HITACHI

SM0174

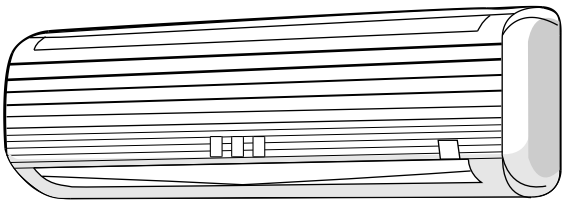
RAK25NH4 RAC25NH4
RAK35NH4 RAC35NH4
RAK50NH4 RAC50NH4

SERVICE MANUAL

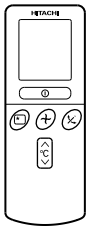
TECHNICAL INFORMATION

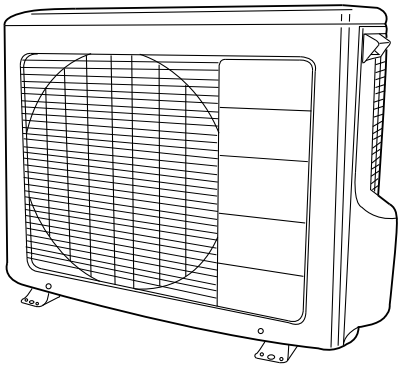
REFER TO THE FOUNDATION MANUAL

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

MAY 2003 **Refrigeration & Air-Conditioning Division**

FOR SERVICE PERSONNEL ONLY

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SPLIT UNIT AIR CONDITIONER INSTALLATION MANUAL

Outdoor Unit HFC R410A **RAC-25NH4 RAC-35NH4 RAC-50NH4**

- Carefully read through the procedures of proper installation before starting installation work.
- The sales agent should inform customers regarding the correct operation of installation.

Tools Needed For Installation Work

- ⊕ ⊖ Screwdriver • Measuring Tape • Knife • Saw • ø 65mm Power Drill • Hexagonal Wrench Key (⏢ 4mm) • Wrench (14, 17, 22, 26, 27mm) • Gas Leakage Detector • Pipe Cutter • Putty • Vinyl Tape • Pliers • Flare Tool

SAFETY PRECAUTION

- Read the safety precautions carefully before operating the unit.
- The contents of this section are vital to ensure safety. Please pay special attention to the following sign.

⚠ WARNING ..... Incorrect methods of installation may cause death or serious injury.

⚠ CAUTION ..... Improper installation may result in serious consequence.

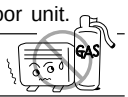
Be sure that the unit operates in proper condition after installation. Explain to customer the proper way of operating the unit as described in the user's guide.

⚠ WARNING

- Please request your sales agent or qualified technician to install your unit. Water leakage, short circuit or fire may occur if you do the installation work yourself.
- Please observe the instructions stated in the installation manual during the process of installation. Improper installation may cause water leakage, electric shock and fire.
- Make sure that the units are mounted at locations which are able to provide full support to the weight of the units. If not, the units may collapse and impose danger.
- Observe the rules and regulations of the electrical installation and the methods described in the installation manual when dealing with the electrical work. Use power cables approved by the authorities of your country.
- Be sure to use the specified wire for connecting the indoor and outdoor units. Please ensure that the connections are tight after the conductors of the wire are inserted into the terminals. Improper insertion and loose contact may cause over-heating and fire.
- Please use the specified components for installation work. Otherwise, the units may collapse or water leakage, electric shock and fire may occur.
- Be sure to use the specified piping set for R-410A. Otherwise, this may result in broken copper pipes or faults.
- When installing or removing an air conditioner, only specified refrigerant (R410A) shall be allowed, do not allow air or moisture to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture may be caused.
- Be sure to ventilate fully if a refrigerant gas leak while at work. If the refrigerant gas comes into contact with fire, a poisonous gas may occur.
- After completion of installation work, check to make sure that there is no refrigeration gas leakage. If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur.
- Unauthorized modifications to the air conditioner may be dangerous. If a breakdown occurs please call a qualified air conditioner technician or electrician. Improper repairs may result in water leakage, electric shock and fire, etc.

⚠ CAUTION

- A circuit breaker or fuse (16A time delay) must be installed. Without a circuit breaker or fuse the danger of electric shock exists. A main switch with a contact gap of more than 3mm has to be installed in the power supply line to the outdoor unit.
- Do not install the unit near a 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.
- Piping shall be suitable supported with a maximum spacing of 1m between the supports.

THE CHOICE OF MOUNTING SITE (Please note the following matters and obtain permission from customer before installation).

OUTDOOR UNIT

⚠ WARNING

- The Outdoor unit must be mounted at a location which can support heavy weight. Otherwise, noise and vibration will increase.

⚠ CAUTION

- Do not expose the unit under direct sunshine or rain. Besides, ventilation must be good and clear of obstruction.
- The air blown out of the unit should not point directly to animals or plants.
- The clearances of the unit from top, left, right and front are specified in figure below. At least 3 of the above sides must be open air.
- Be sure that the hot air blown out of the unit and noise do not disturb the neighbourhood.
- Do not install at a location where there is flammable gas, steam, oil and smoke.
- The location must be convenient for water drainage.
- Place the Outdoor unit and its connecting cord at least 1m away from the antenna or signal line of television, radio or telephone. This is to avoid noise interference.

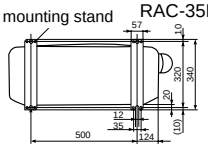
Names of Outdoor Components

No.	Item	Qty
⑩	Bush (RAC-25NH4, RAC-35NH4) 	2
	(RAC-50NH4)	3
⑪	Drain Pipe 	1
⑬	Bush 	1

Dimension of Mounting Stand of the Outdoor unit

(unit: mm) (RAC-25NH4, RAC-35NH4)

mounting stand



Dimension of Mounting Stand of the Outdoor unit

(unit: mm) (RAC-50NH4)

mounting stand

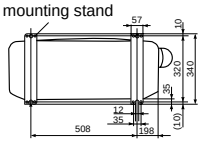
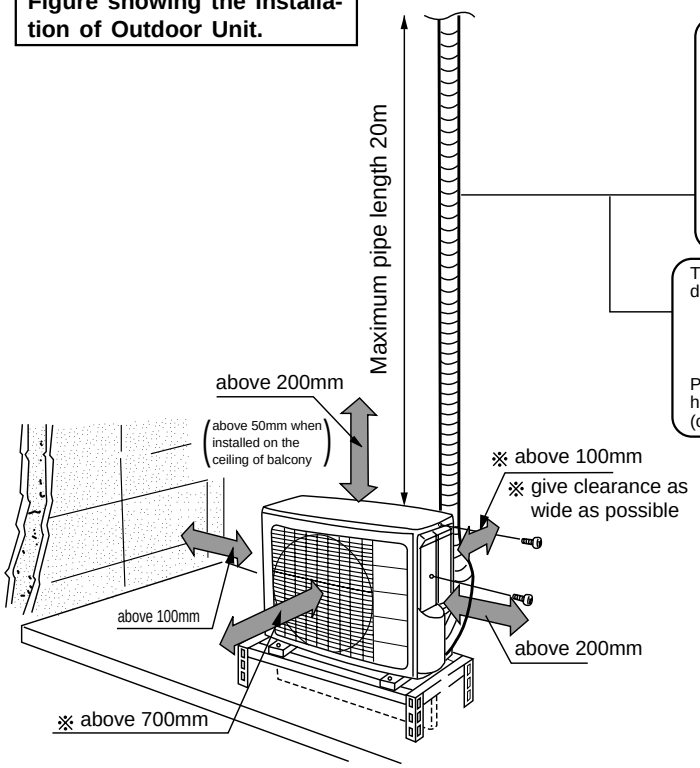
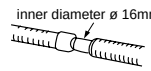


Figure showing the Installation of Outdoor Unit.



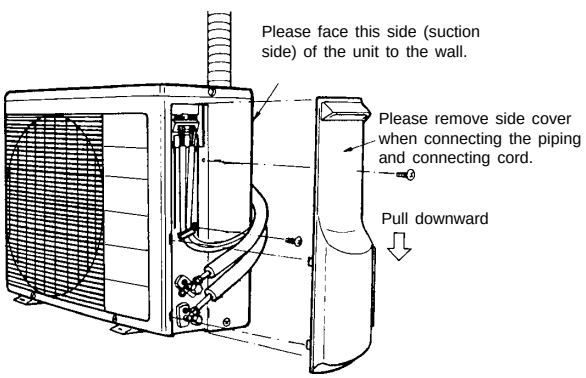
- The difference in height between the indoor and outdoor unit should be kept max 5m.
- The connecting pipe, no matter big or small, should all be insulated with insulation pipe and then wrapped with vinyl tape. (The insulator will deteriorate if it is not wrapped with tape).

The connection of insulated drain hose.



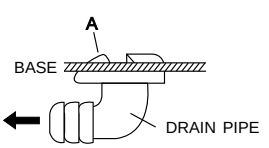
Please use insulated drain hose for the indoor piping (commercial product).

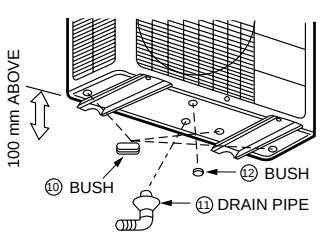
- Please mount the Outdoor unit on stable ground to prevent vibration and increase of noise level.
- Decide the location for piping after sorting out the different types of pipe available.
- When removing side cover, please pull the handle after undoing the hook by pulling it downward.



CONDENSED WATER DISPOSAL OF OUTDOOR UNIT

- There are holes on the base of Outdoor unit for condensed water to exhaust.
- In order to flow condensed water to the drain, the unit is installed on a stand or a block so that the unit is 100mm above the ground as shown figure. Join the drain pipe to one hole.
- At first insert one portion of the hook to the base (Portion A), then pull the drain pipe in the direction shown by the arrow while inserting the hook into the base. After installation, check whether the drain pipe cling to the base firmly.





When Using and Installing In Cold Areas

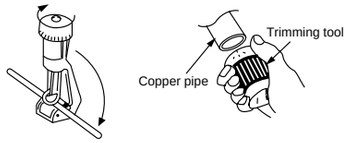
When the air conditioner is used in low temperature and in snowy conditions, water from the heat exchanger may freeze on the base surface to cause poor drainage. When using the air conditioner in such areas, do not install the bushings. Keep a minimum of 250mm between the drain hole and the ground. When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

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

INSTALLATION OF REFRIGERATING PIPES AND AIR REMOVAL

1 Preparation of Pipe

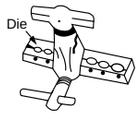
- Use a pipe cutter to cut the copper pipe.

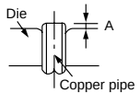


⚠ CAUTION

- Jagged edge will cause leakage.
- Point the side to be trimmed downwards during trimming to prevent copper chips from entering the pipe.

- Before flaring, please put on the flare nut.



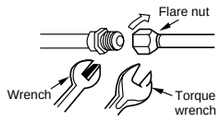


- Recommend to use R410A flaring tool.

Outer Diameter (mm)	A (mm)	
	For R410A tool	For R22 tool
6.35	0.0 ~ 0.5mm	1.0mm
9.52	0.0 ~ 0.5mm	1.0mm
12.7	0.0 ~ 0.5mm	1.0mm

2 Pipe Connection

⚠ CAUTION In case of removing flare nut of an Indoor unit, first remove a nut of small diameter side, or a seal cap of big diameter side will fly out. Prevent water from entering into the piping when working.

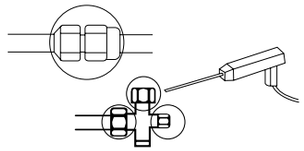


		Outer dia.of pipe	Torque N·m (kgf · cm)
Small dia. side		6.35 (1/4")	13.7 – 18.6 (140 – 190)
Large dia. side		9.52 (3/8")	34.3 – 44.1 (350 – 450)
		12.7 (1/2")	44.1 – 53.9 (450 – 550)
Valve head cap	Small dia. side	6.35 (1/4")	19.6 – 24.5 (200 ~ 250)
	Large dia. side	9.52 (3/8")	19.6 – 24.5 (200 ~ 250)
		12.7 (1/2")	29.4 – 34.3 (300 – 350)
Valve core cap			12.3 – 15.7 (125 ~ 160)

Gas Leakage Inspection

Please use gas leakage detector to check if leakage occurs at the connection of Flare nut as shown on the right.

If gas leakage occurs, further tighten the connection to stop leakage. (Use the detector provided for R410A)



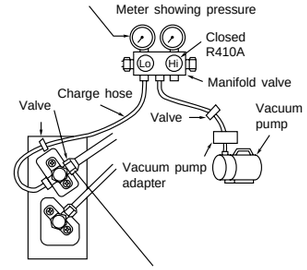
3 Removal Of Air From The Pipe And Gas Leakage Inspection

AIR REMOVAL

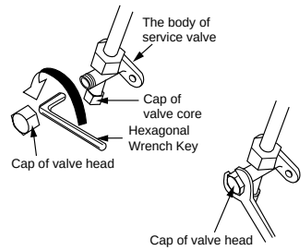
Procedures of using Vacuum Pump for Air Removal

1. As shown in right figure, remove the cap of valve core. Then, connect the charge hose. Remove the cap of valve head. Connect the vacuum pump adapter to the vacuum pump and connect the charge hose to the adapter.
2. Fully tighten the “Hi” shuttle of the manifold valve and completely unscrew the “Lo” shuttle. Run the vacuum pump for about 10–15 minutes, then completely tighten the “Lo” shuttle and switch off the vacuum pump.
3. Completely unscrew the spindle of the service valve (at 2 places) in anti-clockwise direction to allow the flow of coolant (using Hexagonal Wrench key).
4. Remove the charge hose and tighten the cap of valve head. Check the cap’s periphery if there is any gas leakage. The task is then completed.

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



When pumping starts, slightly loosen the flare nut to check of air sucked in. Then tighten the flare nut.



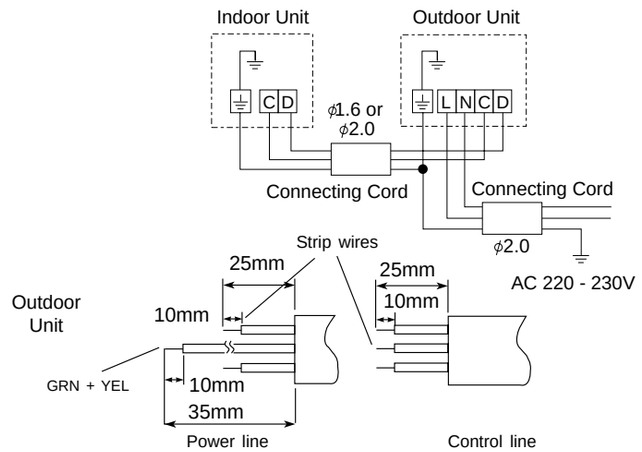
CONNECTION OF POWER CORD

⚠ WARNING ● THIS APPLIANCE MUST BE EARTHED.

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

Procedures of Wiring

In case that power is supplied from Outdoor Unit



⚠ WARNING

- The naked part of the wire core should be 10 mm and fix it to the terminal tightly. Then try to pull the individual wire to check if the contact is tight. Improper insertion may burn the terminal.
- Be sure to use only power cables approved from the authorities in your country. For example in Germany: Cable type: NYM 3x1.5mm^2.
- Please refer to the installation manual for wire connection to the terminals of the units. The cabling must meet the standards of electrical installation.
- There is a AC voltage of 230V between the L and N terminals. Therefore, before servicing, be sure to remove the plug from the AC outlet or switch off the main switch.

Wiring of The Outdoor Unit

- Please remove the side cover for wire connection.

⚠ WARNING

- If you cannot attach the side cover due to the connecting cord, press the connecting cord in direction to the front panel to fix it.
- Be sure that the hooks of the side cover is fixed in certainly. Otherwise water leakage may occur and this causes short circuit or faults.
- The connecting cord should not touch to service valve and pipes. (It becomes high temperature in heating operation.)

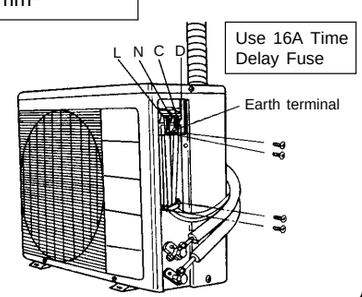
Checking for the electric source and the voltage range

- Before installation, the power source must be checked and necessary wiring work must be completed. To make the wiring capacity proper, use the wire gauges list below for the lead-in from a pole transformer and for the wiring from a switch board of fuse box to the main switch and outdoor unit in consideration of the locked rotor current.

IMPORTANT

Cable length	Wire cross-section
up to 6m	1.5mm^2
up to 15m	2.5mm^2
up to 25m	4.0mm^2

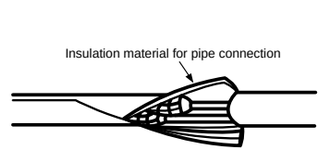
- Investigate the power supply capacity and other electrical conditions at the installation location.
  Depending on the model of room air conditioner to be installed, request the customer to make arrangements for the necessary electrical work etc.
  The electrical work includes the wiring work up the outdoor. In localities where electrical conditions are poor, use of a voltage regulation is recommended.

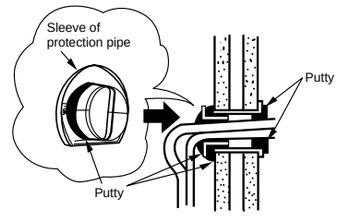


FINAL STAGE OF INSTALLATION

1 Insulation And Maintenance Of Pipe Connection

- The connected terminals should be completely sealed with heat insulator and then tied up with rubber strap.
- Please tie the pipe and power line together with vinyl tape as shown in the figure showing the installation of Indoor and Outdoor units. Then fix their position with holders.
- To enchance the heat insulation and to prevent water condensation, please cover the outdoor part of the drain hose and pipe with insulation pipe.
- Completely seal any gap with putty.





2 Power Source And Operation Test

Power Source

⚠ CAUTION

- Please use a new socket. Accident may occur due to the use of old socket because of poor contact.
- Please plug in and then remove the plug for 2 – 3 times. This is to ensure that the plug is completely plugged into the socket.
- Keep additional length for the power cord and do not render the plug under external force as this may cause poor contact.
- Do not fix the power cord with U-shape nail.

Operation Test

- Please ensure that the air conditioner is in normal operating condition during the operation test.
- Explain to your customer the proper operation procedures as described in the user’s manual.

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SPLIT UNIT AIR CONDITIONER INSTALLATION MANUAL

Indoor Unit HFC R410A

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

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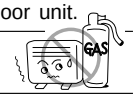


- Please ensure smooth flow of water when installing the drain hose.
- Piping shall be suitable supported with a maximum spacing of 1m between the supports.

THE CHOICE OF MOUNTING SITE (Please note the following matters and obtain permission from customer before installation).

INDOOR UNIT

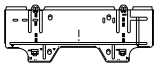
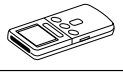
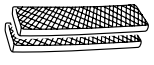
⚠ WARNING

- The unit should be mounted at stable, non-vibratory location which can provide full support to the unit.

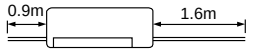
⚠ CAUTION

- No nearby heat source and no obstruction near the air outlet is allowed.
- The clearance distances from top, right and left are specified in figure below.
- The location must be convenient for water drainage and pipe connection with the Outdoor unit.
- To avoid interference from noise please place the unit and its remote controller at least 1m from the radio, television and inverter type fluorescent lamp.
- To avoid any error in signal transmission from the remote controller, please put the controller far away from high-frequency machines and high-power wireless systems.
- The installation height of indoor unit must be 2.3m or more in a non public area.

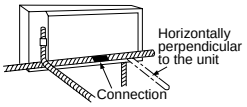
Names of Indoor Components

No.	Item	Qty
①	Hanger 	1
②	Screw for Hanger (4.1x32)	6
③	Holder for Remote Controller 	1
④	AAA Size Battery 	2
⑤	Screw for holder of Remote Controller  (3.1x16)	2
⑥	Insulation pipe 	1
⑦	Remote Controller 	1
⑧	Purifying Filter 	1
⑨	Holder 	1

The Length of Indoor Unit Connecting Cord



Direction of Piping

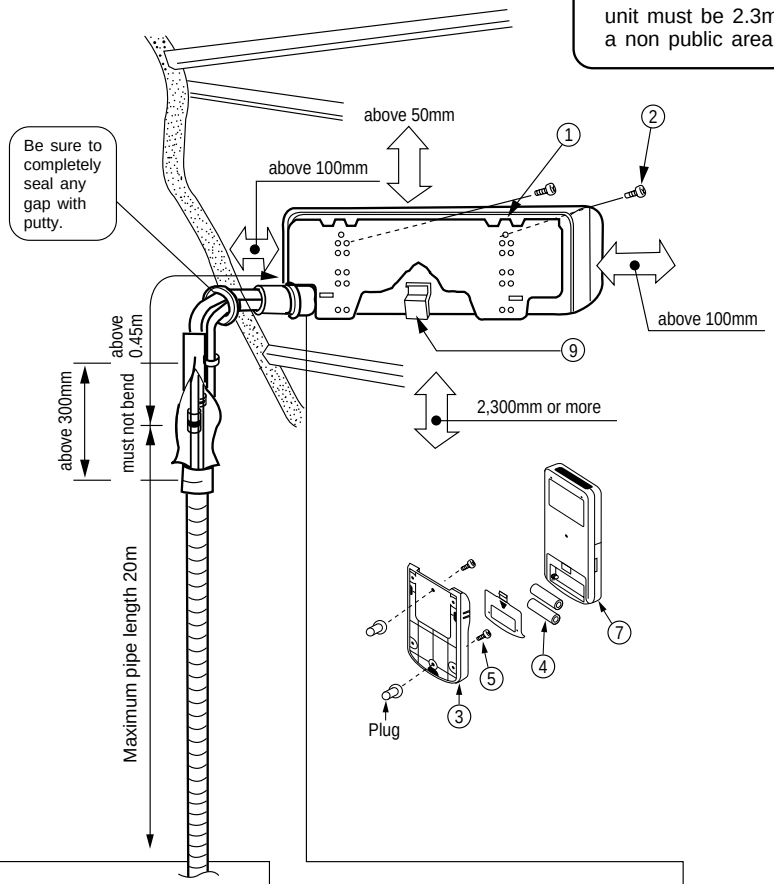


There are 4 directions allowed, namely, horizontally perpendicular to the unit, vertically down from right, horizontally out from right and horizontally out to left. Don't form the piping downward at the left of the unit.

Figure showing the Installation of Indoor Unit.

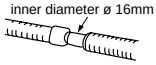
⚠ CAUTION

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



- The difference in height between the indoor and outdoor unit should be kept max 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).

The connection of insulated drain hose.



Please use insulated drain hose for the indoor piping (commercial product).

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

INDOOR UNIT

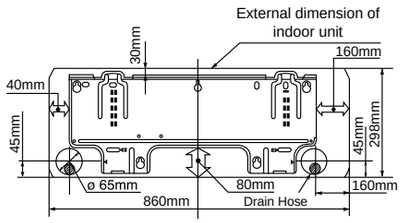
1 Installation of Hanger, Wall Penetration and Installation of Protection Pipe

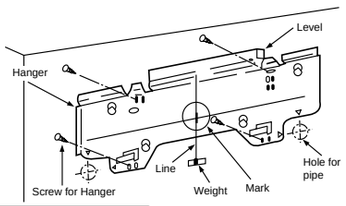
⚠ CAUTION

- The draining of the water container inside the indoor unit can be done from the left. Therefore the hanger must be fixed horizontally or slightly tilted towards the side of drain hose. Otherwise, condensed water may overflow the water container.

Direct Mounting On The Wall

- Please use hidden beams in the wall to hold the hanger.



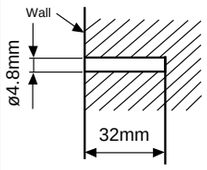


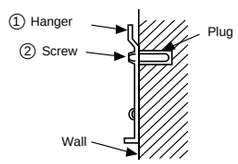
Please use more than 4 screws.

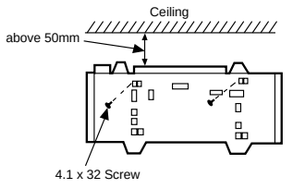
Procedures of Installation and Precautions

- Procedures to fix the hanger.

1. Drill holes on wall. (As shown below)
2. Push plug into the holes. (As shown below)
3. Fix the hanger on wall with 4.1 x 32 screw (As shown in figure below)

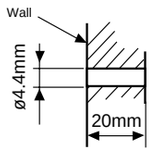


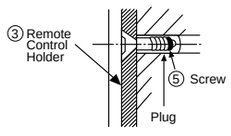




- Procedures to fix the holder of remote control.

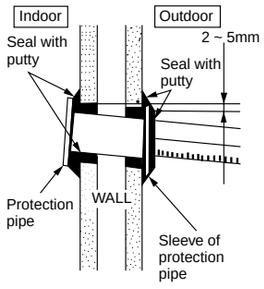
1. Drill holes on wall. (As shown below)
2. Push plug into the holes. (As shown below)





Wall Penetration and Installation of Protection Pipe

- Drill a ø 65mm hole on wall which is slightly tilted towards the outdoor side. Drill the wall at a small angle.
- Cut the protection pipe according to the wall thickness.
- Empty gap in the sleeve of protection pipe should be completely sealed with putty to avoid dripping of rain water into the room.



⚠WARNING

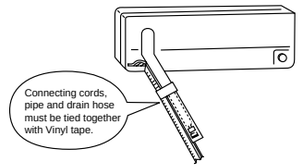
Be sure that the wire is not in contact with any metal in the wall. Please use the protection pipe as wire passing through the hollow part of the wall so as to prevent the possibility of damaged by mouse. Unless it seals completely, any air with high humidity flows from outdoor and any dew may drop.

2 Installation of the Indoor Unit

VERTICALLY DOWNWARD PIPING

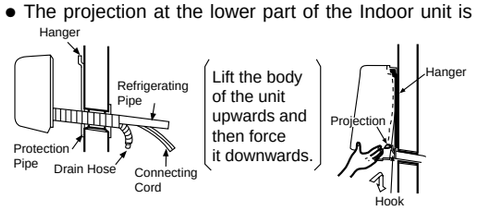
Preparation

- Connect connecting cord.
- Pull out the pipe, connecting cord and drain hose.



Installation

- The upper part of the Indoor unit is hanged on the hanger.
- The projection at the lower part of the Indoor unit is hooked onto the hanger.

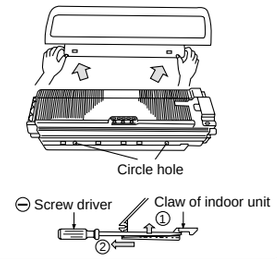


⚠ CAUTION

Please pull the lower part of the Indoor unit outwards to check if the unit is hooked onto the hanger. Improper installation may cause vibration and noise.

HOW TO REMOVE INDOOR UNIT FROM HANGER

- Pull down PULL section on the bottom of indoor unit and pull it towards you, then claws are released from hanger. (Indicated by 2 arrows in the drawing on the right.)
- When bottom face of indoor unit cannot be pulled due to obstacles, etc. Remove front cover, insert screw driver into circle hole, pull claws down and pull indoor unit towards you.
- Please check how to remove and attach front cover in this instruction manual.



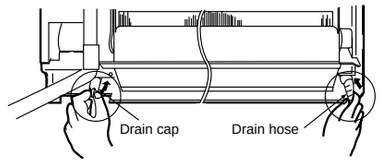
HORIZONTAL PIPING

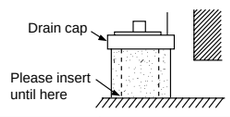
Preparation

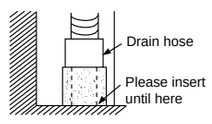
Change of Drain Hose and Installation Procedures.

- Exchange the location of drain hose and drain cap during horizontal piping as shown in figure below. Be sure to plug in the drain hose until the insulating material folds upon itself.

- Please use pliers to pull out the drain cap. (This is an easier way to remove the drain cap).



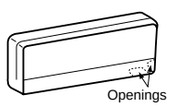


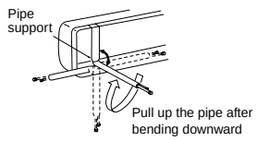


⚠ CAUTION | Condensed water may leak out if not inserted properly.

HORIZONTAL & DOWNWARD PIPING – MAKING OPENINGS

- During horizontal or downward piping, use a knife to cut openings as shown in figure. Then smoothen the edges of openings with a file.

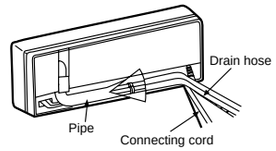


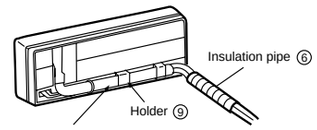


- Turn the piping while holding down the lower portion of pipe-support by hand.

INSTALLATION OF REFRIGERATING PIPES AFTER CONNECTION

- The refrigerating pipes should be adjusted to fit into the hole on the wall and then ready for further connection.
- The terminals of 2 connected pipes must be covered with insulator used for terminal connection. Then the pipes are wrapped with insulation pipe.
- Connect the connecting cord after removing electrical cover. (Refer to “CONNECTION OF POWER CORD”)
- After adjustment, fit the connecting cord and pipes into the space available under the indoor unit. Use holder to hold them tight.

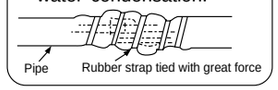




- Holder can be attached at the either of 2 places. Please select the easier position.

⚠ CAUTION

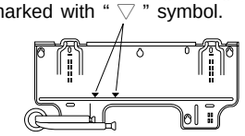
- The rubber strap used for fixing the insulator should not be tied with great force. Otherwise, this will damage heat insulation and causes water condensation.



THE CONNECTION OF REFRIGERATING PIPE DURING THE INSTALLATION OF INDOOR UNIT

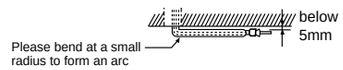
Preparation To Install Refrigerating Pipes

- The refrigerating pipes and connecting cord transform and are attached.
- The end of the refrigerating pipes are at locations marked with “ ▽ ” symbol.



⚠ CAUTION

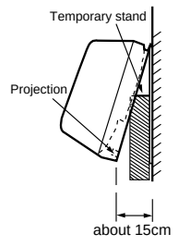
- Please fix in the plastic core after flaring to avoid plastic chips entering the pipes.

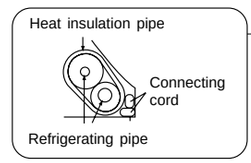


Installation

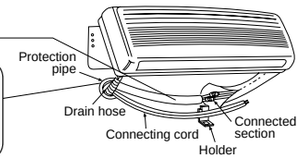
Hang the Indoor unit onto the hanger. Use the temporary stand at the back of the Indoor unit to push its lower part 15cm forwards.

- Place the drain hose through the hole on the wall.
- Wrap the refrigerating pipes with insulation pipe after connecting refrigerating pipe.
- Connect the connecting cord after removing electrical cover. (Refer to “Connection of Power Cord”)
- After adjustment, the connecting cord and refrigerating pipes are placed into the space available under the Indoor unit.
- The projection of Indoor unit must hook to the hanger.

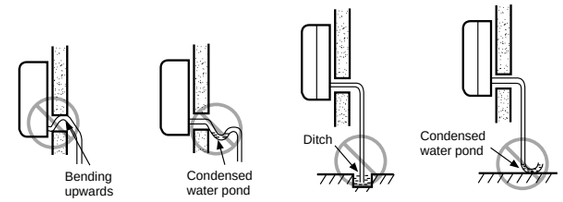




Pull this to the front during the connection of refrigerating pipes to ease task.



3 Installation of Drain Hose



⚠ CAUTION

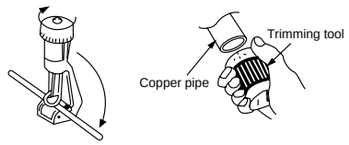
Be sure that the drain hose is not loosely connected or bend.

⚠ CAUTION | You are free to choose the side (left or right) for the installation of drain hose. Please ensure the smooth flow of condensed water of the Indoor unit during installation. (Carelessness may result in water leakage.)

INSTALLATION OF REFRIGERATING PIPES AND AIR REMOVAL

1 Preparation of Pipe

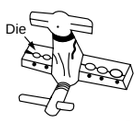
● Use a pipe cutter to cut the copper pipe.

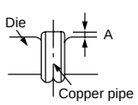


⚠ CAUTION

- Jagged edge will cause leakage.
- Point the side to be trimmed downwards during trimming to prevent copper chips from entering the pipe.

● Before flaring, please put on the flare nut.





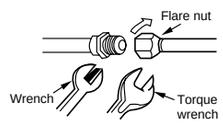
● Recommend to use R410A flaring tool.

Outer Diameter (mm)	A (mm)	
	For R410A tool	For R22 tool
6.35	0.0 ~ 0.5mm	1.0mm
9.52	0.0 ~ 0.5mm	1.0mm
12.7	0.0 ~ 0.5mm	1.0mm

2 Pipe Connection

⚠ CAUTION

In case of removing flare nut of an Indoor unit, first remove a nut of small diameter side, or a seal cap of big diameter side will fly out. Prevent water from entering into the piping when working.



		Outer dia.of pipe	Torque N·m (kgf · cm)
Small dia. side		6.35 (1/4")	13.7 – 18.6 (140 – 190)
Large dia. side		9.52 (3/8")	34.3 – 44.1 (350 – 450)
		12.7 (1/2")	44.1 – 53.9 (450 – 550)
Valve head cap	Small dia. side	6.35 (1/4")	19.6 – 24.5 (200 ~ 250)
	Large dia. side	9.52 (3/8")	19.6 – 24.5 (200 ~ 250)
		12.7 (1/2")	29.4 – 34.3 (300 – 350)
Valve core cap			12.3 – 15.7 (125 ~ 160)

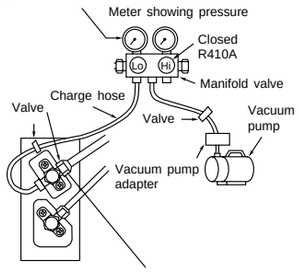
3 Removal Of Air From The Pipe And Gas Leakage Inspection

AIR REMOVAL

Procedures of using Vacuum Pump for Air Removal

1. As shown in right figure, remove the cap of valve core. Then, connect the charge hose. Remove the cap of valve head. Connect the vacuum pump adapter to the vacuum pump and connect the charge hose to the adapter.
2. Fully tighten the “Hi” shuttle of the manifold valve and completely unscrew the “Lo” shuttle. Run the vacuum pump for about 10–15 minutes, then completely tighten the “Lo” shuttle and switch off the vacuum pump.
3. Completely unscrew the spindle of the service valve (at 2 places) in anti-clockwise direction to allow the flow of coolant (using Hexagonal Wrench key).
4. Remove the charge hose and tighten the cap of valve head. Check the cap’s periphery if there is any gas leakage. The task is then completed.

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

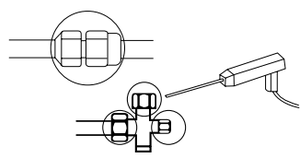


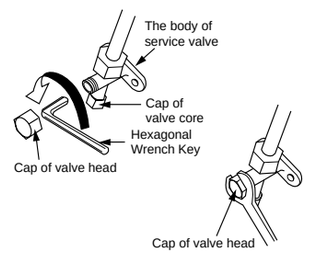
When pumping starts, slightly loosen the flare nut to check of air sucked in. Then tighten the flare nut.

Gas Leakage Inspection

Please use gas leakage detector to check if leakage occurs at the connection of Flare nut as shown on the right.

If gas leakage occurs, further tighten the connection to stop leakage. (Use the detector provided for R410A).





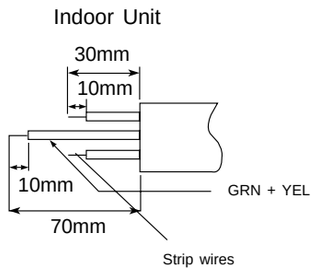
CONNECTION OF POWER CORD

⚠ WARNING ● THIS APPLIANCE MUST BE EARTHED.

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

Procedures of Wiring

In case that power is supplied from Indoor Unit



⚠ WARNING

- The naked part of the wire core should be 10 mm and fix it to the terminal tightly. Then try to pull the individual wire to check if the contact is tight. Improper insertion may burn the terminal.
- Be sure to use only power cables approved from the authorities in your country. For example in Germany: Cable type: NYM 3x1.5mm^2.
- Please refer to the installation manual for wire connection to the terminals of the units. The cabling must meet the standards of electrical installation.
- There is a AC voltage of 230V between the L and N terminals. Therefore, before servicing, be sure to remove the plug from the AC outlet or switch off the main switch.

Wiring Of The Indoor Unit

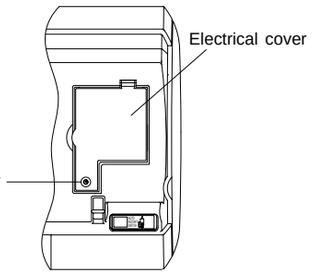
● For wire connection of the Indoor unit, you need to remove front panel and electrical cover.

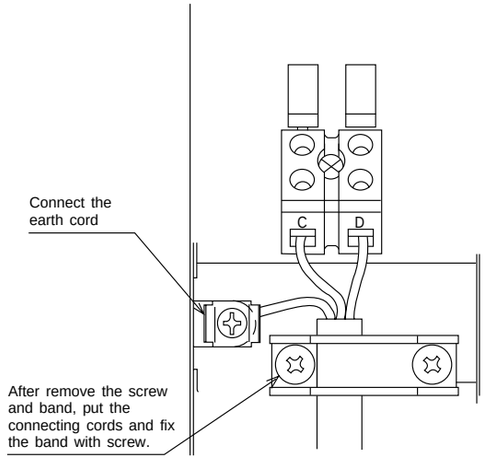
Method to remove front panel

● Refer to “FINAL STAGE OF INSTALLATION – How to Remove The Front Cover”.

Method to remove electrical cover

- Remove the screw and electrical cover.
- Insert the connecting cord (C, D) from the bottom of unit.
- Fixed the wire to terminal wires firmly as shown in figure at right side.





Checking for the electric source and the voltage range

● Before installation, the power source must be checked and necessary wiring work must be completed. To make the wiring capacity proper, use the wire gauges list below for the lead-in from a pole transformer and for the wiring from a switch board of fuse box to the main switch and outdoor unit in consideration of the locked rotor current.

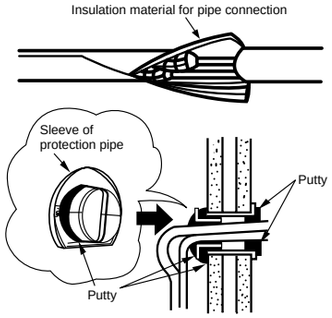
IMPORTANT

Cable length	Wire cross-section
up to 6m	1.5mm^2
up to 15m	2.5mm^2
up to 25m	4.0mm^2

FINAL STAGE OF INSTALLATION

1 Insulation And Maintenance Of Pipe Connection

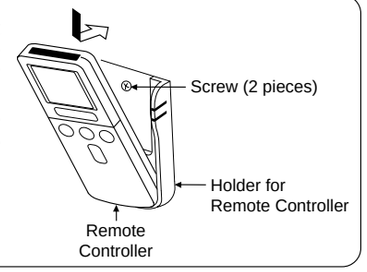
- The connected terminals should be completely sealed with heat insulator and then tied up with rubber strap.
- Please tie the pipe and power line together with vinyl tape as shown in the figure showing the installation of Indoor and Outdoor units. Then fix their position with holders.
- To enchance the heat insulation and to prevent water condensation, please cover the outdoor part of the drain hose and pipe with insulation pipe.
- Completely seal any gap with putty.



2 Installation Of Remote Controller

- The remote controller can be placed in its holder which is fixed on wall or beam.
- To operate the remote controller at its holder, please ensure that the unit can receive signal transmitted from the controller at the place where the holder is to be fixed. The unit will beep when signal is received from the remote controller. The signal transmission is weaken by the fluorescent light. Therefore, during the installation of the remote control holder, please switch on the light, even during day time, to determine the mounting location of the holder.

The controller must be hooked onto the hook at the lower part of the holder. Push in the remote controller in the direction as shown in figure below.



3 Power Source And Operation Test

Power Source

⚠ CAUTION

- Please use a new socket. Accident may occur due to the use of old socket because of poor contact.
- Please plug in and then remove the plug for 2 – 3 times. This is to ensure that the plug is completely plugged into the socket.
- Keep additional length for the power cord and do not render the plug under external force as this may cause poor contact.
- Do not fix the power cord with U-shape nail.

