	3000 min^{-1}	3800 min^{-1}	5800 min^{-1}
CSTD	2500 min^{-1}	3550 min^{-1}	5200 min^{-1}
CKYMAX	2200 min^{-1}	2800 min^{-1}	3550 min^{-1}
CJKMAX	2000 min^{-1}	2500 min^{-1}	2700 min^{-1}
CBEMAX	1800 min^{-1}	2200 min^{-1}	2000 min^{-1}
WMIN	1200 min^{-1}	1200 min^{-1}	1200 min^{-1}
CMIN	1500 min^{-1}	1500 min^{-1}	1500 min^{-1}
STARTMC	60 Seconds	60 Seconds	60 Seconds
DWNRATEW	80%	80%	80%
DWNRATEC	80%	80%	80%
SHIFTW	3.33°C	3.33°C	3.33°C
SHIFTC	1.00°C	1.00°C	0.33°C
CLMXTP	30.00°C	30.00°C	30.00°C
YNEOF	22.00°C	22.00°C	28.00°C
TEION	5.00°C	5.00°C	2.00°C
TEIOF	9.00°C	9.00°C	9.00°C
SFTDSW	1.00°C	1.00°C	1.00°C
DFTIM1	45 Minutes	45 Minutes	45 Minutes
DFTIM2	60 Minutes	60 Minutes	60 Minutes

Basic Cooling Operation

Table 2 ΔTCMAX

Temperature difference	Calculated compressor rpm
1.66	2265 min^{-1}
2	2435 min^{-1}
2.33	2600 min^{-1}
2.66	2765 min^{-1}
3	2935 min^{-1}
3.33	3100 min^{-1}
3.66	3265 min^{-1}
4	3435 min^{-1}
4.33	3600 min^{-1}
4.66	3765 min^{-1}
5	3935 min^{-1}
5.33	4100 min^{-1}
5.66	4265 min^{-1}
6	4435 min^{-1}
6.33	4600 min^{-1}
6.66	4765 min^{-1}
7	4935 min^{-1}
7.33	5100 min^{-1}
7.66	5265 min^{-1}
8	5435 min^{-1}
8.33	5600 min^{-1}
8.66	5765 min^{-1}
9	5935 min^{-1}
9.33	6100 min^{-1}
9.66	6265 min^{-1}
10	6435 min^{-1}
10.33	6600 min^{-1}
10.66	6765 min^{-1}
11	6935 min^{-1}

Note:
1. See the data in Table 1 on page 47 for each constant in capital letters in the diagrams.

Labels in diagram: Room temperature; ΔTCMAX; Temperature set for cooling and dehumidifying (value set by remote control [+]); 1°C; 0.66°C; 1.33°C; Fan speed set to "auto"; Start/stop switch — Start, Stop, Start, Stop; Thermo judgment — Thermo OFF; Indoor fan — Ultra-Hi, Hi, Med, Lo, Ultra-Lo; (Engaged in the set fan speed in cases other than "auto" fan speed); Operation lamp; 1 min.; NOTE (9); Compressor rotation speed — Max., Rating, 3000, Min., 0; 1min.; Outdoor fan — Lo; 15sec.; Reversing valve (heating "on" mode)

Notes:
(1) Condition for entering into Cool Dashed mode. When fan set to "Hi" or "Auto mode" and temperature difference between indoor temperature and set temperature has a corresponding compressor rpm (calculated value in Table 7) larger than WMAX.
(2) Cool Dashed will release when i) a maximum 25 minutes is lapsed and ii) room temperature is lower than set temperature −3°C (thermo off) and iii) when room temperature has achieved setting temperature −1°C then maximum Cool Dashed time will be revised to 20 minutes. And iv) indoor fan is set to Lo and Med fan mode and v) change operation mode.
(3) During Cool Dashed operation, thermo off temperature is set temperature (with shift value) −3°C. After thermo off, operation continue in Fuzzy control mode.
(4) Compressor minimum "ON" time and "OFF" time is 3 minutes.
(5) During normal cooling mode, compressor maximum rpm CMAX will maintain for 60 minutes if indoor temperature is lower than CLMXTP. No time constrain if indoor temperature is higher than CLMXTP.
(6) When fan is set to "Hi", compressor rpm will be limited to CKYMAX.
(7) When fan is set to "Med", compressor rpm will be limited to CJKMAX.
(8) When fan is set to "Lo", compressor rpm will be limited to CBEMAX.
(9) During Cool Dashed, when room temperature reaches set temperature −1°C compressor rpm is actual rpm x DWNRATEC.

New Cool Rhythm

Notes:
(1) New cool rhythm is engaged when the fan speed is "auto" and the room temperature is less than set one plus 0.66°C in the "auto" operation mode or cooling mode.
(2) The minimum new cool rhythm time is 10 minutes when the temperature falls and rises.
(3) Cool rhythm is not engaged during Nice temperature, Sleep operation.
(4) PI control is engaged during new cool rhythm: the speed limit is the same as during normal operation.
(5) The new cool rhythm set temperature is also shifted during thermo OFF.

Cooling Defrost
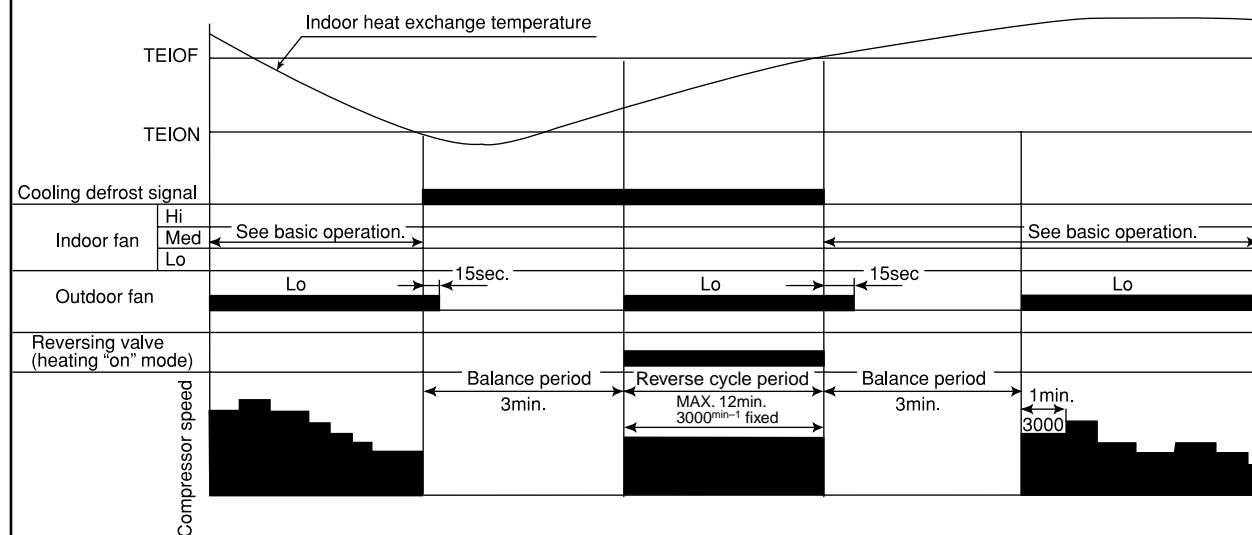
Cooling Sleep Operation
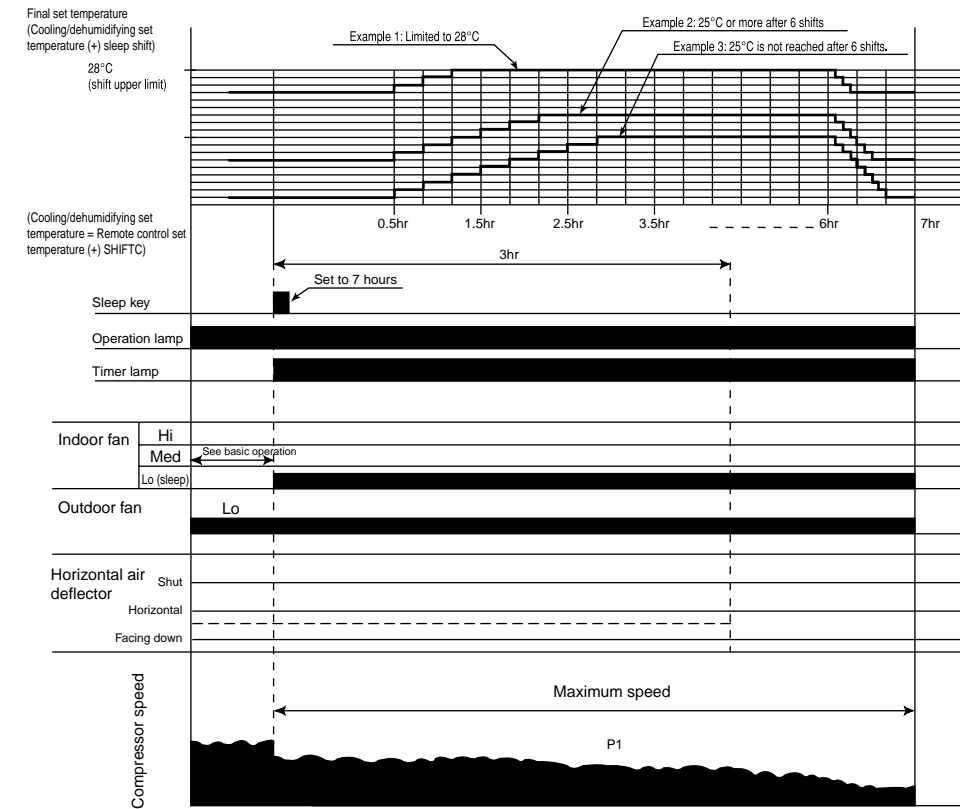
Notes:
(1) The sleep operation starts when the sleep key is pressed.
(2) When the sleep key is set, the maximum compressor speed is limited, and the indoor fan is set to "sleep Lo".
(3) 30 minutes after the sleep key is set, the sleep shift of temperature starts, and upper shift is made at least 6 times. If 25°C is not reached after 6 shifts, shifts repeat unit 25°C is reached.
(4) The sleep shift upper value of set temperature is 28°C.
(5) After 6 hours, a shift down to the initial set temperature is made at a rate of 0.33°C/5 min.
(6) If the operation mode is changed during sleep operation, the set temperature is cleared, and shift starts from the point when switching is made.
(7) The indoor fan speed does not change even when the fan speed mode is changed.
(8) When operation is stopped during sleep operation, the set temperature when stopped, as well as the time, continue to be counted.
(9) If the set lime is changed during sleep operation, all data including set temperature, time, etc. is cleared and restarted.
(10) If sleep operation is canceled by the cancel key or sleep key, all data is cleared.

Dehumidifying

30sec. Room temperature judgement

Room temperature

Cooling preset temperaure

+ 3 °C
+ 2.33 °C

−1.33°C
−0.66°C

2 °C

Room temperature judgement

30 sec.

Start/Stop Switch

Operation lamp

Thermostat judgement

Indoor fan	Hi
	Med
	Lo

5 min. OFF/1 min. ON

Outdoor fan	Hi
	Med
	Lo

15 sec. Delay

15 sec.

15 sec.

15 sec.

Reversing valve

Compressor rotation speed

1 min.

1 min.

1 min.
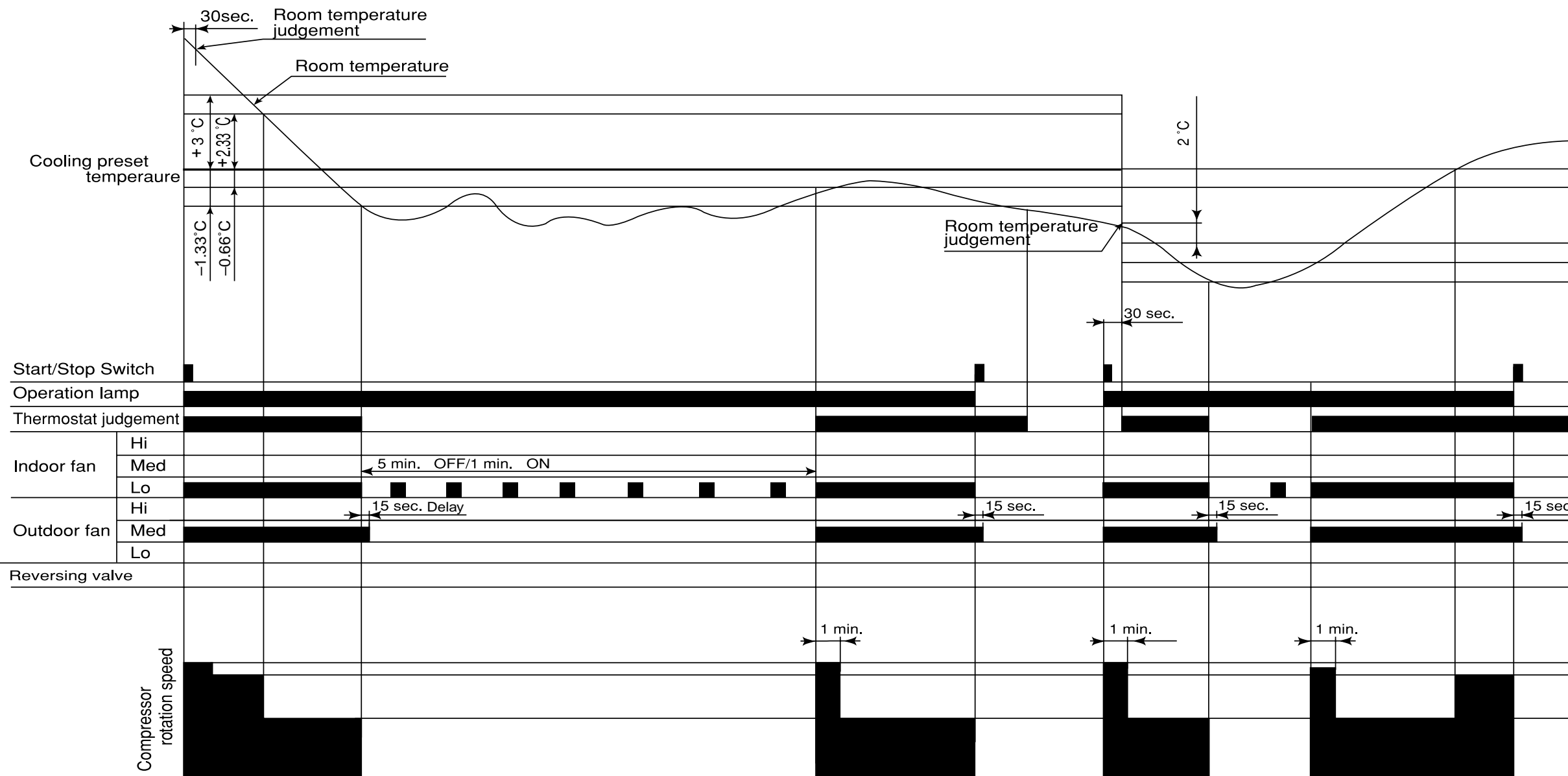
Notes:
(1) If the room temperature is (cooling preset temperature) - (1.33°C) or less after 30 seconds from starting the operation, the operation is done assuming
as the preset temperature = (room temperature at the time) - (2°C).
(2) The indoor fan is operated in the "Lo" mode. During thermo OFF indoor fan will be OFF for 5 minutes and ON for 1 minute.
(3) When the operation is started by the themostat turning ON, the start of the indoor fan is delayed 32 seconds after the start of compressor operation.
(4) The compressor is operated forcedly for 3 minutes after operation is started.
(5) The minimum ON time and OFF time of the compressor are 3 minutes.

Basic Heating Operation

Table 3 ΔTWMAX

Temperature difference	Calculated compressor rpm
1.66	1965 min⁻¹
2	2135 min⁻¹
2.33	2300 min⁻¹
2.66	2465 min⁻¹
3	2635 min⁻¹
3.33	2800 min⁻¹
3.66	2965 min⁻¹
4	3135 min⁻¹
4.33	3300 min⁻¹
4.66	3465 min⁻¹
5	3635 min⁻¹
5.33	3800 min⁻¹
5.66	3965 min⁻¹
6	4135 min⁻¹
6.33	4300 min⁻¹
6.66	4465 min⁻¹
7	4635 min⁻¹
7.33	4800 min⁻¹
7.66	4965 min⁻¹
8	5135 min⁻¹
8.33	5300 min⁻¹
8.66	5465 min⁻¹
9	5635 min⁻¹
9.33	5800 min⁻¹
9.66	5965 min⁻¹
10	6135 min⁻¹
10.33	6300 min⁻¹
10.66	6465 min⁻¹
11	6635 min⁻¹

Notes:
1. See the data in Table 1 on page 47 for each constant in capital letters in the diagrams.

Notes:
(1) Condition for entering into Hot Dashed mode. When fan set to "Hi" or "Auto mode" and i) Indoor temperature is lower than 18°C, and ii) outdoor temperature is lower than 10°C, and iii) Temperature difference between indoor temperature and set temperature has a corresponding compressor rpm (calculated value in Table 3) larger than WMAX.
(2) Hot Dashed will release when i) Room temperature has achieved the set temperature + SFTDSW. ii) Thermo off.
(3) During Hot Dashed operation, thermo off temperature is set temperature (with shift value) +3°C. After thermo off, operation continue in Fuzzy control mode.
(4) Compressor minimum "ON" time and "OFF" time is 3 minutes.
(5) During normal heating mode, compressor maximum rpm WMAX will maintain for 120 minutes if indoor temperature is higher than 18°C. No time limit constrain if indoor temperature is lower than 18°C and outdoor temperature is lower than 2°C.
(6) During Hotkeep or Defrost mode, indoor operation lamp will blink at interval of 3 seconds "ON" and 0.5 second "OFF".
(7) When heating mode starts, it will enter into Hotkeep mode if indoor heat exchanger temperature is lower than YNEOF + 0.33°C.
(8) When fan is set to "Med" or "Lo", compressor rpm will be limited to WBEMAX.
(9) In "Ultra-Lo" fan mode, if indoor temperature is lower than 18°C, indoor fan will stop. If indoor temperature is higher than 18°C + 0.33°C, fan will continue in "Ultra-Lo" mode. During Hotkeep or Defrost mode, fan will continue in "Ultra-Lo" mode.
(10) During Hot Dashed or outdoor temperature is lower than –5°C, compressor rpm is WMAX2.
(11) During Hot Dashed, when room temperature reaches set temperature + SFTDSW compressor rpm is actual rpm x DWNRATEW.

Reversing Valve Defrosting

Over defrosting inhibit period

15' or more | Auto fresh defrosting

30sec. | 30sec.

Start/Stop Switch — Fan speed set to 'Hi'

Stop

Defrost signal

Preheating judgment — Preheating released | Preheating

Indoor fan — Hi / Med / Lo / Ultra-Lo

10sec.

Outdoor fan — Hi | Hi | 15sec.

Operation lamp

Reversing valve (heating "on" mode)

Deceleration period | Reverse cycle period | Reverse cycle period

12min. Max. | TDP431 | 3min. Max. | 3min. | 12min. Max.

TDP411 | TDP412 | TDP413 | TDP421 | 1 min | 1min.

WMAX (WMAX2)

TDP422

3000 | 2400 | 1950 | 3000 | 3000

WMIN

0

Notes:
(1) The defrosting inhibit period is set as shown in the diagram below. When defrosting has finished once, the inhibit period is newly set, based on the outdoor temperature when the compressor was started. During this period, the defrost signal is not accepted.
(2) If the difference between the room and outdoor temperature is large when defrosting is finished, the maximum compressor speed (WMAX) or (WMAX2) can be continued for 120 minutes maximum.
(3) The defrosting period is 12 minutes maximum.
(4) When operation is stopped during defrosting, it is switched to auto refresh defrosting.
(5) Auto refresh defrosting cannot be engaged within 15 minutes after operation is started or defrosting is finished.

Setting Defrosting Inhibit Period

Time

DFTIM2

DFTIM1

-5°C | 0°C | Outdoor temperature
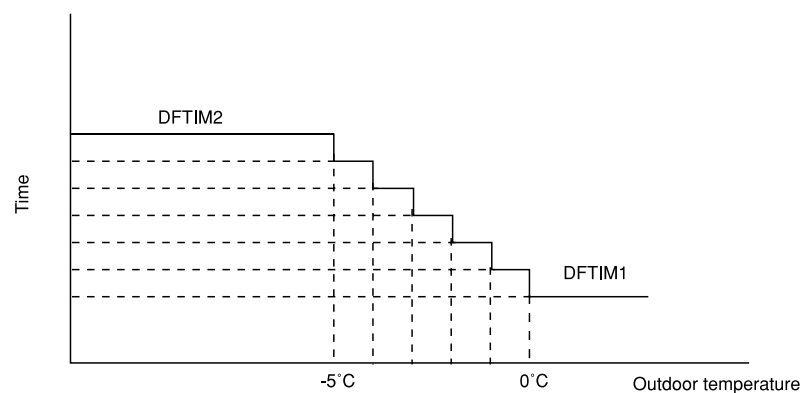
Notes:
(1) The time is set according to the outdoor temperature when it is between 0°C and -5°C.
(2) DFTIM1 is used when the outdoor temperature ≧ 0°C.
(3) DFTIM2 is used when the outdoor temperature ≦ -5°C.

Heating Sleep Operation
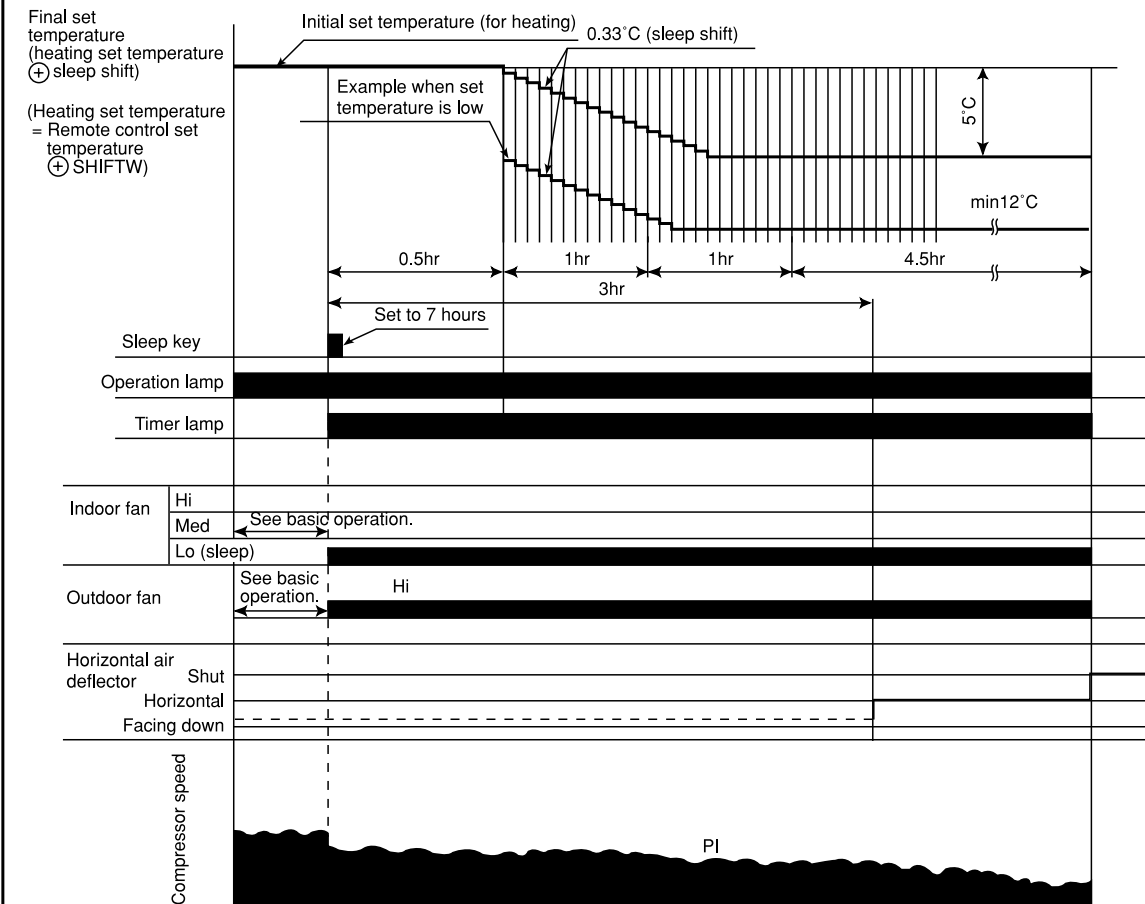
Final set temperature (heating set temperature ⊕ sleep shift)

Initial set temperature (for heating)

0.33°C (sleep shift)

(Heating set temperature = Remote control set temperature ⊕ SHIFTW)

Example when set temperature is low

5°C

min12°C

0.5hr | 1hr | 1hr | 4.5hr

3hr

Sleep key — Set to 7 hours

Operation lamp

Timer lamp

Indoor fan — Hi / Med / Lo (sleep) — See basic operation.

Outdoor fan — See basic operation. | Hi

Horizontal air deflector — Shut / Horizontal / Facing down

Compressor speed — PI

Notes:
(1) The sleep operation starts when the sleep key is pressed.
(2) When the sleep key is set, the maximum compressor speed is limited to WSTD+2000/2, and the indoor fan is set to "sleep Lo".
(3) 30 minutes after the sleep key is set, the sleep shift of set temperature starts.
(4) The maximum sleep shift of set temperature is 5°C, and the minimum is 12°C.
(5) If the operation mode is changed during sleep operation, the changed operation mode is set and sleep control starts.
(6) The indoor fan speed does not change even when the fan speed mode is changed. (Lo)
(7) When defrosting is to be set during sleep operation, defrosting is engaged and sleep operation is restored after defrosting.
(8) When operation is stopped during sleep operation, the set temperature when stopped, as well as the time, continue to be counted.
(9) If the set time is changed during sleep operation, all data including set temperature, time, etc. is cleared and restarted.
(10) If sleep operation is canceled by the cancel key or sleep key, all data is cleared.

REFRIGERATING CYCLE DIAGRAM
MODEL RAK-25NH4 / RAC-25NH4
RAK-35NH4 / RAC-35NH4

COOLING, DEHUMIDIFYING, DEFROSTING

OUTDOOR UNIT

INDOOR UNIT

ø9.52

COMPRESSOR

SUCTION TANK

REVERSING VALVE

SERVICE VALVE (3/8)

SINGLE-ENDED UNION (3/8)

ø9.52

ø9.52

ø8.0

ø8.0

ø12.7

ø12.7

ø12.7

ø12.7

ø12.7

ø7.0

ø7.0

ø7.0

ø7.0

ø7.0

ø7.0

ø6.35

ELECTRIC EXPANSION VALVE

ø6.35

SERVICE VALVE (1/4)

ø12.7

ø6.35

STRAINER

ø6.35

STRAINER

CHARGING PIPE

ø6.35

ø6.35

ø6.35

SINGLE-ENDED UNION (1/4)

HEATING

OUTDOOR UNIT

INDOOR UNIT

ø9.52

COMPRESSOR

SUCTION TANK

REVERSING VALVE

SERVICE VALVE (3/8)

SINGLE-ENDED UNION (3/8)

ø9.52

ø9.52

ø8.0

ø8.0

ø12.7

ø12.7

ø12.7

ø12.7

ø12.7

ø7.0

ø7.0

ø7.0

ø7.0

ø7.0

ø7.0

ø6.35

ELECTRIC EXPANSION VALVE

ø6.35

SERVICE VALVE (1/4)

ø12.7

ø6.35

STRAINER

ø6.35

STRAINER

CHARGING PIPE

ø6.35

ø6.35

ø6.35

SINGLE-ENDED UNION (1/4)

REFRIGERATING CYCLE DIAGRAM

MODEL RAK-50NH4 / RAC-50NH4

COOLING, DEHUMIDIFYING, DEFROSTING

OUTDOOR UNIT

ø8.0

COMPRESSOR

SERVICE VALVE (1/2)

INDOOR UNIT

SINGLE-ENDED UNION (1/2)

ø9.52

ø12.7

SUCTION TANK

ø7.0

ø8.0

ø7.0

REVERSING VALVE

ø7.0

ø6.35

ø12.7

ø7.0

ø6.35

ø12.7

ø6.35

ø7.0

ø6.35

ø6.35

ELECTRIC EXPANSION VALVE

ø7.0

ø7.0

SERVICE VALVE (1/4)

ø6.35

STRAINER

ø6.35

ø9.0

STRAINER

ø6.35

SINGLE-ENDED UNION (1/4)

ø6.35

HEATING

OUTDOOR UNIT

ø8.0

COMPRESSOR

SERVICE VALVE (1/2)

INDOOR UNIT

SINGLE-ENDED UNION (1/2)

ø9.52

ø12.7

SUCTION TANK

ø7.0

ø8.0

ø7.0

REVERSING VALVE

ø7.0

ø6.35

ø12.7

ø7.0

ø6.35

ø12.7

ø6.35

ø7.0

ø6.35

ø6.35

ELECTRIC EXPANSION VALVE

ø7.0

SERVICE VALVE (1/4)

ø6.35

STRAINER

ø6.35

ø9.0

STRAINER

ø6.35

SINGLE-ENDED UNION (1/4)

ø6.35

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AUTO SWING FUNCTION

MODEL: RAK-25NH4, RAK-35NH4, RAK-50NH4

INPUT SIGNAL	PRESENT CONDITION			OPERATING SPECIFICATION	REFERENCE
	OPERATION	OPERATION MODE	AIR DEFLECTOR		
KEY INPUT	STOP	EACH MODE	STOP	ONE SWING (CLOSING AIR DEFLECTOR) ① DOWNWARD ② UPWARD	INITIALIZE AT NEXT OPERATION.
			DURING ONE SWING	STOP AT THE MOMENT.	
	DURING OPERATION	AUTO COOL COOL FAN AUTO DRY DRY	STOP	START SWINGING ① DOWNWARD ② UPWARD ③ DOWNWARD	
			DURING SWINGING	STOP AT THE MOMENT.	
		AUTO HEAT HEAT CIRCULATOR	STOP	START SWINGING ① DOWNWARD ② UPWARD ③ DOWNWARD	
			DURING SWINGING	STOP AT THE MOMENT.	
THERMO. ON (INTERNAL FAN ON)	DURING OPERATION	AUTO DRY DRY	TEMPORARY STOP	START SWING AGAIN.	
THERMO. ON (INTERNAL FAN OFF)	DURING OPERATION	AUTO HAET HEAT CIRCULATOR	DURING SWINGING	STOP SWINGING TEMPORARILY. (SWING MODE IS CLEARED IF SWING COMMAND IS TRANSMITTED DURING TEMPORARY STOP.)	
MAIN SWITCH ON	STOP	COOL FAN DRY	STOP DURING ONE SWING	INITIALIZE ① DOWNWARD ② UPWARD	
		HEAT CIRCULATOR	STOP DURING ONE SWING	INITIALIZE ① DOWNWARD	
MAIN SWITCH OFF	DURING OPERATION	EACH MODE	STOP DURING SWINGING	ONE SWING (CLOSING AIR DEFLECTOR) ① DOWNWARD ② UPWARD	INITIALIZE AT NEXT OPERATION.
			DURING INITIALIZING	INITIALIZING CONDITION OF EACH MODE.	
CHANGE OF OPERATION	DURING OPERATION	EACH MODE	STOP DURING SWINGING	STOP SWINGING AND MODE BECOMES INITIALIZING CONDITION.	

