

HITACHI

PM

NO. 0164E

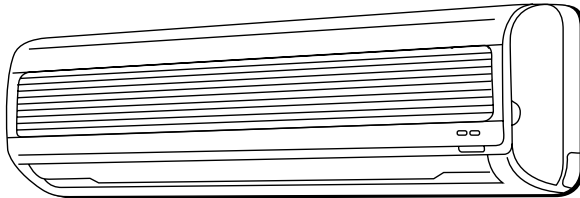
SERVICE MANUAL

TECHNICAL INFORMATION

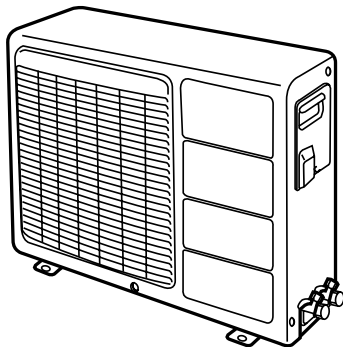
FOR SERVICE PERSONNEL ONLY

RAS-25CNH11 RAC-25CNH11

REFER TO THE FOUNDATION MANUAL
CONTENTS



RAS-25CNH11



RAC-25CNH11



SPECIFICATIONS -----4

SAFETY PRECAUTION -----6

HOW TO USE -----8

CONSTRUCTION AND DIMENSIONAL DIAGRAM -----29

MAIN PARTS COMPONENT -----30

WIRING DIAGRAM-----33

CIRCUIT DIAGRAM-----35

BLOCK DIAGRAM-----39

BASIC MODE -----41

AUTO SWING FUNCTION-----54

DESCRIPTION OF MAIN CIRCUIT OPERATION -----55

REFRIGERATING CYCLE DIAGRAM-----86

SERVICE CALL Q & A -----87

TROUBLE SHOOTING-----91

PARTS LIST AND DIAGRAM-----113

SPECIFICATIONS

TYPE	WALL TYPE		
	INDOOR UNIT	OUTDOOR UNIT	
MODEL	RAS-25CNH11	RAC-25CNH11	
POWER SOURCE	1ø 220V 50Hz		
TOTAL INPUT (W)	910 (190 ~ 1,150) [COOL] / 1,250 (160 ~ 1,350) [HEAT]		
TOTAL AMPERES (RATED / MAX.) (A)	4.20 ~ 3.85 [COOL] / 5.75 ~ 5.25 [HEAT]		
COOLING CAPACITY	(kW)	2.50 (0.90 ~ 2.80)	
	(B.T.U./h)	8,870 (3,070 ~ 9,550)	
HEATING CAPACITY	(kW)	3.60 (0.90 ~ 4.00)	
	(B.T.U./h)	12,280 (3,070 ~ 13,650)	
DIMENSIONS (mm)	W	744	700
	H	248	570
	D	168	210
NET WEIGHT (kg)	5.5	29	

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

ROOM AIR CONDITIONER

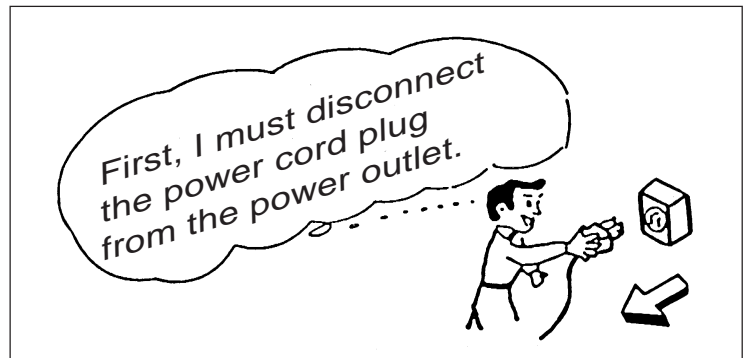
INDOOR UNIT + OUTDOOR UNIT

JANUARY 2003

H.A.P.M.

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 occurrence 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 $1M\Omega$ 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).

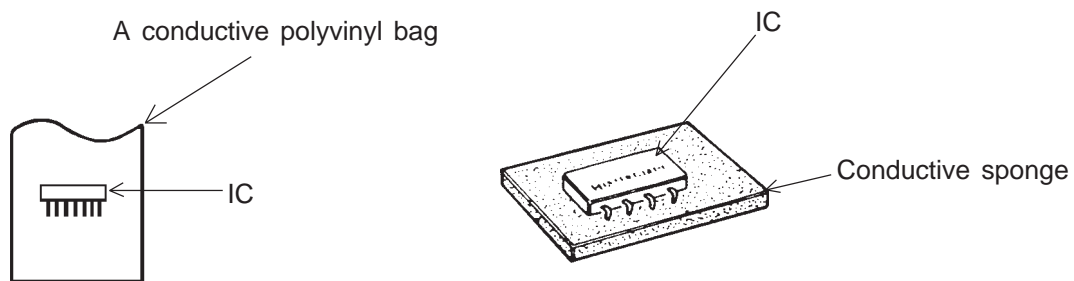


Fig. 1. Conductive Container

- (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.

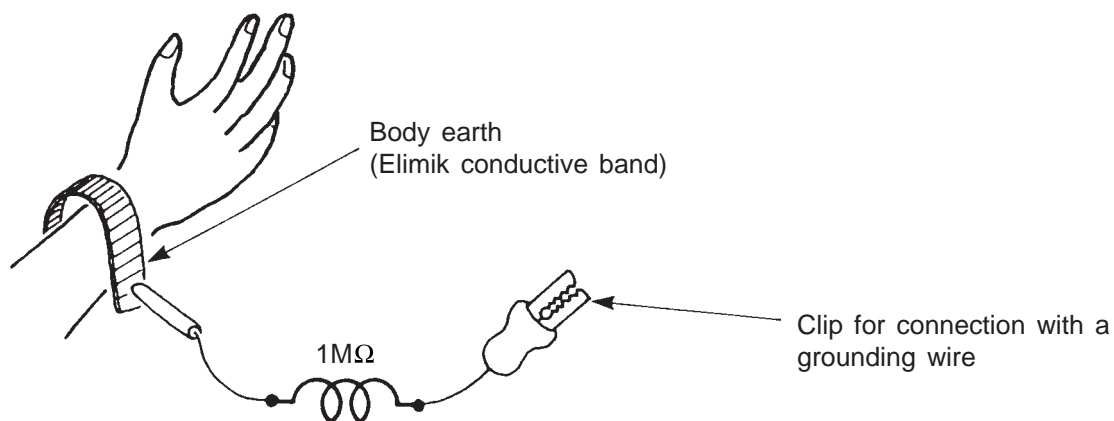


Fig. 2. Body Earth

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

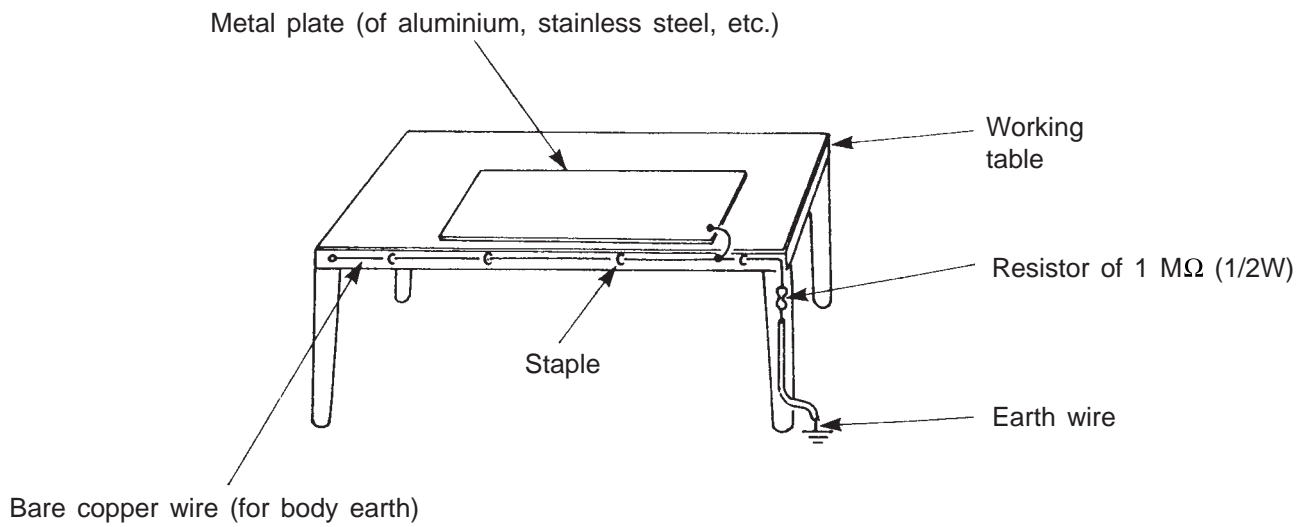


Fig. 3. Grounding of the working table

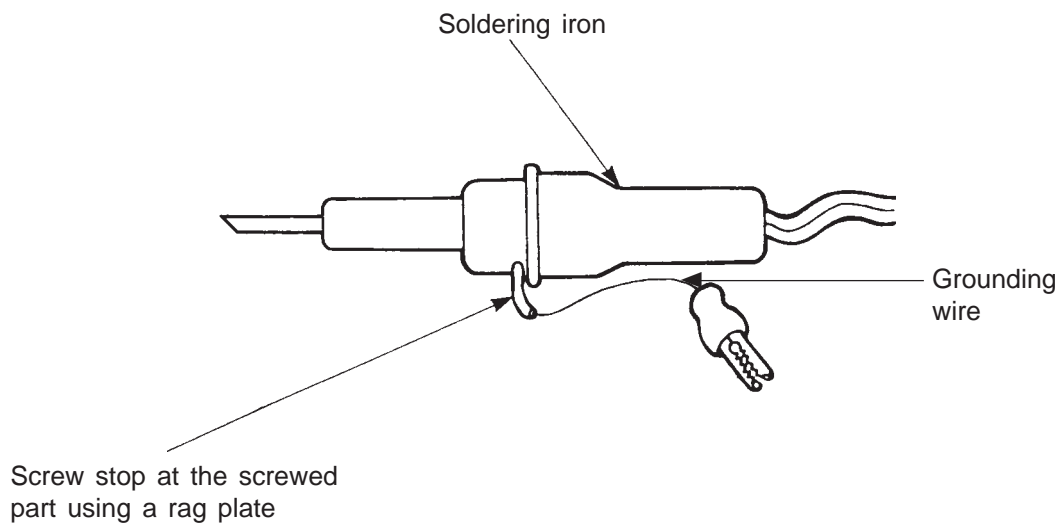


Fig. 4. Grounding a soldering iron

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**

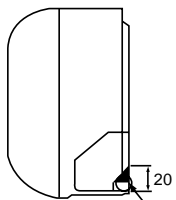
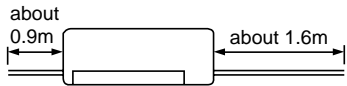
1. In quiet operation or stopping the running, slight flowing noise of refrigerant in the refrigerating cycle is heard occasionally, but this noise is not abnormal for the operation.
2. When it thunders near by, it is recommend to stop the operation and to disconnect the power cord plug from the power outlet for safety.
3. If the room air conditioner is stopped by setting the temperature or mis-operation, and then re-started in a moment, cooling 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.
4. This room air conditioner should not be used at the cooling operation when the outside temperature is below 20°C.
5. When the operation knob is set to "COOL" from another position, IC delay circuit functions and stops the compressor for the first 3 minutes, which is not an abnormal phenomenon.

SPECIFICATIONS

MODEL		RAS-25CNH11	RAC-25CNH11
FAN MOTOR		20 W	
FAN MOTOR CAPACITOR		NO	
FAN MOTOR PROTECTOR		NO	
COMPRESSOR		NO	GR20DR2F
COMPRESSOR MOTOR CAPACITOR		-----	NO
OVERLOAD PROTECTOR		NO	YES
OVERHEAT PROTECTOR		NO	YES
FUSE		NO	3A
POWER RELAY, STICK RELAY		NO	G4A
POWER SWITCH		YES	NO
TEMPORARY SWITCH		YES	NO
SERVICE SWITCH		NO	YES
TRANSFORMER		NO	
VARISTOR		NO	416NR
NOISE SUPPRESSOR		NO	YES
REMOTE CONTROL SWITCH (LIQUID CRYSTAL)		YES	NO
THERMOSTAT		YES (IC)	NO
FUSE CAPACITY		-----	16A INRUSH WITHSTAND TYPE
REFRIGERANT CHARGING VOLUME (Refrigerant 22)	UNIT	-----	* 690g
	PIPES	WITHOUT REFRIGERANT BECAUSE COUPLING IS FLARE TYPE. P - 105 VK1 (5m), P - 108 VK1 (8m)	

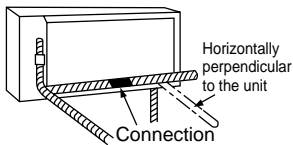
* 690g for piping set of 5~8m.

The Length of Indoor Unit Connecting Cord



Cut away shaded portion, and finish the edge of the opening so that there is no burr.

Direction of Piping



There are 3 directions allowed, namely, horizontally perpendicular to the unit, vertically down from right, horizontally out from right. Don't form the piping downward at the left of the unit.

Dimension of Mounting Stand of the outdoor unit

(unit : mm)

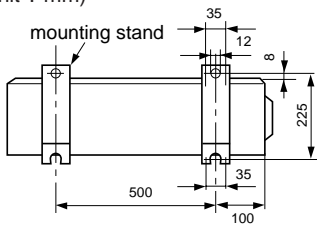
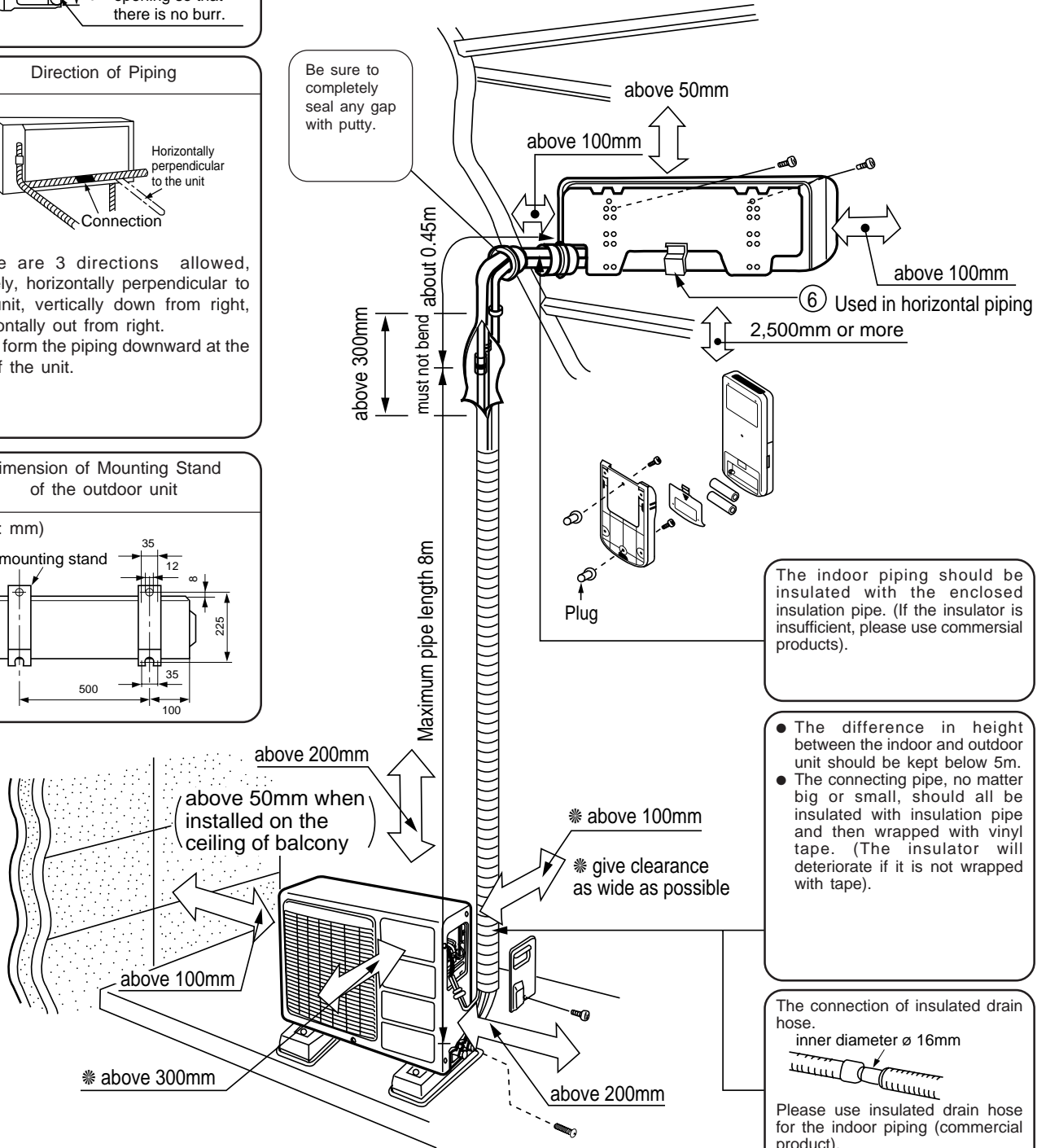


Figure showing the Installation of Indoor and Outdoor Unit.



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

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




The connection of insulated drain hose.
inner diameter \varnothing 16mm

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










SAFETY PRECAUTION




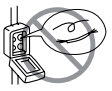
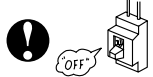
- Please read the “Safety Precaution” carefully before operating the unit to ensure correct usage of the unit.
- Pay special attention to signs of “**▲ Warning**” and “**▲ Caution**”. The “Warning” section contains matters which, if not observed strictly, may cause death or serious injury. The “Caution” section contains matters which may result in serious consequences if not observed properly. Please observe all instructions strictly to ensure safety.
- The sign indicate the following meanings.

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

- Please keep this manual after reading.

PRECAUTIONS DURING INSTALLATION		
 WARNING	<ul style="list-style-type: none"> ● Do not reconstruct the unit. Water leakage, fault, short circuit or fire may occur if you reconstruct the unit by yourself. 	
	<ul style="list-style-type: none"> ● Please ask your sales agent or qualified technician for the installation of your unit. Water leakage, short circuit or fire may occur if you install the unit by yourself. 	
	<ul style="list-style-type: none"> ● Please use earth line. Do not place the earth line near water or gas pipes, lightning-conductor, or the earth line of telephone. Improper installation of earth line may cause electric shock. 	
 CAUTION	<ul style="list-style-type: none"> ● A circuit breaker should be installed depending on the mounting site of the unit. Without a circuit breaker, the danger of electric shock exists. 	
	<ul style="list-style-type: none"> ● Do not install near location where there is flammable gas. The outdoor unit may catch fire if flammable gas leaks around it. 	
	<ul style="list-style-type: none"> ● Please ensure smooth flow of water when installing the drain hose. 	

PRECAUTIONS DURING SHIFTING OR MAINTENANCE		
 WARNING	<ul style="list-style-type: none"> ● Should abnormal situation arises (like burning smell), please stop operating the unit and turn off the circuit breaker. Contact your agent. Fault, short circuit or fire may occur if you continue to operate the unit under abnormal situation. 	
	<ul style="list-style-type: none"> ● Please contact your agent for maintenance. Improper self maintenance may cause electric shock and fire. 	
	<ul style="list-style-type: none"> ● Please contact your agent if you need to remove and reinstall the unit. Electric shock or fire may occur if you remove and reinstall the unit yourself improperly. 	

PRECAUTIONS DURING OPERATION		
 WARNING	<ul style="list-style-type: none"> ● Avoid an extended period of direct air flow for your health. 	
	<ul style="list-style-type: none"> ● Do not put objects like thin rods into the panel of blower and suction side because the high-speed fan inside may cause danger. 	
	<ul style="list-style-type: none"> ● Do not use any conductor as fuse wire, this could cause fatal accident. 	
	<ul style="list-style-type: none"> ● During thunder storm, disconnect and turn off the circuit breaker. 	

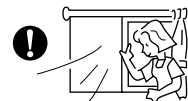
PRECAUTIONS DURING OPERATION

- The product shall be operated under the manufacturer specification and not for any other intended use.



- Do not attempt to operate the unit with wet hands, this could cause fatal accident.

- When operating the unit with burning equipments, regularly ventilate the room to avoid oxygen insufficiency.



- Do not direct the cool air coming out from the air-conditioner panel to face household heating apparatus as this may affect the working of apparatus such as the electric kettle, oven etc.

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

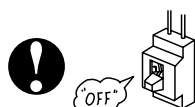
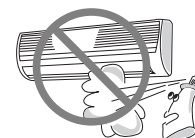


- Do not splash or direct water to the body of the unit when cleaning it as this may cause short circuit.



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- Do not use any aerosol or hair sprays near the indoor unit. This chemical can adhere on heat exchanger fin and blocked the evaporation water flow to drain pan. The water will drop on tangential fan and cause water splashing out from indoor unit.



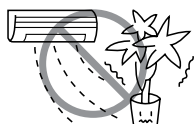
- Please switch off the unit and turn off the circuit breaker during cleaning, the high-speed fan inside the unit may cause danger.

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



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

- Do not put water container (like vase) on the indoor unit to avoid water dripping into the unit. Dripping water will damage the insulator inside the unit and causes short-circuit.

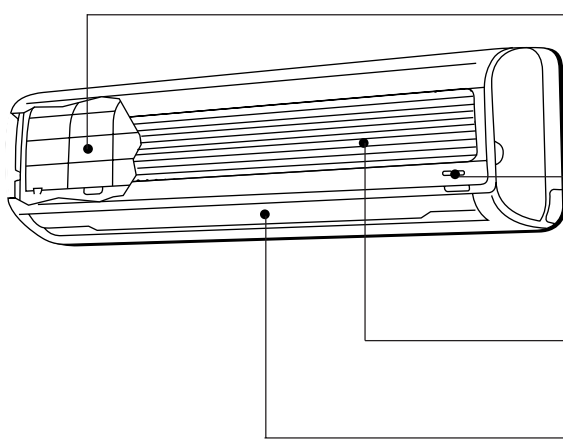


- Do not place plants directly under the air flow as it is bad for the plants.

- When operating the unit with the door and windows opened, (the room humidity is always above 80%) and with the air deflector facing down or moving automatically for a long period of time, water will condense on the air deflector and drips down occasionally. This will wet your furniture. Therefore, do not operate under such condition for a long time.
- If the amount of heat in the room is above the cooling or heating capability of the unit (for example: more people entering the room, using heating equipments and etc.), the preset room temperature cannot be achieved.

NAMES AND FUNCTIONS OF EACH PART

INDOOR UNIT



Air filter

To prevent dust from coming into the indoor unit.
(Refer page 25)

Indoor unit indicators

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

Front panel (Air Inlet)

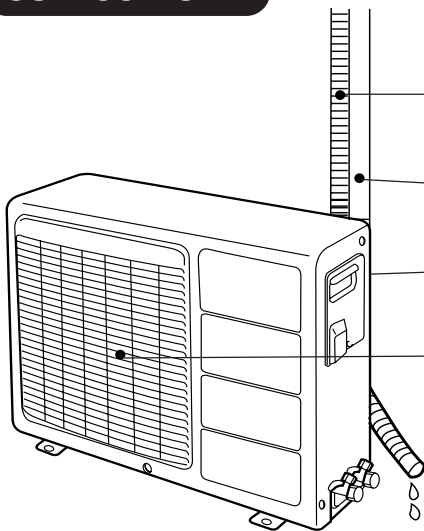
Horizontal deflector ● Vertical deflector (Air Outlet)

(Refer page 20)

Remote controller

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

OUTDOOR UNIT



DRAIN PIPE

Condensed water drain to outside.

CONNECTING CORD

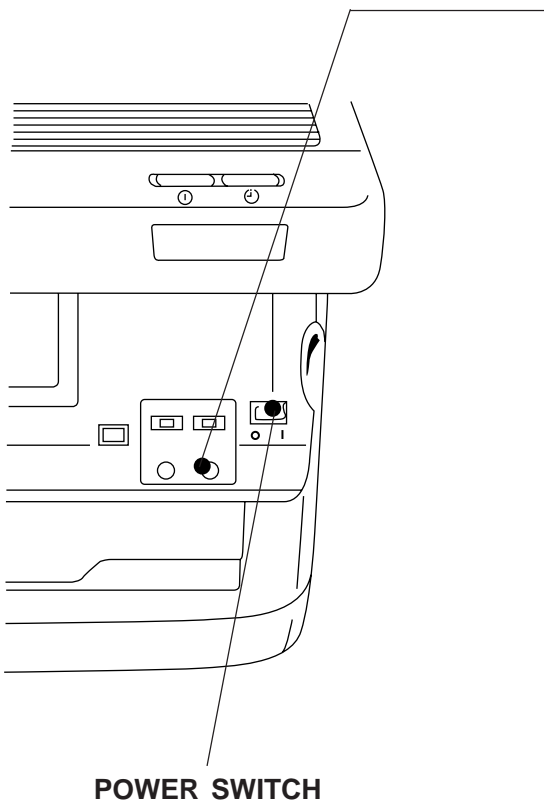
AIR INLET (BACK, LEFT SIDE)

AIR OUTLET

MODEL NAME AND DIMENSIONS

MODEL	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
RAS-25CNH11	745	248	175
RAC-25CNH11	700	570	210

OPERATION INDICATOR

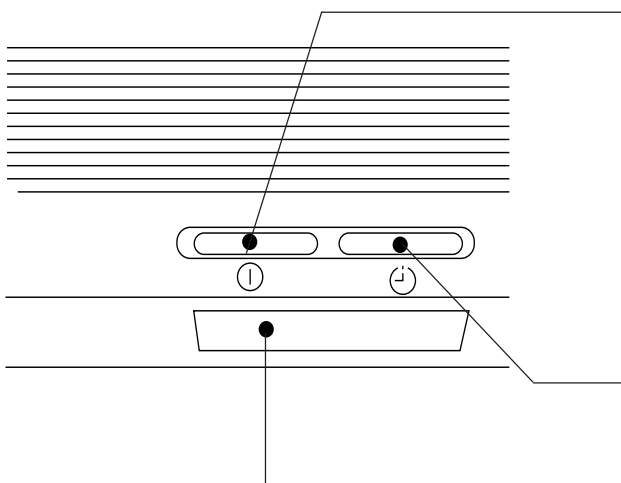


TEMPORARY SWITCH

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

- By setting the temporary switch, the operation is done in previously set operation mode.
- When the operation is done using the temporary switch after the power source is turned off and turn on again, the operation is done in automatic mode.

INDOOR UNIT INDICATORS



OPERATION LAMP

This lamp lights during operation.

The OPERATION LAMP flashes in the following cases during heating.

(1) During preheating

For about 2–3 minutes after starting up.

(2) During defrosting

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

TIMER LAMP

This lamp lights when the timer is working.

SIGNAL RECEIVER

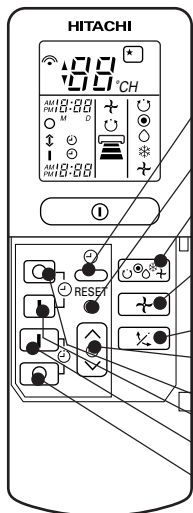
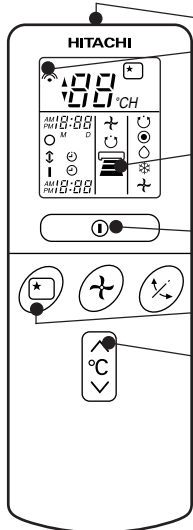
There will be a beep sound when this receiver receives signal from remote controller.

NAMES AND FUNCTIONS OF REMOTE CONTROL UNIT

REMOTE CONTROLLER

This controls the operation of the indoor unit. The range of control is about 7 meters. If indoor lighting is controlled electronically, the range of control may be shorter.

This unit can be fixed on a wall using the fixture provided. Before fixing it, make sure the indoor unit can be controlled from the remote controller.



- **Signal emitting window/transmission sign**
Point this window toward the indoor unit when controlling it. The transmission sign blinks when a signal is sent.
- **Display**
This indicates the room temperature selected, current time, timer status, function and intensity of circulation selected.
- **START/STOP button**
Press this button to start operation. Press it again to stop operation.
- **SLEEP button**
Use this button to set the sleep timer.
- **TEMPERATURE buttons**
Use these buttons to raise or lower the temperature setting. (Keep pressed, and the value will change more quickly.)
- **TIME button**
Use this button to set and check the time and date.
- **RESET buttons**
- **FUNCTION selector**
Use this button to select the operating mode. Every time you press it, the mode will change from ☺ (AUTO) to ● (HEAT) to ○ (DEHUMIDIFY) to * (COOL) and to † (FAN) cyclically.
- **FAN SPEED selector**
This determines the fan speed. Every time you press this button, the intensity of circulation will change from ☺ (AUTO) to ☺ (HI) to ☺ (MED) to ☺ (LOW) (during the † (FAN) mode, from ☺ HI to ☺ MED to ☺ LOW).
- **AUTO SWING button**
Controls the angle of the horizontal air deflector.
- **TIMER control**
Use this button to set the timer.
- **OFF-TIMER button** Select the turn OFF time.
- **ON-TIMER button** Select the turn ON time.
- **RESERVE button** Time setting reservation.
- **CANCEL button** Cancel time reservation.

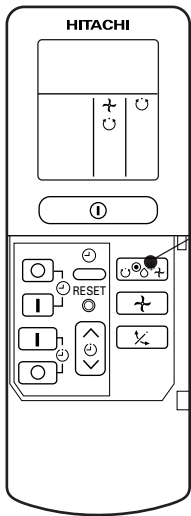
☺	AUTO
●	HEAT
○	DEHUMIDIFY
*	COOL
†	FAN
☺ ☺ ☺	FAN SPEED LOW MED HI
*	SLEEPING
○	STOP (CANCEL)
I	START (RESERVE)
①	START/STOP
⌚	TIME
⌚	TIMER SET
⌚	TIMER SELECTOR ON TIMER OFF TIMER
↔	AUTO SWING

Precautions for Use


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

AUTOMATIC OPERATION

The device will automatically determine the mode of operation, HEAT, COOL or DEHUMIDIFY depending on the initial room temperature. The selected mode of operation will not change when the room temperature varies.





1

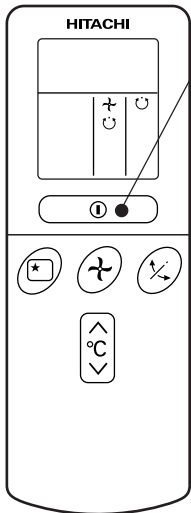
Press the FUNCTION selector so that the display indicates the  (AUTO) mode of operation.

- When AUTO has been selected, the device will automatically determine the mode of operation, HEAT, COOL or DEHUMIDIFY depending on the initial room temperature.

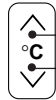
START STOP

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

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



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



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

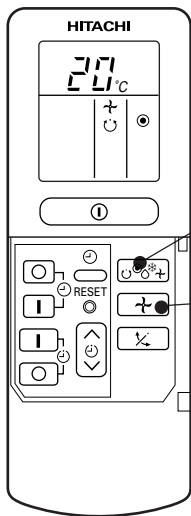
- The preset temperature and the actual room temperature may vary somewhat depending on conditions.
- The display does not indicate the preset temperature in the AUTO mode. If you change the setting, the indoor unit will produce a beep.

■ Condition of Automatic Operation

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

HEATING OPERATION

- Use the device for heating when the outdoor temperature is under 21°C.
When it is too warm (over 21°C), the heating function may not work in order to protect the device.



1

Press the FUNCTION selector so that the display indicates ● (HEAT).

2

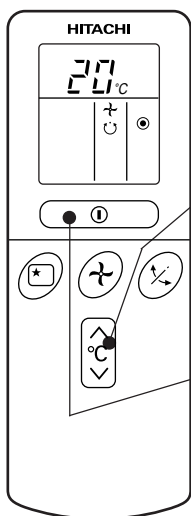
Set the desired FAN SPEED with the (FAN SPEED) button (the display indicates the setting).

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

(HI) : Economical as the room will become warm quickly.
But you may feel a chill at the beginning.

(MED) : Quiet.

(LOW) : More quiet.



3

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



The range of 18-22°C is recommended as the room temperature for heating.

If the temperature setting is 20°C, the room temperature will be controlled at around 20°C.

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

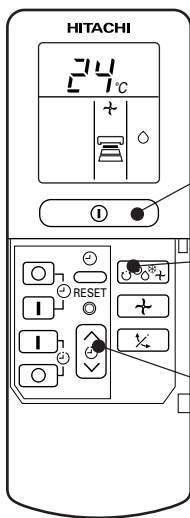
**START
STOP**

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

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

DEHUMIDIFYING OPERATION


Use the device for dehumidifying when the room temperature is over 16°C.
When it is under 15°C, the dehumidifying function will not work.



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

1 Press the FUNCTION selector so that the display indicates ◯ (DEHUMIDIFY).
The FAN SPEED is set at LOW automatically.
The FAN SPEED button does not work.

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

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

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

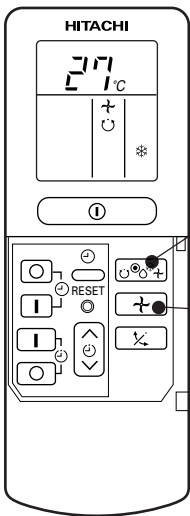
■ Dehumidifying Function

When the room temperature is higher than the temperature setting: The device will dehumidify the room, reducing the room temperature to the preset level.

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

COOLING OPERATION

Use the device for cooling when the outdoor temperature is 22-42°C.
If in doors humidity is very high (80%), some dew may form on the air outlet grille of the indoor unit.




1

Press the FUNCTION selector so that the display indicates * (COOL).


2

Set the desired FAN SPEED with the \updownarrow (FAN SPEED) button (the display indicates the setting).

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

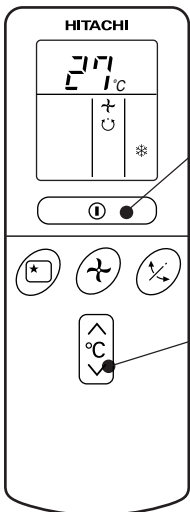
 (HI) : Economical as the room will become cool quickly.

 (MED) : Quiet.

 (LOW) : More quiet.

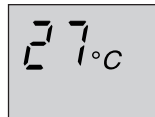
**START
STOP**

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



3

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



The range of 25-28°C is recommended as the room temperature for cooling.

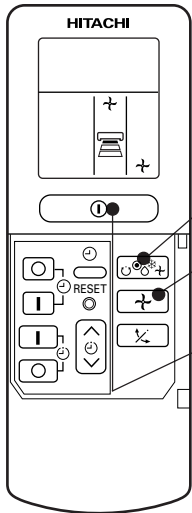
If the temperature setting is 27°C, the room temperature will be controlled at around 27°C.

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

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

FAN OPERATION

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



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

2 Press the (FAN SPEED) button.*

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

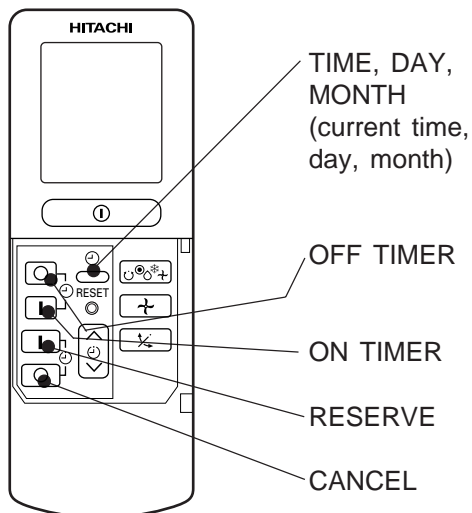
* Note • In the fan operation mode, only display of FAN SPEED setting will change by pressing FAN SPEED button; the actual fan speed cannot be changed directly from HI to LOW mode.

FAN SPEED (AUTO)

..... When the AUTO fan speed mode is set in the cooling/heating operation:

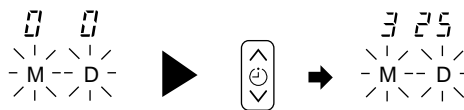
For the heating operation	<ul style="list-style-type: none"> ● The fan speed will automatically change according to the temperature of discharged air. ● When the difference of room temperature and setting temperature is large, fan starts to run at HI speed. ● When the room temperature reaches setting temperature, fan speed changes to LOW automatically.
For the cooling operation	<ul style="list-style-type: none"> ● When the difference of room temperature and setting temperature is large, fan starts to run at HI speed. ● After room temperature reaches the preset temperature, the cooling operation, which changes the fan speed and room temperature to obtain optimum conditions for natural healthful cooling will be performed.

HOW TO SET THE TIMER



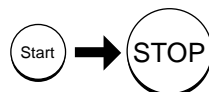
Time, Day, Month

After you change the batteries;



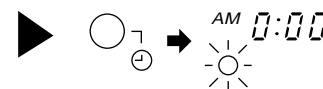
1 Set the current month and day with the TIMER control button.

OFF-Timer



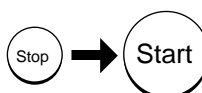
You can set the device to turn off at the present time.

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

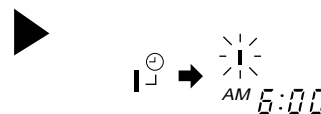


ON-Timer

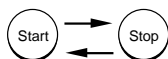
- The device will turn on at the designated times.



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

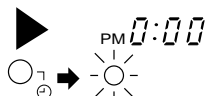


ON/OFF-Timer

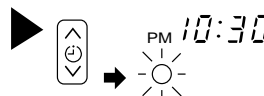


- The device will turn on (off) and off (on) at the designated times.
- The switching occurs first at the preset time that comes earlier.
- The arrow mark appearing on the display indicates the sequence of switching operations.