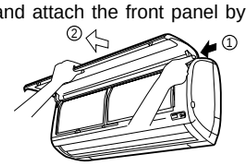
Operation Test

- Please ensure that the air conditioner is in normal operating condition during the operation test.
- Explain to your customer the proper operation procedures as described in the user's manual.

How to Remove The Front Cover

1 Remove the front panel.

- Please remove and attach the front panel by both hands.



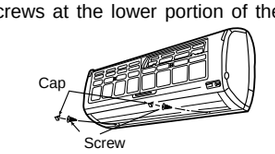
- After opening the front panel by both hands.

① Undo the right arm while pushing it inside.

② Slide the front panel to right as shown in figure. Then remove while pulling it to front.

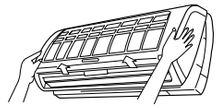
2 Remove the filters.

3 Remove the caps and screws at the lower portion of the front cover.



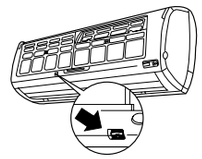
4 Pull the front cover upward as far as the location where the lower portion of the front cover is on the deflector.

5 Remove while pulling the front cover in direction to arrow as shown in figure to hold the both sides of front cover.



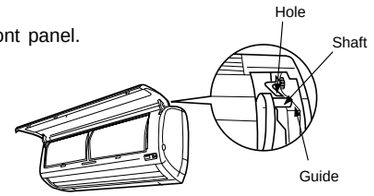
How to Attach the Front Cover

① After covering the front cover to the unit, certainly hook at the upper portion (three places). Then, check that the drain pan is certainly attached. Push the center of front cover in the direction of arrow.



② Fix the front cover at lower portion by screws and attach the caps.

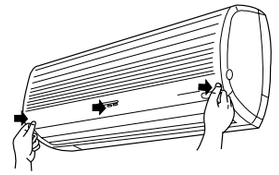
③ Attach the front panel.



- Certainly insert the left shaft of the front panel to the hole of the front cover. Next insert the right shaft as same as the left.

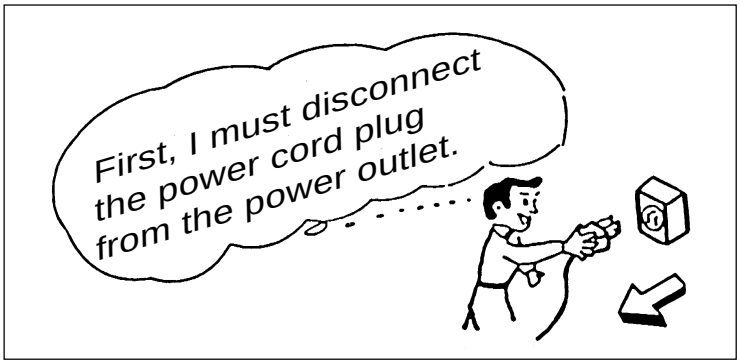
④ Attach the filters which are placed the surface written "FRONT" up.

- After attaching the filters, push the front panel at three arrow portion as shown in figure and close it.



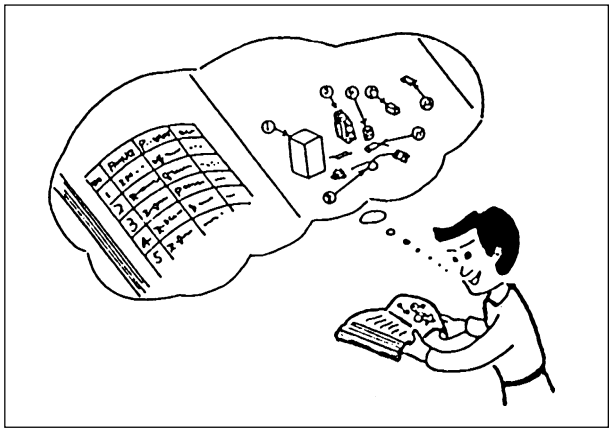
SAFETY DURING REPAIR WORK

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



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

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



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

WORKING STANDARDS FOR PREVENTING BREAKAGE OF SEMICONDUCTORS

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

2. Object parts

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

3. Items to be observed in handling

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

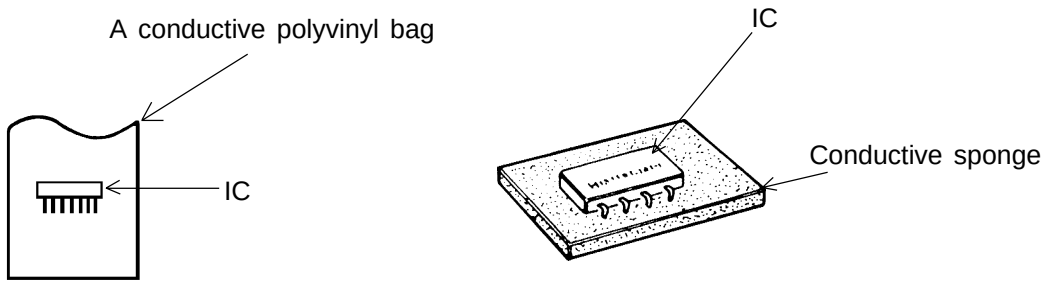


Fig. 1. Conductive Container

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

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

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

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

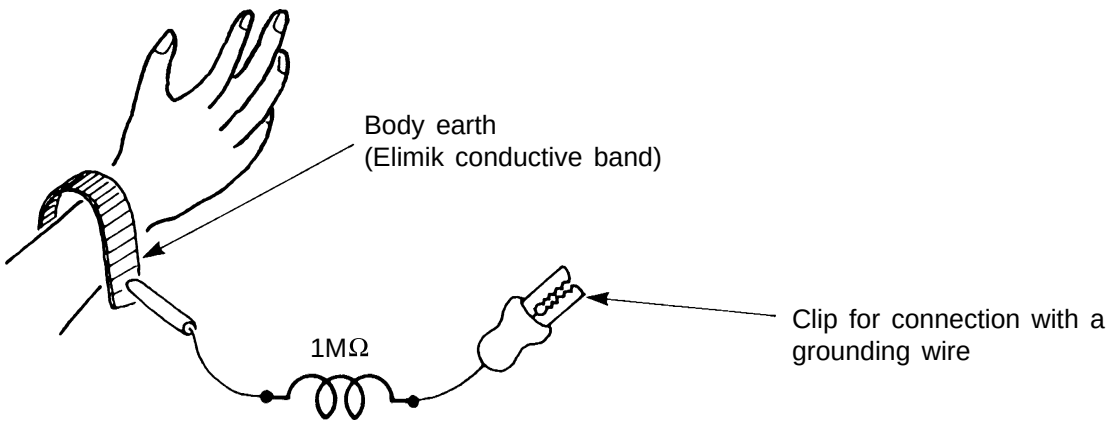


Fig. 2. Body Earth

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

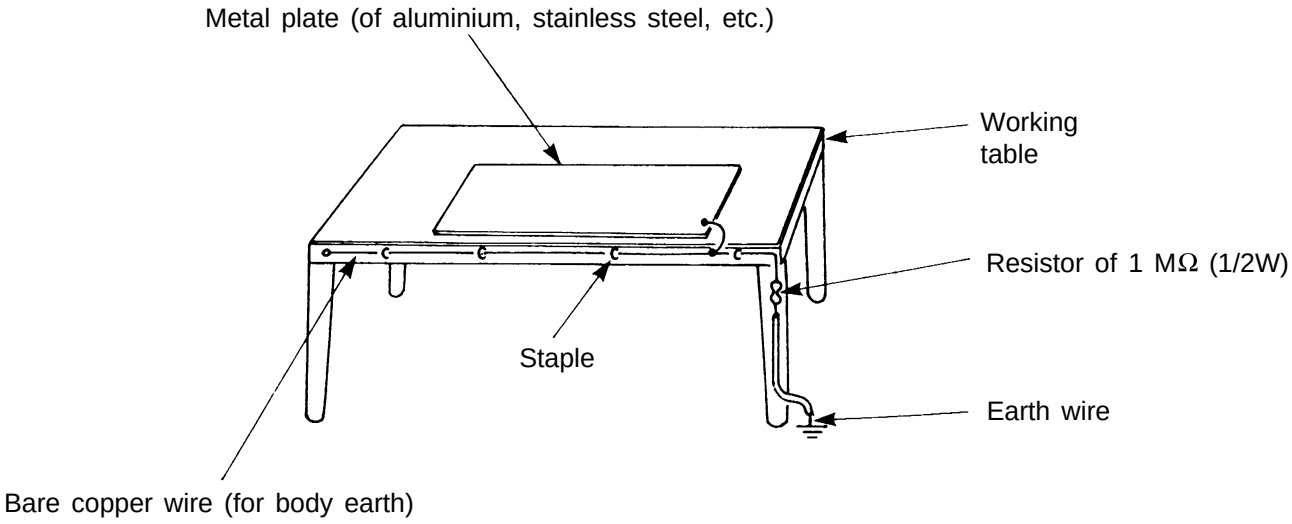


Fig. 3. Grounding of the working table

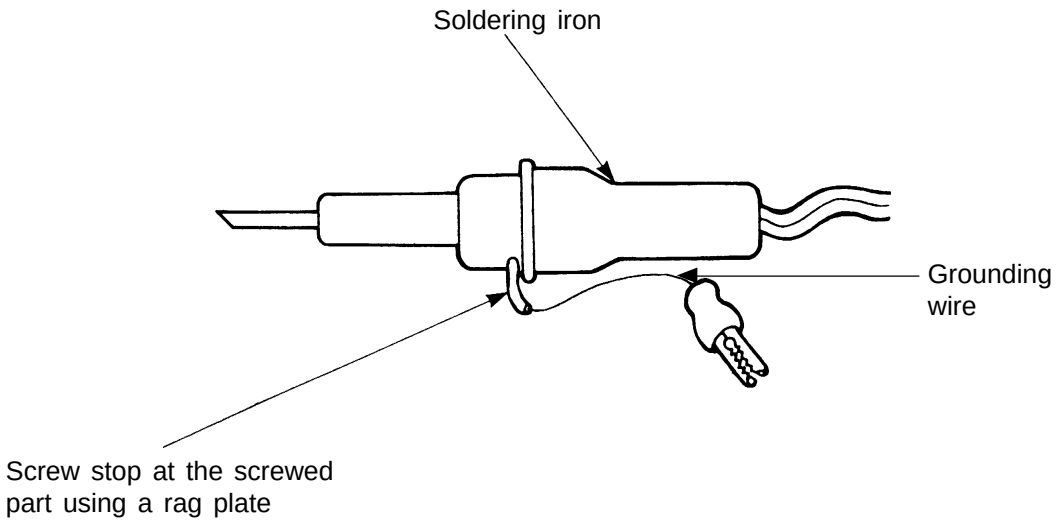


Fig. 4. Grounding a soldering iron

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

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

⚠ CAUTION

1. In quiet operation or stopping the 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.

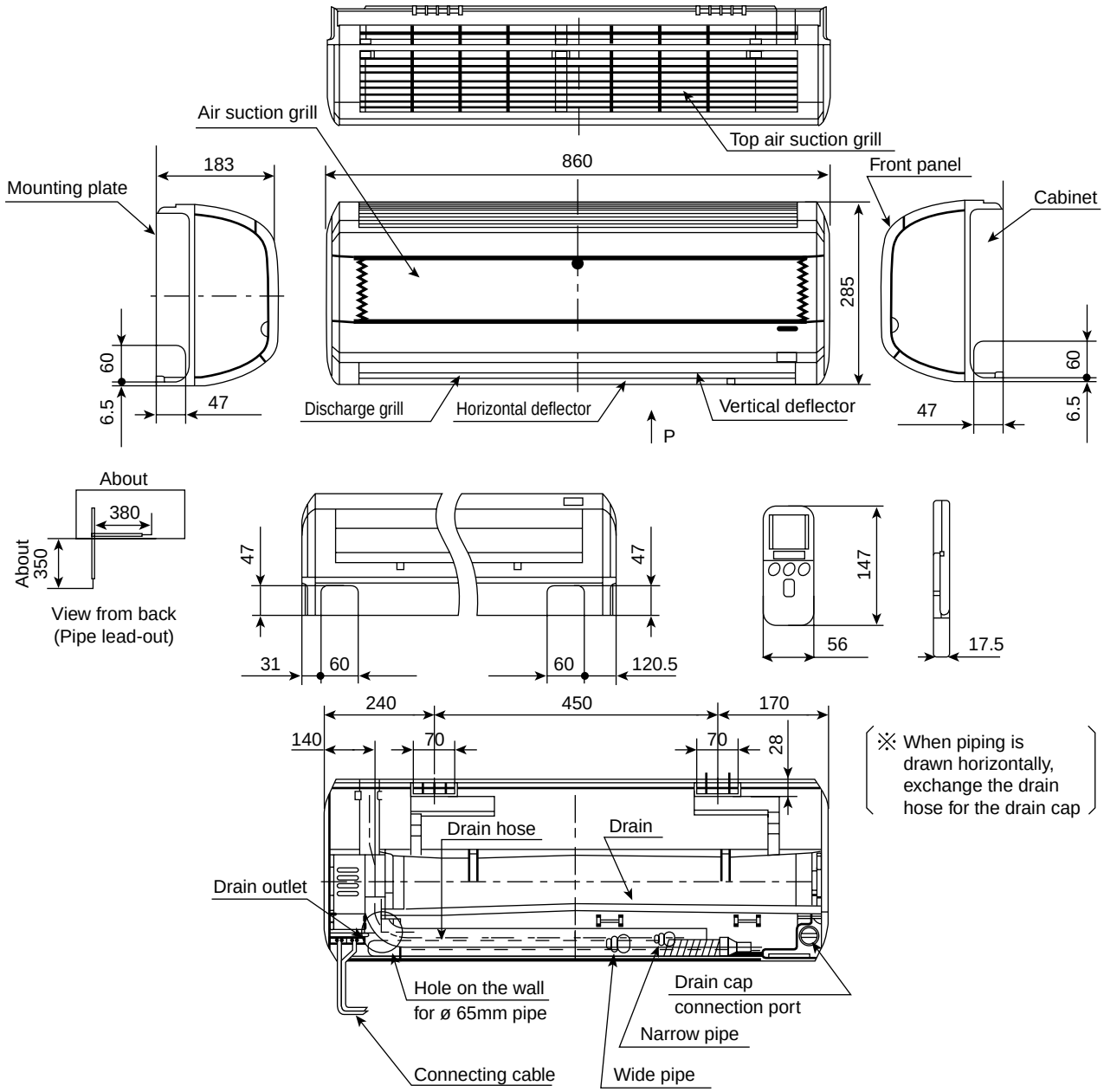
7. When the outside heat exchanger is frosted, the frost is melted by operating the hot gas system, it is not trouble that at this time fan stops and the vapour may rise from the outside heat exchanger.

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.			

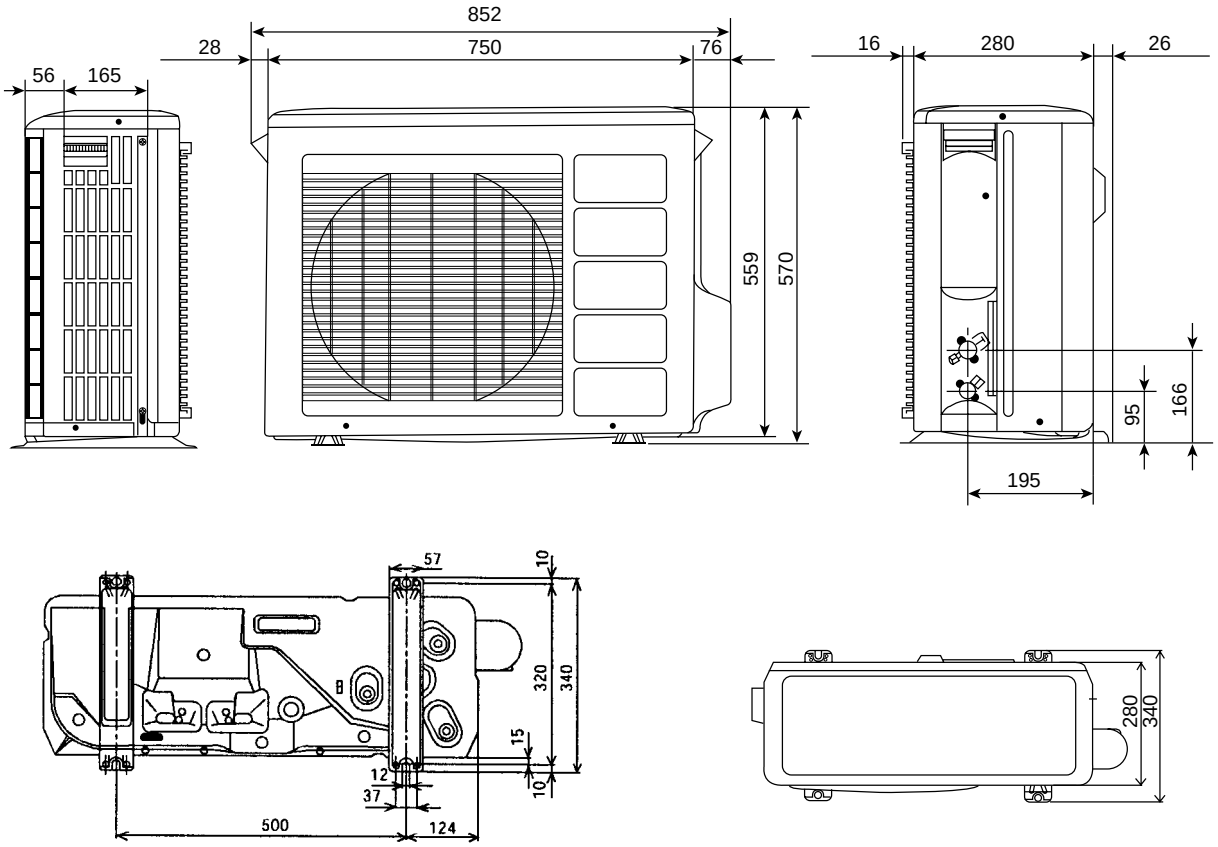
CONSTRUCTION AND DIMENSIONAL DIAGRAM

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

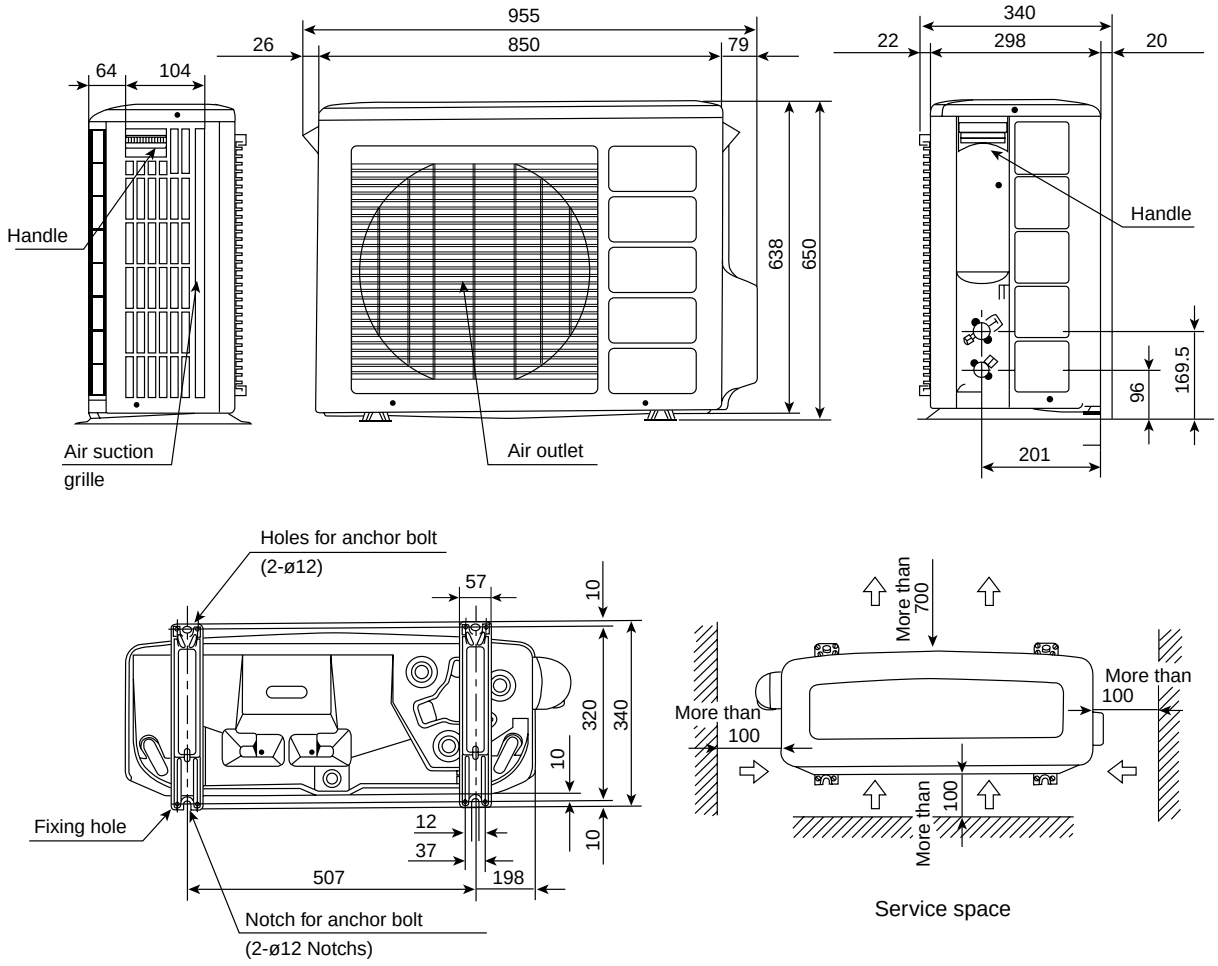


CONSTRUCTION AND DIMENSIONAL DIAGRAM FOR OUTDOOR

MODEL RAC-25NH4, RAC-35NH4



MODEL RAC-50NH4



MAIN PARTS COMPONENT

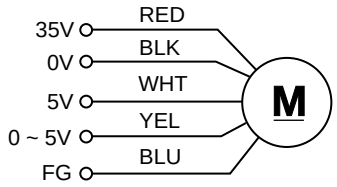
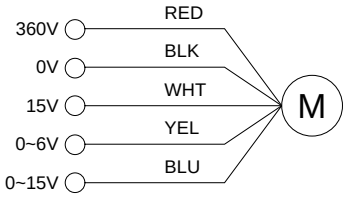
THERMOSTAT

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	 (Control circuit built in)	

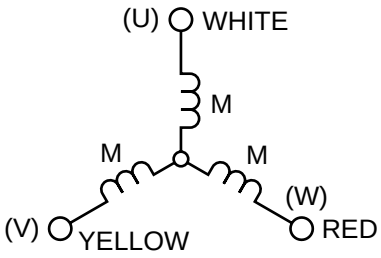
BLU : BLUE YEL : YELLOW BRN : BROWN WHT : WHITE

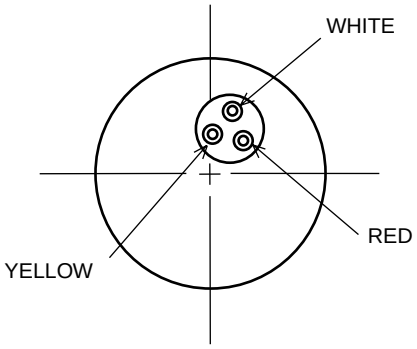
GRY : GRAY ORN : ORANGE GRN : GREEN RED : RED

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		



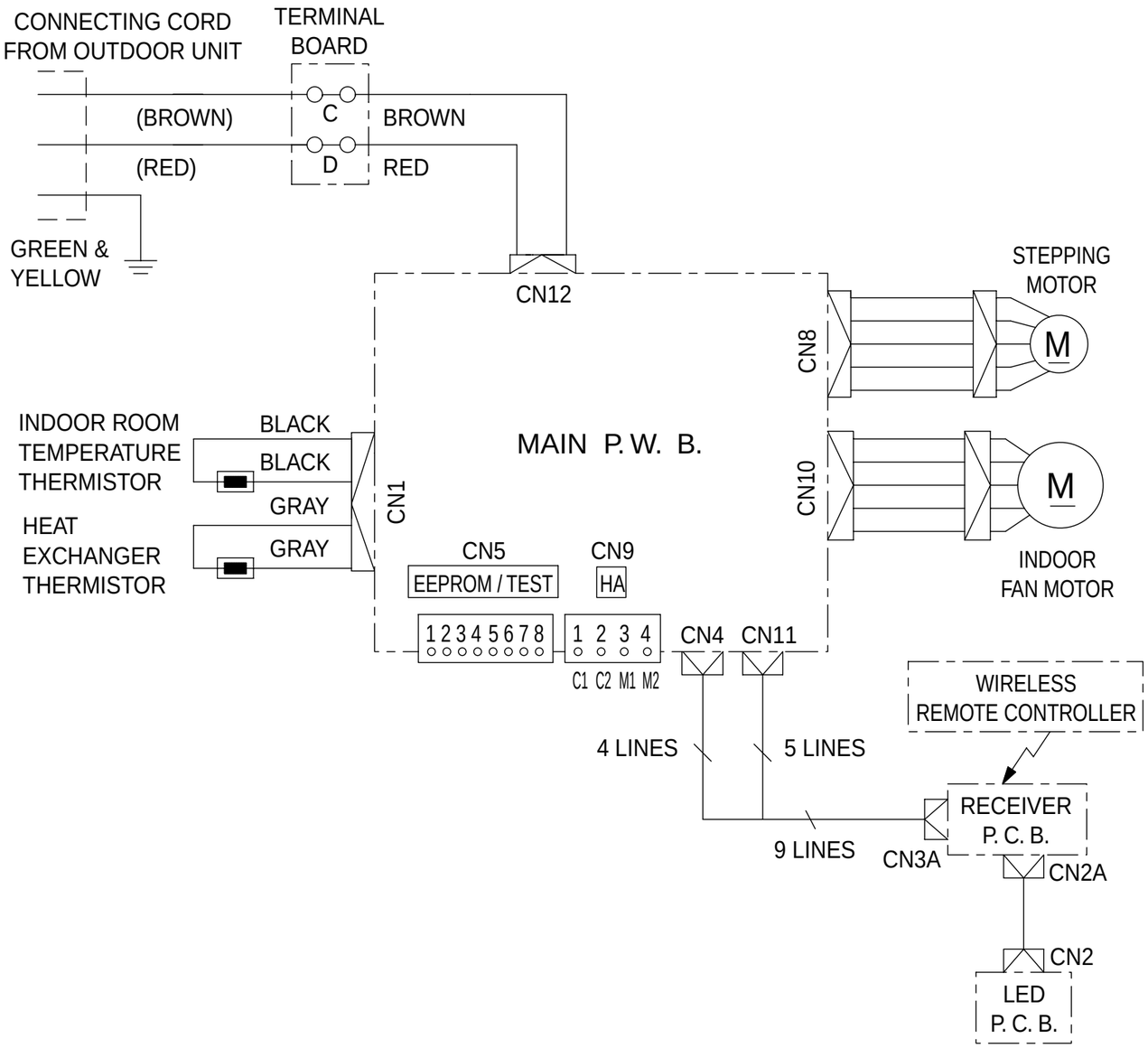
⚠CAUTION

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.

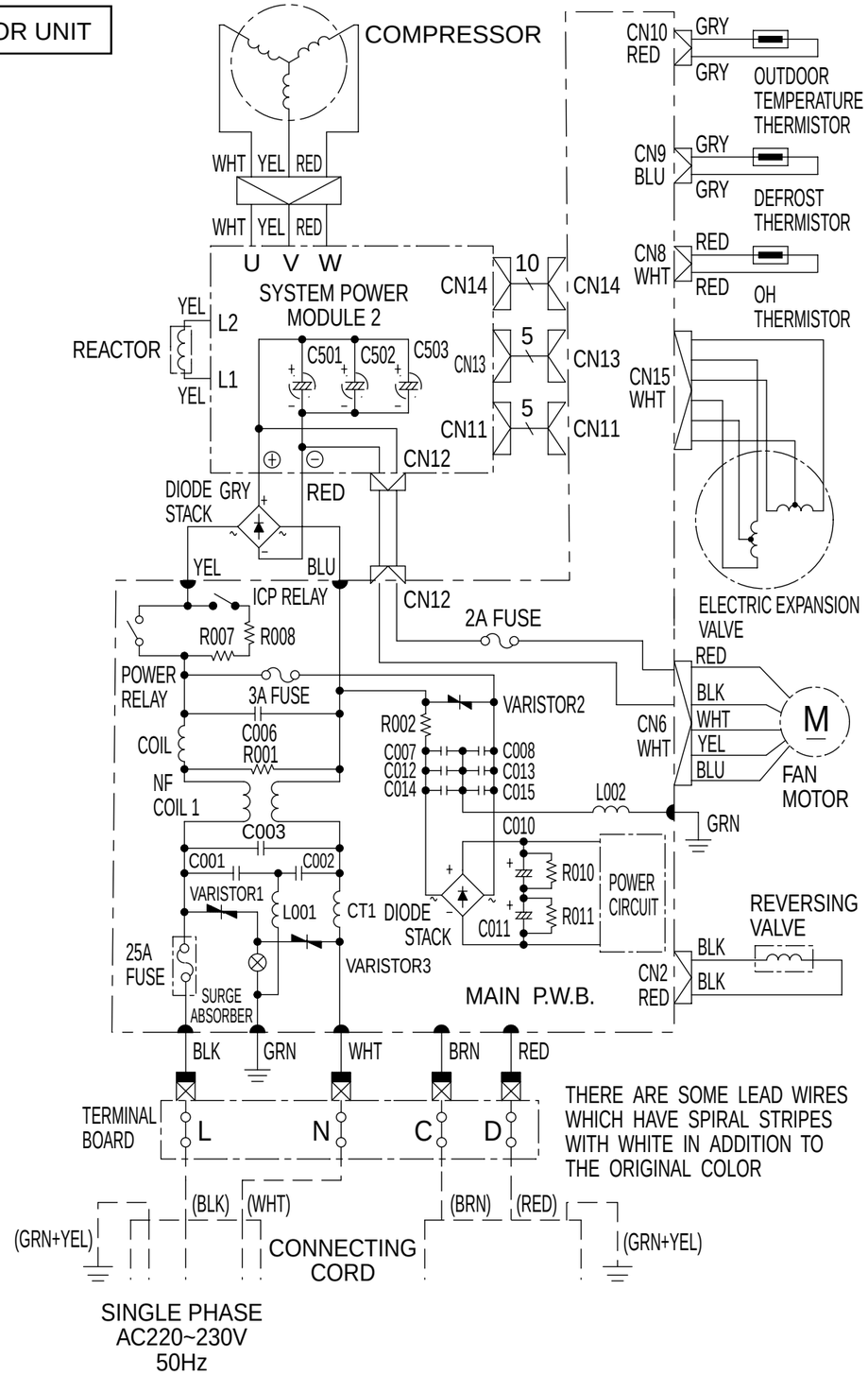
WIRING DIAGRAM

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

INDOOR UNIT

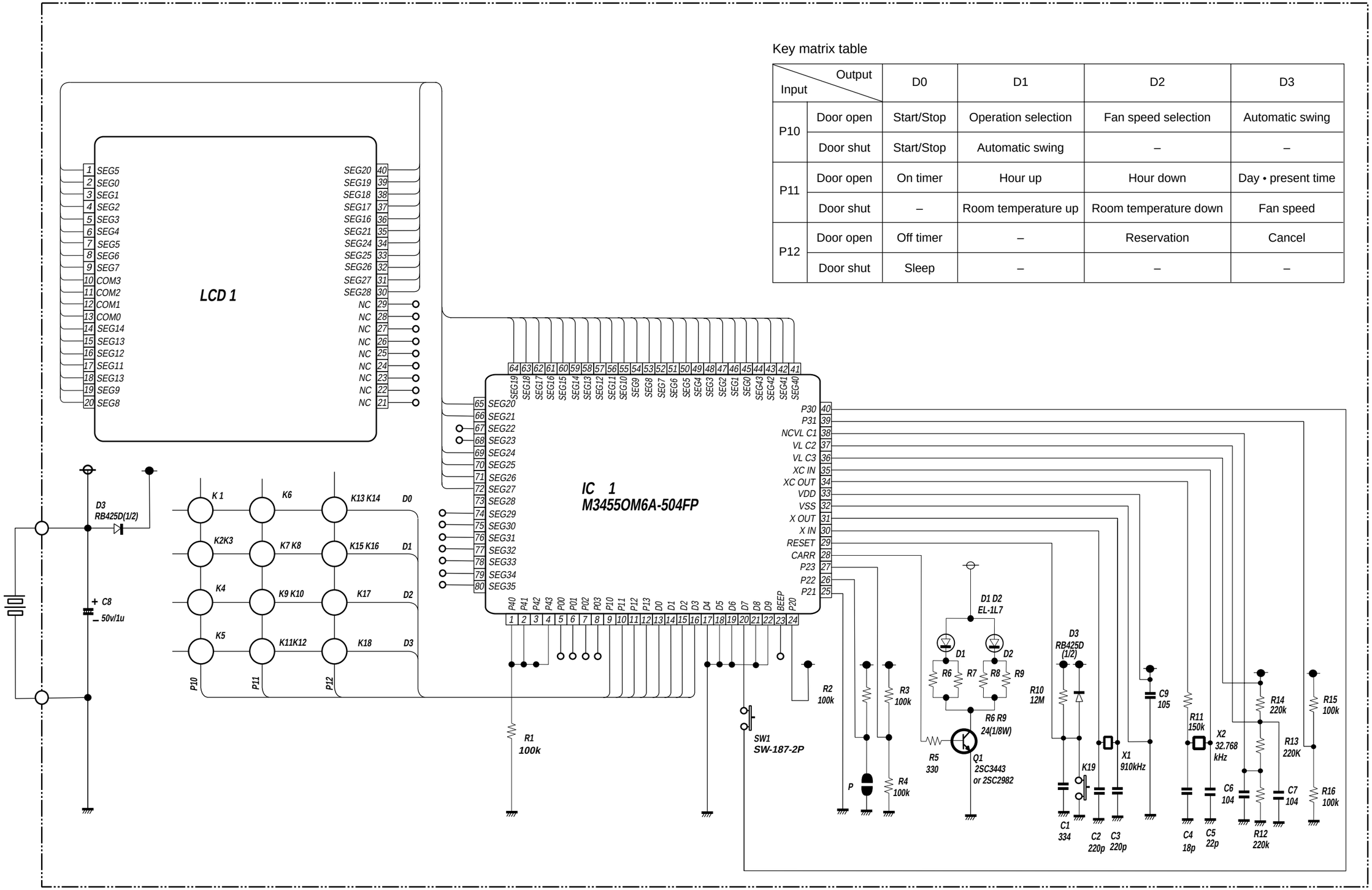


OUTDOOR UNIT



CIRCUIT DIAGRAM

Remote Control

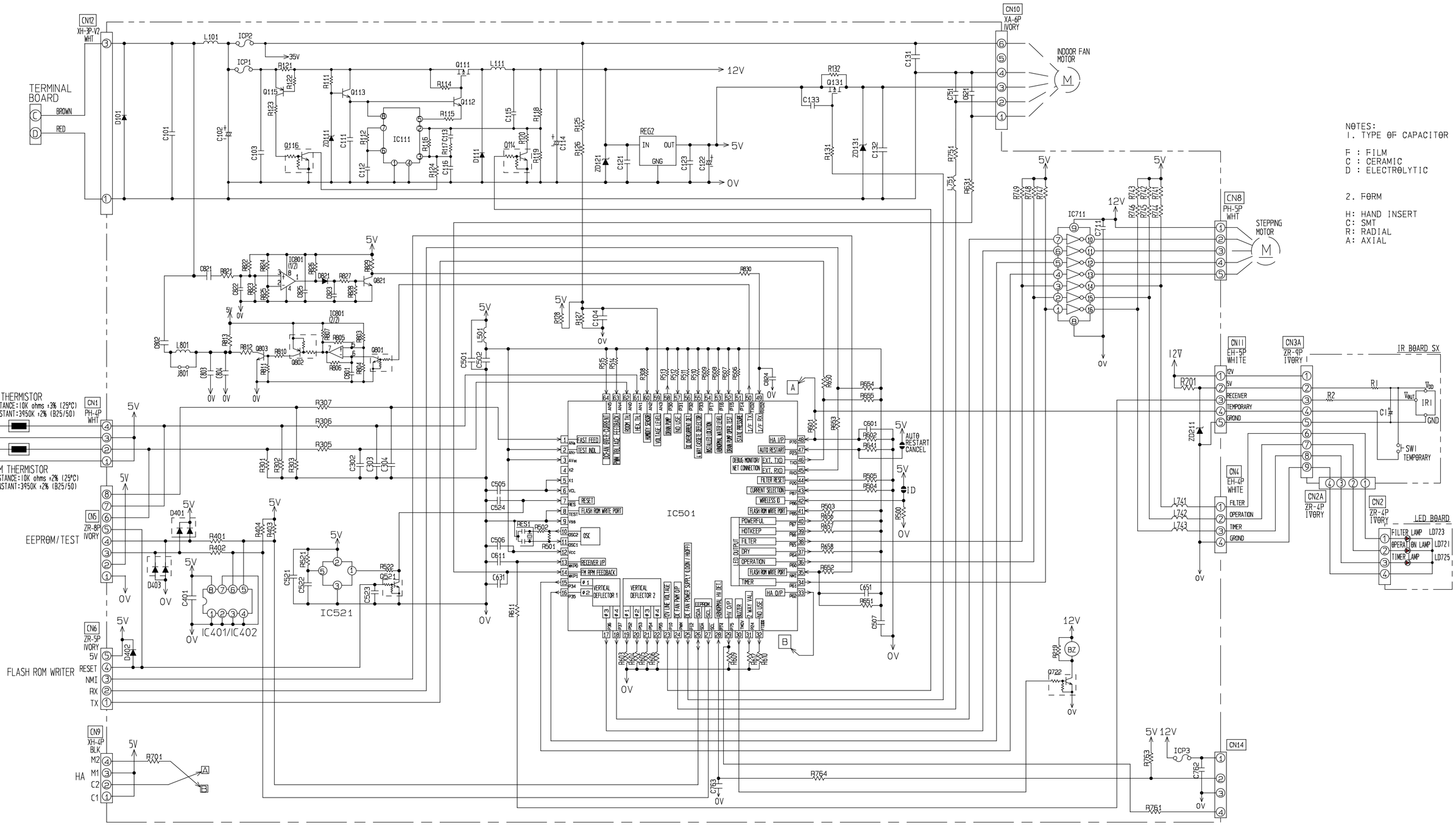


Key matrix table

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



RESISTOR

SYMBOL	RESISTANCE	TOL.	POWER	FORM
R111	27K	±5%	1/10W	C
R112	30K	±5%	1/16W	C
R114	750	±5%	1/8W	C
R115	560	±5%	1/8W	C
R116				
R117	68K	±5%	1/16W	C
R118	75K	±2%	1/16W	C
R119	6.98K	±2%	1/16W	C
R120				
R121	0.56	±5%	1/4W	C
R122	100	±5%	1/16W	C
R123	33K	±5%	1/16W	C
R124	100	±5%	1/16W	C
R125				
R126				
R127				
R128	10K	±5%	1/16W	C
R131				
R132	JUMPER	–	1/16W	C
R201	1K	±5%	1/10W	C
R219	3.3K	±5%	1/10W	C
R301	12.7K	±1%	1/16W	C
R302	12.7K	±1%	1/16W	C
R303	10K	±5%	1/16W	C
R305	1K	±5%	1/16W	C
R306	1K	±5%	1/16W	C

SYMBOL	RESISTANCE	TOL.	POWER	FORM
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	±5%	1/16W	C
R404	5.1K	±5%	1/16W	C
R500	10K	±5%	1/16W	C
R501	1M	±5%	1/16W	C
R502	0	±5%	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	1K	±5%	1/16W	C
R602	10K	±5%	1/16W	C
R603	10K	±5%	1/16W	C

SYMBOL	RESISTANCE	TOL.	POWER	FORM
R604	10K	±5%	1/16W	C
R605	10K	±5%	1/16W	C
R606	10K	±5%	1/16W	C
R609				
R610	10K	±5%	1/16W	C
R611	1K	±5%	1/16W	C
R612	10K	±5%	1/16W	C
R631	1K	±5%	1/16W	C
R641	10K	±5%	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