DESCRIPTION OF MAIN CIRCUIT OPERATION

MODEL   RAK-25NH4, RAK-35NH4, RAK-50NH4

1. Reset Circuit
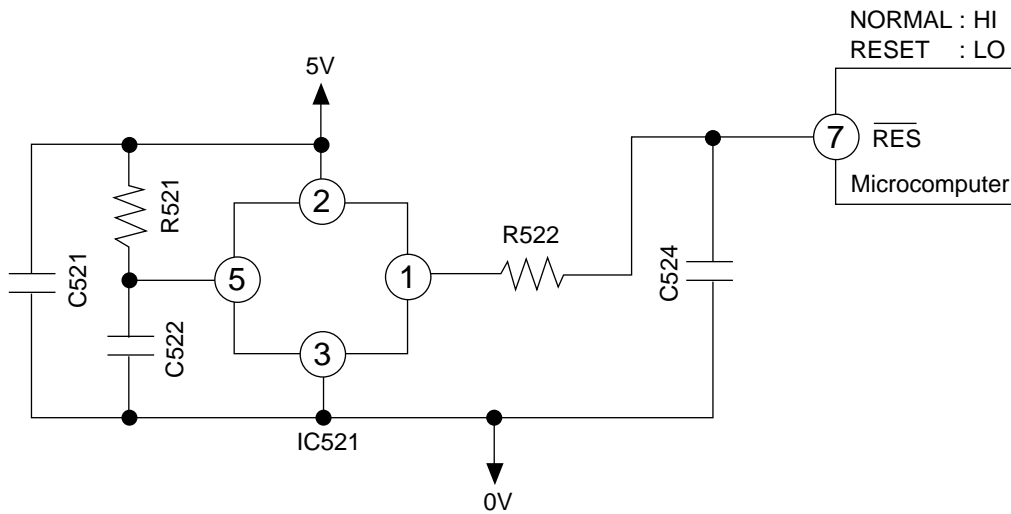
Fig. 1-1
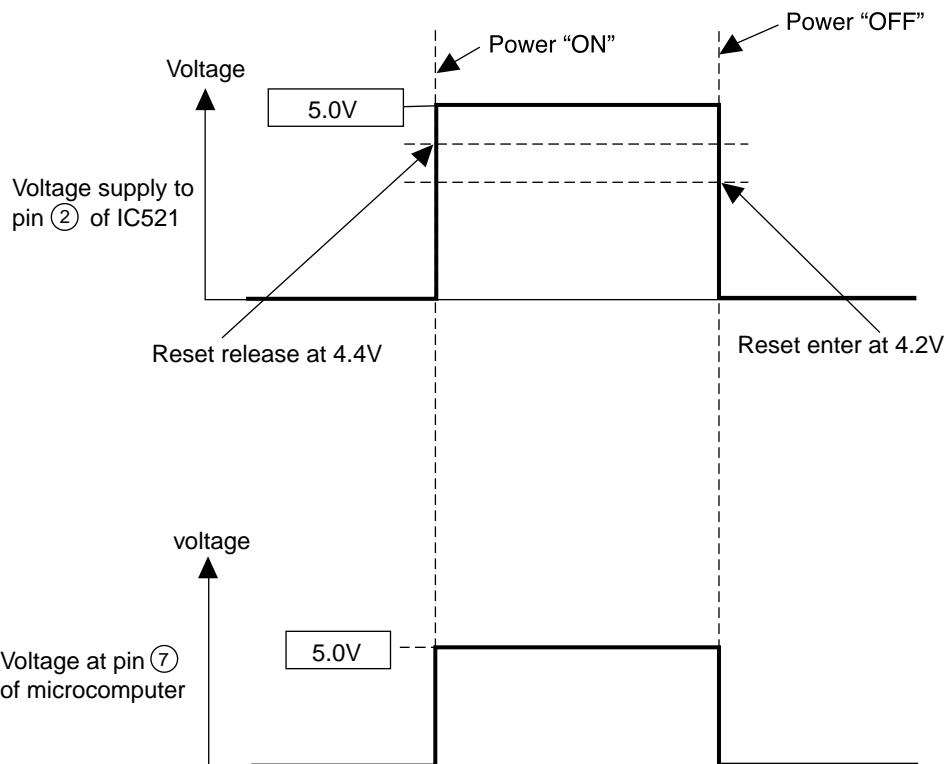
Fig. 1-2

- The reset circuit initializes the microcomputer program when power is ON or OFF.
- Low voltage at pin ⑦ resets the microcomputer and Hi activates the microcomputer.
- When power "ON" 5V voltage rises and reaches 4.4V, pin ① of IC521 is set to "Hi". At this time the microcomputer starts operation.
- When power "OFF" voltage drops and reaches 4.2V, pin ① of IC521 is set to "Low". This will RESET the microcomputer.

2. Receiver Circuit
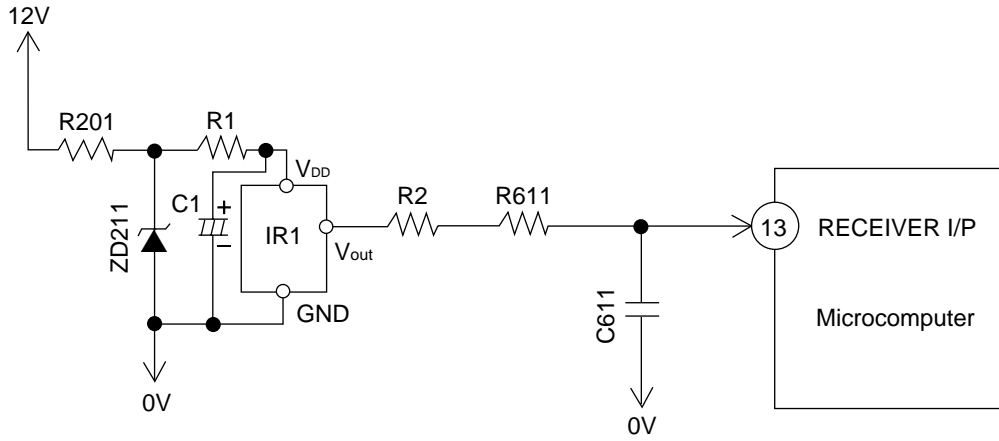
Fig. 2-1

- The light receiver unit receives the infrared signal from the wireless remote control. The receiver amplifies and shapes the signal and outputs it.

3. Buzzer Circuit
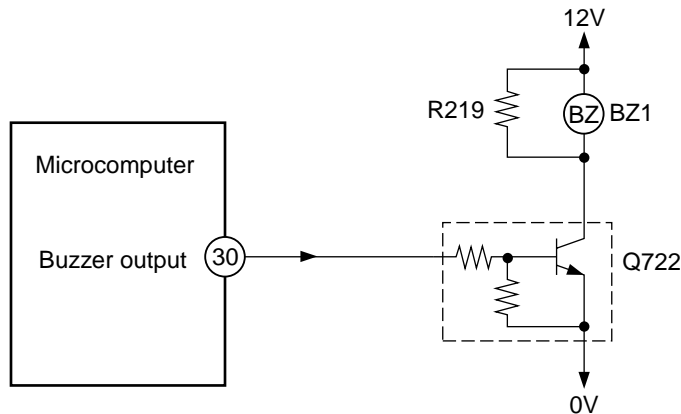
Fig. 3-1 Buzzer Circuit

- When the buzzer sounds, an approx. 3.9kHz square signal is output from buzzer output pin ③⓪ of the microcomputer. After the amplitude of this signal has been set to 12Vp-p by a transistor, it is applied to the buzzer. The piezoelectric element in the buzzer oscillates to generate the buzzer's sound.
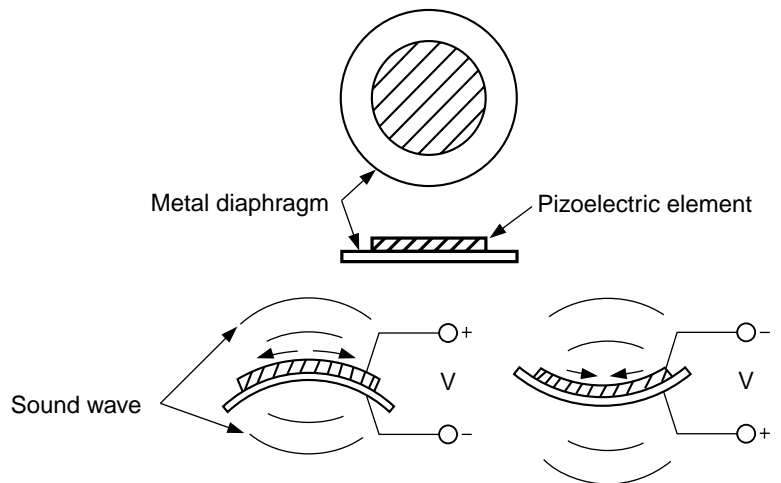
Fig. 3-2 Buzzer Operation

4. Auto Sweep Motor Circuit
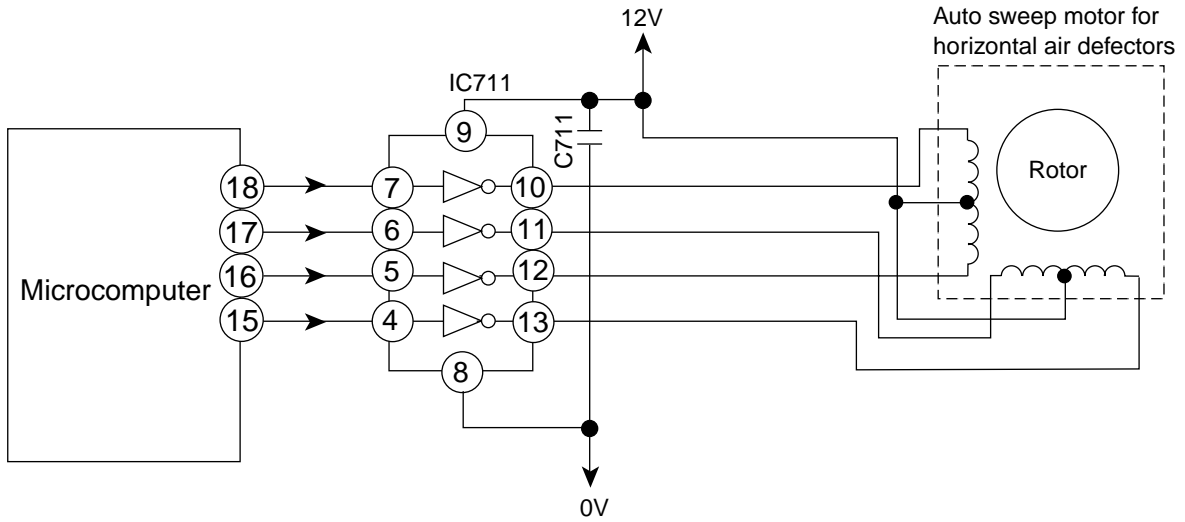
Fig.4-1

- Fig. 4-1 shows the Auto sweep motor drive circuit; the signals shown in Fig.4-2 are output from pins ⑮ – ⑱ of microcomputer.

Microcomputer pins	Step width								Horizontal air deflectors: 10ms.
Horizontal air deflectors	1	2	3	4	5	6	7	8	
⑮									
⑯									
⑰									
⑱									

Fig.4-2 Microcomputer Output Signals

- As the microcomputer's outputs change as shown in Fig.4-2, the core of the auto sweep motor is excited to turn the rotor. Table 4-1 shows the rotation angle of horizontal air deflectors.

Table 4-1 Auto sweep Motor Rotation

	Rotation angle per step (°)	Time per step (ms.)
Horizontal air deflectors	0.0882	10

5. Room Temperature Thermistor Circuit

● Fig. 5-1 shows the room temperature thermistor circuit.
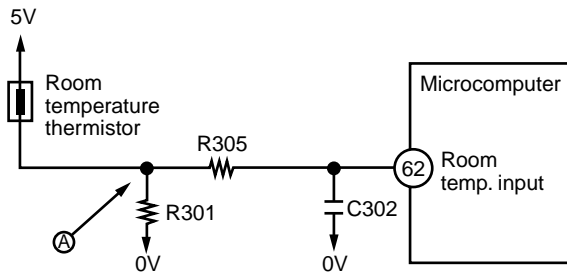
● The voltage at Ⓐ depends on the room temperature as shown in Fig. 5-2.

Fig. 5-1
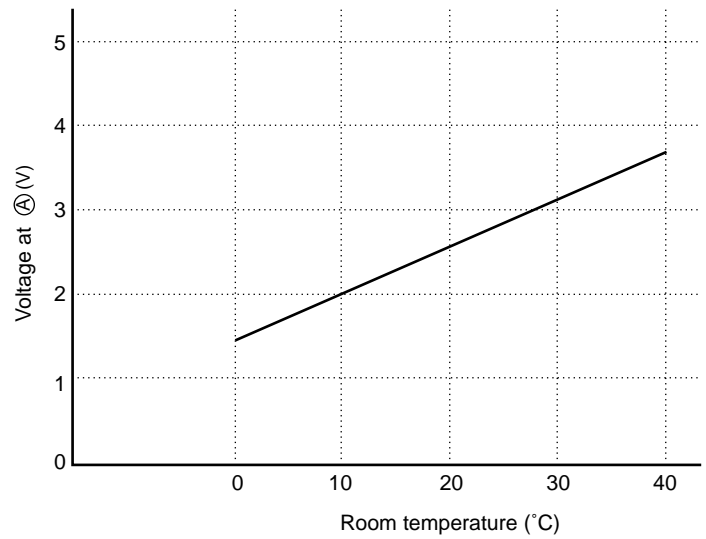
Fig. 5-2

6. Heat exchanger temperature thermistor circuit
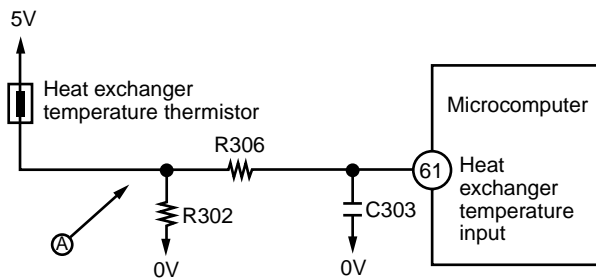
Fig. 6-1

● The circuit detects the indoor heat exchanger temperature and controls the following.

(1) Preheating.

(2) Low-temperature defrosting during cooling and dehumidifying operation.

(3) Detection of the reversing valve non-operation or heat exchanger temperature thermistor open.

The voltage at Ⓐ depends on the heat exchanger temperature as shown in Fig. 6-2.
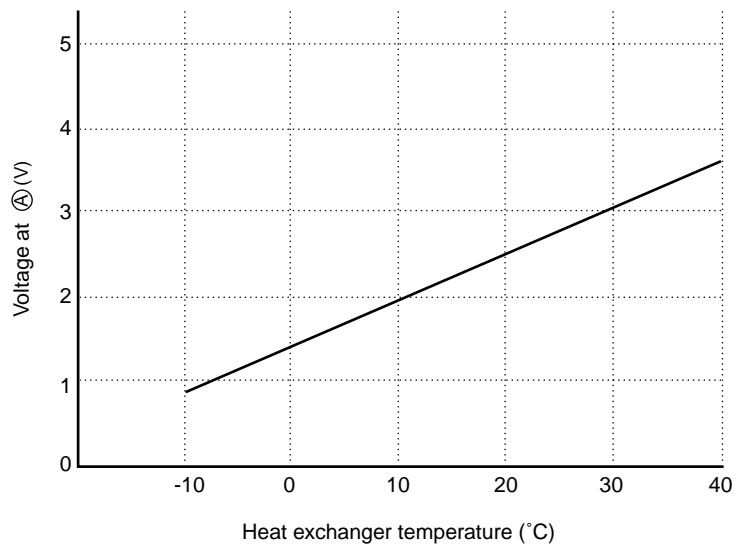
Fig. 6-2

7. Initial Setting Circuit (IC401)

- When power is supplied, the microcomputer reads the data in IC401 or IC402 (E^2PROM) and sets the preheating activation value and the rating and maximum speed of the compressor, etc. to their initial values.

- Data of self-diagnosis mode is stored in IC401 or IC402; data will not be erased even when power is turned off.
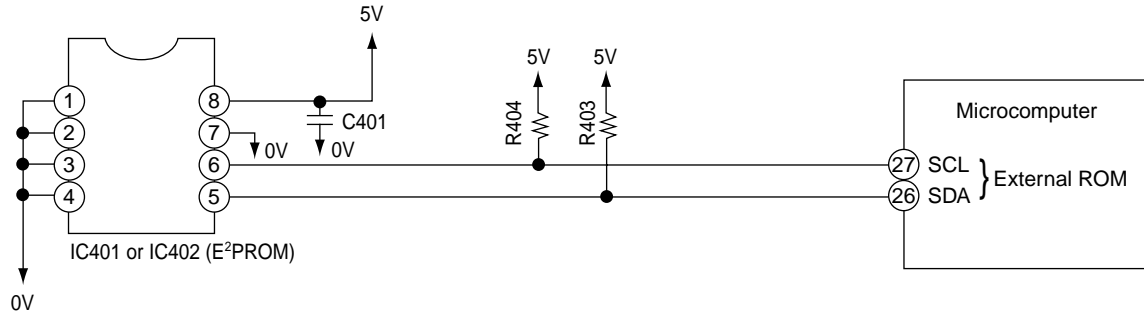
Fig. 7-1

Model RAC-25NH4, RAC-35NH4, RAC-50NH4

1. Power Circuit
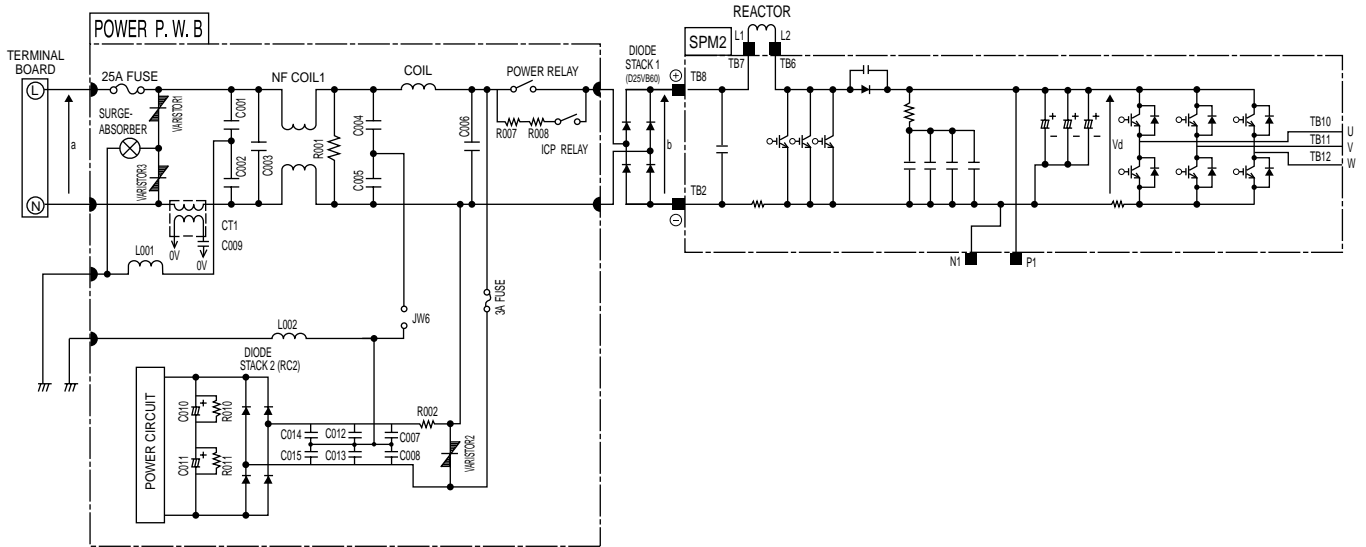
Fig. 1-1

● This circuit full-wave rectifies 220-230V 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 260-360V when the compressor is operated

(1) 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.

(2) Diode stacks

These rectify the 220-230V AC from terminals L and N to a DC power supply.

< Reference >

● In case of malfunction or defective connection: Immediately after the compressor starts, it may stop due to "abnormally low speed" active error, etc.

The compressor may continue to operate normally, but the power-factor will decrease, the operation current will increase, and the overcurrent breaker of the household power board will probably activate.

● 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 diode stack 1 is faulty, the compressor may stop due to "lp", "anbormally low speed", etc. immediately after it starts, or it may not operate at all because no DC voltage is generated between the positive ⊕ and negative ⊖ terminals.

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

● If diode stack 2 is faulty, DC voltage may not be generated and the compressor may not operate at all. Also, be aware that the 3A fuse might have blown.

(3) Smoothing capacitor (C501, C502, C503)

This smoothes (averages) the voltage rectified by the diode stacks.

<Notes> Smoothing capacitor C501 is not available for model RAC-25NH4 and RAC-35NH4.
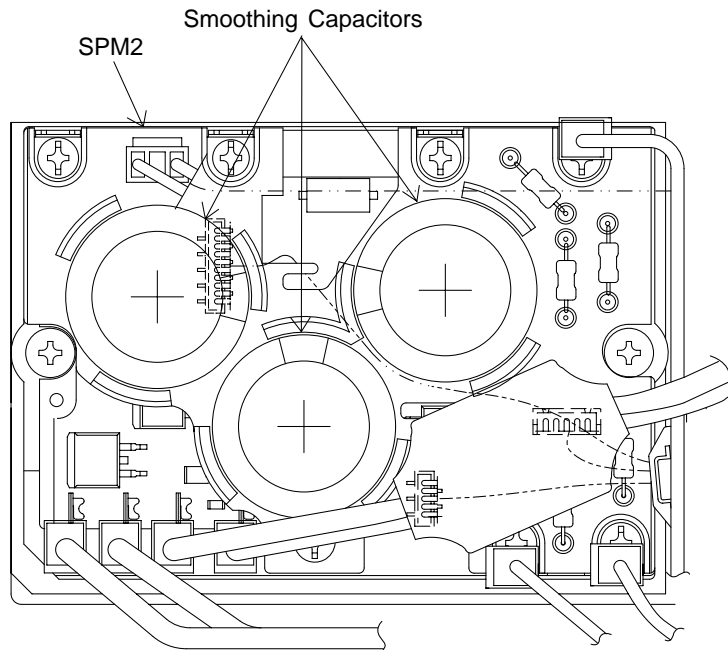
Fig. 1-2
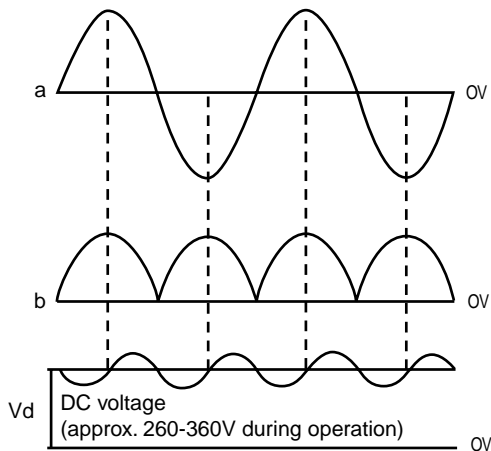
Fig. 1-3

● 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.

(4) Smoothing capacitor (C010, C011)
This smoothes (averages) the voltage rectified by the diode stack2. A DC voltage is generated in the same way as in Fig. 1-3.
Voltage between + side of C010 and – side of C011 is about 330V.

(5) C001 to C003, C012 to C015, C007, C008, NF COIL1, COIL, absorb electrical noise generated during operation of compressor, and also absorb external noise entering from power line to protect electronic parts.

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

(7) Inrush protective resistor (R007, R008)
This works to protect from overcurrent when power is turned on.

< Reference >

● When inrush protective resistor is defective, diode stack may malfunction. As a result, DC voltage is not generated and no operation can be done.

2. Indoor/Outdoor Interface Circuit

- The interface circuit superimposes an interface signal on the DC 35V 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 DC 35V line and a transmiting circuit which detects the interface signal on the DC 35V 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.

- Communication signal from outdoor microcomputer to indoor microcomputer. At first outdoor microcomputer will send a request signal (SDO) to indoor microcomputer. A high-frequency IF signal approx. 38 KHz is generated and modulated by the request signal (SDO) inside the outdoor microcomputer then output to pin ⑪ of microcomputer. This modulated IF signal is output to pin ㉚ of HIC and amplified by amp. This signal is superimposed to DC 35V line via C801 and L801.
  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 output to pin ㊾ 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.

- Communication signal from indoor microcomputer to outdoor microcomputer. The request signal (SDO) generates by indoor microcomputer is output to pin ㊿, and amplifies by C801. IF signal approx. 38 kHz is generated by comparator, then modulate by the request signal from pin ㊿ of indoor microprocessor. This modulated IF signal is then amplified and superimposed to DC 35V line via L801 and C802 of indoor interface circuit.
  Fig. 2-3 shows the voltages at each component when data is transferred from outdoor microcomputer to indoor microcomputer.
  The circuit operation of the outdoor receiving circuit is same as indoor receiving circuit.