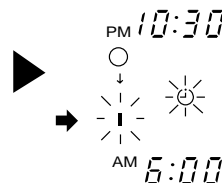
1 Press the (ON-OFF) button so that the (OFF) mark blinks.



2 Set the turn-off time with the TIMER control button. Press the (RESERVE) button.



3 Press the (ON-TIMER) button so that the (OFF) mark lights and the (ON) mark blinks.



How to Cancel Reservation

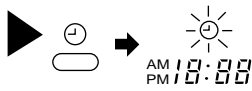
Point the signal window of the remote controller toward the indoor unit, and press the (CANCEL) button.

The (RESERVED) sign goes out with a beep and the (TIMER) lamp turns off on the indoor unit.

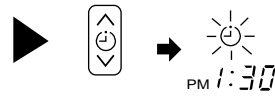
NOTE

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

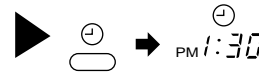
2 Press the ⊖ (TIME) button.



3 Set the current time with the TIMER control button.



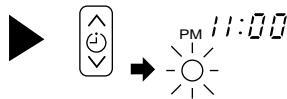
4 Press the ⊖ (TIME) button again. The time indication starts lighting instead of flashing.



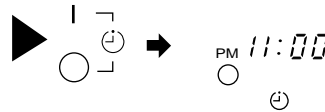
- The time indication will disappear automatically in 10 second.
 - To check the current time setting, press the ⊖ (TIME) button twice.
- The setting of the current time is now complete.

Example: The current time is 1:30 p.m.

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



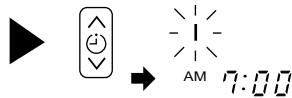
3 Point the signal window of the remote controller toward the indoor unit, and press the | (RESERVE) button. The ⊖ (OFF) mark starts lighting instead of flashing and the sign ⊖ (RESERVED) lights. A beep occurs and the ⊖ (TIMER) lamp lights on the indoor unit.



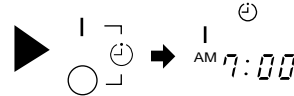
Example: The device will turn off at 11:00p.m.

The setting of turn-off time is now complete.

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

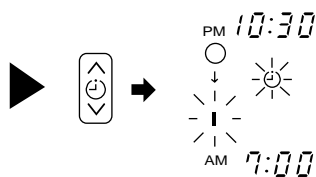


3 Point the signal window of the remote controller toward the indoor unit, and press the | (RESERVE) button. The | (ON) mark starts lighting instead of flashing and the ⊖ (RESERVED) sign lights. A beep occurs and the ⊖ (TIMER) lamp lights on the indoor unit.

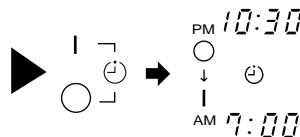


Example:
The device will automatically turn on earlier so that the preset temperature can be reached at 7:00 a.m.
The setting of the turn-on time is now complete.

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




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

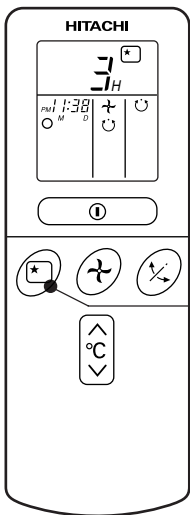


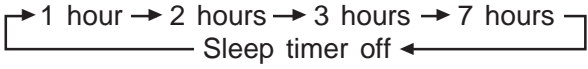
Example:
The device will turn off at 10:30 p.m. and then automatically turn on earlier so that the preset temperature can be reached at 7:00 a.m.
The settings of the turn-on/off times are now complete.

- The timer may be used in three ways: off-timer, on-timer, and ON/OFF (OFF/ON)-timer. Set the current time at first because it serves as a reference.
- As the time settings are stored in memory in the remote controller, you only have to press the | (RESERVE) button in order to use the same settings next time.

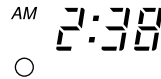
HOW TO SET THE SLEEP TIMER

Set the current time at first if it is not set before (see the pages for setting the current time). Press the  (SLEEP) button, and the display changes as shown below.

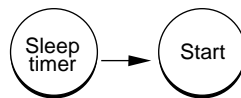


Mode	Indication
Sleep timer	

Sleep Timer: The device will continue working for the designated number of hours and then turn off. Point the signal window of the remote controller toward the indoor unit, and press the SLEEP button. The timer information will be displayed on the remote controller. The TIMER lamp lights with a beep from the indoor unit. When the sleep timer has been set, the display indicates the turn-off time.



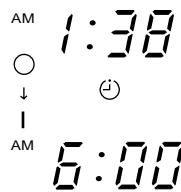
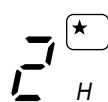
Example: If you set 3 hours sleep time at 11:38 p.m., the turn-off time is 2:38 a.m.



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

1 Set the ON-timer.


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




For heating:

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

How to Cancel Reservation

Point the signal window of the remote controller toward the indoor unit, and press the  (CANCEL) button.

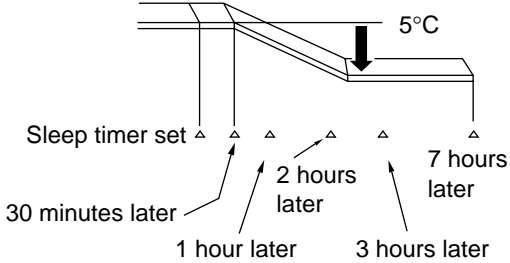
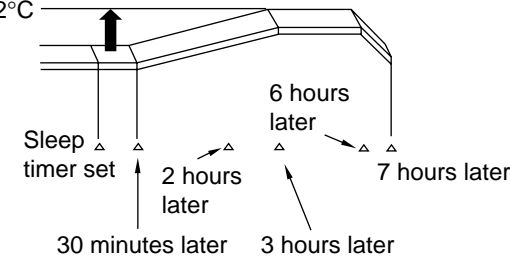
The  (RESERVED) sign goes out with a beep and the  (TIMER) lamp turns off on the indoor unit.

Explanation of the sleep timer

The device will control the FAN SPEED and room temperature automatically so as to be quiet and good for people's health.

You can set the sleep timer to turn off after 1, 2, 3 or 7 hours. The FAN SPEED and room temperature will be controlled as shown below.

Operation with the sleep timer


Function	Operation
Heating “ ● ”	<p>The room temperature will be controlled 5°C below the temperature and the FAN SPEED will be set to LOW setting 30 minutes after the setting of the sleep timer.</p> 
Cooling “ ❄ ” and dehumidifying “ ◊ ”	<p>The room temperature will be controlled 2°C above the temperature and the FAN SPEED will be set to LOW setting 30 minutes after the setting of the sleep timer.</p> 
Fan “ ✂ ”	<p>The settings of room temperature and circulation are varied.</p>

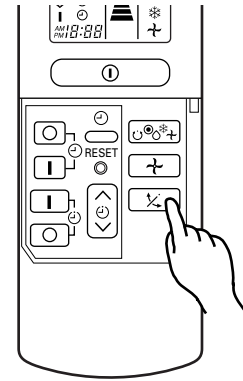
NOTE


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

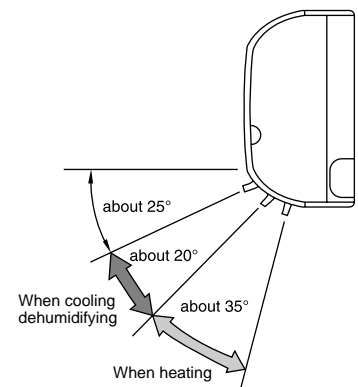
ADJUSTING THE AIR DEFLECTOR

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

The horizontal air deflector is automatically set to the proper angle suitable for each operation. The deflector can be swung up and down continuously and also set to the desired angle using the “ (AUTO SWING)” button.



- If the “ (AUTO SWING)” button is pressed once, the horizontal air deflector swings up and down. If the button is pressed again, the deflector stops in its current position. Several seconds (about 6 seconds) may be required before the deflector starts to move.
- Use the horizontal air deflector within the adjusting range shown on the right.
- When the operation is stopped, the horizontal air deflector moves and stops at the position where the air outlet closes.

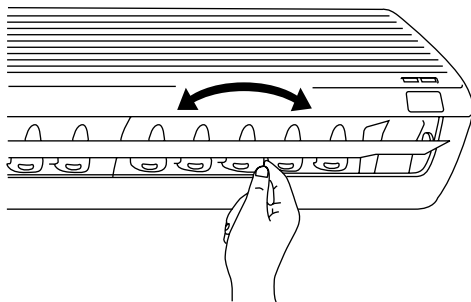


CAUTION

- In “Cooling” operation, do not keep the horizontal air deflector swinging for a long time. Some dew may form on the horizontal air deflector and some dew drops may fall from it.

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

Hold the vertical air deflector as shown in the figure and adjust the conditioned air to the left and right.

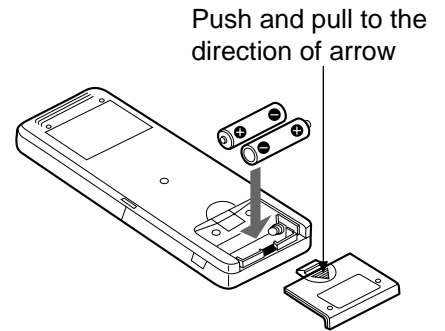


HOW TO EXCHANGE THE BATTERIES IN THE REMOTE CONTROLLER

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



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



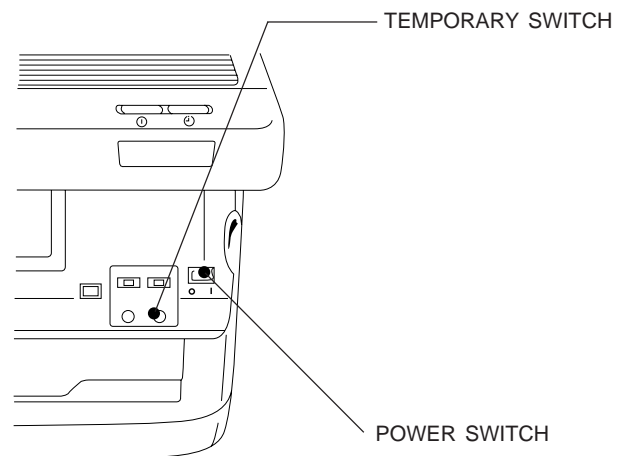
CAUTION

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

TEMPORARY SWITCH

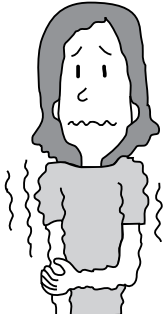
Use this switch to start and stop when the remote controller does not work.

- By setting the temporary switch, the operation is done in previously set operation mode.
- When the operation is done using the temporary switch after the power source is turned off and turn on again, the operation is done in automatic mode.



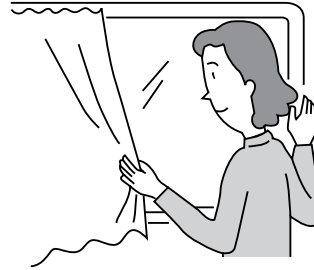
THE IDEAL WAYS OF OPERATION

Suitable Room Temperature



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

Install curtain or blinds



It is possible to reduce heat entering the room through windows.

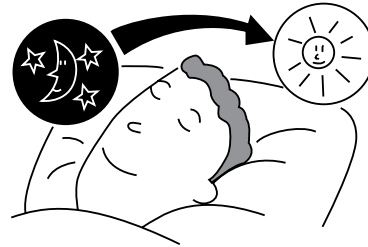
Ventilation

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



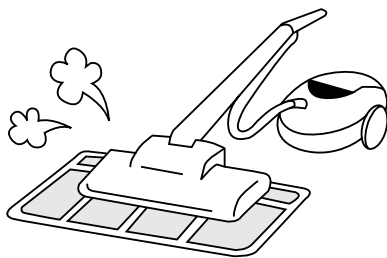
Effective Usage Of Timer

At night, please use the “OFF or ON timer operation mode”, together with your wake up time in the morning. This will enable you to enjoy a comfortable room temperature. Please use the timer effectively.



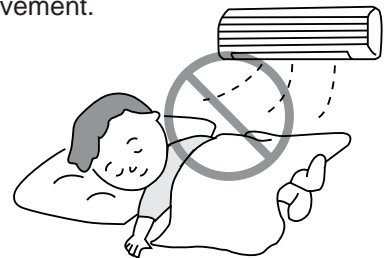
Do Not Forget To Clean The Air Filter

Dusty air filter will reduce the air volume and the cooling efficiency. To prevent from wasting electric energy, please clean the filter every 2 weeks.



Please Adjust Suitable Temperature For Baby And Children

Please pay attention to the room temperature and air flow direction when operating the unit for baby, children and old folks who have difficulty in movement.

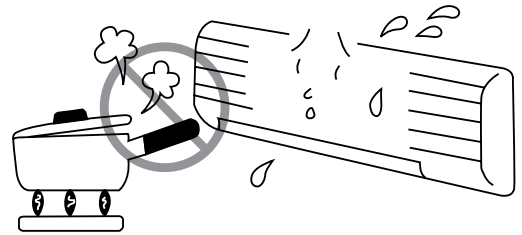


FOR USER'S INFORMATION

The Air Conditioner And The Heat Source In The Room

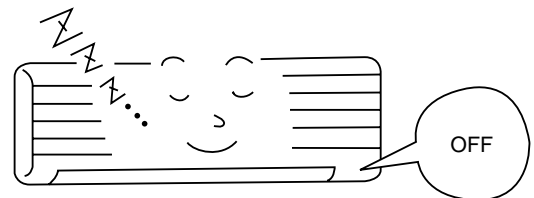
⚠ Caution

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



Not Operating For A Long Time

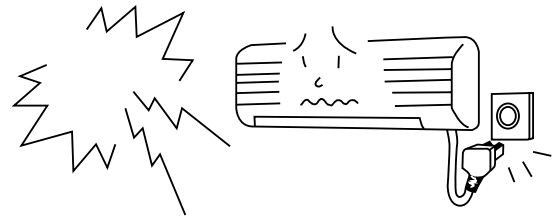
When the indoor unit is not to be used for a long period of time, please switch off the power from the mains. If the power from mains remains "ON", the indoor unit still consumes about 8W in the operation control circuit even if it is in "OFF" mode.



When Lightning Occurs

⚠ Warning

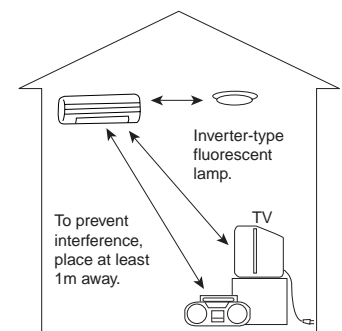
To protect the whole unit during lightning, please stop operating the unit and remove the plug from the socket.



Interference From Electrical Products

⚠ Caution

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

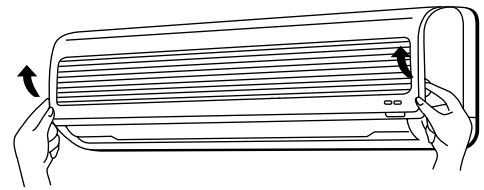


ATTACHING THE AIR CLEANSING AND DEODORIZING FILTERS

Before installation, be sure to stop the operation by using the remote controller.

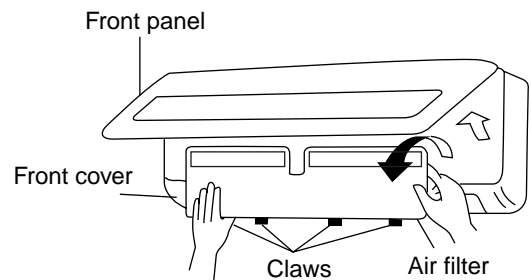
1 Open the front panel.

- Pull up the front panel holding it at both sides by both hands.



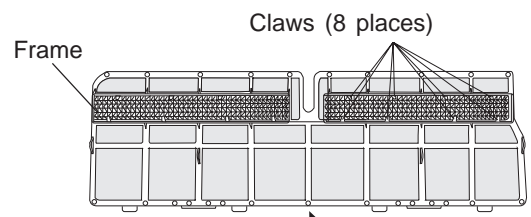
2 Remove the filter.

- Push the filter upward to release the claws and pull out the filter.



3 Attaching the air cleansing and deodorizing filters to the filter.

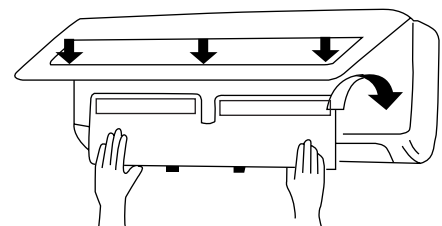
- Attach the air cleansing and deodorizing filters to the frame by gently compress its both sides and release after insertion into filter frame.



Make sure the "FRONT" is facing back side

CAUTION

Do not bend the air cleansing and deodorizing filter as it may cause damage to the structure.



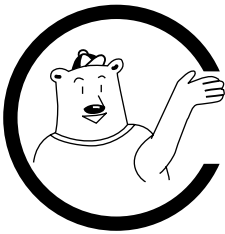
4 Attach the filter.

- Attach the filter by ensuring that the surface written "FRONT" is facing front.
- After attaching the filter, push the front panel at three arrow portions as shown in figure and close it.



NOTE

- In case of removing the air cleansing and deodorizing filters, please follow the above procedures.
- The cooling capacity is slightly weakened and the cooling speed becomes slower when the air cleansing and deodorizing filters are used. So, set the fan speed to "HIGH" when using it in this condition.
- Air cleansing and deodorizing filters are washable and reusable up to 20 times by using vacuum cleaner or water rinse under running tap water. Type number for this air cleansing filter is <SPX-CFH5>.
- Do not operate the air conditioner without filter. Dust may enter the air conditioner and fault may occur.



MAINTENANCE

⚠ CAUTION

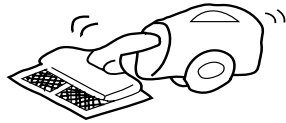
Before the cleaning, stop operation and disconnect the power supply.

1. AIR FILTER

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

PROCEDURE

- 1 Open the front panel and remove the filter
 - Gently lift and remove the air cleansing and deodorizing filters from the air filter frame.
- 2
 - Vacuum dust from the air filter and air cleansing and deodorizing filters using vacuum cleaner. If there is too much dust, rinse under running tap water and gently brush it with soft bristle brush. Allow filters to dry in shade.

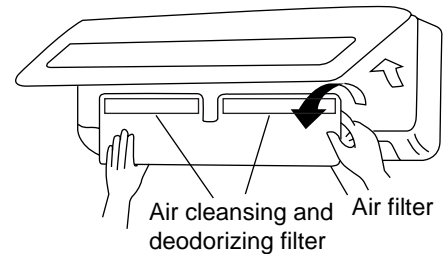
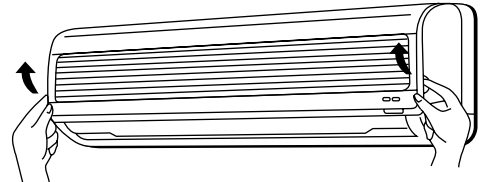


- 3
 - Re-insert the air cleansing and deodorizing filters to the filter frame. Set the filter with "FRONT" mark facing front, and slot them into the original state.
 - After attaching the filter, push the front panel at three arrow portions as shown in figure and close it.

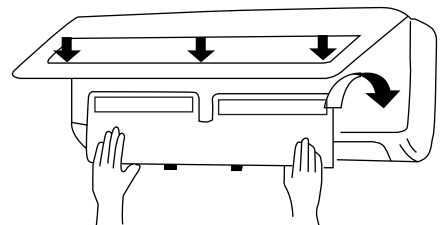
NOTE:

- Air cleansing and deodorizing filter should be cleaned every month or sooner if noticeable loading occurs. When used overtime, it may lose its deodorizing function. For maximum performance, it is recommended to replace it every 3-6 months depending on application requirements.

REMOVING METHOD



INSTALLATION METHOD

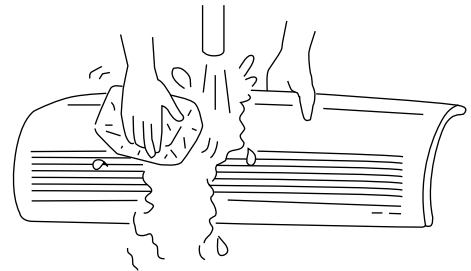


⚠ CAUTION

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

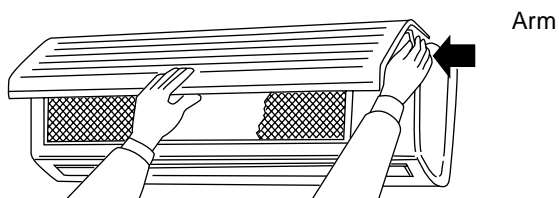
2. Washable Front Panel

- Remove the front panel and wash with clean water.
Wash it with a soft sponge.
After using neutral detergent, wash thoroughly with clean water.
- When front panel is not removed, wipe it with a soft dry cloth. Wipe the remote controller thoroughly with a soft dry cloth.
- Wipe the water thoroughly.
If water remains at indicators or signal receiver of indoor unit, it causes trouble.



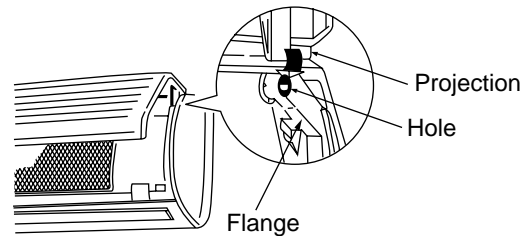
Method of removing the front panel.
Be sure to hold the front panel with both hands to detach and attach it.

Removing the Front Panel



- When the front panel is fully opened with both hands, push the right arm to the inside to release it, and while closing the front panel slightly, put it out forward.

Attaching the Front Panel



- Move the projections of the left and right arms into the **Flanges** in the unit and securely insert them into the holes.

⚠ CAUTION

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

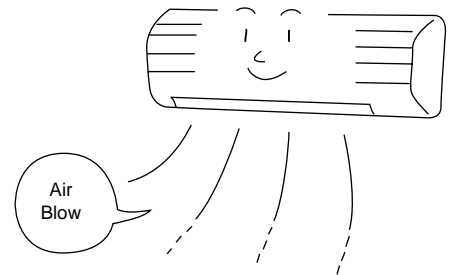


▲ CAUTION

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

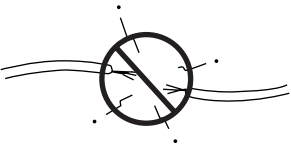
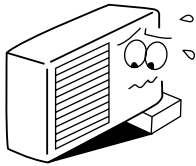
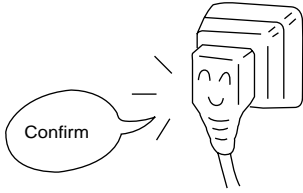
3. MAINTENANCE AT BEGINNING OF LONG OFF PERIOD

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



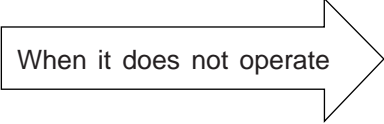
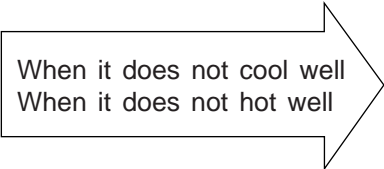
REGULAR INSPECTION

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

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

AFTER SALE SERVICE AND WARRANTY

WHEN ASKING FOR SERVICE, CHECK THE FOLLOWING POINTS.

CONDITION	CHECK THE FOLLOWING POINTS
 <p>When it does not operate</p>	<ul style="list-style-type: none"> ● Is the fuse all right? ● Is the voltage extremely high or low? ● Is the circuit breaker "ON"?
 <p>When it does not cool well When it does not hot well</p>	<ul style="list-style-type: none"> ● Was the air filter cleaned? ● Does sunlight fall directly on the outdoor unit? ● Is the air flow of the outdoor unit obstructed? ● Are the doors or windows opened, or is there any source of heat in the room? ● Is the set temperature suitable?



Notes

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

- Please contact your sales agent immediately if the air conditioner still fails to operate normally after the above inspections. Inform your agent of the model of your unit, production number, date of installation. Please also inform him regarding the fault.
- Power supply shall be connected at the rated voltage, otherwise the unit will be broken or could not reach the specified capacity.

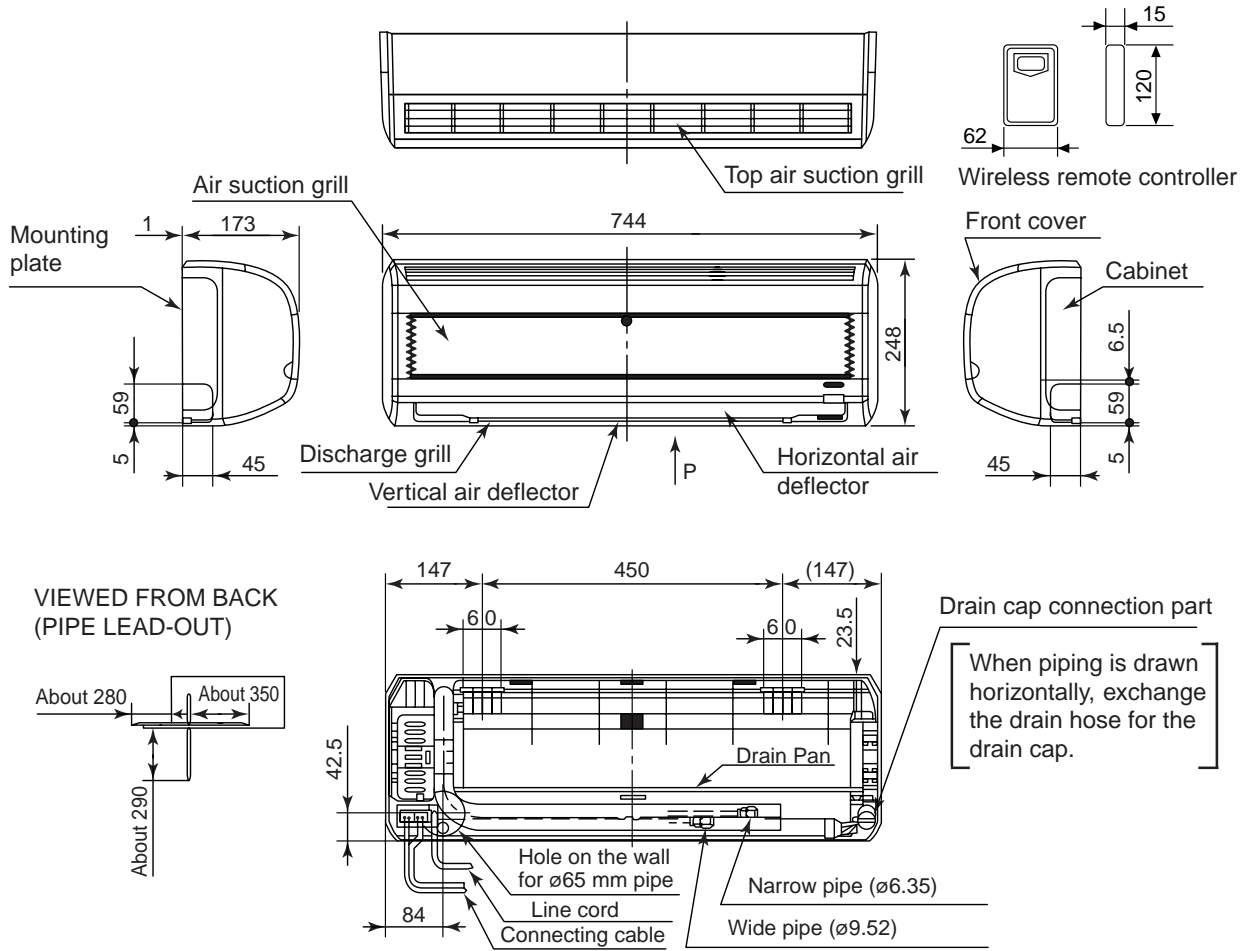
Please note:

On switching on the equipment, particularly when the room light is dimmed, a slight brightness fluctuation may occur. This is of no consequence.

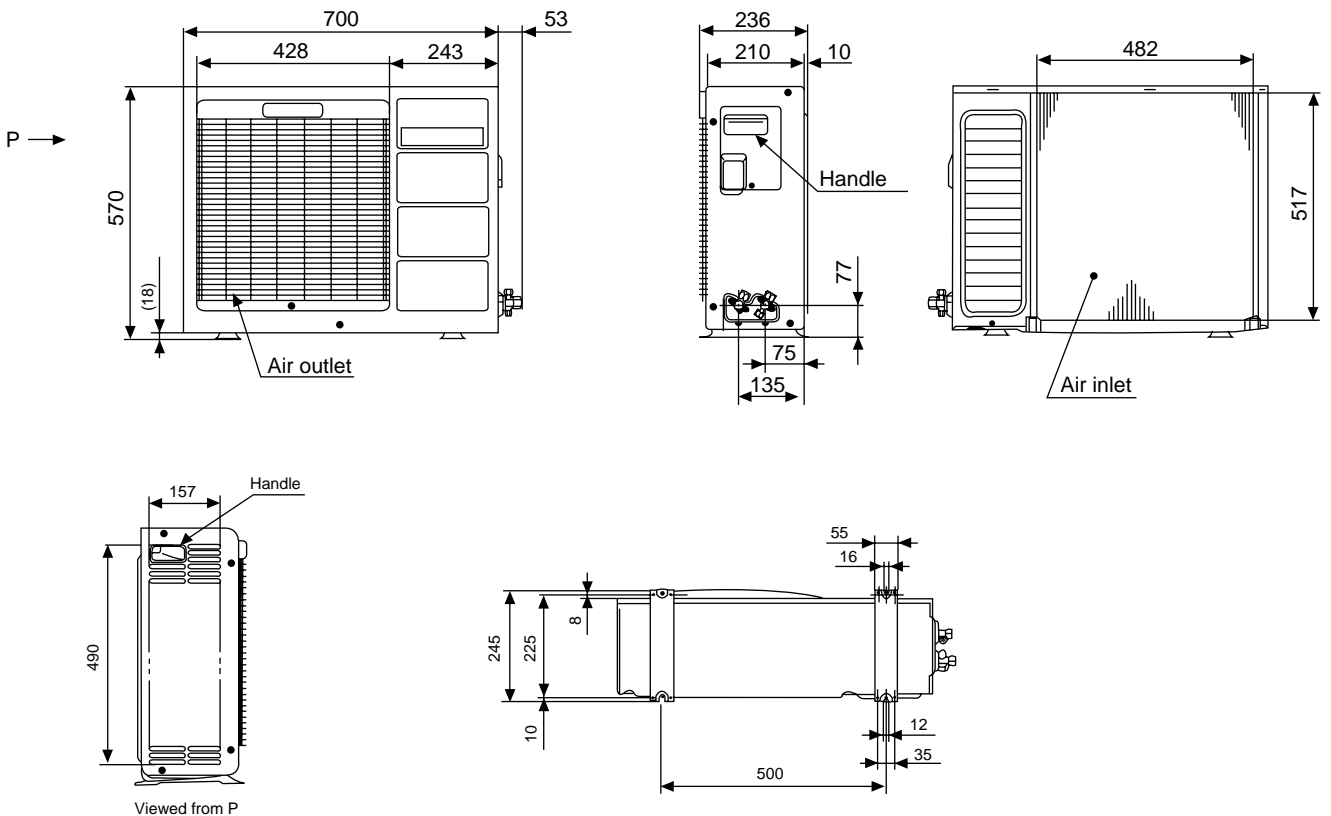
The conditions of the local Power Supply Companies are to be observed.

CONSTRUCTION AND DIMENSIONAL DIAGRAM

MODEL RAS-25CNH11



MODEL RAC-25CNH11



MAIN PARTS COMPONENT

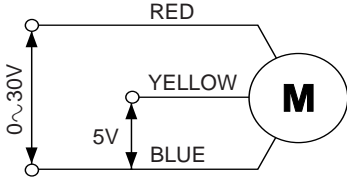
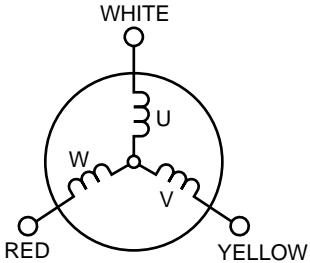
THERMOSTAT

Thermostat Specifications

MODEL			RAS-25CNH11
THERMOSTAT MODEL			IC
TEMPERATURE °C (°F)	INDICATION 16	ON	17.6 (63.7)
		OFF	16.6 (61.8)
	INDICATION 24	ON	25.6 (78.1)
		OFF	24.6 (76.3)
	INDICATION 32	ON	33.6 (92.5)
		OFF	32.6 (90.7)

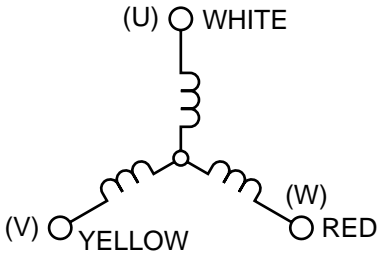
FAN MOTOR

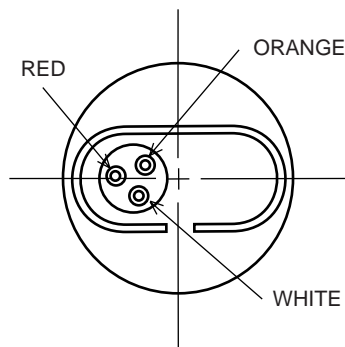
Fan Motor Specifications

MODEL		RAS-25CNH11	RAC-25CNH11
RATED VOLTAGE		DC0 – 35V	DC230V
OUTPUT		20W	20W
CONNECTION			
RESISTANCE VALUE (Ω)	20°C (68°F)	_____	_____
	75°C (167°F)	_____	_____

COMPRESSOR MOTOR

Compressor Motor Specifications

MODEL	RAC-25CNH11	
COMPRESSOR MODEL	GR20DR2F	
PHASE	SINGLE	
RATED VOLTAGE	AC 220 – 240 V	
RATED FREQUENCY	50 Hz	
POWER SOURCE FOR COMPRESSOR	Vcc max = 360V	
POLE NUMBER	4	
CONNECTION		
RESISTANCE VALUE (Ω)	20°C (68°F)	2M = 3.21
	75°C (167°F)	2M = 3.90



CAUTION

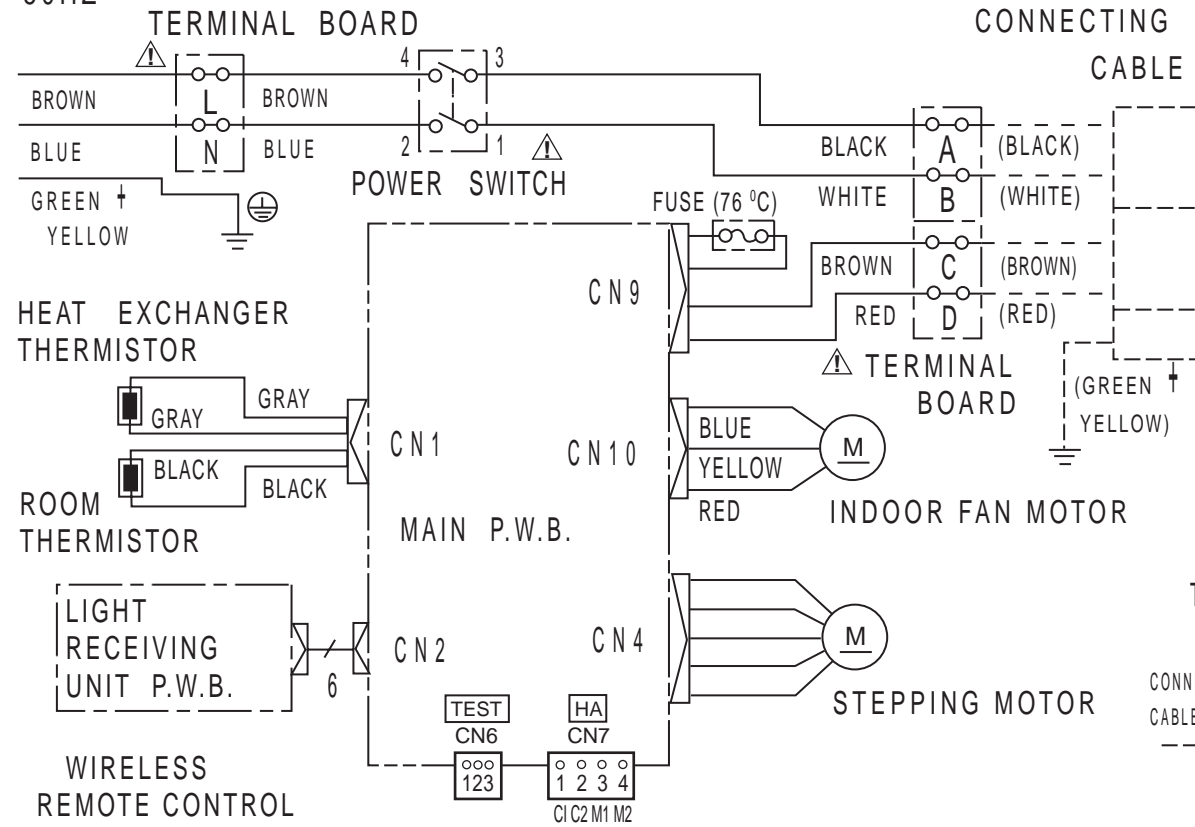
When the refrigerating cycle has been operated for a long time with the capillary tubes clogged or crushed or with too little refrigerant, check the color of the refrigerating machine oil inside the compressor. If the color has been changed conspicuously, replace the compressor.