SYMBOL	RESISTANCE	TOL.	POWER	FORM
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	±1%	1/16W	C
R826	1K	±5%	1/16W	C
R827	3K	±5%	1/16W	C
R828	10K	±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(ΦF)	H
C103	470P	630V	C	C
C104				
C111	2.2μ	10V	C(BH)	C
C112	1000P	50V	C(BH)	C
C113	0.047μ	25V	C(BH)	C
C114	220μ	35V	D(ΦF)	H
C115				
C116				
C121	0.1μ	25V	C(FH)	C
C122	100μ	10V	D(ΦF)	H
C123	0.1μ	25V	C(FH)	C
C131	0.22μ	50V	C(BH)	C
C132	0.1μ	25V	C(FH)	C
C133				
C302	0.1μ	25V	C(FH)	C
C303	0.1μ	25V	C(FH)	C
C304	0.1μ	25V	C(FH)	C
C401	0.1μ	25V	C(FH)	C
C501	0.1μ	25V	C(FH)	C
C502	0.1μ	25V	C(FH)	C
C505	0.1μ	25V	C(FH)	C
C506	0.1μ	25V	C(FH)	C
C507	0.1μ	25V	C(FH)	C

SYMBOL	CAPACITANCE	TOL.	TYPE	FORM
C521	0.1μ	25V	C(FH)	C
C522	0.22μ	10V	C(BH)	C
C523	0.1μ	25V	C(FH)	C
C524	0.1μ	25V	C(FH)	C
C601	0.1μ	25V	C(FH)	C
C611	1000P	50V	C(BH)	C
C621				
C631	1000P	50V	C(BH)	C
C651	0.1μ	25V	C(FH)	C
C711	0.1μ	25V	C(FH)	C
C751	1μ	16V	C(FH)	C
C762				
C763	0.1μ	25V	C(FH)	C
C801	150P	50V	C(CH)	C
C802	0.22μ	50V	F	H
C803	0.1μ	25V	C(FH)	C
C804				
C821	0.01μ	50V	F	H
C822	1000P	50V	C(BH)	C
C823	0.047μ	25V	C(BH)	C
C824	0.01μ	50V	C(BH)	C
C825	0.1μ	25V	C(FH)	C
C1	33μ	10V	D(ΦA)	H

TRANSISTOR

SYMBOL	MODEL	FORM
Q111	2SJ518	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	S24C01BDP	H
IC501	AX-7R11	C
IC521	RN5VD42C	C
IC711	ULN2003ANS	C
IC801	NJM2903M	C
IR1	RPM6938-V4	H

LED

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

ICPS

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

OSCILLATOR

SYMBOL	MODEL	FREQ.	FORM
RES1	CSTLS10M2Z	10MHz	H

ZENER DIODE

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

BUZZER

SYMBOL	MODEL	FORM	
BZ	PKM13EPY	H	ALTERNATIVE PART

SWITCH

SYMBOL	MODEL	FORM
SW1	EVQP09K	H

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

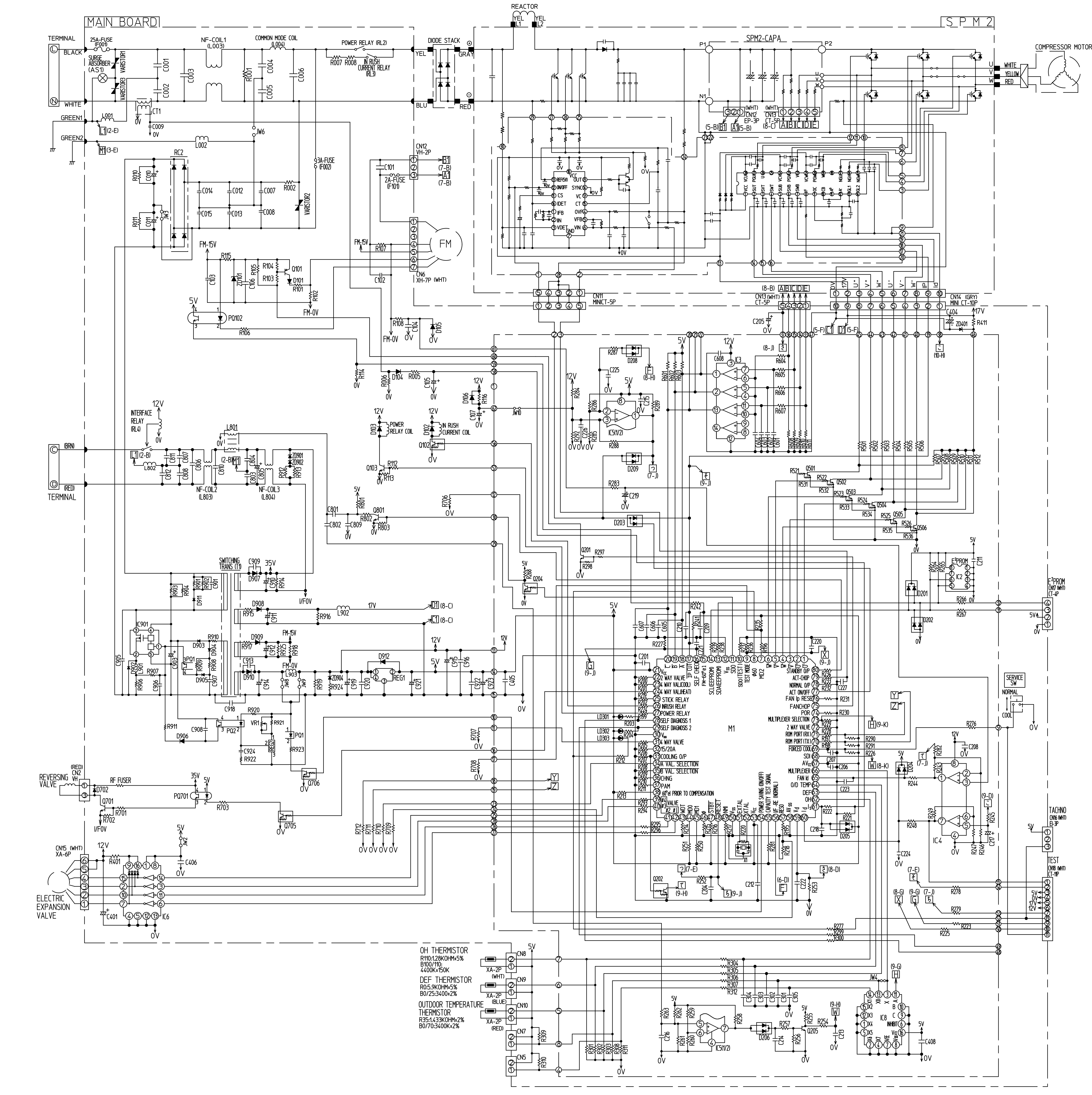
SYMBOL	USAGE	FORM
J801	NONE	C

CONNECTORS

SYMBOL	MODEL NO.	COLOR	FORM	REMARK
CN1	PH-4P (TOP ENTRY)	WHITE	H	ROOM/HEAT EXCH THERMISTOR
CN2	ZR-4P (SIDE ENTRY)	IVORY	H	LED BOARD
CN2A	ZR-4P (SIDE ENTRY)	IVORY	H	LED BOARD (IR BOARD)
CN3A	ZR-9P (SIDE ENTRY)	IVORY	H	IR BOARD
CN4	EH-4P (TOP ENTRY)	WHITE	H	LED BOARD (MAIN BOARD)
CN5	ZR-8P (SIDE ENTRY)	IVORY	H	EEPROM / TEST
CN6	ZR-5P (TOP ENTRY)	IVORY	H	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	H	INDOOR PWM FAN
CN11	EH-5P (TOP ENTRY)	WHITE	H	IR BOARD
CN12	XH-3P-V2 (TOP ENTRY)	WHITE	H	35V SUPPLY
CN14				

CIRCUIT DIAGRAM

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



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

RESISTORS

MARK	RATING (R)	(%)	(W)	MOUNTING	BOARD	REMARK
R001	470K	5%	1/2	A	M	
R002	2.2	5%	5	H	M	CEMENT
R005	1.69K	1%	1/4	A	M	
R006	1K	1%	1/4	A	M	
R007	100	5%	10	H	M	CEMENT
R008	100	5%	10	H	M	CEMENT
R010	470K	5%	1/2	A	M	
R011	470K	5%	1/2	A	M	
R101	3.6K	1%	1/4	A	M	
R102	3K	1%	1/4	A	M	
R103	30K	5%	1/4	A	M	
R104	3.9K	5%	1/4	A	M	
R105	7.5K	5%	1/4	A	M	
R106	2.4K	5%	1/4	A	M	
R107	1	1%	2	P	M	
R108	510	5%	1/4	A	M	
R112	10K	5%	1/4	A	M	
R113	7.5K	5%	1/4	A	M	
R114	1K	5%	1/4	A	M	
R115	JUMPER			A	M	
R116				A	M	
R195	1K	5%	1/16	C	HIC	1608
R196	1K	5%	1/16	C	HIC	1608
R197	1K	5%	1/16	C	HIC	1608
R198	1K	5%	1/16	C	HIC	1608
R199	1K	5%	1/16	C	HIC	1608
R200	10K	5%	1/16	C	HIC	1608
R201	10K	5%	1/16	C	HIC	1608
R202	10K	5%	1/16	C	HIC	1608
R203	390	5%	1/16	C	HIC	1608
R204	390	5%	1/16	C	HIC	1608
R205	1K	5%	1/16	C	HIC	1608
R206	10K	5%	1/16	C	HIC	1608
R207	10K	5%	1/16	C	HIC	1608
R208	1K	5%	1/16	C	HIC	1608
R209	10K	5%	1/16	C	HIC	1608
R210	10K	5%	1/16	C	HIC	1608
R211	10K	5%	1/16	C	HIC	1608
R212	390	5%	1/16	C	HIC	1608
R213	10K	5%	1/16	C	HIC	1608
R214	10K	5%	1/16	C	HIC	1608
R215	10K	5%	1/16	C	HIC	1608
R216	10K	5%	1/16	C	HIC	1608
R217	10K	5%	1/16	C	HIC	1608
R218	10K	5%	1/16	C	HIC	1608
R219	1K	5%	1/16	C	HIC	1608
R220	1M	5%	1/16	C	HIC	1608
R221	10K	1%	1/16	C	HIC	1608
R222	510	5%	1/16	C	HIC	1608
R223	1K	5%	1/16	C	HIC	1608
R224	1K	5%	1/16	C	HIC	1608
R225	1K	5%	1/16	C	HIC	1608
R226	10K	5%	1/16	C	HIC	1608
R227	10K	5%	1/16	C	HIC	1608
R228	10K	5%	1/16	C	HIC	1608
R229	10K	5%	1/16	C	HIC	1608
R230	10K	5%	1/16	C	HIC	1608
R231	10K	5%	1/16	C	HIC	1608
R232	10K	5%	1/16	C	HIC	1608
R233	100	5%	1/16	C	HIC	1608
R234	1K	5%	1/16	C	HIC	1608
R235	10K	5%	1/16	C	HIC	1608
R236	10K	5%	1/16	C	HIC	1608
R237	10K	5%	1/16	C	HIC	1608
R238	100	5%	1/16	C	HIC	1608
R239	100	5%	1/16	C	HIC	1608
R241	5.6K	5%	1/16	C	HIC	1608
R242	1K	5%	1/16	C	HIC	1608
R243	2K	1%	1/16	C	HIC	1608
R244	2K	5%	1/16	C	HIC	1608
R245	10K	5%	1/16	C	HIC	1608
R246	1K	1%	1/16	C	HIC	1608
R247	3.16K	1%	1/16	C	HIC	1608
R248	2K	5%	1/16	C	HIC	1608
R249	20K	1%	1/16	C	HIC	1608
R250	10K	5%	1/16	C	HIC	1608
R251	10K	5%	1/16	C	HIC	1608
R252	5.1K	5%	1/16	C	HIC	1608
R253	3.32K	1%	1/16	C	HIC	1608
R254	100	5%	1/16	C	HIC	1608
R255	2K	5%	1/16	C	HIC	1608
R256	10K	5%	1/16	C	HIC	1608
R257	3K	5%	1/16	C	HIC	1608
R258	1K	5%	1/16	C	HIC	1608
R259	8.25K	1%	1/16	C	HIC	1608
R260	10K	1%	1/16	C	HIC	1608
R261	10K	1%	1/16	C	HIC	1608
R262	10K	1%	1/16	C	HIC	1608
R263	1K	5%	1/16	C	HIC	1608
R264	5.1K	5%	1/16	C	HIC	1608
R265	5.1K	5%	1/16	C	HIC	1608
R266	390	5%	1/16	C	HIC	1608
R267	390	5%	1/16	C	HIC	1608
R268	2K	5%	1/10	C	HIC	2125
R276	100	5%	1/16	C	HIC	1608
R277	100	5%	1/16	C	HIC	1608
R278	100	5%	1/16	C	HIC	1608
R279	100	5%	1/16	C	HIC	1608
R281	10K	5%	1/16	C	HIC	1608
R282		5%	1/16	C	HIC	1608
R283	1K	5%	1/16	C	HIC	1608
R284	10K	2%	1/16	C	HIC	1608
R285	4.7K	2%	1/16	C	HIC	1608
R286	5.1K	2%	1/16	C	HIC	1608
R287			1/16	C	HIC	1608
R288	51K	5%	1/16	C	HIC	1608
R289	5.1K	5%	1/16	C	HIC	1608
R290	10K	5%	1/16	C	HIC	1608
R291	10K	5%	1/16	C	HIC	1608
R292	3K	2%	1/16	C	HIC	1608
R293	100	5%	1/16	C	HIC	1608
R294	100	5%	1/16	C	HIC	1608
R295	100	5%	1/16	C	HIC	1608
R296	100	5%	1/16	C	HIC	1608
R297	10K	5%	1/16	C	HIC	1608
R298	5.1K	5%	1/16	C	HIC	1608
R299	100	5%	1/16	C	HIC	1608
R300	100	5%	1/16	C	HIC	1608
R301	3.74K	1%	1/16	C	HIC	1608
R302	3.01K	1%	1/16	C	HIC	1608
R303	3.01K	1%	1/16	C	HIC	1608
R304	100	5%	1/16	C	HIC	1608
R305	100	5%	1/16	C	HIC	1608
R306	100	5%	1/16	C	HIC	1608
R307	100	5%	1/16	C	HIC	1608

RESISTORS

MARK	RATING (R)	(%)	(W)	MOUNTING	BOARD	REMARK
R308	3.01K	1%	1/16	C	HIC	1608
R309	5.1K	5%	1/4	A	M	
R310	5.1K	5%	1/4	A	M	
R311	10K	1%	1/16	C	HIC	1608
R312	100	5%	1/16	C	HIC	1608
R401	100	5%	1/4	A	M	
R411	JUMPER					
R501	1K	5%	1/16	C	HIC	1608
R502	1K	5%	1/16	C	HIC	1608
R503	1K	5%	1/16	C	HIC	1608
R504	1K	5%	1/16	C	HIC	1608
R505	1K	5%	1/16	C	HIC	1608
R506	1K	5%	1/16	C	HIC	1608
R507	5.1K	5%	1/8	C	HIC	3216
R508	5.1K	5%	1/8	C	HIC	3216
R509	5.1K	5%	1/8	C	HIC	3216
R510	5.1K	5%	1/8	C	HIC	3216
R511	5.1K	5%	1/8	C	HIC	3216
R512	5.1K	5%	1/8	C	HIC	3216
R521	10K	5%	1/16	C	HIC	1608
R522	10K	5%	1/16	C	HIC	1608
R523	10K	5%	1/16	C	HIC	1608
R524	10K	5%	1/16	C	HIC	1608
R525	10K	5%	1/16	C	HIC	1608
R526	10K	5%	1/16	C	HIC	1608
R531	5.1K	5%	1/16	C	HIC	1608
R532	5.1K	5%	1/16	C	HIC	1608
R533	5.1K	5%	1/16	C	HIC	1608
R534	5.1K	5%	1/16	C	HIC	1608
R535	5.1K	5%	1/16	C	HIC	1608
R536	5.1K	5%	1/16	C	HIC	1608
R601	2K	5%	1/16	C	HIC	1608
R602	2K	5%	1/16	C	HIC	1608
R603	2K	5%	1/16	C	HIC	1608
R604	100	5%	1/16	C	HIC	1608
R605	100	5%	1/16	C	HIC	1608
R606	100	5%	1/16	C	HIC	1608
R607	100	5%	1/16	C	HIC	1608
R608	4.02K	1%	1/16	C	HIC	1608
R609	4.02K	1%	1/16	C	HIC	1608
R610	4.02K	1%	1/16	C	HIC	1608
R611	4.02K	1%	1/16	C	HIC	1608
R701	7.5K	5%	1/2	A	M	
R702	10K	5%	1/4	A	M	
R703	470	5%	1/4	A	M	
R706	10K	5%	1/4	A	M	
R707	10K	5%	1/4	A	M	
R708						
R709						
R710	10K	5%	1/4	A	M	
R711						
R712						
R801	39	5%	1/4	A	M	
R802	39	5%	1/4	A	M	
R803	3K	5%	1/4	A	M	
R901	200K	5%	1/2	A	M	
R902	200K	5%	1/2	A	M	
R903	820K	5%	1/2	A	M	
R904	820K	5%	1/2	A	M	
R906	0.39	5%	2	P	M	
R907	680	5%	1/4	A	M	
R908	2.7K	5%	1/4	A	M	
R909	2.7K	5%	1/4	A	M	
R910	6.2	5%	1/2	A	M	
R911	4.3K	5%	1/4	A	M	
R912	270	5%	2	H	M	
R913						
R914	47K	5%	1/4	A	M	
R915	JUMPER			A	M	
R916	1.5K	5%	1	A	M	
R917	3.3	5%	1	P	M	
R918	1K	5%	1	P	M	
R919	3K	5%	1/4	A	M	
R920	680	5%	1/4	A	M	
R921						
R922	JUMPER			A	M	
R923	1K	5%	1/4	A	M	
R924						
R925						

ICS

MARK	MODEL	MOUNTING	BOARD	REMARK
IC901	STR-F6523	H	M	
REG1	PQ05RD08	H	M	
REG2	SE012N	H	M	
IC2	S24C02BFJ-TB	S	HIC	
IC3	NJM2901M-TE1	S	HIC	
IC4	NJM2904M-TE3	S	HIC	
IC5	NJM2903V-TE1	S	HIC	
IC6	M54567P	H	M	
IC8				
M1	AX-8N00	Q	HIC	

SURGE PROTECTORS

MARK	MODEL	MOUNTING	BOARD	REMARK
VARISTOR1	450NR12D	P	M	
VARISTOR2	450NR12D	P	M	
VARISTOR3	450NR12D	P	M	
AS1	RA-102M-C6-Y	H	M	

SWITCH

MARK	MODEL	MOUNTING	BOARD	REMARK
SW1	KSM0612BTS	R	M	

CAPACITORS

MARK	RATING (uF)	(V)	COMPONENT TYPE	MOUNTING	BOARD	REMARK	
C001	0.01	AC 250	C	P	M		
C002	0.01	AC 250	C	P	M		
C003	0.68	AC 250/275V	F	H	M		
C004							
C005							
C006	4	400	F	H	M	HITACHI	
C007	0.01	AC 250	C	P	M		(RAC-50NH4 ONLY)
C008	0.01	AC 250	C	P	M		(RAC-50NH4 ONLY)
C009	0.1	50	C	R	M		
C010	100	250	D	R	M		
C011	100	250	D	R	M		
C012	0.01	AC 250	C	R	M		
C013	0.01	AC 250	C	R	M		
C014	0.01	AC 250	C	R	M		
C015	0.01	AC 250	C	R	M		
C101	0.082	630	F	H	M		
C102							
C103	0.1	50	C	R	M		
C104	1000P	50	C	R	M		
C105	100	10	D	R	M	VR	
C106							
C107	2.2	50	D	R	M	VR	
C201	0.047	25	C	C	HIC	1608	
C204	0.047	25	C	C	HIC	1608	
C205	1	50	D	R	M	VR	
C206	0.047	25	C	C	HIC	1608	
C207	0.1	25	C	C	HIC	1608	
C208	0.047	25	C	C	HIC	1608	
C209	0.047	25	C	C	HIC	1608	
C210	0.0047	50	C	C	HIC	1608	
C211	0.047	25	C	C	HIC	1608	
C212	0.047	25	C	C	HIC	1608	
C213	0.047	25	C	C	HIC	1608	
C214	0.068	16	C	C	HIC	1608	
C215	0.047	25	C	C	HIC	1608	
C216	0.0047	50	C	C	HIC	1608	
C217	22	6.3	D	C	HIC	WX	
C218	0.1	16	C	C	HIC	1608	
C219	2.2	50	D	C	HIC	WX	
C220	0.047	25	C	C	HIC	1608	
C221	0.1	25	C	C	HIC	1608	
C222	0.1	16	C	C	HIC	1608	
C223	0.01	50	C	C	HIC	1608	
C224	0.01	50	C	C	HIC	1608	
C225	0.01	50	C	C	HIC	1608	
C226	0.1	16	C	C	HIC	1608	
C227	2200p	50	C	C	HIC	1608	
C301	0.1	16	C	C	HIC	1608	
C302	0.1	16	C	C	HIC	1608	
C303	0.1	16	C	C	HIC	1608	
C304	0.1	16	C	C	HIC	1608	
C305	0.1	16	C	C	HIC	1608	
C401	100	25	D	R	M	VR	
C404	100	25	D	R	M	PF	
C405	0.1	16	C	C	HIC	1608	
C406	0.1	50	C	R	M		
C408	0.1	16	C	C	HIC	1608	
C601	0.00068	50	C	C	HIC	CH 2125	
C602	0.00068	50	C	C	HIC	CH 2125	
C603	0.00068	50	C	C	HIC	CH 2125	
C604	0.00068	50	C	C	HIC	CH 2125	
C605	0.001	50	C	C	HIC	1608	
C606	0.001	50	C	C	HIC	1608	
C607	0.001	50	C	C	HIC	1608	
C608	0.047	25	C	C	HIC	1608	
C801	0.15	50	F	R	M		
C802	0.022	50	F	R	M		
C803	0.01	AC 250	C	P	M		
C804	0.01	AC 250	C	P	M		
C805	68	50	D	R	M	PF	
C806	0.15	50	F	R	M		
C807	0.01	AC 250	C	P	M		
C808	0.01	AC 250	C	P	M		
C809	0.15	50	c	R	M		
C810							
C811	0.01	AC 250	C	P	M		(RAC-50NH4 ONLY)
C812	0.01	AC 250	C	P	M		(RAC-50NH4 ONLY)
C901	0.01	1K	C	H	M		
C903	120	25	D	R	M		
C905	1000P	2K	C	P	M	LXV	
C906	470p	50	C	R	M		
C907	1800p	50	C	R	M		
C908	0.1	50	C	R	M		
C909							
C910	330	50	D	R	M	LXV	
C911	220	25	D	R	M	LXV	
C912	330	25	D	R	M	PF	
C913							
C914	470	16	D	R	M	PF	
C915	120	16	D	R	M	LXV	
C916	0.1	50	C	R	M		
C918	0.001	AC 250	C	P	M		
C919							
C920	0.1	50	C	R	M		
C921	180	10	D	R	M	PF	
C922	0.1	50	C	R	M		
C923	180	10	D	R	M	PF	
C924	0.1	50	C	R	M		

RELAYS

MARK	MODEL	MOUNTING	BOARD	REMARK
POWER RELAY (RL2)	G4A-1A-PE	H	M	
INTERFACE R. (RL4)	FTR-F3AA012E	H	M	
IN RUSH C. R. (RL3)	FTR-F3AA012E	H	M	

LEDS

MARK	MODEL	MOUNTING	BOARD	REMARK
LD301	LT1D67A	C	HIC	RED
LD302	LT1D67A	C	HIC	RED
LD303	LT1D67A	C	HIC	RED

ZENER DIODES

MARK	MODEL	MOUNTING	BOARD	REMARK
ZD101				
ZD401				
ZD901	HZ12CPTK	H	M	
ZD902	HZ12CPTK	H	M	
ZD904				

TRANSISTORS

MARK	MODEL	MOUNTING	BOARD	REMARK
Q101	2SA673	R	M	
Q102	DTC114YSATP	R	M	
Q103	2SC3246	R	M	
Q201	2SC2462LC	C	HIC	
Q202				
Q204	RN1402	C	HIC	
Q205	2SC2462LC	C	HIC	
Q501	2SC2462LC	C	HIC	
Q502	2SC2462LC	C	HIC	
Q503	2SC2462LC	C	HIC	
Q504	2SC2462LC	C	HIC	
Q505	2SC2462LC	C	HIC	
Q506	2SC2462LC	C	HIC	
Q701	2SC1214CTZ	R	M	
Q705	DTC114YSATP	R	M	
Q706	DTC114YSATP	R	M	
Q801	2SC1214CTZ	R	M	

CONNECTORS

MARK	MODEL	MOUNTING	BOARD	REMARK
CN2	B2P3-VH-R	H	M	
CN6	B5(7-2.3)B-XH-A	H	M	
CN8	B02B-XASK-1N	H	M	
CN9	B02B-XAEK-1	H	M	
CN10	B02B-XARK-1	H	M	
CN11	0-353297-5	H	M	
CN12	B2P3-VH	H	M	
CN13	0-175487-5	H	M	
CN14	1-353297-0	H	M	
CN15	B06B-XASK-1N	H	M	
CN16				
CN17	0-175487-4	H	M	
CN18	1-175487-1	H	M	

PHOTOCOUPLERS

MARK	MODEL	MOUNTING	BOARD	REMARK
PQ1	TLP521-1	H	M	
PQ2	TLP521-1	H	M	
PQ102	TLP521-1	H	M	
PQ701	TLP521-1	H	M	

VARIABLE RESISTOR

	RATING	MOUNTING	BOARD	REMARK
VR1	200Ω,300mV	A	M	

FUSE

MARK	MODEL	MOUNTING	BOARD	REMARK
RF FUSER	JUMPER	A	M	
F001	250VTLNC25A	H	M	250V,25A
F002	N20SL-250-3A	H	M	250V, 3A
F101	N20SL-250-2A	H	M	250V, 2A

COILS

MARK	MODEL	MOUNTING	BOARD	REMARK
L001	FBA04MA450	A	M	
L002	FBA04MA450	A	M	
L003	1015-20132A1	A	M	
L004	1AX03615-03171	H	M	
L801	TD012	H	M	
L802	FBA04MA450	A	M	
L803	CM204	A	M	
L804	CM137	A	M	
L901	BL01RN1	A	M	
L902	JUMPER	A	M	
L903	JUMPER	A	M	
CT1	PCN01906-03161	H	M	
T1	TMHA010	H	M	

OSCILLATOR

MARK	MODEL	MOUNTING	BOARD	REMARK
X1	CSTCV16MXJ0C3	C	HIC	16MHZ

JUMPERS

MARK	MODEL	MOUNTING	BOARD	REMARK
JW2	EXIST	A	M	
JW3	NONE	A	M	
JW4	CHIP JUMPER	C	HIC	
JW6	NONE	A	M	
JW8	EXIST	A	M	
JW9	NONE	A	M	
JW10	CHIP JUMPER	C	HIC	

DIODES

MARK	MODEL	MOUNTING	BOARD	REMARK
D101	1N4936	A	M	
D102	1N4148	A	M	
D103	1N4148	A	M	
D104	1N4148	A	M	
D105	1N4148	A	M	
D106				
D201	HSM2838CTR	C	HIC	
D202	HSM2836CTL	C	HIC	
D203	HSM2836CTL	C	HIC	
D204	HSM2838CTR	C	HIC	
D205	HSM2838CTR	C	HIC	
D206	HSM2838CTR	C	HIC	
D208	HSM2838CTR	C	HIC	
D209	HSM2838CTR	C	HIC	
D702	1N4148	A	M	
D902	1N4148	A	M	
D903	RMPG06G	A	M	
D904	RMPG06G	A	M	
D905	1N4148	A	M	
D906	1N4148	A	M	
D907	RN3Z-N	H	M	
D908	1N4936	A	M	
D909	1N4936	A	M	
D910	RK36	A	M	
D911	RU1P	A	M	
D912	1N4148	A	M	
RC2	D3SBA60	H	M	

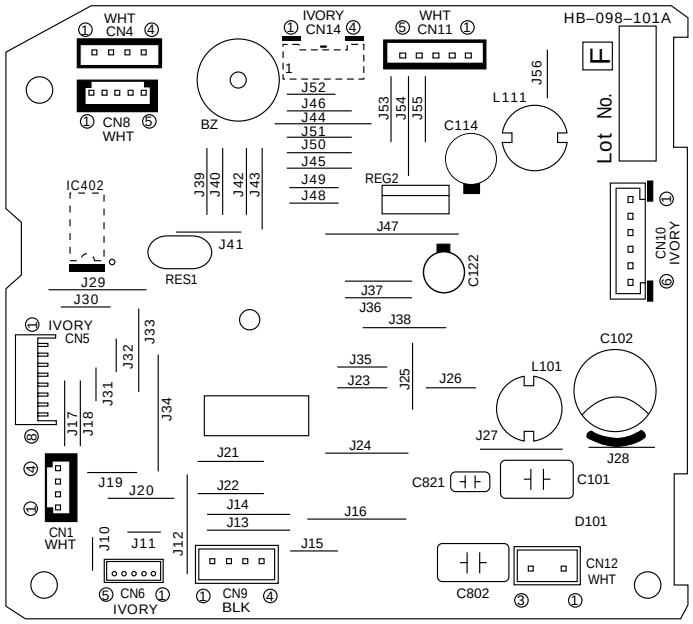
PRINTED WIRING BOARD LOCATION DIAGRAM

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

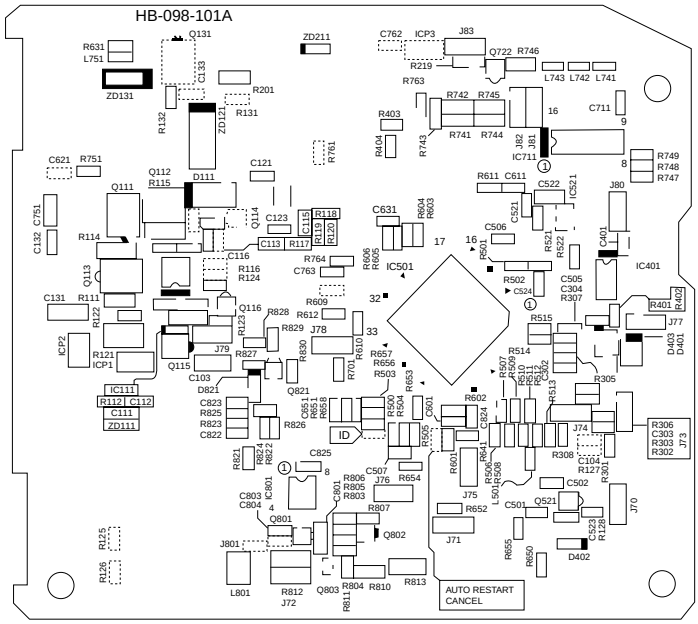
MAIN P.W.B.

Marking on P.W.B.

COMPONENT SIDE

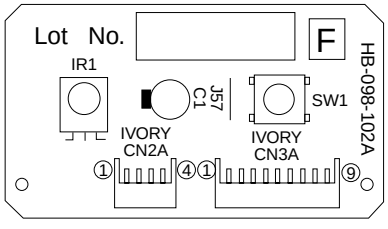


SOLDERING SIDE

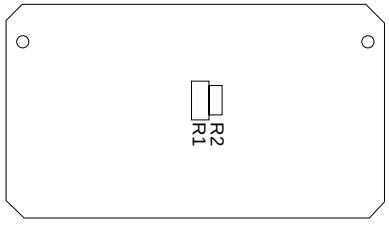


RECEIVING P.W.B.

Marking on P.W.B.