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

(Communications from outdoor microcomputer to indoor microcomputer)

(Communications from indoor microcomputer to outdoor microcomputer)
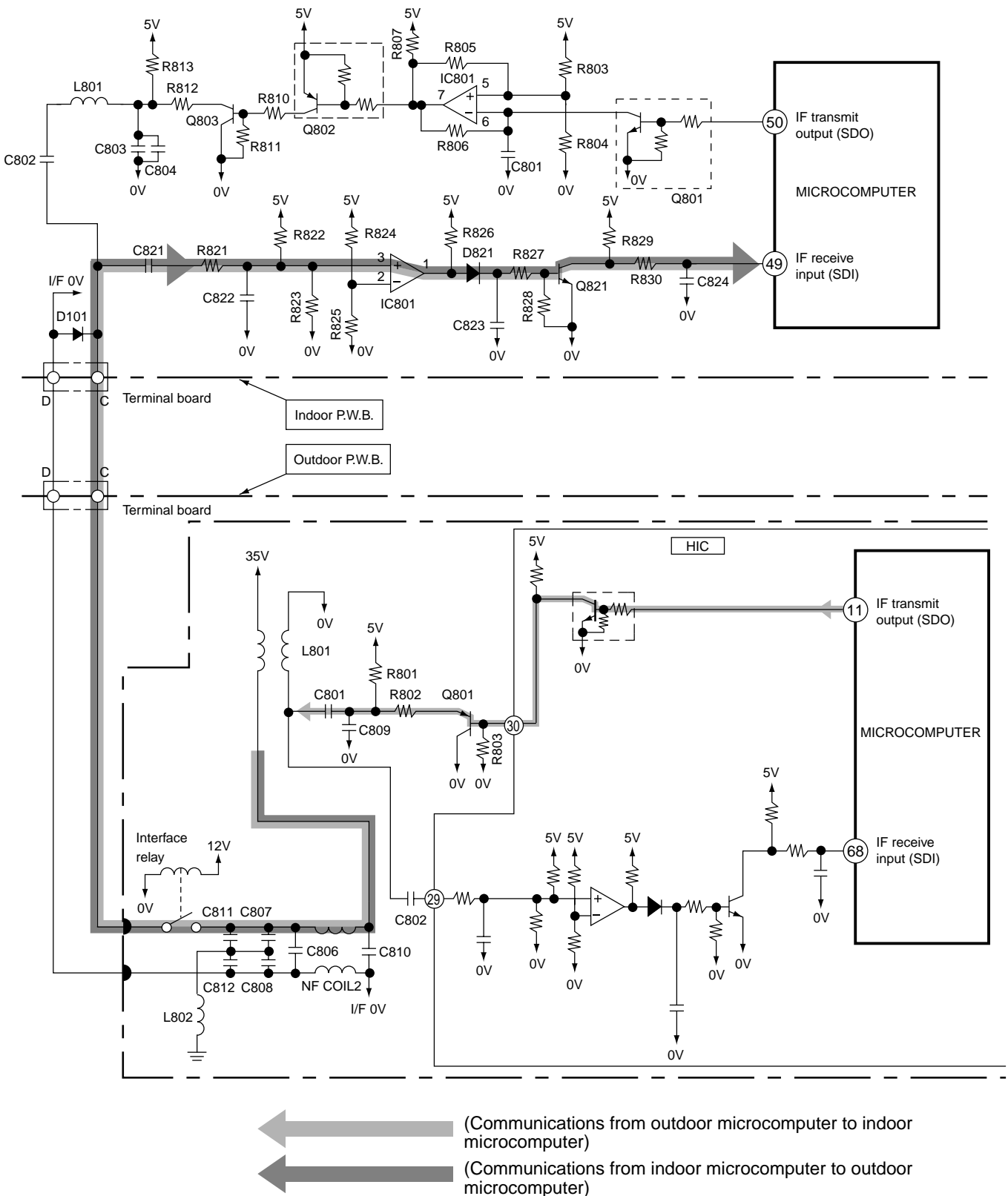
Fig. 2-1 Indoor/outdoor interface Circuit
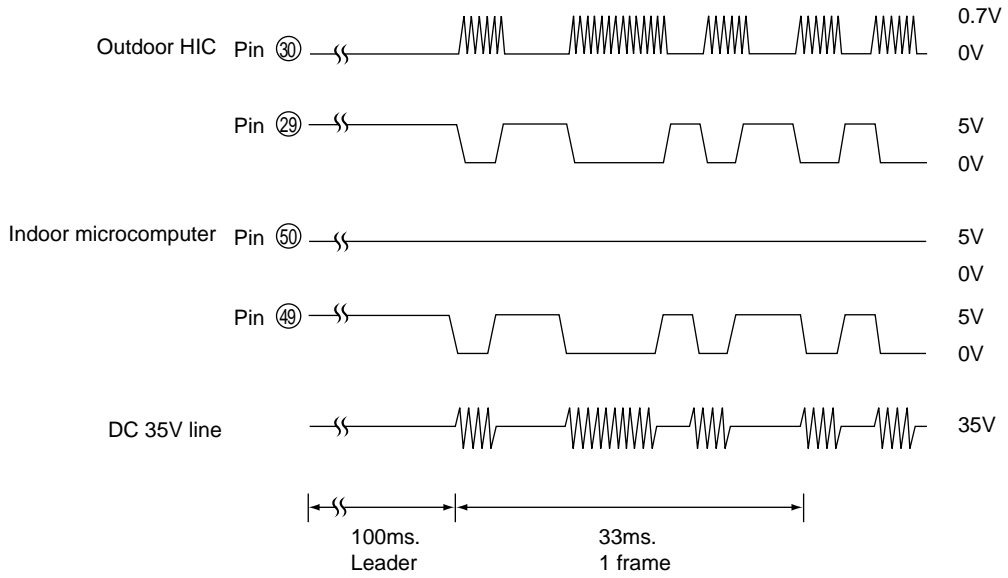
Fig. 2-2 Voltages Waveforms of indoor / Outdoor Microcomputers (Outdoor to Indoor Communications)
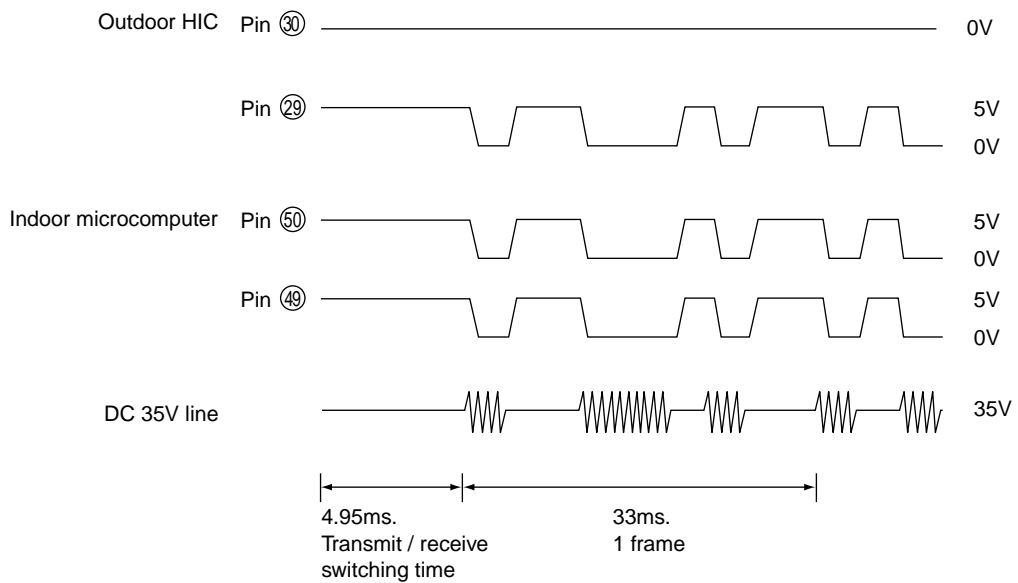
Fig. 2-3 Voltages Waveforms of indoor / Outdoor Microcomputers (Indoor to Outdoor Communications)

[Serial Communications Format during Normal Communications]

(1) Outdoor microcomputer (HIC) to indoor microcomputer

1 frame = 100ms. + 33.3ms. x 8 + 4.95ms. = 371.35ms.

When reset (approx. 10ms.)

Leader (100ms.)

Outdoor message

Character No. 0 (33.3ms.) 1 (33.3ms.) 2 (33.3ms.) 3 (33.3ms.)

Bit No = 0 ··· 7   0 ··· 7   0 ··· 7   0 ··· 7

(2) Indoor microcomputer to outdoor microcomputer (HIC)

When reset (approx. 10ms.)

Transmit/receive switching time (4.95ms.)

Indoor message

Character No. 0 (33.3ms.) 1 (33.3ms.) 2 (33.3ms.) 3 (33.3ms.)

Bit No = 0 ··· 7   0 ··· 7   0 ··· 7   0 ··· 7

Leader (100ms.)
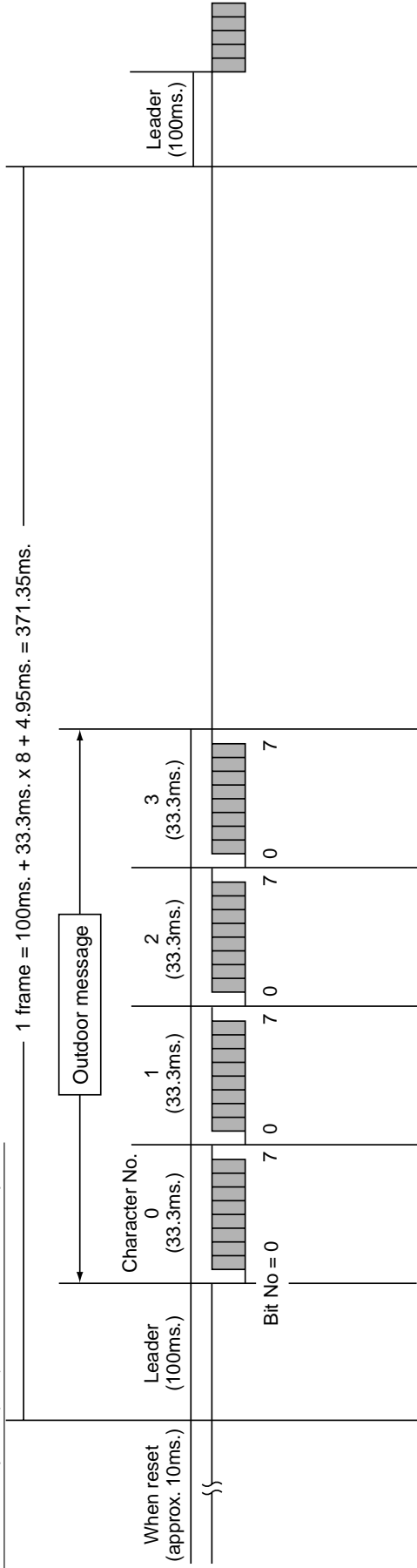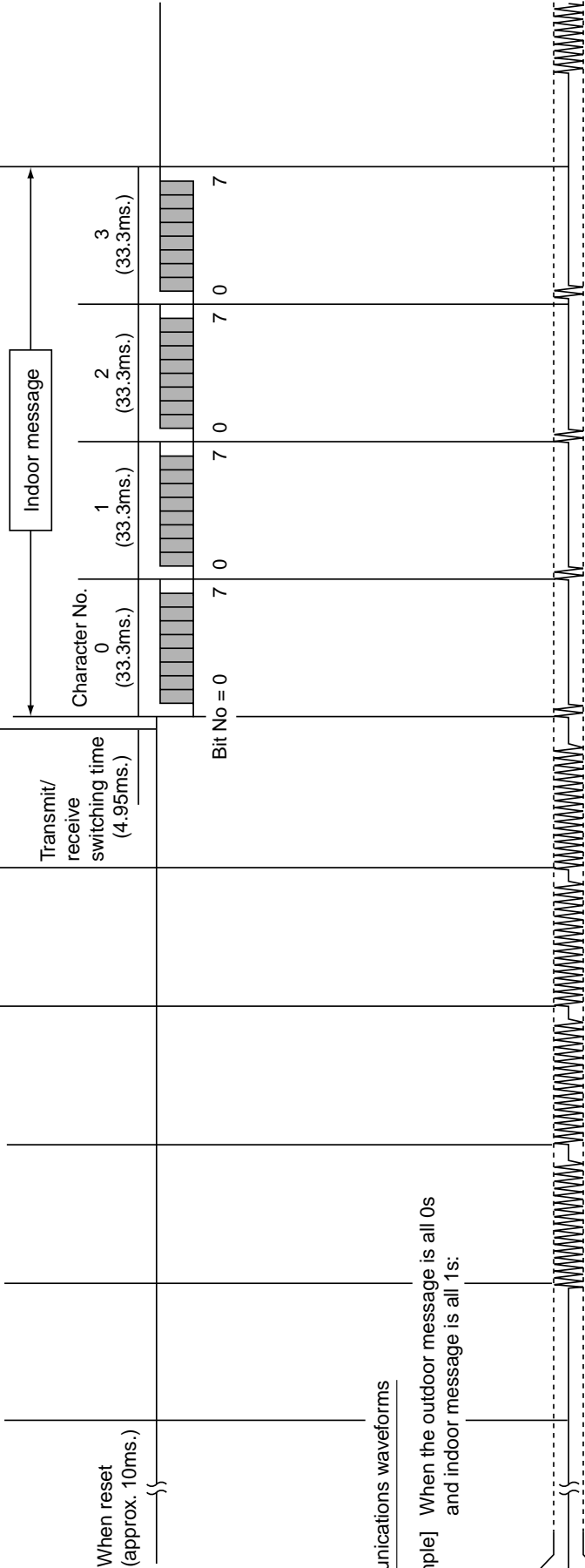
(3) Communications waveforms

[Example] When the outdoor message is all 0s and indoor message is all 1s:

36 (V)
35 (V)
34 (V)

Fig. 2-4

– 72 –
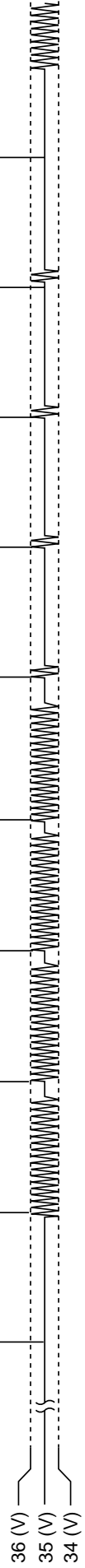
[Serial Communications Data]

(1) Outdoor message

Character No.	Bit No.	Contents	Data
0	0	Multi-bit	1/0
0	1		0
0	2	During forced operation	1/0
0	3	Defrost request signal	1/0
0	4	Self-diagnosis (0 LSB)	1/0
0	5	Self-diagnosis (1)	1/0
0	6	Self-diagnosis (2)	1/0
0	7	Self-diagnosis (3 MSB)	1/0
1	0	Outside temperature (0 LSB)	1/0
1	1	Outside temperature (1	1/0
1	2	Outside temperature (2)	1/0
1	3	Outside temperature (3)	1/0
1	4	Outside temperature (4)	1/0
1	5	Outside temperature (5)	1/0
1	6	Outside temperature (6)	1/0
1	7	Outside temperature (7 MSB)	1/0
2	0	Compressor during operation	1/0
2	1	Compressor during operation	1/0
2	2	Actual compressor rotation speed (0 LSB)	1/0
2	3	Actual compressor rotation speed (1)	1/0
2	4	Actual compressor rotation speed (2)	1/0
2	5	Actual compressor rotation speed (3)	1/0
2	6	Actual compressor rotation speed (4)	1/0
2	7	Actual compressor rotation speed (5 MSB)	1/0
3	0		0
3	1	Fan-7-step request	1
3	2		0
3	3		0
3	4		0
3	5		0
3	6		0
3	7		0

(2) Indoor message

Character No.	Bit No.	Contents	Data
0	0	Operation mode (0 LSB)	1/0
0	1	Operation mode (1)	1/0
0	2	Operation mode (2 MSB)	1/0
0	3	Indoor in-operation bit	1/0
0	4	Capacity code (0 LSB)	0
0	5	Capacity code (1)	0
0	6	Capacity code (2)	0
0	7	Capacity code (3 MSB)	0
1	0	Fan (0 LSB)	1/0
1	1	Fan (1	1/0
1	2	Fan (2 MSB)	1/0
1	3	2-way valve	0
1	4	Reversing valve	1/0
1	5		0
1	6		0
1	7	Compressor ON	1/0
2	0	Compressor command speed (0 LSB)	1/0
2	1	Compressor command speed (1)	1/0
2	2	Compressor command speed (2)	1/0
2	3	Compressor command speed (3)	1/0
2	4	Compressor command speed (4)	1/0
2	5	Compressor command speed (5)	1/0
2	6	Compressor command speed (6)	1/0
2	7	Compressor command speed (7 MSB)	1/0
3	0	15/20(A)	1/0
3	1	OVL up	1/0
3	2		1/0
3	3	Compressor minimum rotation speed (0 LSB)	1/0
3	4	Compressor minimum rotation speed (1)	1/0
3	5	Compressor minimum rotation speed (2)	1/0
3	6	Compressor minimum rotation speed (3)	1/0
3	7	Compressor minimum rotation speed (4 MSB)	1/0

3. Power Module Circuit

- Fig. 3-1 shows the system power module and its peripheral circuit.
- The three transistors on the positive ⊕ side are called the upper arm, and the three transistors on the negative ⊖ side, the lower arm.
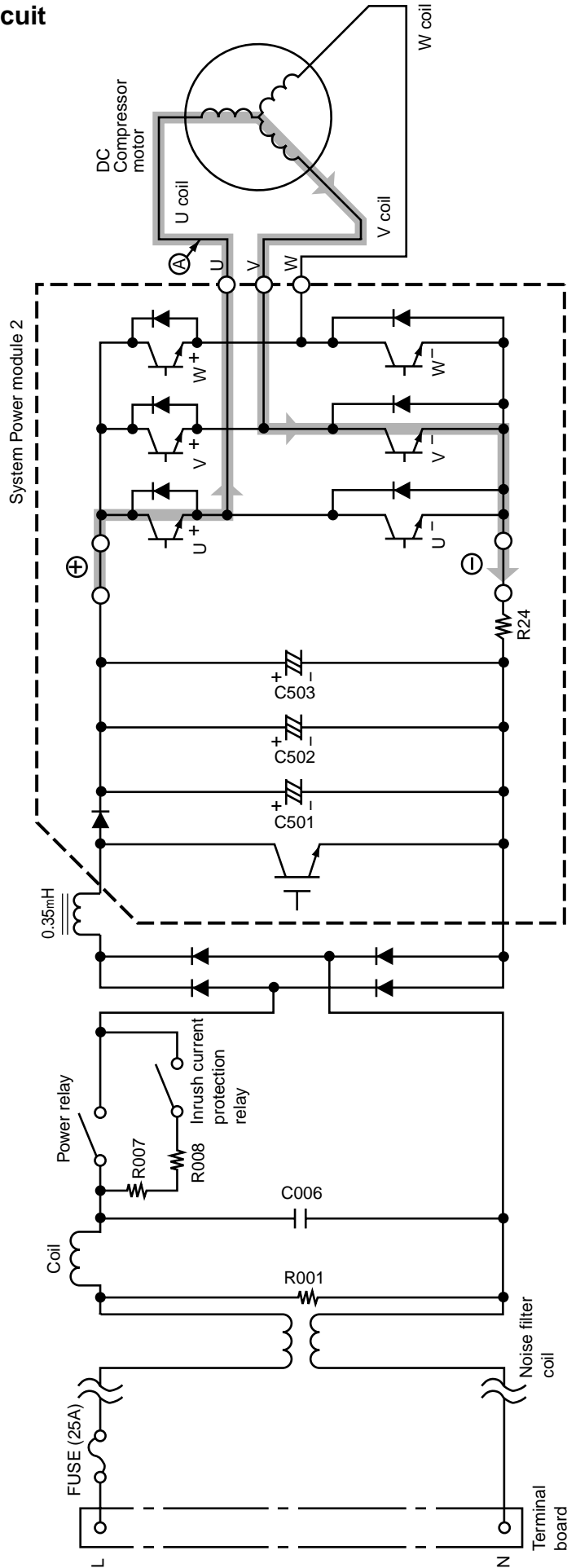
Fig. 3-1 Power module circuit (U⁺ is ON, V⁻ is ON)

- DC 260-360V is input to system power module and system power module switches power supply current according to rotation position of magnet rotor. The switching order is as shown in Fig. 3-2.

$$\left[\begin{array}{l}\text{At point E: U}^+ \text{ is ON, V}^- \text{ is ON (circuit in Fig. 3-1)} \\ \text{At point F: U}^+ \text{ is chopped (OFF), V}^- \text{ is ON (circuit in Fig. 3-4)}\end{array}\right]$$
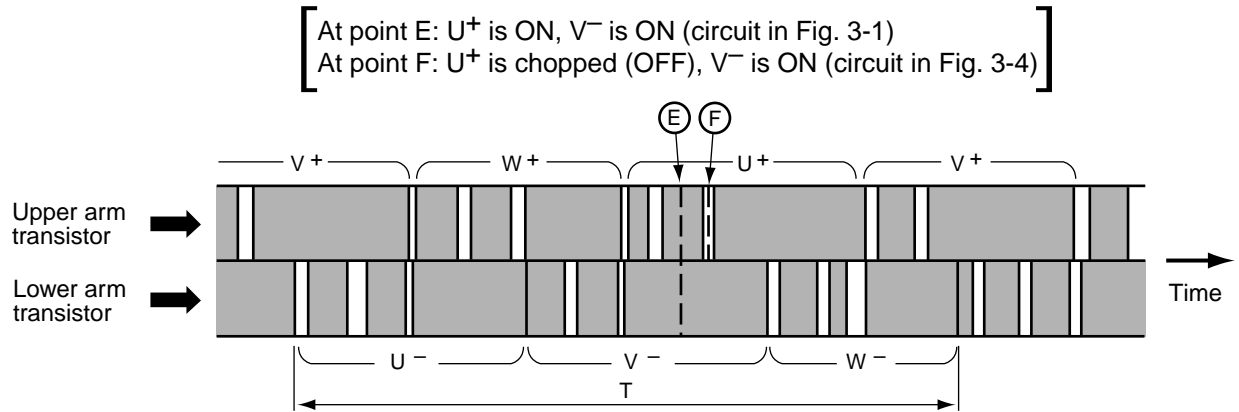
Fig. 3-2 Switching order of power module

- Upper arm transistor is controlled to ON/OFF by 3.3kHz chopper signal. Rotation speed of the compress is proportional to duty ratio (ON time/ ON time + OFF time) of this chopper signal.

- Time T in Fig. 3-2 shows the switching period, and relation with rotation speed (N) of the compressor is shown by formula below;

$$N = 60/2 \times 1/T$$

- Fig. 3-3 shows voltage waveform at each point shown in Figs. 3-1 and 3-4. First half of upper arm is chopper, second half is ON, and first half of lower arm is chopper, second half is ON.
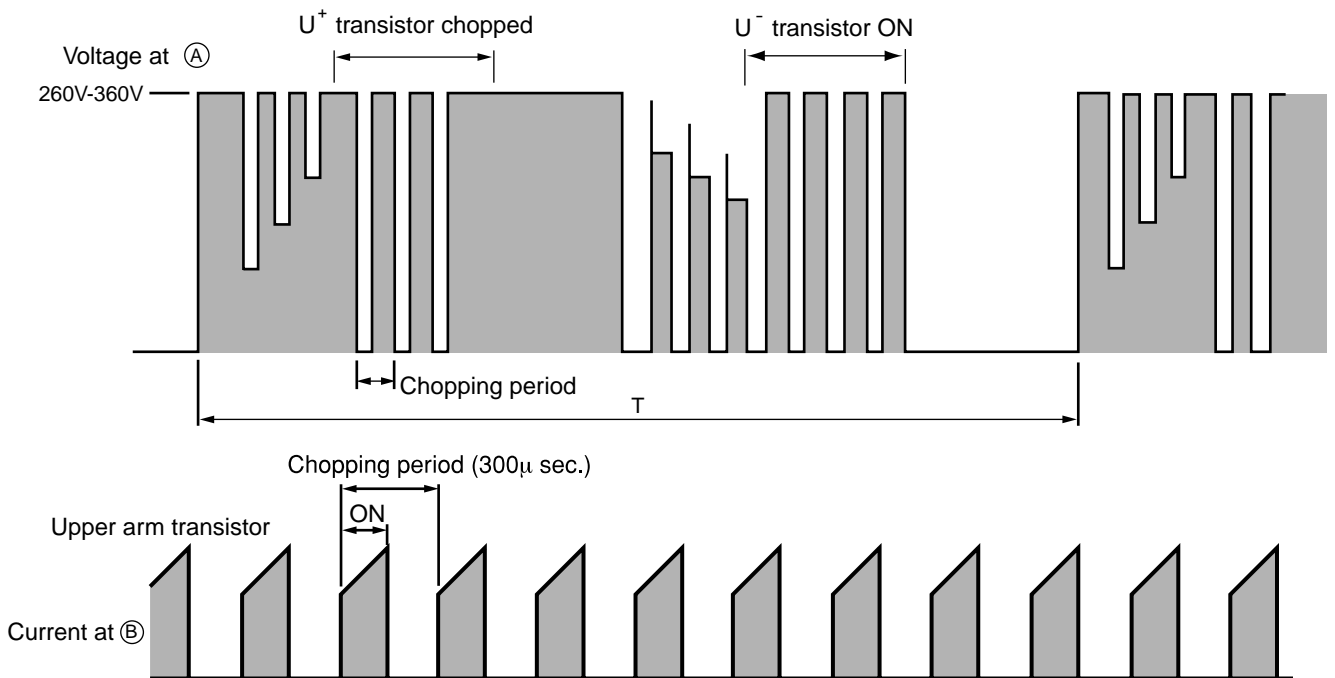
Fig. 3-3 Voltage waveform at each point

- When power is supplied U$^+$ → U$^-$, because of that U$^+$ is chopped, current flows as shown below; Ⓑ

    (1) When U$^+$ transistor is ON: U$^+$ transistor → U coil → V coil → V$^-$ transistor → DC current detection resistor → Point Ⓑ (Fig. 3-1)

    (2) When U$^+$ transistor is OFF: (by inductance of motor coil) U coil → V coil → V$^-$ transistor → Return diode → Point Ⓐ (Fig. 3-4)
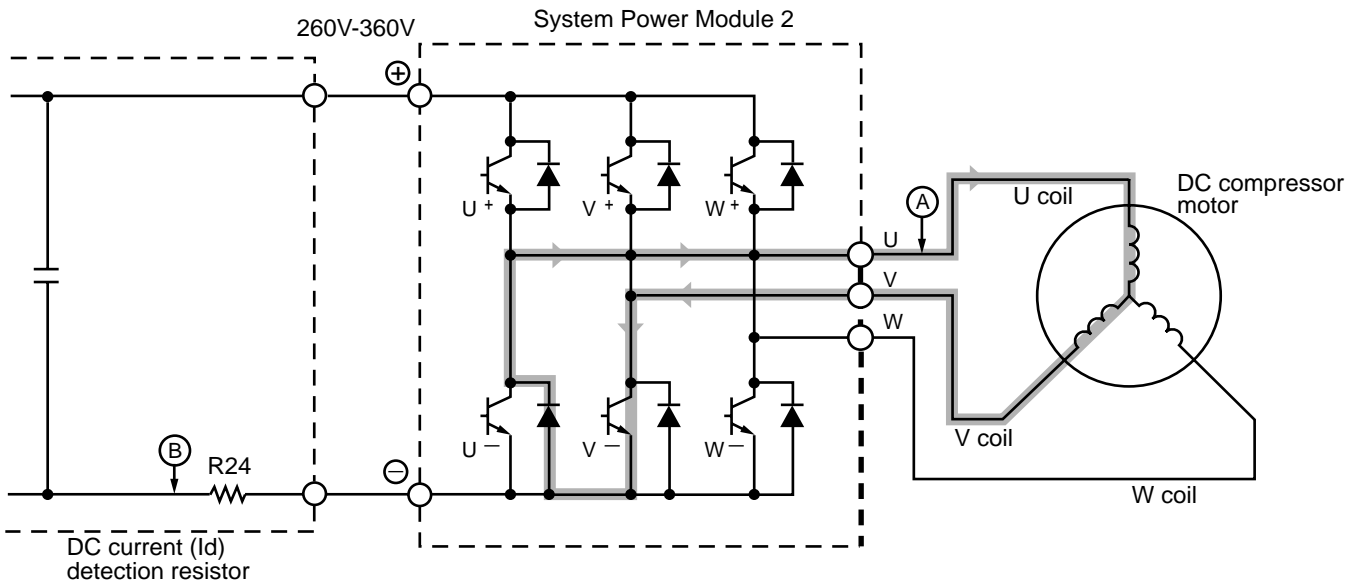
Fig. 3-4 Power module circuit (U$^+$ is ON, V$^-$ is ON)

● Since current flows at point ⓑ only when U+ transistor is ON, the current waveform at point ⓑ becomes intermittent waveform as shown in Fig. 3-3. 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 power module is detective, self diagnosis lamps on the control P.W.B. may indicate as shown below:
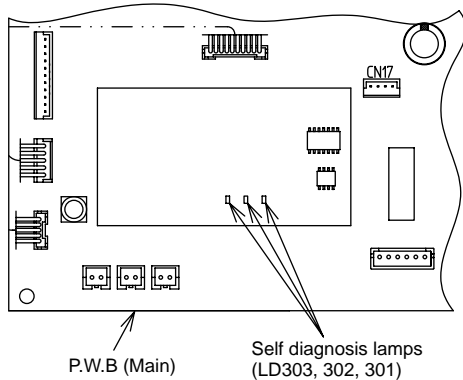
Fig. 3-5

Table 3-1

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

● Simplified check of power module (Lighting mode when operated with compressor leads disconnected)

  (1) Disconnect connector of 3-pole (WHT, YEL, RED) lead wire connecting to compressor located at the lower part of electric parts box.

  (2) Set to compressor operation state (other than FAN mode) and press Start/stop switch of remote control.

  (3) If normal operation continues for more than 1 minute (LD303 lights), power module is considered normal.

  ※ Refer to other item (troubleshooting on page 94) for independent checking of power module.