WIRING DIAGRAM

MODEL RAS-25CNH11 / RAC-25CNH11

Indoor unit

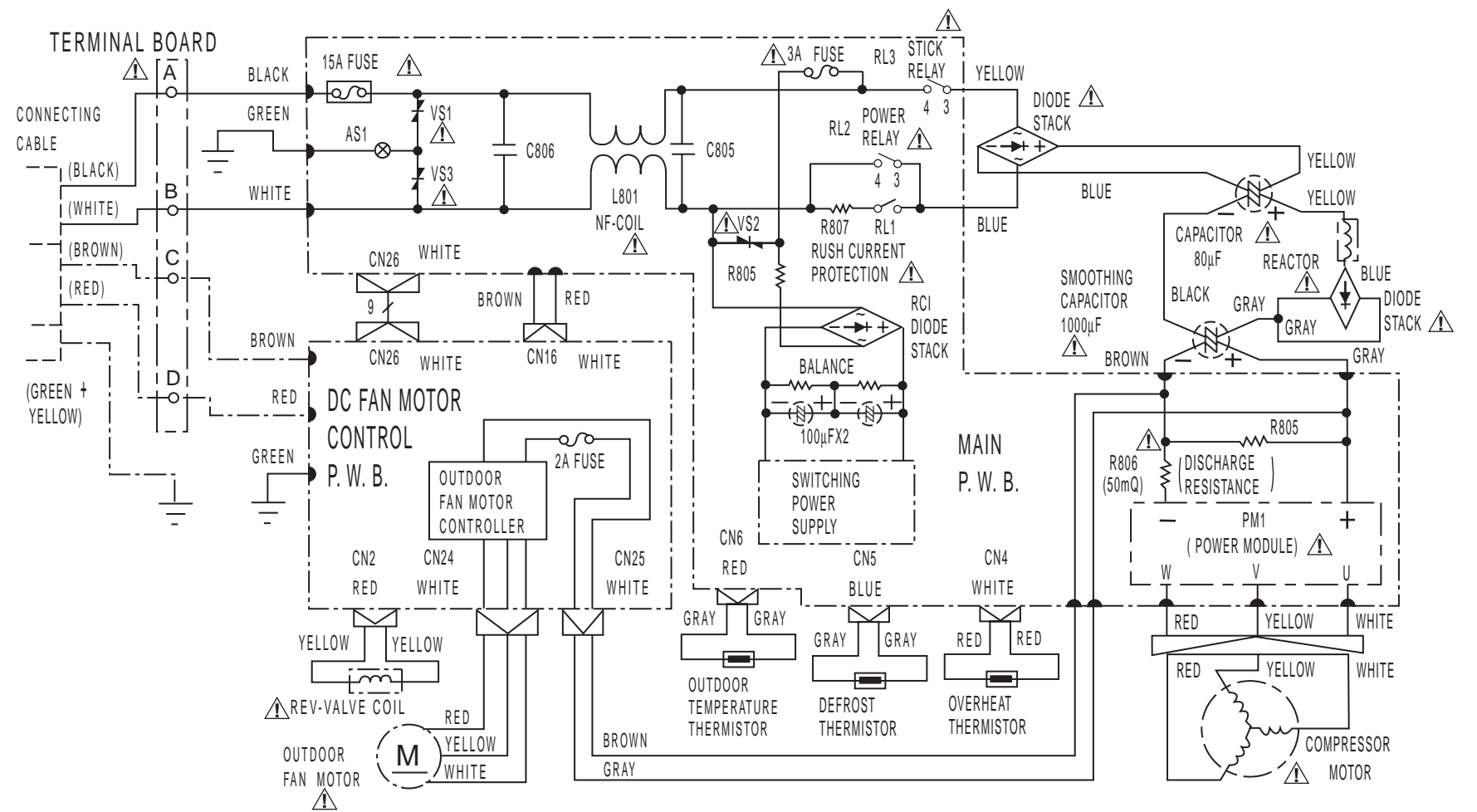
AC 220V
50HZ



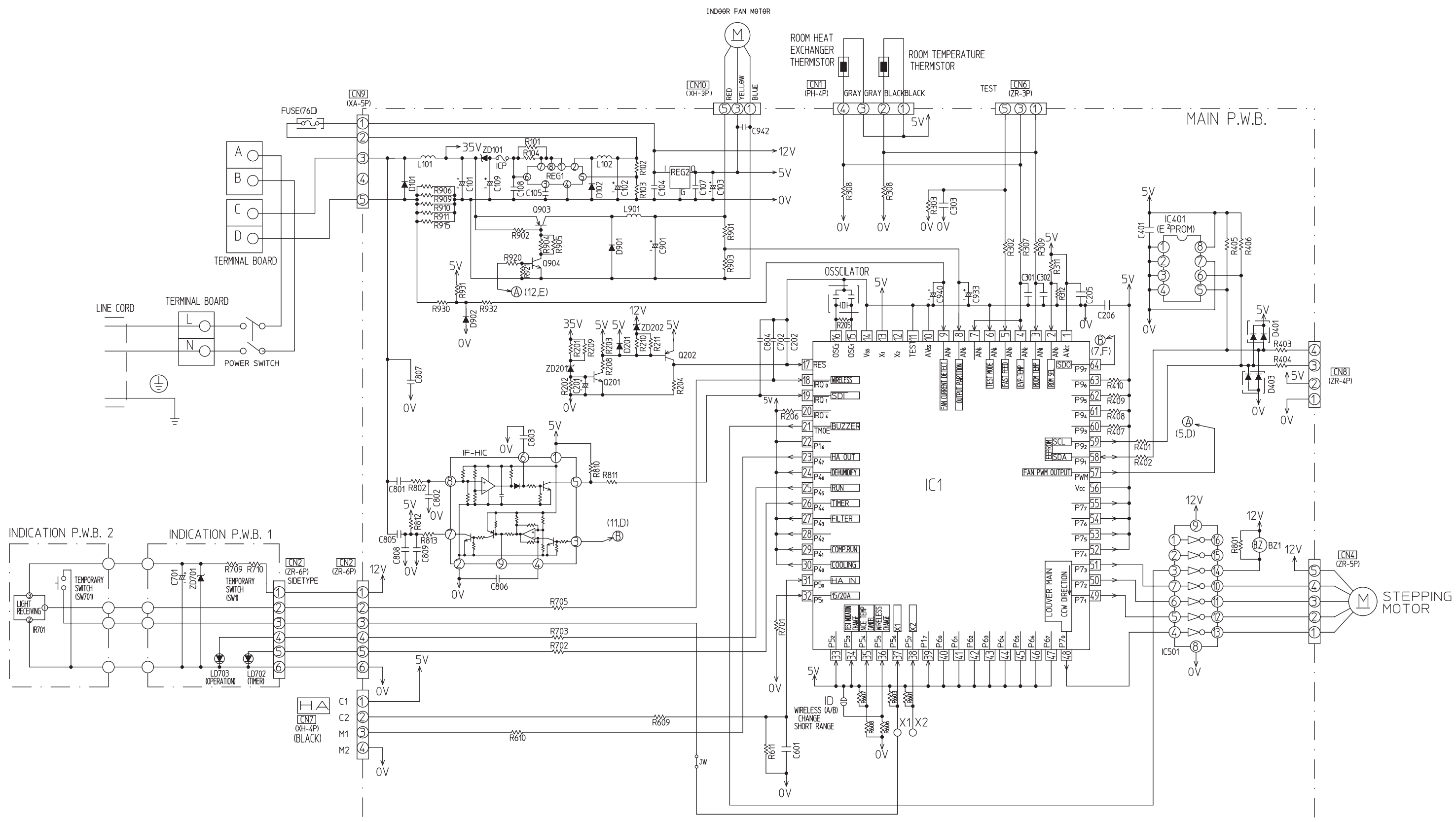
CAUTION

The marked parts ⚠ are very important ones for safety.

Outdoor unit



CIRCUIT DIAGRAM
MODEL RAS-25CNH11



RESISTØR

SYMBOL	RESISTANCE	TOLERANCE	POWER
R101	1.0	+5%	1/4W
R102	10K	±2%	1/16W
R103	1.2K	+2%	1/16W
R104	1.0	+5%	1/4W
R201	5.1K	+5%	1/10W
R202	10K	+5%	1/10W
R203	2.7K	+5%	1/16W
R204	5.1K	+5%	1/16W
R205	1M	+5%	1/16W
R206	10K	+5%	1/10W
R208	5.1K	+5%	1/10W
R210	12K	+5%	1/10W
R211	12K	+5%	1/10W
R302	1K	+5%	1/16W
R303	10K	+5%	1/16W
R307	1K	+5%	1/16W
R308	12.7K	±1%	1/10W
R309	1K	+5%	1/16W

SYMBOL	RESISTANCE	TOLERANCE	POWER
R310	12.7K	±1%	1/10W
R311	1K	+5%	1/16W
R312	10K	+5%	1/16W
R401	390	+5%	1/16W
R402	390	+5%	1/16W
R403	390	+5%	1/16W
R404	390	+5%	1/16W
R405	5.1K	+5%	1/16W
R406	5.1K	+5%	1/16W
R407	10K	+5%	1/16W
R408	10K	+5%	1/16W
R409	10K	+5%	1/16W
R410	10K	+5%	1/16W
R601	10K	+5%	1/16W
R603	10K	+5%	1/16W
R606	10K	+5%	1/16W
R607	10K	+5%	1/16W
R608	1K	+5%	1/16W
R609	1K	+5%	1/16W

SYMBOL	RESISTANCE	TOLERANCE	POWER
R610	1K	+5%	1/16W
R611	10K	+5%	1/16W
R701	390	+5%	1/16W
R702	390	+5%	1/10W
R703	200	+5%	1/10W
R705	1K	+5%	1/16W
R709	1K	+5%	1/4W
R710	1K	+5%	1/4W
R801	3.3K	+5%	1/10W
R802	1K	+5%	1/16W
R810	5.1K	+5%	1/16W
R811	5.1K	+5%	1/16W
R812	20	+5%	1/4W
R813	20	+5%	1/4W

SYMBOL	RESISTANCE	TOLERANCE	POWER
R901	20K	+1%	1/10W
R902	300	+5%	1/16W
R903	2.21K	+1%	1/10W
R904	2.0K	+5%	2W
R905	2.0K	+5%	2W
R906	1.5	+5%	1/4W
R909	1.5	+5%	1/4W
R910	1.5	+5%	1/4W
R911	1.5	+5%	1/4W
R915	1.5	+5%	1/4W
R920	3.3K	+5%	1/16W
R921	3.3K	+5%	1/16W
R930	1K	±1%	1/10W
R931	8.25K	±1%	1/10W
R932	5.1K	+5%	1/16W

CAPACITØR

SYMBOL	RATING	KIND
C101	220u, 50V	D
C102	100u, 50V	D
C103	100u, 10V	D
C104	0.1u, 25V	C
C105	220P, 50V	C
C107	0.047u, 25V	C
C108	0.022u, 50V	C
C109	56u, 50V	D
C201	33u, 10V	D
C202	0.1u, 25V	C
C205	0.1u, 25V	C
C206	0.1u, 25V	C
C301	0.1u, 25V	C
C302	0.1u, 25V	C
C303	0.1u, 25V	C
C401	0.1u, 25V	C
C601	0.1u, 25V	C
C701	33u, 10V	C
C702	1000P, 50V	C

SYMBOL	RATING	KIND
C801	1000P, 50V	F
C802	1000P, 50V	C
C803	0.047u, 16V	C
C804	0.01u, 50V	C
C805	0.22u, 50V	F
C806	150P, 50V	C
C807	0.22u, 50V	F
C901	150u, 50V	D
C933	10u, 16V	D
C940	10u, 16V	D
C942	0.1u, 25V	C

TRANSISTØR

SYMBOL	MØDEL NØ.
Q201	2SC2462LC
Q202	2SA1121SC
Q903	2SA1757F
Q904	2SC3624A
D101	G4DL-6140
D102	D1FS6
D201	HSM2838C
D401	HSM2838C
D403	HSM2836C
D901	D1FS6
D902	LFB01

ØSCILLATØR

MØDEL NØ.
EFØEC8004A4

CØIL

SYMBOL	RATED VALUE
L101	82uH, 1.3A
L102	550uH, 0.6A
L901	450uH, 1.5A

LED

SYMBOL	MØDEL NØ.	CØLØR
LD702	SLR-332DC3F	ØRANGE
LD703	SLR-342YC3F	YELLØW

ZENNER DIØDE

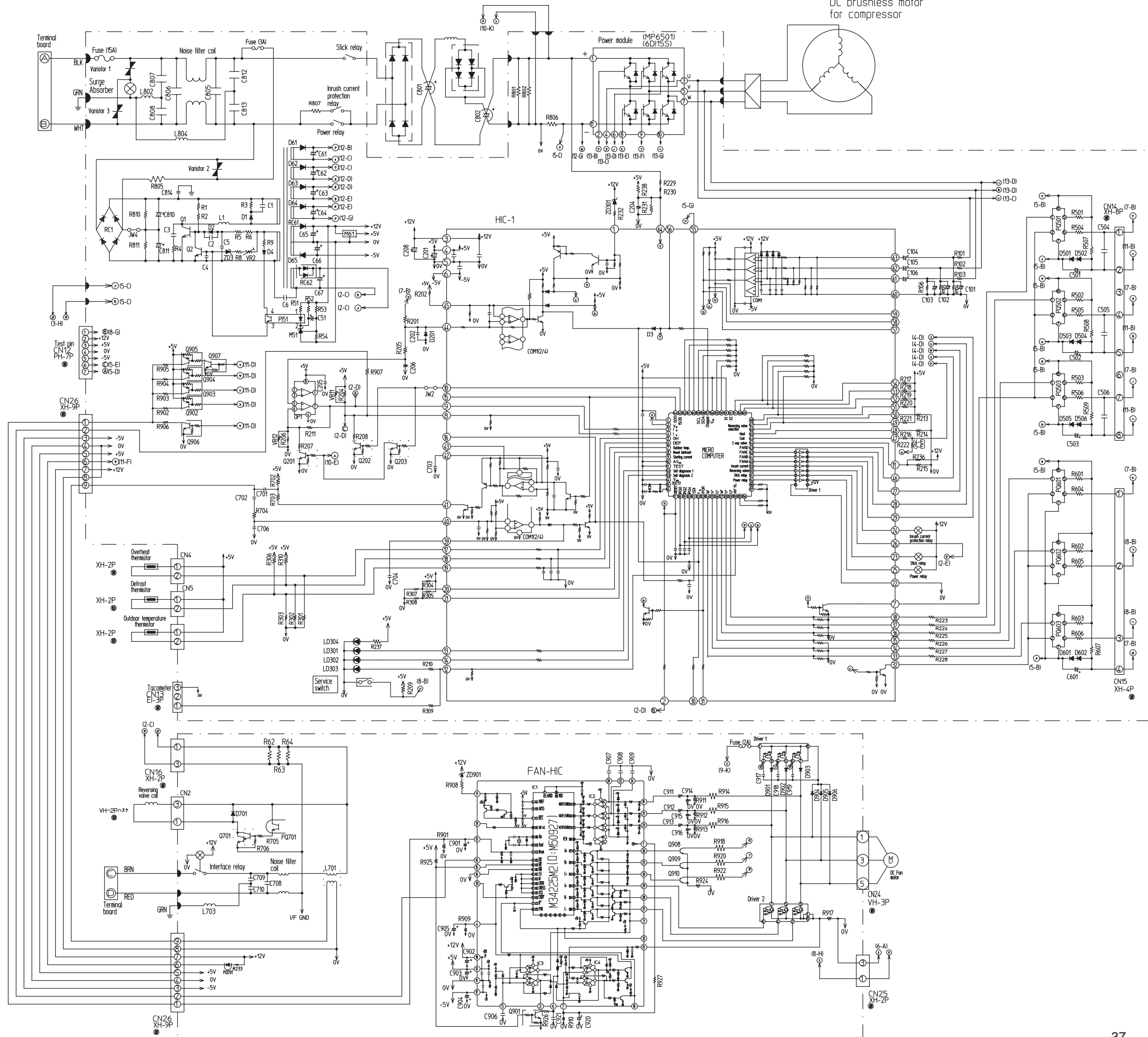
SYMBOL	MØDEL NØ.
ZD101	PT25.1
ZD201	RZL24
ZD202	RZL10
ZD701	RD5.1UJN2

IC

SYMBOL	MØDEL NØ.
REG1	MC34063AM
REG2	MC7805CT
IC1	HD6433714
IC401	S24C01AFJ
IC501	ULN2003ANS
IF-H1C	RREA3725
IR701	RRZL1816

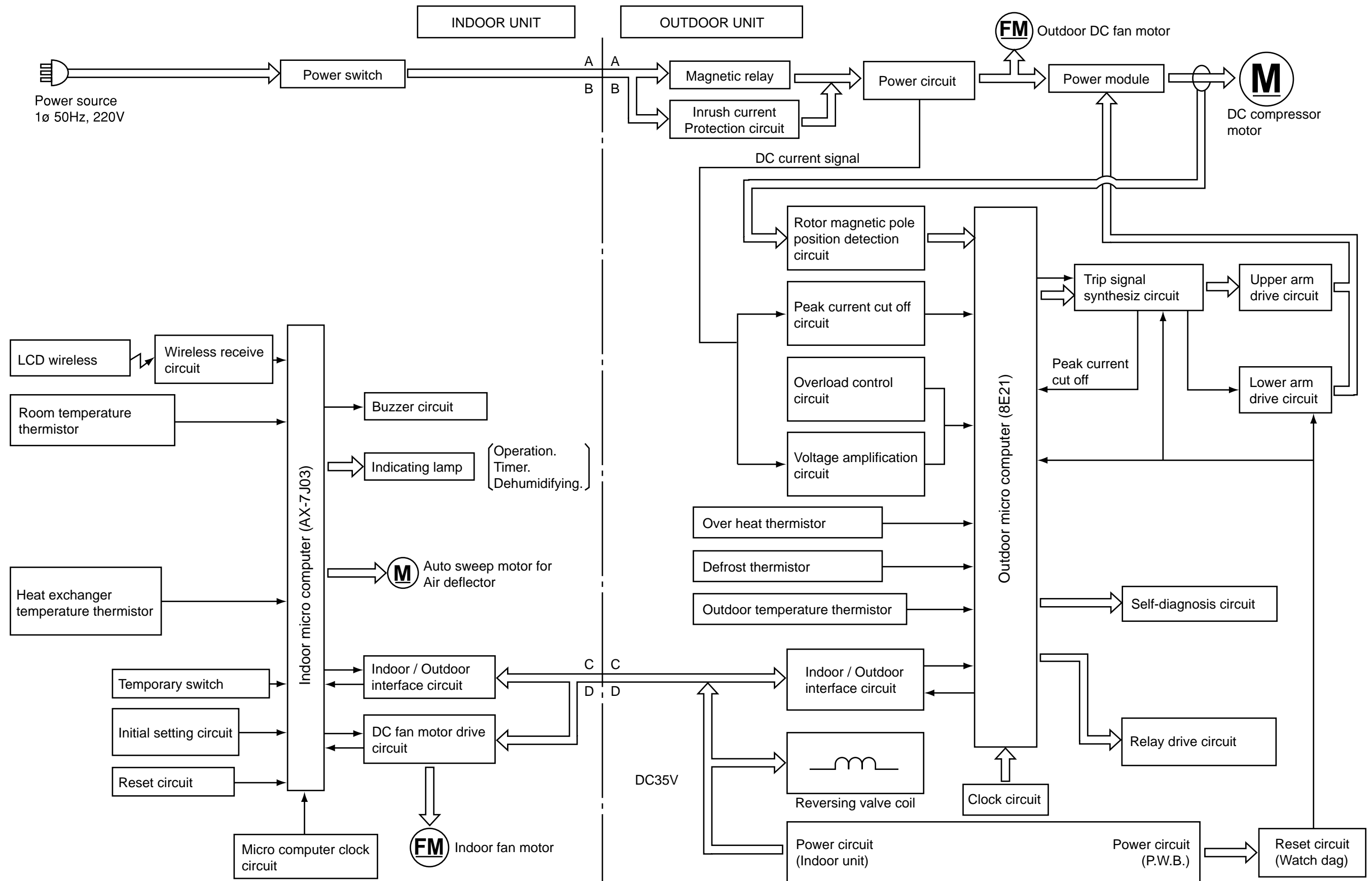
**CIRCUIT DIAGRAM
MODEL RAC-25CNH11**

DC brushless motor
for compressor



BLOCK DIAGRAM

MODEL RAS-25CNH11/RAC-25CNH11



BASIC MODE

MODEL RAS-25CNH11

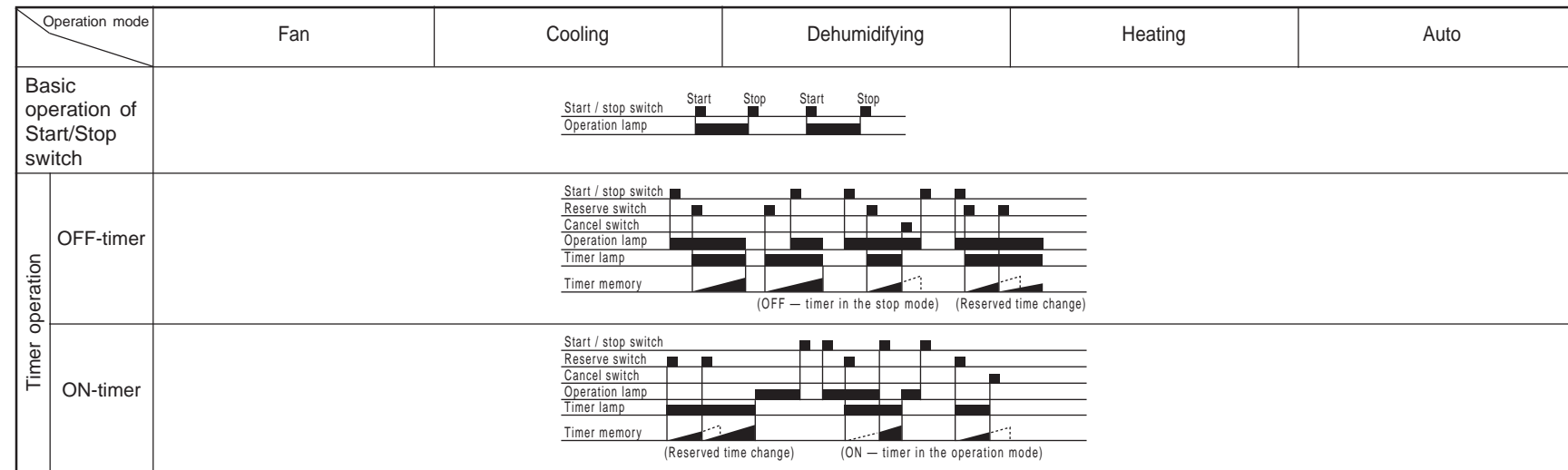


Table 3 Room temp. shift value

Operation mode		Shift value
Heating	Normal	SHIFTW
Cooling, dehumidifying	Normal	SHIFTC
	Cool Rhythm	SFTRZM

Table 2 Room temp. shift value

Operation mode	Fan speed tap	Label name	Voltage set value
Heating	Super Lo	AFWSS	9.8V
	Lo	AFWS	16.6V
	Overload	AFWKAF	19.1V
	Med	AFWL	19.1V
	Hi	AFWH	27.7V
	Super Hi	AFWHH	27.7V
Cooling	Lo	AFCS	16.0V
	Med	AFCL	18.7V
	Hi	AFCH	20.9V
	Super Hi	AFCHH	20.9V
Dehumidifying	Lo	AFDS	16.0V
	Med	AFDL	18.7V
	Super Lo	AFDSS	15.0V

Note:

1. Refer to data in Table 1 and 2 for constants shown by capital letters in Table 3.

Table 1

Data		Model	RAS-25CNH11
Source file name	Label name	Required value of unit side	
MODDT (mode data file)	WMAX	5400 min ⁻¹	
	WSTD	4700 min ⁻¹	
	CMAX	4000 min ⁻¹	
	CSTD	4000 min ⁻¹	
	CKYMAX	2500 min ⁻¹	
	CJKMAX	2500 min ⁻¹	
	COYMAX	2450 min ⁻¹	
	WMIN	1950 min ⁻¹	
	CMIN	1950 min ⁻¹	
	DMIN	1950 min ⁻¹	
	SDMAX	2500 min ⁻¹	
	SDRPM	2150 min ⁻¹	
	SHIFTW	1.33 °C	
	SHIFTC	0 °C	
	SFTRZM	2.0 °C	
	YNEOF	24 °C	
	TEION	5 °C	
	TEIOF	9 °C	
	TDSFNP	5 °C	
	CLMXTP	30 °C	
	DFTIM	40 min.	
	TDF411	57 sec.	
	TDF412	Above value+37 sec.	
	TDF413	Above value+ 0 sec.	
	TDF421	60 sec.	
	TDF422	3900 min ⁻¹	
	TDF431	75 sec.	
	SITUA	0.3	
	SITUB	5.67 °C	
	SFTDSW	1.33 °C	
KAFON	48 °C		
KAFOF	42 °C		

Operation mode		Cooling	Dehumidifying	Heating	Auto						
Fan speed mode (Indoor unit)	Auto	<p>Changes to "Med" or "Lo" from "Hi" according to the room temperature.</p> <p>1. Operation continues in "Hi" mode until the thermostat turns off for the 1st time. ("Super Hi" is set during Cool dash operation with the compressor rotating at maximum speed.) 2. Operates in "Lo" mode when the thermostat is OFF.</p>		<p>Operation mode is changed to one of "Super lo", "Lo", "Med", "Hi", "Super Hi" and "Stop" according to the room temperature, time and heat exchanger temperature. When the heat exchanger temperature becomes 18°C or less except for the preheating operation mode, "Stop" is set. (The operation recovers at 18.66°C)</p> <p>Compressor rotates at maximum speed during Hot dash operation or when recovered from defrosting.</p>	<p>The following operation mode is set depending on the room temperature when the operation is started. However, in the auto cooling mode, the Cool rhythm operation starts when the room temperature becomes the preset temperature + 0.66°C after the Dash operation is completed.</p> <table border="1"> <tr> <td>Cooling</td> <td>Preset temperature for cooling : 27 °C Fan speed mode : AUTO</td> </tr> <tr> <td>Dehumidifying</td> <td>Preset temperature for dehumidifying : (Room temp. at operation start)-2 °C Fan speed mode : Lo</td> </tr> <tr> <td>Heating</td> <td>Preset temperature for heating : 23 °C Fan speed mode : AUTO</td> </tr> </table>	Cooling	Preset temperature for cooling : 27 °C Fan speed mode : AUTO	Dehumidifying	Preset temperature for dehumidifying : (Room temp. at operation start)-2 °C Fan speed mode : Lo	Heating	Preset temperature for heating : 23 °C Fan speed mode : AUTO
	Cooling	Preset temperature for cooling : 27 °C Fan speed mode : AUTO									
	Dehumidifying	Preset temperature for dehumidifying : (Room temp. at operation start)-2 °C Fan speed mode : Lo									
	Heating	Preset temperature for heating : 23 °C Fan speed mode : AUTO									
Hi	"Super Hi" mode operation is done during Cool dash operation with the compressor rotating at maximum speed, and "Hi" mode operation is done in other modes.		<p>Operation mode is changed to one of "Lo", "Med", "Hi", "Super Hi" and "Stop" according to the room temperature and time. "Super Hi" operation is done when the compressor rotates at maximum or when recovering from defrosting.</p>	<p>Note</p> <p>(1) Mode is not changed after the operation is started. (2) The preset temperature can be changed within ±3°C using the room temp. control button "Λ" "V". For example, if the preset temperature for cooling is increased by +2°C to change it to 29°C, the preset temperature for heating is also changed to 25°C. Also the operation mode selected from the room temperature at the start of operation is judged based on the changed value.</p>							
Med.	"Med" mode operation is done regardless of the room temperature.		<p>Operation mode is changed to one of "Lo", "Med" and "Stop" according to the room temperature and time.</p>								
Lo	"Lo" mode operation is done regardless of the room temperature.	<p>"Lo" mode and "Stop" mode are repeated according to the compressor operation.</p>	<p>Operation mode is changed to one of "Lo" and "Stop" according to the room temperature and time. The fan speed is controlled by the heat exchanger temperature and overload control is done as shown below.</p>								
Basic mode of the temperature control	Refer to page 45.	Refer to page 49.	Refer to page 51 and 53.								

Note:

1. Refer to data in Page 41 Table 1 and 2 for each constant shown by capital letters in the diagram.

BASIC COOLING OPERATION

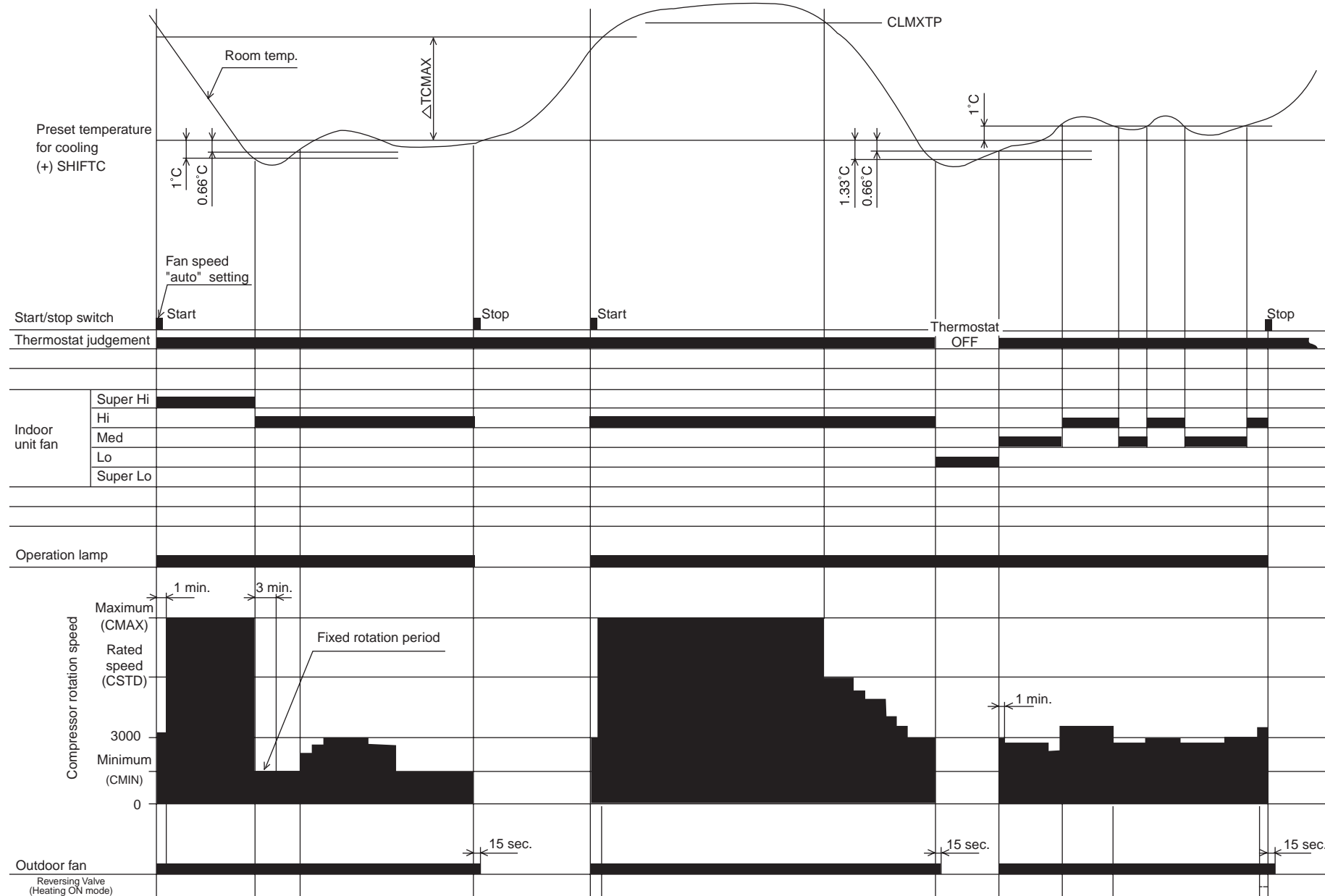


Table 1 ΔTCMAX

Max. speed (CMAX) — Min. speed (CMIN)	Room temp. — Preset temp. (including shift)
650min ⁻¹	1.66°C
750min ⁻¹	2.00°C
800min ⁻¹	2.33°C
850min ⁻¹	2.66°C
950min ⁻¹	3.00°C
1000min ⁻¹	3.33°C
1050min ⁻¹	3.66°C
1150min ⁻¹	4.00°C
1200min ⁻¹	4.33°C
1250min ⁻¹	4.66°C
1350min ⁻¹	5.00°C
1400min ⁻¹	5.33°C
1450min ⁻¹	5.66°C
1550min ⁻¹	6.00°C
1600min ⁻¹	6.33°C
1650min ⁻¹	6.66°C

Table 2 Dewing condition judgement value

	Item	Temperature
Room temp.	Dewing condition (ON)	30°C
	Dewing condition (OFF)	32°C
External temp.	Dewing condition (ON)	32°C
	Dewing condition (OFF)	34°C

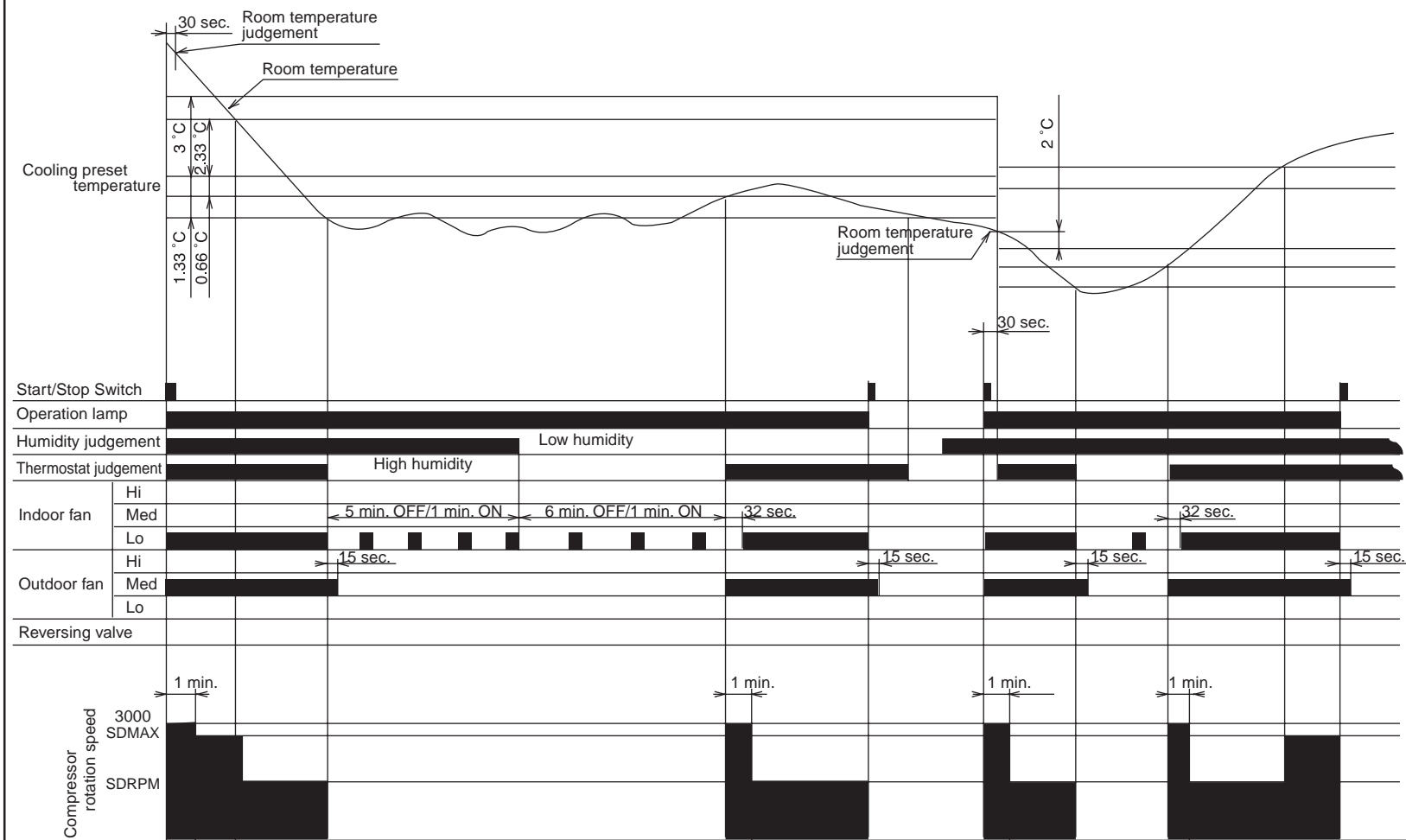
Note:

1. Refer to data in page 41 Table 1 for each constant shown by capital letters in the diagram.

Note:

- (1) Conditions to start Cool dash operation are as follows. When the operation starts with the "AUTO" or "Hi" fan speed or when the fan speed is changed to "Hi" during cooling operation, if the temperature difference between the room temperature with the compressor rotating at maximum speed and the preset temperature is (ΔTCMAX: refer to Table 1) or more, Cool dash will start.
- (2) Conditions for releasing Cool dash operation (compressor maximum rotation speed period) are as follows.
 - ① Cool dash has been continued for 25 minutes.
 - ② The room temperature reaches the cooling preset temperature (including cooling shift value) -1°C and then the room temperature ≥ preset temperature -0.66°C is reached after the fixed rotation period has elapsed.
 - ③ The thermostat is turned OFF.
(Ehen Cool dash is released by above ①, PI control starts without operating for fixed rotation period.)
- (3) The thermostat OFF temperature during Cool dash operation is cooling preset temperature (including cooling shift value) +3°C, and after the thermostat is turned OFF, Cool dash is finished and PI control starts.
- (4) The minimum ON time of the compressor is 3 minutes, and minimum OFF time is also 3 minutes.
- (5) The compressor speed in the fixed rotation period after releasing Cool dash maximum speed is the minimum speed (CMIN).
- (6) The time limit to keep the maximum speed (CMAX) of the compressor in the normal cooling operation (other than Cool dash) is within 60 minutes when the room temperature is CLMXTP or less. If the room temperature is more than CLMXTP, there is no time limit.
- (7) When the fan speed setting of the remote control is "Med", the maximum compressor speed is CJKMAX.
- (8) When the fan speed setting of the remote control is "Lo", the maximum compressor rotation speed is COZMAX.
- (9) When the fan speed setting of the remote control is "Hi", and both the room temperature and external temperature (data from the outdoor unit) satisfy the dewing condition shown in Table 2, the maximum compressor speed is CKYMAX. (This control is effective only when external temperature data is provided.)