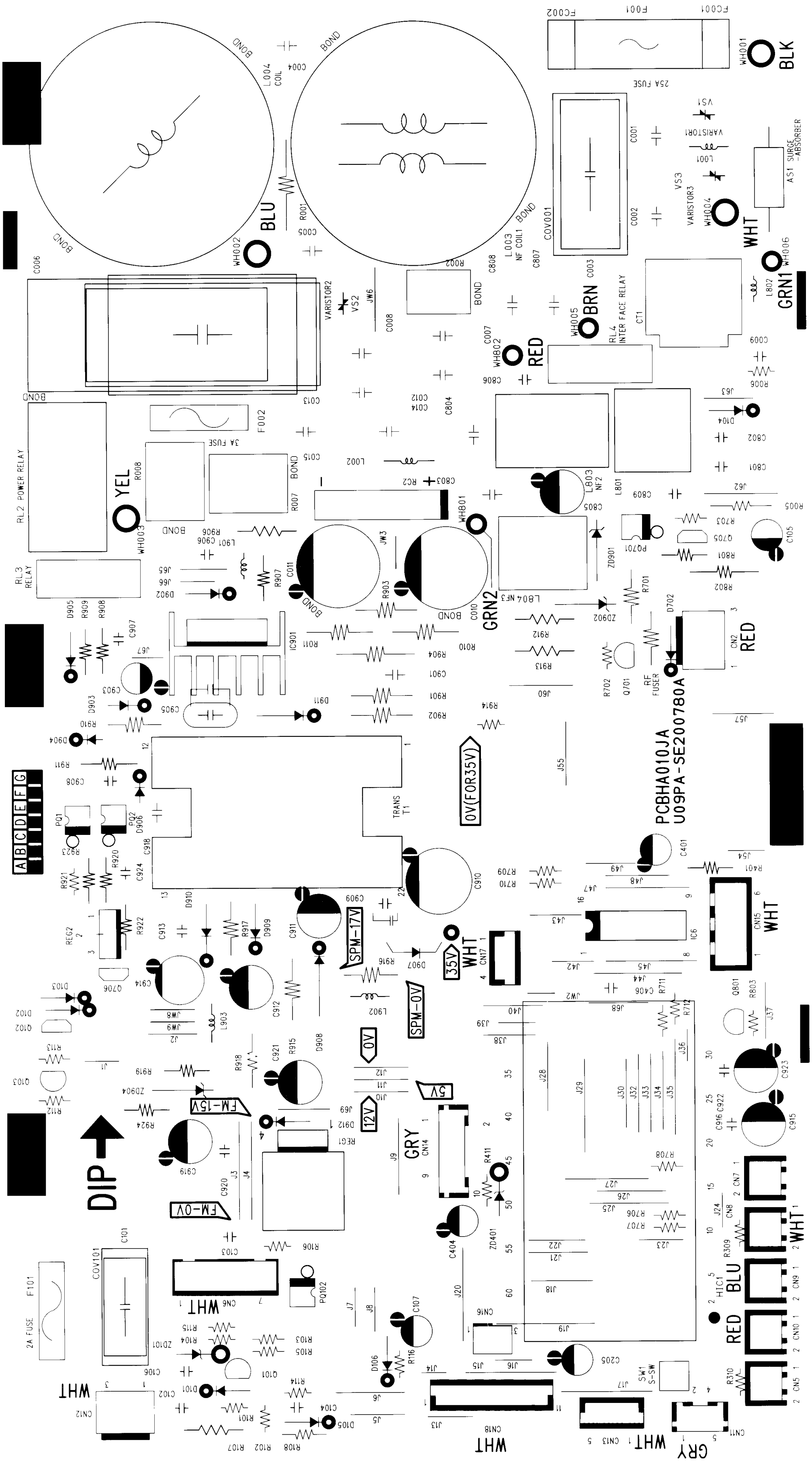
COMPONENT SIDE



SOLDERING SIDE

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

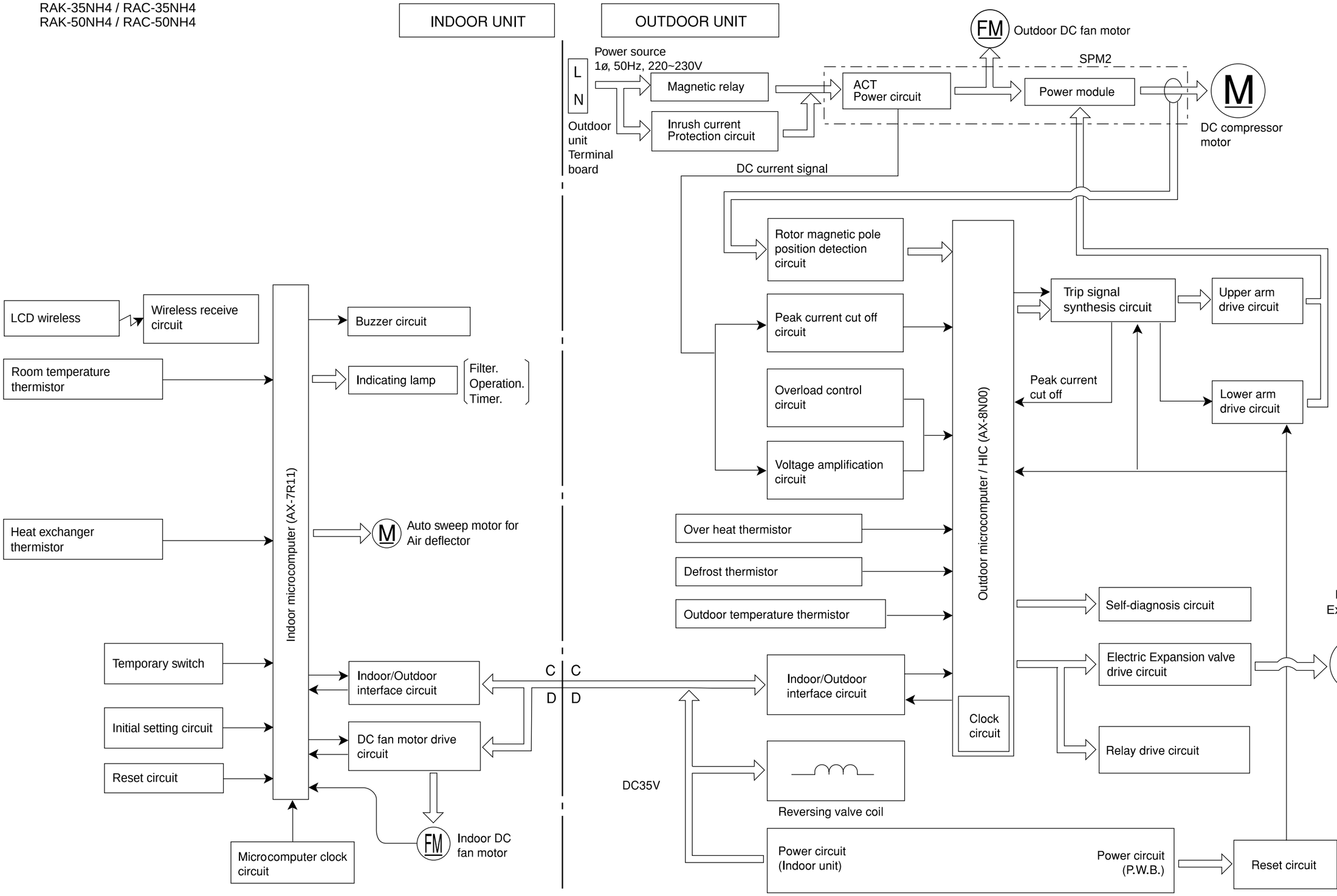
MAIN P.W.B. Marking on P.W.B



COMPONENT SIDE

BLOCK DIAGRAM

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



BASIC MODE

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

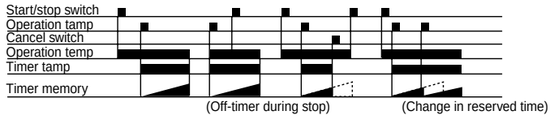
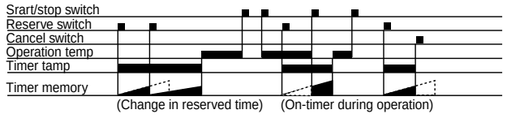
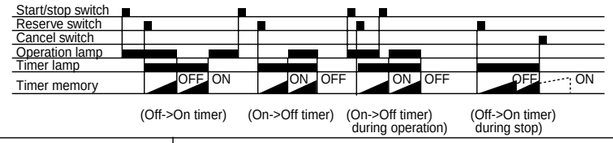
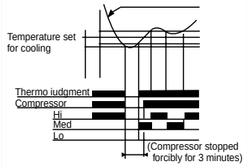
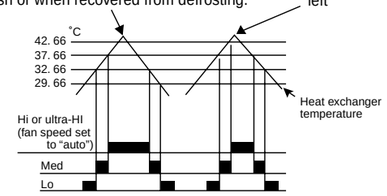
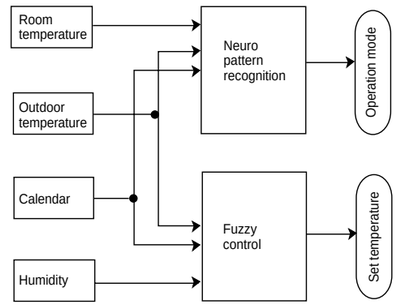
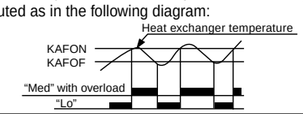
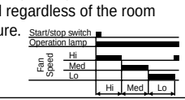
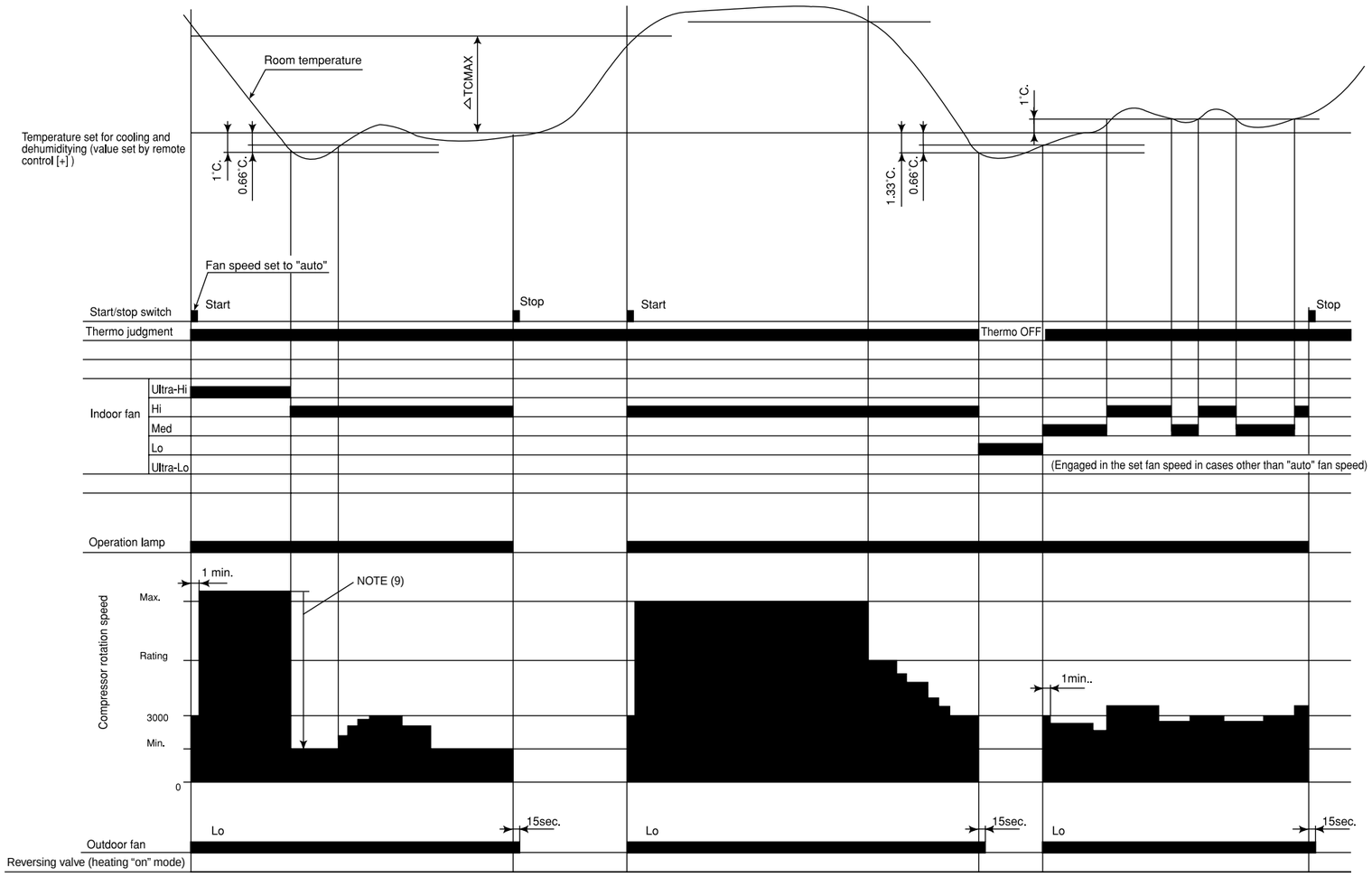
Operation mode	Fan	Cooling	Dehumidifying (dehumidifying operation by the function select button only, not including that engaged by the dehumidify button)	Heating	N&F auto	Special auto (not normally used)
Basic operation of start/stop switch						
Timer functions — Off-timer						
Timer functions — On-timer						
Timer functions — Off -> On On -> Off timer						
Fan speed mode (indoor fan) — Auto		Changes from “Hi” to “Med” or “Lo” depending on room temperature.  1. Runs at “Hi” until first thermo off after operation is started. 2. Runs at “Lo” when thermo is off.	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”, “Hi”, “ultra-Hi” or “stop” depending on the room temperature, time and heat exchange temperature. Set to “stop” if the room temperature is 18˚C in the “ultra-Lo” mode other than during preheating (cooling is recovered at 18.33˚C). When the compressor is running at maximum speed during hot dash or when recovered from defrosting. In modes other than left 	The neuro & fuzzy control allows device to determine optimum operation mode and set temperature. However, during auto cooling, the new cool rhythm starts when the room temperature is less than the set temperature plus 0.66˚C, after dash is finished.  Notes: (1) The set temperature can be varied ±3˚C using the temperature setting buttons ^ and v. (2) If operation is started by tele-control or by temporary switch in status where remote control has not been used after power was supplied, the operation mode will be as follows (since there is no stored calendar data): Room temparature at operation start (˚C) Cooling — Set temperature: 28˚C, Fan mode: Auto Dehumidifying — Set temperature: Room temperature at operation start, Fan mode: Auto Heating — Set temperature: 22˚C, Fan mode: Auto	The special auto mode is based on N&F auto, but the following is different: Operation mode / Mode change during operation N&F auto — Does not change as long as outdoor temperature or calendar data does not change greatly. Special auto — The operation mode will be judged the same as at operation start every hour. The special auto operation mode is entered when operation is started in the following status: <Start condition> Power is supplied white the tele-control signal is being input. (Operation starts automatically.) <End condition> The remote control restores the normal operation mode. Note (1) Since there is no stored calendar data, N&F control is not determined. See Note (2) of N&F auto.
Fan speed mode (indoor fan) — Hi	Operates at “Hi” regardless of the room temperature.	Set to “ultra-Hi” when the compressor runs at maximum speed, and to “Hi” in other modes.	Set to “Hi” in modes other than when the compressor stops.	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.		
Fan speed mode (indoor fan) — Med	Operates at “Med” regardless of the room temperature.	Same as at left.	Set to “Med” in modes other than when the compressor stops.	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).		
Fan speed mode (indoor fan) — Lo	Operates at “Lo” regardless of the room temperature.	Same as at left.	Set to “Lo” in modes other than when the compressor stops.	Set to “ultra-Lo”, “Lo”, or “stop” depending on the room temperature and time. Set to “stop” if the room temperature is 18˚C in the “ultra-Lo” mode other than during 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: 		
Basic operation of temperature controller	Performs only fan operation at the set speed regardless of the room temperature. 	See page 49.	See page 53.	See page 55.		
Sleep operation (with sleep button ON)	• Enters sleep operation after set as on the left. • Action during sleep operation Lo (sleep) operation	• Same as at left • See page 51.	• Same as at left • See page 53.	• Same as at left • See page 57.	• Same as at left. • Performs the sleep operation of each operation mode.	

Table 1 Mode data file

	RAK-25NH4	RAK-35NH4	RAK-50NH4
LABEL NAME	**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



Notes:

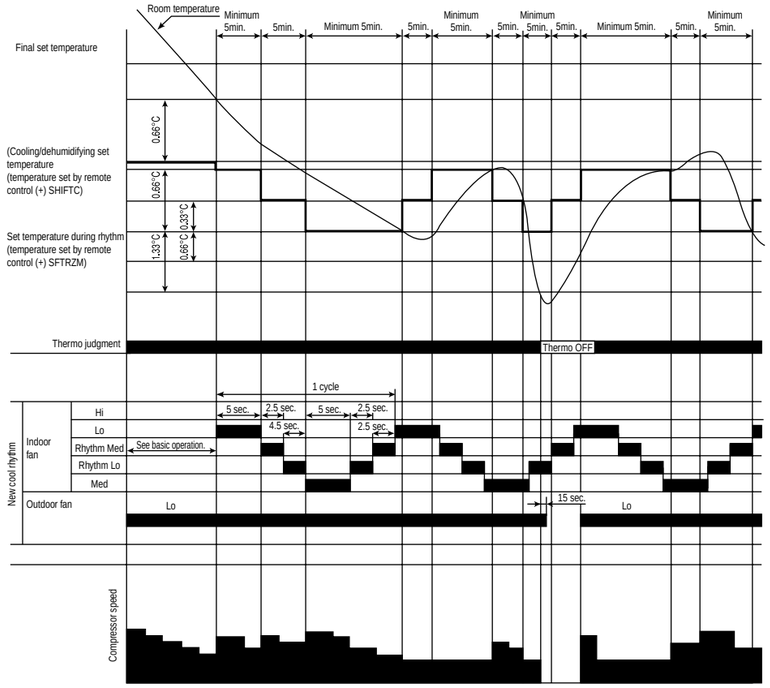
(1) Condition for entering into Cool Dashed mode. When fan set to “Hi” or “Auto mode” and temperature difference between indoor temperature and set temperature has a corresponding compressor rpm (calculated value in Table 7) larger than WMAX.
(2) Cool Dashed will release when i) a maximum 25 minutes 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.

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}

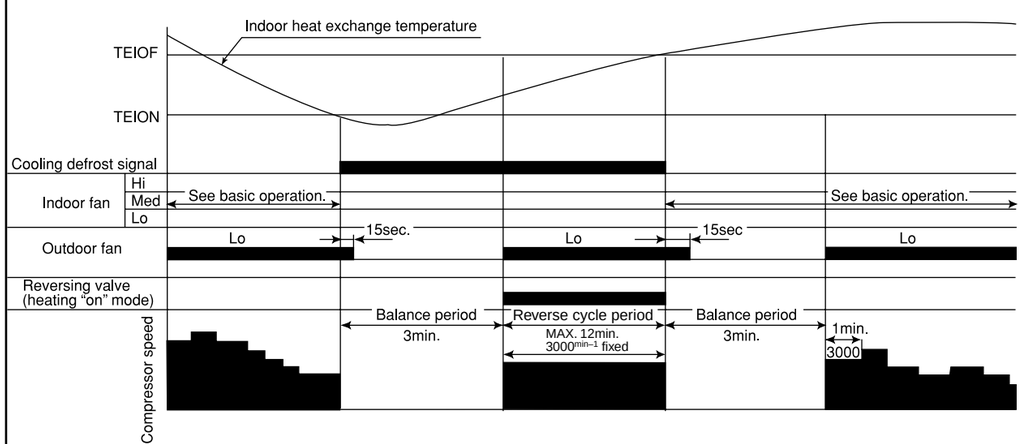
Note:
1. See the data in Table 1 on page 47 for each constant in capital letters in the diagrams.

New Cool Rhythm

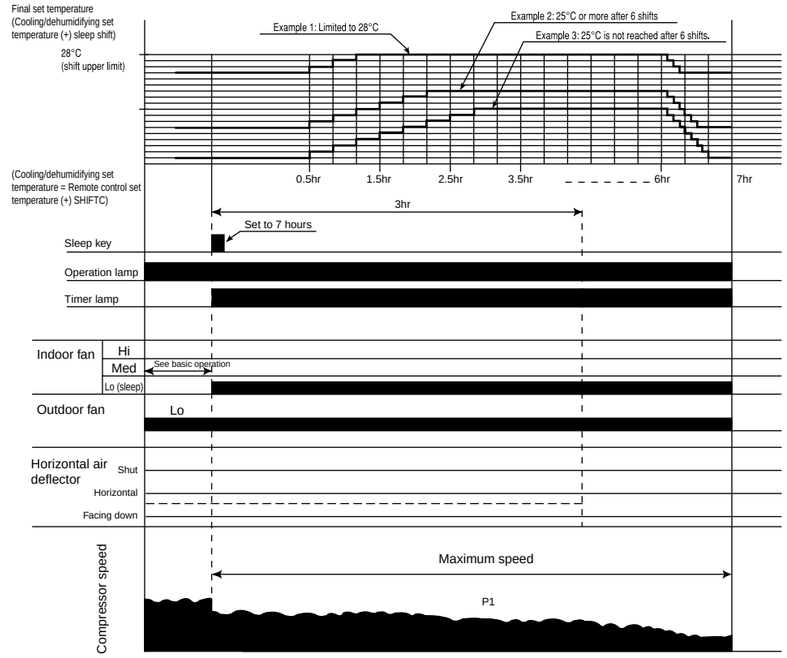


Notes:
(1) New cool rhythm is engaged when the fan speed is “auto” and the room temperature is less than set one plus 0.66˚C in the “auto” operation mode or cooling mode.
(2) The minimum new cool rhythm time is 10 minutes when the temperature falls and rises.
(3) Cool rhythm is not engaged during Nice 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

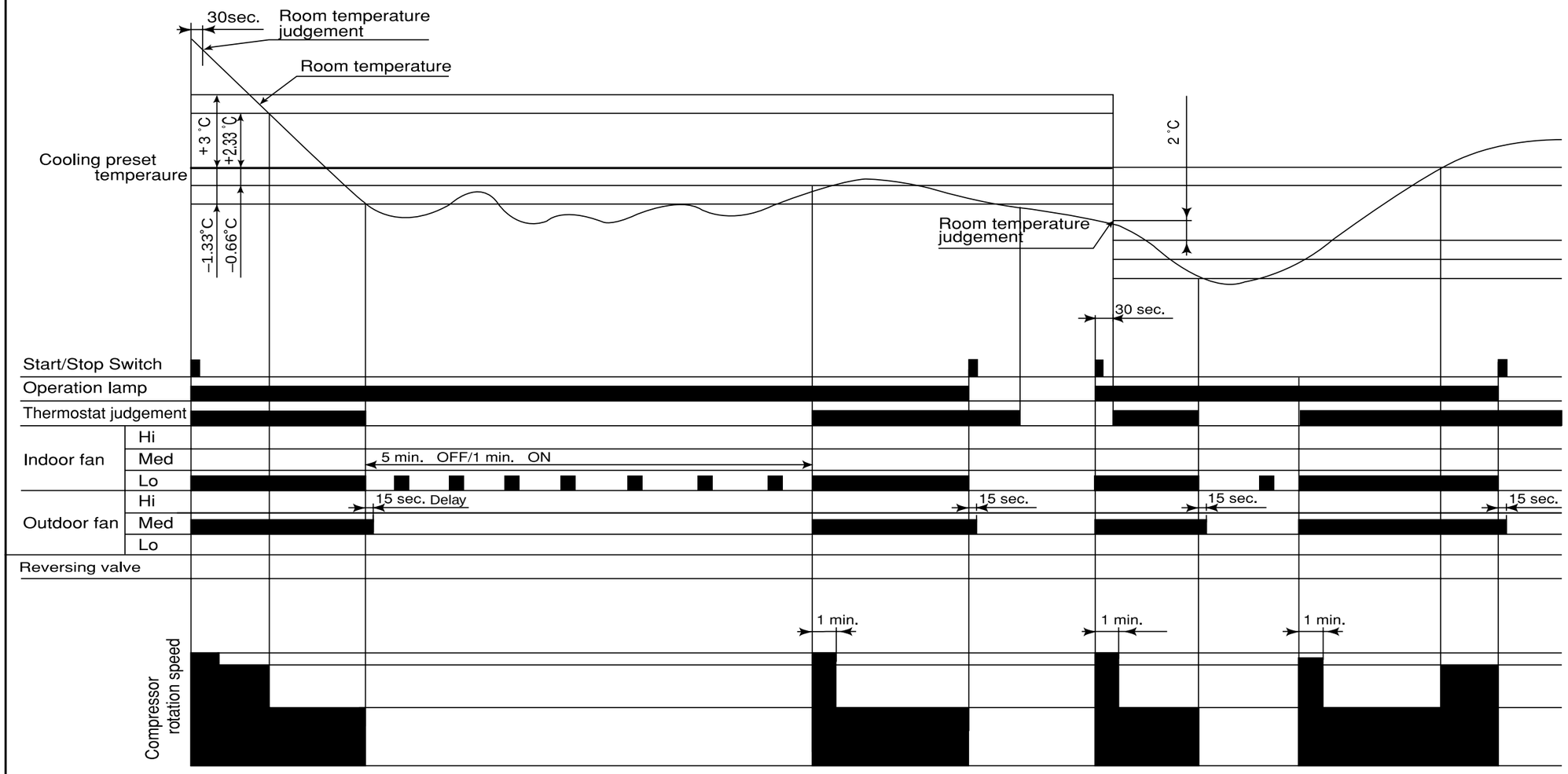


Cooling Sleep Operation



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.

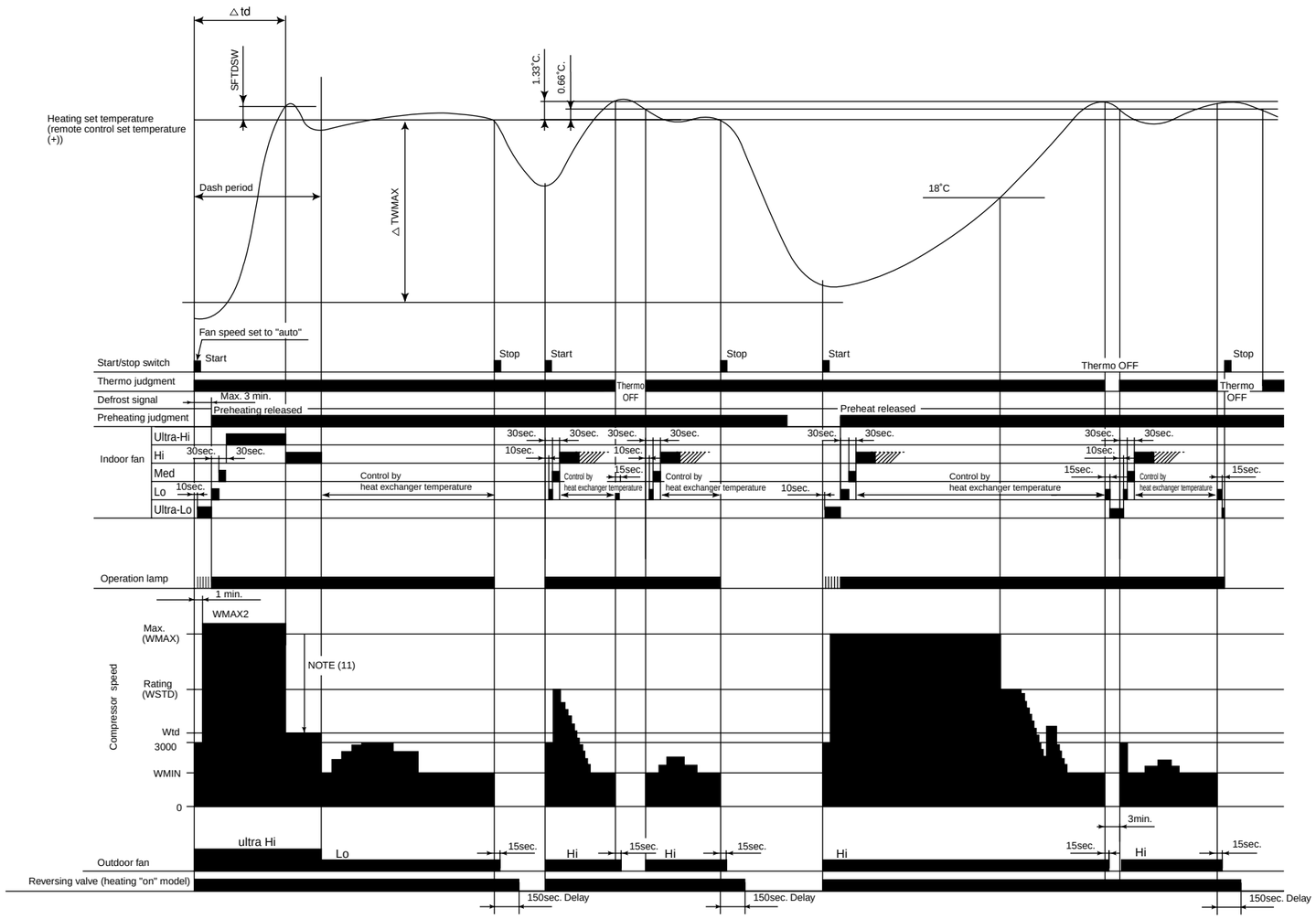
Dehumidifying



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



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.

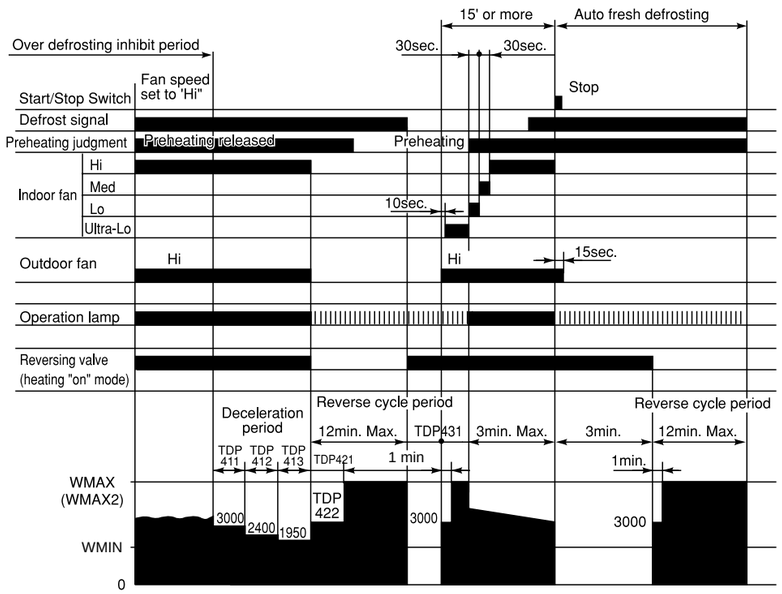
Table 3 ΔTWMAX

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.

Reversing Valve Defrosting



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.

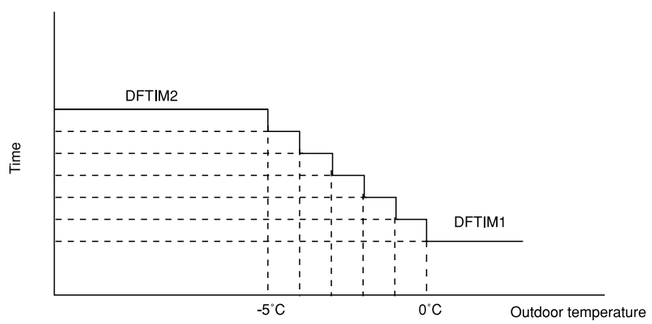
(2) If the difference between the room and outdoor temperature is large when defrosting is finished, the maximum compressor speed (WMAX) or (WMAX2) can be continued for 120 minutes maximum.

(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



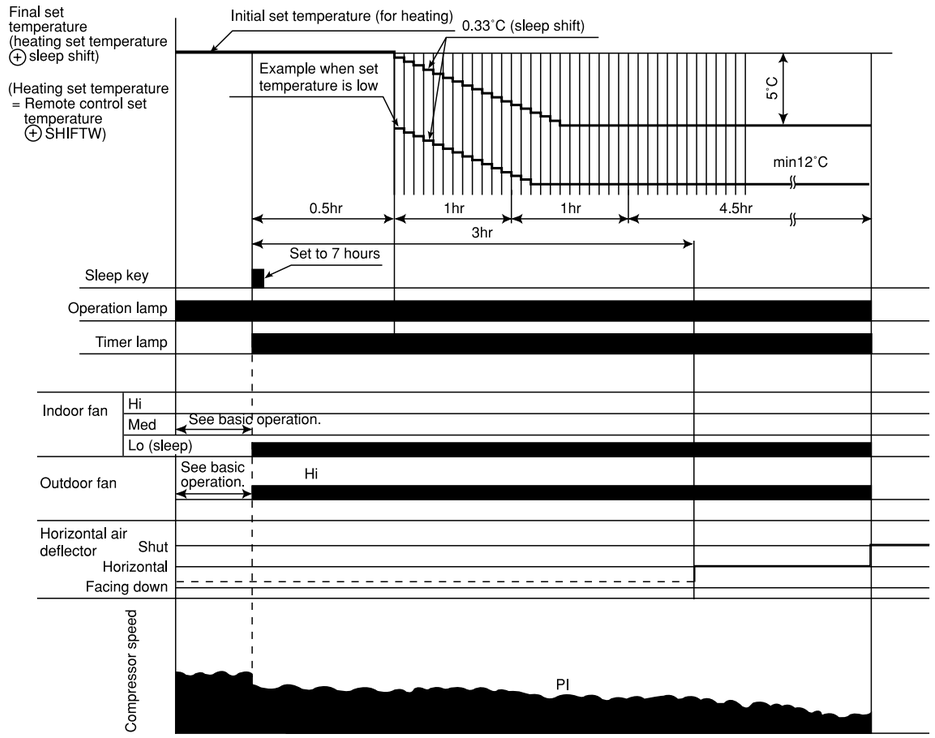
Notes:

(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



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.

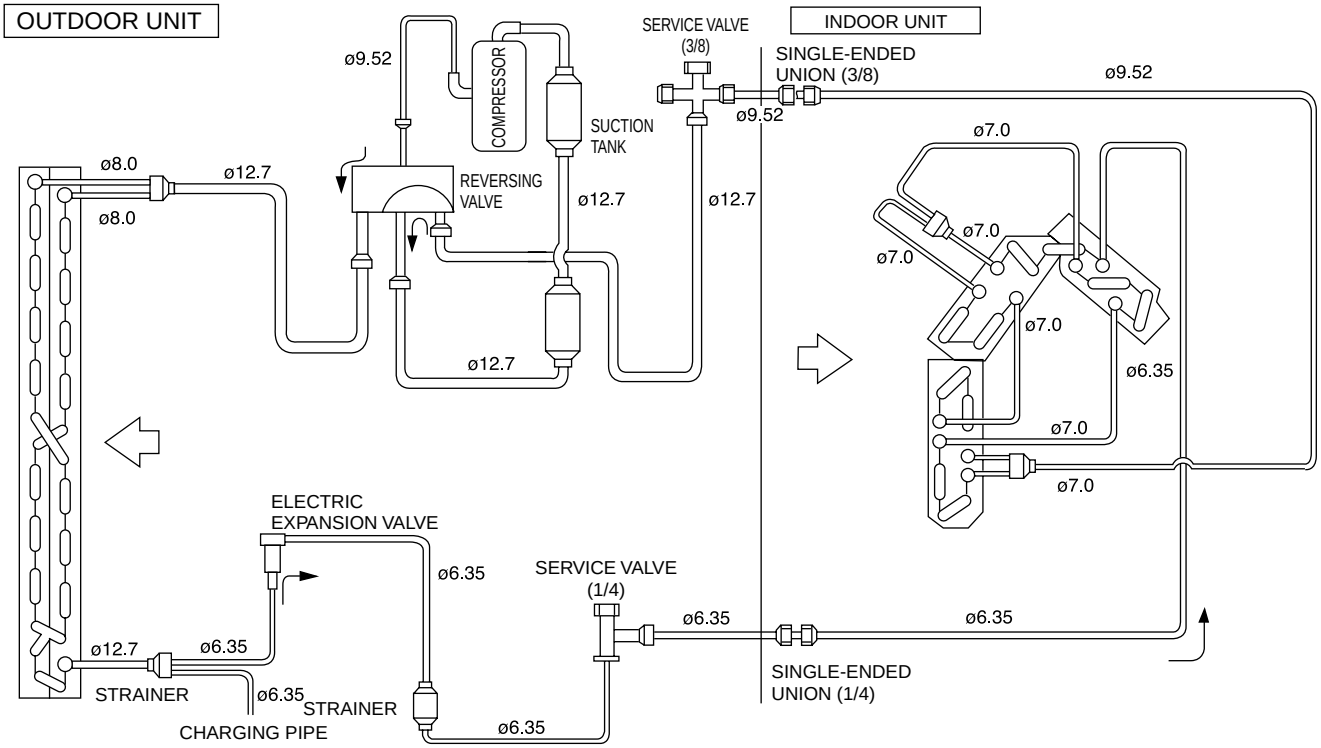
(9) If the set time is changed during sleep operation, all data including set temperature, time, etc. is cleared and restarted.

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

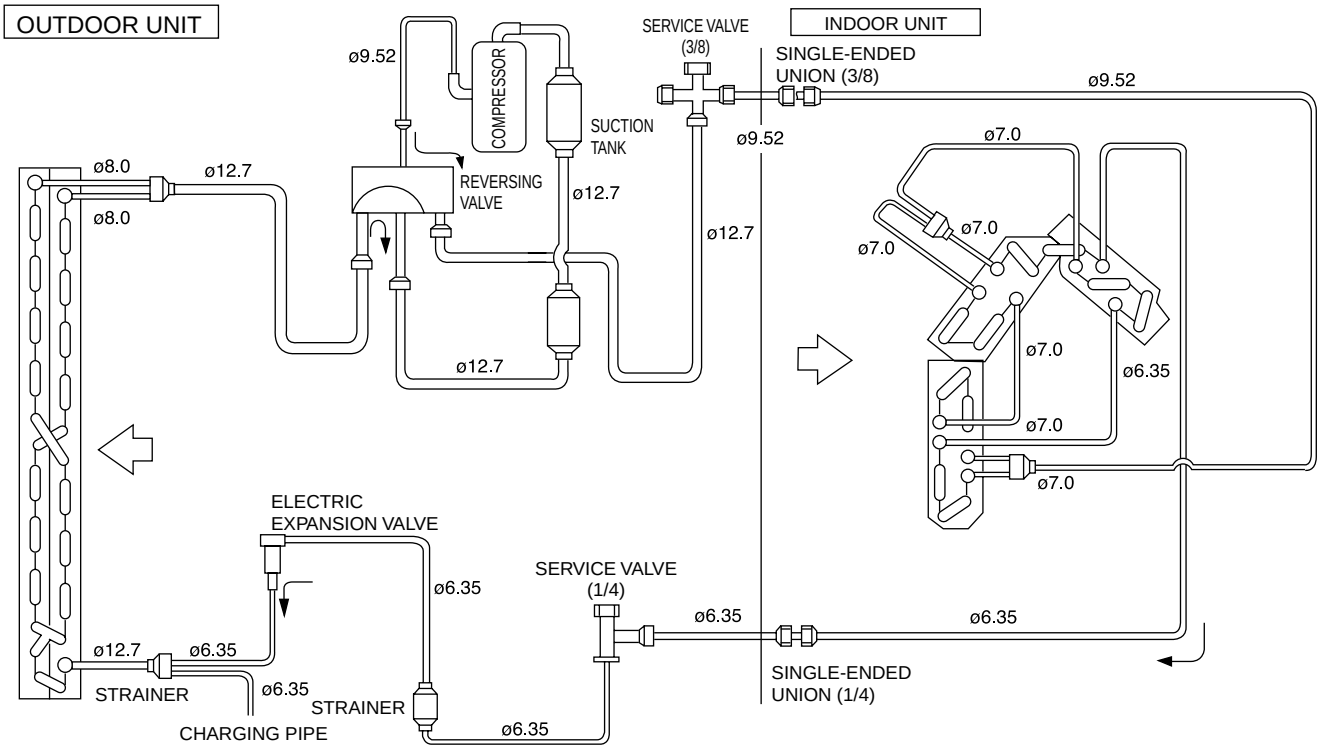
REFRIGERATING CYCLE DIAGRAM

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

COOLING, DEHUMIDIFYING, DEFROSTING



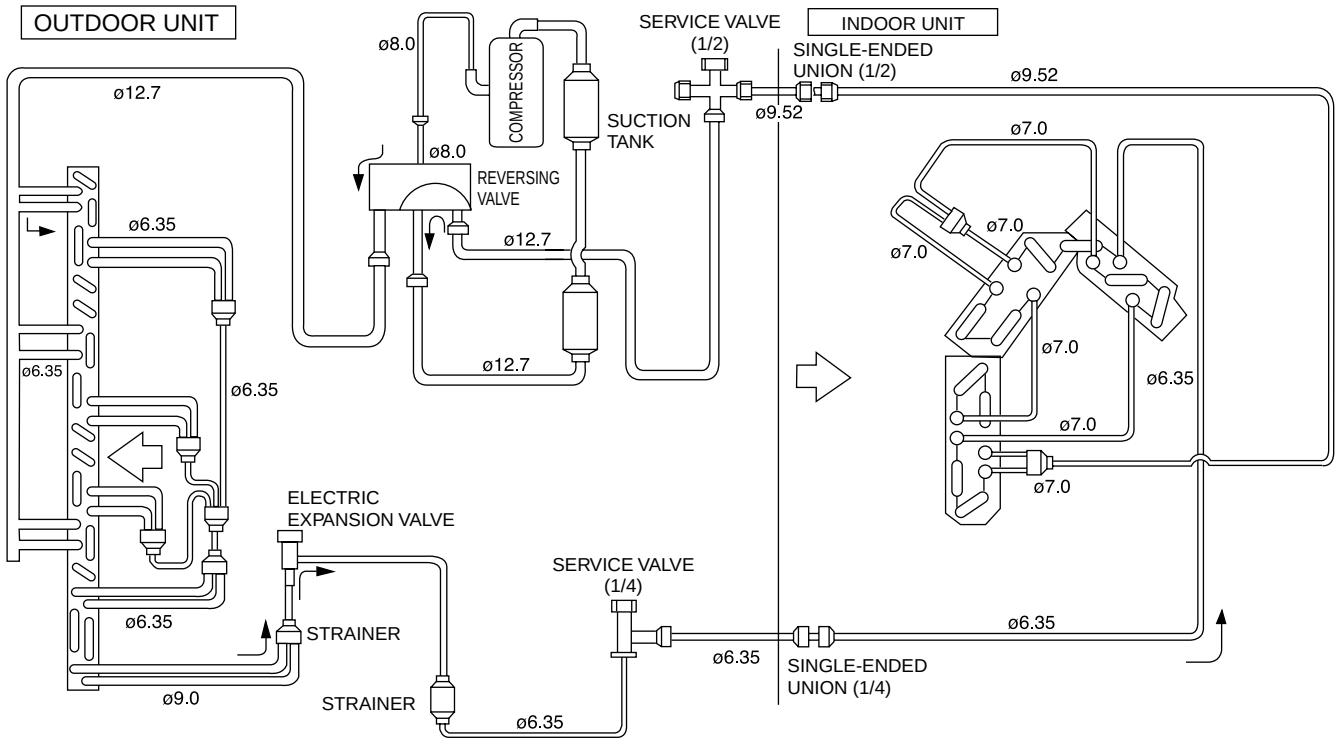
HEATING



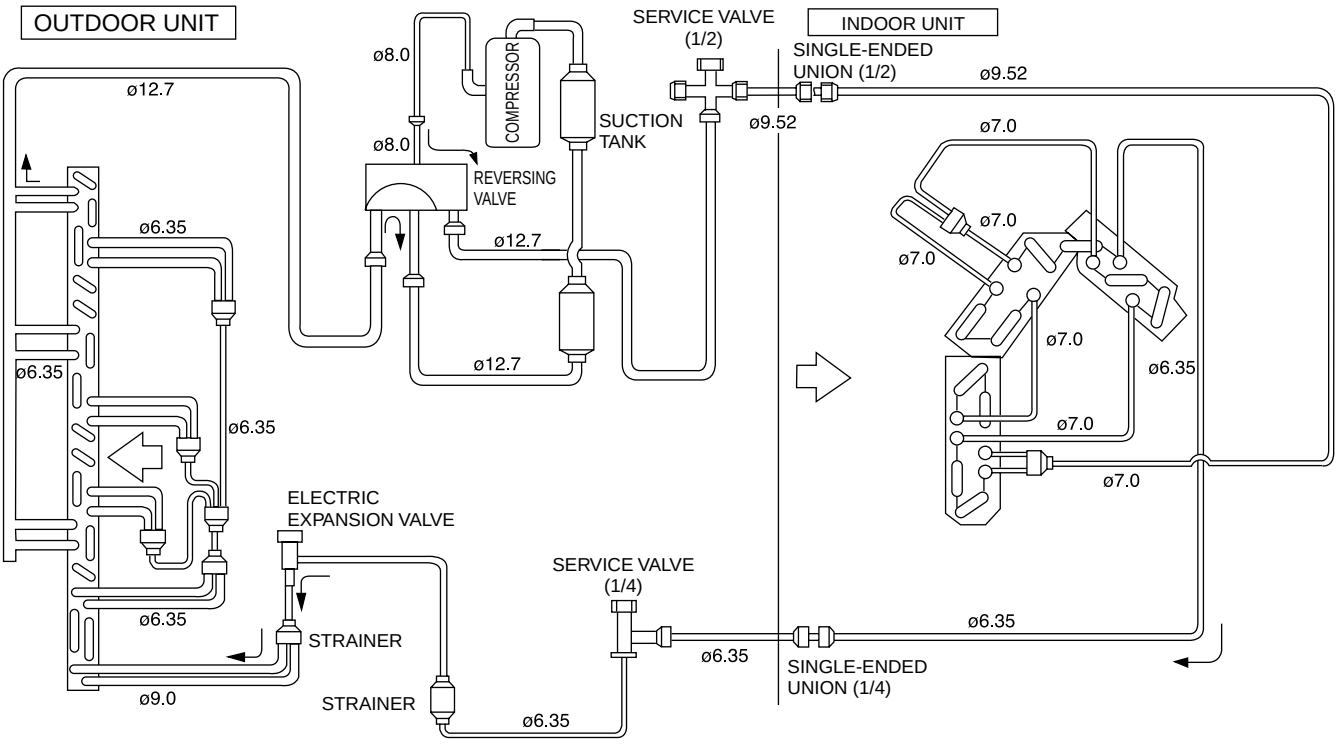
REFRIGERATING CYCLE DIAGRAM

MODEL RAK-50NH4 / RAC-50NH4

COOLING, DEHUMIDIFYING, DEFROSTING



HEATING



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 AUTO HAET HEAT CIRCULATOR	TEMPORARY STOP	START SWING AGAIN.	
THERMO. ON (INTERNAL FAN OFF)			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		
CHANGE OF OPERATION	DURING OPERATION	EACH MODE	STOP	INITIALIZING CONDITION OF EACH MODE.	
			DURING SWINGING	STOP SWINGING AND MODE BECOMES INITIALIZING CONDITION.	