4. Power Circuit for P.W.B.

- Fig. 4-1 shows the power circuit for P.W.B. and waveform at each point.
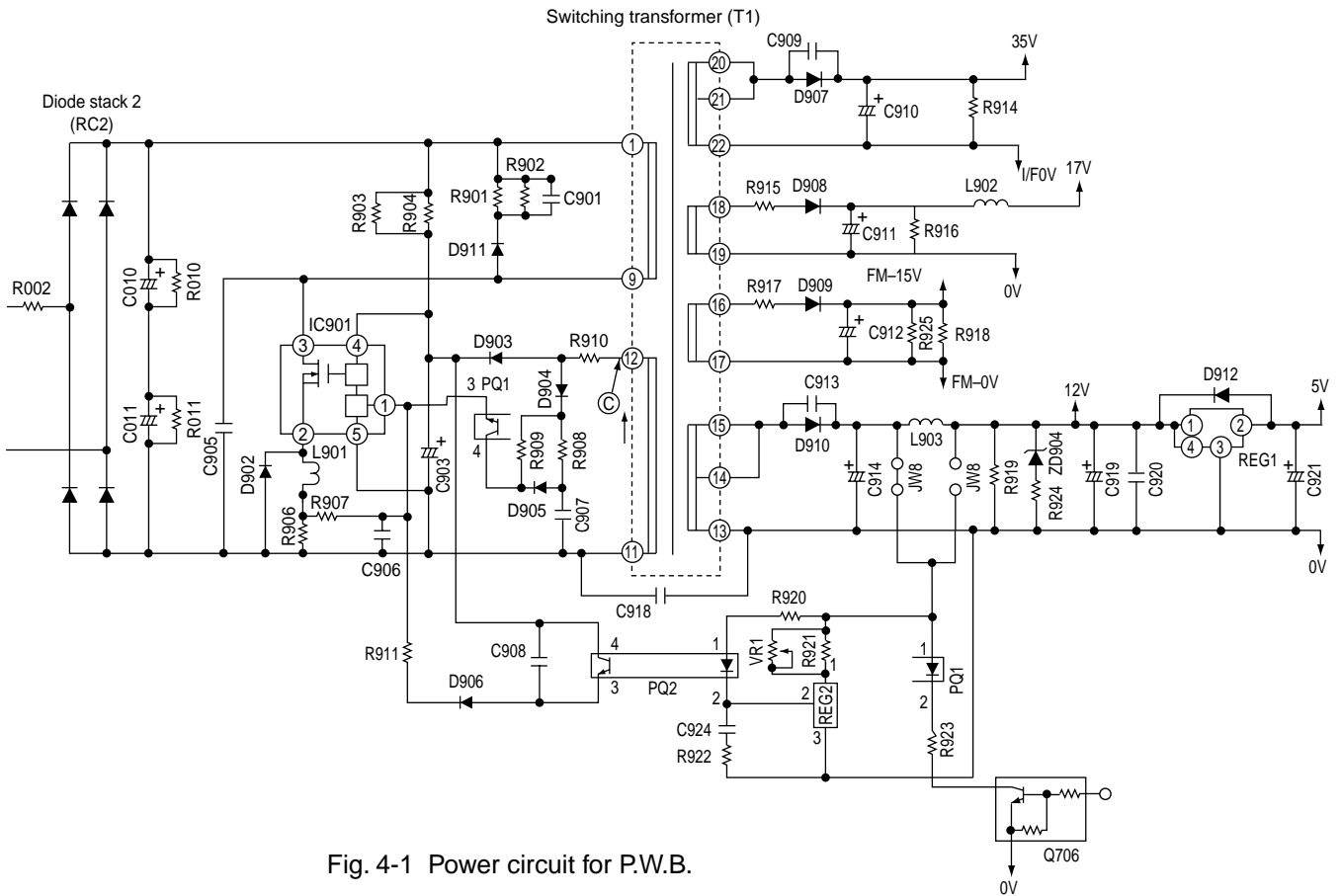
Fig. 4-1 Power circuit for P.W.B.

- In the power circuit for P.W.B., power supply for microcomputer, peripheral circuits, and system power module driver circuit and, as well as DC 35V, are produced by switching power circuit.

- Switching power circuit performs voltage conversion effectively by switching transistor IC901 to convert DC 330V voltage to high frequency of about 20kHz to 200kHz.

- Transistor IC901 operates as follows:

(1) Shifting from OFF to ON

- DC about 330V is applied from smoothing capacitors C010 ⊕ and C011 ⊖ in the control power circuit. With this power, current flows to pin ④ of IC901 via R903 and R904 and IC901 starts to tum ON. Since voltage in the direction of arrow generates at point ⓒ at the same time, current passing through R910 and D903 is positive-fed back to IC901.

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(2) During ON

● The drain current at IC901 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 C919 reaches the specified value, REG2 turns on and current flows to PQ2 ①-②. This turns the secondary circuits on, sets IC901 pin ① to "Hi", and turns IC901 off.

(4) During OFF

● While IC901 is on, the following energy charges the primary windings of the transformer:

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

$$I : Current\ when\ IC1\ is\ off$$

This energy discharges to the secondary windings during power off. That is, C910, C911, C912, C914 is charged according to the turn ratio of each winding.

● At the start, an overcurrent flows to IC901 because of the charged current at C910, C911, C912, C914.

● The drain current at IC901 generates a voltage across R906. If it exceeds the IC901 base voltage, it sets the IC901 gate voltage to "HI".

● R906 limits the gate voltage to prevent excessive collector current from flowing to IC901.

<Reference>

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

(1) Make sure that 5V and 12V on the control P.W.B., upper arm U, V and W, and the lower arm 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 Microcomputer is abnormal.
③ 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 17V are abnormal:
D908, D909 or drive circuit is abnormal.

(5) When all voltage are abnormal:
IC901, R906, etc. are possibly abnormal.

* If IC901 is abnormal, be aware that other components, such as the power module, REG (regulator), etc. are possibly defective.

[When the switching power supply seems to be abnormal, the voltage between IC901 pin ④ (to be measured at the leads of R904 and R903) and IC901 pin ⑤ (to be measured at R906 lead) may be between 11 and 16V. This is because the protection circuit of IC901 is operating.]

5. Reversing valve control circuit
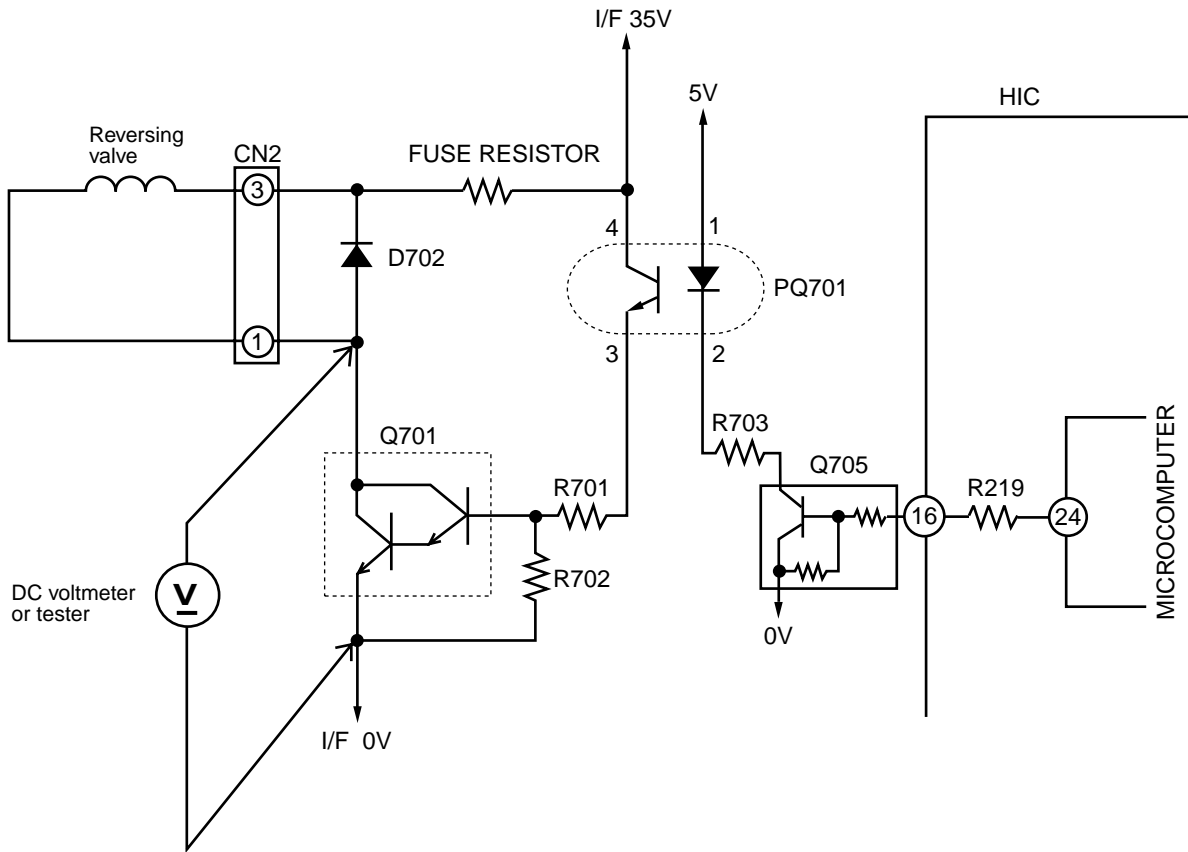
Fig. 5 – 1

- Reversing valve control circuit can switch reversing valve ON/OFF according to instruction from indoor microcomputer depending on the operation condition shows in Table 5-1.

  Voltage at each point in each operation condition is approximately as shown below when measured by tester. (When collector voltage of Q701 is measured)

Table 5-1

Operation condition		Collector voltage of Q701
Cooling	General operation of Cooling	About 35V
Heating	In normal heating operation	About 0.8V
	MAX. rotation speed instructed by indoor microcomputer after defrost is completed	About 0.8V
	Defrosting	About 35V
Dehumidifying	Sensor dry	About 35V

6. Rotor magnetic pole position detection circuit
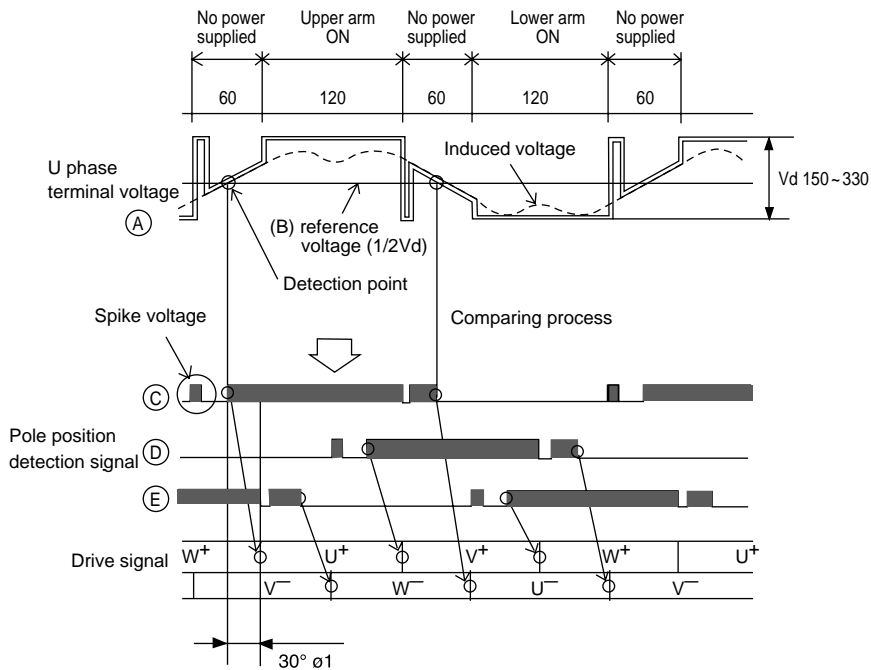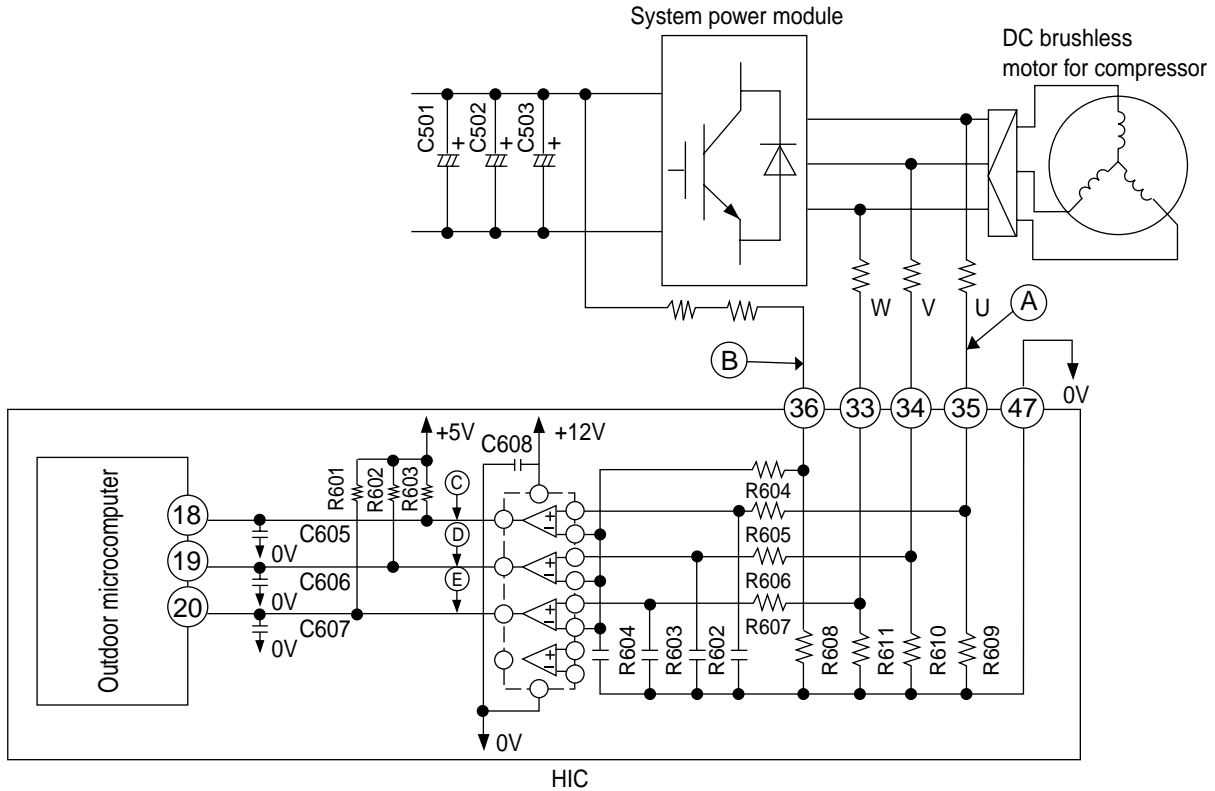
Fig. 6-1 Rotor magnetic pole position detection circuit and voltage waveform at each point

- To detect U phase, voltage at point Ⓒ is produced by driving motor induced voltage signal (voltage at point Ⓐ) and 1/2 voltage of Vd (voltage at point Ⓑ), and comparing with comparator.
- For V phase and W phase, voltage at point Ⓓ and voltage at point Ⓔ are produced in the same way as above. Voltage at point Ⓒ is taken into indoor unit microcomputer, switching timing to U⁺ transistor from W⁺ transistor is produced by delaying 30° from rise waveform, ignoring spike voltage. In addition, switching timing to U-transistor from W-transistor is produced by delaying 30° from fall waveform.
- For V phase and W phase, in the same way as above, drive signals are produced from voltages at point Ⓓ and point Ⓔ. Phases are shifted by 120° and 240°, respectively, comparing with U phase.

7. Drive Circuit

Fig. 7-1 shows the drive circuit.
The circuits for U phase, V phase and W phase have the same Configuration.

- In low speed rotation mode (PWM range), as shown in Fig. 7-2, 0-5V chopper signal is ouput from microcomputer for each phase. Signal output from microcomputer is ouput to IC1 and is inverted by active Lo to become 0-15V chopper signal; it is then drive the transistor of each phase.

- In high speed rotation mode (PWM range), as shown in Fig. 7-3, 0-5V drive signal is ouput from microcomputer for each phase (with no chopper because of full duty). Signal output from microcomputer is input to IC1 and is inverted by active Lo to become 0-15V drive signal; it is then drive the transistor of each phase.
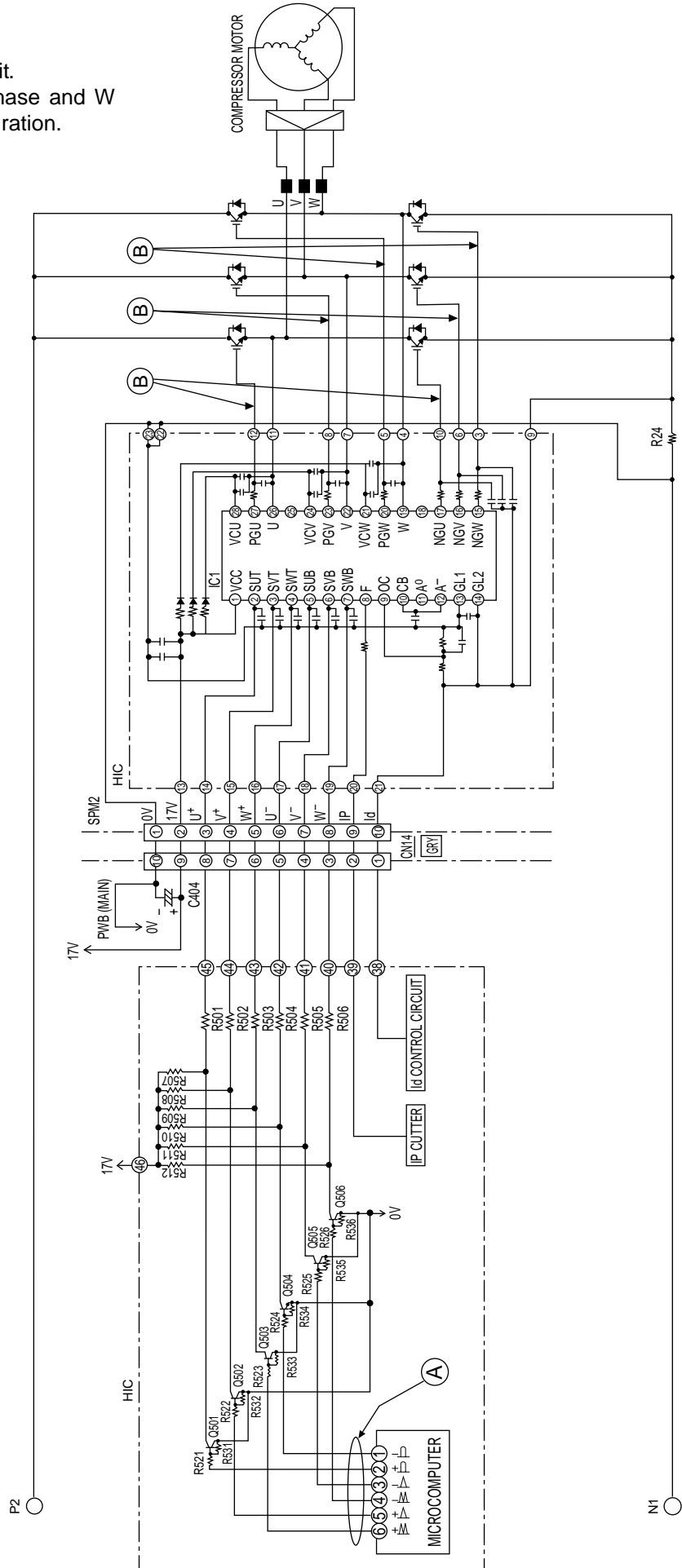
Fig.. 7-1

– 81 –

[Low speed rotation mode]
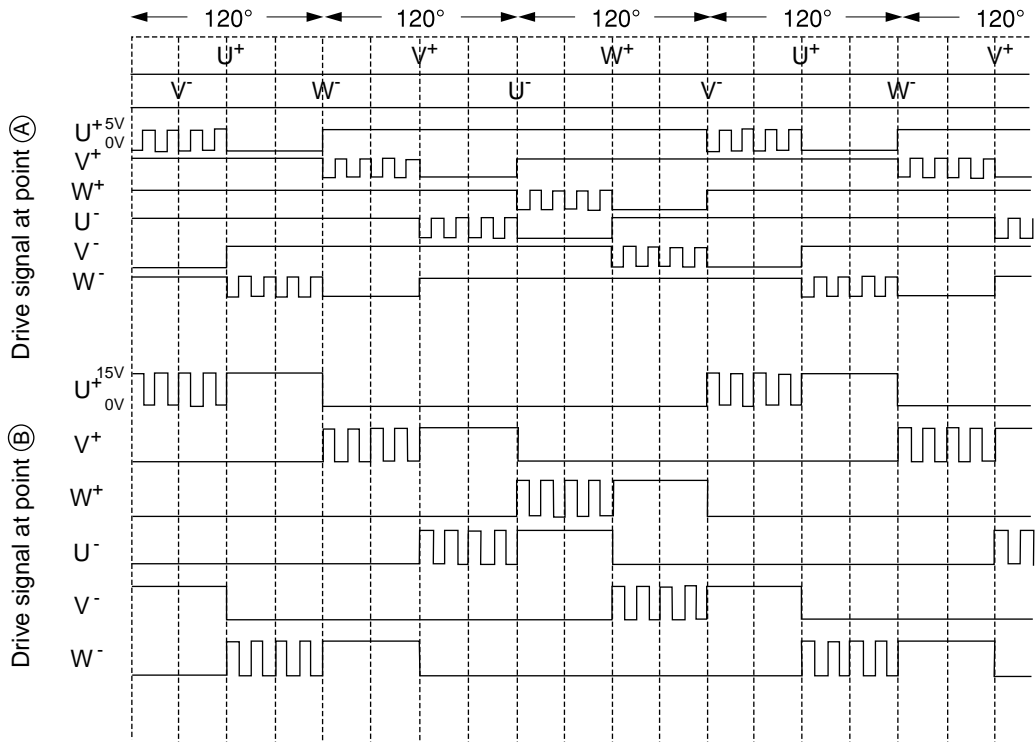
Fig. 7-2

[High speed rotation mode]
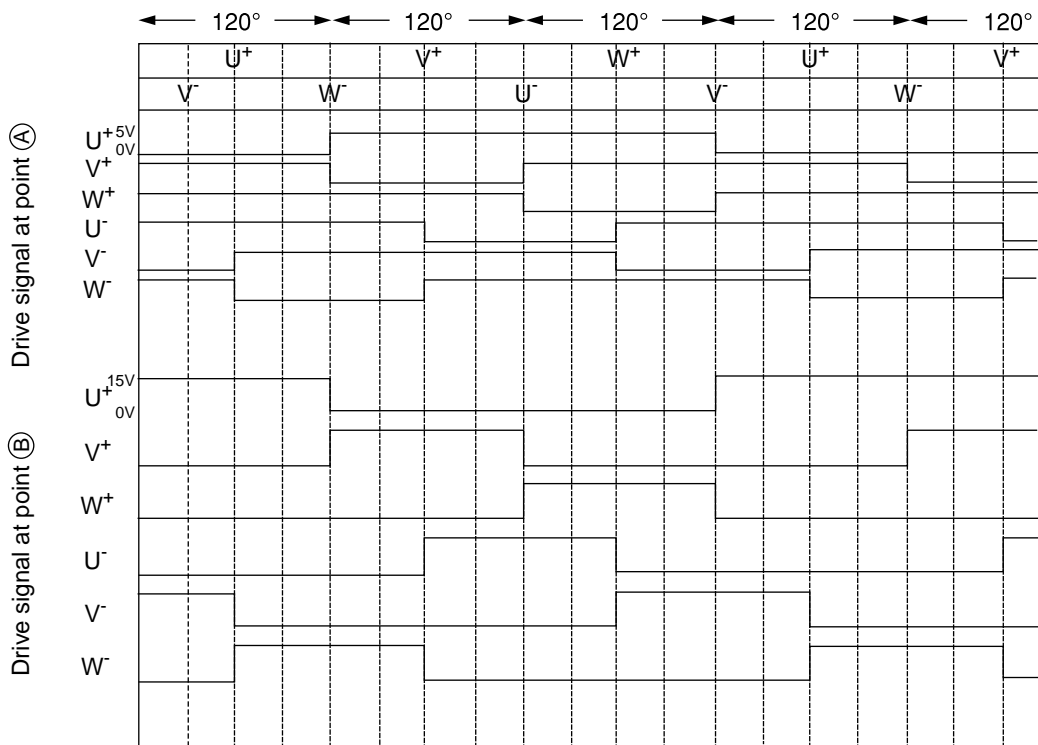
Fig. 7-3

8. HIC and Peripheral Circuits

- Fig. 8-1 shows the micro computer and its peripheral circuits, Table 8-1, the basic operations of each circuit block, and Fig. 8-2, the system configuration.
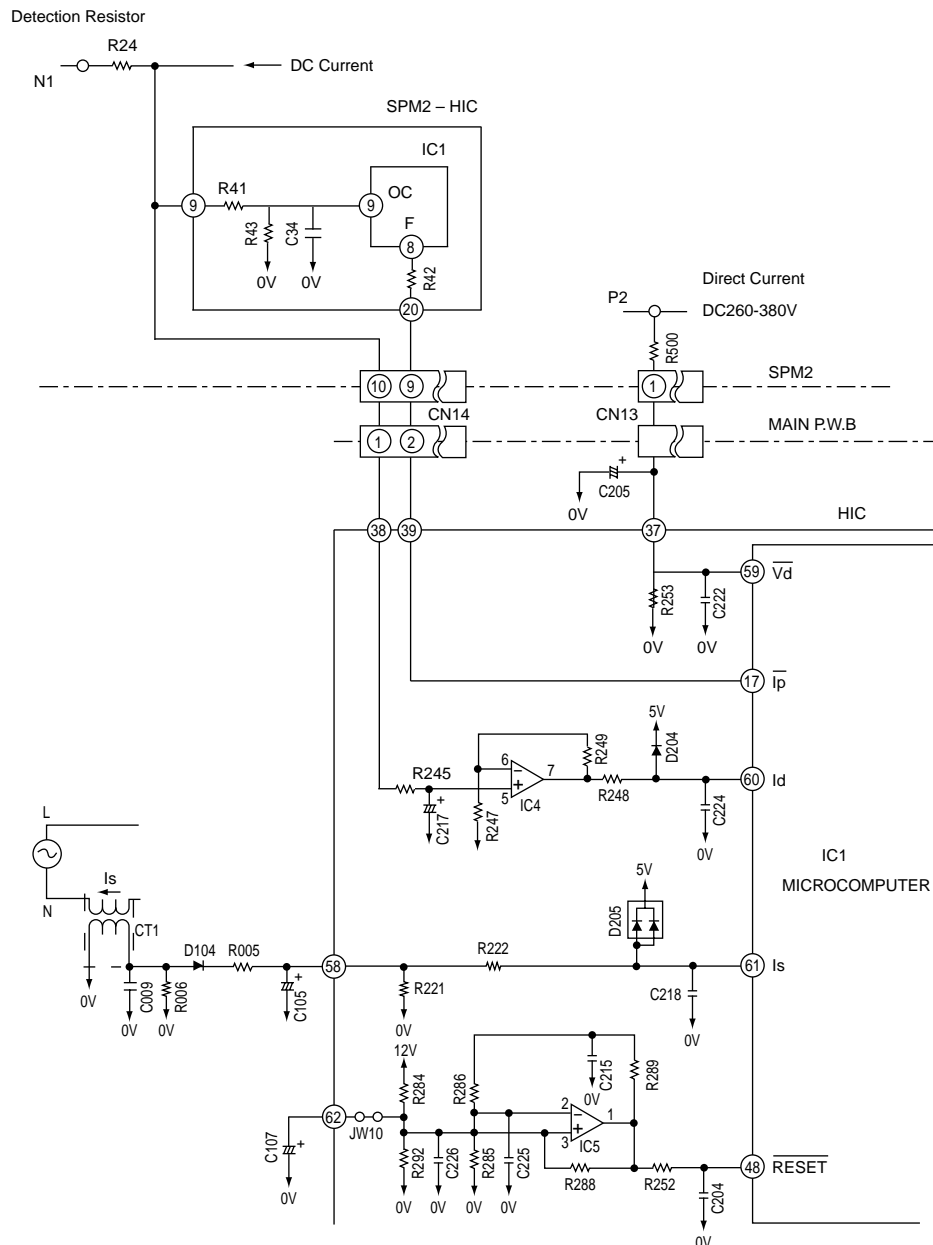
Fig. 8-1 Microcomputer and Peripheral Circuits

Table 8-1

Circuit block	Basic operation
Peak current cutoff circuit	Detects DC current flowing power module and during overcurrent (instantaneous value) flows, stops upper/lower arm drive circuits and also produces Ip signal by which drive signal output is stopped.
Set value circuit	Compares voltage detected, amplified and input to HIC with set voltage value in microcomputer, and controls overload when set value exceeds input voltage.
Voltage amplifier circuit	Voltage-amplifies DC current level detected by the detection resistor and inputs this to microcomputer. Internal or external overload is judged in microcomputer.
Reset circuit	Produces reset voltage.
Trip signal synthesis circuit	Modulates chopper signal to drive signal and stops according to presence/absence of Ip signal or reset signal.
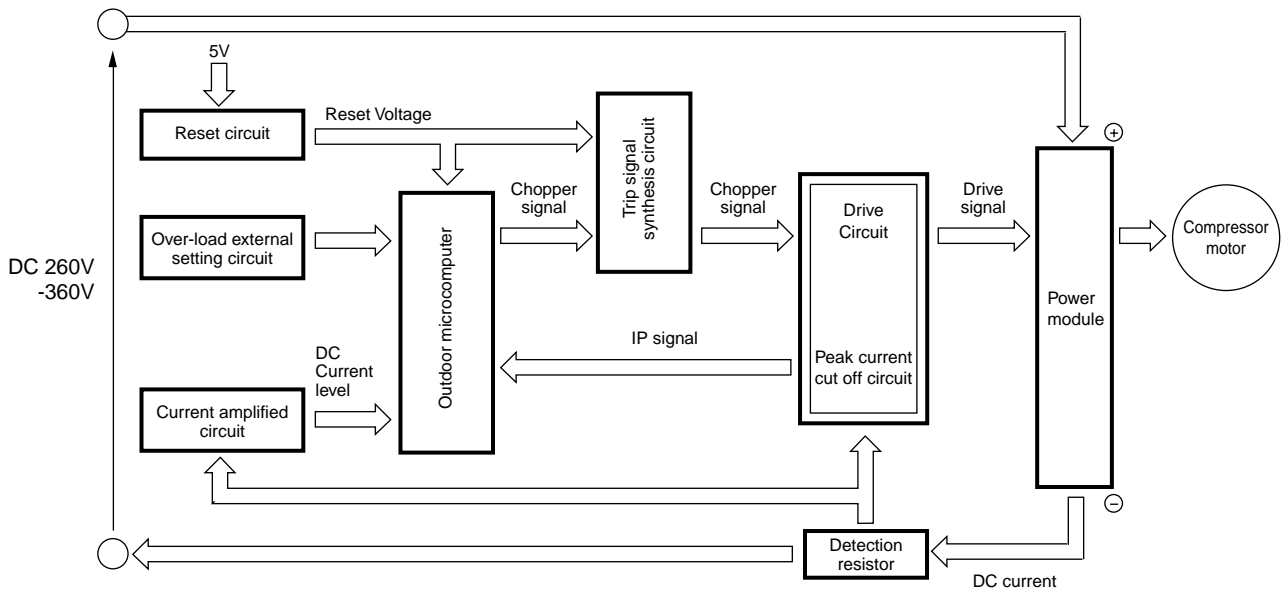
Fig. 8-2

- The following describes the operations of each circuit in detail.