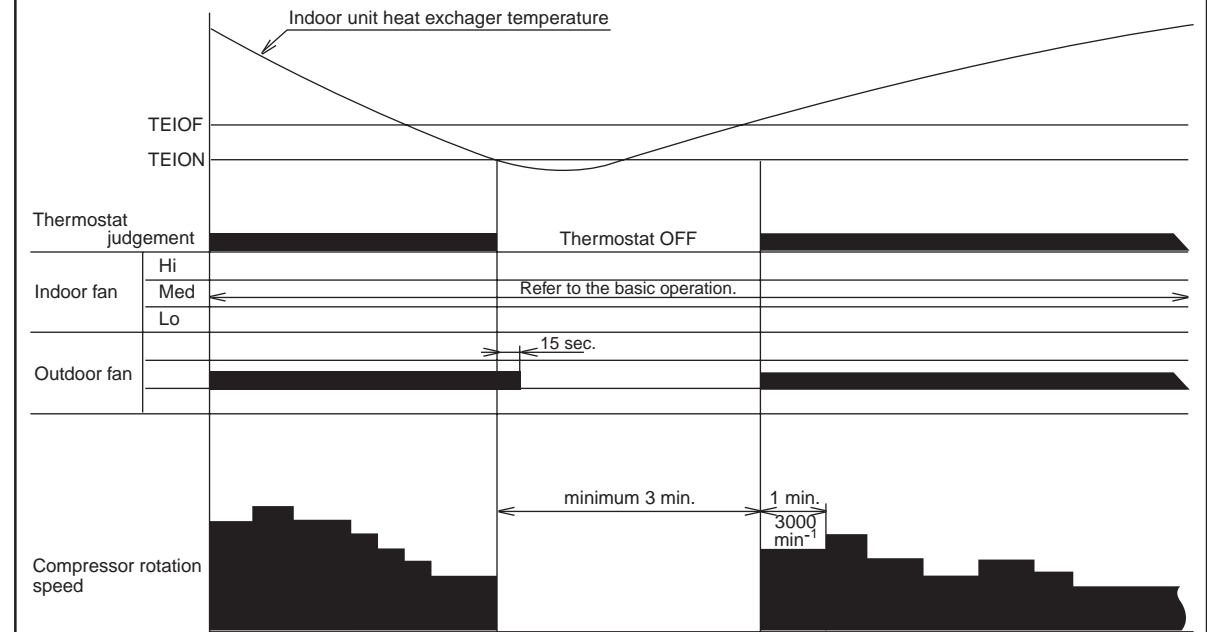
Dehumidifying



Note:

- (1) 30 seconds after the operation is started, when the room temperature is (cooling preset temperature) - (1.33°C) or less, 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, OFF for 5 minutes and ON for 1 minute (at high humidity) or OFF for 6 minutes and ON for 1 minute (at low humidity), repeatedly according to the humidity judgement when the thermostat is turned OFF.
- (3) When the operation is started by the thermostat 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.

Cooling defrost

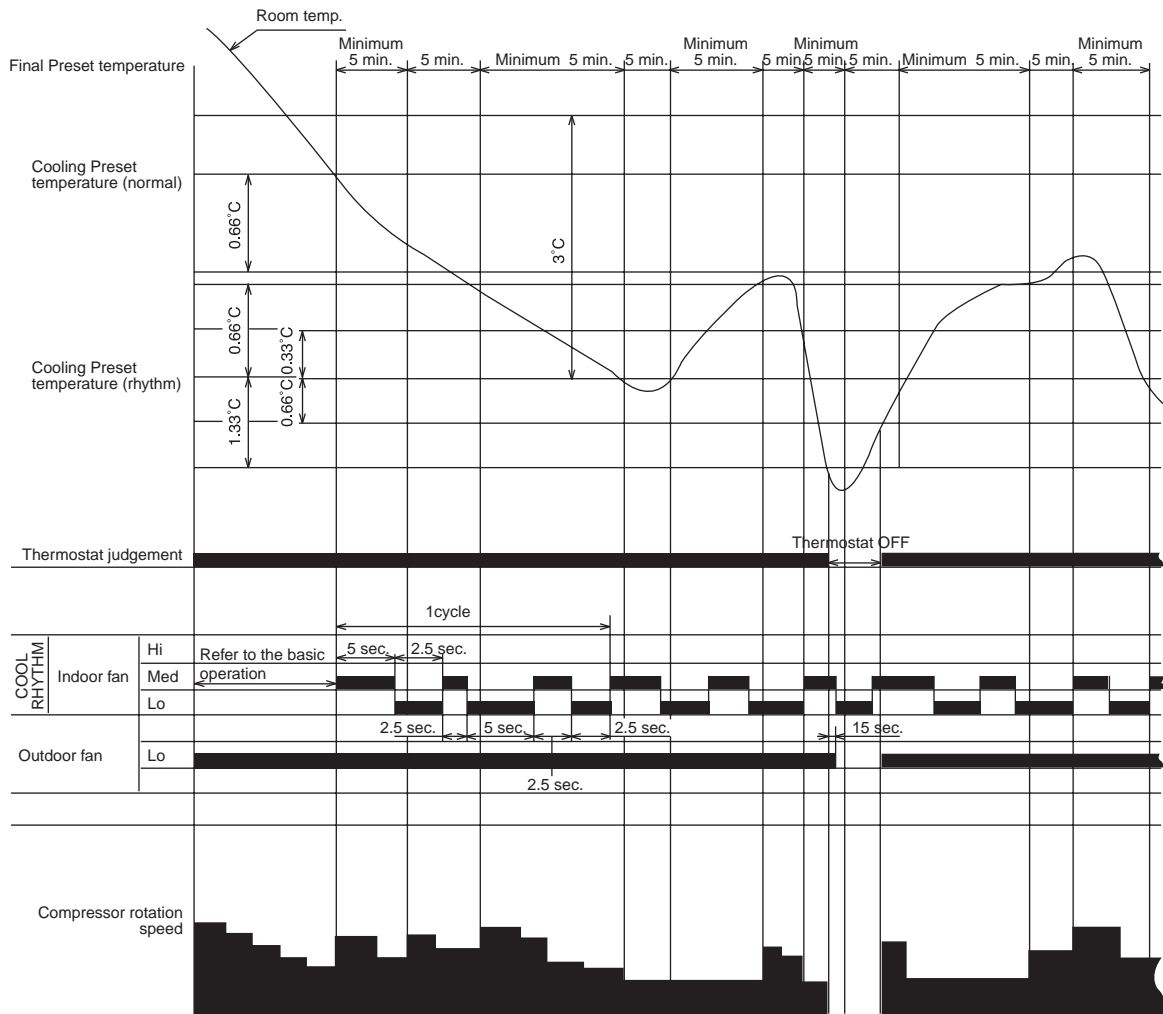


Note: (1) Compressor stop time is 3 minutes minimum.

Note:

1. Refer to data in page 41 Table 1 for each constant shown by capital letters in the diagram.

COOL RHYTHM



Note:

- (1) Cool rhythm operation starts during the cooling operation in the AUTO operation mode, not during Cool dash, and when the room temperature is the preset temperature $+0.66^{\circ}\text{C}$ or less.
- (2) In Cool rhythm operation, the temperature rising period is 10 minutes (minimum) and also temperature falling period is 10 minutes (minimum).
- (3) The Cool rhythm operation is not done during Nice temperature, Sleep and Cool dash operations.
- (4) In Cool rhythm operation, PI control is done and the compressor rotation speed limit is the same as in normal operation.
- (5) When the thermostat is turned OFF, the shifting of the preset temperature in Cool rhythm operation is done.

Basic heating operation

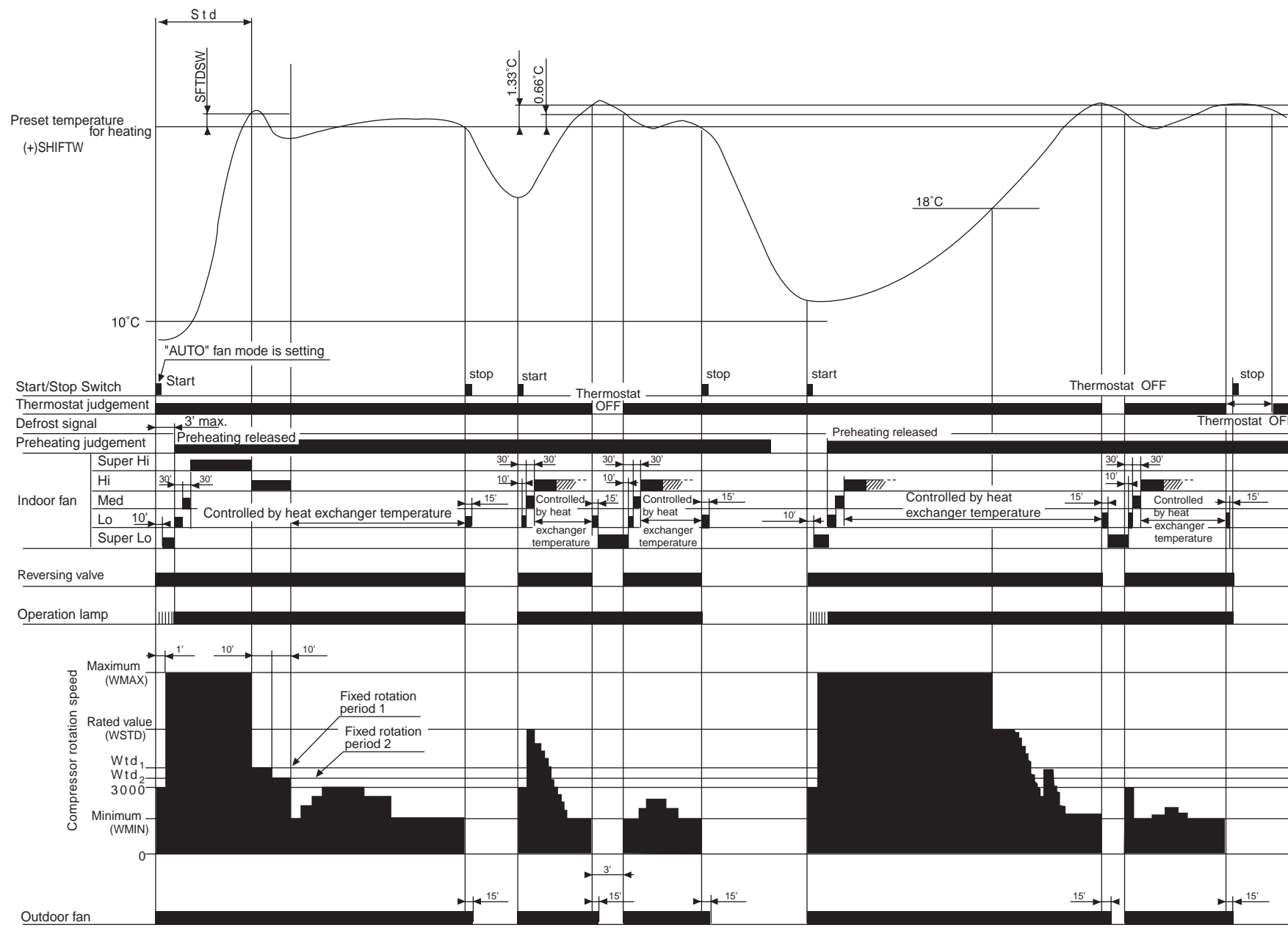


Table 1 Speed specification during fixed rotation period

Δt_d (Hot dash time)	Wtd ₁	Wtd ₂
Less than 10 minutes	2150min ⁻¹	1700min ⁻¹
10 minutes to less than 20 minutes	3150min ⁻¹	2500min ⁻¹
20 minutes or more	4150min ⁻¹	3300min ⁻¹

Table 2 ΔT_{WMAX}

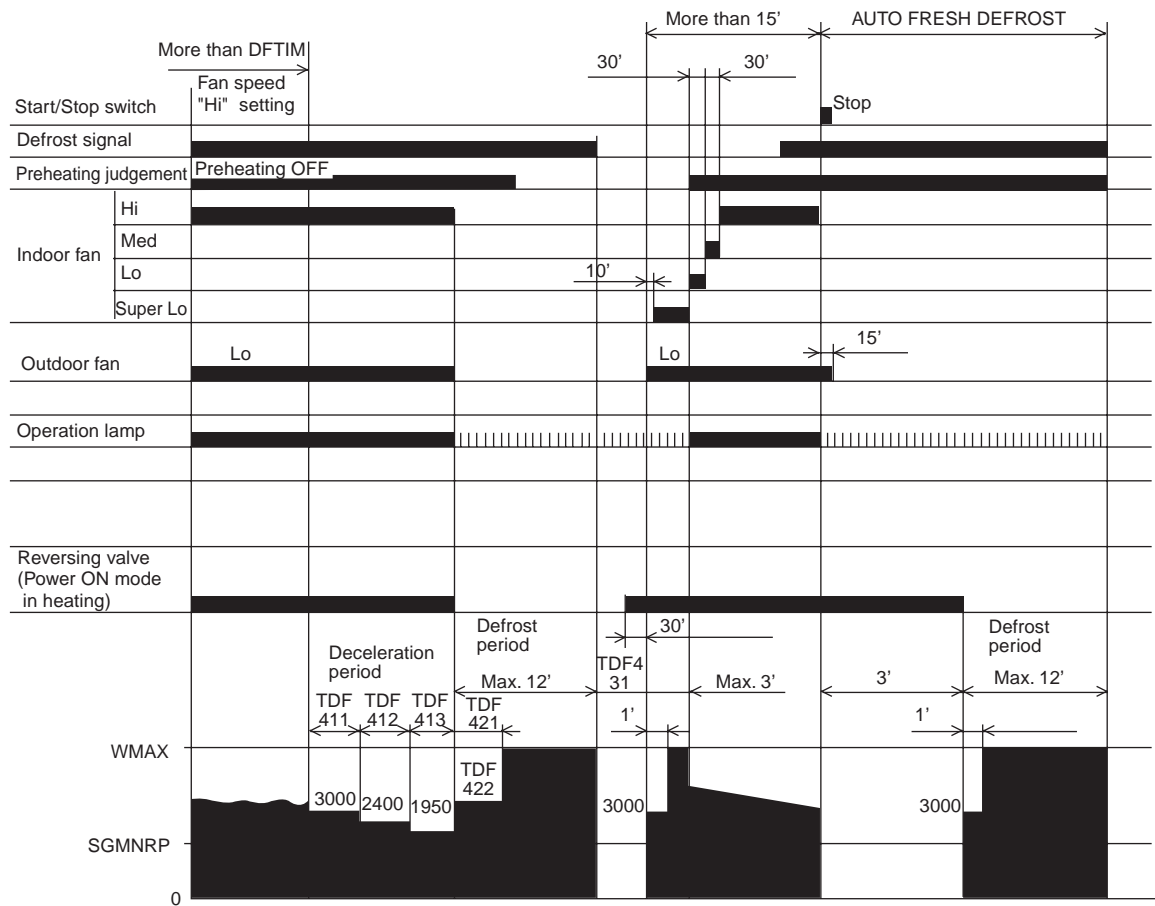
Max. speed (WMAX) - Min. speed (WMIN)	Preset temp. (including shift) - Room temp.
650min ⁻¹	1.66°C
750min ⁻¹	2.00°C
800min ⁻¹	2.33°C
850min ⁻¹	2.66°C
950min ⁻¹	3.00°C
1000min ⁻¹	3.33°C
1050min ⁻¹	3.66°C
1150min ⁻¹	4.00°C
1200min ⁻¹	4.33°C
1250min ⁻¹	4.66°C
1350min ⁻¹	5.00°C
1400min ⁻¹	5.33°C
1450min ⁻¹	5.66°C
1550min ⁻¹	6.00°C
1600min ⁻¹	6.33°C
1650min ⁻¹	6.66°C

- Note:**
- Conditions for starting Hot dash operation are as follows. When the operation starts from the "AUTO" or "Hi" fan speed or when the fan speed is changed to "Hi" during heating operation. If the temperature difference between the room temperature with the compressor rotating at maximum speed and the set temperature is (ΔT_{WMAX} : refer to Table 2) and present room temperature is 10°C or less, Hot dash will start.
 - Conditions for releasing Hot dash operation (compressor maximum rotation speed period) are as follows.
 - The limit time for compressor maximum speed operation is exceeded.
 - The room temperature reaches the heating preset temperature (including heating shift value) + SFTDSW.
 - The thermostat is turned OFF. (When Hot dash is released by above ①, PI control starts without operating fixed speed periods 1 and 2.)
 - The thermostat OFF temperature during HOT dash operation is heating preset temperature (including heating shift value) + SFTDSW + 3°C, and after the thermostat is turned OFF, Hot dash is finished and the PI control starts.
 - The minimum ON time of the compressor is 3 minutes, and minimum OFF time is also 3 minutes.
 - The compressor speeds in the fixed speed periods 1 and 2 after releasing the Hot dash maximum rotation (Wtd1 and Wtd2) are determined as in Table 2 depending on the maximum rotation holding time (Δt_d).
 - The time limit to hold the maximum rotation (WMAX) of the compressor in the normal heating operation (other than Hot dash) is within 60 minutes when the room temperature is 18°C or more. If the room temperature is less than 18°C, there is no time limit.
 - During initial cycle operation, preheating operation, defrosting (including balancing operation after defrosting) or AUTO-FRESH defrosting, the operation lamp will blink at intervals of one second.
 - Preheating operation is determined as follows; preheating comes on when heat exchanger temperature < YNEOF - 0.66°C when operation is started with start / stop switch; preheating mode is released when heat exchanger temperature > YNEOF.
 - Rotation speed of compressor is limited to the value of Rating for Heating (WSTD) + 2000 / 2 min⁻¹ or less in "Low" fan operation mode.
 - In "Super Low" fan operation mode, when room temperature drops below 18°C, indoor fan operation will stop. When room temperature reaches 18°C + 0.66°C, Super Low fan operation will start again. However during preheating or preheating after defrosting, Super Low fan operation will not stop even if room temperature drops below 18°C.

Note:

- Refer to data in Table 1 in page 41 for each constant shown by capital letters in the diagram.
- [] means minute and [] means second (ex. 30', 50") in the diagram.

Reversing valve defrost



Note:

- (1) The DEFROST inhibit period is DFTIM. After DEFROST is completed, defrost signal is not accepted for DFTIM. However, first inhibit period is fixed at 40 minutes.
- (2) If the temperature difference between the room temperature and set temperature is great after the DEFROST is completed, compressor can keep maximum rotation speed (WMAX) for up to 120 minutes.
- (3) DEFROST period is a maximum 12 minutes.
- (4) When operation is stopped during DEFROST, the mode switches to AUTO FRESH DEFROST.
- (5) AUTO FRESH DEFROST does not work within 15 minutes after the operation is started or after DEFROST is completed.

Note:

1. Refer to data in Table 1 on page 41 for each constant shown in capital letters in the diagram.
2. In the diagram, ○' attached to the top right of number mean minute, ○" means second. (ex. 30', 15")

AUTO SWING FUNCTION

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 HEAT HEAT CIRCULATOR	TEMPORARY STOP	START SWING AGAIN.	
			DURING SWINGING	STOP SWINGING TEMPORARILY. (SWING MODE IS CLEARED IF SWING COMMAND IS TRANSMITTED DURING TEMPORARY STOP.)	
THERMO. OFF (INTERNAL FAN OFF)	DURING OPERATION	AUTO DRY DRY AUTO HEAT HEAT CIRCULATOR	TEMPORARY STOP	START SWING AGAIN.	
			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 RAS-25CNH11

1. Reset Circuit

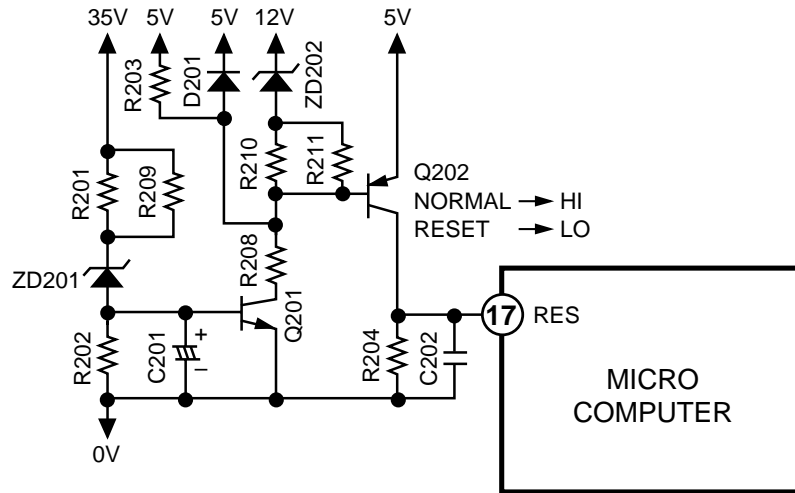


Fig. 1-1

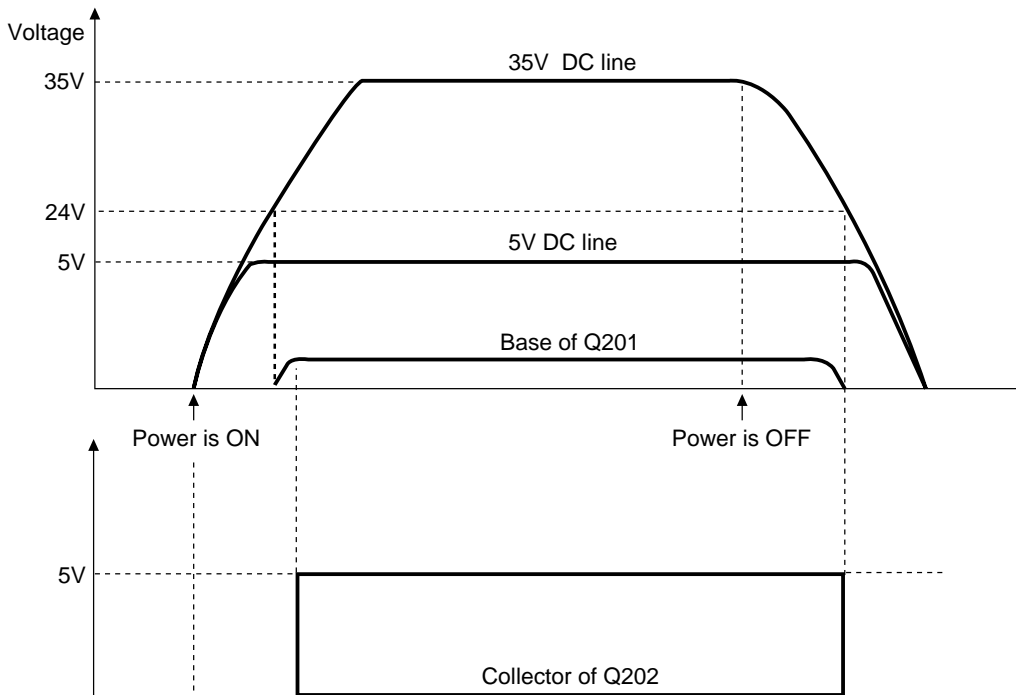


Fig. 1-2

- The reset circuit initializes the program when power is supplied or power is restored following a power failure.
- RESET "Lo" or SET "Hi" activates the micro computer.
- Fig. 1-2 shows the waveforms in each circuit when power is ON and OFF.
- When the power is supplied, the voltages on the 35V and 5V DC lines rise, and when the 35V DC line becomes approx. 24V, ZD201 turns on and the voltage at the base of Q201 rises to turn Q201 on. Since the collector of Q201 goes "Lo" at this time, Q202 turns on and the reset input of the micro computer goes "Hi". The 5V DC line has already been 5V at this time and the micro computer starts operation.
- When power is OFF, the voltage on the 35V DC line drops, and when it is approx. 24V, ZD201 turns off, Q201 and Q202 turn off, and the reset input of the micro computer goes "Lo" to reset it.

2. Receive Circuit

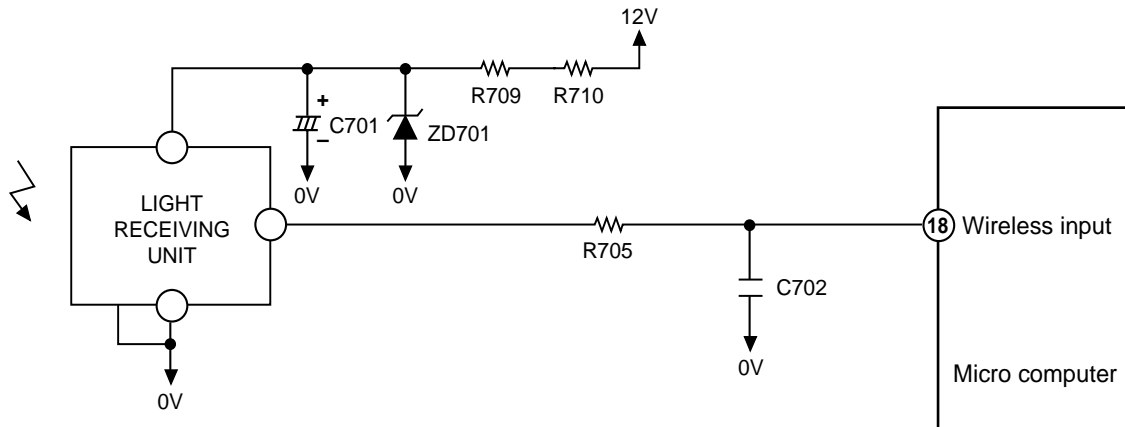


Fig. 2-1

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

3. Buzzer Circuit

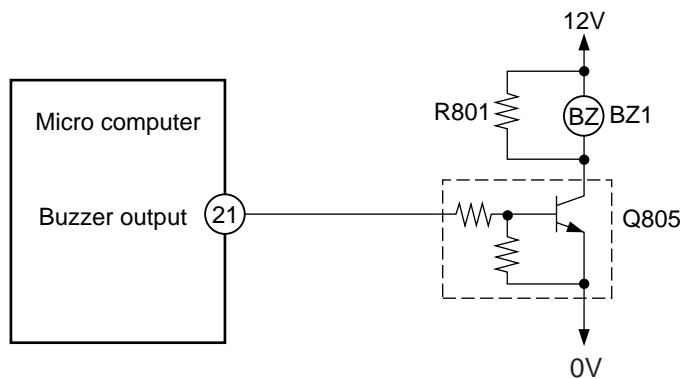


Fig. 3-1 Buzzer Circuit

- When the buzzer sounds, an approx. 3.9kHz square signal is output from buzzer output pin ②1 of the micro computer. 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.

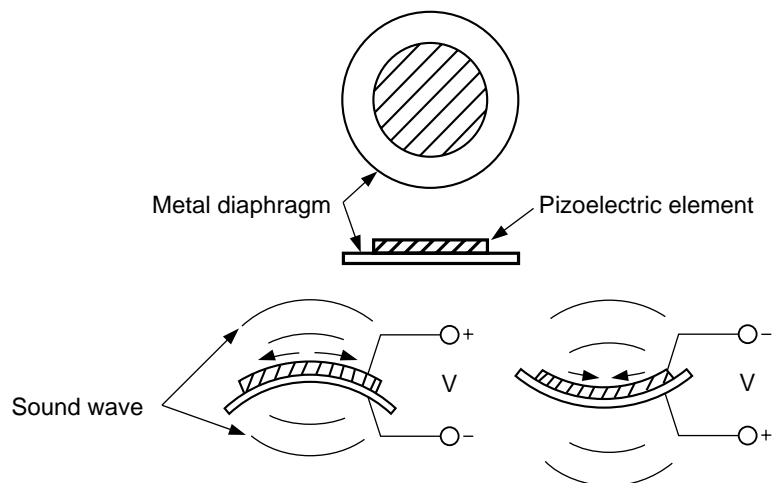


Fig. 3-2 Buzzer Operation

4. Auto Sweep Motor Circuit

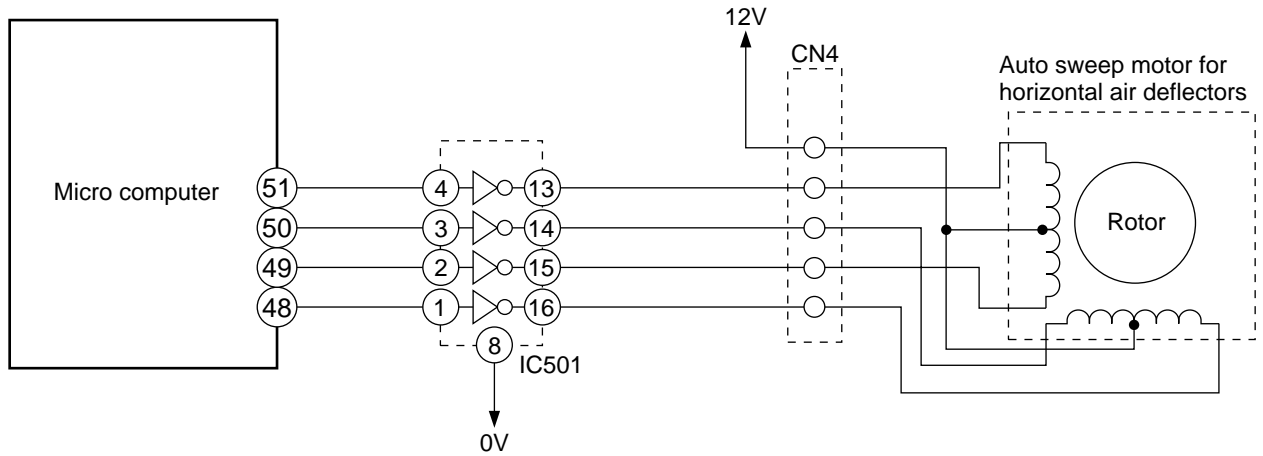


Fig. 4-1 Auto Sweep Motor Circuit (Horizontal air deflectors)

- Fig. 4-1 shows the Auto sweep motor drive circuit; the signals shown in Fig. 4-2 are output from pins ④⑧–⑤① of the micro computer.

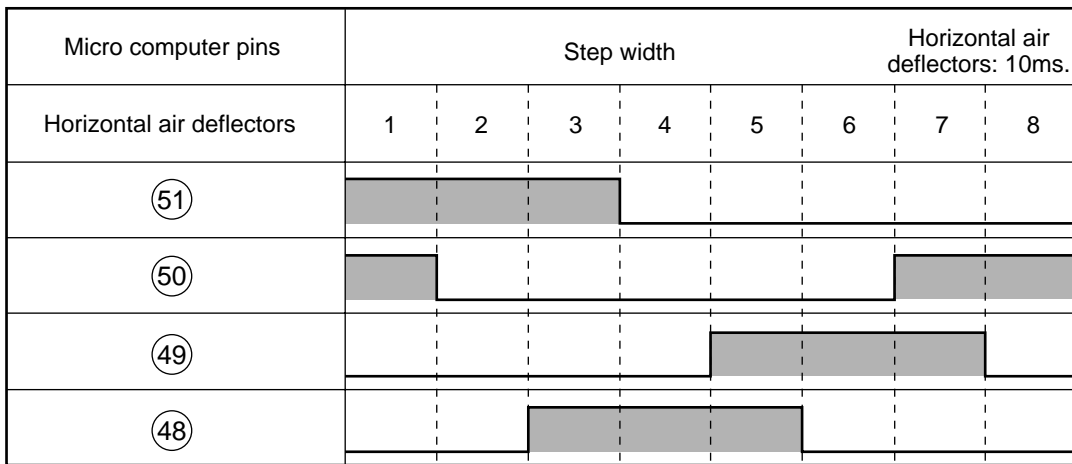


Fig. 4-2 Micro computer Output Signals

- As the micro computer'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	0.0879	10

5. Room Temperature Thermistor Circuit

- Fig. 5-1 shows the room temperature thermistor circuit.

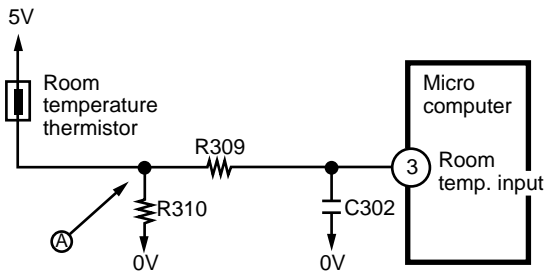


Fig. 5-1

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

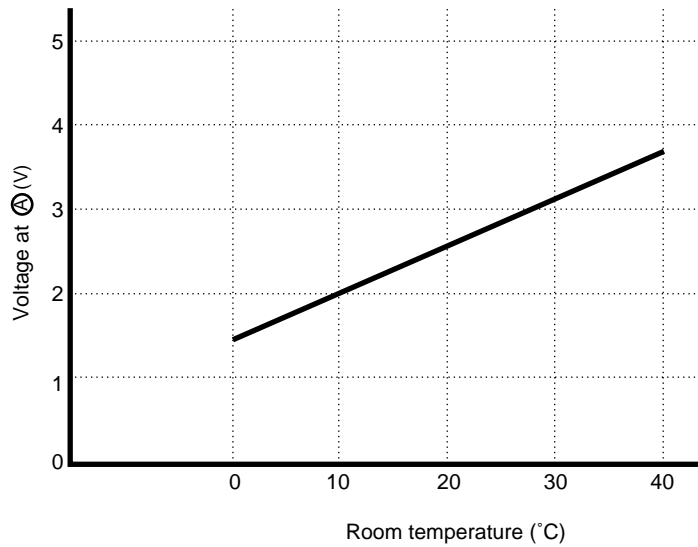


Fig. 5-2

6. Heat exchanger temperature thermistor circuit

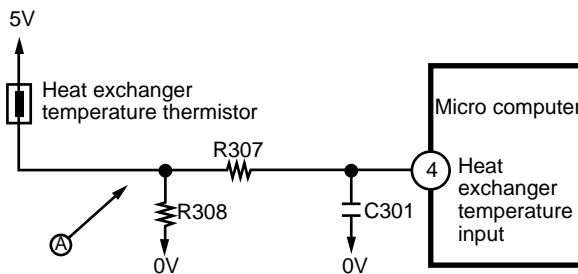


Fig. 6-1

- 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 (A) depends on the heat exchanger temperature as shown in Fig. 6-2.

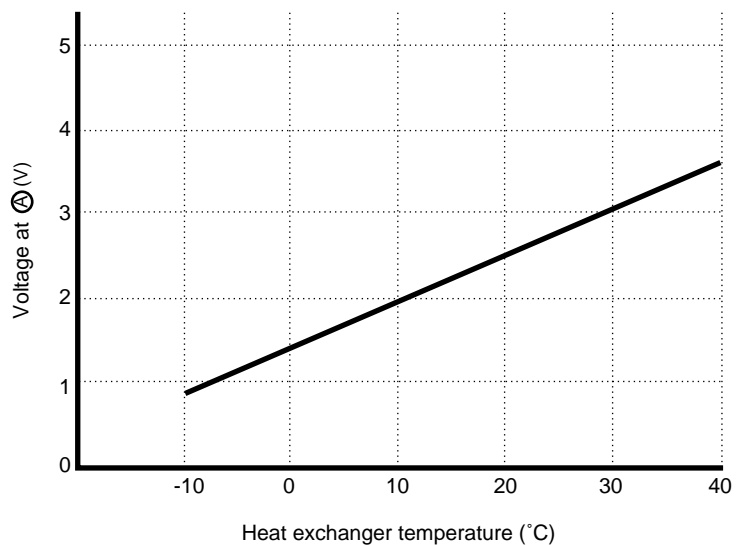


Fig. 6-2

7. Temporary Switch

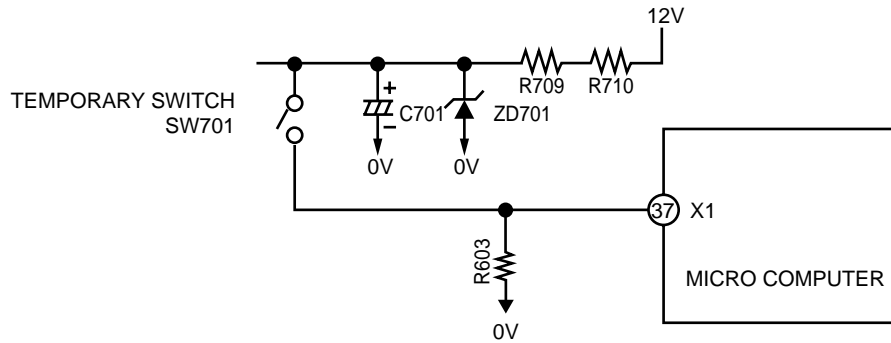


Fig. 7-1

- The temporary switch is used to operate the air conditioner temporarily when the wireless remote control is lost or faulty.
- The air conditioner operates in the previous mode at the previously set temperature. However, when the power switch is set to OFF, it starts automatic operation.

8. DC Fan Motor Drive Circuit

- Fig. 8-1 shows the indoor DC fan motor drive circuit.