DESCRIPTION OF MAIN CIRCUIT OPERATION

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

1. Reset Circuit

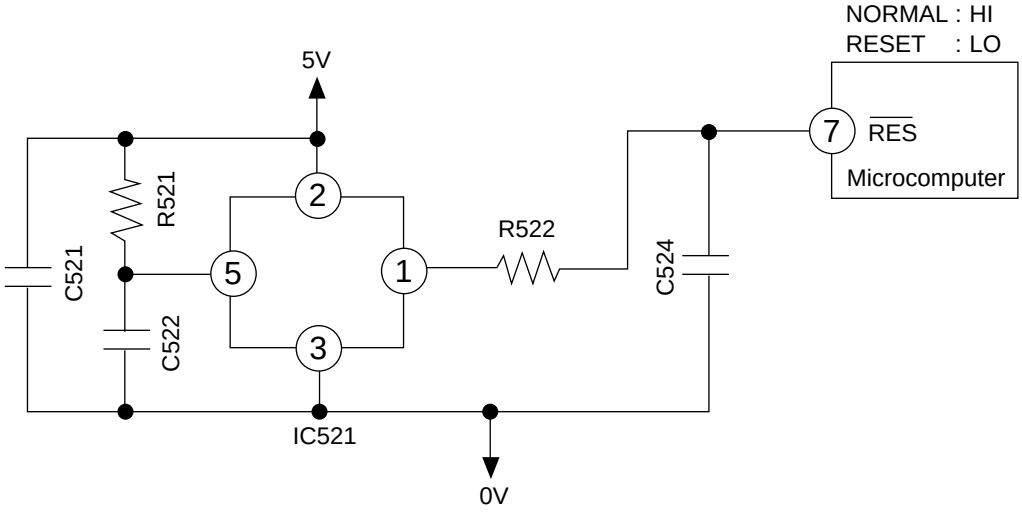


Fig. 1-1

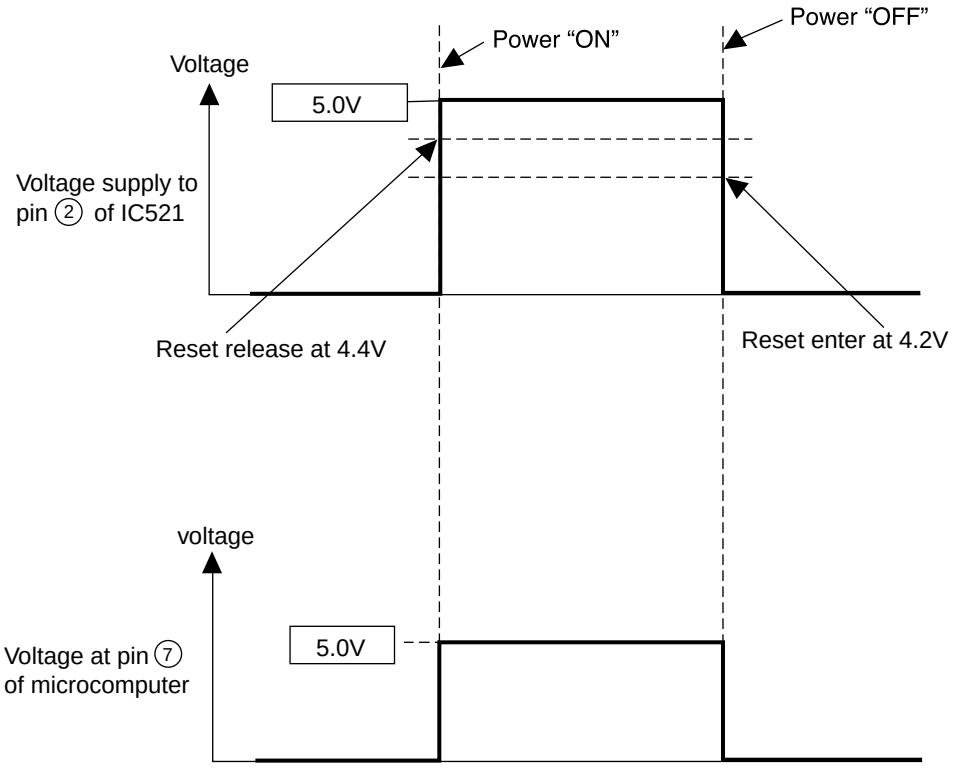


Fig. 1-2

- 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

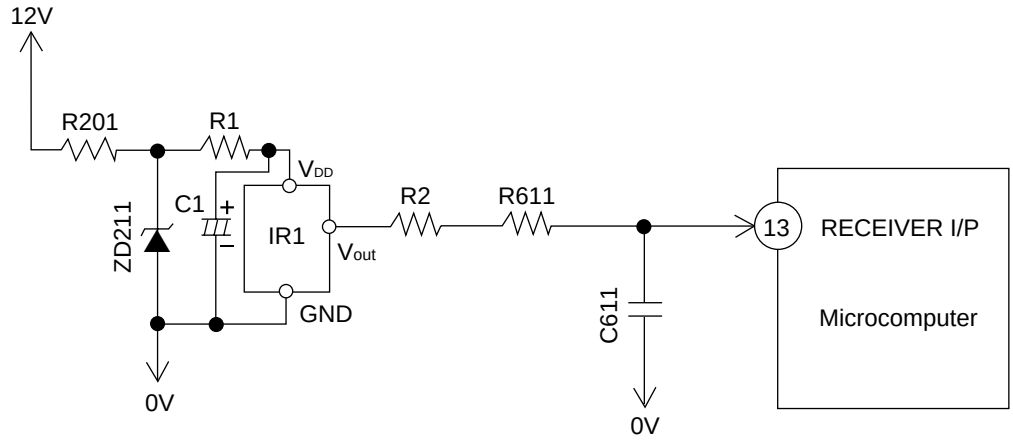


Fig. 2-1

- 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

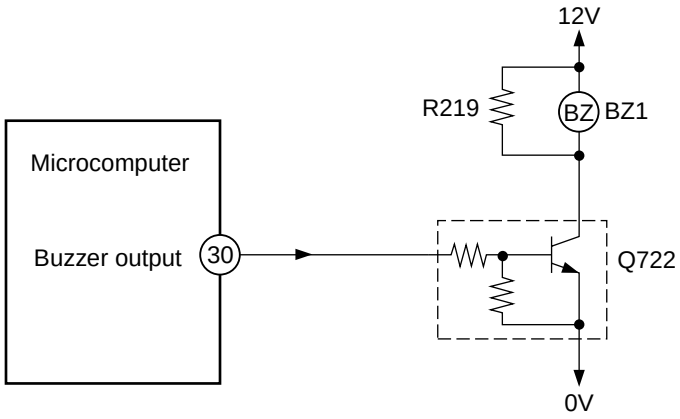


Fig. 3-1 Buzzer Circuit

- 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.

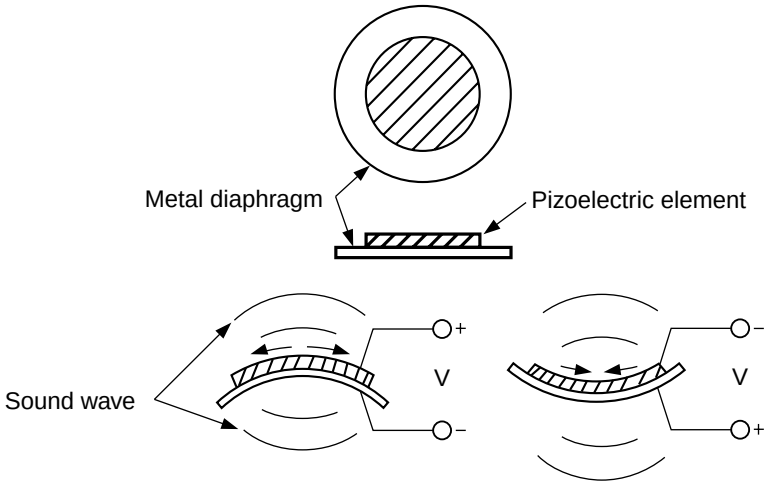


Fig. 3-2 Buzzer Operation

4. Auto Sweep Motor Circuit

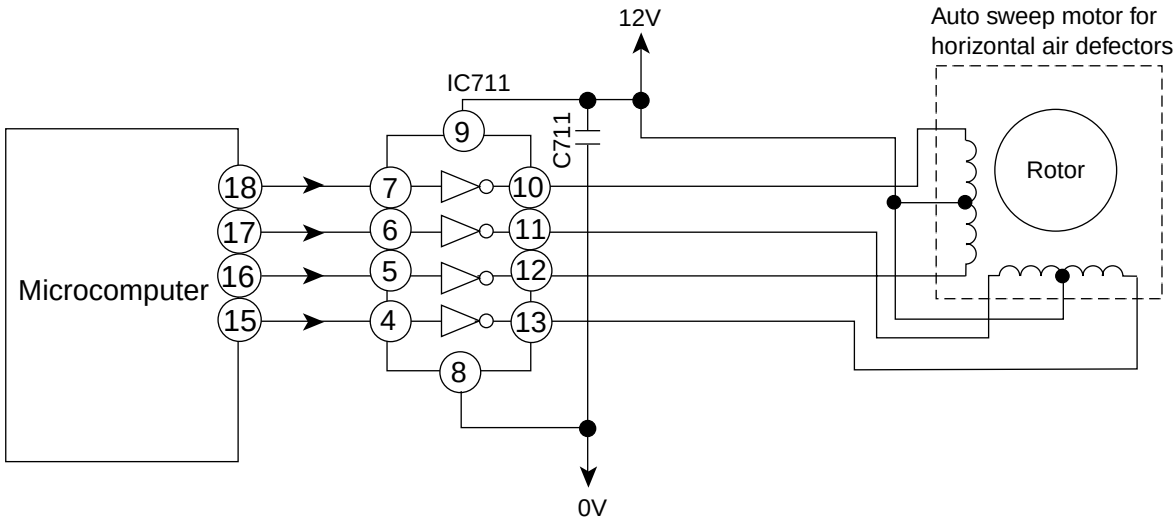


Fig.4-1

- 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.

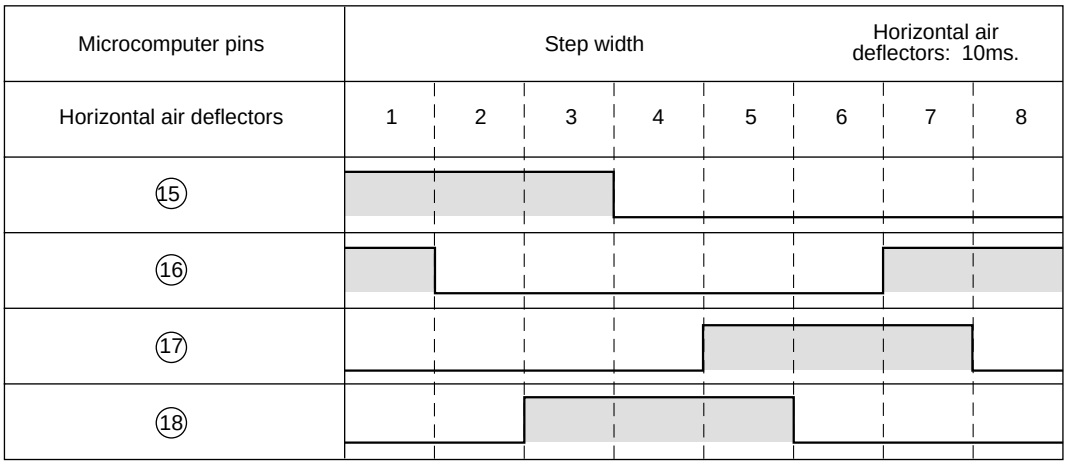


Fig.4-2 Microcomputer Output Signals

- 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.

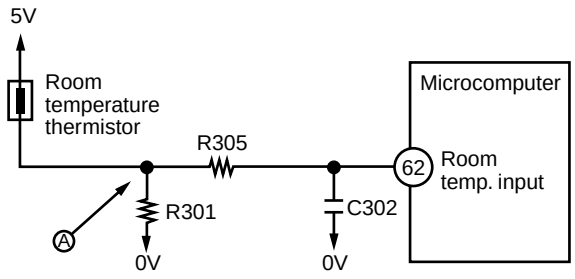


Fig. 5-1

- The voltage at Ⓐ depends on the room temperature as shown in Fig. 5-2.

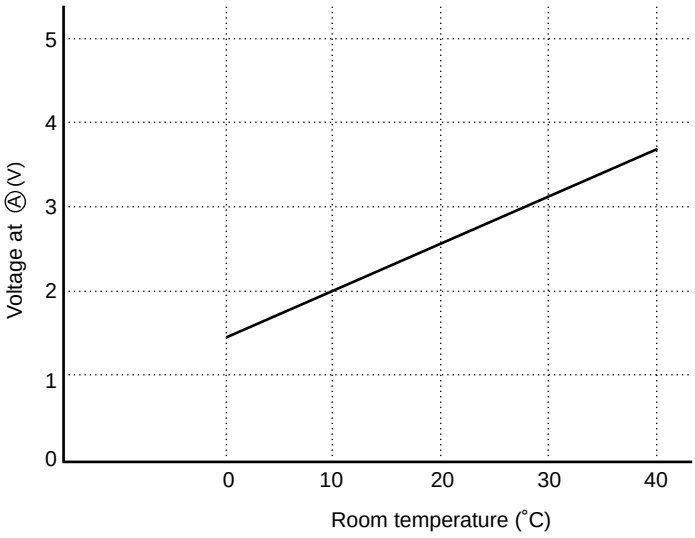


Fig. 5-2

6. Heat exchanger temperature thermistor circuit

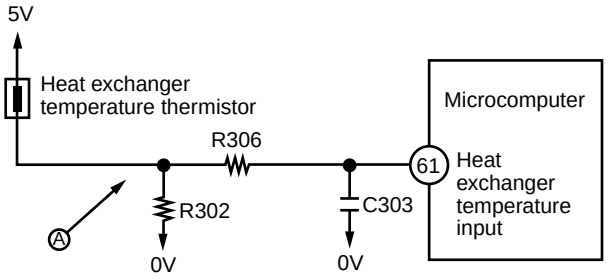


Fig. 6-1

- 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.

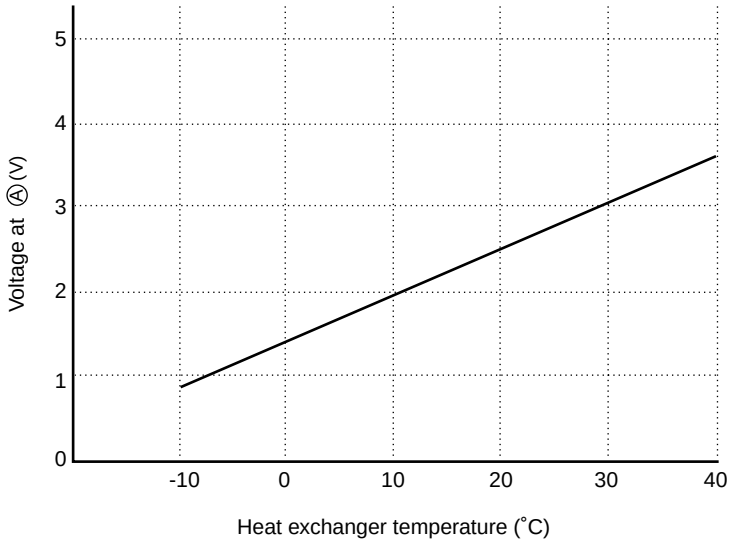


Fig. 6-2

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.

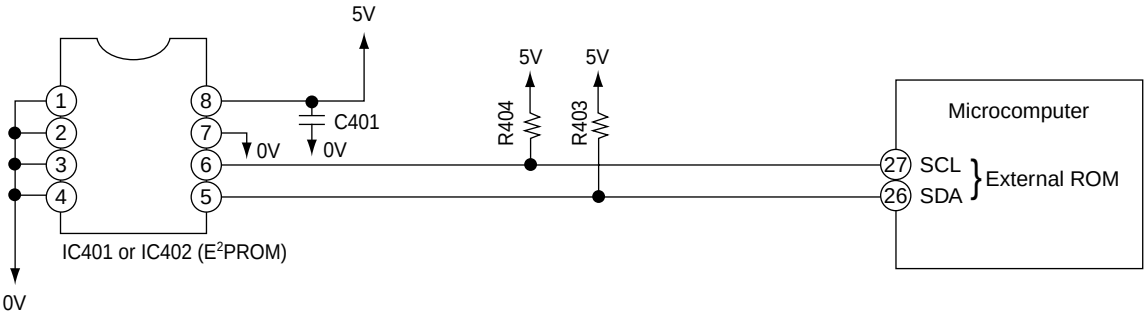


Fig. 7-1

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

1. Power Circuit

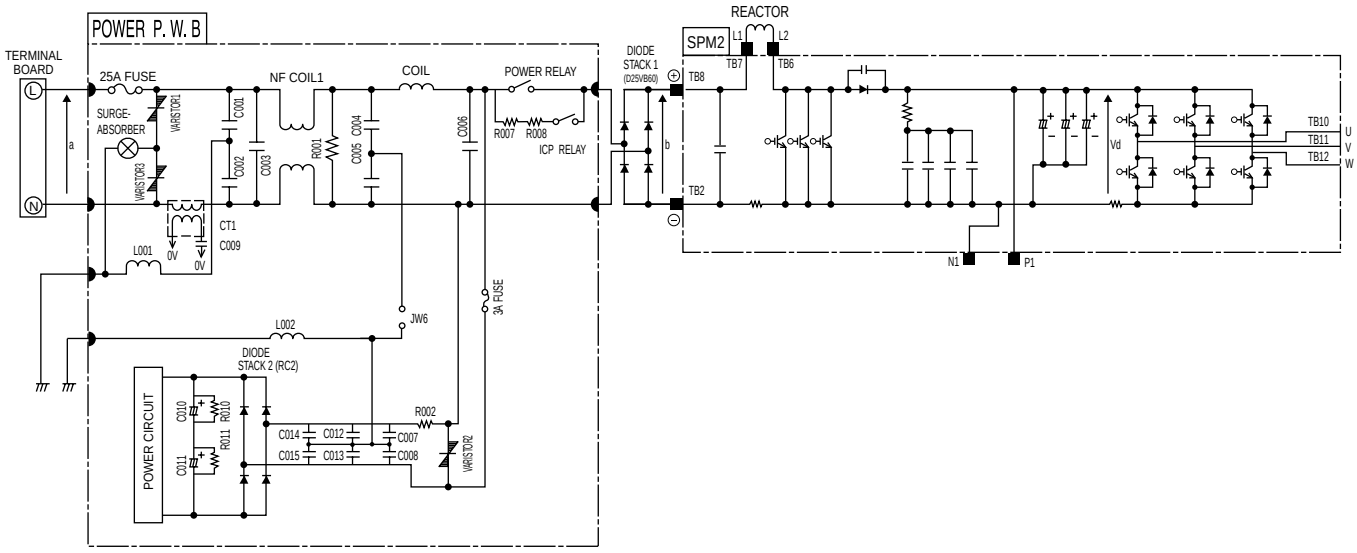


Fig. 1-1

- 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.

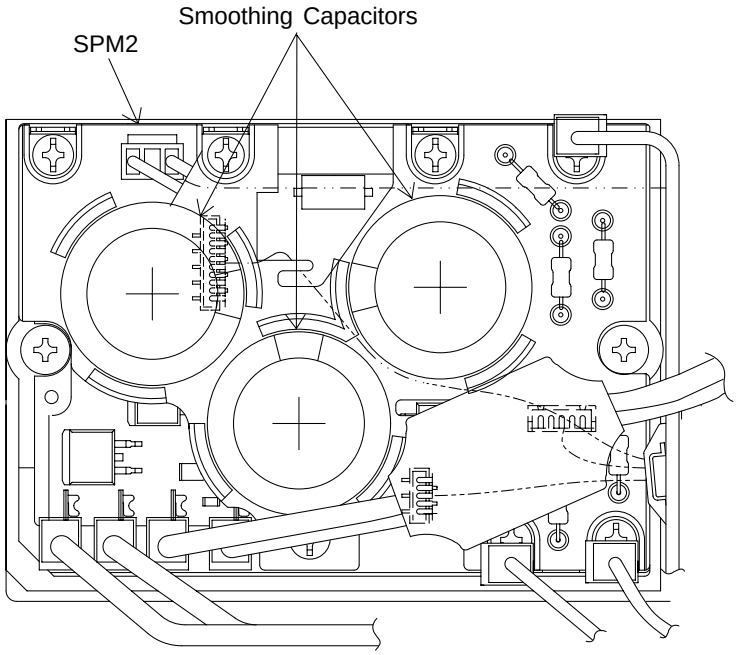


Fig. 1-2

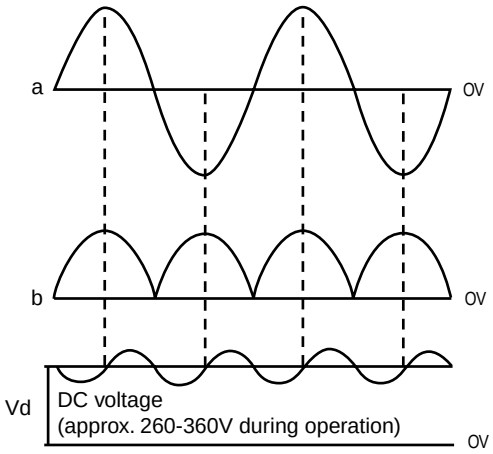


Fig. 1-3

- 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.

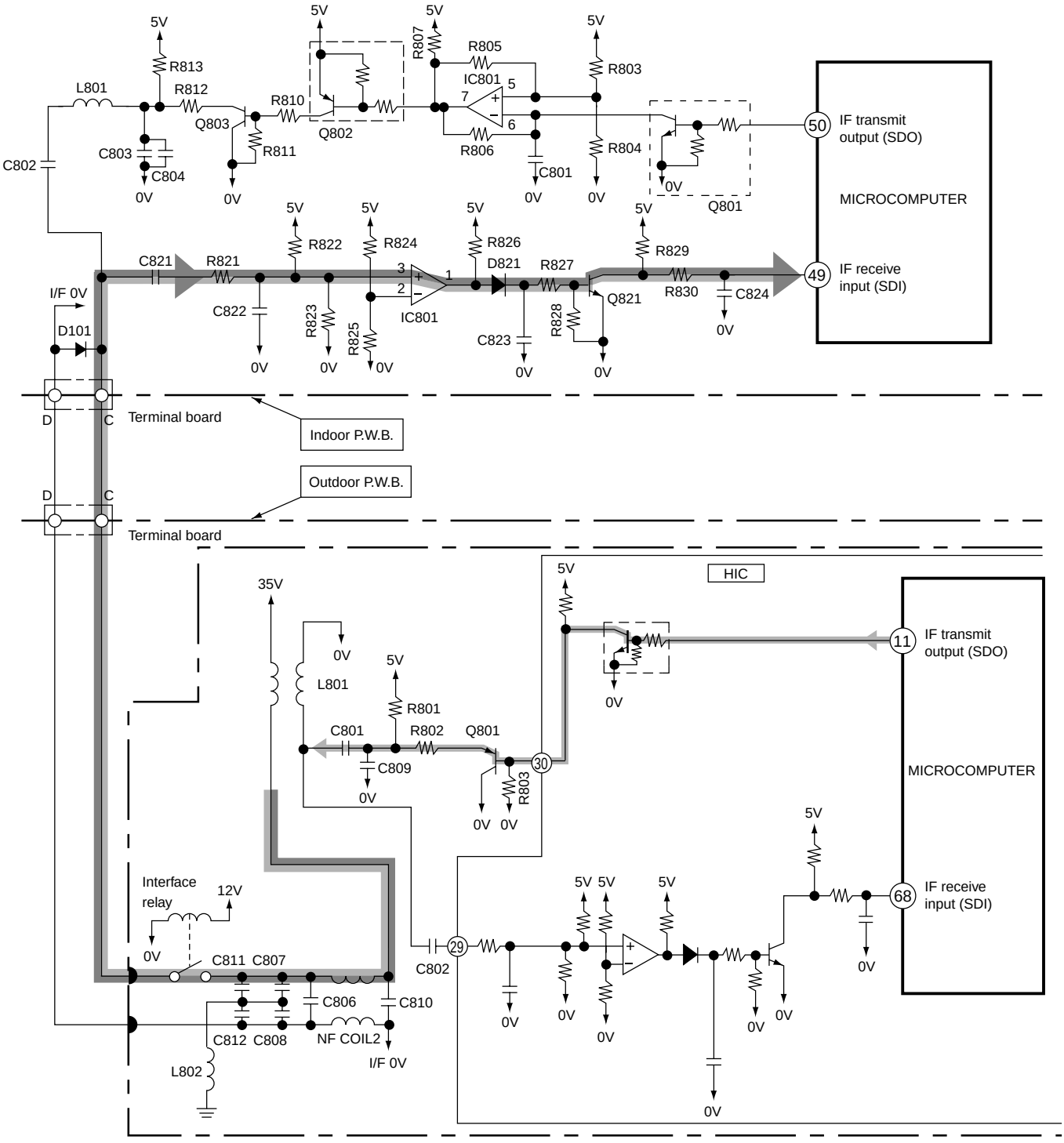


Fig. 2-1 Indoor/outdoor interface Circuit

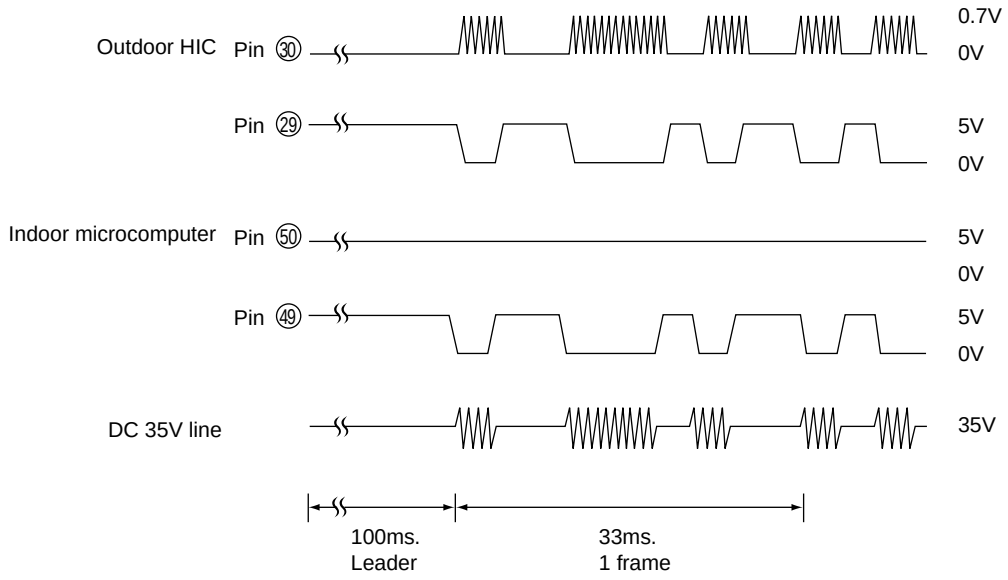


Fig. 2-2 Voltages Waveforms of indoor / Outdoor Microcomputers (Outdoor to Indoor Communications)

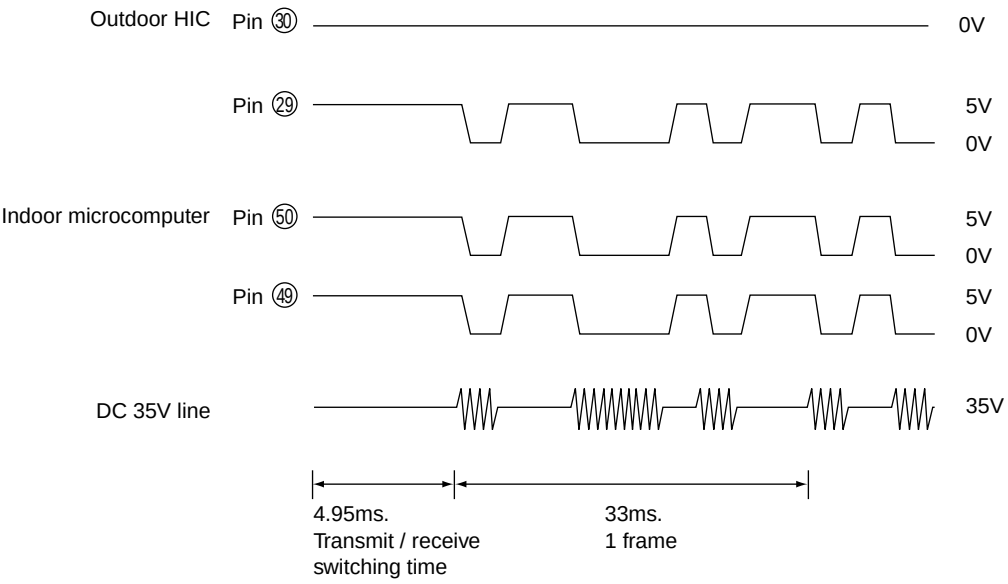


Fig. 2-3 Voltages Waveforms of indoor / Outdoor Microcomputers (Indoor to Outdoor Communications)

[Serial Communications Format during Normal Communications]

(1) Outdoor microcomputer (HIC) to indoor microcomputer

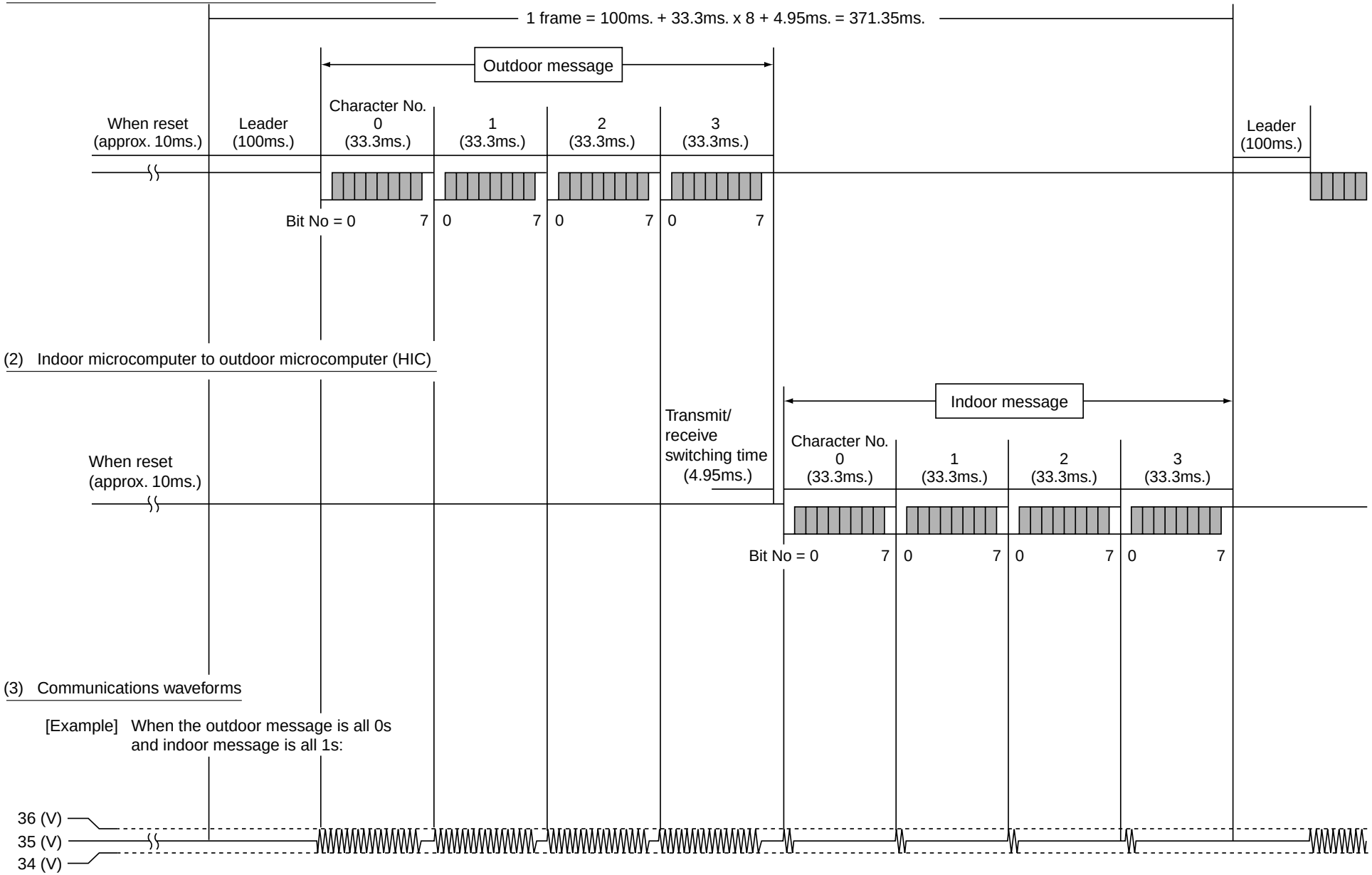


Fig. 2-4

[Serial Communications Data]

(1) Outdoor message

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

(2) Indoor message

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

- 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.

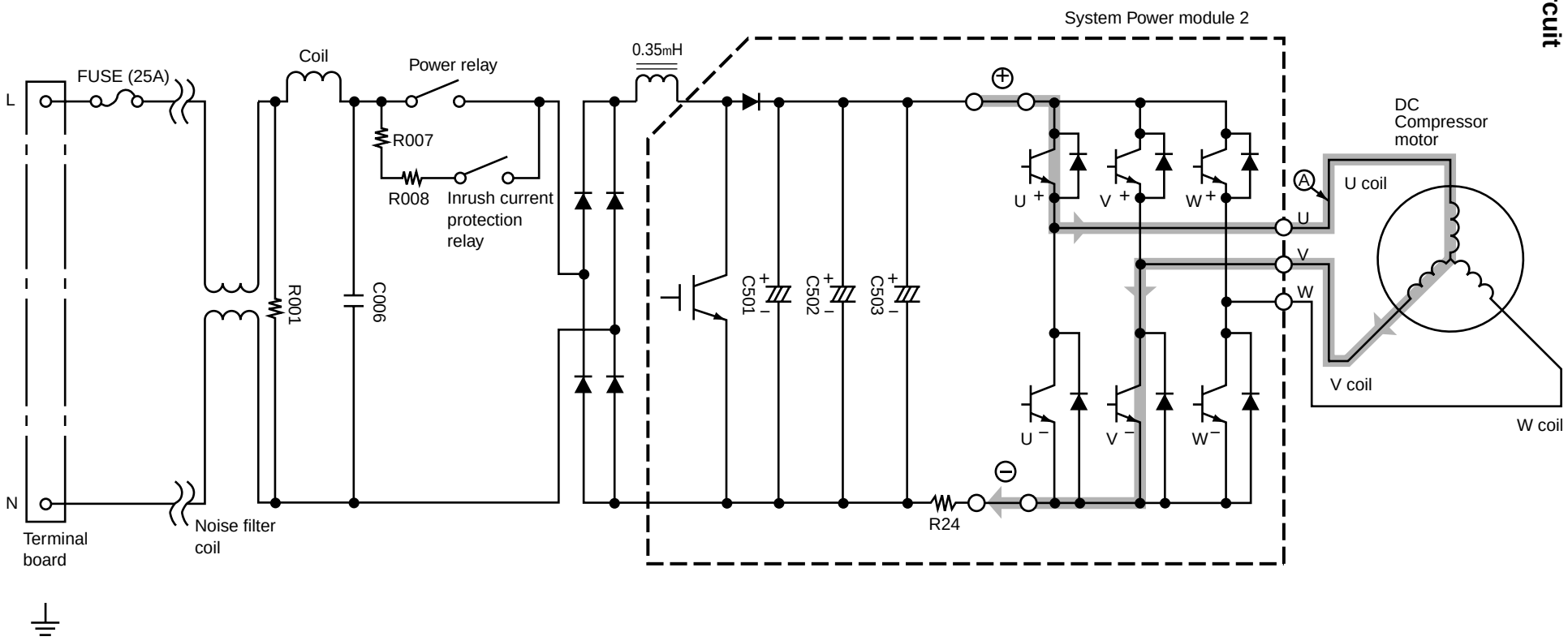


Fig. 3-1 Power module circuit (U^+ is ON, V^- is ON)

- 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.

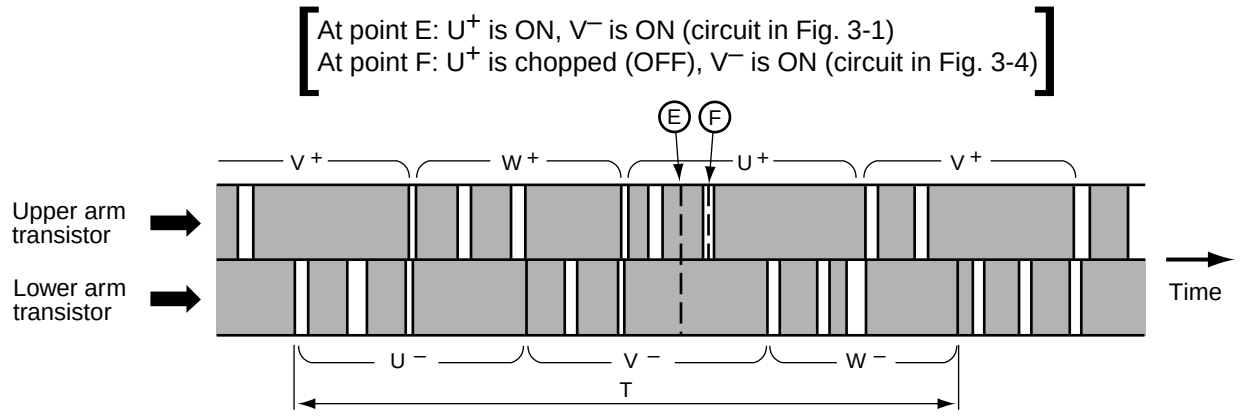


Fig. 3-2 Switching order of power module

- 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.

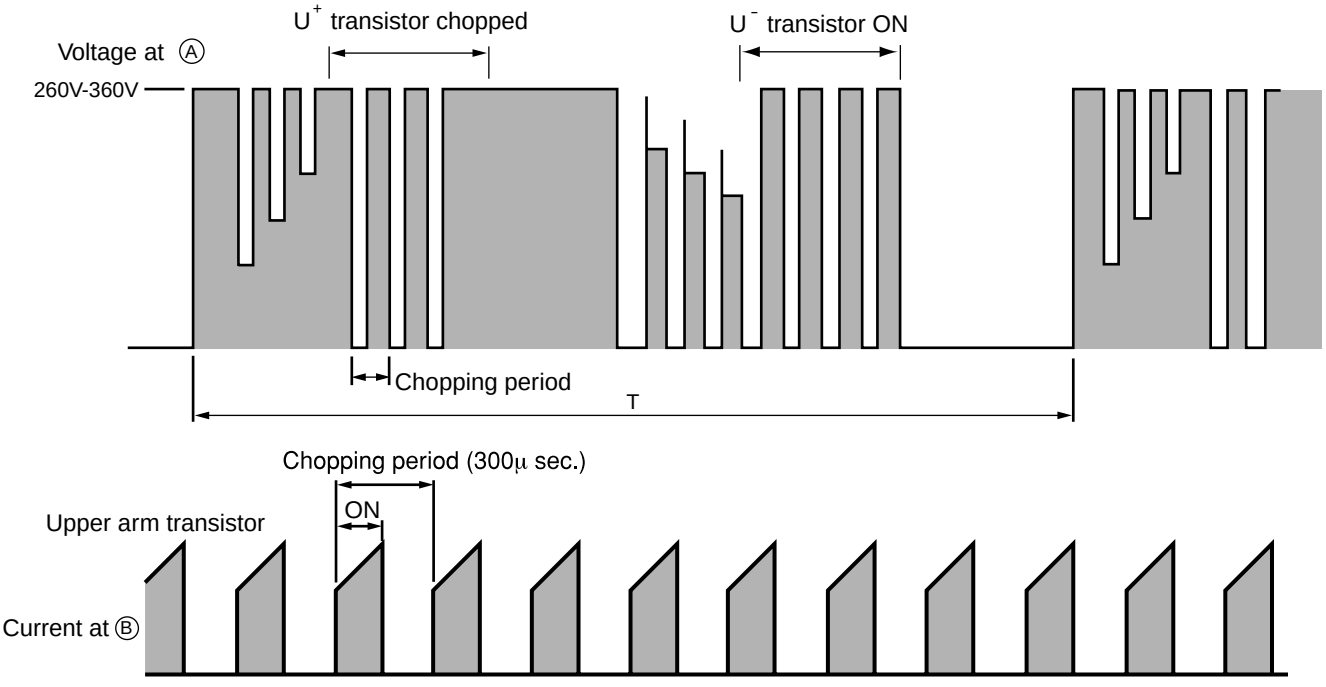


Fig. 3-3 Voltage waveform at each point

- When power is supplied $U^+ \rightarrow U^-$, 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)

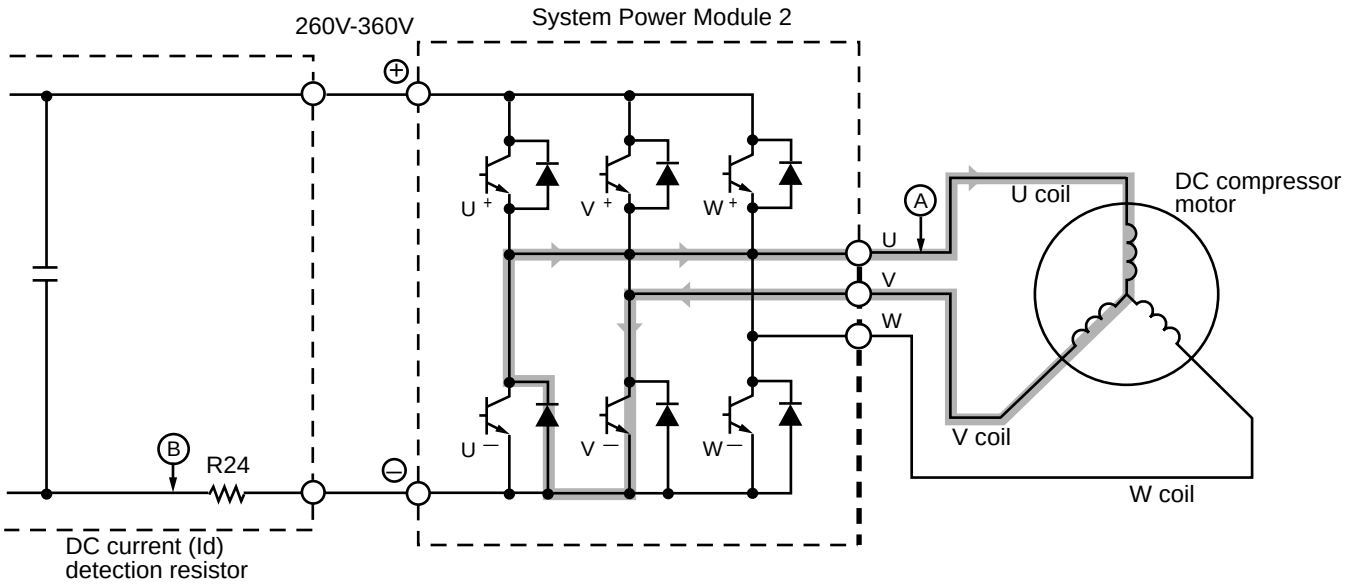


Fig. 3-4 Power module circuit (U^+ is ON, V^- is ON)

- 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:

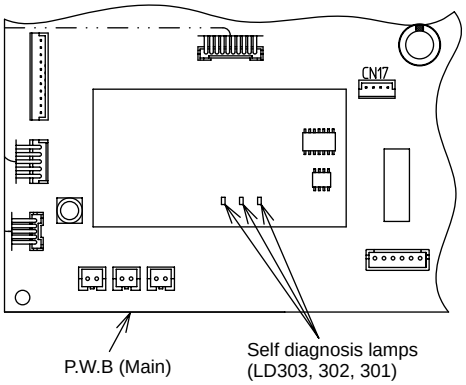


Fig. 3-5

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.