(1) Peak current cut off circuit
Fig.8-3 Peak Current Cut off Circuit and Waveforms at Each Section.
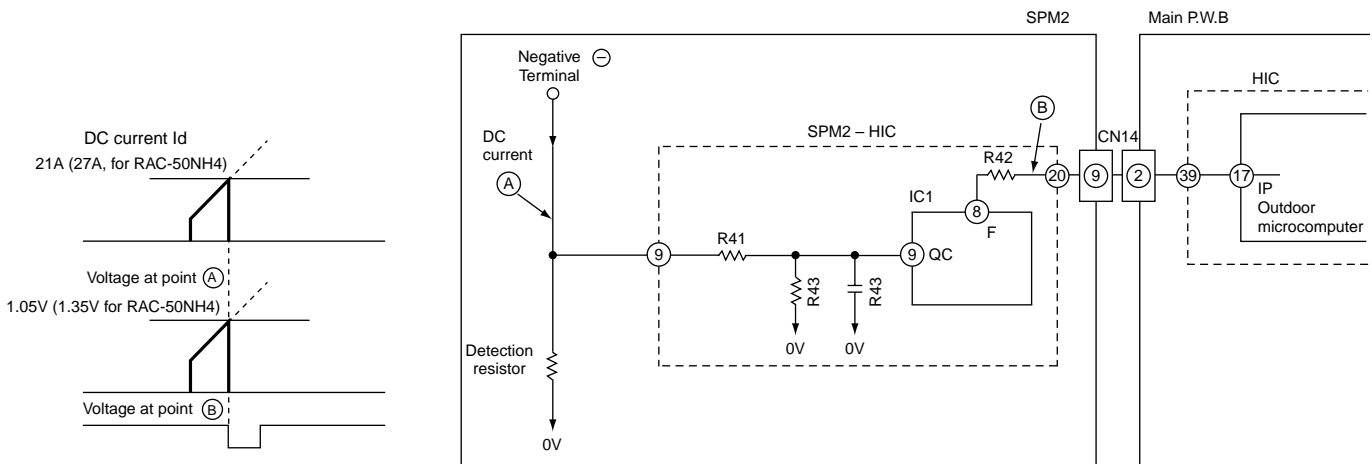
Fig.8-3

- The Ip cut off circuit detects an instantaneous excessive current and stops inverter to protect parts such as SPM2, etc.
- As shown in diagram, if current exceeding 21A (27A for RAC-50NH4) flows, voltage at point Ⓐ recognized by detecting resistor is input to pin ⑩ of SPM2 – HIC, and voltage divided by R41 and R43 is input to pin ⑨ of IC1. Since threshold of IC1 is exceeded in this case, Lo signal is input from pin ⑧ (Voltage at point Ⓑ. When Lo signal is input to pin ⑰ of microcomputer, microcomputer stops drive output.
- When drive output from microcomputer is stopped, all drive output goes Hi, and microcomputer is initialized to enter drive signal standby mode. 3 minutes later, microcomputer outputs drive signal again, to start operation.

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(2) 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. 8-4 shows the overload control system configuration and Fig. 8-5 is a characteristic diagram of overload judgement values. There are two judgement methods-external judgement which compares the externally set value with the DC current value regardless of the rotation speed and internal judgement which compares the set value that varies according to the rotation speed programmed in the microcomputer software with the DC current value.
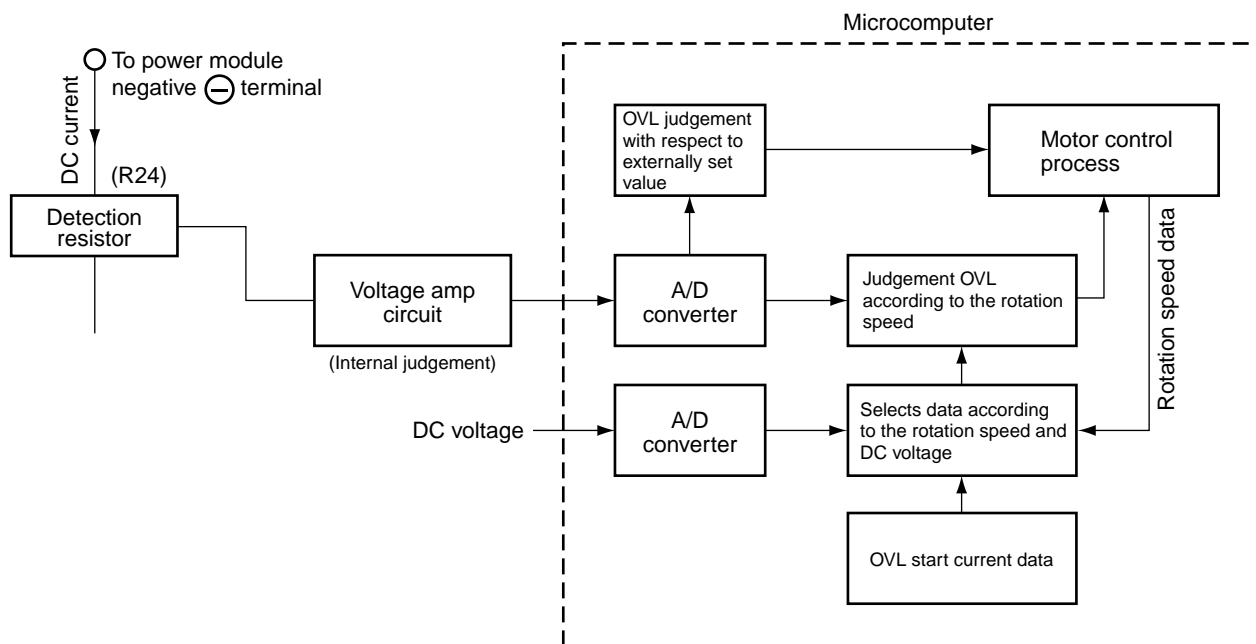
Fig. 8-4 Overload Control System Configuration
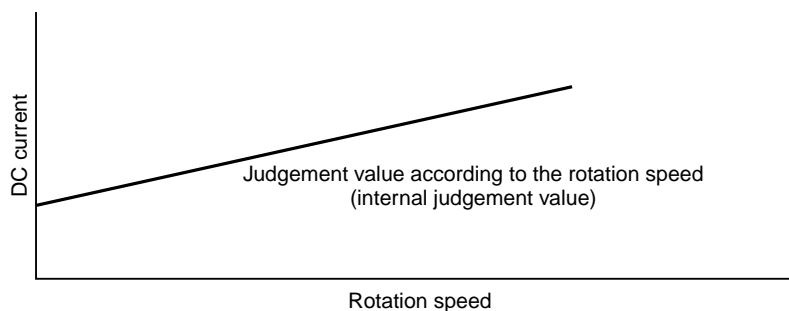
Fig. 8-5

①. Overload external judgement circuit

● Fig. 8-1. The filter consisting of R245 and C217 removes high harmonic components from the voltage generated by the current flowing to Detection resistor; R245 and C217 average the voltage. This voltage is then input to IC4 pin ⑤ is then amplified and supplied to microcomputer pin ⑥⓪. The microcomputer compares this input with the internally set value, and if the input exceeds the set value, it enters overload control status.

● Fig. 8-7 shows the rotation speed control. When the voltage at pin ⑥⓪ of the microcomputer exceeds the set value, the microcomputer decreases the rotation speed of the compressor and reduces the load regardless of the rotation speed commanded by the indoor microcomputer.
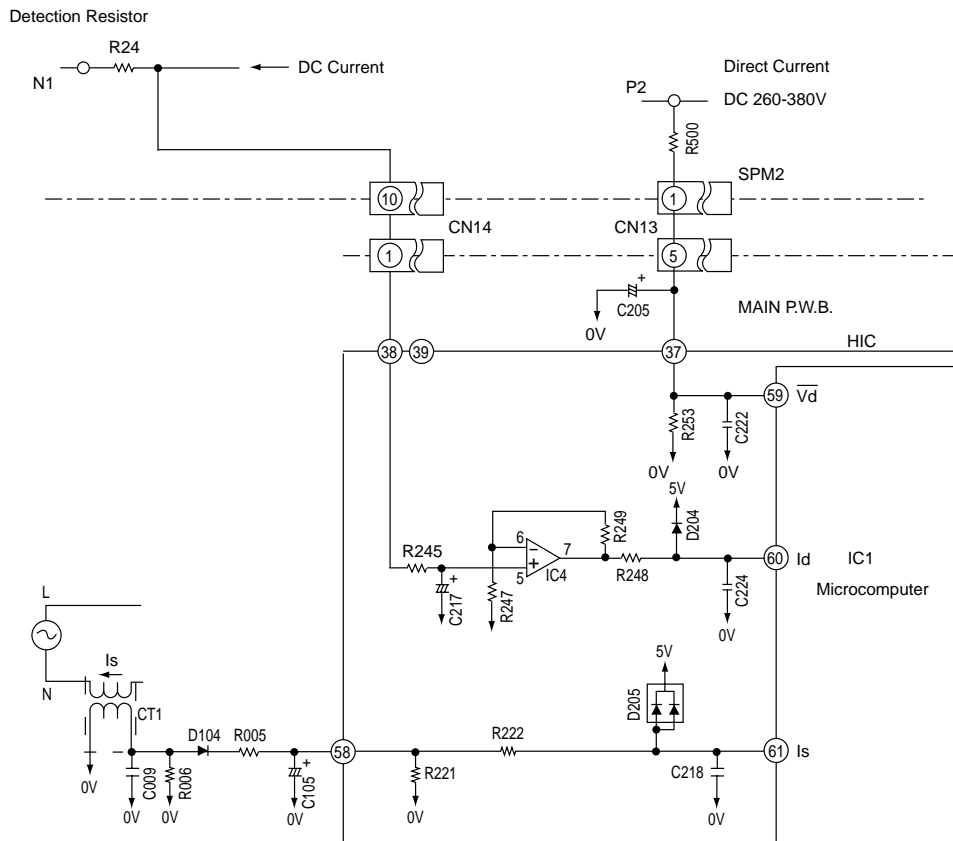
Fig. 8-6
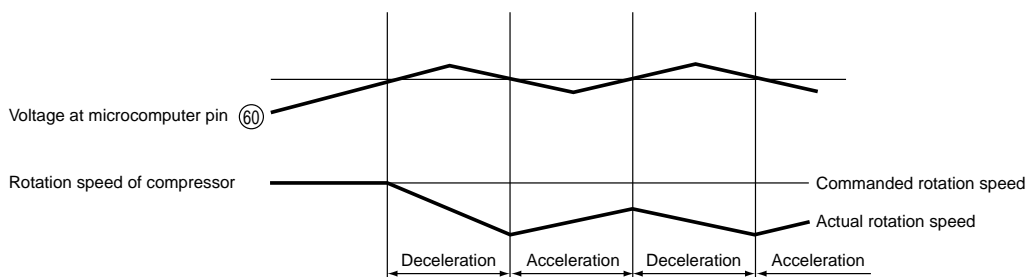
Fig. 8-7

②. Voltage amp. circuit

● The voltage amp. circuit amplifies the DC current level detected by the detection resistor after being converted to a voltage and supplies it to the microcomputer. Receiving this, the microcomputer converts it to a digital signal and compares it with the internal data to judge whether or not overload control is required.

< During overload control >

● The filter consisting of R245 and C217 removes high harmonic components from the voltage generated from the DC current flowing to the detection resistor, and supplies it to IC4 pin ⑤ IC4 forms a non-inverting voltage amp. circuit together with the peripheral elements.

● The microcomputer stores the set values which vary according to the rotation speed. When the DC current level exceeds the set value, the microcomputer enters the overload control state.

● The set Value is determined by the amplification of the voltage amp. circuit.

$$\left\{ \begin{array}{l} \bullet \text{ Amplification : high} \rightarrow \text{DC current : low} \\ \bullet \text{ Amplification : low} \rightarrow \text{DC current: high} \end{array} \right.$$

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● R500, R253, detect the DC voltage at the power circuit. The microcomputer receives a DC voltage (260-380V) via HIC ㊲ and applies correction to the overload set value so the DC current is low (high) when the DC voltage is high (low).

(Since the load level is indicated by the DC voltage multiplied by DC current, R247, R248, R249 are provided to perform the same overload judgement even when the voltage varies.)
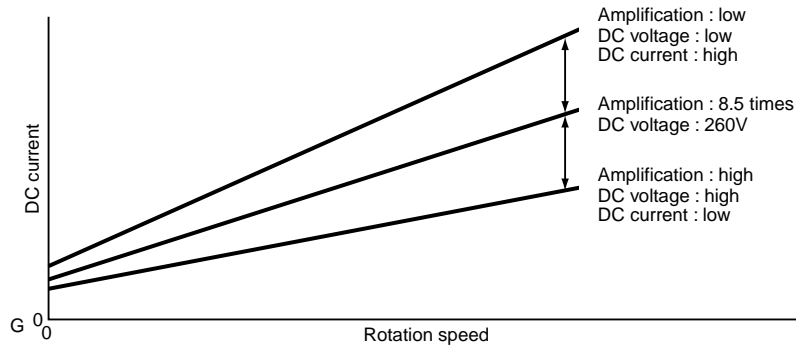
Fig. 8-8

< During start current control >

● It is required to maintain the start current (DC current) constant to smooth the start of the DC motor for the compressor.

● RAC-25NH4, RAC-35NH4, RAC-50NH4 uses software to control the start current.

● The start current varies when the supply voltage varies. This control method copes with variations in the voltages as follows.

(1) Turns on the power module's U^+ and V^- transistors so the current flows to the motor windings as shown in Fig8-9.

(2) Varies the turn-ON time of the W^+ transistor according to the DC voltage level and the start is controlled so the start current is approx. 10A as shown in Fig. 8-10.

Fig. 8-9

Fig. 8-10

– 87 –
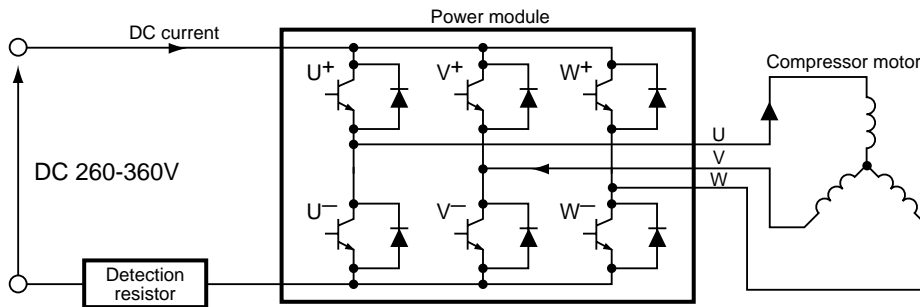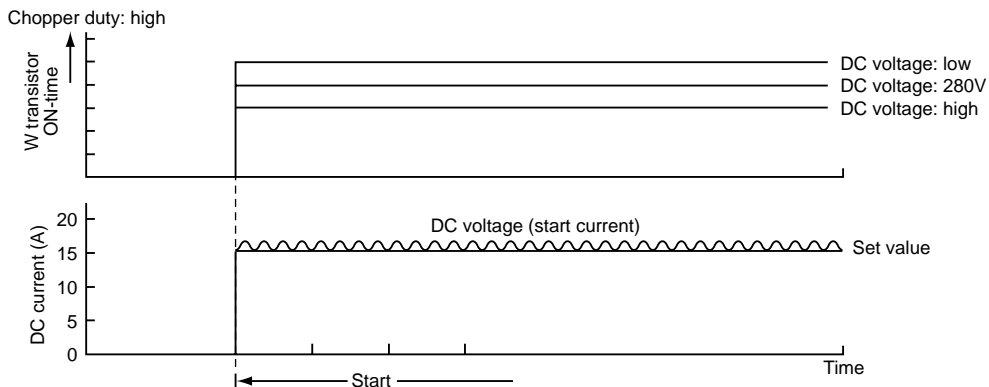
9. Temperature Detection Circuit
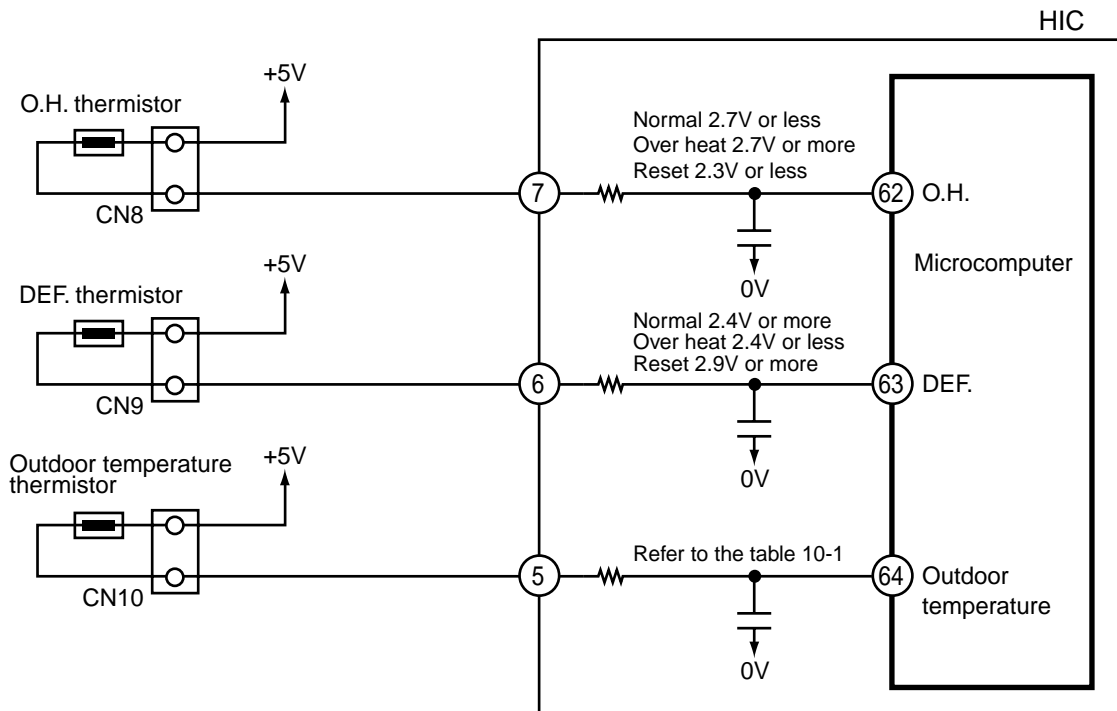
Fig. 9-1

- The Over heat thermistor circuit detects the temperature at the surface of the compressor head, the Defrost. thermistor circuit detects the defrosting operation temperature.
- A thermistor is a negative resistor element which has the characteristics that the higher (lower) the temperature, the lower (higher) the resistance.
- When the compressor is heated, the resistance of the Over heat thermistor becomes low and voltage at pin ⑥② of microcomputer is increased.
- Microcomputer compares the voltage present at pin ⑥② with the internal set value, if it is exceeded the set value microcomputer judges that the compressor is overheated and stops operation.
- When frost forms on the outdoor heat exchanger, the temperature at the exchanger drops abruptly. Therefore the resistance of the Defrost. thermistor becomes high and the voltage at pin ⑥③ of microcomputer drops.
  If this voltage becomes lower than the set value stored inside, the microcomputer starts defrosting control.
- During defrosting operation the microcomputer transfers the defrosting condition command to the indoor microcomputer via the circuit interface.
- The microcomputer always reads the outdoor temperature via a thermistor (microcomputer pin ⑥④), and transfers it to the indoor unit, thus controlling the compressor rotation speed according to the value set at the EEPROM in the indoor unit, and switching the operation status (outdoor fan on/off, etc.) in the dry mode.

  The following shows the typical values of outdoor temperature in relation to the voltage:

  Table 9-1

Outdoor temperature (°C)	-10	0	10	20	30	40
Microcomputer pin ⑤ voltage (V)	1.19	1.69	2.23	2.75	3.22	3.62

<Reference>

When the thermistor is open, in open status, or is disconnected, microcomputer pins ⑥②–⑥④ are approx. 0V; when the thermistor is shorted, they are approx. 5 V, and LD301 blinks seven times.

However, an error is detected only when the OH thermistor is shorted; in such a case, the blinking mode is entered 12 minutes after the compressor starts operation.

10. Reset Circuit
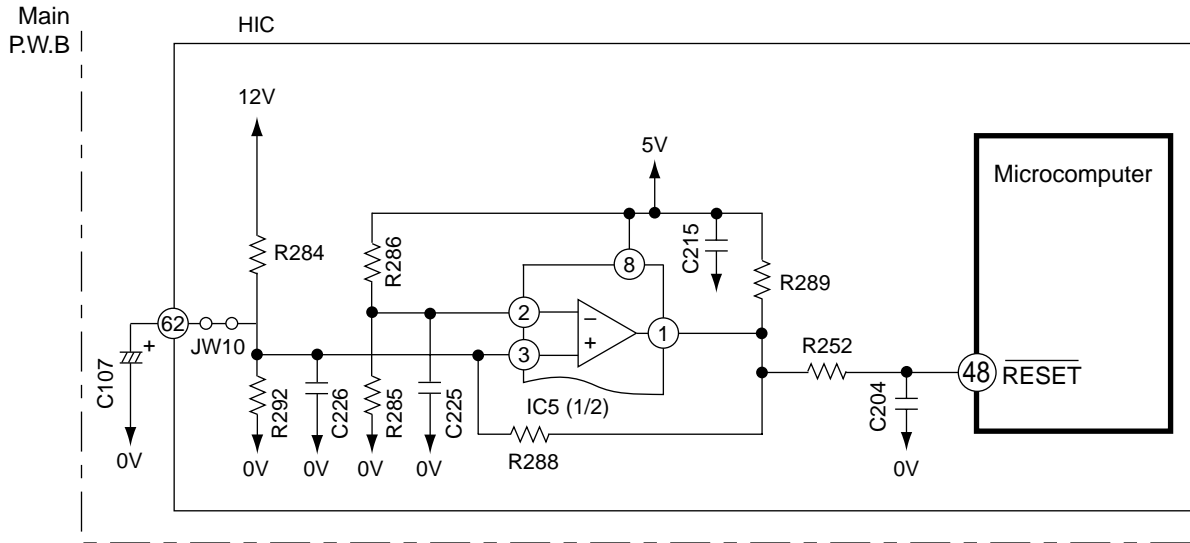
Fig. 10-1

- The reset circuit initializes the microcomputer program when Power is "ON" or "OFF".
- Low voltage at pin ㊽ resets the microcomputer, and HI activates the microcomputer.
- Fig. 10-1 shows the reset circuit and Fig. 10-2 shows waveform at each point when power is turned on and off.
- When power is turned on, 12V line and 5V line voltages rise and 12V line voltage reaches 10.9V and reset voltage input to pin ㊽ of microcomputer is set to Hi.
- Reset voltage will be hold "Hi" until the 12V line voltage drops to 9.90V even though the power shuts down.
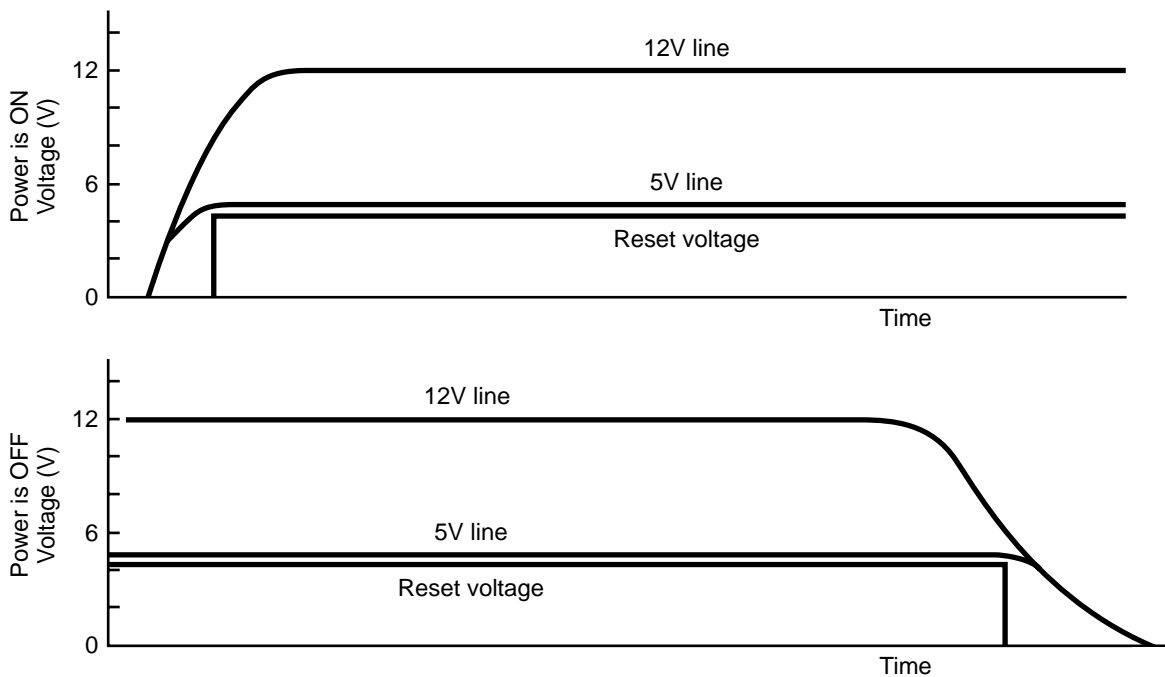
Fig. 10-2