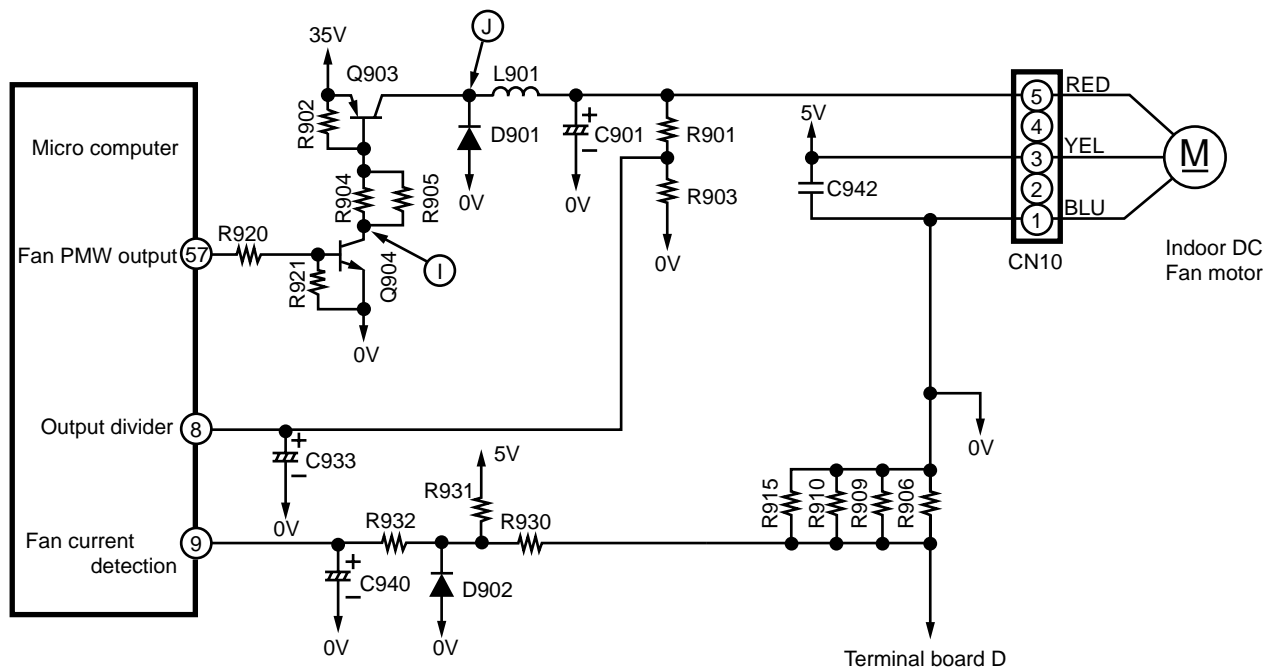


Fig. 8-1

- The circuit produces the fan motor drive voltages, 8-33V, from 35V DC supplied from the outdoor unit and controls the fan motor speed.
- Q903 is switched on and off according to the signal at fan PWM output pin ⑤⑦ to control the voltage which is smoothed by D901, L901 and C901 to drive the fan motor.
- The output voltage is divided by R901 and R903 and is input to divided voltage output pin ⑧; the micro computer controls the fan PWM output so the output voltage is set to the specified value. The chopper frequency of the fan PWM output is 15.7kHz.
- In the Fan current detection circuit, 35V line current is detected by R906~R915 and input to fan current detection pin ⑨. Microcomputer detects overcurrent comparing it with the current judgment value corresponding to the fan rotation speed.

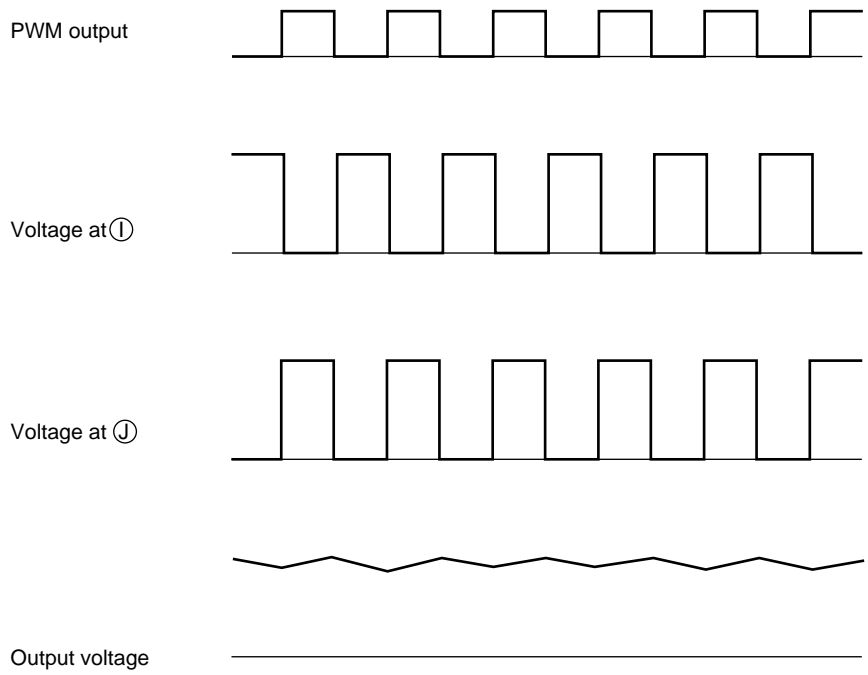


Fig. 8-2

Fan Motor Set Wind Velocity and DC Voltage (between blue and red) Characteristics

Mode	Fan Speed	Connector blue-red voltage (V)	Rotation Speed (min ⁻¹)	
INDOOR FAN SPEED	HEATING	SS	9.8	714
		S	16.6	950
		OVERLOAD	19.1	1,040
		LO	19.1	1,040
		HI	27.7	1,350
		SUPER HI	27.7	1,350
	COOLING	S	16.0	930
		LO	18.7	1,020
		HI	20.9	1,100
		SUPER HI	20.9	1,100
	DEHUMIDIFYING	S	16.0	930

9. 12V Power Circuit

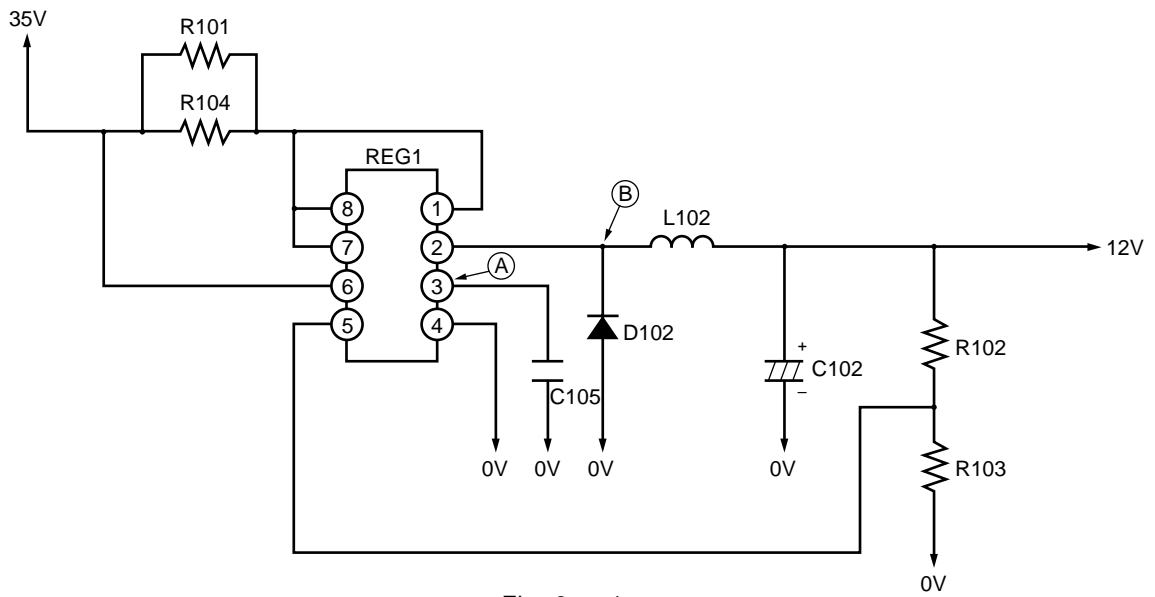


Fig. 9 — 1

- DC 35V supplied from the outdoor unit is controlled by switching of regulator 1, and is smoothed by D102, L102 and C102 to produce 12V.
- Output voltage is divided by R102 and R103, and input to output dividing pin ⑤ to control switching, so that output voltage is 12V.

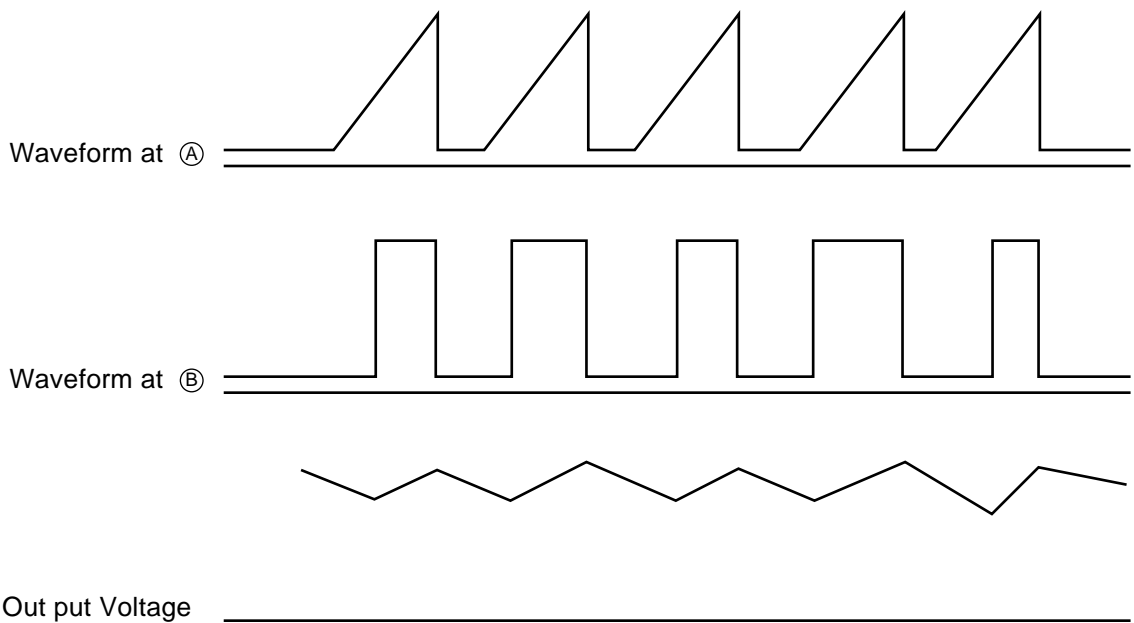
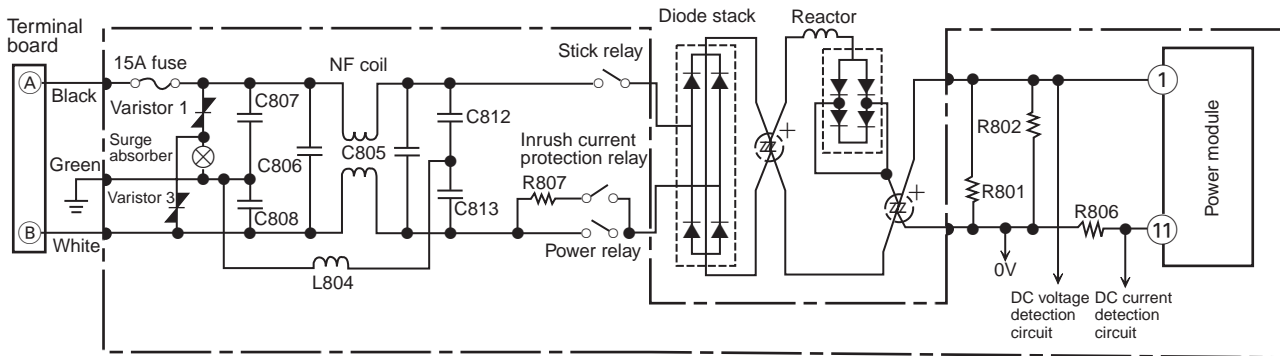


Fig. 9 — 2

Model RAC-25CNH11

1. Power Circuit



- This circuit full-wave rectifies 220V AC applied between terminals A:B to produce a DC voltage of $220 \times \sqrt{2} = 310V$ at the positive and negative terminals. However, the voltage is approx. 260-290V when the compressor is operating.
- The following describes the main parts components.
 - (1) Reactor and power capacitor

The filter consisting of a reactor and power capacitor removes high harmonics components from the current containing high harmonics occurring when the compressor is operating to improve the power factor.

 - < Reference >
 - If the reactor is faulty or the connection is defective, the compressor may stop due to “abnormality in line voltage”, etc. immediately after it is started.
 - < Reference >
 - When diode become defective, the compressor may stop due to” abnormality in line voltage”, etc. immediately after it is started or no operation may be done as a DC voltage is not generated between the positive ⊕ and negative ⊖ terminals.
 - When diode stack becomes defective, check whether the 15A fuse has blown.
 - (2) Diode stacks

These rectify the 220V AC from terminal boards A and B to a DC power supply.

(3) Smoothing capacitor

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

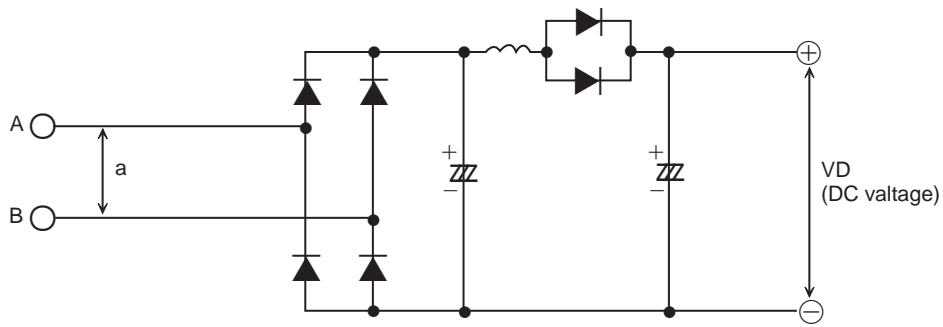


Fig. 1-2

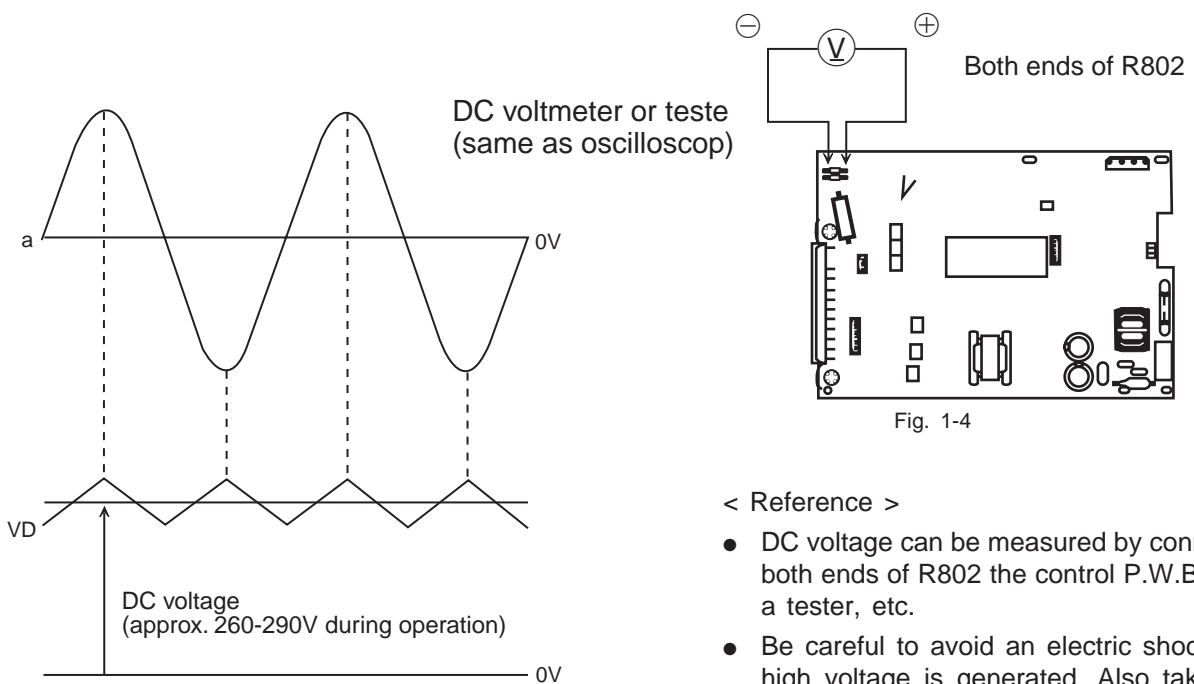


Fig. 1-3

Fig. 1-4

< Reference >

- DC voltage can be measured by connecting both ends of R802 the control P.W.B. using a tester, etc.
- 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

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

A DC voltage is generated in the same way as in Fig. 1-3.

(5) C805 - C808, C812, C813, L804 (NF coil)

These 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, 3

These absorb external power surge.

(7) Inrush protective resistor (R807)

This works to protect from overcurrent when power is turned on.

R807 Short-circuit → Overcurrent flows in rush protection ON mode
 Open → Overcurrent flows with power relay turned ON. (damaged each time power relay is turned ON) Diode stack and 15A fuse deteriorate.

< 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 36V DC line supplied from the outdoor unit to perform communications between indoor and outdoor units. This circuit consists of a transmitting circuit which superimposes an interface signal transmit from the micro computer on the 35V DC line and a transmitting circuit which detects the interface signal on the 35V DC line and outputs it to the micro computer.
- Communications are performed by mutually transmitting 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.
- Outdoor micro computer to indoor micro computer

Request signal output from IF transmitting output pin ⑥④ of outdoor microcomputer input to transmitting circuit. Transmitting circuit and receiving circuit of the outdoor unit are provided inside HIC. Transmitting circuit intermits high frequency oscillation circuit of about 36kHz with comparator according to the request signal. This high frequency signal is applied by the transistor and is ourput from HIC ④① pin, then superimposed with DC 35V line via C701 and L701.

To prevent mis-operation, outdoor microcomputer does not accept receive signal whil outputting request signal.

The receiving circuit of the indoor unit consists of COM4. The interface signal from the outdoor unit, whose DC component is cut from DC35V line at C801, is waveform-shaped and rectified amplified in HIC, then input to receive input pin ①⑨ of indoor microcomputer.

Fig. 2-2 shows the voltages at each component when data is transferred from the outdoor microcomputer to the indoor microcomputer.

- Indoor micro computer to outdoor micro computer

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

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

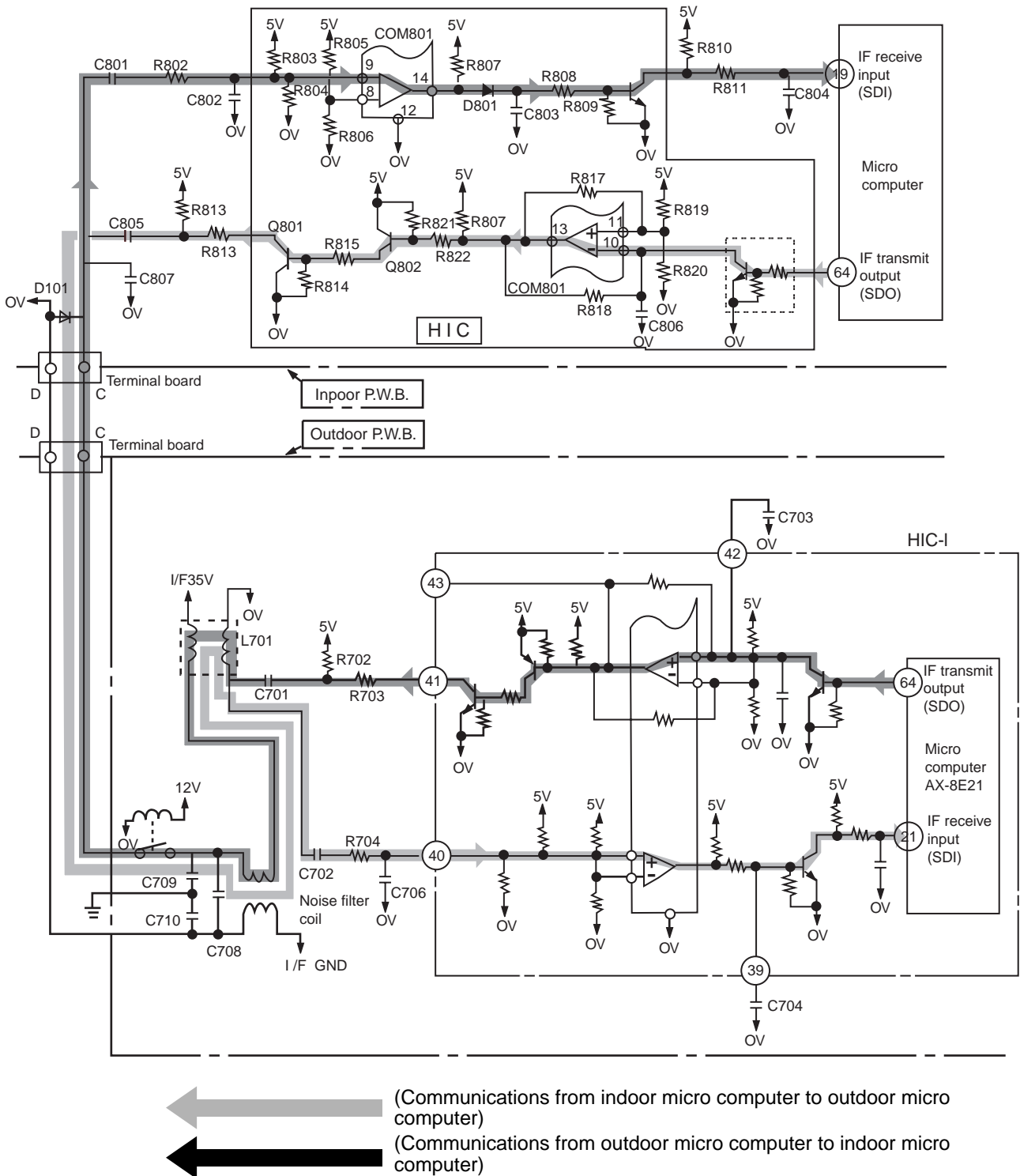


Fig. 2-1 Indoor/outdoor interface Circuit

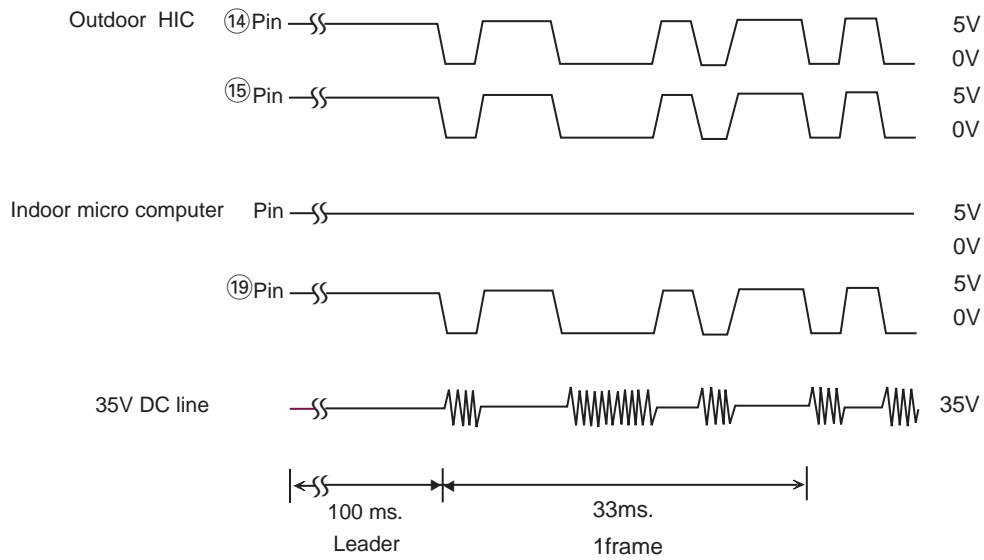


Fig. 2-2 Voltages Waveforms of indoor / Outdoor Micro computers (Outdoor to Indoor Communications)

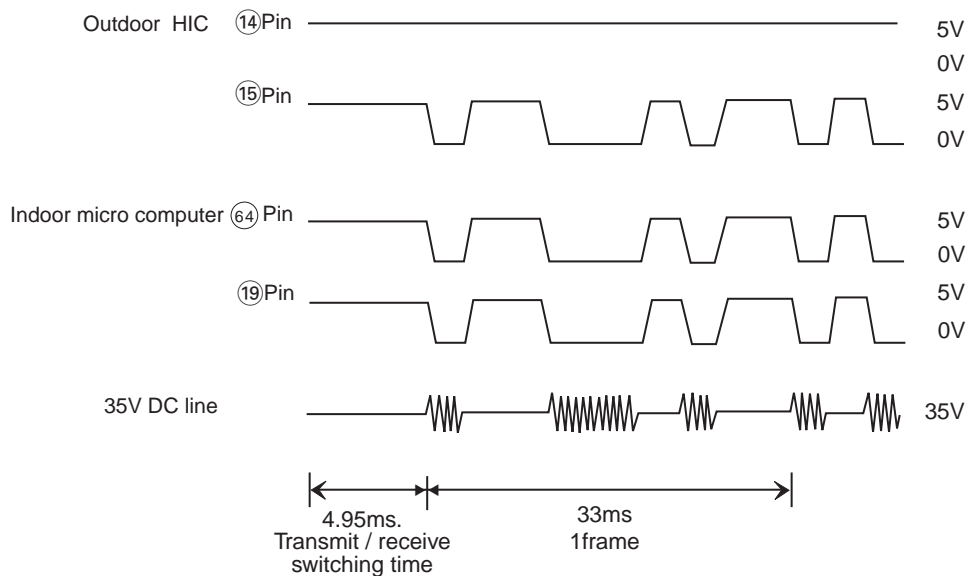


Fig. 2-3 Voltages Waveforms of indoor / Outdoor Micro computers (Indoor to Outdoor Communications)

3. Power Module Circuit

- Fig. 3-1 shows the power module and its peripheral circuits. The three transistors on the positive ⊕ side, the three transistors on the negative ⊖ side, and the three transistors on the positive ⊕ side, the three transistors on the negative ⊖ side, and the three transistors on the negative ⊖ side, the lower arm.

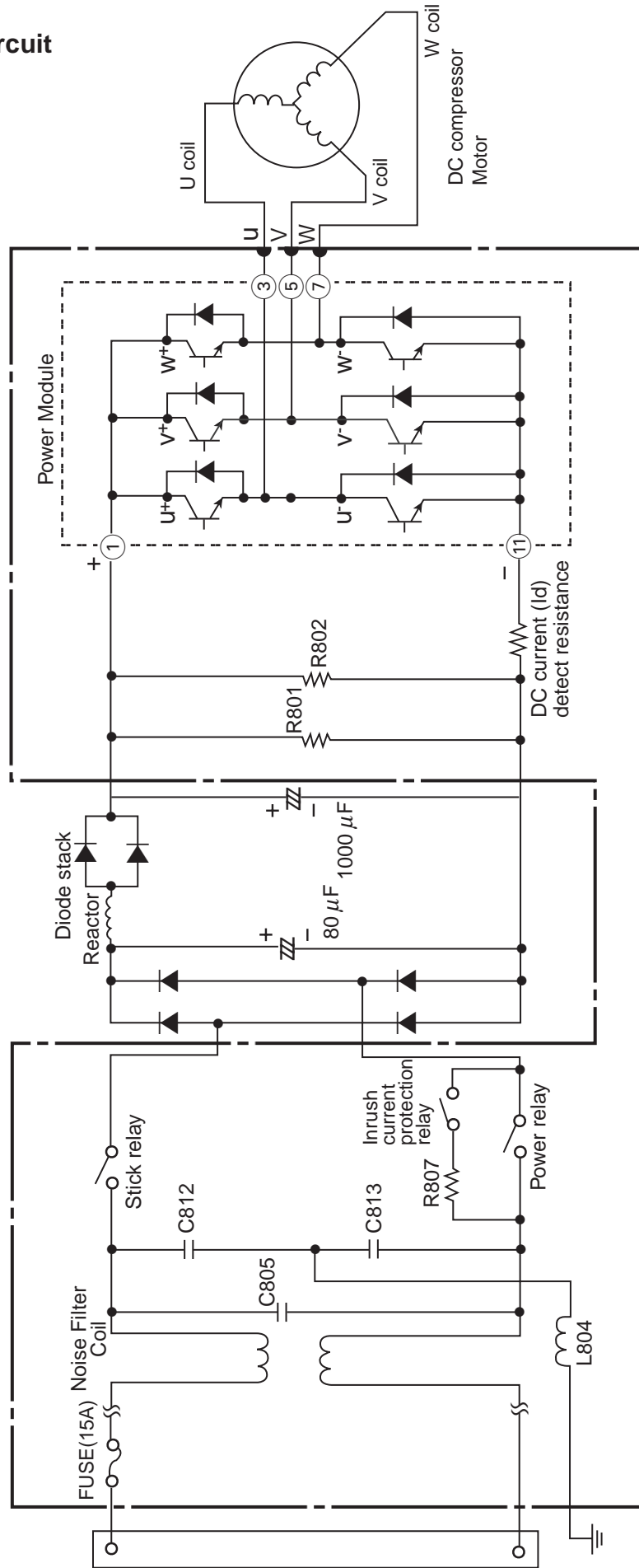


Fig. 3-1 Power module circuit (U⁺ is ON, V is ON)

- DC 230V is input to power module and power module switches power supply current according to rotation position of magnet rotor. The switching order is as shown in Fig. 3-2.

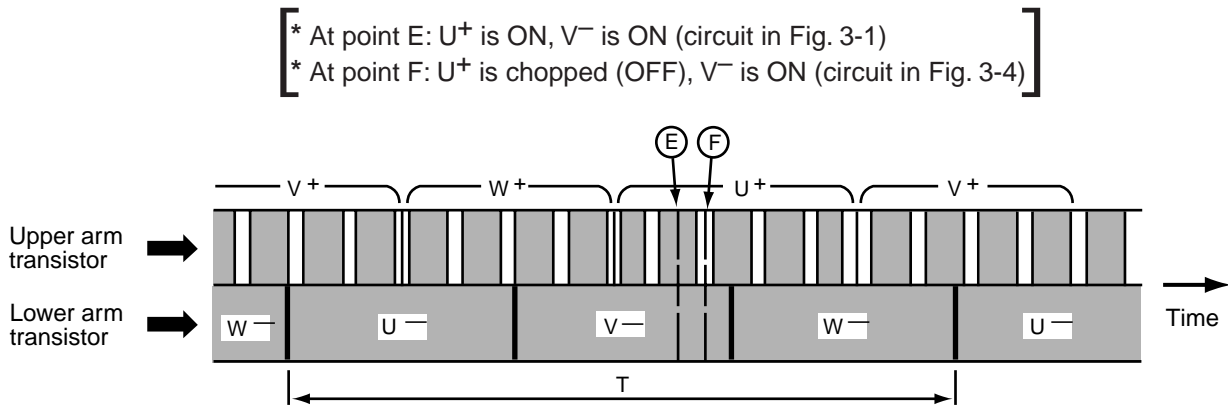


Fig. 3-2 Switching order of power module

- Upper arm transistor is controlled to ON/OFF by 3.2kHz 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.

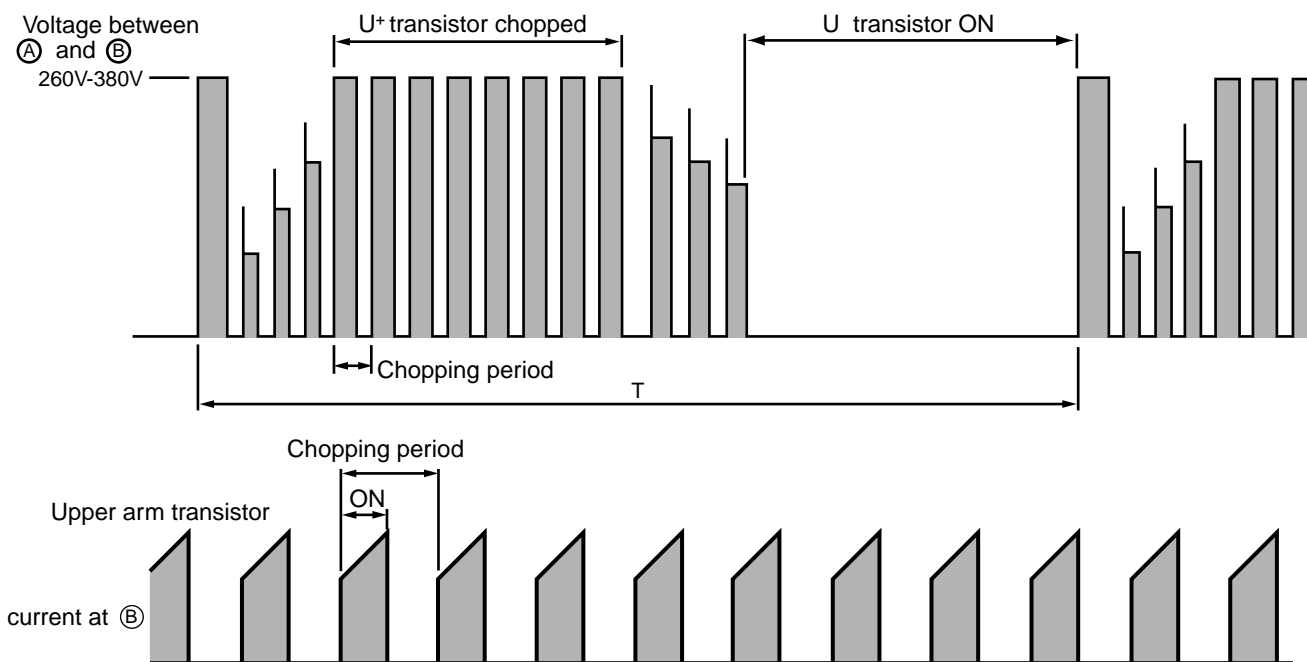


Fig. 3-3 Voltage waveform at each point

- When power is supplied U⁺ → U⁻, because of that U⁺ is chopped, current flows as shown below; ②
 (1) When U⁺ transistor is ON: U⁺ transistor → U coil → V coil → V⁻ transistor → DC current detection resistor → Point ② (Fig. 3-1)
 When U⁺ transistor is OFF: (by inductance of motor coil) U coil → V coil → V⁻ transistor → Return diode → Point ① (Fig. 3-4)

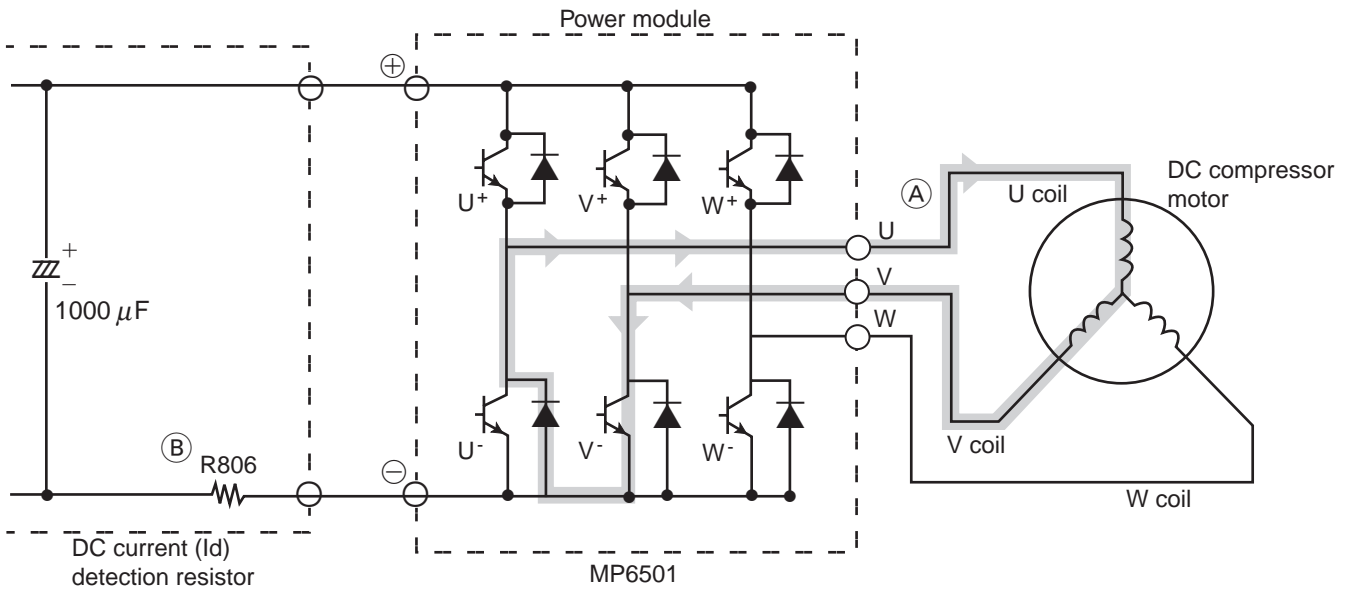


Fig. 3-4 Power module circuit (U⁺ is ON, V⁻ is ON)

- Since current flows at point (B) only when U⁺ transistor is ON, the current waveform at point (B) becomes intermittent waveform as shown in Fig. 3-3. Since current at point (B) is approximately proportional to the input current of the air conditioner, input current is controlled by using DC current (I_d) detection resistor.