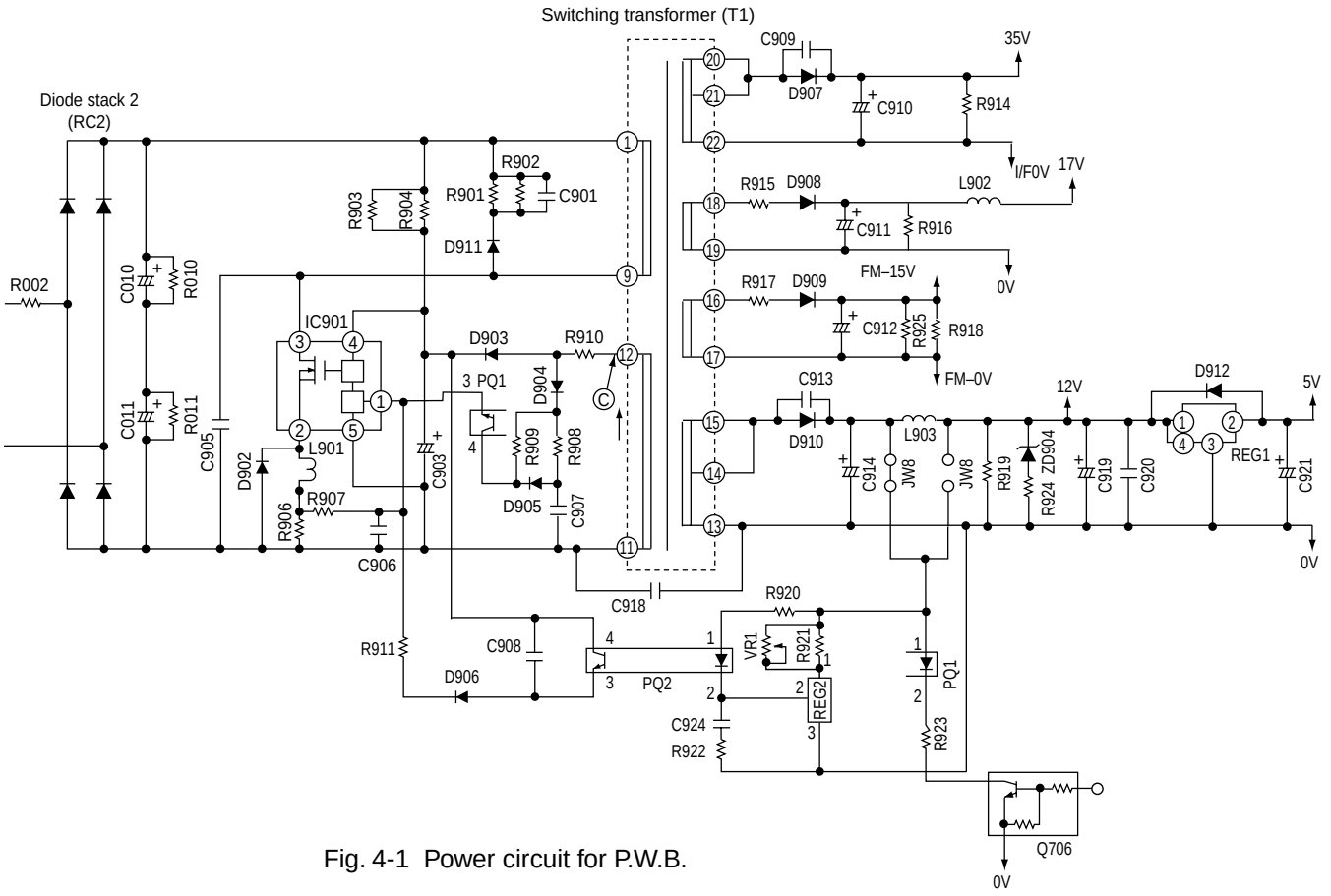


Fig. 4-1 Power circuit for P.W.B.

- 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.

(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=$LI^2/2$. Here, 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

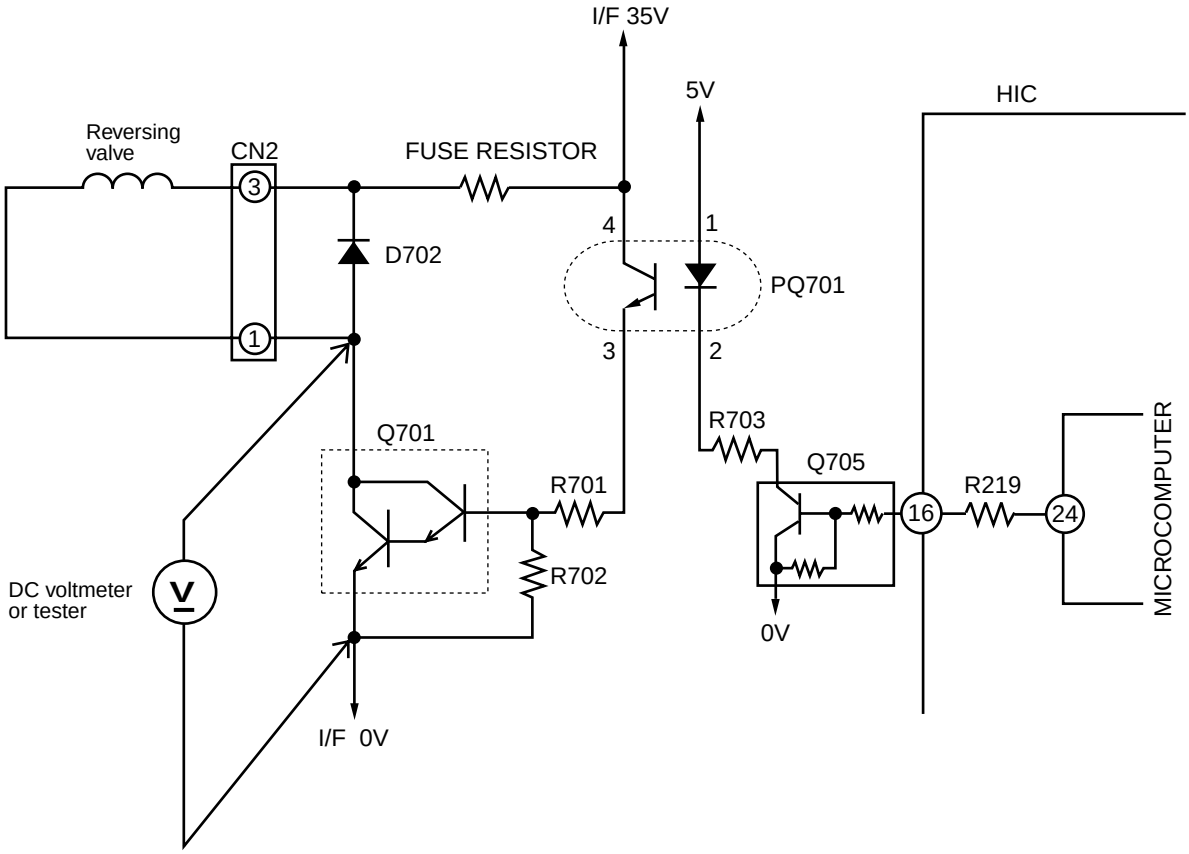


Fig. 5 – 1

- 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

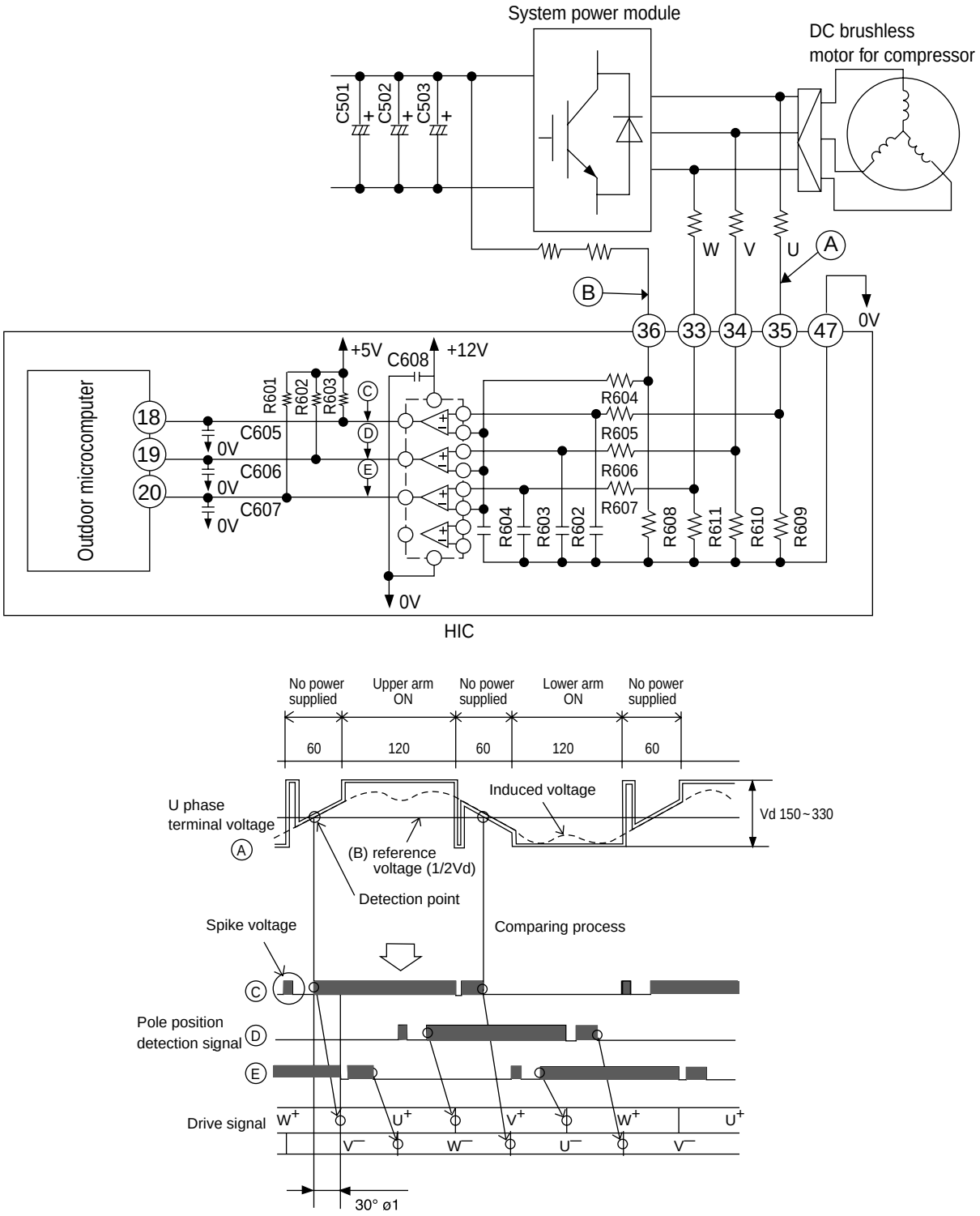


Fig. 6-1 Rotor magnetic pole position detection circuit and voltage waveform at each point

- 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.

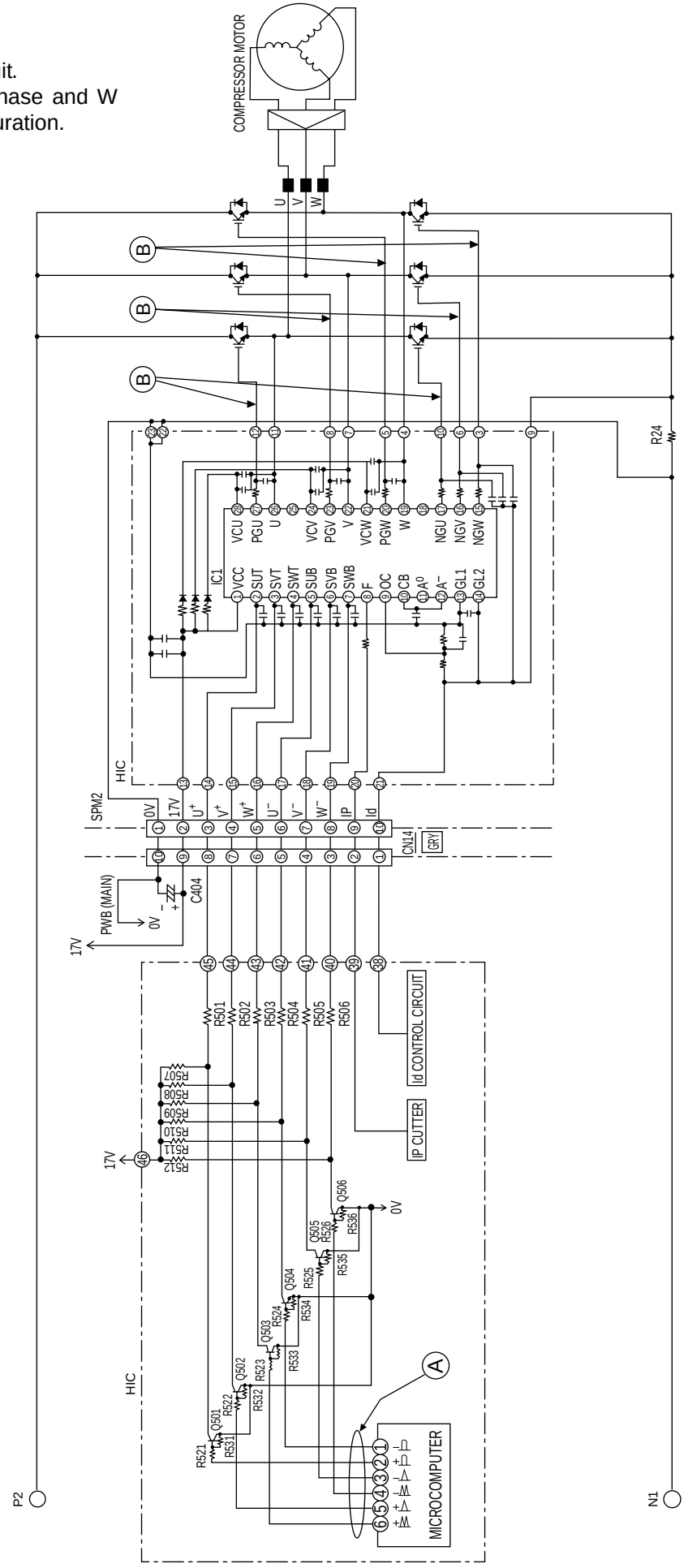


Fig.. 7-1

[Low speed rotation mode]

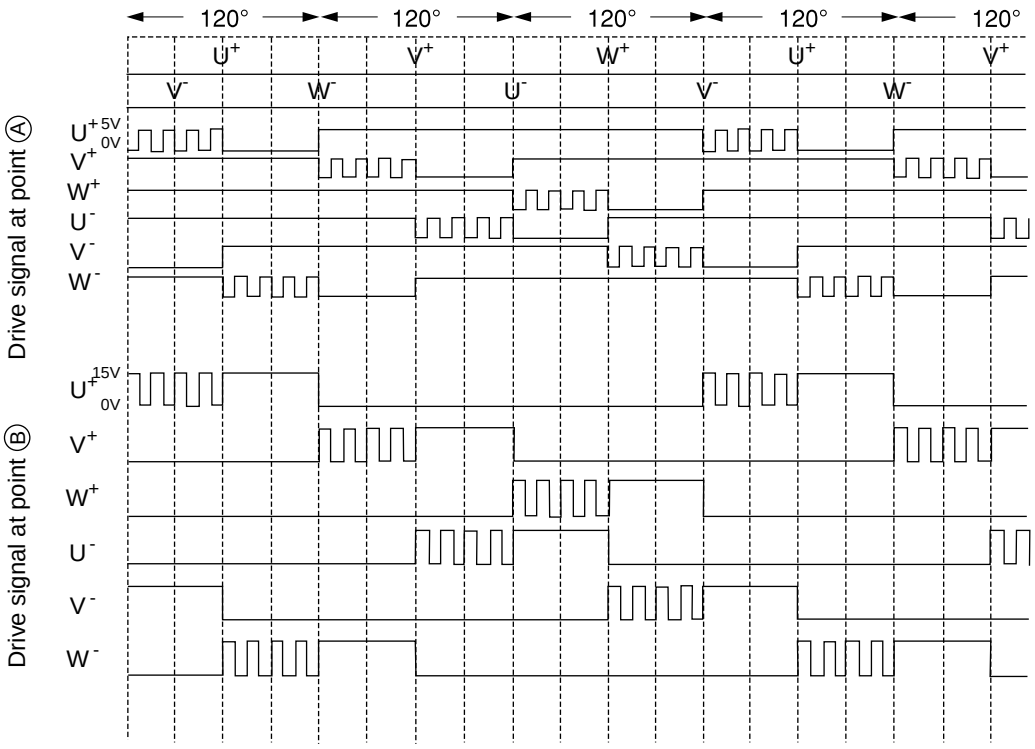


Fig. 7-2

[High speed rotation mode]

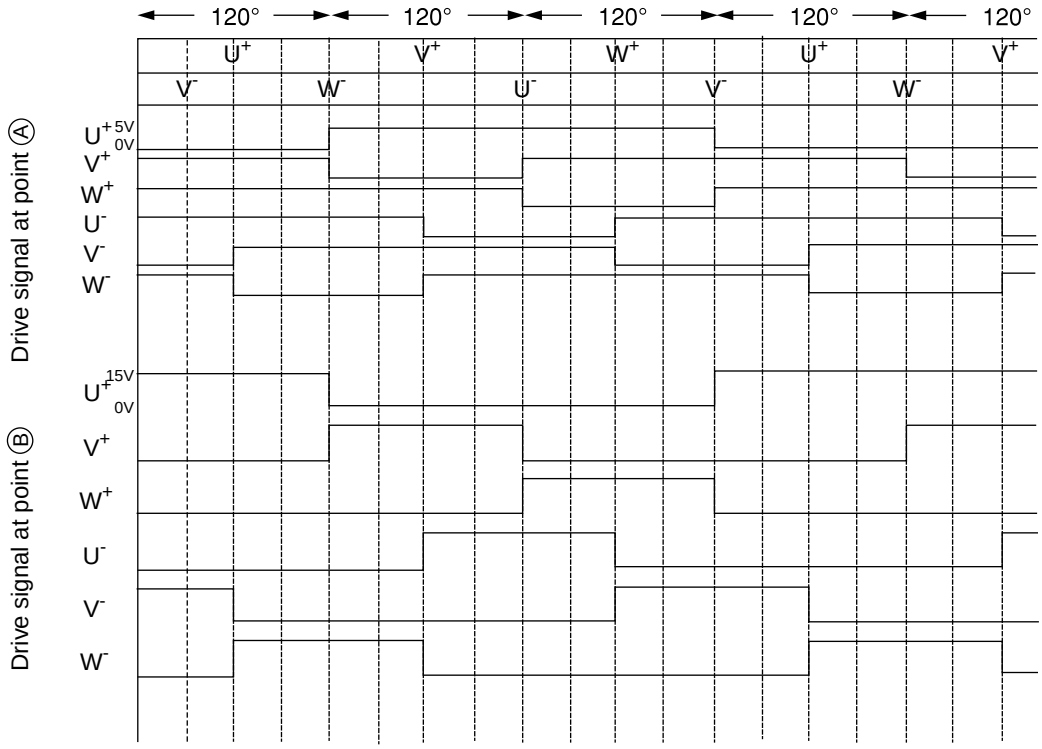


Fig. 7-3

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.

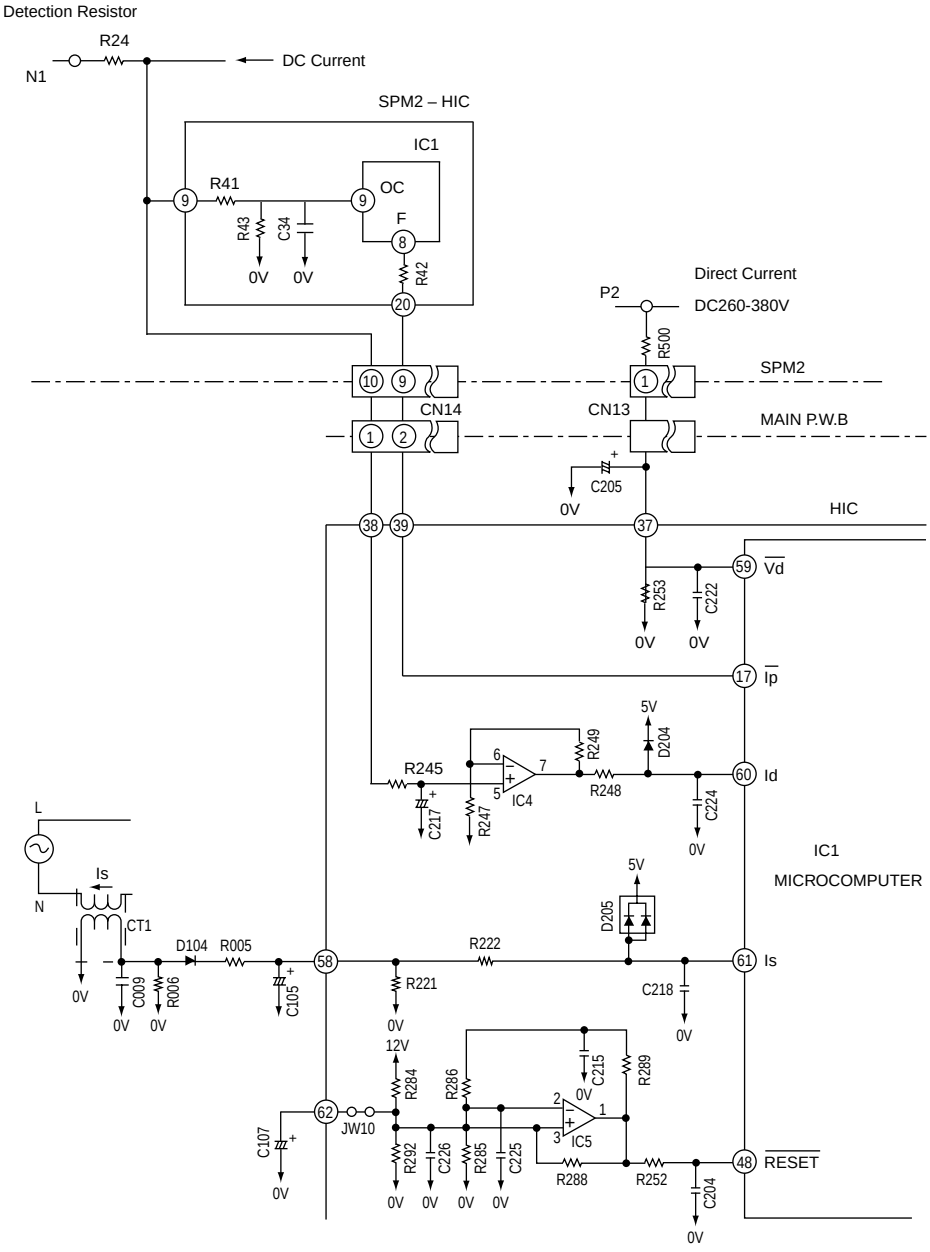


Fig. 8-1 Microcomputer and Peripheral Circuits

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.

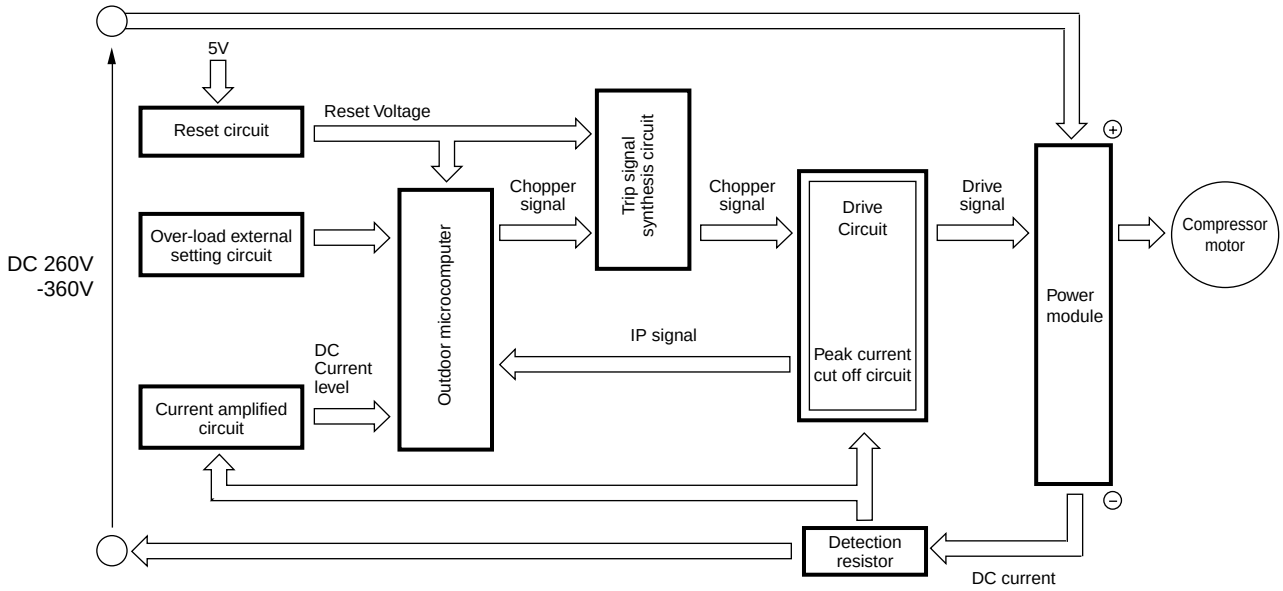


Fig. 8-2

- 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.

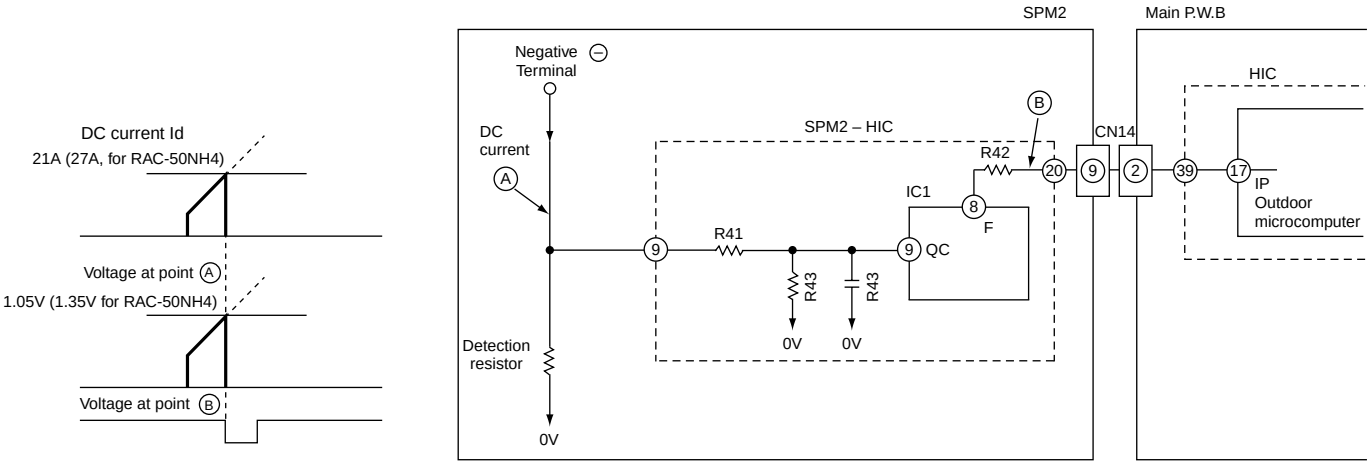


Fig.8-3

- 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.

(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.

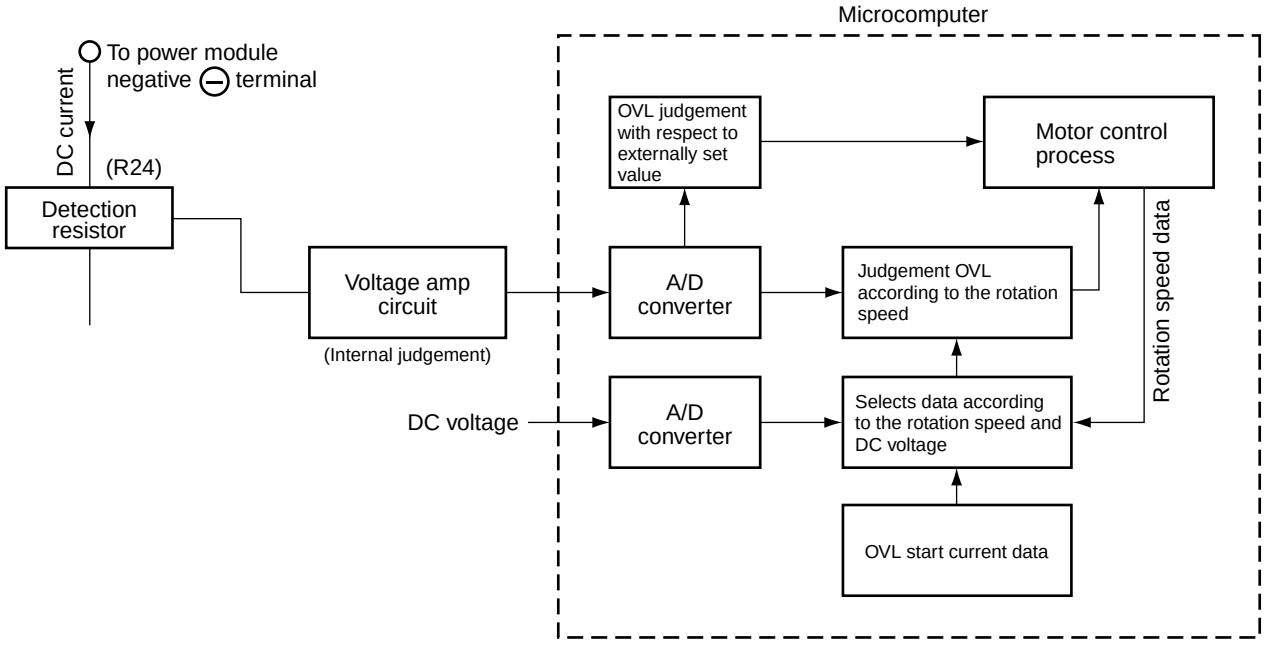


Fig. 8-4 Overload Control System Configuration

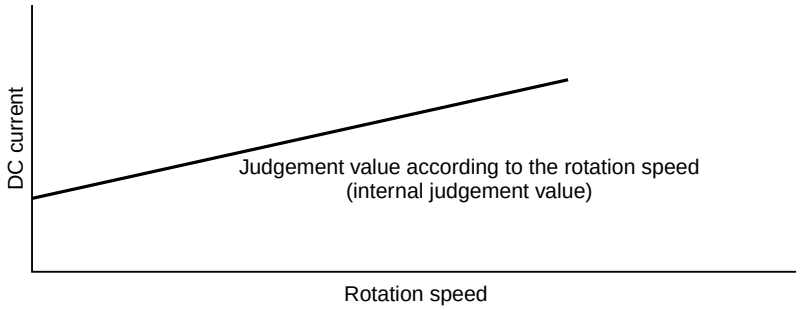


Fig. 8-5

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.

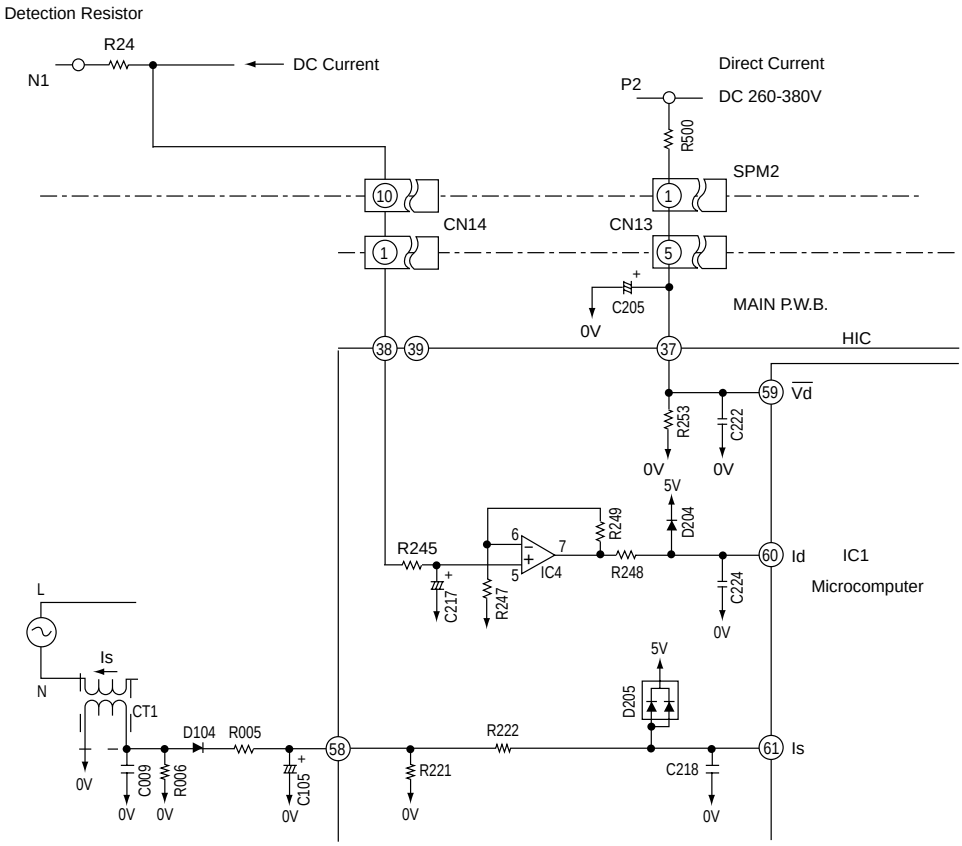


Fig. 8-6

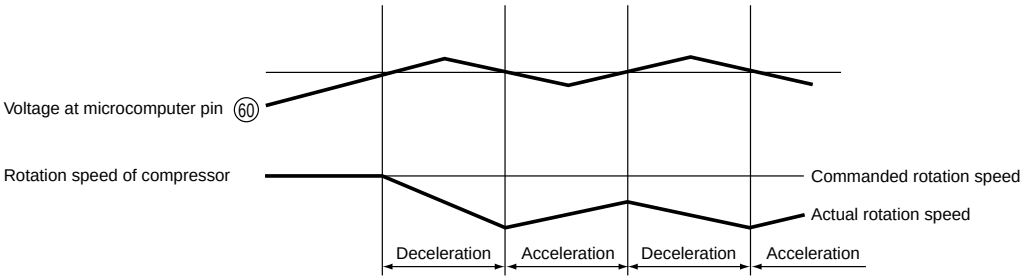


Fig. 8-7

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.

{
- Amplification : high → DC current : low
- Amplification : low → DC current: high

- 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.)

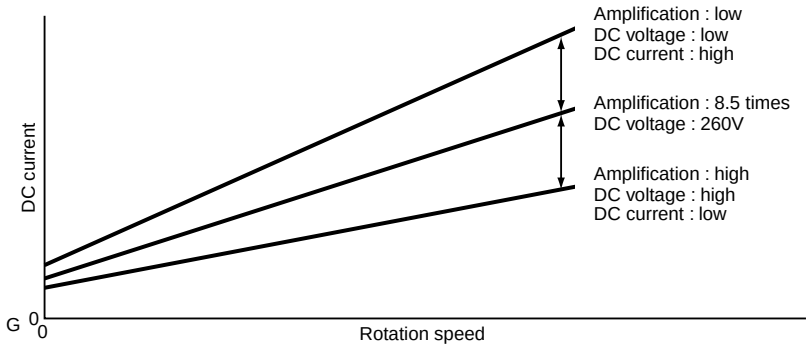


Fig. 8-8

< 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.

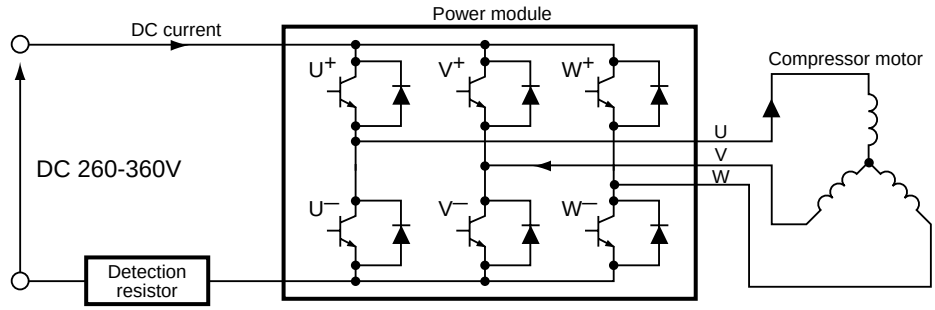


Fig. 8-9

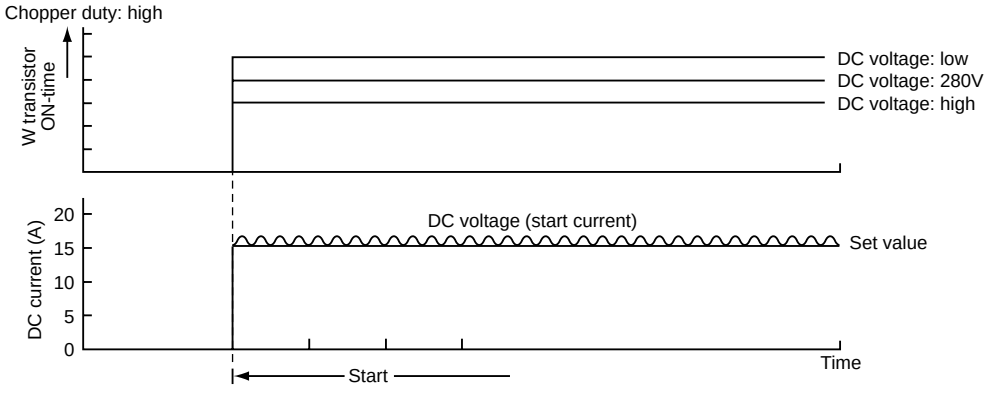


Fig. 8-10

9. Temperature Detection Circuit

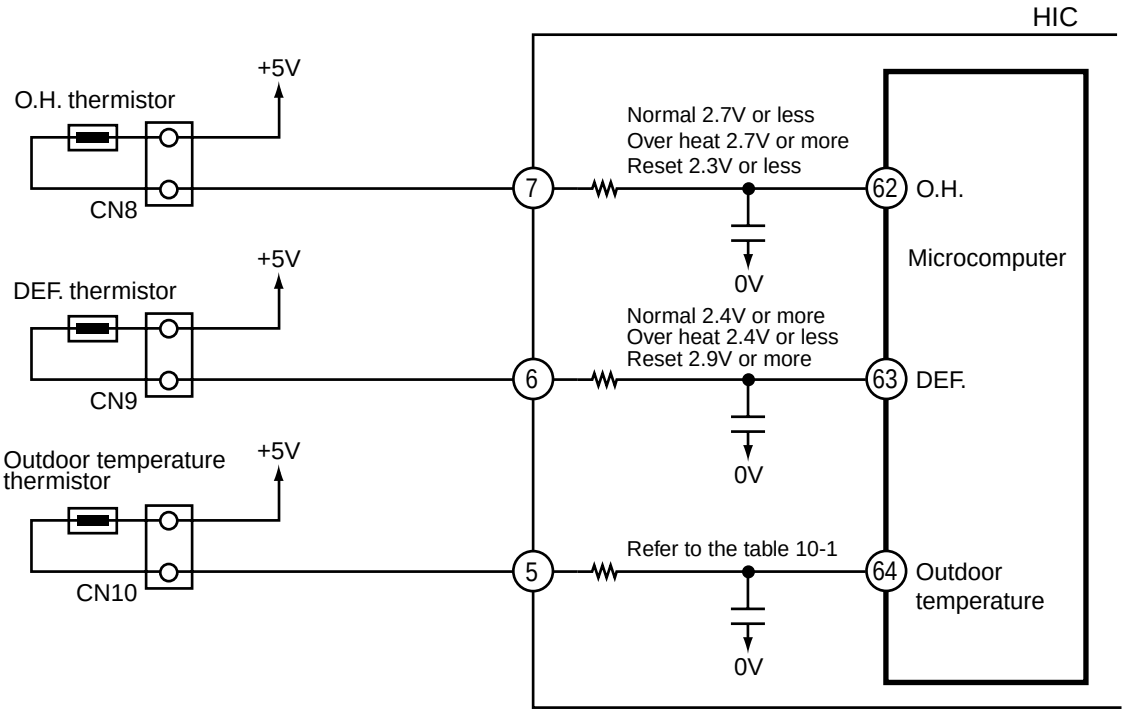


Fig. 9-1

- 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

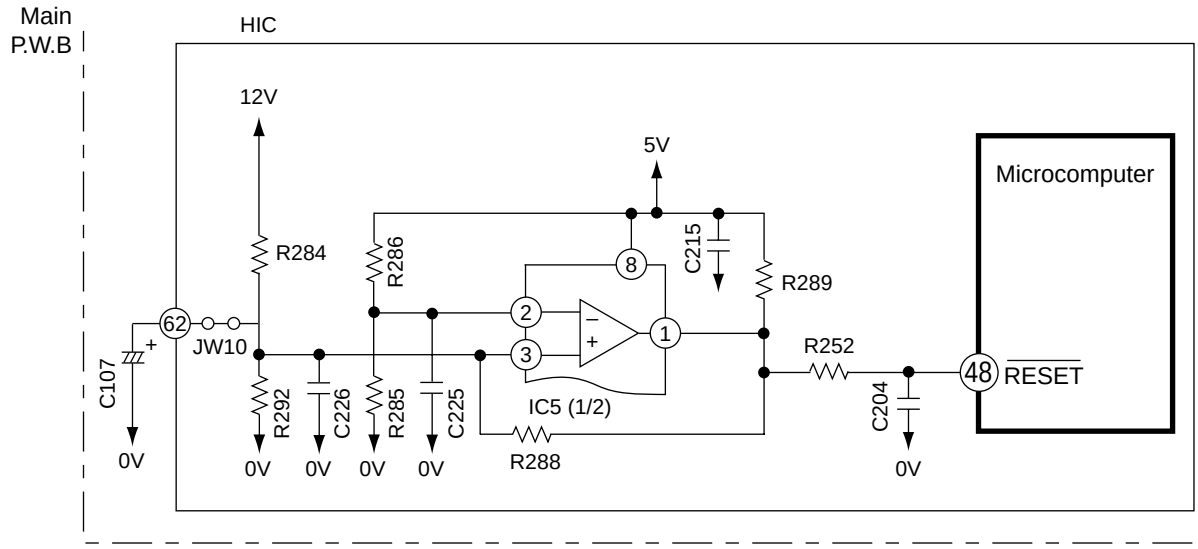


Fig. 10-1

- 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.