11. Outdoor DC Fan Motor control circuit.
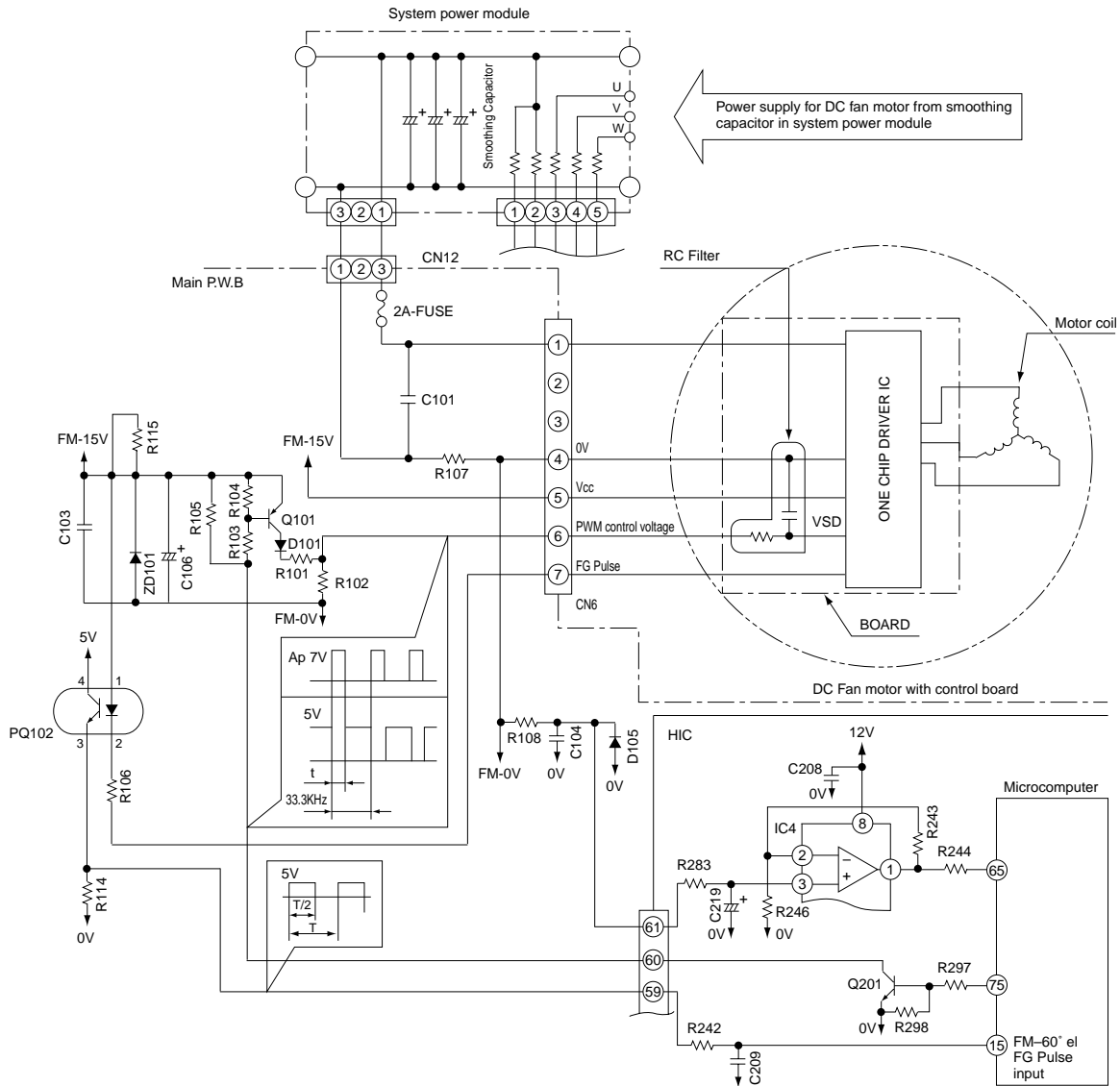
Fig. 11-1

- This model uses DC Fan Motor which has a controller circuit in the Motor.
- This DC Fan Motor will rotate by control voltage apply to Vsp input. (Voltage range: 1.7 to 7V DC)
  Vsp high : Faster ; Vsp low : slower ; Vsp lower than 1.7V : stop
- Motor will output FG pulse by following this motor revolution.
- Outdoor Microprocessor will output PWM control signal from FMCHOP terminal by following the instruction from indoor Microprocessor.
- This PWM control signal will convert to Vsp voltage by smoothing circuit (Q101 & RC filter)
- Fan motor will start to rotate when Vsp was proceeding over than 1.7V, and generate FG pulse by rotation speed.
- FG pulse will feed back to Outdoor Microprocessor through PQ102.
- PQ102 is the isolator between Microprocessor circuit and DC Fan Motor circuit, which has to match the Fan Motor revolution with instructed revolution. Such as...
          FG feedback: Faster – Instruction: Slower ... Decrease pulse width
          FG feedback: Slower – Instruction: Faster ... Increase pulse width
- FG pulse is also used for Fan Motor failure detection
- Microprocessor will monitor FG pulse 30 seconds after start the fan motor. If there is no signal detected, it will consider that the Fan Motor was malfunction and stop the operation. In this case, LD302 on control PWB will blink 12 times. (Fan Motor lock detected)
- R107 and IC4 are used for Fan Motor over current

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< Reference >

- When operation stop with LD301 blinks 12 times, it may be caused by faulty DC fan motor.
- In this case, please check CN6 and CN12 connection first. It makes Fan Motor Lock also if those connectors are in misconnection.
- DC Fan Motor has broken when 2A Fuse was burned. Please replace both DC Fan Motor and 2A Fuse together.
- It will makes "Fan Lock Stop"when something has disturb the Fan rotation by inserting materials into propeller fan or ice has growing inside of outdoor unit by snowing.
- It may make "Fan Lock Stop" by strong wind (ex. 17m/sec or above) against the Fan rotation. In this case, unit will be restart again after a while.
- In case of "Fan Lock Stop" even though the DC Fan Motor is rotating correctly, the possible casue is Fan Motor problem or PQ102 on board or control board problem. Stop after the Fan motor runs 2 minutes, Fan Motor may be broken.

< Caution >

- Please take care for the electrical shock by high voltage of DC Fan Motor power source which is common with compressor when you are servicing this unit.
- You can not confirm the coil and wiring of Motor due to the built in control circuit in Fan Motor.

12. Power Factor Control Circuit

Power factor is controlled to 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
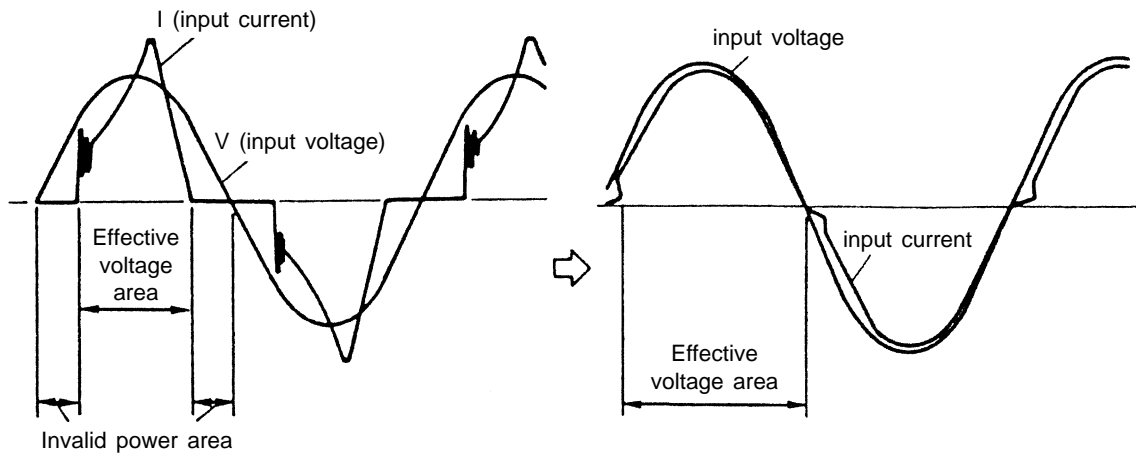
(Even if voltage is applied. current does not flow)

* 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.

SERVICE CALL Q & A

Model   RAK-25NH4 / RAC-25NH4
RAK-35NH4 / RAC-35NH4
RAK-50NH4 / RAC-50NH4

COOLING MODE

Q1 The compressor has stopped suddenly during cooling operation.

A1 Check if the indoor heat exchanger is frosted. Wait for 3-4 minutes until it is defrosted.

If the air conditioner operates in cooling mode when it is cold, the evaporator may get frosted.

DEHUMIDIFYING MODE

Q2 Sound of running water is heard from indoor unit during dehumidifying.

A2 Normal sound when refrigerant flows in pipe.

Q3 Compressor occasionally does not operate during dehumidifying.

A3 Compressor may not operate when room temperature is 10°C or less. It also stops when the humidity is preset humidity or less.

HEATING MODE

Q4 The circulation stops occasionally during Heating mode.

A4 It occurs during defrosting. Wait for 5-10 minutes until the condenser is defrosted.

Q5 When the fan speed is set at HIGH or MED, the flow is actually Weak.

A5 At the beginning of heating, the fan speed remains LOW for 30 seconds. If HIGH is selected, it switches to LOW and again to MED after additional 30 seconds.

Q6 Heating operation stops while the temperature is preset at "30".

A6 If temperature is high in the outdoor, heating operation may stop to protect internal devices.

AUTO FRESH DEFROSTING

Q7 After the ON/OFF button is pressed to stop heating, the outdoor unit is still working with the OPERATION lamp lighting.

A7 Auto Fresh Defrosting is carried out : the system checks the outdoor heat exchanger and defrosts it as necessary before stopping operation.

AUTO OPERATION

Q8 Fan speed does not change when fan speed selector is changed during auto operation.

A8 At this point fan speed is automatic.

NICE TEMPERATURE RESERVATION

Q9 When on-timer has been programmed, operation starts before the preset time has been reached.

A9 This is because "Nice temperature reservation" function is operating. This function starts operation earlier so the preset temperature is reached at the preset time. Operation may start maximum 60 minutes before the preset time.

Q10 Does "Nice temperature reservation" function operate during dehumidifying?

A10 It does not work. It works only during cooling and heating.

Q11 Even if the same time is preset, the operation start time varies.

A11 This is because "Nice temperature reservation" function is operating. The start time varies according to the load of room. Since load varies greatly during heating, the operation start time is corrected, so it will vary each day.

INFRARED REMOTE CONTROL

Q12 Timer cannot be set.

A12 Has the clock been set? Timer cannot be set unless the clock has been set.

Q13 The current time display disappears soon.

A13 The current time disappears in approx. 10 seconds. The time set display has priority.

When the current time is set the display flashes for approx 3 minutes.

Q14 The timer has been programmed, but the preset time disappears.

A14 Is the current time past the preset time? When the preset time reaches the current time, it disappears.

OTHERS

Q15 The indoor fan varies among high air flow, low air flow and breeze in the auto fan speed mode. (Heating operation)

⟹ **A15** This is because the cool wind prevention function is operating, and does not indicate a fault.

The heat exchanger temperature is sensed in the auto speed mode. When the temperature is low, the fan speed varies among high air flow, low air flow and breeze.

Q16 Loud noise from the outdoor unit is heard when operation is started.

⟹ **A16** When operation is started, the compressor rotation speed goes to maximum to increase the heating or cooling capability, so noise becomes slightly louder. This does not indicate a fault.

Q17 Noise from the outdoor unit occasionally changes.

⟹ **A17** The compressor rotation speed changes according to the difference between the thermostat set temperature and room temperature. This does not indicate a fault.

Q18 There is a difference between the set temperature and room temperature.

⟹ **A18** There may be a difference between the set temperature and room temperature because of construction of room, air current, etc. Set the temperature at a comfortable for the space.

Q19 Air does not flow immediately after operation is started.

⟹ **A19** Preliminary operation is performed for one minute when the power switch on and heating or dehumidifying is set. The operation lamp blinks during this time for heating. This does not indicate a fault.

TROUBLE SHOOTING

Model   RAK-25NH4 / RAC-25NH4
**   RAK-35NH4 / RAC-35NH4**
**   RAK-50NH4 / RAC-50NH4**

PRECAUTIONS FOR CHECKING

DANGER

1. Remember that the 0V line is biased to 155-170V 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.

Power source
1ø220V-230V, 50Hz

System power module 2

ACT Module

Power module

Compressor motor

Indoor unit electric parts

Control P.W.B.

C   DC35V
D   0V

MAIN P.W.B.
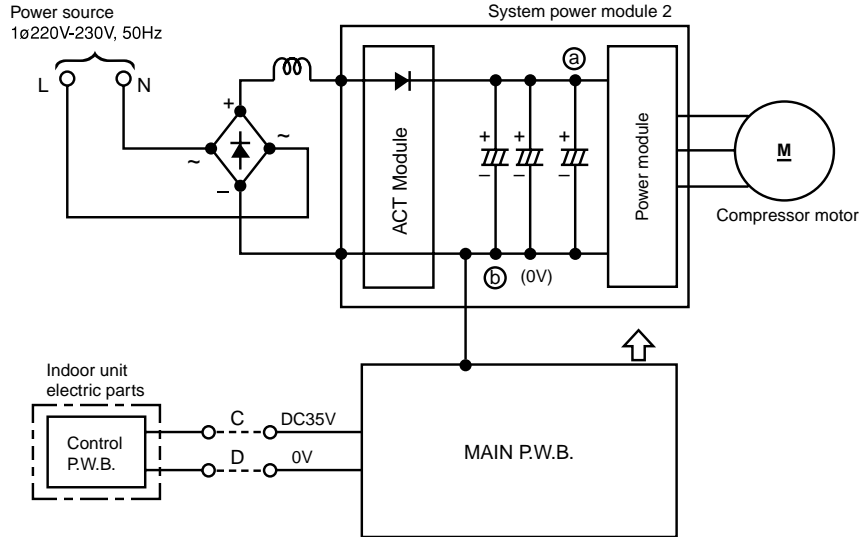
Across ⓐ – ⓑ (0V line)................... approx 260-360V
Across ⓐ – ground......................... approx 155-170V
Across ⓑ (0V line)– ground............ approx 155-170V

DANGER

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

Outdoor unit P.W.B.

Always keep your hands and metallic things away from the enclosure of the oscilloscope.

DANGER! Don't install the ground line.

Oscilloscope
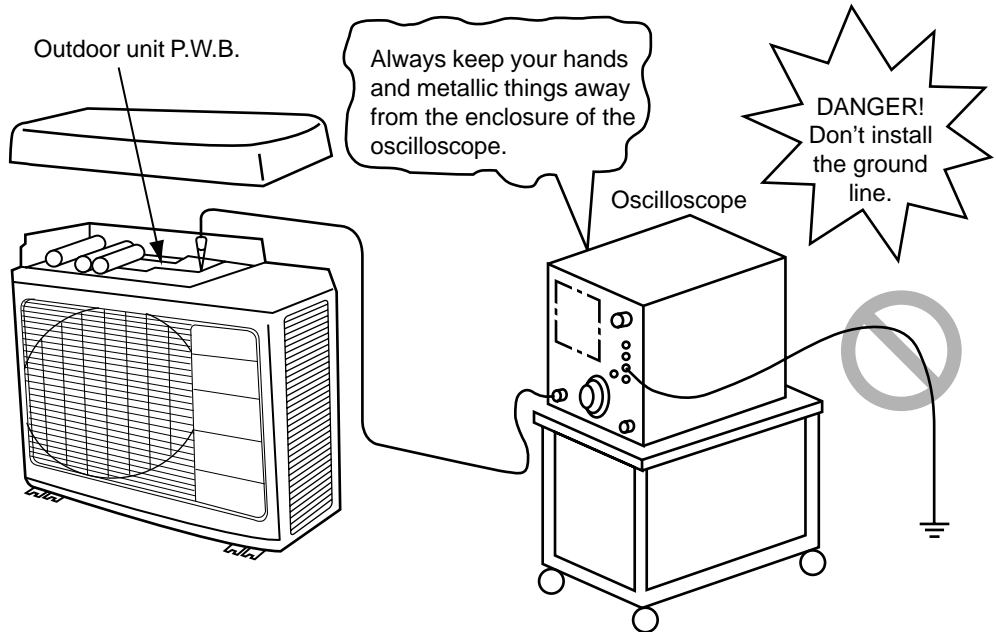
DISCHARGE PROCEDURE AND POWER SHUT OFF METHOD FOR POWER CIRCUIT

⚠ WARNING ⚡	Caution ● Voltage of about 300-330V is charged between both ends of smoothing capacitors ● During continuity check for each part of circuit in indoor unit electrical parts, disconnect red/gray lead wire connected from diode stack to system power module (SPM2) to prevent secondary trouble. (Be sure to discharge smoothing capacitor)

1. Turn OFF the Power supply to the outdoor unit.
2. After power is turned off, wait for 10 minutes or more. Then, remove electrical parts cover and apply soldering iron of 30 to 75W for 15 seconds or more to P2 and N1 terminals on system power module, in order to discharge voltage in smoothing capacitor.
3. Remove receptable of red/gray lead wire connected to system power module from diode stack before performing operation chech of each circuit.

P1

N1
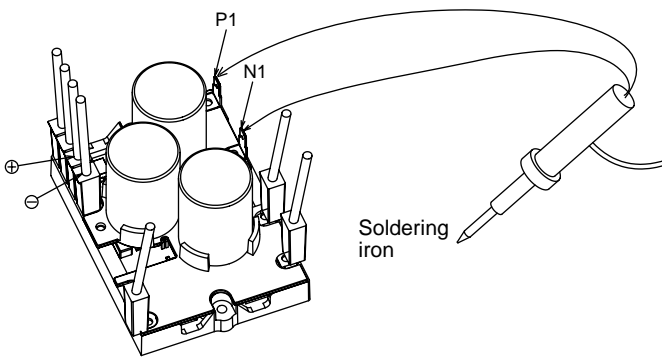
Soldering iron

System power module

Do not use a soldering iron with transformer: If one is used, thermal fuse inside transformer will be blown

As shown above, apply soldering iron to metal parts (receptable) inside the sleeve corresponding to P1 and N1 terminals of system power module: Do this with smoothing capacitors kept connected. By removing red/gray lead wire from diode stack, power supply can be shut off. (corresponding to ⊕ and ⊖ terminals of system power module)

RAC-25NH4, RAC-35NH4

SPM2   Smoothing capacitors

RAC-50NH4

SPM2   Smoothing capacitors
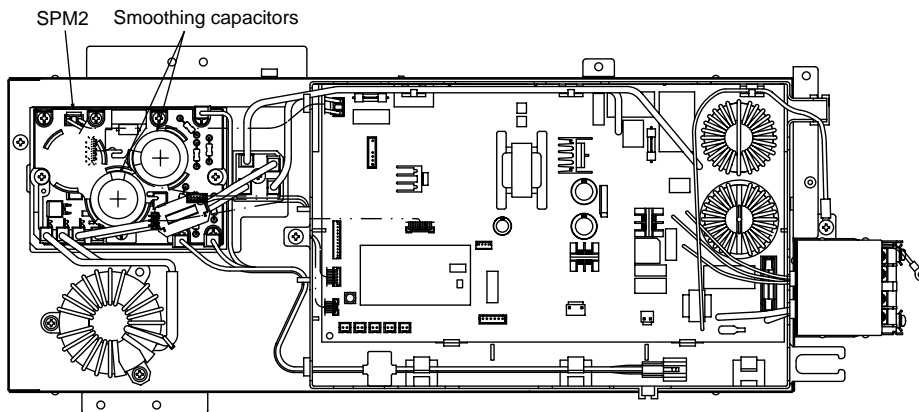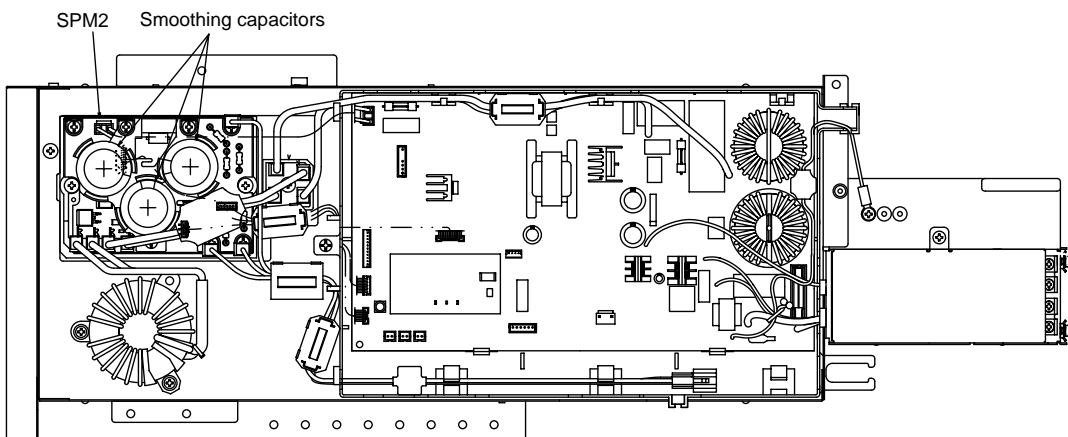
CHECKING THE INDOOR/OUTDOOR UNIT ELECTRICAL PARTS AND REFRIGERATING CYCLE

Model   **RAK-25NH4 / RAC-25NH4**
RAK-35NH4 / RAC-35NH4
RAK-50NH4 / RAC-50NH4

Timer lamp

Does the timer lamp on the indoor unit blink? ⟹ See "Troubleshooting when the timer lamp blinks".

↓ No

Set to room temperature 16°C in the cooling mode or to 32°C in the heating mode, and press the start/stop button

↓

Does the operation lamp on the indoor unit start to light or blink? ⟹ No

↓ Yes

Is the compressor in the outdoor unit operating?

Yes   No

Remove the outdoor unit cover and electrical parts cover, and check self-diagnosis lamp LD301

P.W.B

Service switch   Self diagnosis lamps (LD303, 302, 301)

Does LD301 blink one time ?
* Repeats 0.25-second on and 2-second off.

Blinking other than one time   One-time blinking

Press the service switch for 1 sec. Does the compressor operate? (After checking, be sure to press the service switch to stop the operation).

Remove the terminal cover and check the voltage between terminal (C) and terminal (D)

Terminal C (+35V)   Terminal D (0V)

Is approx. DC 33 to 37V being generated? Is the polarity correct?

No   Yes

Check to see whether the F-cable is connected incorrectly or disconnected

Normal

Yes

No

See "Out door unit self-diagnosis lamp lighting mode".

Check the refrigerating cycle.   Check the outdoor electrical parts.   Check the indoor electrical parts.

TROUBLESHOOTING WHEN TIMER LAMP BLINKS.
Model RAK-25NH4, RAK-35NH4, RAK-50NH4
Perform troubleshooting according to the number of times the indoor timer lamp and outdoor LD301 blink.

SELF-DIAGNOSIS LIGHTING MODE
Model: RAK-25NH4, RAK-35NH4, RAK-50NH4

No.	Blinking of Timer lamp	Reason for indication	Possible cause
1	▌5sec.▌ – – – – – – – 1 time	Reversing valve defective When the indoor heat exchanger temperature is too low in the heating mode or it is too high in the cooling mode.	(1) Reversing valve defective (2) Heat exchanger thermistor disconnected (only in the heating mode) (Note) The malfunction mode is entered the 3rd time this abnormal indication appears (read every 3 minutes).
2	▌▌5sec.▌ – – – – – – 2 times	Outdoor unit forced operation When the outdoor unit is in forced operation or balancing operation after forced operation	Electrical parts in the outdoor unit
3	▌▌▌5sec.▌ – – – – – 3 times	Indoor/outdoor interface defective When the interface signal from the outdoor unit is interrupted.	(1) Indoor interface circuit (2) Outdoor interface circuit
4	▌▌ ~ ▌▌5sec.▌ – – 4 times	Outdoor electrical assembly defective.	Please check at the outdoor electrical led lamp blinking (LD301) and refer to self diagnosis lighting mode for outdoor unit.
5	▌▌ ~ ▌▌5sec.▌ – – 9 times	Room thermistor or heat exchanger thermistor is faulty When room thermistor or heat exchanger thermistor is opened circuit or short circuit.	(1) Room thermistor (2) Heat exchanger thermistor
6	▌▌ ~ ▌▌5sec.▌ – – 10 times	Over-current detection at the DC fan motor when over-current is detected at the DC fan motor of the indoor unit.	(1) Indoor fan locked (2) Indoor fan motor (3) Indoor control P.W.B.
※1	7	▌▌ ~ ▌▌5sec.▌ – – 13 times	IC401 or IC402 data reading error When data read from IC401 or IC402 is incorrect.	IC401 or IC402 abnormal
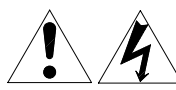
(▌ – – Lights for 0.5 sec. at interval of 0.5 sec..)

<Cautions>

(1) If the interface circuit is faulty when power is supplied, the self-diagnosis display will not be displayed.

(2) If the indoor unit does not operate at all, check to see if the F-cable is connected or disconnected.

(3) To check operation again when the timer lamp is blinking, you can use the remote control for operation (except for mode mark ※1).

SELF-DIAGNOSIS LIGHTING MODE

MODEL: RAC-25NH4, RAC-35NH4 & RAC-50NH4

DANGER (DC360V)

- SWITCH OFF MAIN POWER SUPPLY TO THE OUTDOOR UNIT AT LEAST 10 MINUTES BEFORE START THE SERVICING WORK.
- MAKE SURE THE DC VOLTAGE LEVEL AT MEASURING POSITION (P1) AND (N1) IS LESS THAN 10V.
- DO NOT TOUCH THE SCREWS OF THE SYSTEM POWER MODULE WHEN THE UNIT IS TURNED ON. HIGH VOLTAGE STILL REMAIN EVEN AFTER THE UNIT IS TURNED OFF.
- DO NOT TOUCH ANY OTHER PARTS EXCEPT THE SERVICE SWITCH WHEN SERVICE OPERATION IS CONDUCTED.

SELF-DIAGNOSIS LIGHTING MODE ■ LIT ▨ BLINKING □ OFF

LD301	LD302	SELF-DIAGNOSIS NAME	DETAILS	MAIN CHECK POINT
		[1] DURING OPERATION		LD303 LIGHTS. ■
□	□	NORMAL OPERATION	COMPRESSOR OPERATION	NOT MALFUNCTION
■	□	OVERLOAD (1)	UNDER OVERLOAD CONDITION, THE ROTATION SPEED IS CONTROLLED AUTOMATICALLY IN ORDER TO PROTECT THE COMPRESSOR.	THIS SHOWS AN OVERLOAD, NOT MALFUNCTION.
□	■	OVERLOAD (2)		
■	■	OVERLOAD (3)		

[2] DURING STOP — LD303 GOES OFF. □

LD301	LD302	NAME	DETAILS	MAIN CHECK POINT
□	□	NORMAL STOP	INDOOR THERMOSTAT OFF. MAIN OPERATION OFF.	NOT MALFUNCTION.
▨ (1 TIME)	□	RESET STOP	WHEN STOPPED WITH POWER RESET. (NORMAL WHEN POWER HAS BEEN TURNED ON.)	① P.W.B.s (POWER CIRCUIT, HIC, ETC.)
▨ (2 TIMES)	□	PEAK CURRENT CUT	OVER CURRENT IS DETECTED.	① SYSTEM POWER MODULE ② COMPRESSOR ③ P.W.B.s
▨ (3 TIMES)	□	ABNORMAL LOW SPEED ROTATION	POSITION DETECTION SIGNAL IS NOT INPUT DURING OPERATION.	① SYSTEM POWER MODULE ② COMPRESSOR ③ P.W.B.s
▨ (4 TIMES)	□	SWITCHING FAILURE	FAIL TO SWITCH FROM INITIAL LOW FREQUENCY SYNC. TO POSITION DETECTION SYNC..	① SYSTEM POWER MODULE ② COMPRESSOR ③ P.W.B.s
▨ (5 TIMES)	□	OVERLOAD LOWER LIMIT CUT	OVERLOAD CONDITION STILL PERSISTING EVEN WHEN ROTATION SPEED IS BELOW THE LOWER RPM LIMIT.	① OUTDOOR UNIT IS EXPOSED TO DIRECT SUNLIGHT OR ITS AIRFLOW BLOCKED. ② FAN MOTOR ③ FAN MOTOR CIRCUIT ④ THE VOLTAGE IS EXTREMELY LOW.
▨ (6 TIMES)	□	OH THERMISTOR TEMP. RISE	OH THERMISTOR IS OPERATING.	① LEAK OF REFRIGERANT ② COMPRESSOR ③ OH THERMISTOR CIRCUIT ④ FAN MOTOR ⑤ FAN MOTOR CIRCUIT
▨ (7 TIMES)	□	ABNORMAL THERMISTOR	THERMISTOR IS OPENED OR SHORTED.	① THERMISTOR ② CONNECTION OF THERMISTOR IS FAULTY ③ THERMISTOR CIRCUIT
▨ (8 TIMES)	□	ACCELERATION DEFECTIVE	NO ACCELERATION ABOVE THE LOWER LIMIT OF THE ROTATION SPEED.	① LEAK OF REFRIGERANT ② COMPRESSOR
▨ (9 TIMES)	□	COMMUNICATION ERROR	COMMUNICATION BETWEEN INDOOR UNIT AND OUTDOOR UNIT ARE INTERRUPTED.	① C. D CABLE IS REVERSED ② CABLE IS DISCONNECTED ③ INTERFACE CIRCUIT OF INDOOR AND OR OUTDOOR UNIT
▨ (10 TIMES)	□	POWER SUPPLY VOLTAGE ERROR	POWER SUPPLY VOLTAGE IS INCORRECT.	① POWER SUPPLY VOLTAGE ② RECEPTACLE OF WIRE AT SYSTEM POWER MODULE IS NOT PROPERLY INSERTED
▨ (12 TIMES)	□	FAN LOCK ERROR	OUTDOOR FAN RPM IS NOT ROTATE AS INTENDED RPM.	① FAN MOTOR ② FAN MOTOR CIRCUIT
▨ (13 TIMES)	□	EEPROM READING ERROR	MICROCOMPUTER CANNOT READ THE DATA IN EEPROM.	① HIC
▨ (14 TIMES)	□	ACTIVE CONVERTER DEFECTIVE	OVER VOLTAGE IS DETECTED BY SYSTEM POWER MODULE.	① SYSTEM POWER MODULE

※ EXAMPLE OF BLINKING (5 TIMES): ▨▨▨▨▨ 2SEC ▨ ·· LIGHTS FOR 0.25 SEC. AT INTERVAL OF 0.25 SEC.
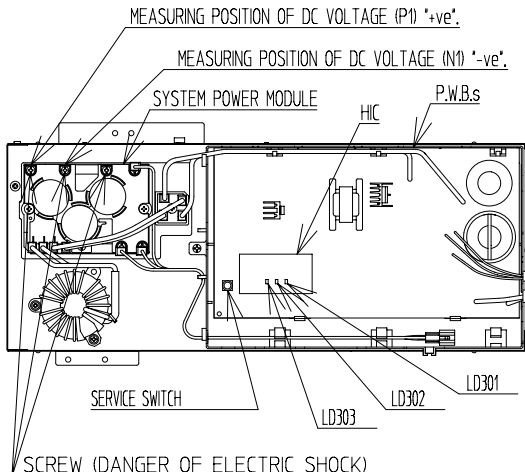
WIRING DIAGRAM
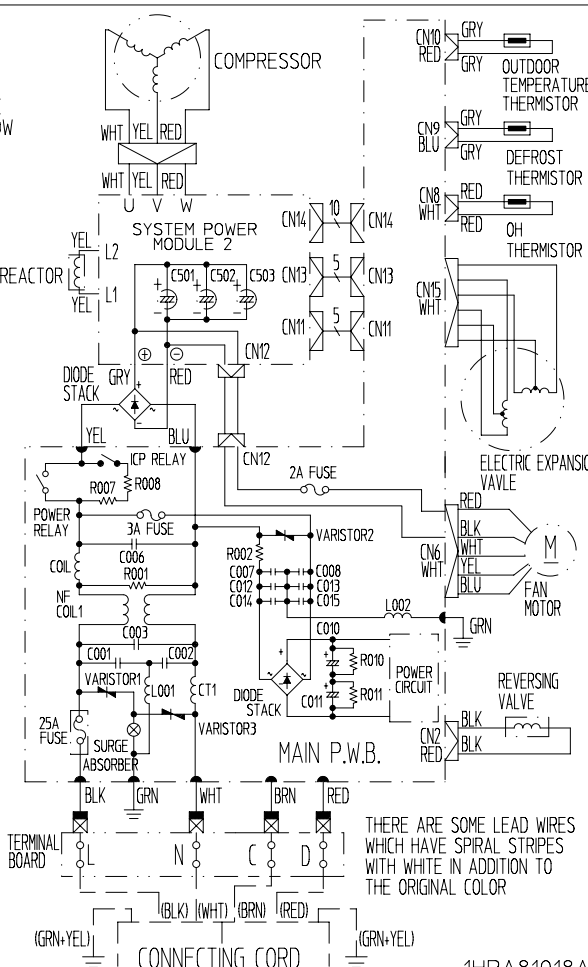
BLK : BLACK GRY : GRAY
BLU : BLUE RED : RED
BRN : BROWN WHT : WHITE
GRN : GREEN YEL : YELLOW

SERVICE OPERATION — COLLECT REFRIGERANT FROM INDOOR UNIT AND STORE AT OUTDOOR UNIT.