<Reference>

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

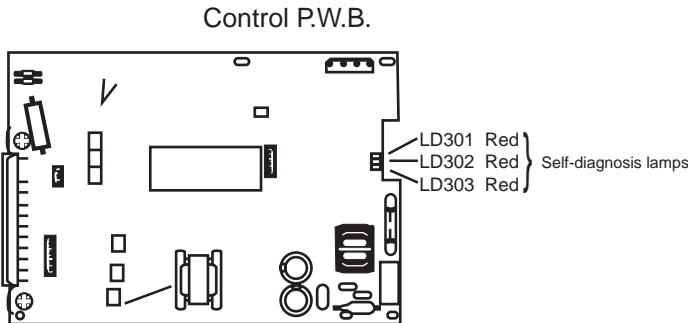


Fig. 3-5

Table 3-1

Self-diagnosis	Self-diagnosis lamp and mode	
I _p (peak current cut)	LD301	Blinks 2 times
Abnormal low speed rotation	LD301	Blinks 3 times
Switching incomplete	LD301	Blinks 4 times
Switching incomplete	LD301	Blinks 10 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 91) 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.

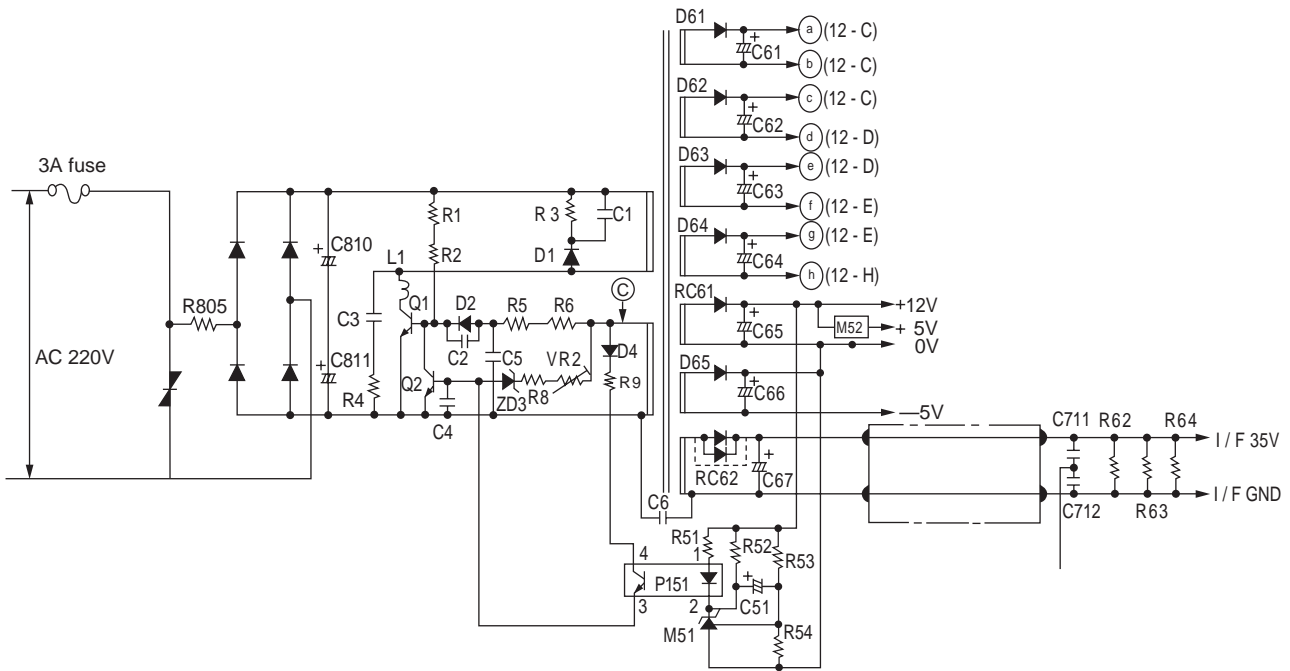


Fig. 4-1 Power circuit for P.W.B.

- In the power circuit for P.W.B., power voltage for microcomputer, peripheral circuits, and power module drive and, as well as DV35V, are produced by switching power circuit.
- Switching power circuit performs voltage conversion effectively by switching transistor Q1 to convert DC270V voltage to high frequency of about 20kHz to 70kHz.
- Transistor Q1 operates as follows:

(1) Shifting from OFF to ON

- DC about 270V is applied from smoothing capacitors C810 ⊕ and C811 ⊖ in the control power circuit. With this power, current flows to base of transistor Q1 via R1 and Q1 starts to turn ON. Since voltage in the direction of arrow generates at point © at the same time, current passing through R5, R6 and D2 is positive-fed back to Q1

(2) During ON period

- Collector current of Q1 is increased directly. In this period, base current is fixed by saturation characteristic of transformer.

(3) Shifting from ON to OFF

- In this circuit, feed back (negative) is applied from 12V output. When voltage between both ends of C65 reaches the specified value, M51 is turned ON and current flows between pin ① and ② of P151, secondary side is turned ON, current flows to base of Q2 via R9 and D4, Q2 is turned ON, and Q1 base current is bypassed to turn Q1 OFF.

(4) During OFF period

- During Q1 ON period, energy as shown below is charged at primary winding of transformer and is discharged to each secondary coil during OFF period:

$$\text{Energy} = LI^2/2.$$

L : Primary inductance

I : Current when Q1 is OFF

Each coil C61 - C67 is charged according to the winding ratio.

ZD3 turns ON Q2 to bypass Q1 base current during ON period to fix value of voltage in the direction of arrow.

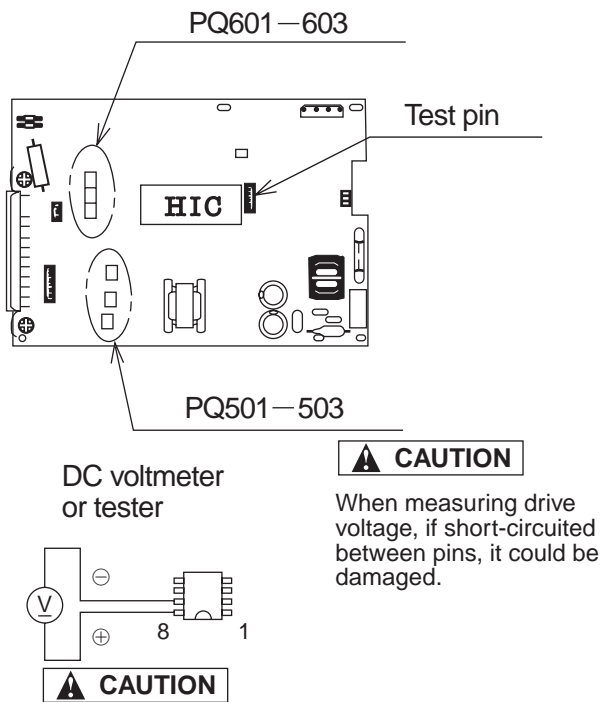
For example, when applied voltage to Q1 is high, voltage in the direction of arrow will rise, and current bypassing to Q2 is increased.

- Overcurrent flows at Q1 due to charged current at C61 - C67 when starting operation.
- When ZD3 reaches On voltage as a result of the voltage generated in the direction of arrow by Q1 collector current, Q2 is turned ON and Q1 base current is bypassed.
- By limiting base current with Q2, Q1 is prevented from allowing too much collector current to flow.

<Reference>

- When power circuit for P.W.B. is estimated as abnormal:

(1) Check that power voltages of 5V, 12V on the control P.W.B., and also power voltage of upper arm U, V and W and lower arm are specified values.



- Check 5V ($\pm 0.5V$), 12V ($\begin{matrix} +1V \\ -1.5V \end{matrix}$) and $\ominus 5V$ ($\begin{matrix} +1V \\ -1.5V \end{matrix}$) using test pin.
- Check as follows to measure power voltage of upper arm (U,V,W) and lower arm drive circuit:
 - U phase of upper arm
Apply \oplus terminal of tester to pin ⑧ of PQ501
Apply \ominus terminal of tester to pin ⑦ of PQ502
 - V phase of upper arm
Apply \oplus terminal of tester to pin ⑧ of PQ501
Apply \ominus terminal of tester to pin ⑦ of PQ502
 - W phase of upper arm
Apply \oplus terminal of tester to pin ⑧ of PQ503
Apply \ominus terminal of tester to pin ⑦ of PQ503
 - Lower arm
Apply \oplus terminal of tester to pin ⑧ of PQ601
Apply \ominus terminal of tester to pin ⑦ of PQ602

CAUTION

※ Be careful not to short-circuit by touching of tester terminals, etc.

For PQ501 — PQ503 and PQ601 — PQ603, apply \oplus terminal to pin ⑧, \ominus terminal to pin ⑦. If short-circuited between pins, it could be damaged.

Fig. 4 - 2

- Abnormal only when output of 5V voltage has decreased:
Regulator 1 is abnormal, short-circuited between 5V and 0V, or output too high.
- When 12V and 5V voltage are abnormal:
 - Mainly;
 - Fan, operation, power, or inrush current protective relays (short-circuit inside relay, etc.)
 - HIC abnormal
Regulator 1 abnormal, etc.
Primary side short-circuited.
When secondary side is short-circuited, primary side is normal because of overcurrent protective device
Voltage rise when primary side is open, feed back system abnormal.
- When each phase of upper arm U, V, W or lower arm power is abnormal:
D61 - D65, RC61, RC62 or drive circuit is abnormal.
- When all voltages are abnormal:
Q210, ZD201, R205, etc. may be abnormal.
※ Be careful, if Q201 is abnormal, other parts such as power module, HIC, regulator could be defective.

5. Reversing valve control circuit

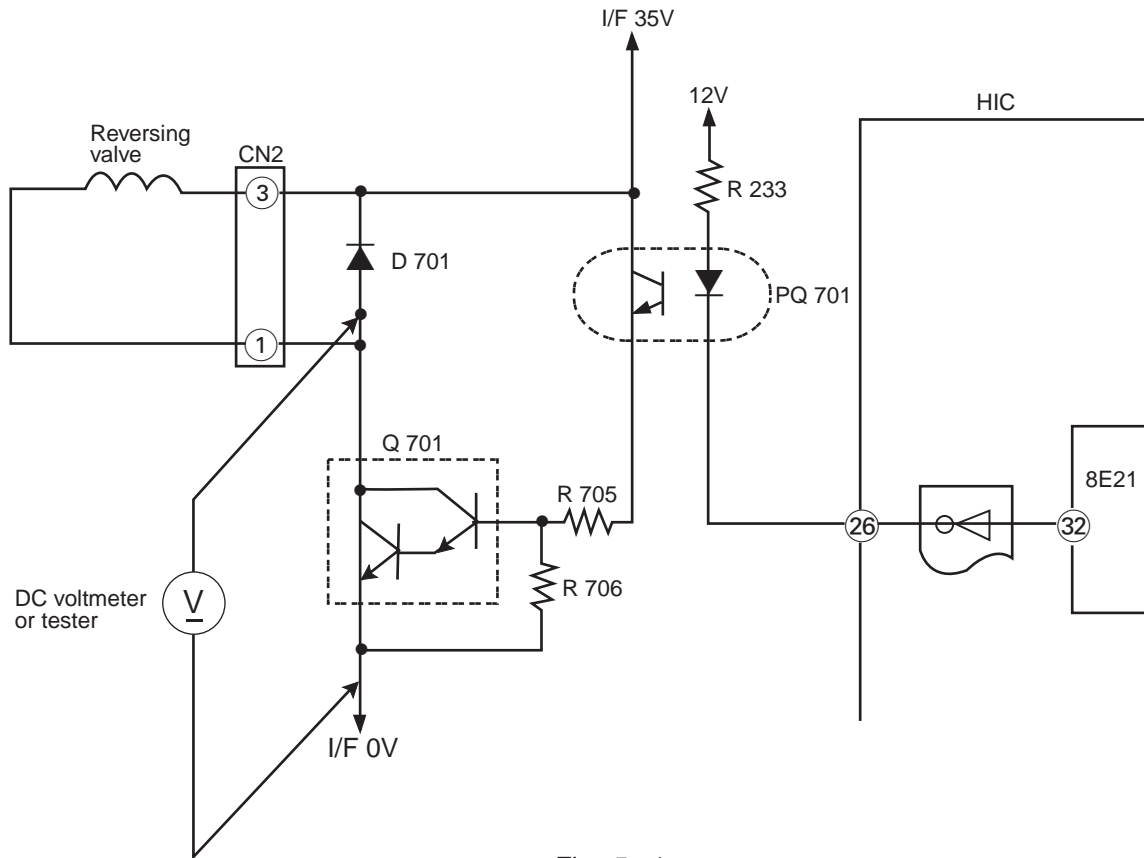


Fig. 5 - 1

- ✱ Since the reversing valve is differential pressure system, even when reversing valve is ON (collector voltage of Q701 is about 0.8V normally), compressor rotation speed instructed by indoor microcomputer exceeds 3300min^{-1} , signal at pin ②④ of microcomputer changes, and collector voltage of Q701 will be about 36V.

This does not indicate trouble. When rotation speed is reduced under 2700min^{-1} , collector voltage of Q701 will fall to about 0.8V again. To measure voltage, connect ⊕ terminal of tester to D701 anode and ⊖ terminal to D line on the terminal board.

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

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

Table 5-1

Operation condition		Collector voltage of Q701
Cooling	General operation of Cooling	About 36V
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

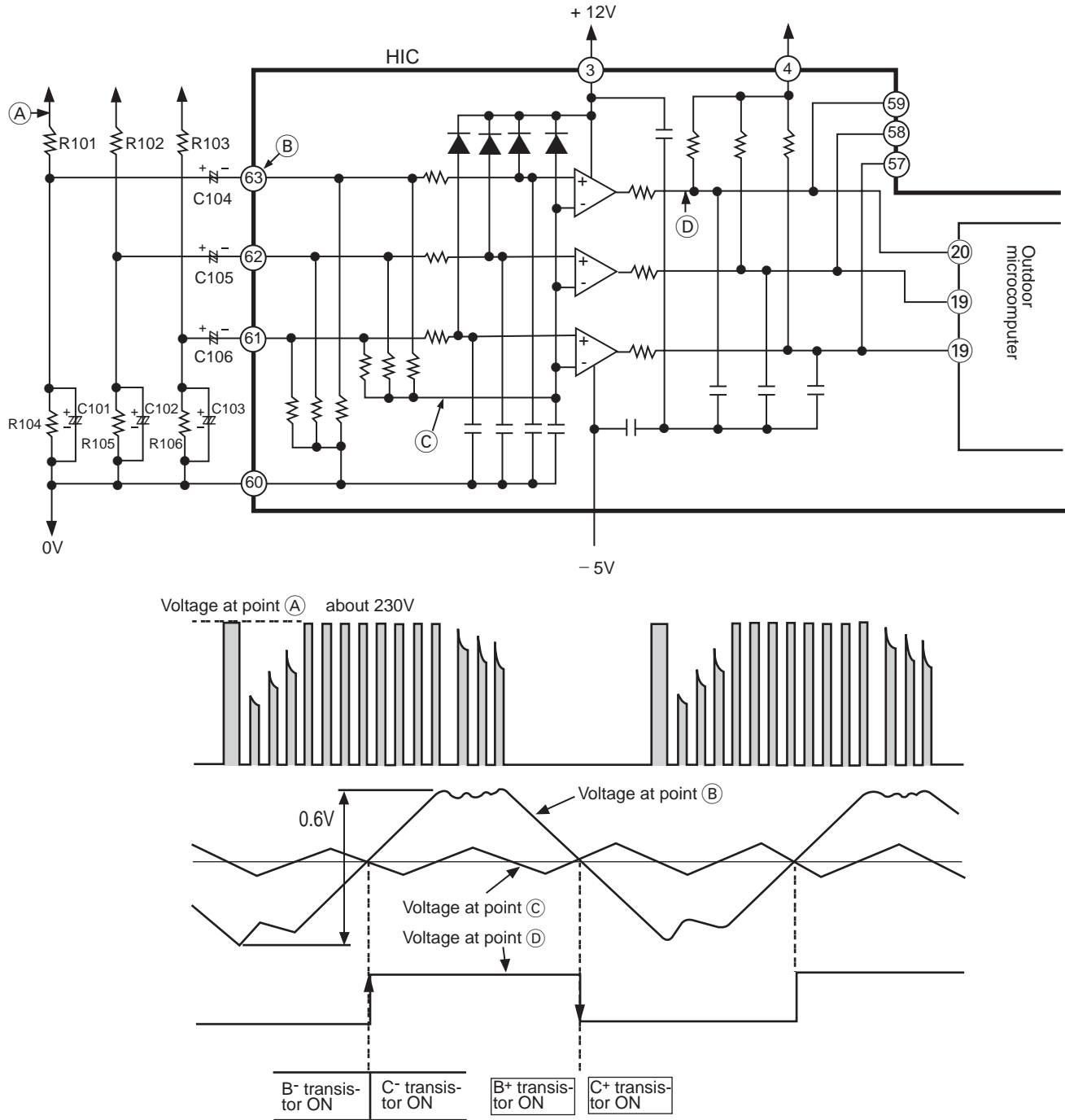


Fig. 6 - 1 Rotor magnetic pole position detection circuit and voltage waveform at each part

- Motor-induced voltage signal (voltage at point (A)) is phase-shifted by 90° by passing lowpass filter consisting of R101, R104 and C101 to make triangular wave (voltage at point (B)). In HIC, 3 phases of this triangular wave are synthesized to produce composite wave (voltage at point (C)). This composite wave becomes a triangular wave with period of $1/3$ times compared with original triangular wave.
 - Voltages at points (B) and (C) are compared by comparator to make voltage at point (D).
- Voltage at point (D) is taken into microcomputer and timing of switching from V^- transistor to W^- transistor is made by rising waveform, and timing of switching from V^+ transistor to W^+ transistor is made by falling waveform.
- For other 2 phases (V phase and W phase), the operation is the same and phases are shifted by 120° and 240° respectively compared with U phase waveform.

7. Drive Circuit

(1) Upper Arm Drive Circuit

- Fig. 7-1 shows the upper arm drive circuit.
The circuit configuration is completely the same for phases A, B and C.

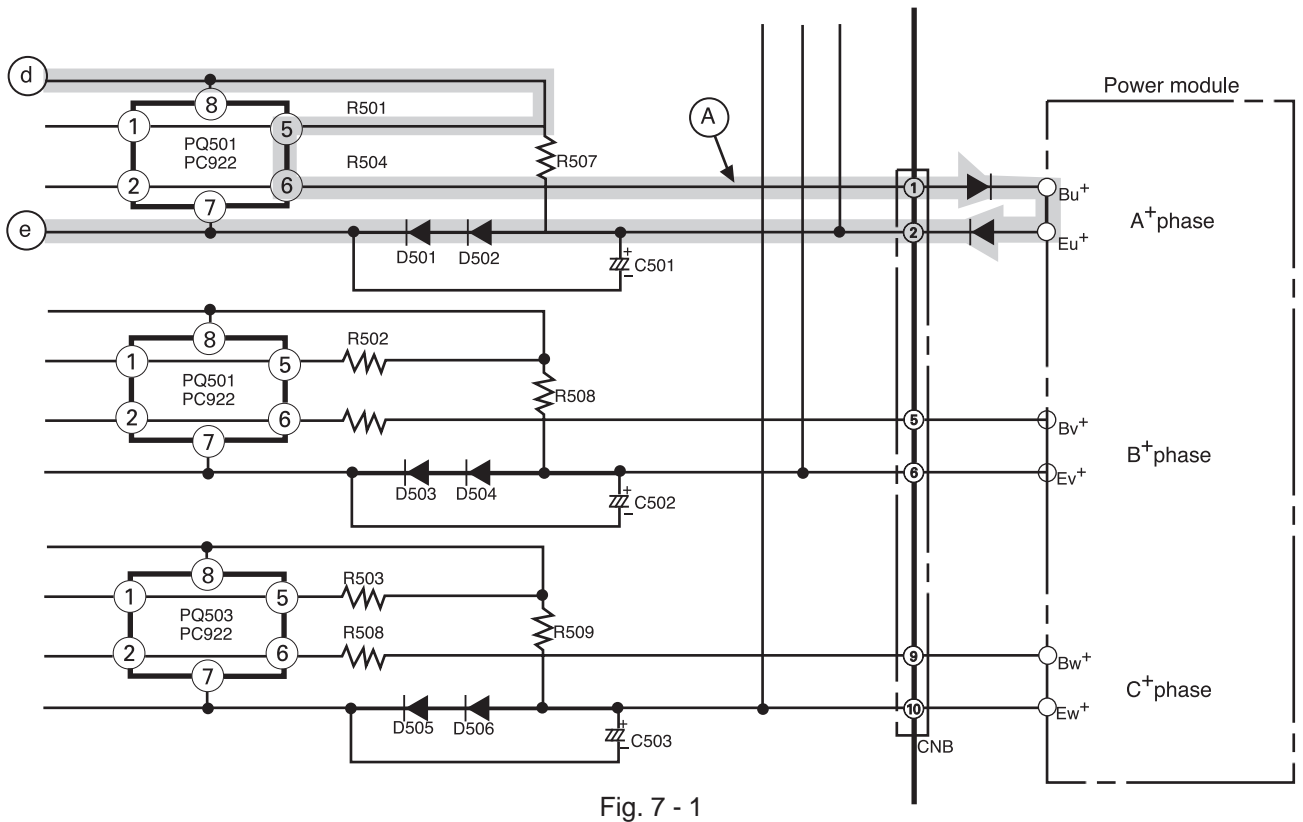


Fig. 7 - 1

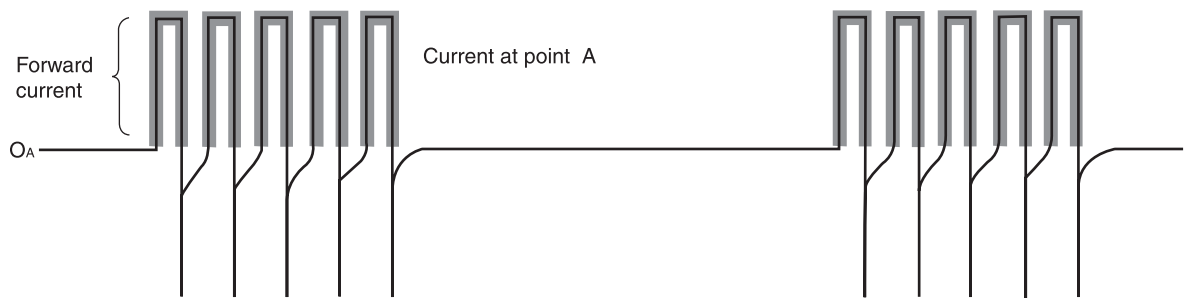


Fig. 7 - 2 Forward Current Waveform at Point (A)

- When pin \circ of HIC goes "Hi" \rightarrow "Lo", a photocoupler between PQ501 pins ① and ② turns on and current flows to terminal ④ \rightarrow R501 \rightarrow PQ501 \rightarrow R504 \rightarrow power module's Bu⁺ terminals \rightarrow Eu⁺ terminals \rightarrow D502 \rightarrow D501 \rightarrow terminal ③ and drives the upper arm transistors. (Fig.7-2)
- As described in the rotor magnetic pole position detecting circuit, the upper arm drive circuit supplies current to the bases of the transistors on the power module's positive \oplus side which turn on or off according to the position detection signals. The signals according to the position detection signals are output from pins ⑳, ㉑ and ㉒ of the micro computer and are input to pins ② of photocouplers PQ501 - PQ503 via driver IC1.

- When pin ②③ of HIC-1 then goes "Hi" → "Lo", a photocoupler between PQ2 pins ① and ② turns off and the reverse bias current flows to C501 → power module's Eu⁺ terminals → Bu⁺ terminals → R504 → PQ501 Switching incomplete to cut off the upper arm transistors. (Fig.7-3)

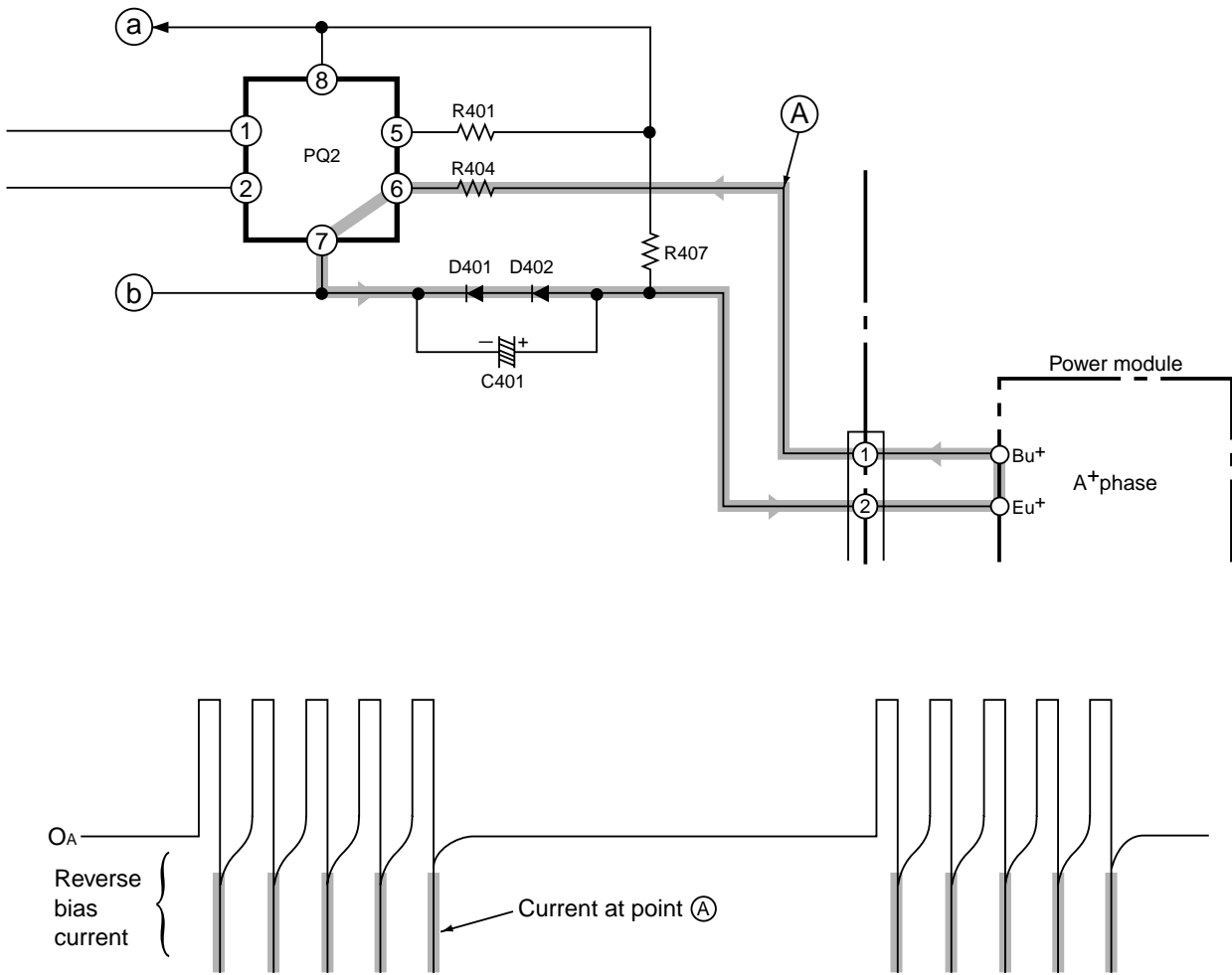


Fig. 7-3 Waveform of Transistor Base Current (Reverse Current at Point ①)

- R507 is used to charge C501 initially.
- The operation is the same for B⁺ and C⁺ phases.

(2) Lower Arm Drive Circuit

- Fig. 7-4 shows the lower arm drive circuit.

The circuit configuration is completely the same for phases A, B and C.

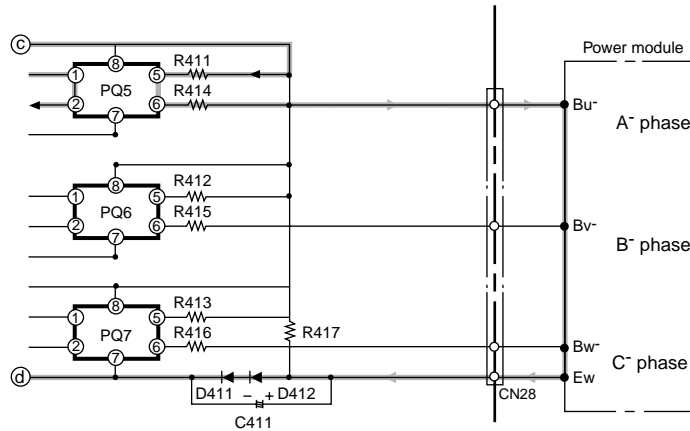


Fig. 7-4

- When pin ③⑤ of the micro computer goes "Lo" → "Hi", a photocoupler between PQ601 pins ① and ② turns on and current flows to terminal (i) → R601 → PQ601 → R604 → power module's BU⁻ terminals → Ew⁻ terminals → D602 → D601 → terminal (k) and drives the lower arm transistors. (Fig. 7-4)
- The signals which turn on or off according to the position detection signals are output from pins ③③④③⑤ of the micro computer in the same way as in the upper arm drive circuit and are input to pins ① of photocouplers P601 and PQ602 via driver IC1.
- No chopper signal is input to the lower arm drive circuit.

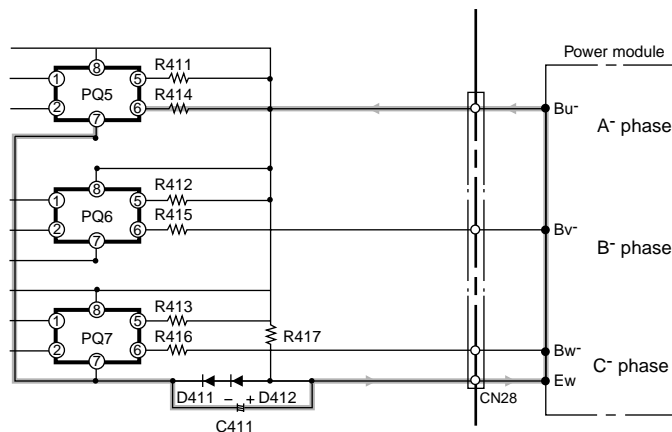


Fig. 7-5

- When pin ③⑤ of the micro computer goes "Hi" → "Lo", a photocoupler between PQ601 pins ① and ② turn off and reverse bias current flows to C411 → power module's Ew⁻ terminals → Bu⁻ terminals → R604 → PQ601 to cut off the lower arm transistors. (Fig. 7-5)
- R607 is used to charge C601 initially.
- The operation is the same for B⁻ and C⁻ phases.
- When the peak current cut off function operates, HIC-1 ③⑩ pins become 0V, PQ501-PQ503 and PQ601-PQ603 turn off and the upper/lower arm drive circuits stop.
- when a reset signal is applied, HIC pins ⑦ and ③② become open, PQ501-PQ503 and PQ601-PQ603 turn off and the upper/lower arm drive circuits stop.

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.

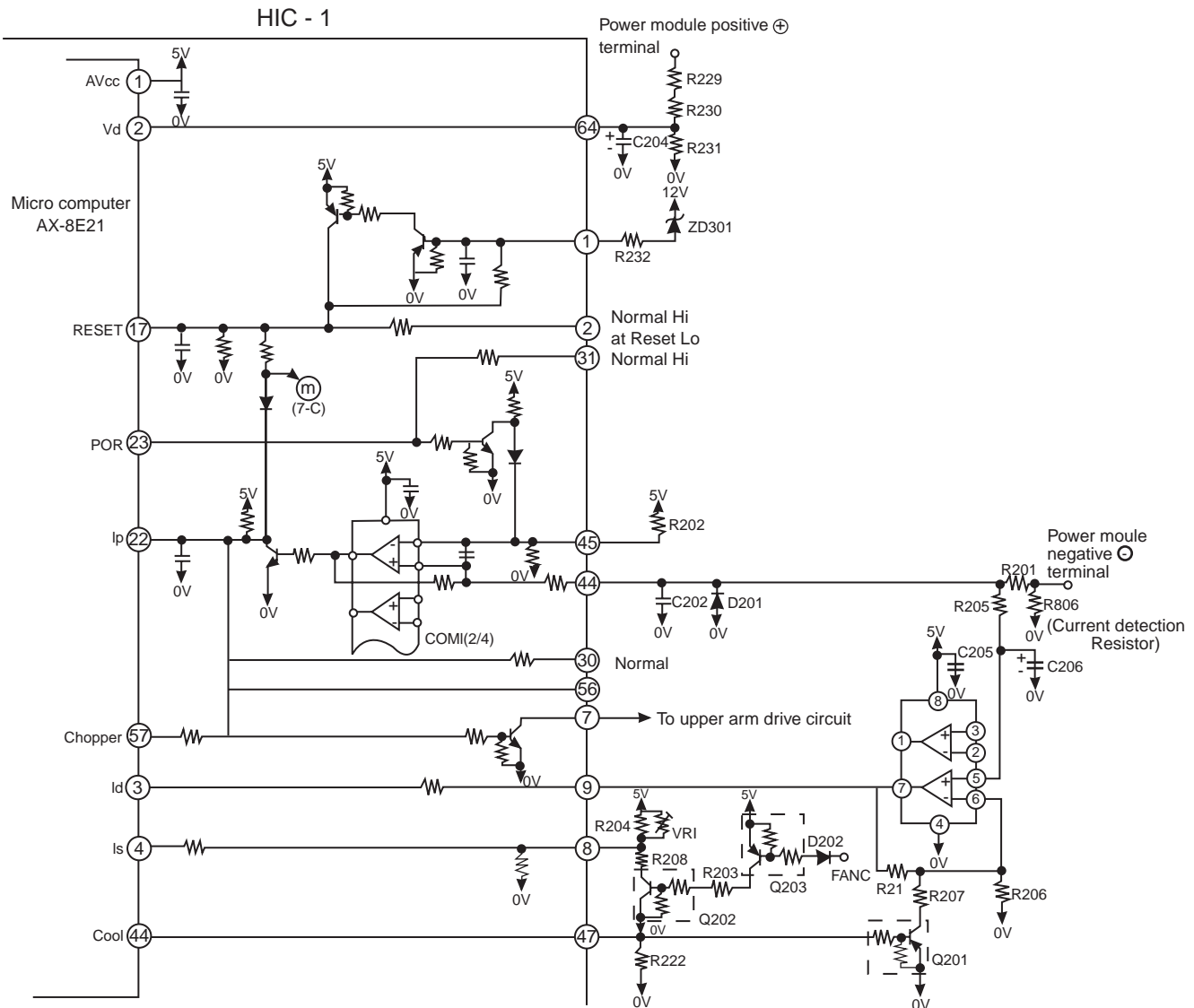


Fig. 8-1 Micro computer(AX-8E21) and peripheral circuits

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 (HIC ③③ – ③⑧) from microcomputer 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.

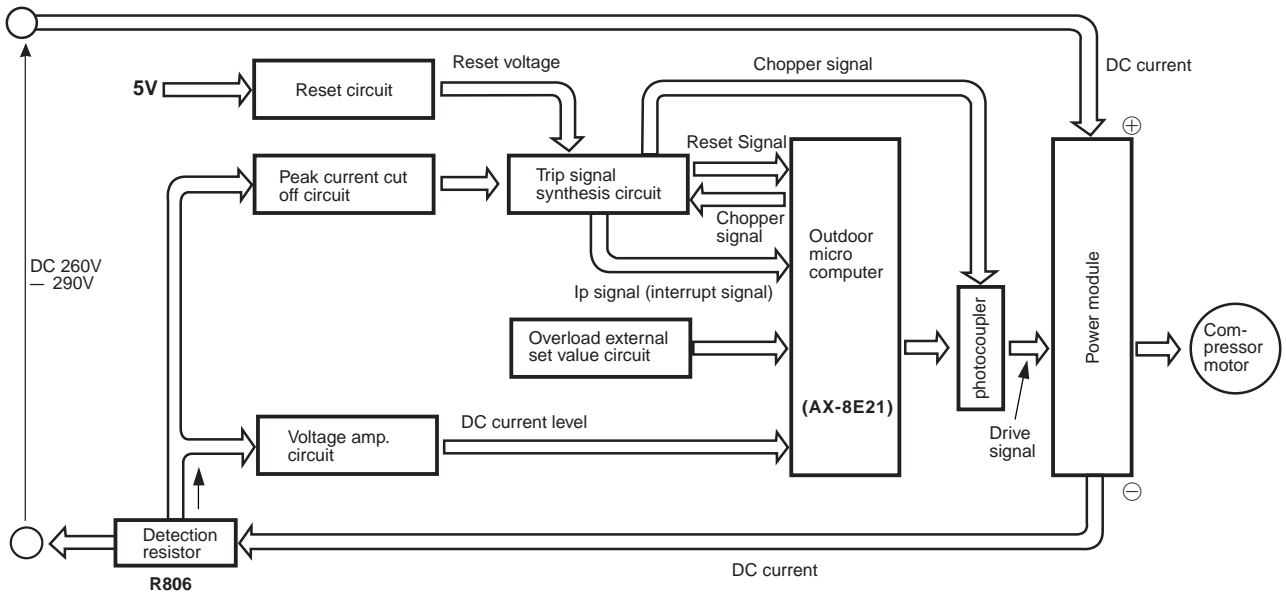


Fig. 8 - 2

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

(1) Peak current cut (Ip) off circuit

Fig.8-3 shows the Peak Current Cut off Circuit and Waveforms at Each Section.