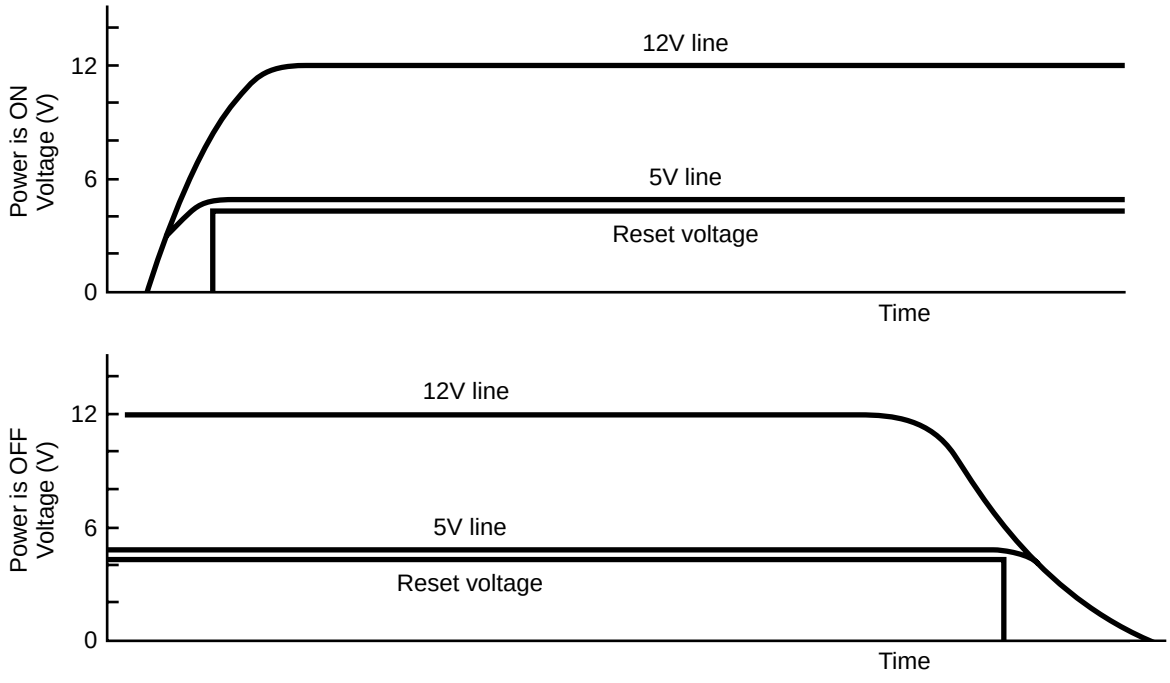


Fig. 10-2

11. Outdoor DC Fan Motor control circuit.

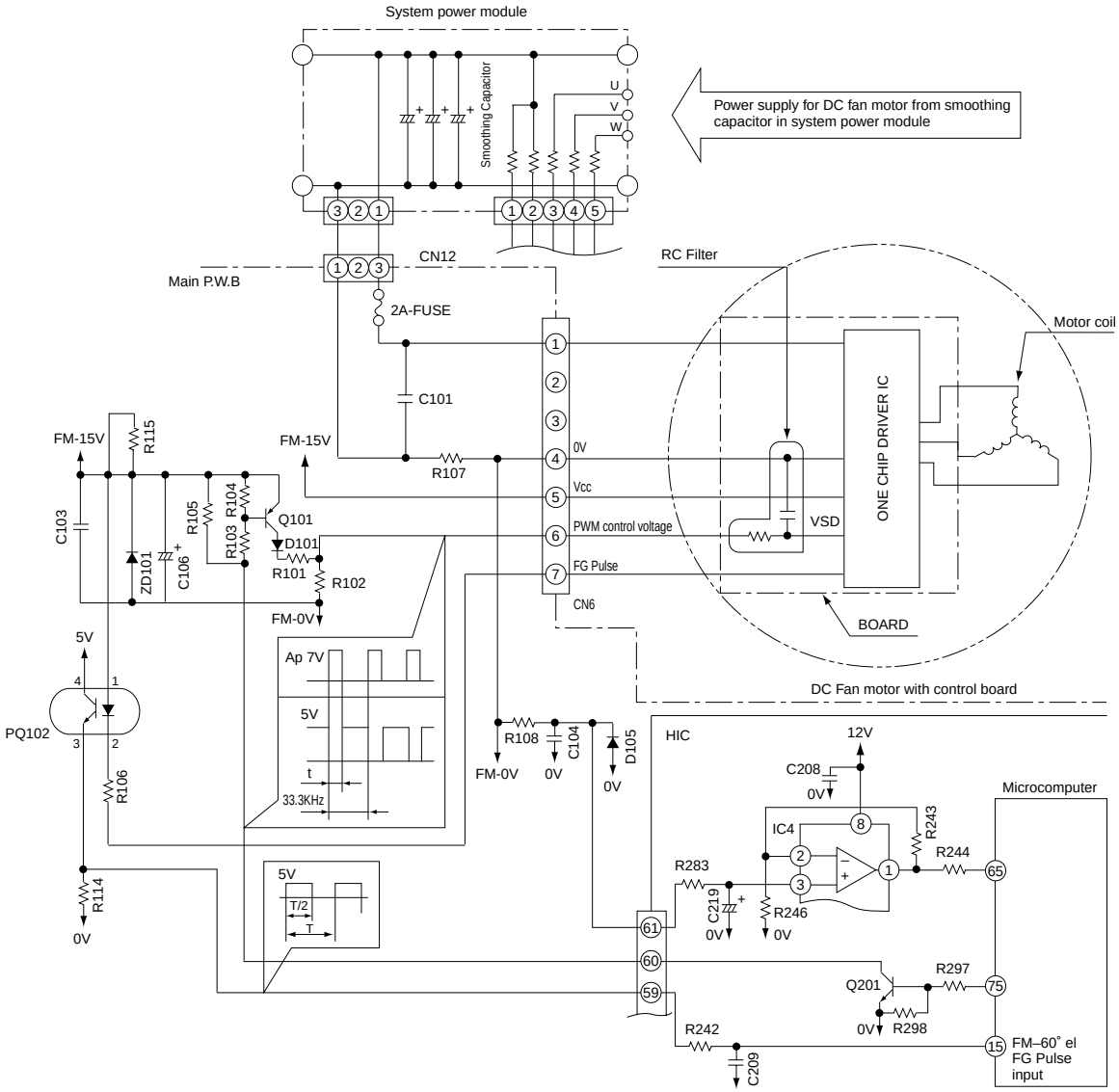


Fig. 11-1

- 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

< 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.

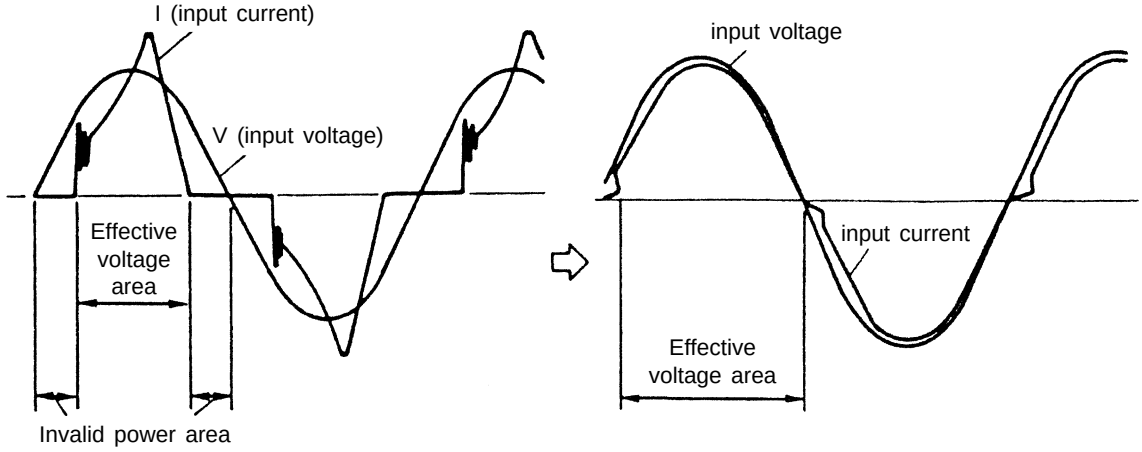
< Caution >

- 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.

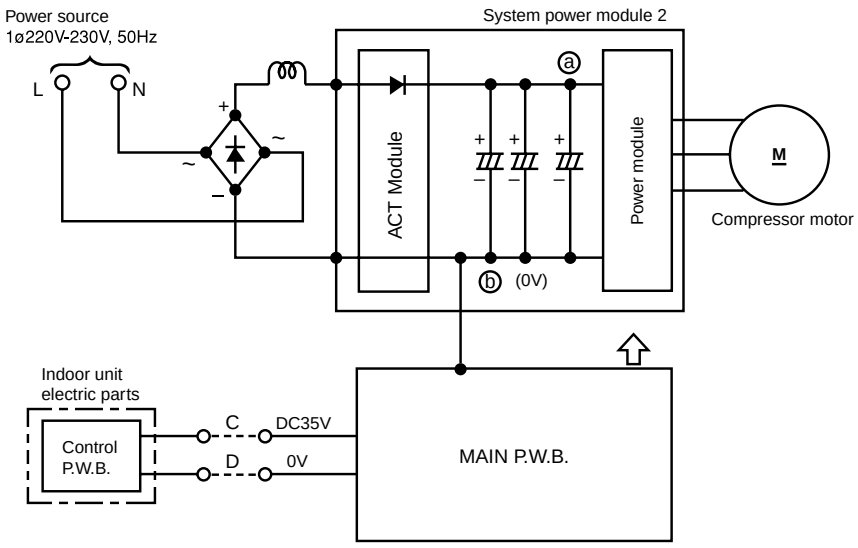
TROUBLE SHOOTING

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

PRECAUTIONS FOR CHECKING

DANGER

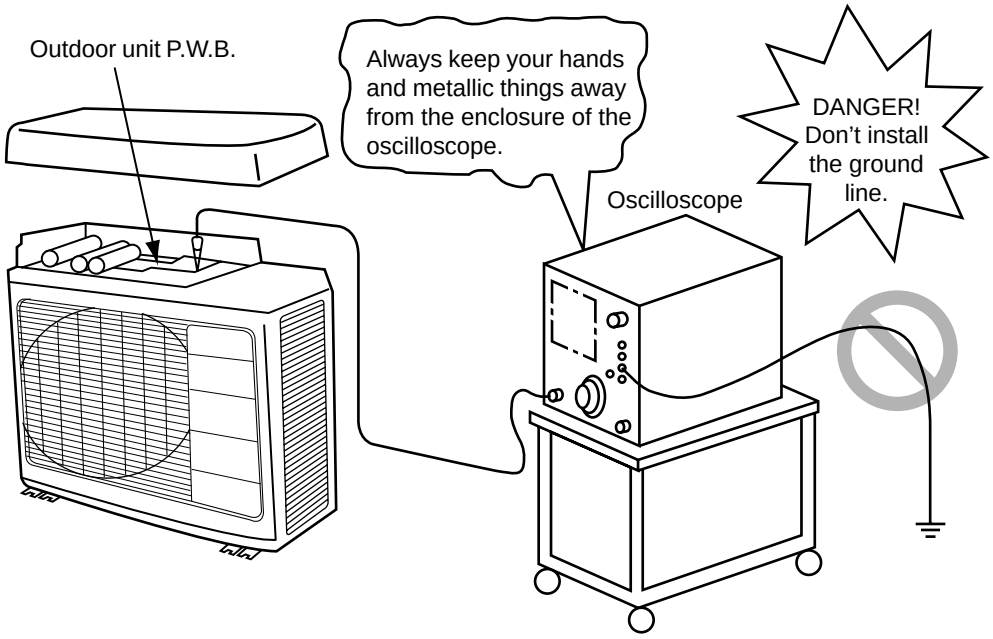
1. Remember that the 0V line is biased to 155-170V in reference to the ground level.
2. Also note that it takes about 10 minutes until the voltage fall after the power switch is turned off.



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.

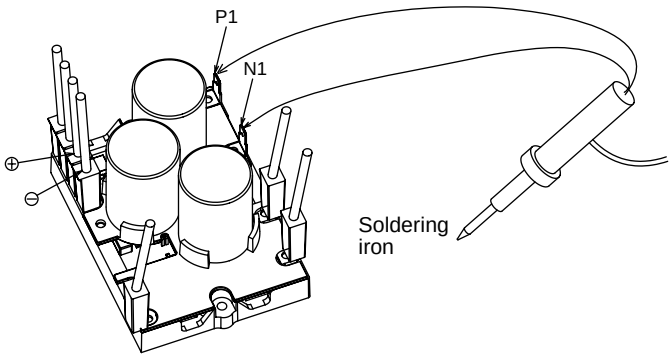


DISCHARGE PROCEDURE AND POWER SHUT OFF METHOD FOR POWER CIRCUIT

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.

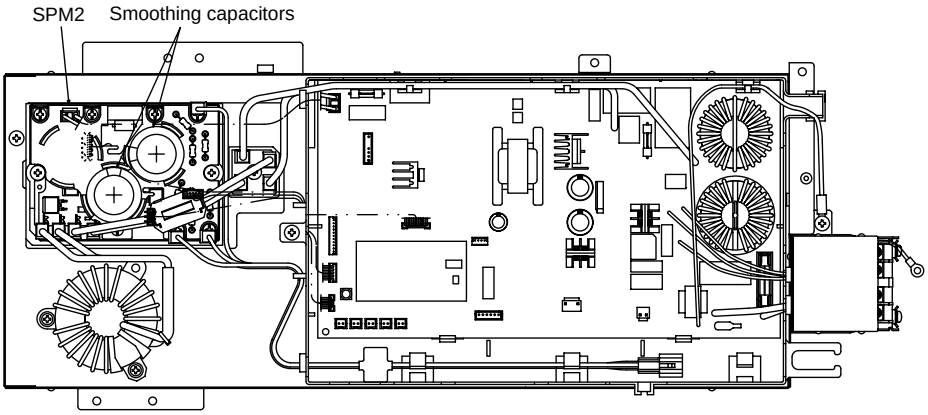


System power module

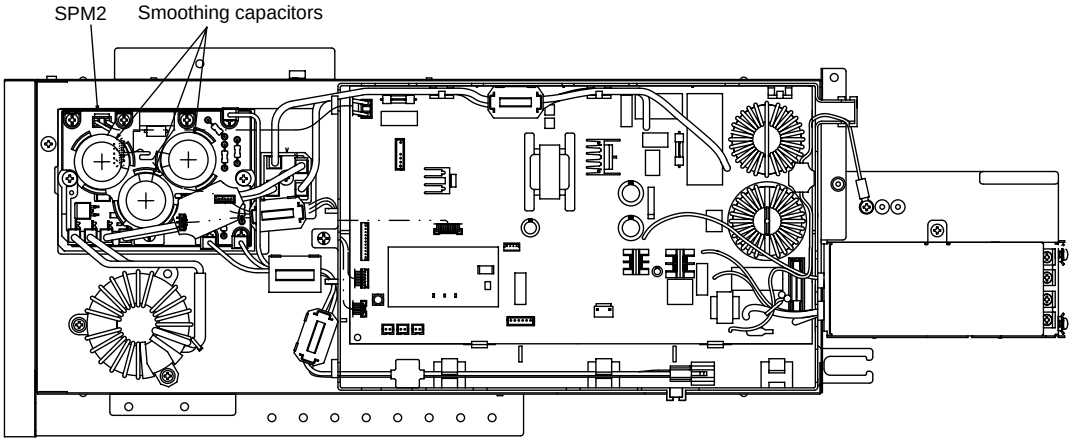
Do not use a soldering iron with transformer: If one is used, thermal fuse inside transformer will be blown

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



RAC-50NH4



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

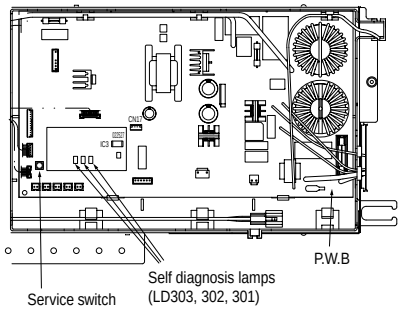
Yes

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



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

Blinking other than one time

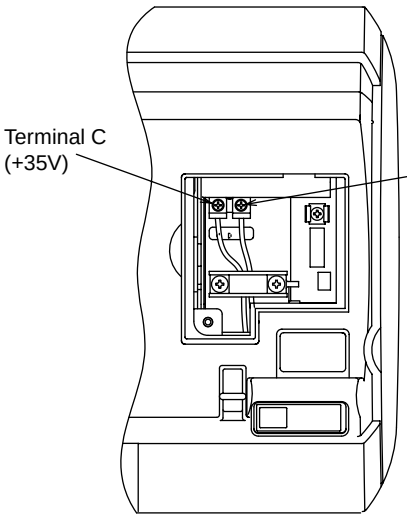
One-time blinking

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

No

See “Out door unit self-diagnosis lamp lighting mode”.

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



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

No

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

Normal

Yes

Yes

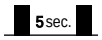
Check the refrigerating cycle.

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	 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	 2 time	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	 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	 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
5	 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 6	 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).

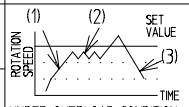
SELF-DIAGNOSIS LIGHTING MODE

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)		

LD301	LD302	[2] DURING STOP	LD303 GOES OFF. □	
□	□	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

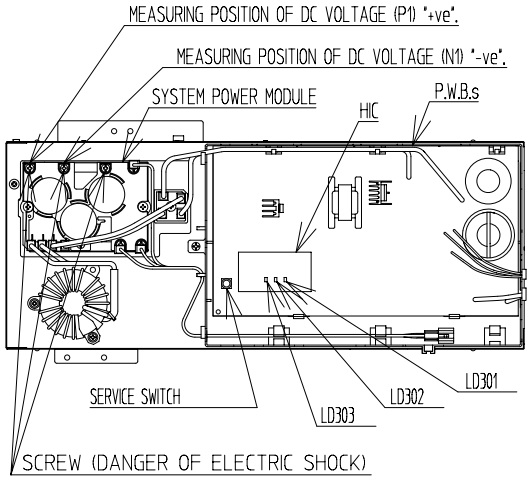
※ EXAMPLE OF BLINKING (5 TIMES) ▨▨▨▨▨ 2SEC ▨ (▨ •• LIGHTS FOR 0.25 SEC. AT INTERVAL OF 0.25 SEC.)

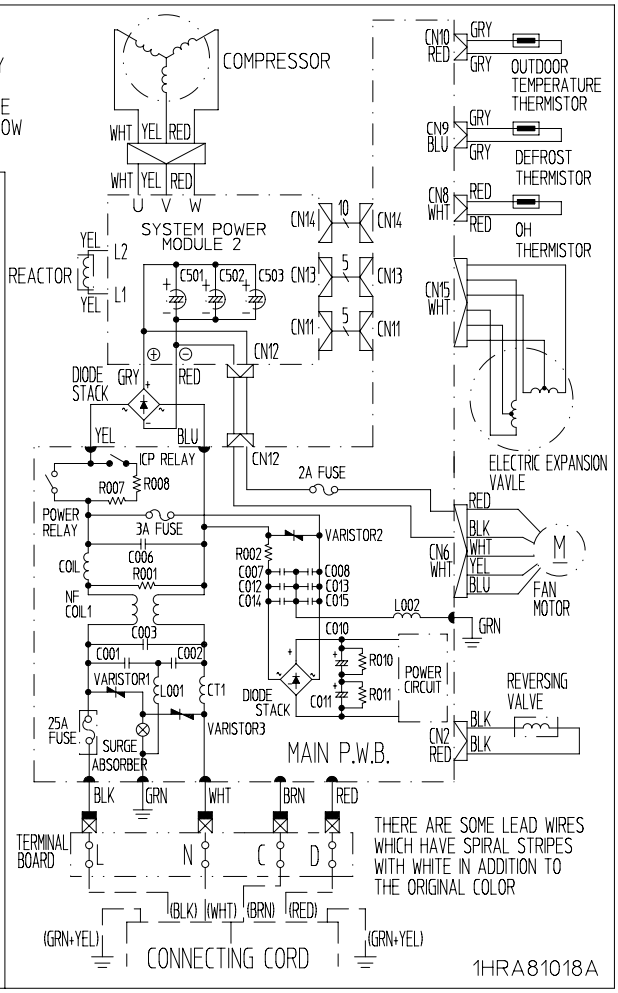
WIRING DIAGRAM

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.

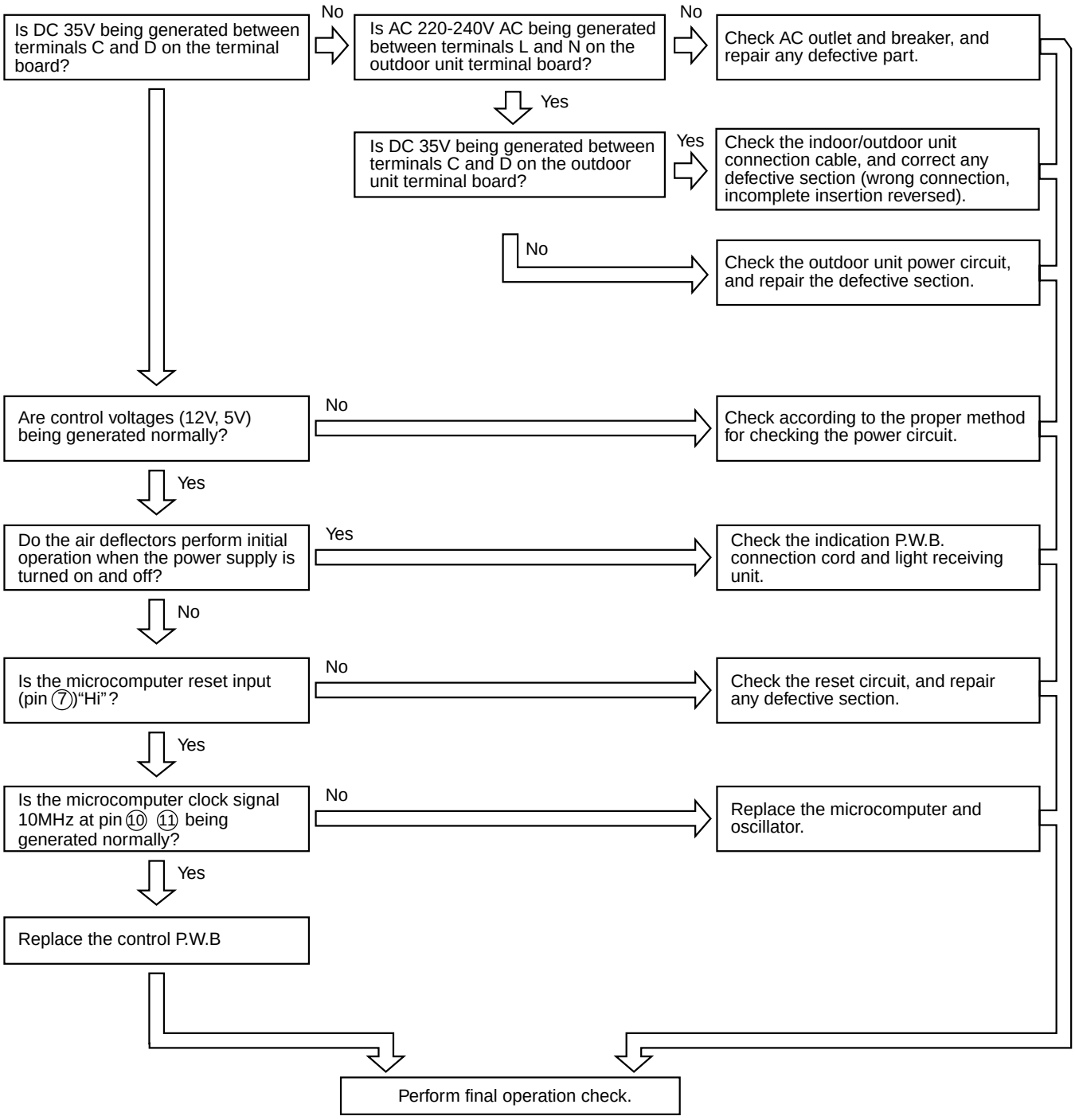
1. SWITCH OFF THE MAIN POWER SUPPLY AND THEN SWITCH IT ON AGAIN. WAIT FOR 1 MINUTE.
2. PRESS AND HOLD THE SERVICE SWITCH FOR 1 SECOND TO START OUTDOOR UNIT IN COOLING OPERATION. IN ORDER TO PREVENT PARTS FROM DAMAGE, DO NOT OPERATE THE OUTDOOR UNIT FOR MORE THAN 5 MINUTES.
3. PRESS AND HOLD THE SERVICE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





CHECKING INDOOR UNIT ELECTRICAL PARTS

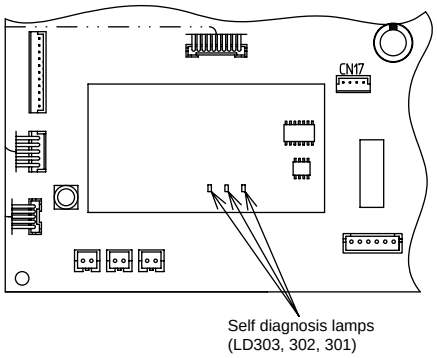
1. Power does not come on (no operation)



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.



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

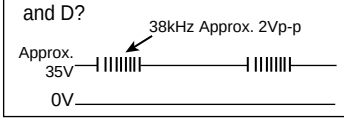
Check the heat exchanger thermistor; if it is defective, replace it.
<Normal values>
10°C → approx. 20kΩ
25°C → approx. 10kΩ
30°C → approx. 8kΩ

No

Does outdoor electrical part LD301 blink nine times?

Yes

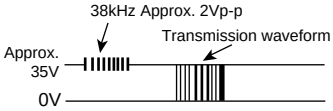
Is the indoor/outdoor unit communication signal superimposed on 35V DC of connection wires C and D?



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?



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).

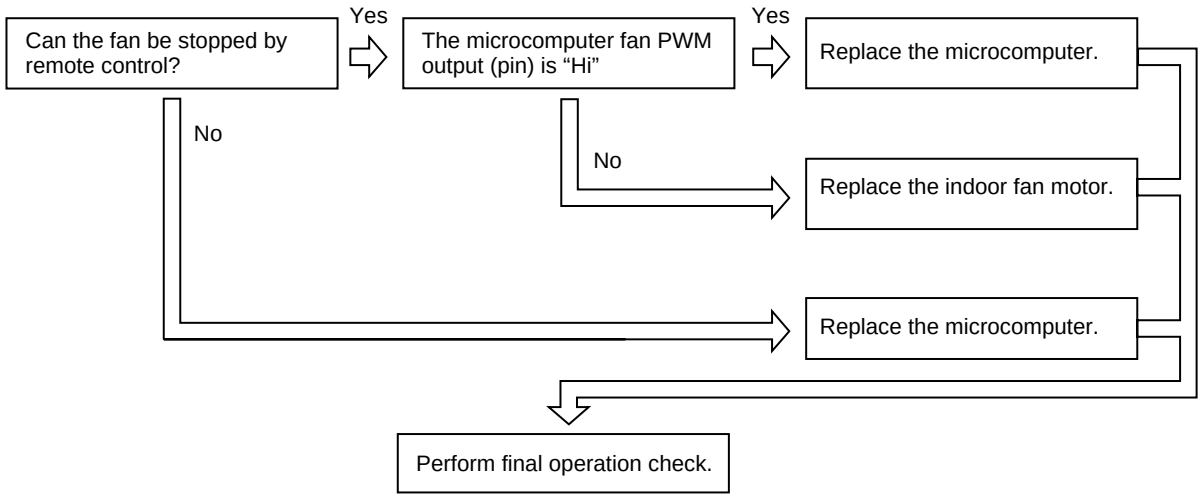
No

Does LD303 switch off several second after it lights?

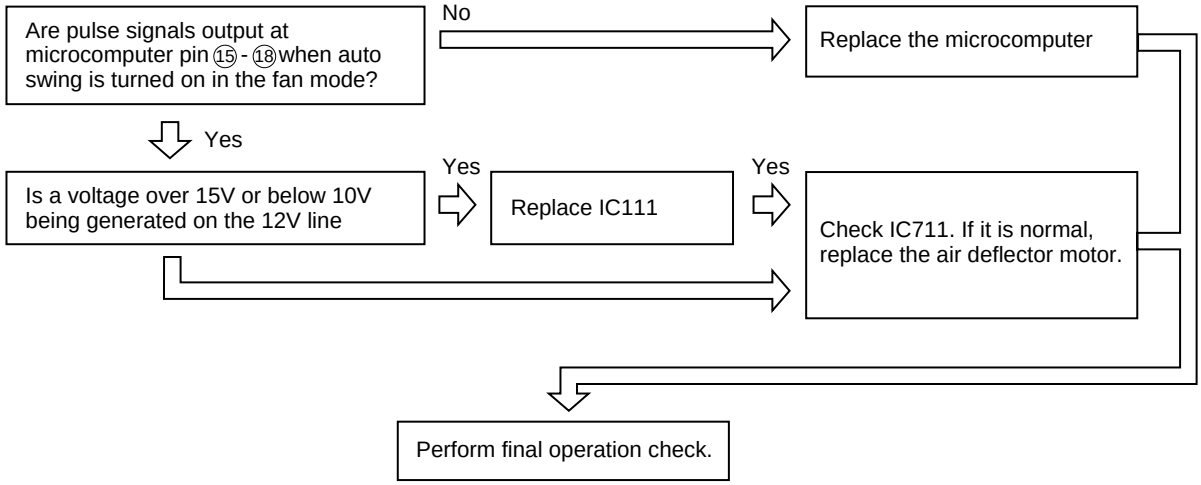
Yes → Check outdoor electrical parts, and repair any defective parts.

Perform final operation check.

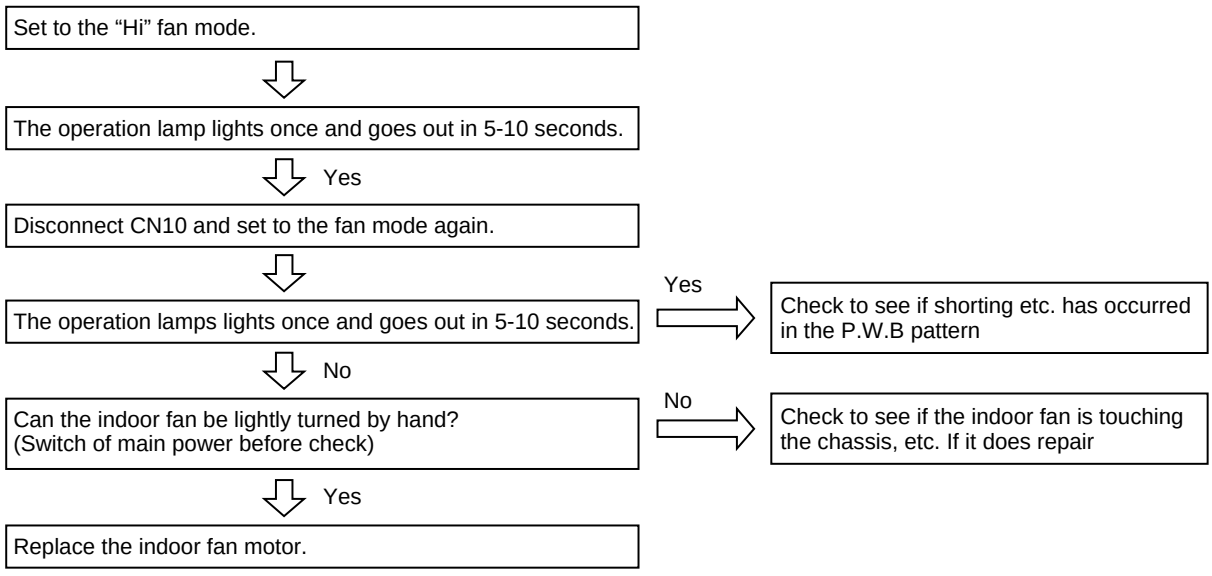
3. Only indoor fan does not operate (other is normal)



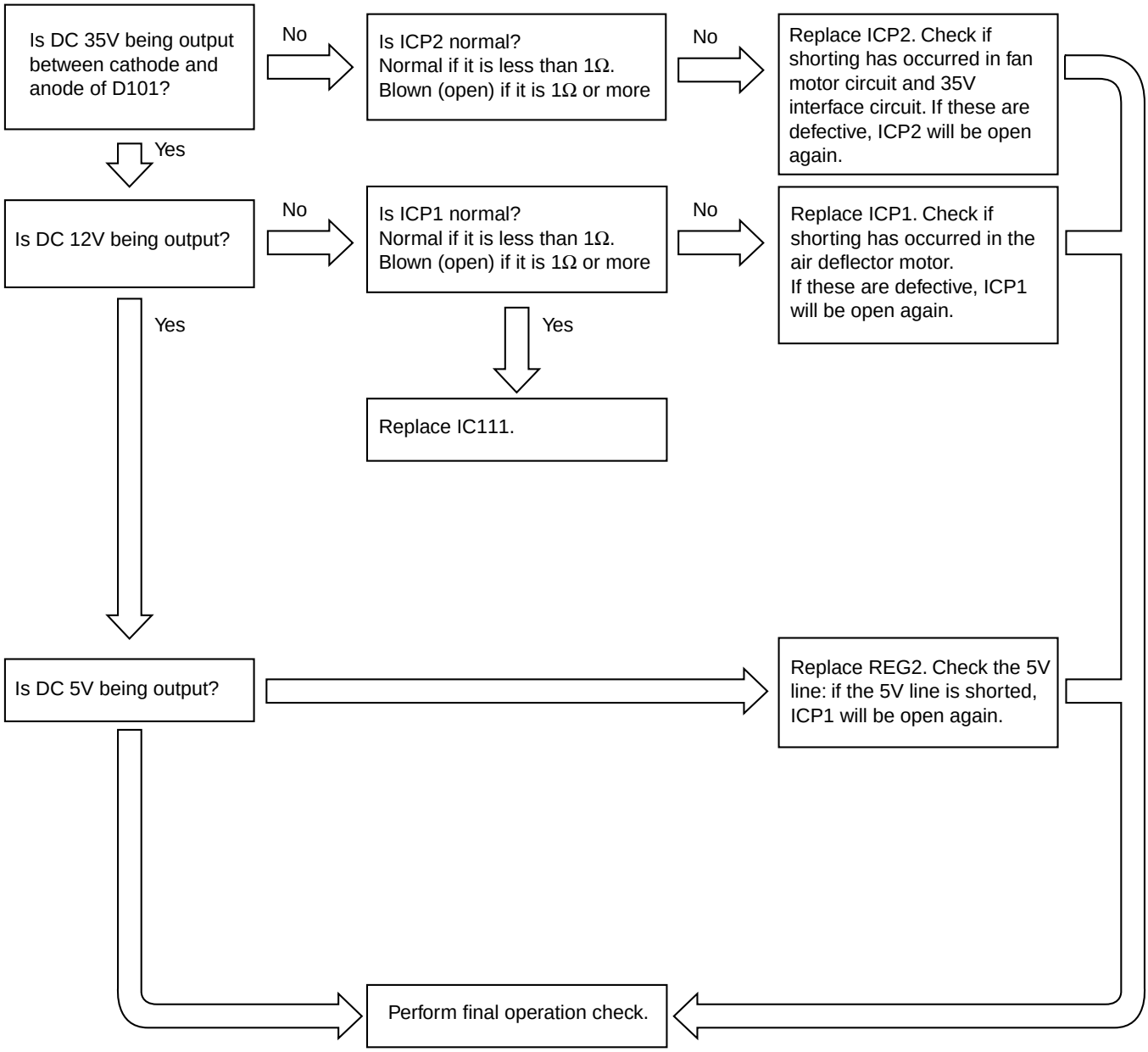
4. Air deflector does not move (others are normal)



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



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



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

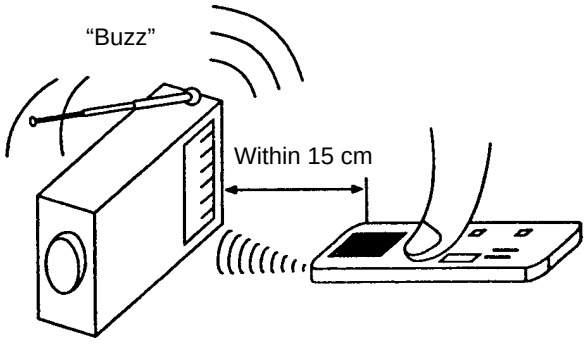
Turn on an AM radio, bring the remote control switch within 15 cm of the radio, and press the ON/OFF button.

Does the radio buzz noisily?

No

Check the LED (D1) with a multimeter.