1. SWITCH OFF THE MAIN POWER SUPPLY AND THEN SWITCH IT ON AGAIN. WAIT FOR 1 MINUTE.
2. PRESS AND HOLD THE SERVICE SWITCH FOR 1 SECOND TO START OUTDOOR UNIT IN COOLING OPERATION. IN ORDER TO PREVENT PARTS FROM DAMAGE, DO NOT OPERATE THE OUTDOOR UNIT FOR MORE THAN 5 MINUTES.
3. PRESS AND HOLD THE SERVICE SWITCH FOR 1 SECOND TO STOP THE SERVICE OPERATION.
4. REPEAT STEP 1 TO 3 IF SERVICE OPERATION NEED TO BE REPEATED.

MEASURING POSITION OF DC VOLTAGE (P1) '+ve'.
MEASURING POSITION OF DC VOLTAGE (N1) '-ve'.
SYSTEM POWER MODULE
HIC
P.W.B.s
LD301
LD302
LD303
SERVICE SWITCH
SCREW (DANGER OF ELECTRIC SHOCK)

COMPRESSOR
SYSTEM POWER MODULE 2
REACTOR
DIODE STACK
ICP RELAY
POWER RELAY
COIL
NF COIL1
VARISTOR1
25A FUSE
SURGE ABSORBER
2A FUSE
VARISTOR2
VARISTOR3
DIODE STACK
POWER CIRCUIT
OUTDOOR TEMPERATURE THERMISTOR
DEFROST THERMISTOR
OH THERMISTOR
ELECTRIC EXPANSION VAVLE
FAN MOTOR
REVERSING VALVE
MAIN P.W.B.
3A FUSE

THERE ARE SOME LEAD WIRES WHICH HAVE SPIRAL STRIPES WITH WHITE IN ADDITION TO THE ORIGINAL COLOR

TERMINAL BOARD
L N C D
(BLK) (WHT) (BRN) (RED)
(GRN+YEL)
CONNECTING CORD
(GRN+YEL)

1HRA81018A

CHECKING INDOOR UNIT ELECTRICAL PARTS

1. Power does not come on (no operation)

Is DC 35V being generated between terminals C and D on the terminal board?

→ **No** → Is AC 220-240V AC being generated between terminals L and N on the outdoor unit terminal board?

→ **No** → Check AC outlet and breaker, and repair any defective part.

↓ **Yes**

Is DC 35V being generated between terminals C and D on the outdoor unit terminal board?

→ **Yes** → Check the indoor/outdoor unit connection cable, and correct any defective section (wrong connection, incomplete insertion reversed).

→ **No** → Check the outdoor unit power circuit, and repair the defective section.

Are control voltages (12V, 5V) being generated normally?

→ **No** → Check according to the proper method for checking the power circuit.

↓ **Yes**

Do the air deflectors perform initial operation when the power supply is turned on and off?

→ **Yes** → Check the indication P.W.B. connection cord and light receiving unit.

↓ **No**

Is the microcomputer reset input (pin ⑦)"Hi" ?

→ **No** → Check the reset circuit, and repair any defective section.

↓ **Yes**

Is the microcomputer clock signal 10MHz at pin ⑩ ⑪ being generated normally?

→ **No** → Replace the microcomputer and oscillator.

↓ **Yes**

Replace the control P.W.B

→ Perform final operation check.

2. **Outdoor unit does not operate (but receives remote infrared signal)**

Set to room temperature 16°C in the cooling mode or to 32°C in the heating mode, and press the start/stop button.

Remove the outdoor unit cover and electrical parts cover, and check self-diagnosis lamp LD301.

CN17

Self diagnosis lamps
(LD303, 302, 301)

Does LD301 blink one time?
*Repeats 0.25-second on and 2-second off.

Yes →

Check the room temperature thermistor; if it is defective, replace it.
<Normal values>
  10°C → approx. 20kΩ
  25°C → approx. 10kΩ
  30°C → approx. 8kΩ

Check the heat exchanger thermistor; if it is defective, replace it.
<Normal values>
  10°C → approx. 20kΩ
  25°C → approx. 10kΩ
  30°C → approx. 8kΩ

No ↓

Does outdoor electrical part LD301 blink nine times?

Yes →

Is the indoor/outdoor unit communication signal superimposed on 35V DC of connection wires C and D?

38kHz Approx. 2Vp-p
Approx. 35V
0V

No →

Check outdoor electrical parts, and repair any defective parts (around the outdoor interface transmitting circuit).

Yes ↓

Is the indoor transmitting signal being generated at Q801's collector?

38kHz Approx. 2Vp-p
Transmission waveform
Approx. 35V
0V

No →

Check the indoor interface transmitting circuit. Replace IC801.

Yes →

Check outdoor electrical parts, and repair any defective parts (around the outdoor interface transmitting circuit).

No ↓

Does LD303 switch off several second after it lights?

Yes →

Check outdoor electrical parts, and repair any defective parts.

Perform final operation check.

3. Only indoor fan does not operate (other is normal)

```
┌──────────────────────────┐  Yes  ┌──────────────────────────┐  Yes  ┌──────────────────────────┐
│ Can the fan be stopped by │ ====> │ The microcomputer fan PWM │ ====> │ Replace the microcomputer.│
│ remote control?          │       │ output (pin) is "Hi"     │       │                          │
└──────────────────────────┘       └──────────────────────────┘       └──────────────────────────┘
         │ No                                 │ No
         │                                    │              ┌──────────────────────────┐
         │                                    └=============> │ Replace the indoor fan motor.│
         │                                                   └──────────────────────────┘
         │
         │                                    ┌──────────────────────────┐
         └==================================> │ Replace the microcomputer.│
                                              └──────────────────────────┘
```

┌──────────────────────────┐
│ Perform final operation check. │
└──────────────────────────┘

4. Air deflector does not move (others are normal)

```
┌──────────────────────────────────┐  No   ┌──────────────────────────┐
│ Are pulse signals output at      │ ====> │ Replace the microcomputer │
│ microcomputer pin ⑮ - ⑱ when auto│       │                          │
│ swing is turned on in the fan mode?│     └──────────────────────────┘
└──────────────────────────────────┘
         │ Yes
┌──────────────────────────────────┐  Yes  ┌──────────────────┐  Yes  ┌──────────────────────────┐
│ Is a voltage over 15V or below 10V│ ====> │ Replace IC111    │ ====> │ Check IC711. If it is normal,│
│ being generated on the 12V line  │       │                  │       │ replace the air deflector motor.│
└──────────────────────────────────┘       └──────────────────┘       └──────────────────────────┘
```

┌──────────────────────────┐
│ Perform final operation check. │
└──────────────────────────┘

5. All systems stop from several seconds to several minutes after operation is started (all indicators are also off)

```
┌──────────────────────────────────────────────┐
│ Set to the "Hi" fan mode.                     │
└──────────────────────────────────────────────┘
                     ↓
┌──────────────────────────────────────────────┐
│ The operation lamp lights once and goes out in 5-10 seconds. │
└──────────────────────────────────────────────┘
                     ↓ Yes
┌──────────────────────────────────────────────┐
│ Disconnect CN10 and set to the fan mode again. │
└──────────────────────────────────────────────┘
                     ↓
┌──────────────────────────────────────────────┐  Yes  ┌──────────────────────────────────┐
│ The operation lamps lights once and goes out in 5-10 seconds. │ ==> │ Check to see if shorting etc. has occurred │
└──────────────────────────────────────────────┘       │ in the P.W.B pattern             │
                     ↓ No                               └──────────────────────────────────┘
┌──────────────────────────────────────────────┐  No   ┌──────────────────────────────────┐
│ Can the indoor fan be lightly turned by hand? │ ==>   │ Check to see if the indoor fan is touching │
│ (Switch of main power before check)          │       │ the chassis, etc. If it does repair │
└──────────────────────────────────────────────┘       └──────────────────────────────────┘
                     ↓ Yes
┌──────────────────────────────────────────────┐
│ Replace the indoor fan motor.                 │
└──────────────────────────────────────────────┘
```

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6. Check the main P.W.B (power circuit)

```
┌─────────────────────┐         ┌─────────────────────────┐         ┌─────────────────────────┐
│ Is DC 35V being output │  No   │ Is ICP2 normal?         │  No    │ Replace ICP2. Check if   │
│ between cathode and   │ ═══>   │ Normal if it is less than 1Ω. │ ═══> │ shorting has occurred in fan │
│ anode of D101?        │       │ Blown (open) if it is 1Ω or more │   │ motor circuit and 35V    │
└─────────────────────┘         └─────────────────────────┘         │ interface circuit. If these are │
         ║ Yes                                                        │ defective, ICP2 will be open │
         ▼                                                            │ again.                   │
┌─────────────────────┐         ┌─────────────────────────┐         └─────────────────────────┘
│ Is DC 12V being output? │ No  │ Is ICP1 normal?         │  No    ┌─────────────────────────┐
│                       │ ═══> │ Normal if it is less than 1Ω. │ ═══> │ Replace ICP1. Check if  │
│                       │      │ Blown (open) if it is 1Ω or more │    │ shorting has occurred in the │
└─────────────────────┘        └─────────────────────────┘          │ air deflector motor.     │
         ║ Yes                          ║ Yes                        │ If these are defective, ICP1 │
         ║                              ▼                            │ will be open again.      │
         ║                  ┌─────────────────────┐                  └─────────────────────────┘
         ║                  │ Replace IC111.      │
         ║                  └─────────────────────┘
         ▼
┌─────────────────────┐                                             ┌─────────────────────────┐
│ Is DC 5V being output? │ ═════════════════════════════════════>  │ Replace REG2. Check the 5V │
│                       │                                           │ line: if the 5V line is shorted, │
└─────────────────────┘                                            │ ICP1 will be open again.  │
         ║                                                           └─────────────────────────┘
         ▼
┌─────────────────────────────┐
│ Perform final operation check. │  <═══
└─────────────────────────────┘
```

CHECKING THE REMOTE CONTROLLER

Is battery polarity correct? — No → Install the battery in the correct polarity.

Yes ↓

Is the battery check sign ⊏+ −⊐ flashing? — Yes → Replace the battery.

No ↓

Turn on an AM radio, bring the remote control switch within 15 cm of the radio, and press the ON/OFF button.

↓

Does the radio buzz noisily? — No → Check the LED (D1) with a multimeter.

Yes ↓

Check the indoor unit signal receiving P. W. B..
If it is good, check the main P. W. B..

"Buzz"

Within 15 cm

[AM radio]

You can check the remote control switch by other methods as explained below.

Using the test card

Ultra redray test card

Sensible area

Within 2 cm

The sensible area should flash in orange when you operate the remote control unit if it is good.

Check functions again.
If it does not work, replace the remote controller.

MODEL RAC-25NH4, RAC-35NH4, RAC-50NH4

[No operation or abnormal operation]

Is AC220-240V being supplied to terminal L and N? — Yes →

Is the 25A fuse normal? — No → If the 25A fuse has blown, be aware that other parts may also be defective (mainly, varistor 2, diode stack, smoothing capacitors, system power module, etc.). → Replace any defective parts.

— Yes →

Is the power circuit normal? / See the description on power circuit for details. → Check to see whether the connected C and D cable correctly? If reversed, correct the cable connection.

— Yes →

Is 5V being generated between Pin ④ (0V) and pin ③ (5V) at CN 18 (test pin)? — No → Is the switching power circuit OK? Has the 3A fuse blown? — Yes → Replace any defective parts. (If the 3A fuse has blown, the switching transformer (T1), R906, etc. may also be defective.)

— No →

— Yes →

Operate the outdoor unit according to the instruction "How to operate the outdoor unit independently". →

How did the self-diagnosis lamp (LD301) light? → See the self-diagnosis lamp lighting mode.

→

LD301 blinks 9 time.
Communication error.

⇒ Is DC 35V being output at terminals C and D? (Normally, DC 33-38.5V is output.)

Yes →

Is DC 35V being output across R914?

No → D907 and C910 may be defective.

Yes ⇒

Is DC 12V being supplied across the control side (coil terminal) of interface relay?

No → There is a defective section between the 12V output of switching power supply on the main P.W.B. and interface relay (also, check for contact with solder, etc.).

Yes ⇒

Is a voltage (at least 10V) being generated between the contact terminals of interface relay?

Yes → Repalce the interface relay.

No ⇒

Check the interface curcuit.

Interface relay

Coil terminal

Contact terminal

LD301 blinks 8 time.
Acceleration defect.

→ Yes → **Is the power module normal?**

- No → Replace the power module.
- Yes → **Is the drive circuit normal?**
  - No → Replace any defective parts.
  - → Check continuity of pattern and lead wires according to the P.W.B. and schematic diagrams.

LD301 blinks 7 time.
Thermistor abnormal.

→ **Is the thermistor connector disconnected?**
※ The problem may be "forgetting to connect after servicing".

- Yes → Connect the thermistor.
- No → **Is the continuity of thermistor normal?**
  - No → Replace the thermistor.
  - Yes → **Is the thermistor circuit normal?**
    - No → Replace parts in the thermistor circuit.
    - → Check continuity of pattern and lead wires according to the P.W.B. and schematic diagrams.

LD301 blinks 6 time.
The temperature at the OH thermistor rises.
→ Is the thermistor circuit normal? → No → Replace parts in the thermistor circuit.

LD301 blinks 5 time.
Overload lower limit cut.
→ Are R503, R541, R542, R549 and peripheral circuits of system power module normal? → No → Replace system power module or defective parts. → Check continuity of new parts.
Yes → Replace the main P.W.B.

LD301 blinks 4 time.
Failure of switching.
→ Is the system power module normal? → No → Replace the system power module.

LD301 blinks 3 time.
Abnormal low speed.
→ Is the drive circuit normal? → No → Replace any defective parts. → Check continuity of pattern and lead wires according to the P.W.B. and schematic diagrams.
Yes →

```
                                                                                              ┌─────────────────────────────┐
                                                                                              │ Make sure again that        │
                                                                                              │ connectors are connected    │
                                                                                              │ securely.                   │
                                                                                              └─────────────────────────────┘
                                                                                                          │
                                                                                                          ▼
┌──────────────────┐  ┌──────────────────┐  ┌──────────────────┐  ┌──────────────────┐     ┌──────────────┐      ┌───────────────────────────┐
│ Replace the      │  │ Replace any      │  │ Replace any      │  │ Replace any      │     │ Operate the  │      │ Perform final operation   │
│ system power     │  │ defective parts. │  │ defective parts. │  │ defective parts. │     │ unit again.  │ ──►  │ check.                    │
│ module.          │  │                  │  │                  │  │                  │     │ is it normal?│      │                           │
└──────────────────┘  └──────────────────┘  └──────────────────┘  └──────────────────┘     └──────────────┘      └───────────────────────────┘
        ▲  No              ▲  No                 ▲  No                 ▲  No
        │                  │                     │                     │
┌──────────────┐ Yes ┌──────────────┐ Yes ┌─────────────────────┐  ┌──────────────────┐
│ Is the system│ ──► │ Is the drive │ ──► │ ● Are R503, R541,   │  │ Is the reset     │
│ power module │     │ circuit      │     │   R542, R549 and    │  │ circuit normal?  │
│ normal?      │     │ normal?      │     │   peripheral        │  │ (Normally,       │
└──────────────┘     └──────────────┘     │   circuits of       │  │ microcomputer    │
        ▲                  ▲               │   system power      │  │ pin ㊽ is        │
        │                  │               │   module normal?    │  │ approx. 5V.)     │
        │                  │               │ ● Is the            │  └──────────────────┘
        │                  │               │   microcomputer IP  │          ▲
        │                  │               │   input signal      │          │
┌──────────────┐          │               │   normal?           │  ┌──────────────────┐
│ LD301 blinks │          │               │   (Normally, pin ⑰  │  │ LD301 blinks     │
│ 2 time.      │          │               │   is approx. 5V.)   │  │ 1 time.          │
│ Peak         │          │               └─────────────────────┘  │ Reset stop.      │
│ current-cut. │ ─────────┴────────────────────────────────────►   └──────────────────┘
└──────────────┘                                                      ⎧ However, the unit always resets and
                                                                      ⎨ stops just after power is supplied:
                                                                      ⎩ this does not indicate a fault.
```

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POWER CIRCUIT

Phenomenon 1 <Rotation speed does not increase>

```
┌─────────────────────────────┐      No      ┌─────────────────────────────┐
│                             │  ─────────►  │ Recheck cord, etc. of the   │
│ Is the DC voltage at least  │              │ system power module. If     │
│ 350V?                       │              │ they are disconnected,      │
│                             │              │ connect them securely.      │
└─────────────────────────────┘              └─────────────────────────────┘
              │ Yes                                         │
              ▼                                             ▼
┌─────────────────────────────┐              ┌─────────────────────────────┐
│ Is the OVL lamp lit?        │              │ If abnormality continues,   │
│ If the lamp is lit, it does │              │ replace the system          │
│ not indicate fault, but the │              │ power module.               │
│ unit is overload status.    │              │                             │
└─────────────────────────────┘              └─────────────────────────────┘
```

Overvoltage defect: system power
module faulty (15-times blinking)

| CHECKING THE REFRIGERATING CYCLE | (JUDGING BETWEEN GAS LEAKAGE AND COMPRESSOR DEFECTIVE) |

1. Troubleshooting procedure (No operation, No heating, No cooling)

Connect U,V,W phase leads to the power module again and operate the air conditioner.

Self-diagnosis lamp \ Lighting mode	Blinks 2 times	Blinks 3 times	Blinks 4 times	Blinks 5 times	Blinks 6 times	Blinks 8times
LD301	Blinking	Blinking	Blinking	Blinking	Blinking	Blinking
Time until the lamp lights	Approx. 10 seconds			Approx. 10 seconds	Within Approx. 30 seconds	Approx. 10 seconds
Possible malfunctioning part	Compressor				Gas leakage	Compressor

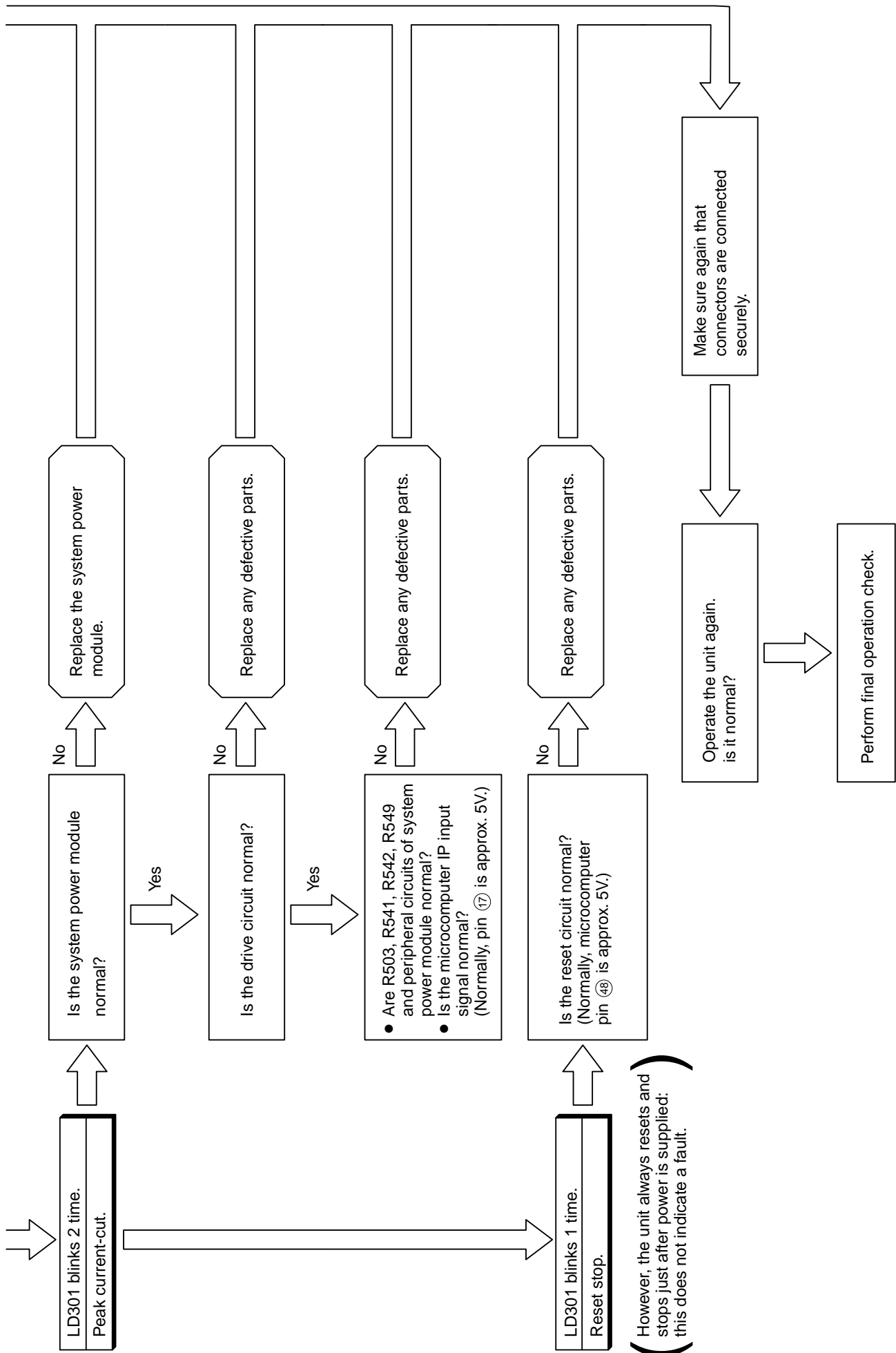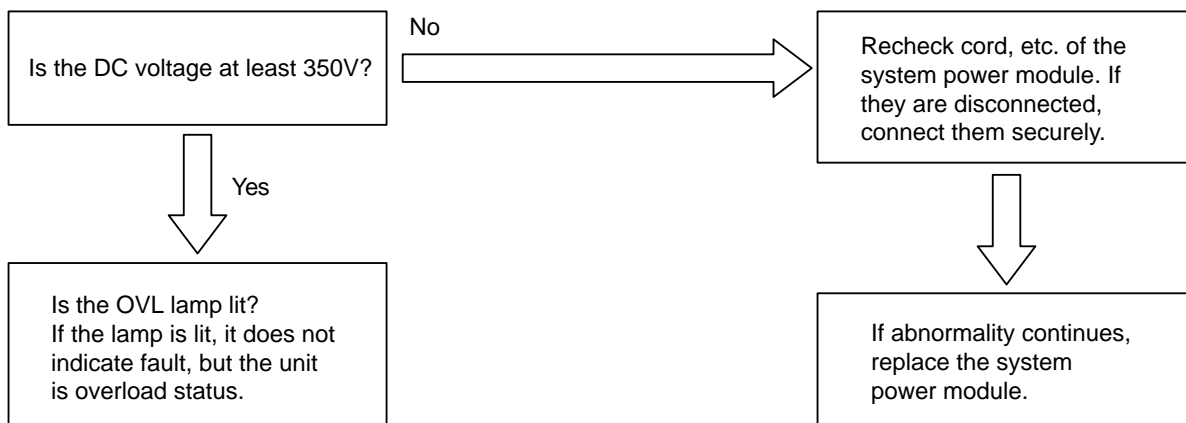Blinking   off
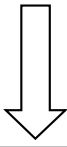
Is the self-diagnosis lamp mode as shown on the right?

YES
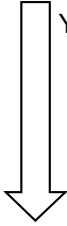
Stop to operate and check the gas pressure in balancing mode.

Normal
(0.39-0.98 MPaG)
(4-10 kg/cm2G)
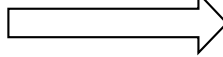
● Checking the system power module

Gas leaking
(less than 4kg/cm2G)
(less than 0.39 MPaG)

When the self-diagnosis lamp lights in the same condition as above.
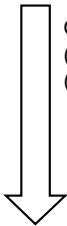
Gas leaks.
Repair and seal refrigerant.
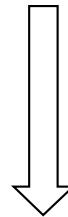
The compressor is defective. Replace it and seal refrigerant.
(If the compressor checker for an inverter type air conditioner is available, re-check using it.)
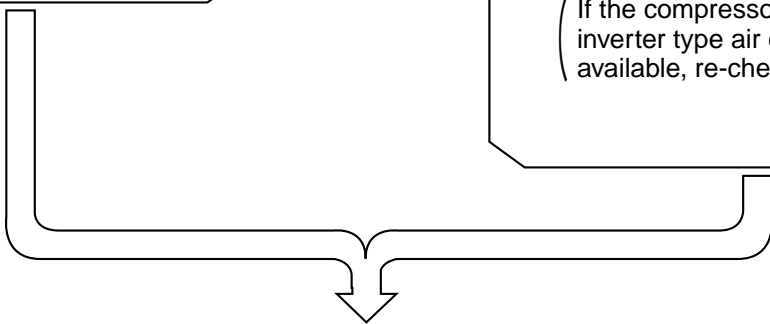
Perform a final check of operation.

HOW TO CHECK SYSTEM POWER MODULE

Checking system power module using tester

Set tester to resistance range (X 100)

If indicator does not swing in the following conductivity check, the system power module is normal.

(In case of digital tester, since built-in battery is set in reverse direction, $\oplus$ and $\ominus$ terminals are reversed.)