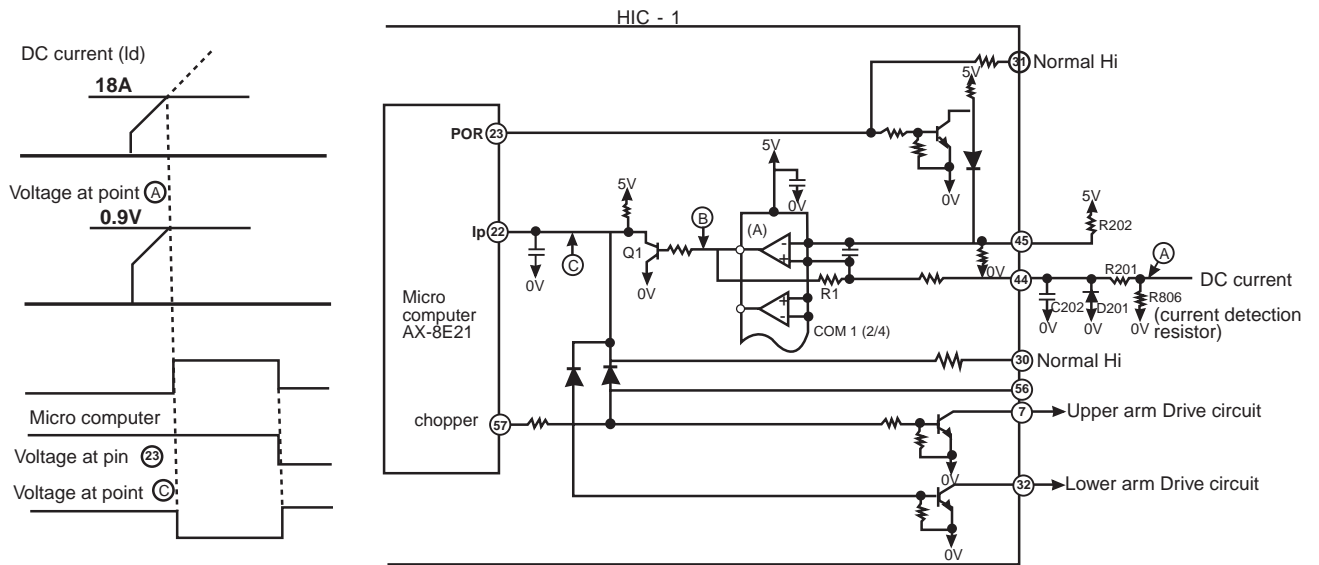


Fig. 8 - 3 Peak current cut off circuit and Waveforms at Each Section

- Ip cut off circuit detects an instantaneous large current and stops drive output signal to protect parts such as power module, etc.
- As shown in the figure, when current exceeding 18A flows, voltage at point A detected by detection resistor is input to ⊕ terminal of COM (A). If it exceeds ⊖ terminal voltage, which is the set value, output pin voltage (point B) of COM (A) changes from Lo to Hi. Thus, Q1 is turned ON to stop drive circuit and, at the same time, voltage at point C changes from Hi to Lo to send Ip signal to pin 22 of microcomputer (observed by pin 30 of HIC) and microcomputer stops drive.
- On the other hand, ⊕ terminal voltage is pulled up by R1, and DC current becomes 0A. Even when voltage at point A returns to 0V, (power is not supplied - current value of zero), Output is temporarily held in Hi state since voltage at - terminal is high. (memory function).
- Just before drive signal is output the next time, Microcomputer switches pin 23 from Hi to Lo (observed by pin 31 of HIC), so that ⊕ terminal voltage < ⊖ terminal voltage to release memory function and return to initial state.

(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 judgement 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 micro computer software with the DC current value.

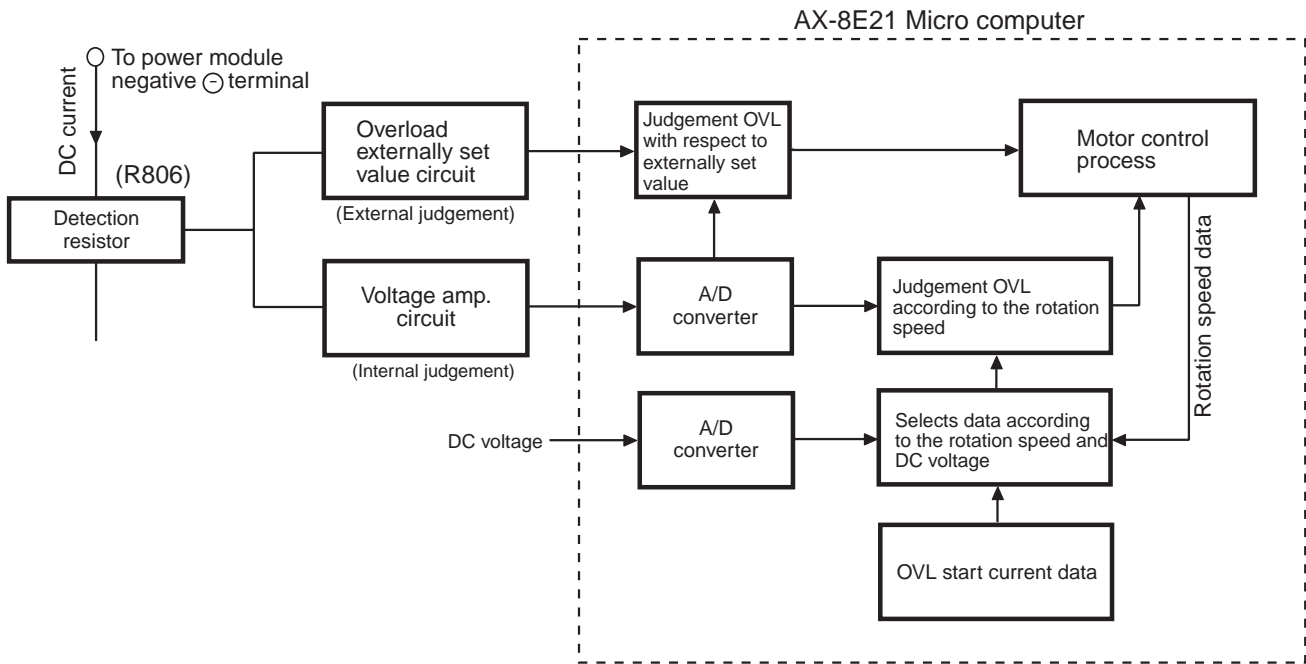


Fig. 8 - 4 Overload Control System Configuration

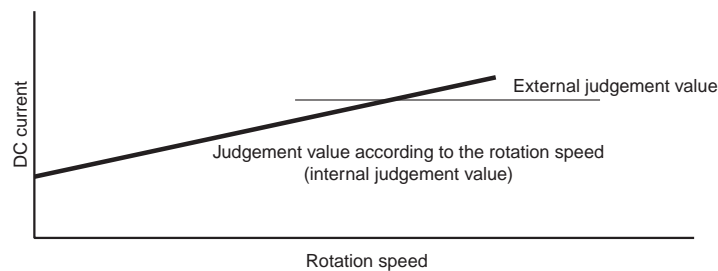


Fig. 8 - 5

①. Overload external judgement circuit

- The filter consisting of R320 and C1 removes high harmonic components from the voltage generated by the current flowing to R806, R2 and C304 average the voltage. This voltage is then input to OP1 pin ⑤ and amplified and is supplied to micro computer pin ⑫ which is compared with the voltage at pin ⑬. If the voltage at pin ⑫ is higher than that at pin ⑬, the micro computer enters the overload control mode.
- Fig. 8-7 shows the rotation speed control. When the voltage at pin ⑨ of HIC exceeds the set value at pin HIC ⑧, the micro computer decreases the rotation speed of the compressor and reduces the load regardless of the rotation speed commanded by the indoor micro computer.

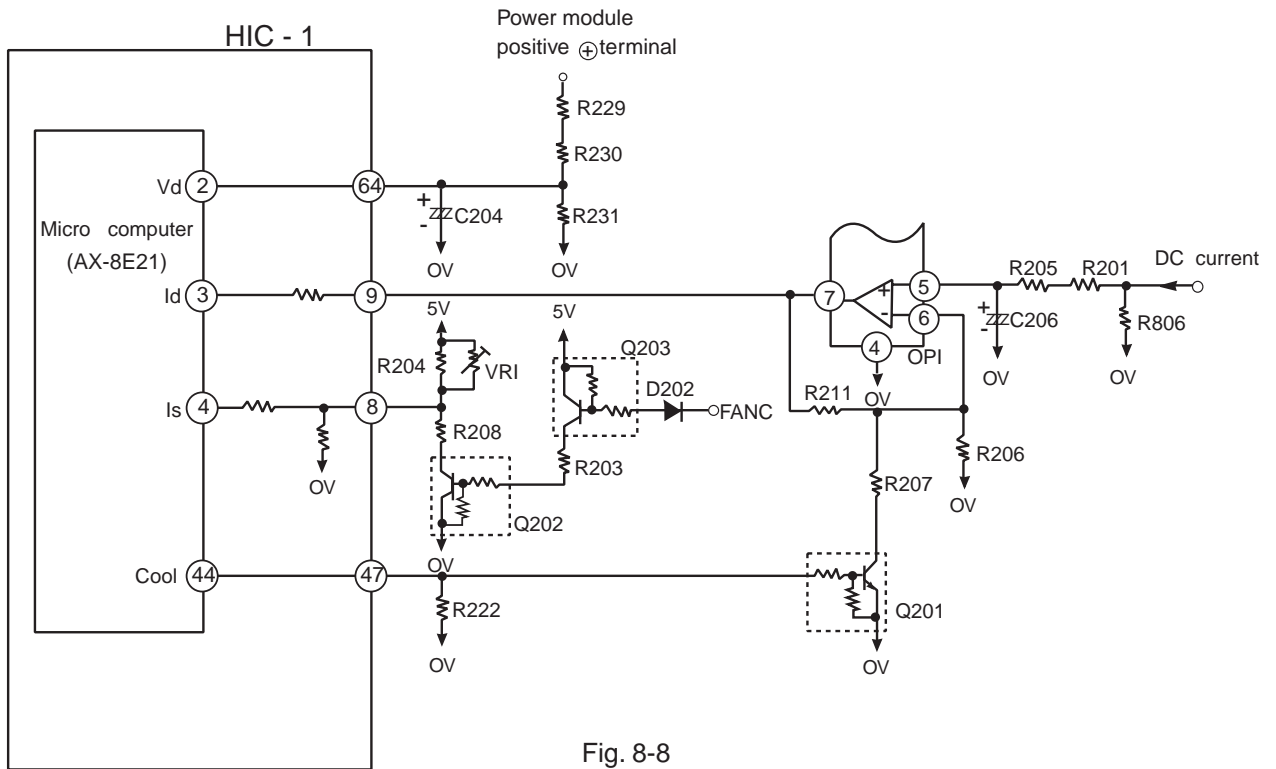


Fig. 8-8

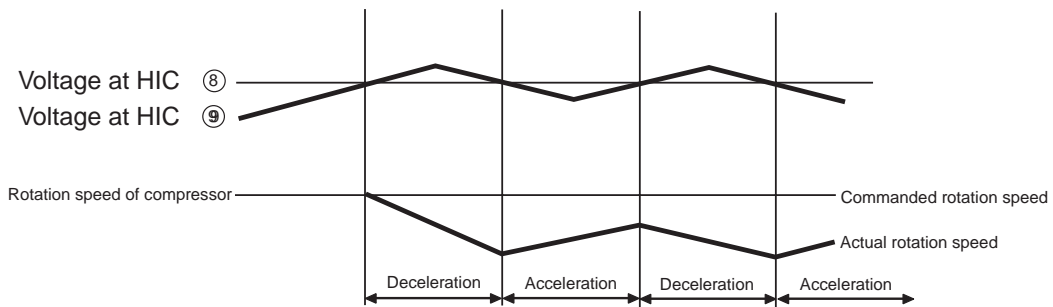


Fig. 8-7

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 micro computer. Receiving this, the micro computer 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 R201 and C202 removes high harmonic components from the voltage generated from the DC current flowing to the detection resistor, and R205 and C206 average the voltage and supplies it to OP1 pin ⑤ OP1 forms a non-inverting voltage amp. circuit together with the peripheral elements.
- The micro computer stores the set values which vary according to the rotation speed as shown in Fig. 8-8. When the DC current level exceeds the set value, the micro computer enters the overload control state. The compressor motor is controlled in the same way as in external judgement described previously.
- The set Value is determined by the amplification of the voltage amp. circuit.

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

- R229, R230, R231 detect the DC voltage at the power circuit. The micro computer receives a DC voltage (210-300V) via HIC (64) 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, R229, R230, R231 are provided to perform the same overload judgement even when the voltage varies.)

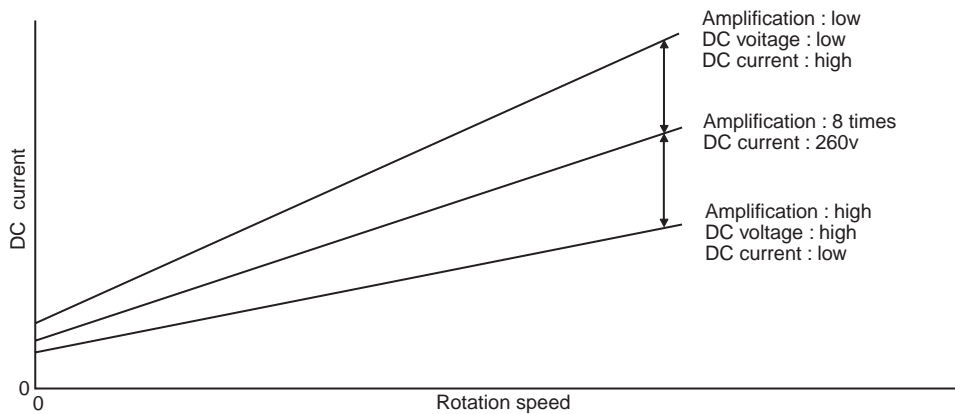


Fig. 8-8

< 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.
- The RAC-25CNH11 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 Fig. 8-9.
- (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. 8A as shown in Fig. 8-10.

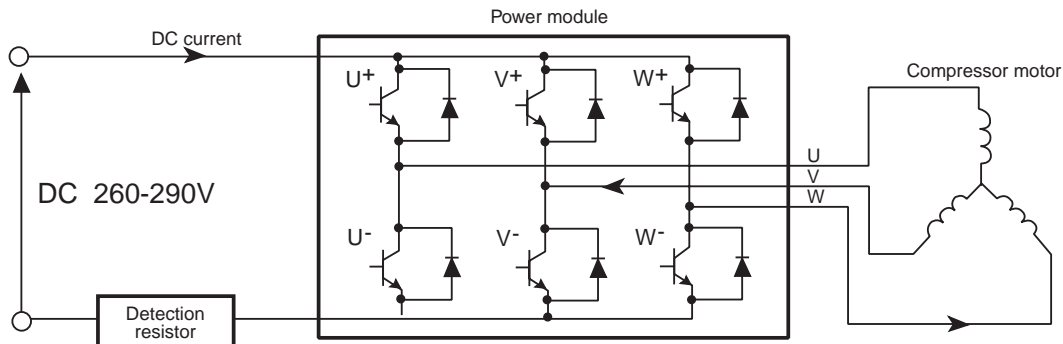


Fig. 8-9

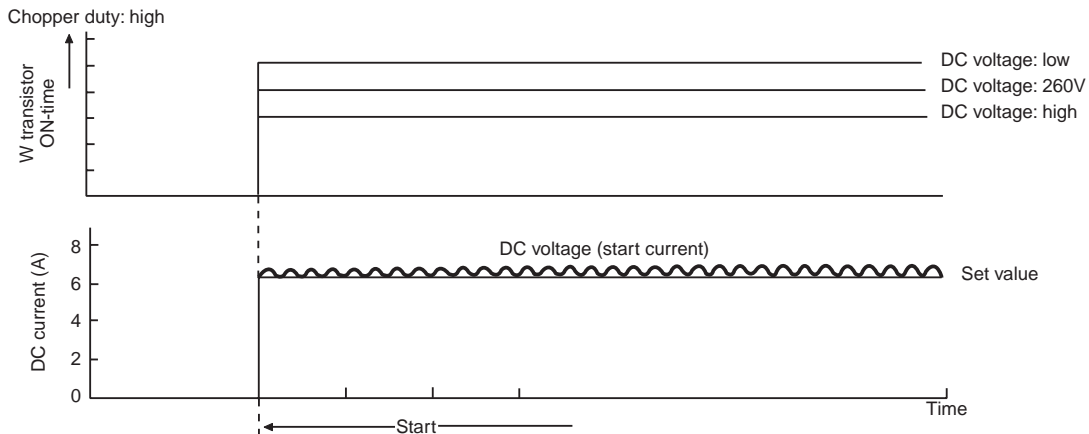


Fig. 8-10

9. Trip Signal Synthesis Circuit

- Fig. 9-1 shows the trip signal synthesis circuit.

This circuit is provided to stop the drive signal, etc. according to whether or not the Ip cut signal or reset signal is present.

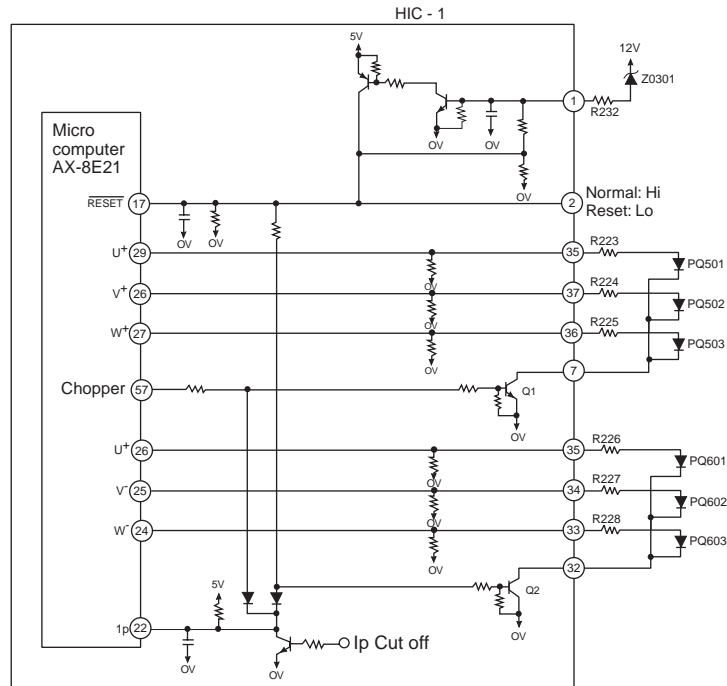


Fig. 9-1 Trip Signal Synthesis Circuit

- Table 9-1 shows to which circuits the various modulation signals are transferred.

For example, the chopper signal is only transferred to the upper arm transistor drive circuit, and the reset signal is transferred to the micro computer and upper and lower arm transistor drive circuits.

- On the other hand, pins ③③-° of the HIC-1 change from "Lo" to "Hi" alternately and supply the voltage to PQ501-PQ503 and PQ601-PQ603.
- The chopper signal from the micro computer is inverted by Q1 and turns PQ501, PQ502 or PQ503 ON or OF to which voltage is applied at a high frequency to supply current, thus transferring the upper arm drive signal.
- When the reset voltage is "Lo", the base of Q2 goes "Lo", to turn Q2 OFF and also stops the operation current of PQ601-PQ603 to switch OFF the lower arm drive signal. With the upper arm transistor drive circuit, the base of Q1 goes "Lo", and the micro computer stop supplying a voltage to PQ501-PQ503, thus switching OFF the drive signal.
- The peak current cut off (Ip cut) signal fixes the base of Q1 and Q2 in the upper/lower arm transistor drive circuits at "Lo" to switch OFF the drive signal in the same way as when the reset voltage is "Lo".

Table 9-1 Circuits to which trip signals are transferred

Modulated signals \ Circuit	Micro Computer	Upper arm transistor drive circuit	Lower arm transistor drive circuit
Chopper signal	—	○	—
Start current limit signal	—	○	—
Peak current cut off signal	○	○	○
Reset signal	○	○	○

10. Temperature Detection Circuit

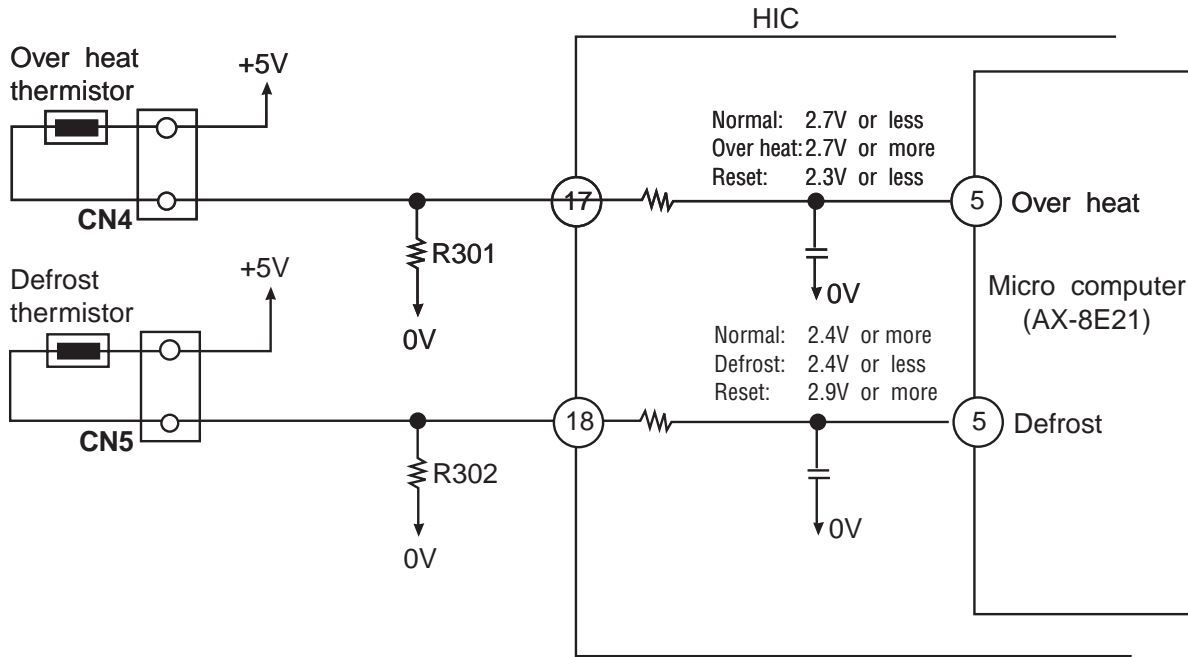


Fig. 10-1

- 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 $\oplus 5V$ is divided by the over heat thermistor and R301 and the voltage at pin ⑰ of HIC.
- HIC the voltage at pin ⑰ and the set value stored inside, and when it exceeds the set value, the micro computer 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 ⑱ of HIC drops. If this voltage becomes lower than the set value stored inside, the micro computer starts defrosting control.
- During defrosting operation the micro computer transfers the defrosting condition command to the indoor microcomputer via the SDO pin IF transfer output of the interface.

11. Reset Circuit

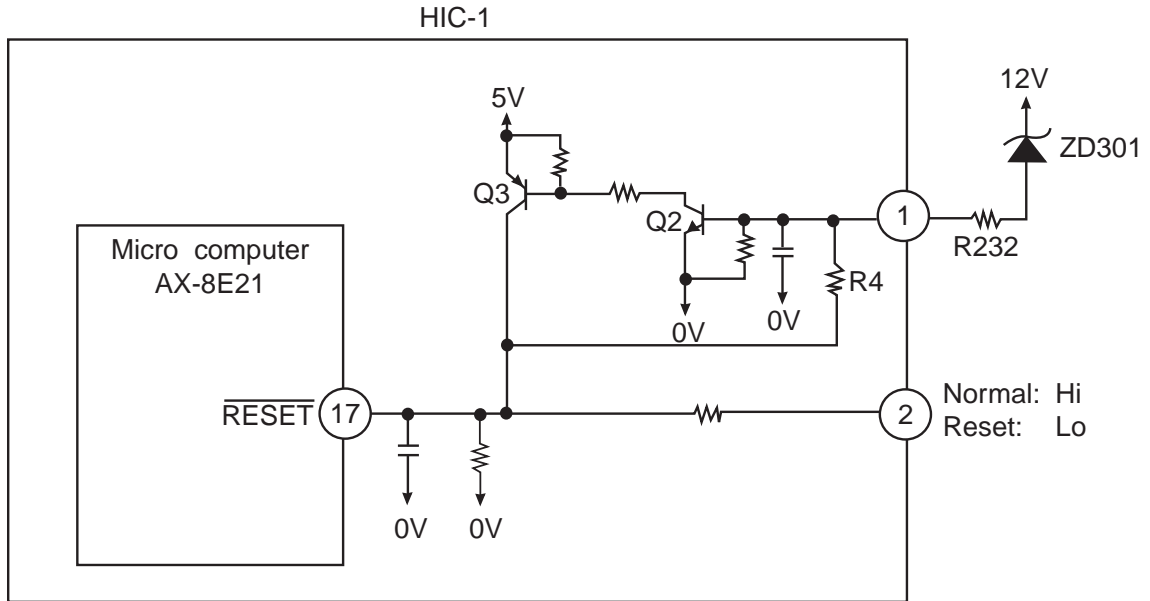


Fig. 11-1

- Reset circuit performs initial setting of the microcomputer program before power is turned on.
- Microcomputer resets program with reset voltage set to Lo, and program can be operated with Hi.
- Fig. 11-1 shows the reset circuit and Fig. 11-2 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 7.2V (Zener voltage of ZD501), ZD301 is turned ON, Q2 and Q3 are turned ON and reset voltage input to pin ⑰ of microcomputer is set to Hi. By ZD501, reset voltage maintains input of pin ⑰ at Lo until V_{DD} of microcomputer rises to 5V to obtain operable status.
- When power is shut off and potential of 12V is lowered, ZD501 is shifted to OFF. However, since reset voltage is feed back to Q2 by R4, Q2 maintains ON state until 12V line voltage drops to about 7.6V. This prevents reset voltage from chattering due to voltage change in 12V line.

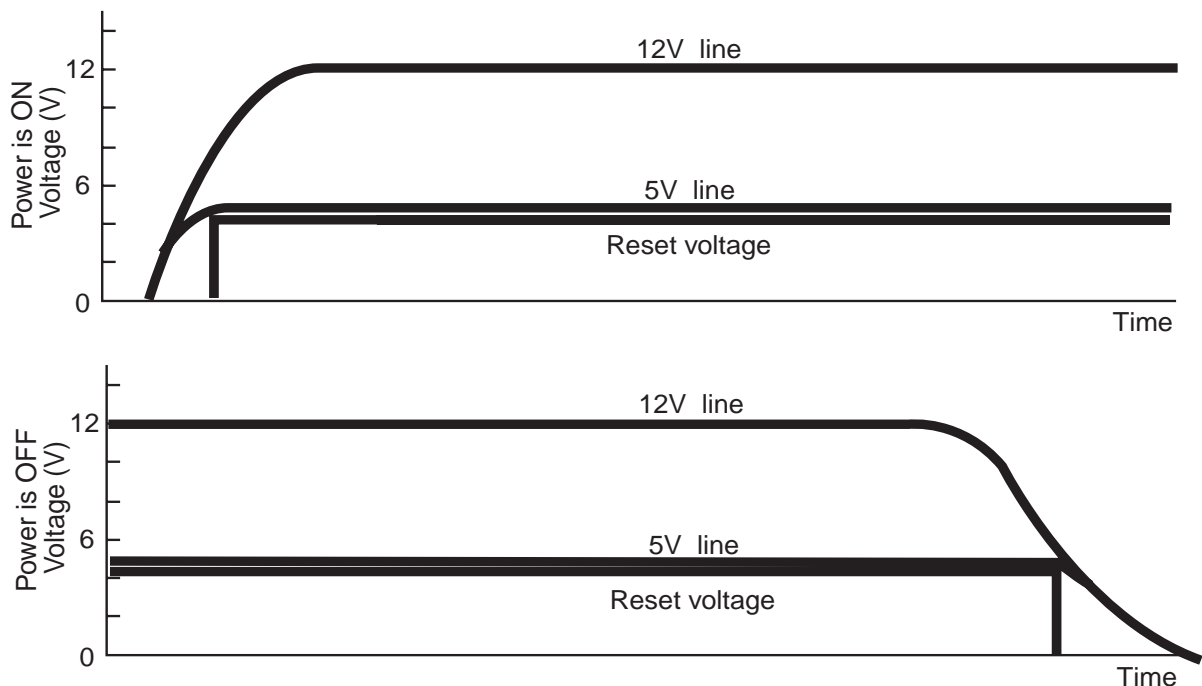
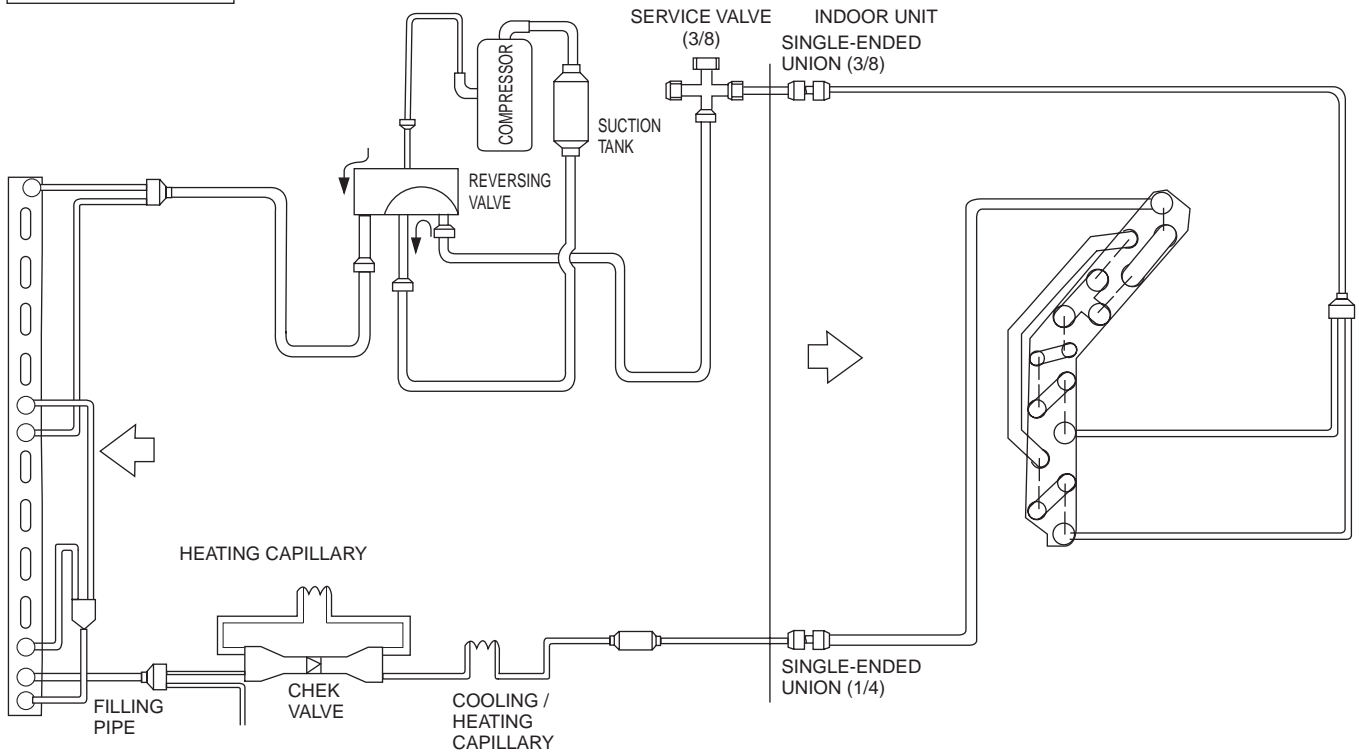


Fig. 11-2

REFRIGERATING CYCLE DIAGRAM

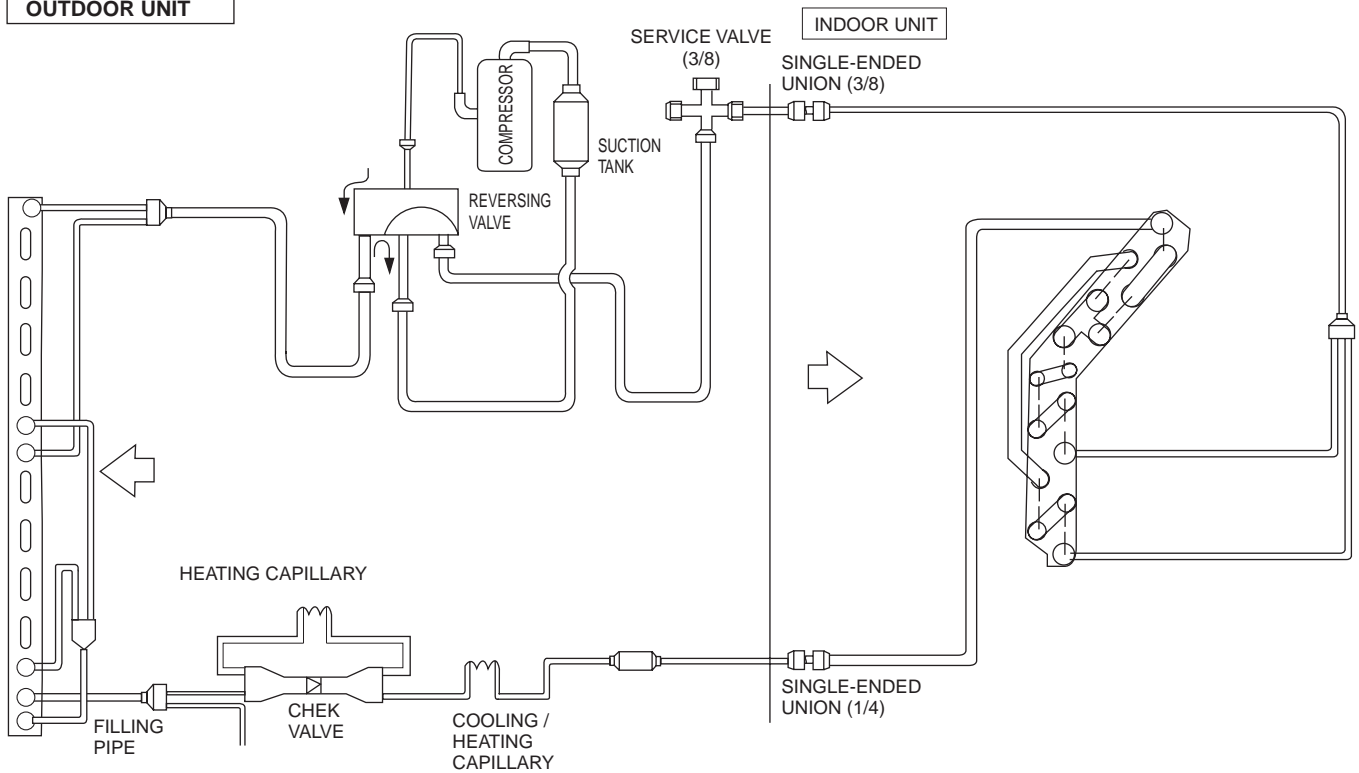
COOLING

OUTDOOR UNIT



HEATING

OUTDOOR UNIT



SERVICE CALL Q & A

MODEL RAS-25CNH11 /RAC-25CNH11

Cooling operation

Q1 The compressor has stopped suddenly during cooling operation.

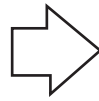


A1 Check if frost has formed on the indoor unit heat exchanger. Wait 3 — 4 minutes until it is defrosted.

If the air conditioner operates in the cooling mode when it is cold, frost may form on the heat exchanger of the indoor unit.

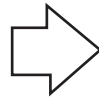
Dehumidifying operation

Q2 The fan speed cannot be changed.



A2 The fan speed is fixed at "Lo" in the dehumidifying mode.

Q3 Cool air is blown in the dehumidifying mode.



A3 This is for higher dehumidifying efficiency. It is not a malfunction.

Q4 The operation is not stopped when the preset room temperature is changed higher using the remote controller during dehumidifying operation.

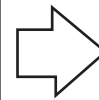


A4 The dehumidifying mode operates as follows by comparing the preset room temperature and the actual room temperature.

- ① When room temperature > preset room temperature, operation is done according to the preset room temperature of the remote controller.
- ② When room temperature < preset room temperature, regardless of the preset room temperature, a temperature slightly lower than the actual room temperature automatically becomes the set temperature.

Since Q4 is the case of above ②, it is not possible to operate using the room temperature control. Turn off using the Start/Stop switch once, set the preset room temperature again, then turn on using the Start/Stop switch.

Q5 Though the preset room temperature is set higher than actual room temperature using the remote controller, dehumidifying operation is done.



A5 This is the case of ② in A4. A temperature slightly lower than the actual room temperature becomes the set temperature and the dehumidifying operation is done if possible.

Heating operation

Q6 The circulation stops occasionally during the heating operation.



A6 This occurs during defrosting. Wait for 5 – 10 minutes until the outdoor unit is defrosted.

Q7 Even when the fan speed is set to "Hi" or "Med", the operation starts in the "Lo" mode.



A7 At the beginning of the heating operation, the fan speed is held to "Lo" for 30 seconds. If "Hi" is selected, operation is done at "Lo" first, then "Med" for 30 seconds and then is switched to "Hi".

Q8 Heating operation stops when the pre-set temperature is 30°C.



A8 If the external temperature is too high, heating operation may stop to protect the unit.

Auto fresh defrosting

Q9 After the Start/stop switch is pressed to stop heating operation, the outdoor units still operate with the Operation lamp lit.



A9 Auto fresh defrosting is carried out. The system checks the outdoor unit and defrosts it if necessary before stopping operation.

Auto operation

Q10 In the auto operation mode, the fan speed cannot be changed using the fan speed selector switch.

Q10 The auto fan speed mode is set automatically.

Q11 How is operation mode decided in AUTO operation?

A11 Automatically, Heating, Cooling or Dehumidifying is chosen according to the room temperature.
Cooling: Room temperature is higher than about 27°C.
Dehumidifying: Room temperature is about 23°C-27°C
Heating: Room temperature is lower than 23°C.

Q12 Is it possible to adjust room temperature in the AUTO operation mode?

A12 The following conditions are set automatically:
In the cooling mode: Room temperature is set to 27°C.
In the dehumidifying mode: Temperature is set to a value slightly lower than present room temperature.
In the heating mode: Room temperature is set to 23°C.
You can raise set room temperature up to 3°C by using [▲], or lower it up to 3°C by using [▼].