Yes

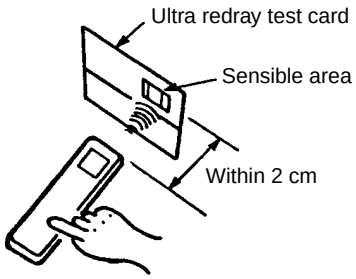


[AM radio]

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

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

Using the test card

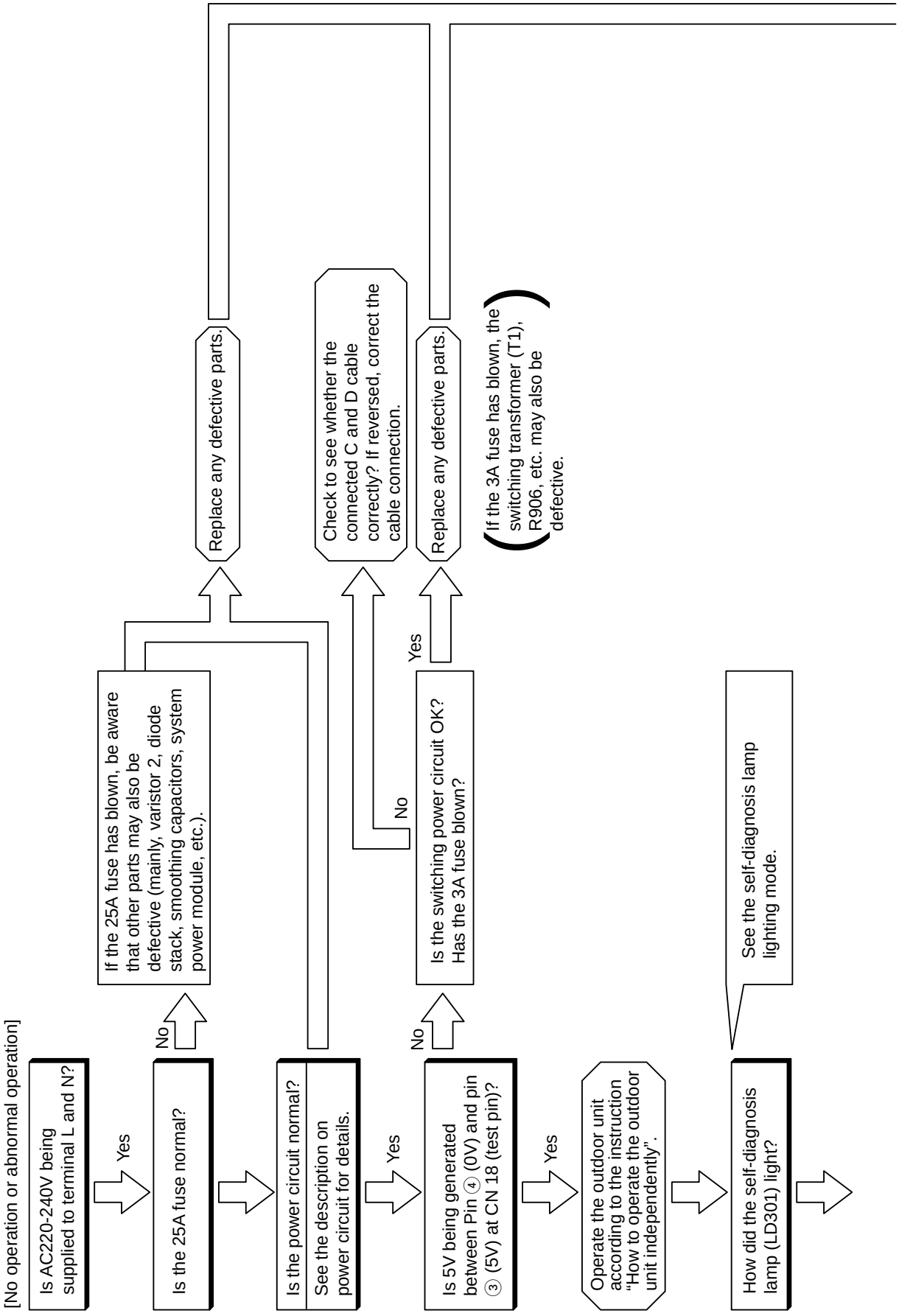


The sensible area should flash in orange when you operate the remote control unit if it is good.

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

CHECKING THE OUTDOOR UNIT ELECTRICAL PARTS

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



LD301 blinks 9 time.
Communication error.

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

Yes

No

Is DC 35V being output across R914?

D907 and C910 may be defective.

Yes

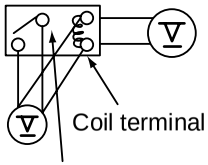
No

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

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

Interface relay



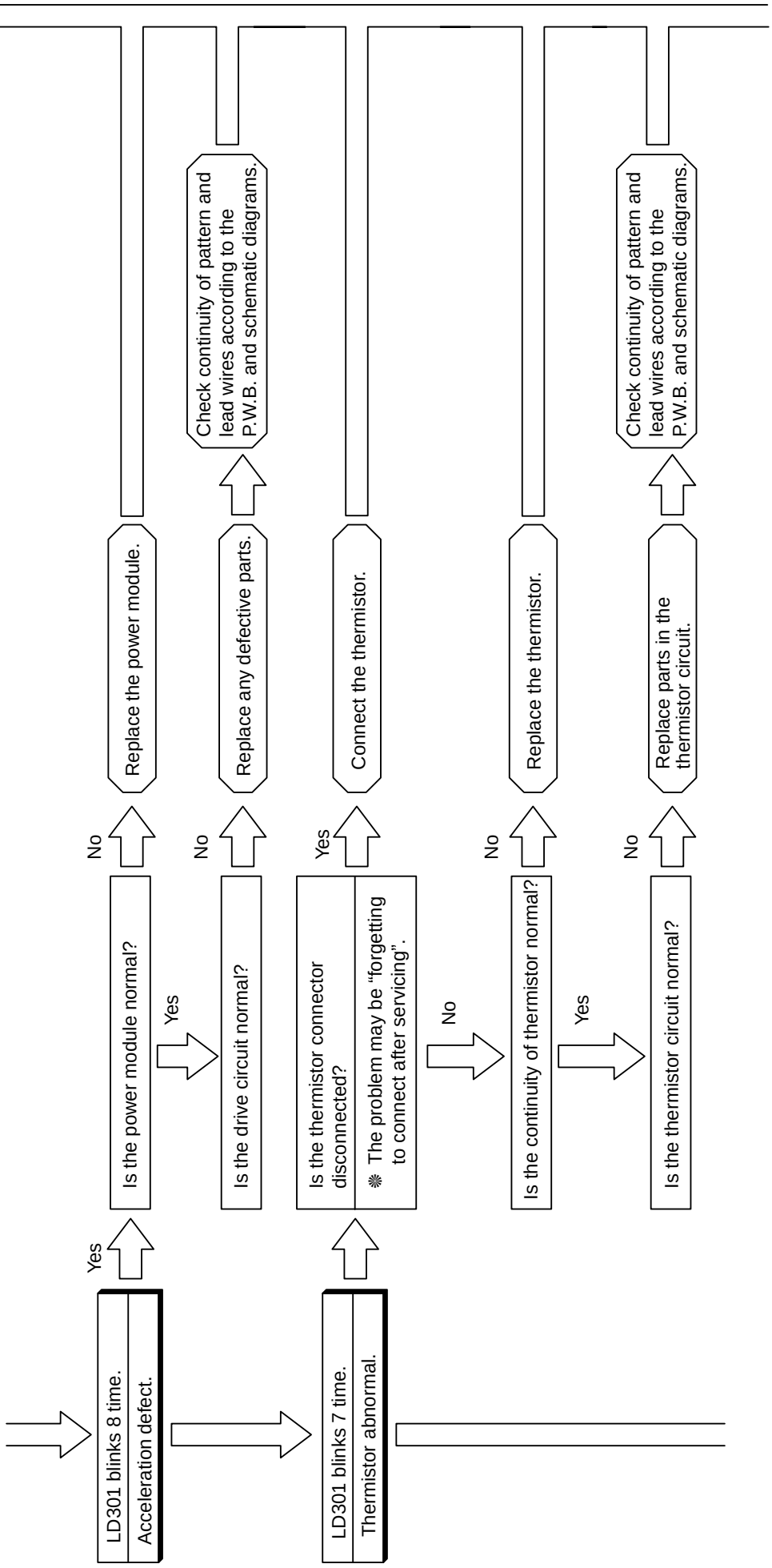
Is a voltage (at least 10V) being generated between the contact terminals of interface relay?

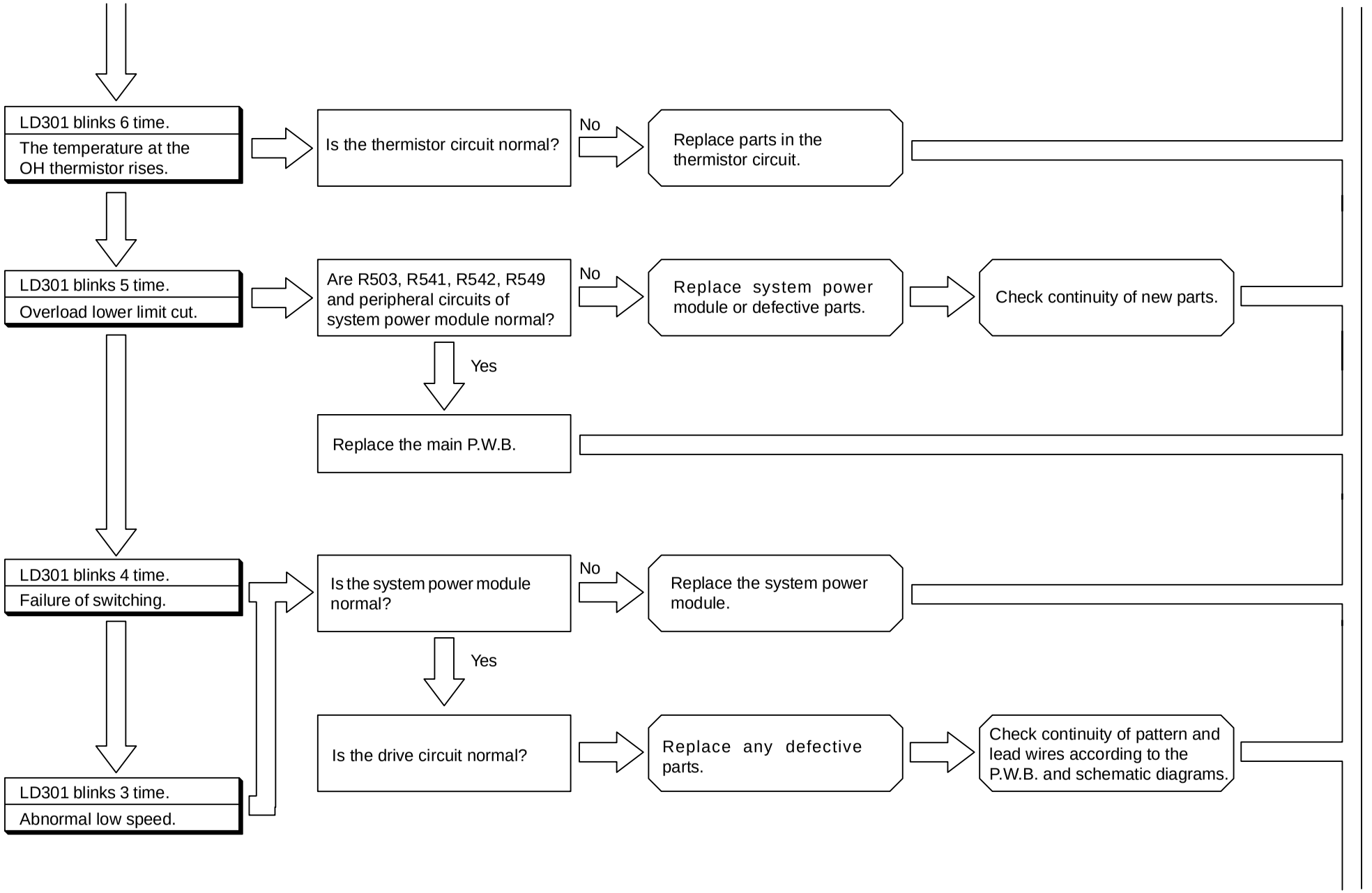
Yes

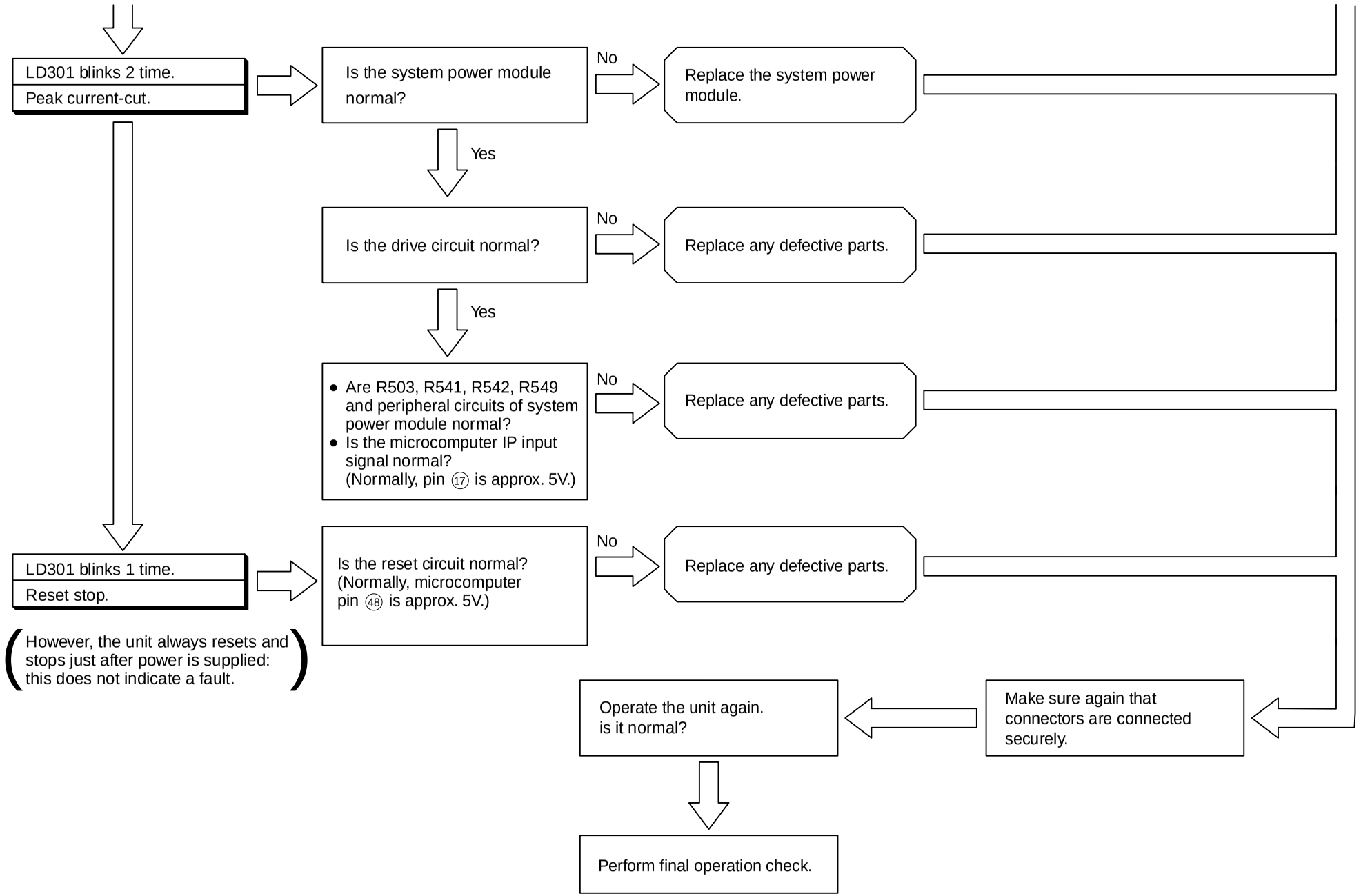
Repalce the interface relay.

No

Check the interface curcuit.

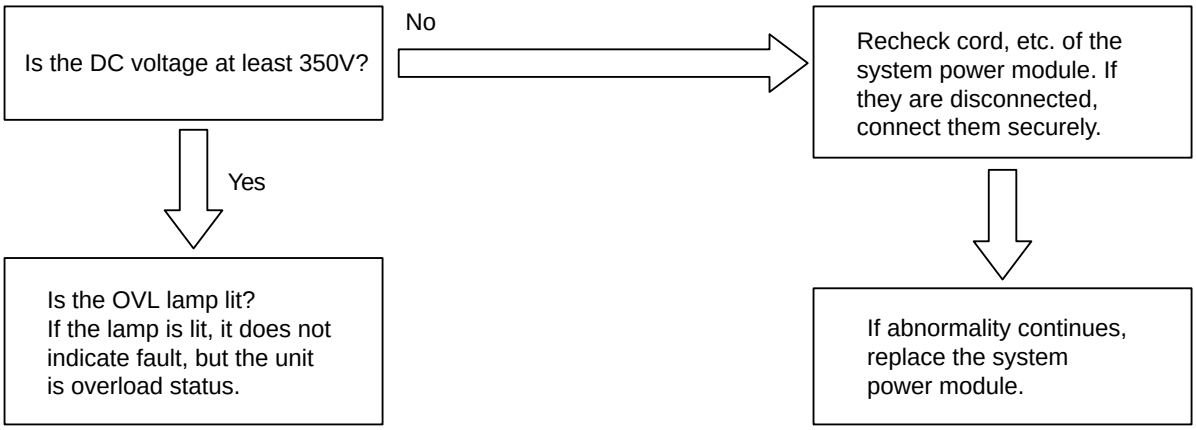

LD301 blinks 8 time.
Acceleration defect.
Yes
Is the power module normal?
No
Replace the power module.
Yes
Is the drive circuit normal?
No
Replace any defective parts.
Check continuity of pattern and lead wires according to the P.W.B. and schematic diagrams.
LD301 blinks 7 time.
Thermistor abnormal.
Yes
Is the thermistor connector disconnected?
❋ The problem may be "forgetting to connect after servicing".
No
Connect the thermistor.
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.
Yes
LD301 blinks 3 time.
Abnormal low speed.
Is the drive circuit normal?
Replace any defective parts.
Check continuity of pattern and lead wires according to the P.W.B. and schematic diagrams.


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

POWER CIRCUIT

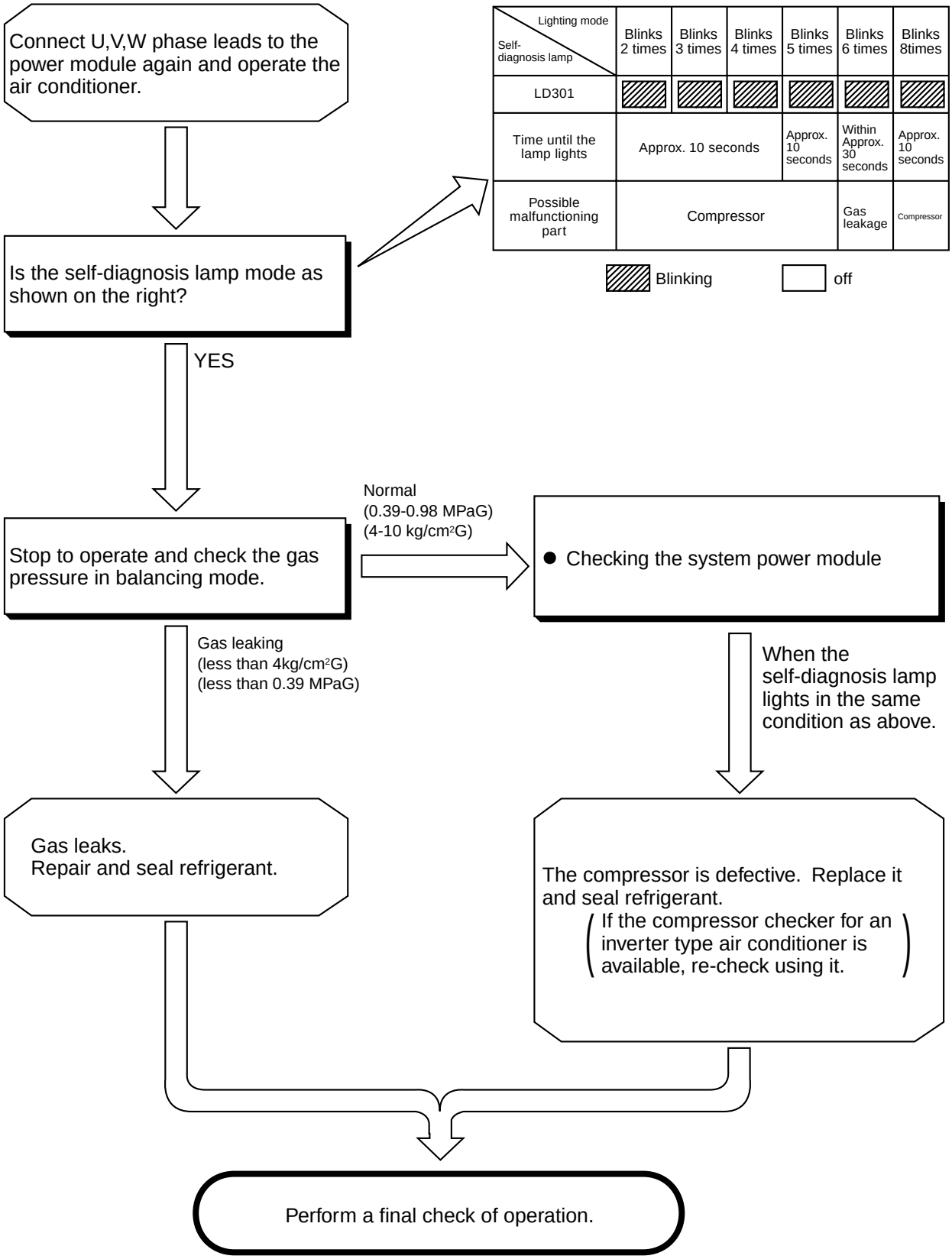
Phenomenon 1 <Rotation speed does not increase>



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)

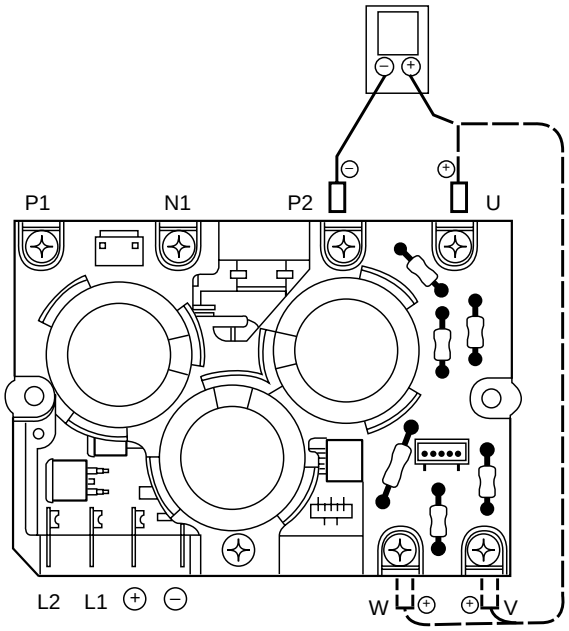


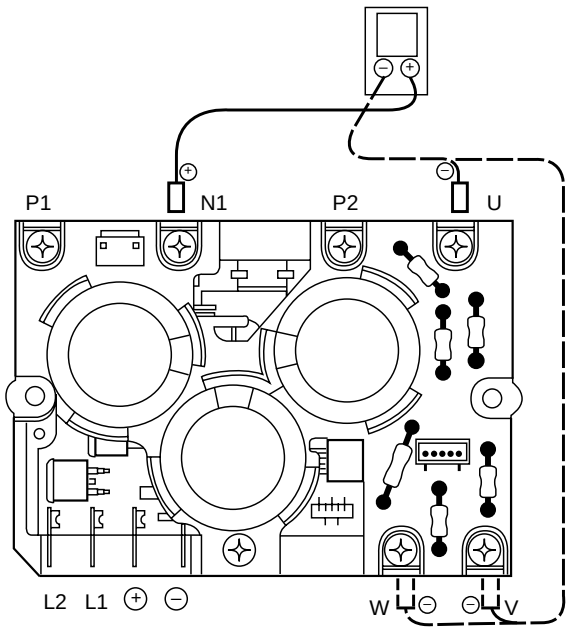
HOW TO CHECK SYSTEM POWER MODULE

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, ⊕ and ⊖ 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 ⊕ and ⊖ terminals are connected in reverse of diagram below, it is normal. Furthermore, compare how indicator swings at U, V and W phases. If indicator swings the same way at each point, it is normal.





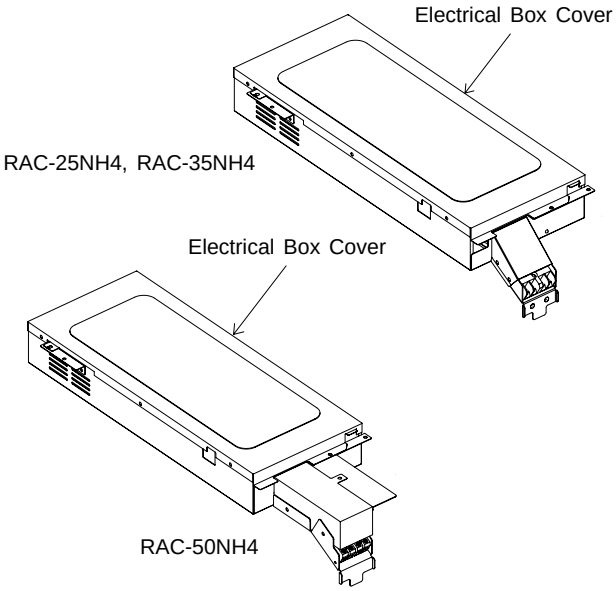
HOW TO OPERATE USING THE SERVICE SWITCH THE OUTDOOR UNIT

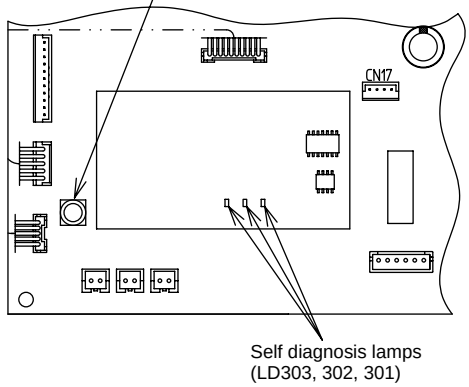
MODEL RAC-25NH4, RAC-35NH4, RAC-50NH4

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.





(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.

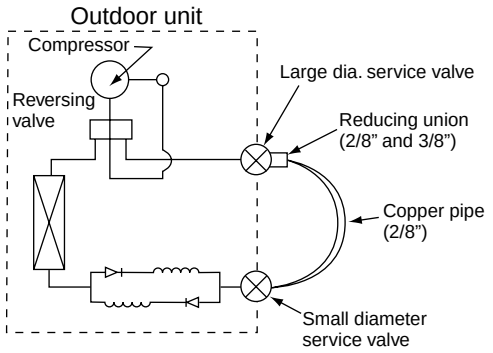
Be sure to push the service switch again to stop the forced cool operation.

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)



Parts to be prepared

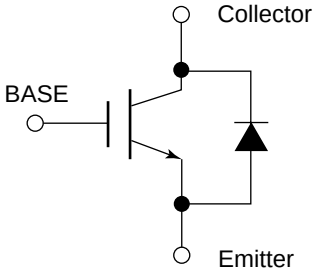
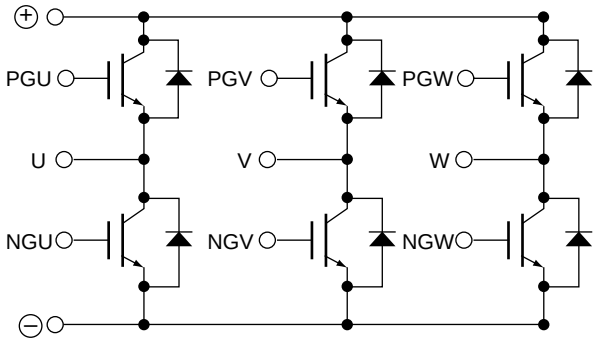
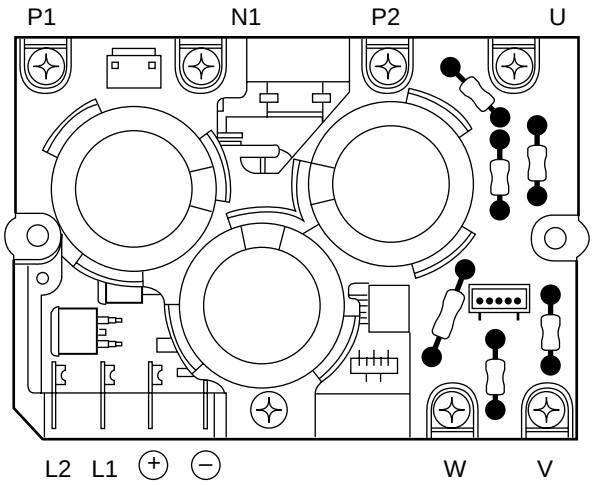
(1) Reducing union
2/8" (6.35mm)
1/2" (12.7mm)
(2) Copper pipe (2/8" and 1/2")
(3) Shorting leads
2 leads approx. 10 cm long with alligator clip or IC clip

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.

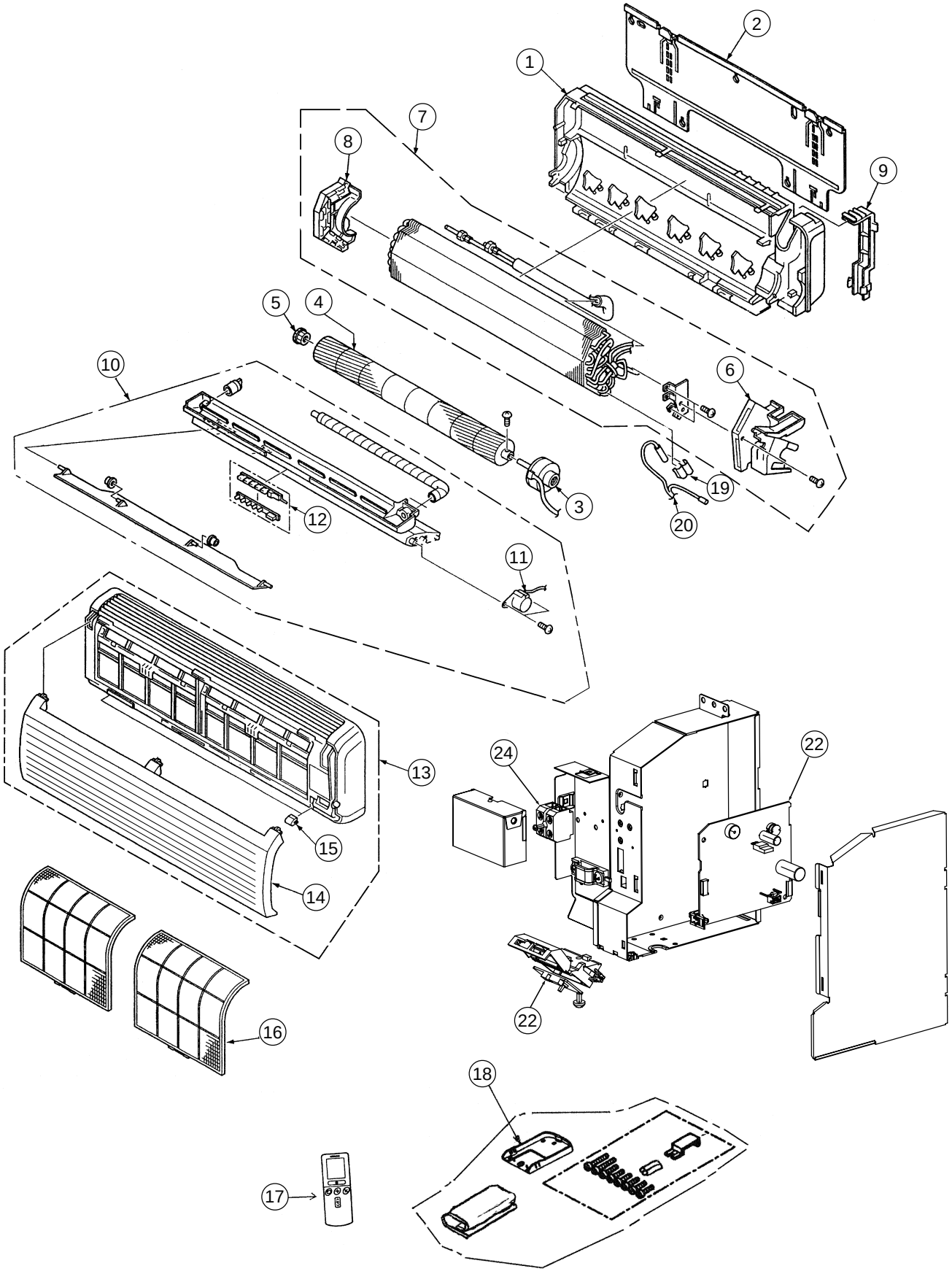
SYSTEM POWER MODULE DIAGNOSIS

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



THE UPDATED PARTS LIST

FOR THIS MODEL IS

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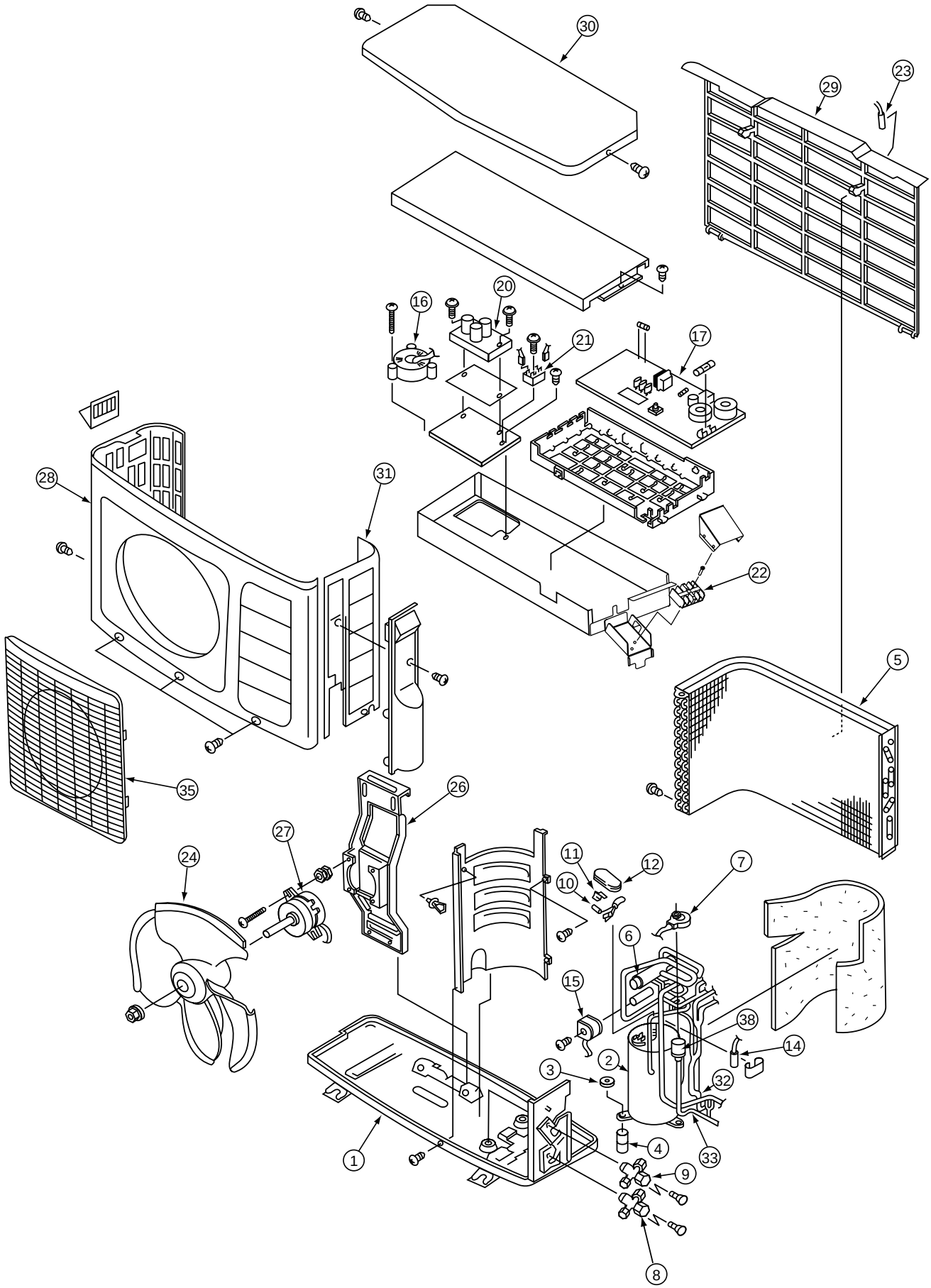
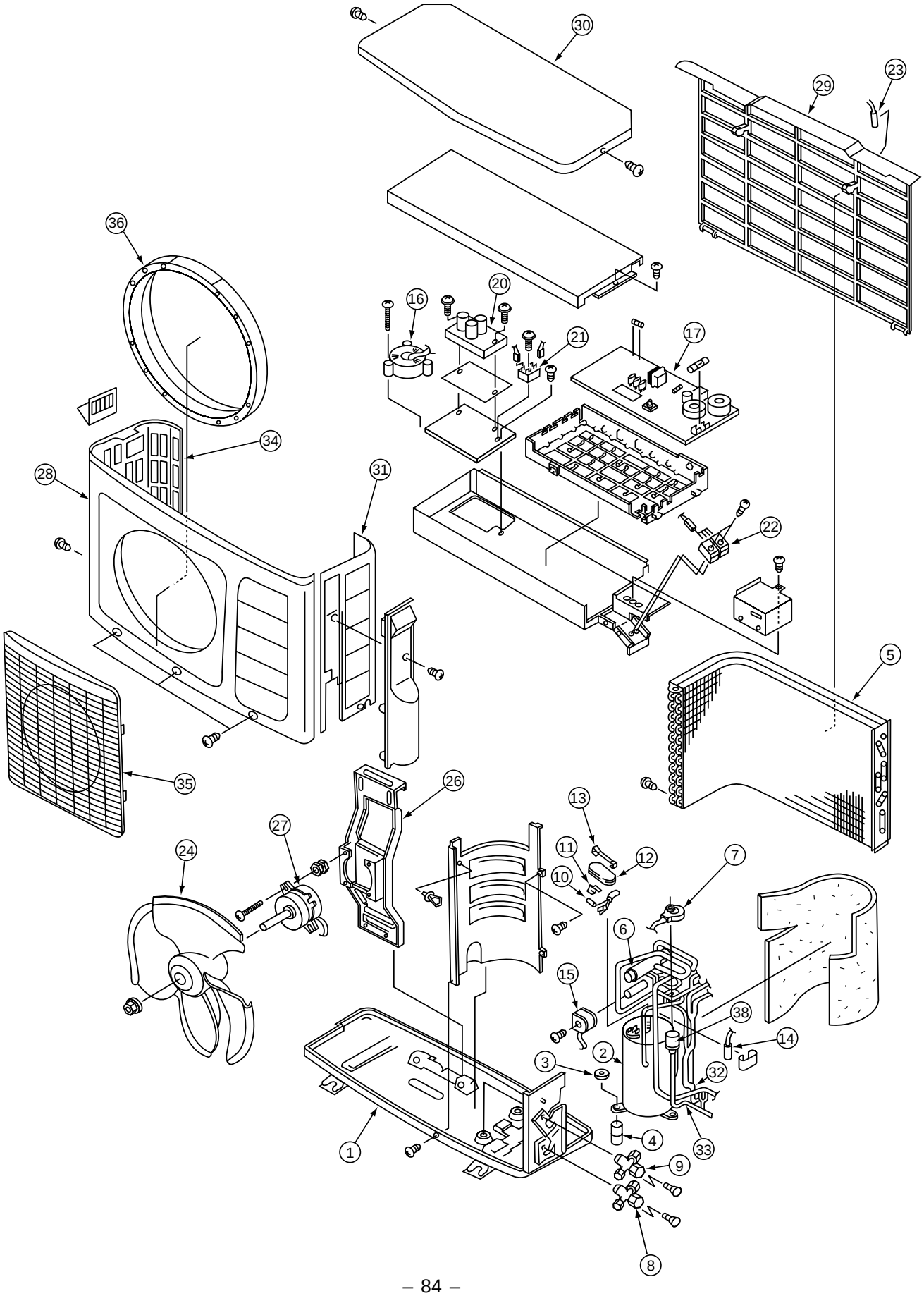
OUTDOOR UNIT
MODEL : RAC-25NH4, RAC-35NH4



PARTS LIST AND DIAGRAM

OUTDOOR UNIT
MODEL : RAC-50NH4



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