⚠ CAUTION

If inner circuit of system power module is disconnected (open), the indicator of tester will not swing and this may assumed as normal. In this case, if indicator swings when $\oplus$ and $\ominus$ 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.
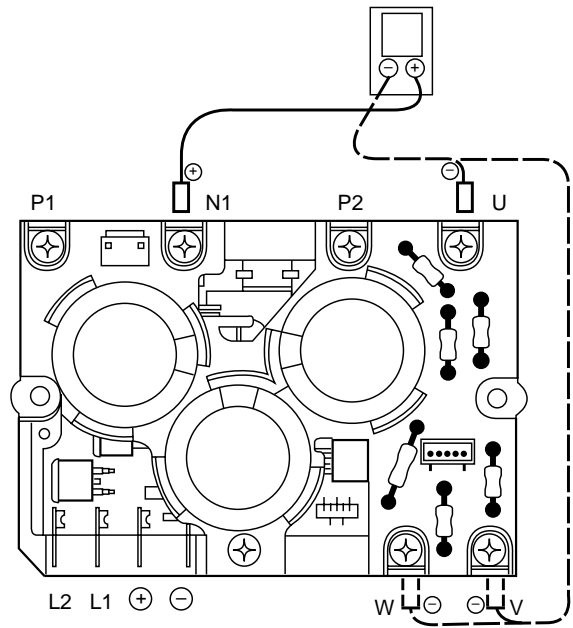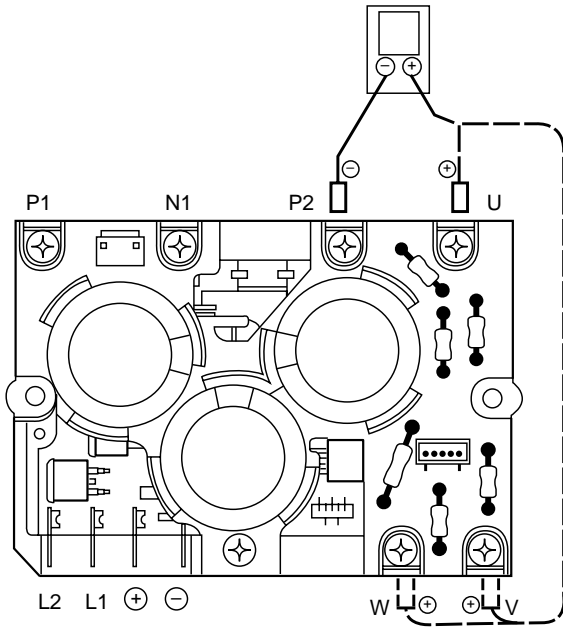
HOW TO OPERATE USING THE SERVICE SWITCH THE OUTDOOR UNIT

MODEL RAC-25NH4, RAC-35NH4, RAC-50NH4

1. Turn off the power supply to outdoor unit and then turn on again.
2. Remove the electrical box cover.

LD303 (red) will light and the unit will operate in the forced cooling mode at this time.

Never operate the unit for more than 5 minutes.

Electrical Box Cover

RAC-25NH4, RAC-35NH4

Electrical Box Cover

RAC-50NH4

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

CN17

Self diagnosis lamps
(LD303, 302, 301)
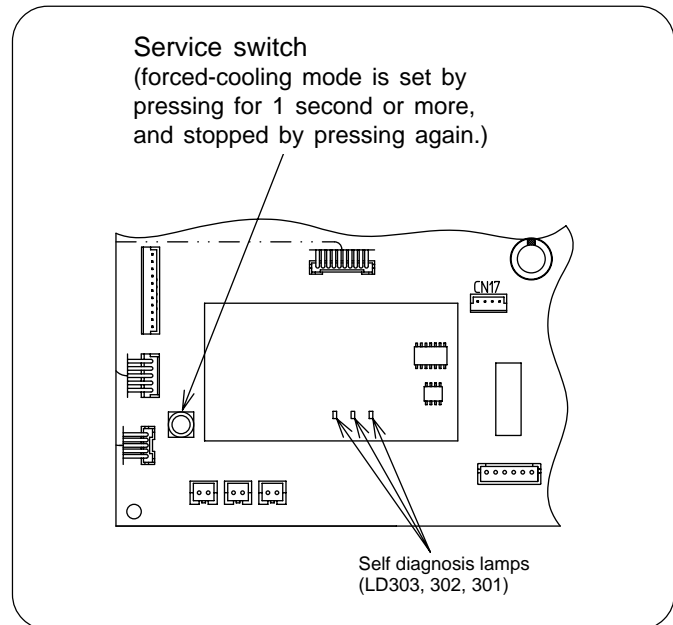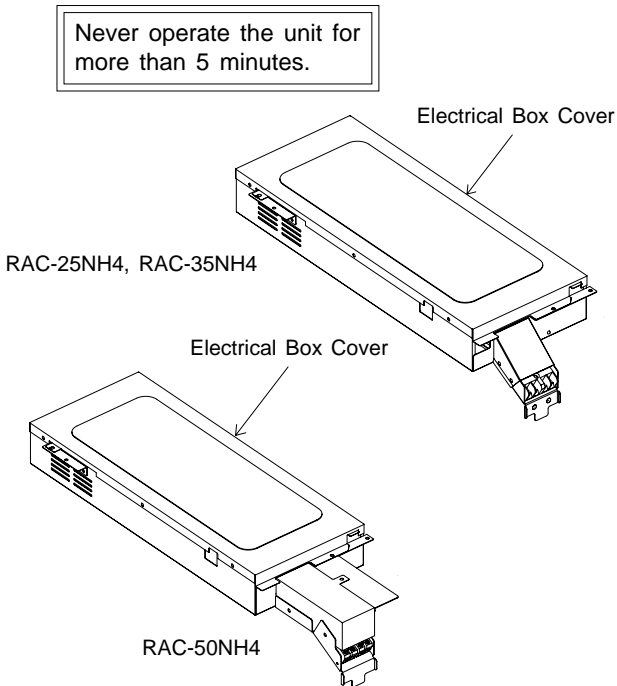
(Cautions)
(1) If interface signal (DC 35V) terminals C and D are not connected when the outdoor unit is in forced cool mode, the outdoor unit defect indicator (LD301) will blink 9 times during operation to indicate communication error.
(2) If checking is done with the compressor connector disconnected, the unit will continue normal operation when the electrical parts are normal, or it will repeat operating for approx. one minute and stop due to overload power limit cut, or it will operate in the overload status.

Be sure to push the service switch again to stop the forced cool operation.

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)

Outdoor unit

Compressor

Reversing valve

Large dia. service valve

Reducing union (2/8" and 3/8")

Copper pipe (2/8")

Small diameter service valve
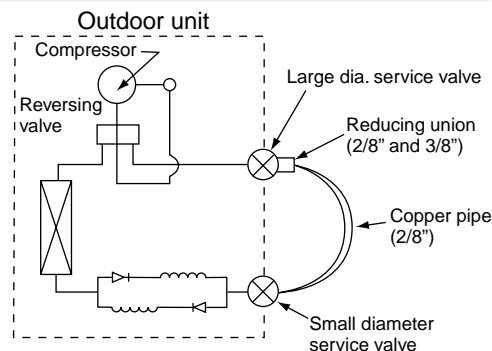
Parts to be prepared

(1) Reducing union
   2/8" (6.35mm)
   1/2" (12.7mm)
(2) Copper pipe (2/8" and 1/2")
(3) Shorting leads
   2 leads approx. 10 cm long with alligator clip or IC clip
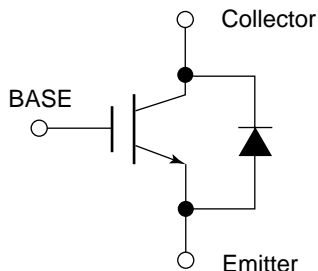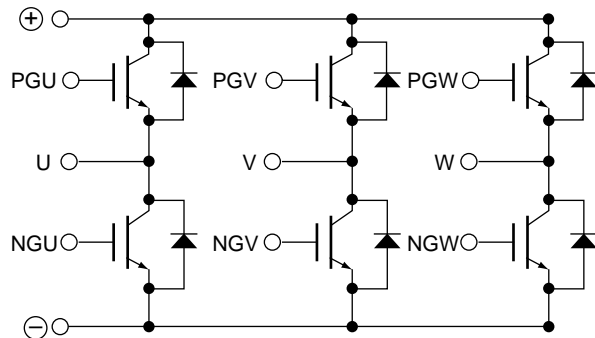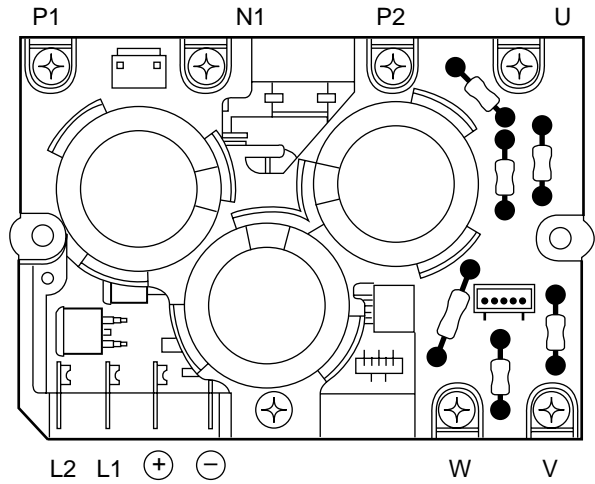
Do not operate for more than 5 minutes

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.

SYSTEM POWER MODULE DIAGNOSIS

Circuit diagram of the device (excepting the reflux diode)	
Circuit diagram of the module	
Terminals symbol mark of the module ※ See next page for measuring value using tester	

PARTS LIST AND DIAGRAM

INDOOR UNIT
MODEL : RAK-25NH4, RAK-35NH4, RAK-50NH4
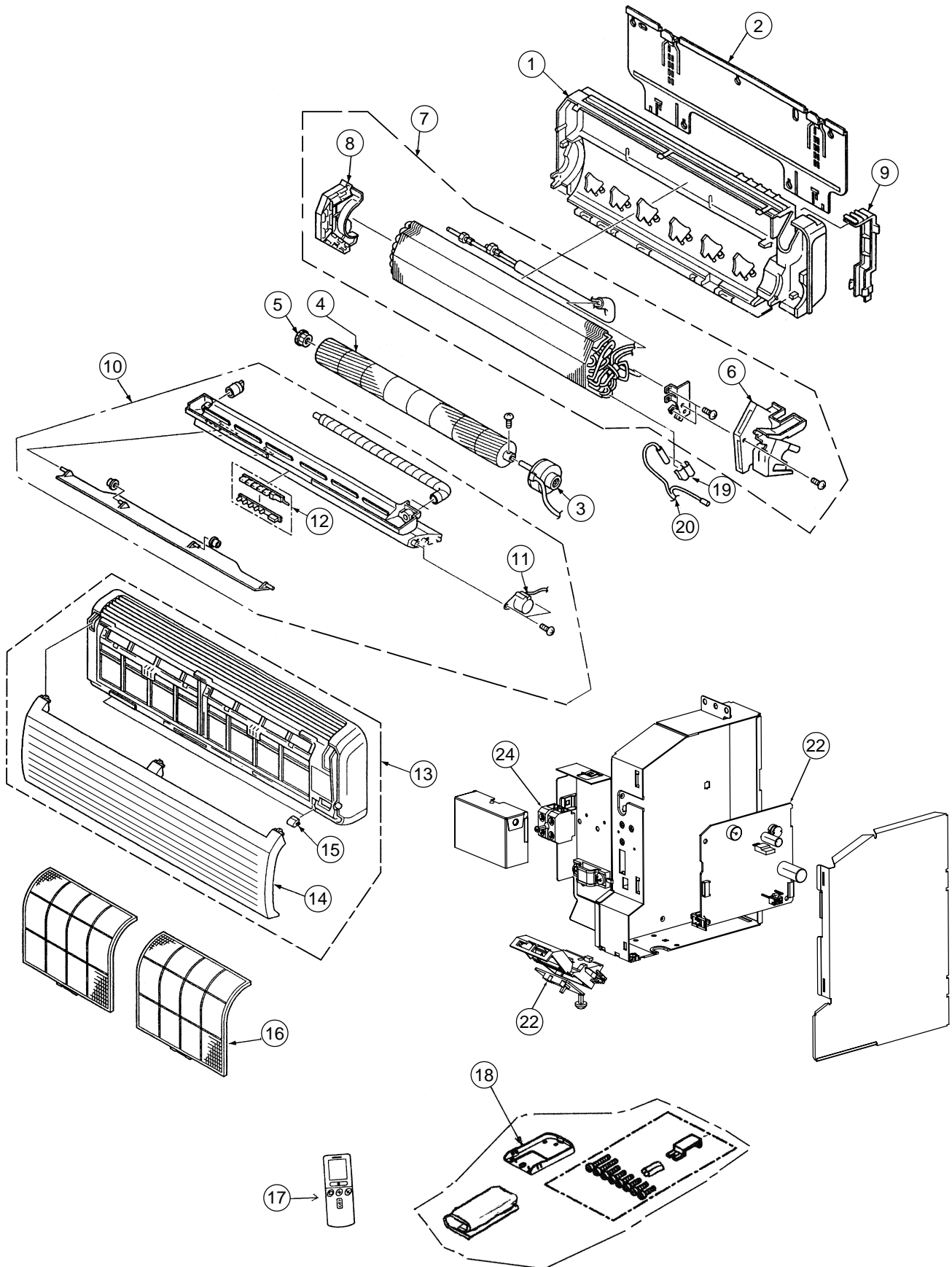
MODEL RAK-25NH4

NO.	PART N0. RAK-25NH4		Q'TY / UNIT	PARTS NAME
1	PMRAK-25NH4	006	1	CABINET
2	PMRAS-40CNH2	023	1	MOUNTING PLATE
3	PMRAK-25NH4	001	1	FAN MOTOR
4	PMRAS-40CNH2	004	1	TANGENTIAL AIR FLOW FAN
5	PMRAS-25CNH2	005	1	P-BEARING ASSEMBLY
6	PMRAS-10C7M	002	1	FAN MOTOR SUPPORT
7	PMRAK-25NH4	002	1	CYCLE ASSY
8	PMRAS-51CHA1	020	1	FAN COVER
9	PMRAS-18CP5	003	1	PIPE SUPPORT
10	PMRAS-10C7M	004	1	DRAIN PAN ASSSEMBLY
11	PMRAS-10C6M	001	1	AUTO SWEEP MOTOR
12	PMRAS-18CH1	001	1	P.W.B (LED)
13	PMRAK-25NH4	005	1	FRONT COVER ASSEMBLY
14	PMRAK-25NH4	007	1	FRONT PANEL
15	PMRAS-10C7M	008	2	CAP
16	PMRAS-40CNH2	019	2	AIR FILTER
17	PMRAS-51CHA1	011	1	REMOTE CONTROL ASSEMBLY
18	PMRAS-10C3M	003	1	REMOTE CONTROL SUPPORT
19	PMRAS-40CNH2	026	1	THERMISTOR SUPPORT
20	PMRAK-25NH4	003	1	THERMISTOR
22	PMRAK-25NH4	004	1	P.W.B (MAIN AND RECEIVING)
24	PMRAS-10C6M	002	1	TERMINAL BOARD (2P)

MODEL   RAK-35NH4

NO.	PART N0. RAK-35NH4		Q'TY / UNIT	PARTS NAME
1	PMRAK-25NH4	006	1	CABINET
2	PMRAS-40CNH2	023	1	MOUNTING PLATE
3	PMRAK-25NH4	001	1	FAN MOTOR
4	PMRAS-40CNH2	004	1	TANGENTIAL AIR FLOW FAN
5	PMRAS-25CNH2	005	1	P-BEARING ASSEMBLY
6	PMRAS-10C7M	002	1	FAN MOTOR SUPPORT
7	PMRAK-25NH4	002	1	CYCLE ASSEMBLY
8	PMRAS-51CHA1	020	1	FAN COVER
9	PMRAS-18CP5	003	1	PIPE SUPPORT
10	PMRAS-10C7M	004	1	DRAIN PAN ASSSEMBLY
11	PMRAS-10C6M	001	1	AUTO SWEEP MOTOR
12	PMRAS-18CH1	001	1	P.W.B (LED)
13	PMRAK-25NH4	005	1	FRONT COVER ASSEMBLY
14	PMRAK-25NH4	007	1	FRONT PANEL
15	PMRAS-10C7M	008	2	CAP
16	PMRAS-40CNH2	019	2	AIR FILTER
17	PMRAS-51CHA1	011	1	REMOTE CONTROL ASSEMBLY
18	PMRAS-10C3M	003	1	REMOTE CONTROL SUPPORT
19	PMRAS-40CNH2	026	1	THERMISTOR SUPPORT
20	PMRAK-25NH4	003	1	THERMISTOR
22	PMRAK-35NH4	001	1	P.W.B (MAIN AND RECEIVING)
24	PMRAS-10C6M	002	1	TERMINAL BOARD (2P)
			Q'TY / UNIT	

MODEL RAK-50NH4

NO.	PART N0. RAK-50NH4		Q'TY / UNIT	PARTS NAME
1	PMRAK-25NH4	006	1	CABINET
2	PMRAS-40CNH2	023	1	MOUNTING PLATE
3	PMRAK-25NH4	001	1	FAN MOTOR
4	PMRAS-40CNH2	004	1	TANGENTIAL AIR FLOW FAN
5	PMRAS-25CNH2	005	1	P-BEARING ASSEMBLY
6	PMRAS-10C7M	002	1	FAN MOTOR SUPPORT
7	PMRAK-50NH4	002	1	CYCLE ASSY
8	PMRAS-51CHA1	020	1	FAN COVER
9	PMRAS-18CP5	003	1	PIPE SUPPORT
10	PMRAS-10C7M	004	1	DRAIN PAN ASSSEMBLY
11	PMRAS-10C6M	001	1	AUTO SWEEP MOTOR
12	PMRAS-18CH1	001	1	P.W.B (LED)
13	PMRAK-25NH4	005	1	FRONT COVER ASSEMBLY
14	PMRAK-25NH4	007	1	FRONT PANEL
15	PMRAS-10C7M	008	2	CAP
16	PMRAS-40CNH2	019	2	AIR FILTER
17	PMRAS-51CHA1	011	1	REMOTE CONTROL ASSEMBLY
18	PMRAS-10C3M	003	1	REMOTE CONTROL SUPPORT
19	PMRAS-40CNH2	026	1	THERMISTOR SUPPORT
20	PMRAK-25NH4	003	1	THERMISTOR
22	PMRAK-50NH4	001	1	P.W.B (MAIN AND RECEIVING)
24	PMRAS-10C6M	002	1	TERMINAL BOARD (2P)

OUTDOOR UNIT
MODEL : RAC-25NH4, RAC-35NH4

MODEL   RAC-25NH4

NO.	PART N0. RAC-25NH4		Q'TY / UNIT	PARTS NAME
1	PMRAC-25NH4	918	1	BASE
2	PMRAC-25NH4	908	1	COMPRESSOR
3	KPNT1	001	6	PUSH NUT
4	RAC-2226HV	805	3	COMPRESSOR RUBBER
5	PMRAC-25NH4	901	1	CONDENSER
6	PMRAC-25NH4	902	1	REVERSING VALVE
7	PMRAC-25NH4	903	1	ELECTRICAL EXPANSION COIL
8	PMRAC-25NH4	904	1	VALVE (2S)
9	PMRAC-25NH4	905	1	VALVE (4S)
10	PMRAC-40CNH2	914	1	THERMISTOR (OH)
11	PMRAC-25NH4	909	1	OVERHEAT THERMISTOR SUPPORT
12	PMRAC-25NH4	910	1	OVERLOAD RELAY COVER
14	PMRAC-40CNH2	915	1	THERMISTOR (DEFROST)
15	PMRAC-07CHV1	921	1	COIL (REVERSING VALVE)
16	PMRAC-40CNH2	908	1	REACTOR
17	PMRAC-25NH4	906	1	P.W.B (MAIN)
20	PMRAC-25NH4	912	1	SYSTEM POWER MODULE
21	PMRAC-40CNH2	902	1	DIODE STACK (D25VB60)
22	PMRAC-25NH4	913	1	TERMINAL BOARD (4P)
23	PMRAC-40CNH2	916	1	THERMISTOR (OUTSIDE TEMPERATURE)
24	PMRAC-25CNH2	902	1	PROPELLER FAN
26	PMRAC-25NH4	914	1	SUPPORT (FAN MOTOR)
27	PMRAC-40CNH2	919	1	FAN MOTOR (40W)
28	PMRAC-51CA1	901	1	CABINET
29	PMRAC-51CA1	908	1	NET
30	PMRAC-51CA1	909	1	TOP COVER
31	PMRAC-25NH4	917	1	SIDE PLATE-R
32	PMRAC-25NH4	915	1	STRAINER
33	PMRAC-25NH4	907	1	STRAINER
35	PMRAC-09CHA1	903	1	GRILL
38	PMRAC-25NH4	916	1	EXPANSION VALVE

MODEL   RAC-35NH4

NO.	PART N0. RAC-35NH4		Q'TY / UNIT	PARTS NAME
1	PMRAC-25NH4	918	1	BASE
2	PMRAC-25NH4	908	1	COMPRESSOR
3	KPNT1	001	6	PUSH NUT
4	RAC-2226HV	805	3	COMPRESSOR RUBBER
5	PMRAC-25NH4	901	1	CONDENSER
6	PMRAC-25NH4	902	1	REVERSING VALVE
7	PMRAC-25NH4	903	1	ELECTRICAL EXPANSION COIL
8	PMRAC-25NH4	904	1	VALVE (2S)
9	PMRAC-25NH4	905	1	VALVE (4S)
10	PMRAC-40CNH2	914	1	THERMISTOR (OH)
11	PMRAC-25NH4	909	1	OVERHEAT THERMISTOR SUPPORT
12	PMRAC-25NH4	910	1	OVERLOAD RELAY COVER
14	PMRAC-40CNH2	915	1	THERMISTOR (DEFROST)
15	PMRAC-07CHV1	921	1	COIL (REVERSING VALVE)
16	PMRAC-40CNH2	908	1	REACTOR
17	PMRAC-35NH4	901	1	P.W.B (MAIN)
20	PMRAC-25NH4	912	1	SYSTEM POWER MODULE
21	PMRAC-40CNH2	902	1	DIODE STACK (D25VB60)
22	PMRAC-25NH4	913	1	TERMINAL BOARD (4P)
23	PMRAC-40CNH2	916	1	THERMISTOR (OUTSIDE TEMPERATURE)
24	PMRAC-25CNH2	902	1	PROPELLER FAN
26	PMRAC-25NH4	914	1	SUPPORT (FAN MOTOR)
27	PMRAC-40CNH2	919	1	FAN MOTOR (40W)
28	PMRAC-51CA1	901	1	CABINET
29	PMRAC-51CA1	908	1	NET
30	PMRAC-51CA1	909	1	TOP COVER
31	PMRAC-25NH4	917	1	SIDE PLATE-R
32	PMRAC-25NH4	915	1	STRAINER
33	PMRAC-25NH4	907	1	STRAINER
35	PMRAC-09CHA1	903	1	GRILL
38	PMRAC-25NH4	916	1	EXPANSION VALVE

PARTS LIST AND DIAGRAM

OUTDOOR UNIT
MODEL : RAC-50NH4
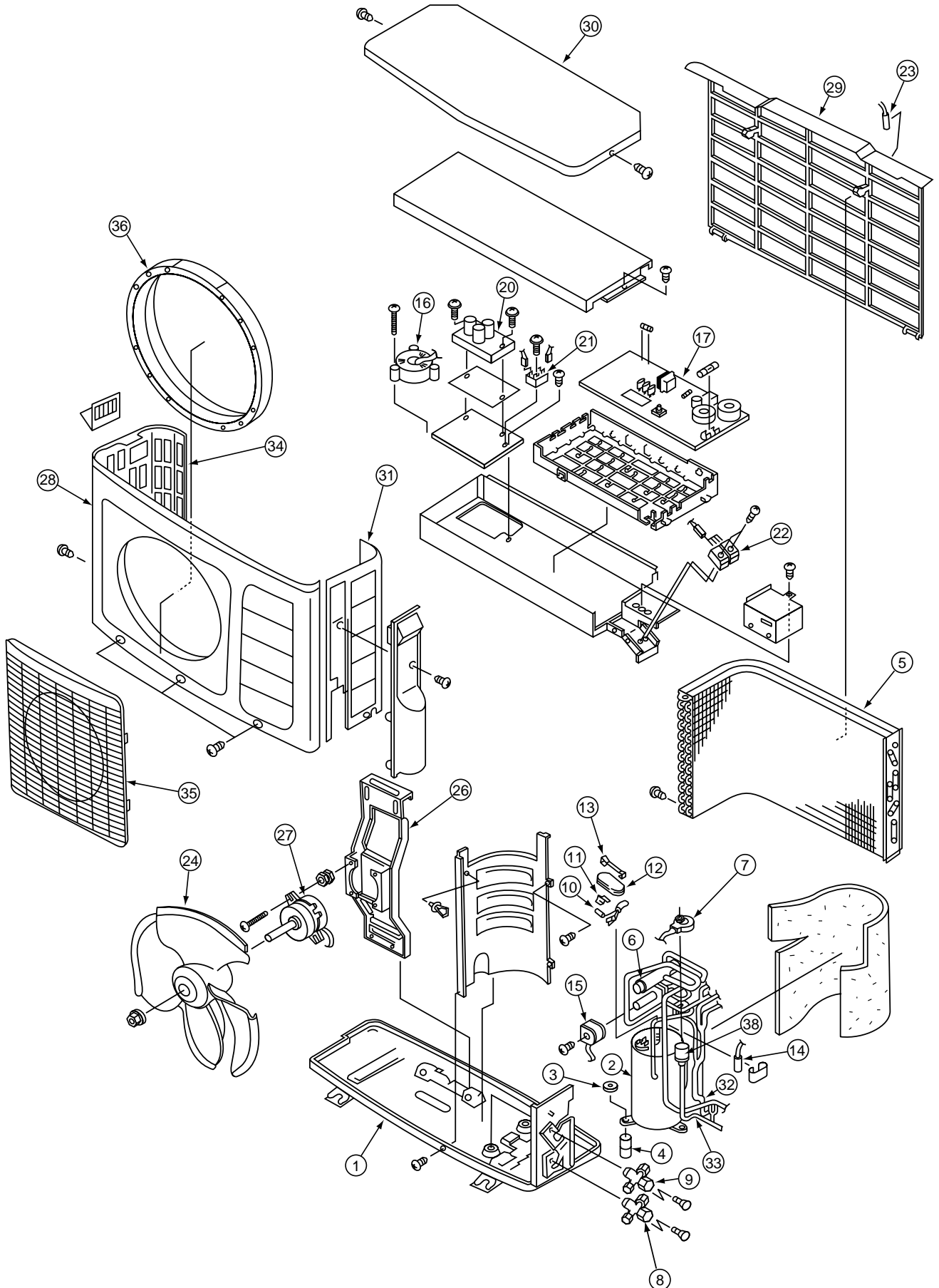
MODEL RAC-50NH4

NO.	PART N0. RAC-50NH4		Q'TY / UNIT	PARTS NAME
1	PMRAC-50NH4	901	1	BASE
2	PMRAC-50NH4	907	1	COMPRESSOR
3	KPNT1	001	4	PUSH NUT
4	RAC-2226HV	805	3	COMPRESSOR RUBBER
5	PMRAC-50NH4	902	1	CONDENSER
6	PMRAC-25NH4	902	1	REVERSING VALVE
7	PMRAC-25NH4	903	1	ELECTRICAL EXPANSION COIL
8	PMRAC-50NH4	903	1	VALVE (2S)
9	PMRAC-50NH4	904	1	VALVE (4S)
10	PMRAC-40CNH2	914	1	THERMISTOR (OH)
11	PMRAC-25NH4	909	1	OVERHEAT THERMISTOR SUPPORT
12	PMRAC-25NH4	910	1	OVERLOAD RELAY COVER
14	PMRAC-40CNH2	915	1	THERMISTOR (DEFROST)
15	PMRAC-07CHV1	921	1	COIL (REVERSING VALVE)
16	PMRAC-40CNH2	908	1	REACTOR
17	PMRAC-50NH4	905	1	P.W.B (MAIN)
20	PMRAC-40CNH2	901	1	SYSTEM POWER MODULE
21	PMRAC-40CNH2	902	1	DIODE STACK (D25VB60)
22	PMRAS-10C6M	002	2	TERMINAL BOARD (2P)
23	PMRAC-40CNH2	916	1	THERMISTOR (OUTSIDE TEMPERATURE)
24	PMRAC-40CNH2	917	1	PROPELLER FAN
26	PMRAC-40CNH2	918	1	SUPPORT (FAN MOTOR)
27	PMRAC-40CNH2	919	1	FAN MOTOR (40W)
28	PMRAC-40CNH2	904	1	CABINET
29	PMRAC-40CNH2	921	1	NET
30	PMRAC-40CNH2	922	1	TOP COVER
31	PMRAC-50NH4	910	1	SIDE PLATE-R
32	PMRAC-50NH4	906	1	STRAINER
33	PMRAC-50NH4	909	1	STRAINER
34	PMRAC-40CNH2	926	1	SIDE PLATE-L
35	PMRAC-40CNH2	928	1	GRILL
36	PMRAC-40CNH2	920	1	MOUTH RING
38	PMRAC-25NH4	916	1	EXPANSION VALVE

HITACHI

RAK-25NH4/RAC-25NH4
RAK-35NH4/RAC-35NH4
RAK-50NH4/RAC-50NH4