When the set temperature has been changed in the AUTO operation mode, the operation mode is decided from the next operation according to the changed set room temperature. for example, If the set room temperature was lowered by 2°C in cooling operation, each mode will operate in the following conditions:
Cooling: Room temperature is higher than about 25°C.
Dehumidifying: Room temperature is about 21°C-25°C.
Heating: room temperature is lower than 21°C

Nice temperature reservation

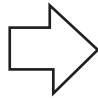
Q13 When ON-timer is set, the system starts working earlier than the reserved time.

A13 The Nice temperature reservation is working correctly. It starts working enough to reach the preset temperature at the reserved time.
It will turn on up to 80 minutes earlier than the reserved time.

Q14 Is it possible to use the Nice temperature reservation in the dehumidifying operation?

A14 No, it is impossible. This works only in the cooling and heating operation.

Q15) Even when the reserved time is the same, the system turns on at a different time.



A15) The Nice temperature reservation is working correctly. The turn-on time varies depending on the conditions of the room. In the heating operation, since the system calculates and corrects the starting time to reach the preset temperature at the reserved time under the current conditions, the operating time is different every day.

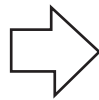
Wireless remote controller

Q16) The timer setting cannot be done.



A16) Has the present time been set?
If the clock is not set, the timer cannot be set.

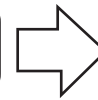
Q17) The present time display is turned off too soon.



A17) The present time display appears for about 10 seconds. The timer set display has priority.

When the present time is set, the display blinks for about 3 minutes.

Q18) The reserved time is erased though the timer was set.



A18) The reserved time may have been passed. When the present time reaches the reserved time, the reserved time is erased.

Common/Others

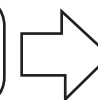
Q19) In the auto fan speed mode, the fan speed changes over between "Hi", "Med" and "Lo".



A19) This is not a problem. The system automatically controls the fan speed to protect the blowing out of cold air.

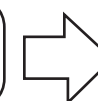
In the Auto fan speed mode, the system detects the heat exchange temperature and automatically changes the fan speed to "Hi", "Med" and "Lo" when the temperature is low.

Q20) The noise from the outdoor gets louder at the start of operation.



A20) This is not a problem. Since the compressor is operated at full speed to increase heating/cooling capacity when starting operation, it gets louder.

Q21) The noise of the outdoor unit changes from time to time.



A21) This is not a problem. The speed of the compressor varies depending of the temperature difference between the preset temperature of the thermostat and the room temperature.

Q21) The room temperature differs from the preset temperature set by the room temperature control.



A22) The room temperature may differ from the preset temperature due to the structure of the room, air flow condition, etc.
If there is a difference, adjust the preset temperature to obtain the optimum room temperature.

Q21) The air does not come out immediately after starting operation.



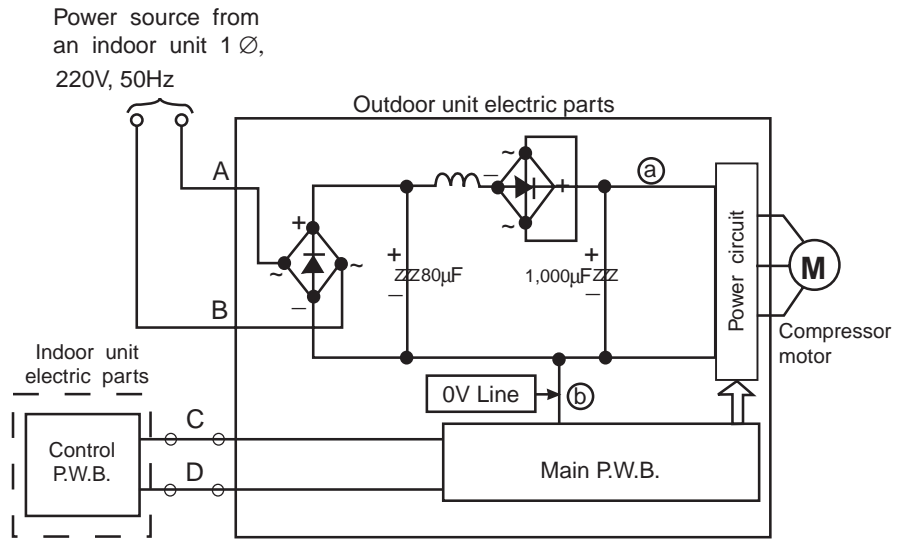
A23) After the power is turned on, when the heating or dehumidifying operation is set, the unit performs heat-running operation for 1 minute. In the heating operation, the operation lamp blinks for this period. It is not a malfunction.

TROUBLE SHOOTING

Model RAS-25CNH11 / RAC-25CNH11

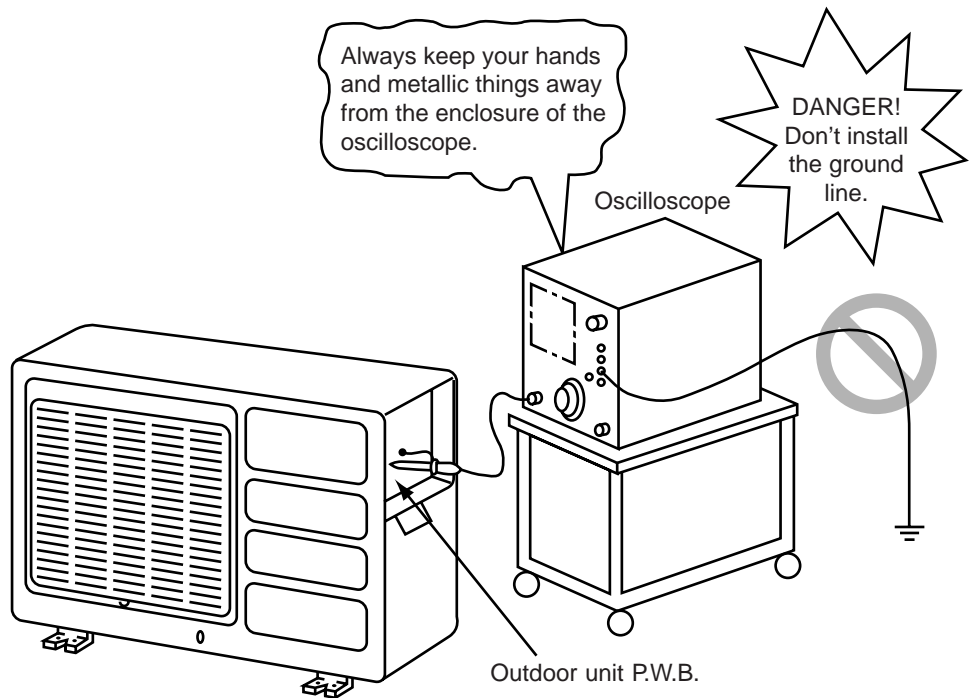
PRECAUTIONS FOR CHECKING

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



Across (a) – (b) (0V line)..... approx. 311-260V
 Across (a) – ground..... approx 1311V
 Across (b) (0V line)– ground..... approx 311V

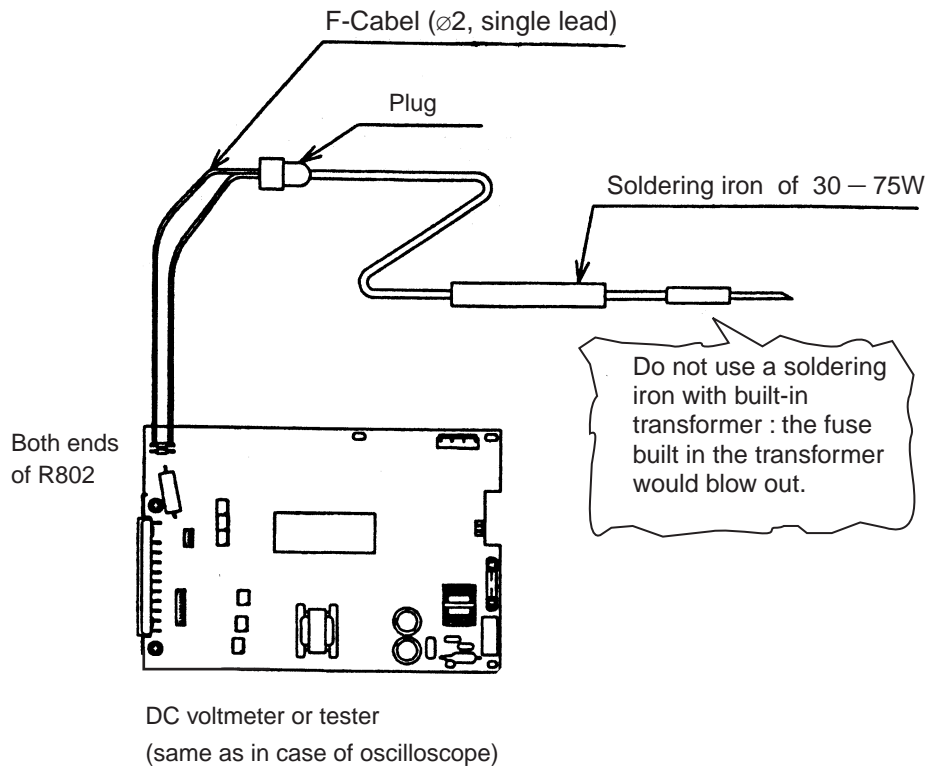
When using an oscilloscope, never ground it. Don't forget that high voltages as noted above may apply to the oscilloscope.



DISCHARGING CAPACITORS

1. Turn off the indoor unit's power switch or unplug the power cord, and wait for a minute or so.
2. Open the cover of the electric parts compartment. Discharge electricity from smoothing capacitors ($1,000\mu\text{F}$) by connecting the leads of a soldering iron of 30 – 75W to the terminals provided for this purpose. Continue discharging for more than 15 seconds.

The smoothing capacitors ($1,000\mu\text{F}$) are charged to about 340V. Don't forget to discharge them before attempting access to electric parts.



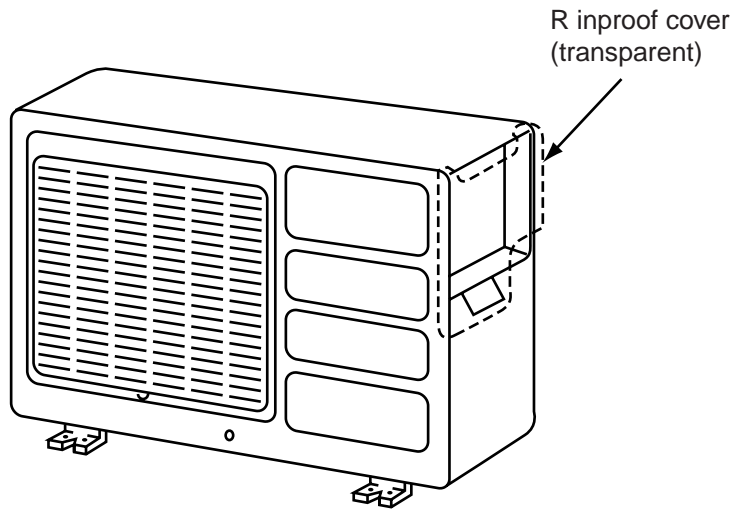
CUTTING OFF POWER SUPPLIED TO THE POWER CIRCUIT

Before checking electric parts of the outdoor unit, disconnect the power line of the power circuit to cut off supply power. This is necessary to protect the parts.

Remove the receptacle of the gray / brown lead wire connected to the smoothing capacitor from control P.W.B. before performing operation check of each point in the circuit.

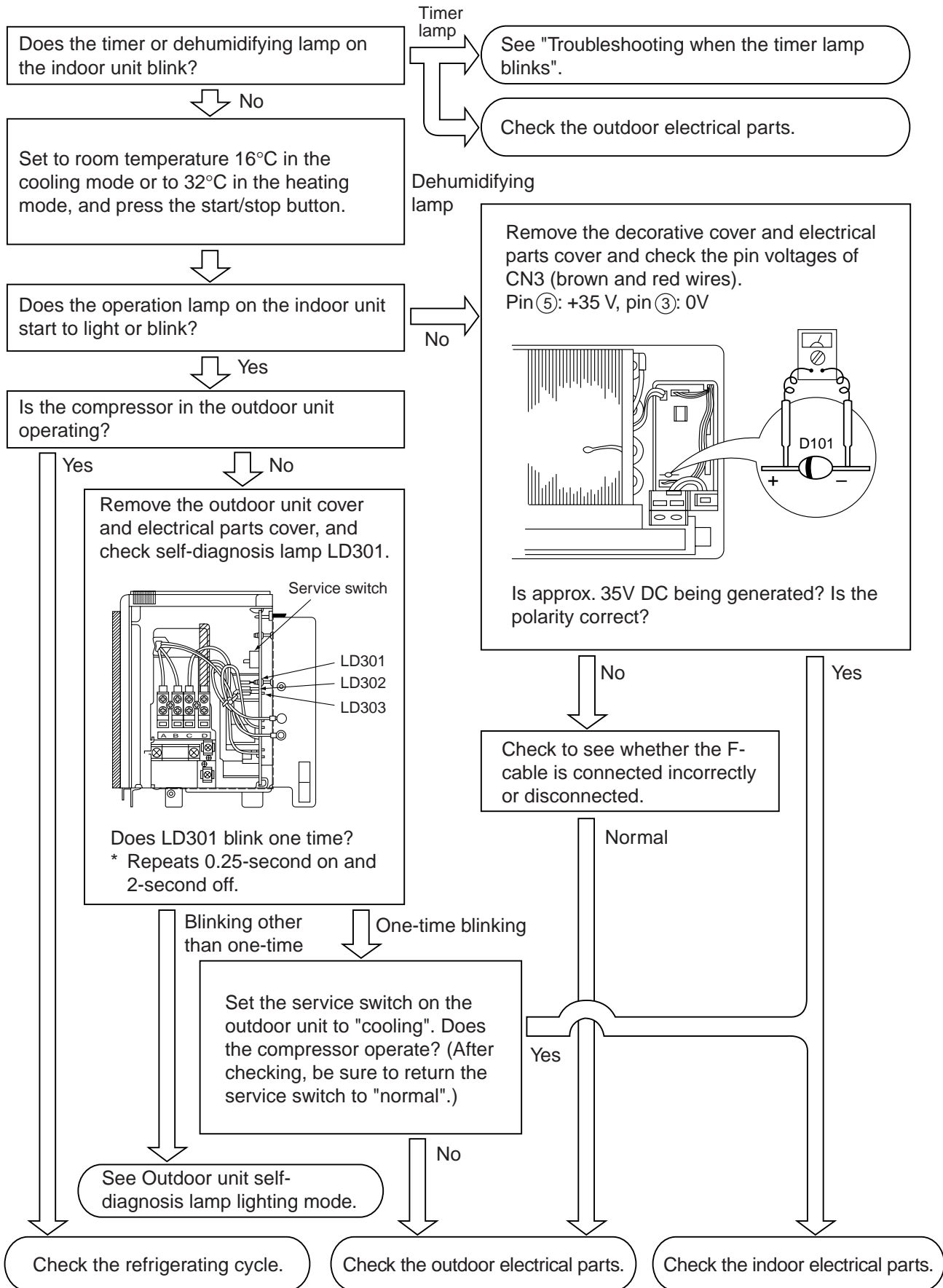
When checking conductivity at each point of circuit in electrical parts of outdoor unit, to prevent secondary trouble, disconnect gray / black lead wire connected to smoothing capacitor from control P.W.b. in order to shut off power to the power module before checking. Connect (+) side of C516 and 5V using clip at this time. If this is not done, there will be no drive output. (LED310 blinking 10 times mode is set.)

Be sure to replace the rainproof cover after checking (rainwater would enter if it is not installed).



CHECKING THE INDOOR/OUTDOOR UNIT ELECTRICAL PARTS AND REFRIGERATING CYCLE

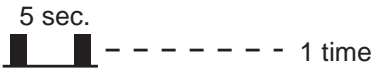
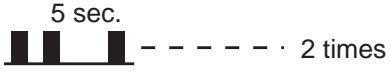
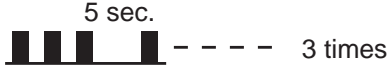



[MODEL RAS-25CNH11 / RAC-25CNH11]




TROUBLE SHOOTING WHEN THE TIMER and DEHUMIDIFYING LAMP BLINKS

MODEL RAS-25CNH11

Perform trouble shooting according to the number of times the timer lamp on the display of the indoor unit blinks

No.	Blinking made of timer lamp	Reason of indication	Possible caues
1	 5 sec. 1 time	<u>Reversing valve defective</u> 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).
2	 5 sec. 2 times	<u>Outdoor unit forced operation</u> When the outdoor unit is in forced operation or balancing operation after forced operation.	Electrical parts in the outdoor unit.
3	 5 sec. 3 times	<u>Indoor unit/outdoor unit interface defective</u> When the interface signal from the outdoor unit is interrupted.	(1) Indoor unit interface circuit (2) Outdoor unit interface circuit
4	 5 sec. 4 times	<u>Outdoor unit electrical components defective</u> When the same error mode is detected 8 times within 30 minutes from outdoor unit electrical components. (However, when error is detected 8 times within two hours only for outdoor thermistor.)	(1) Indoor unit fan motor (2) Outdoor unit electrical components (For details, operate again using remote controller and check from self-diagnosis display of outdoor unit.)
5	 5 sec. 10times	<u>Over-current detection at the DC fan motor</u> When over-current is detected at the DC fan motor of the indoor unit.	(1) Indoor unit fan lock (2) Indoor unit fan motor (3) Indoor unit control P.W.B.
6	 5 sec. 13 times	<u>IC401 data reading error</u> When data read from IC401 is incorrect.	IC401 abnormal

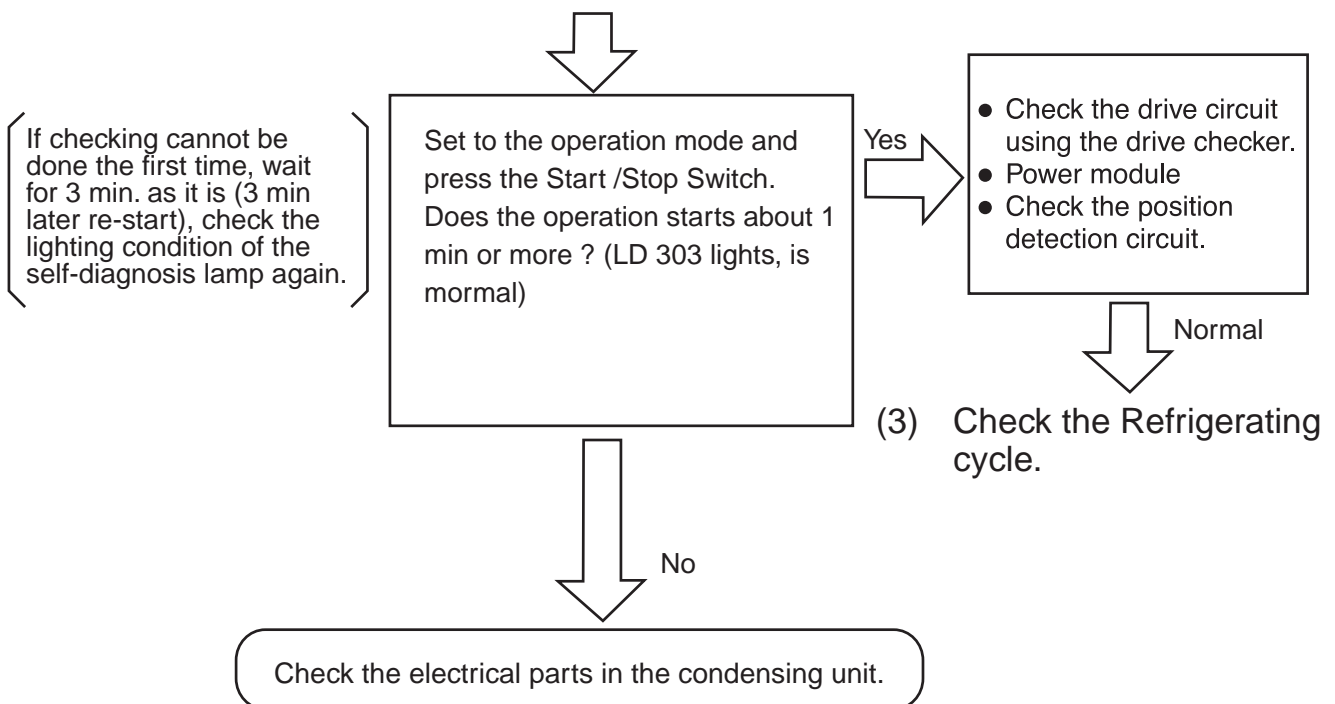
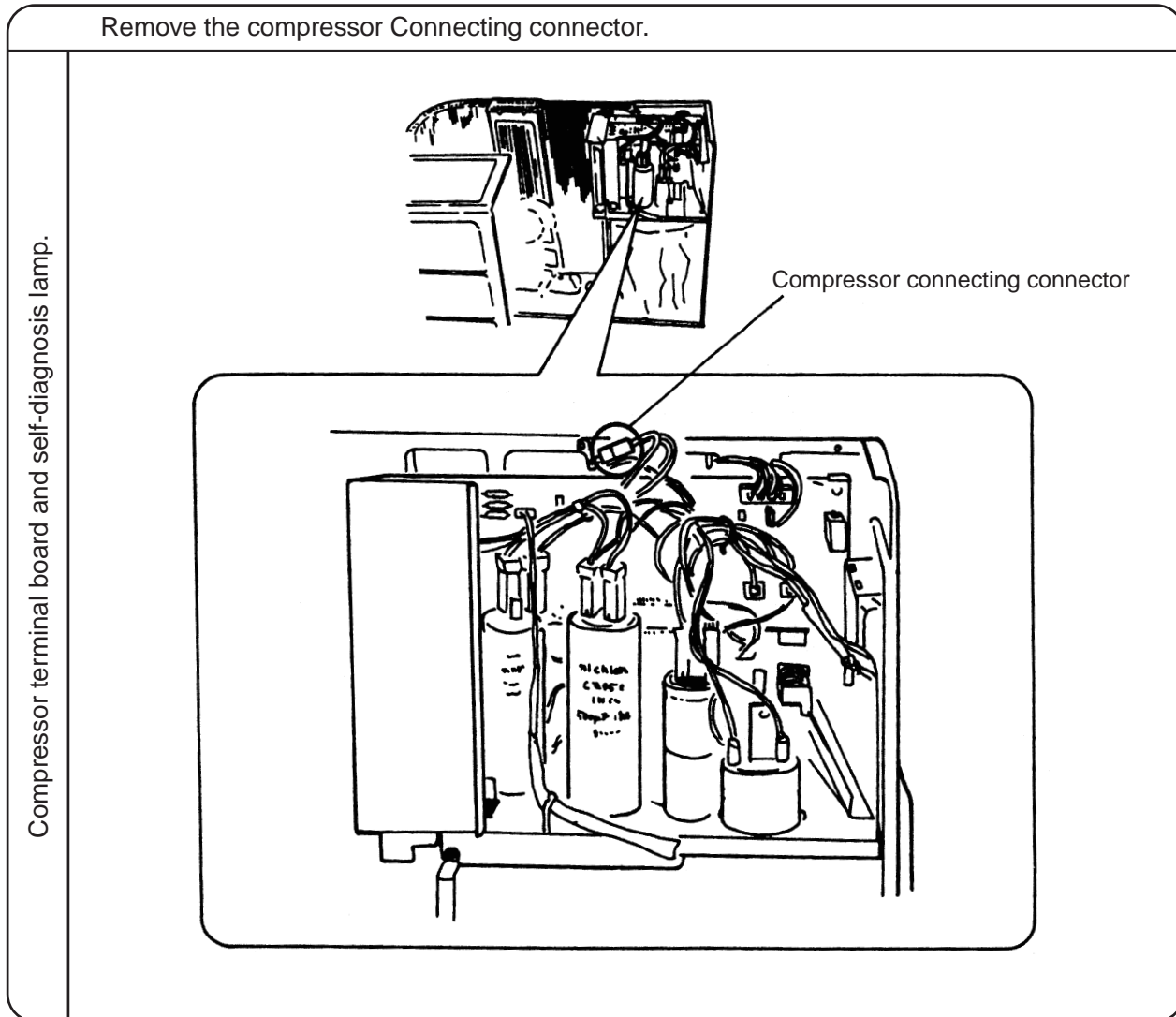
( - lights for 0.5 sec. at intervals of 0.5 sec.)

CAUTION

- (1) If the interface circuit is defective when the power is turned ON, the self-diagnosis indication is not displayed.
- (2) When indoor unit is performing self-diagnosis operation shown above, self-diagnosis lamp of the outdoor unit blinks 9 times.
- (3) If the indoor unit cannot be operated at all, check the connection of the F cable (reverse connection or disconnection.)
- (4) When timer lamp or dehumidifying lamp blinks, remote control can be used to operate for checking operation once again.

2. Outdoor unit (judging between “electrical parts of the condensing unit” and “refrigerating cycle”)

[MODEL RAC-25CNH11]

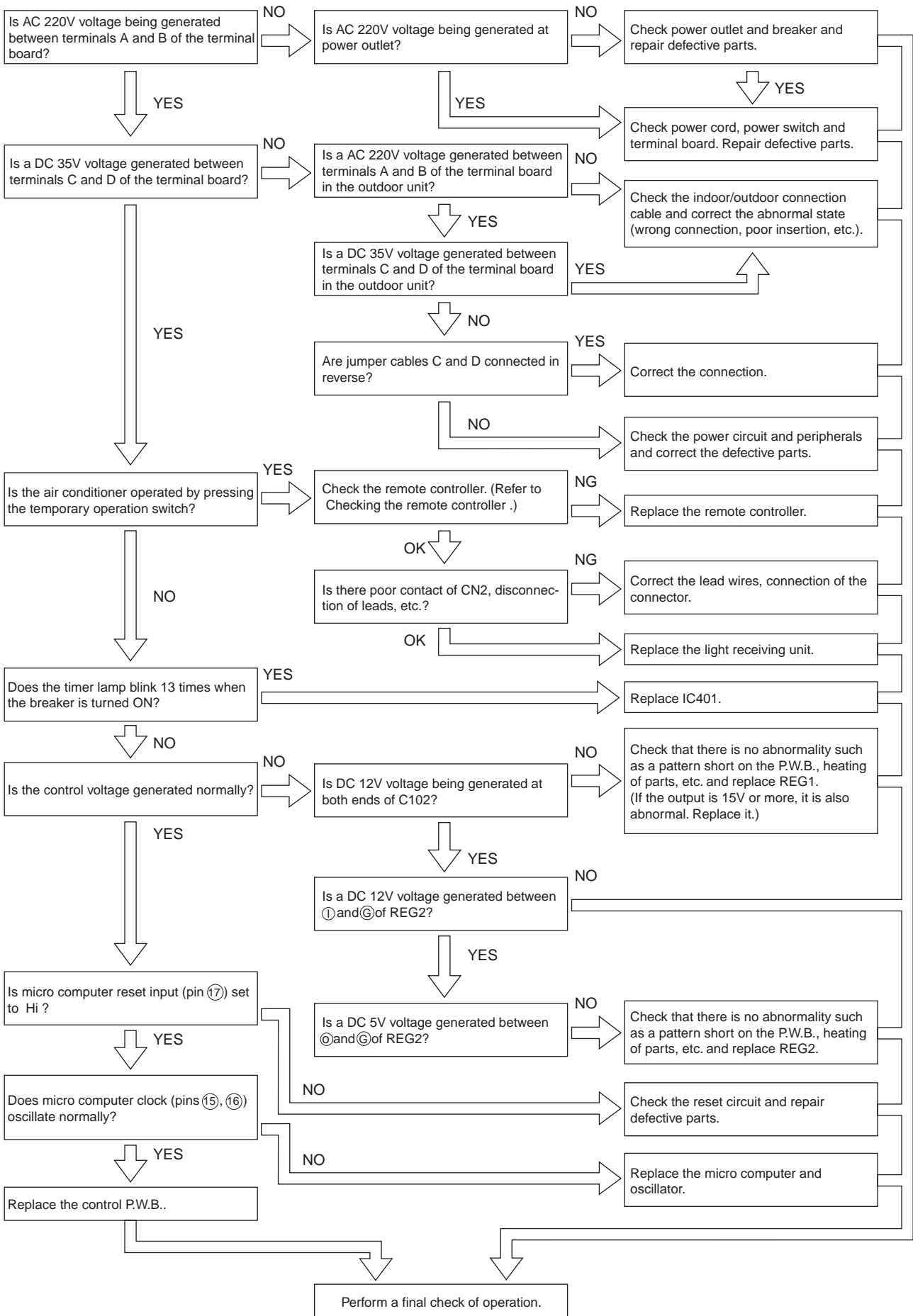


[MODEL RAC-25CNH11]

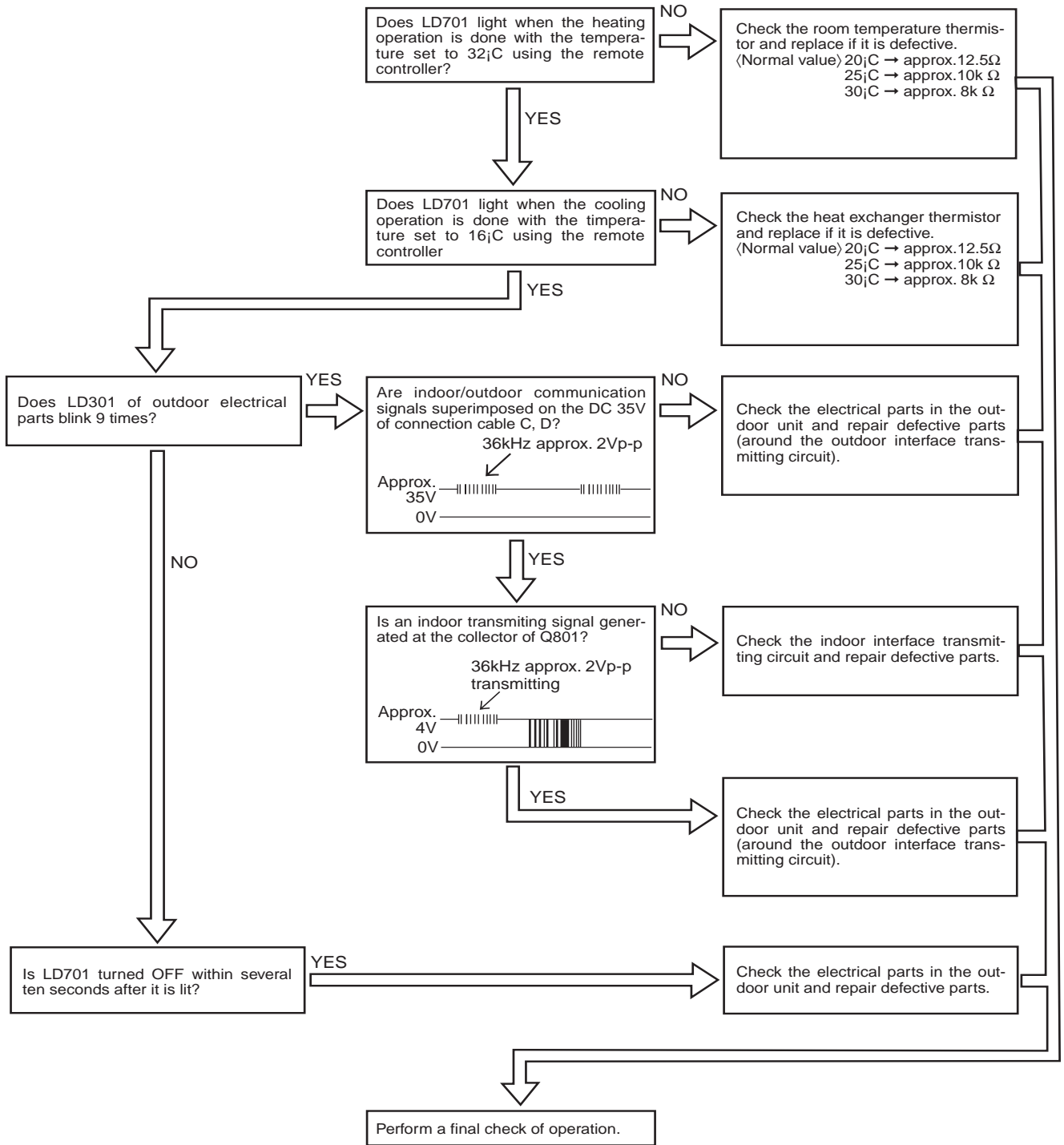
SELF-DIAGNOSIS LIGHTING MODE ■ : LIT ☒ : BLINKING □ : OFF			
LD301 RED	LD302 RED	SELF-DIAGNOSIS NAME	DETAILS
		[1] DURING OPERATION	LD303 (RED) LIGHTS. ■
<input type="checkbox"/>	<input type="checkbox"/>	NORMAL OPERATION	COMPRESSOR OPERATION NOT MALFUNCTION
<input checked="" type="checkbox"/>	<input type="checkbox"/>	OVERLOAD (1)	<p>THE ROTATION SPEED IS AUTOMATICALLY CONTROLLED TO PROTECT THE COMPRESSOR IN THE OVERLOAD CONDITION.</p>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	OVERLOAD (2)	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OVERLOAD (3)	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	SERVICE OPERATION	ONLY BLINKS WHEN LOW FREQUENCY SYNC STARTS IN THE FORCED COOLING OPERATION.
		*TURNING ON AND OFF ARE REPEATED AT BLINKING INTERVAL OF 0.25 SEC. IN BLINKING.	
		[2] DURING STOP	LD303 (RED) GOES OFF. □
<input type="checkbox"/>	<input type="checkbox"/>	NORMAL STOP	INDOOR THERMOSTAT OFF. MAIN OPERATION OFF. NOT MALFUNCTION.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	RESET STOP	WHEN STOPPED WITH POWER RESET. (NORMAL WHEN POWER HAS BEEN TURNED ON.) CONTROL P. W. B. (POWER CIRCUIT, MICROCOMPUTER, ETC.)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1 TIME PEAK CURRENT CUT	OVERCURRENT IS DETECTED. ① POWER MODULE ② COMPRESSOR ③ CONTROL P. W. B.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2 TIMES ABNORMAL LOW SPEED ROTATION	POSITION DETECTION SIGNAL IS NOT INPUT DURING OPERATION. ① POWER MODULE ② COMPRESSOR ③ CONTROL P.W.B. (DRIVE CIRCUIT, POSITION DETECTION CIRCUIT, ETC.)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3 TIMES SWITCHING FAILURE	SWITCHING FROM LOW FREQUENCY SYNC START TO POSITION DETECTION OPERATION FAILURE. ① POWER MODULE ② COMPRESSOR ③ CONTROL P.W.B. (DRIVE CIRCUIT, POSITION DETECTION CIRCUIT, ETC.)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4 TIMES OVERLOAD LOWER LIMIT CUT	UNDER THE LOWER LIMIT OF ROTATION SPEED WITH OVERLOAD CONTROL CIRCUIT OPERATED. ① OUTDOOR UNIT IS EXPOSED TO DIRECT SUNLIGHT OR ITS AIRFLOW BLOCKED. ② FAN MOTOR ③ FAN MOTOR CIRCUIT
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5 TIMES OH, FIN THERMISTOR TEMP. RISE	OH THERMISTOR OR FIN THERMISTOR IS OPERATED. ① LEAK OF REFRIGERANT ② COMPRESSOR ③ THERMISTOR CIRCUIT (OH)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6 TIMES THERMISTOR ABNORMAL	THERMISTOR IS OPEN OR SHORTED. (OH, OUTER TEMPERATURE, DEF. THERMISTOR) ① THERMISTOR ② CONNECTION OF THERMISTOR DEFECTIVE ③ THERMISTOR CIRCUIT
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7 TIMES ACCELERATION DEFECTIVE	NO ACCBLERATION OVER THE LOWER LIMIT OF THE ROTATION SPEED. ① LEAK OF REFRIGERANT ② COMPRESSOR
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8 TIMES COMMUNICATIONS ERROR	COMMUNICATIONS STOPPED. ① INCORRECT CONNECTION OF CABLES ② DISCONNECTION OF CABLE ③ INDOOR/OUTDOOR INTERFACE CIRCUIT
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9 TIMES ABNORMAL POWER VOLTAGE	POWER VOLTAGE IS ABNORMALLY LOW. ① POWER VOLTAGE ② CONNECTION OF REACTOR
		*EXAMPLE OF BLINKING (5 TIMES) (■ . . . LIGHTS FOR 0.25 SEC AT INTERVAL OF 0.25 SEC.)	

(3) LIGHTING MODE IN THE OPERATION WITH COMPRESSOR LEAD DISCONNECTED	
(1) DISCONNECT THE CONNECTORS OF THE LEAD CONNECTED TO THE COMPRESSOR.	
(2) SET TO THE OPERATION MODE AND PRESS THE START/STOP SWITCH.	
(3) WHEN THE OPERATION ABOUT 1min. NORMALLY (LD 303 LIGHTS). THE ELECTRICAL PARTS IN THE OUTDOOR UNIT (ESPECIALLY POWER MODULE) CAN BE THOUGHT TO BE NORMAL.	
SERVICE OPERATION	TO COLLECT REFRIGERANT OR TO OPERATE OUTDOOR UNIT INDEPENDENTLY, TURN OFF POWER SWITCH OF THE INDOOR UNIT ONCE, THEN TURN OFF AGAIN AND SET THE SERVICE SWITCH TO COOL SIDE. (COOLING CYCLE IS SET.) TO OPERATE UNIT AGAIN, BE SURE TO RETURN SERVICE SWITCH TO NORMAL, AND TURN OFF POWER SWITCH, THEN TURN IT ON AGAIN.
CAUTION	BE SURE TO CHECK THAT POWER SWITCH IS TURNED OFF BEFORE SERVICING.

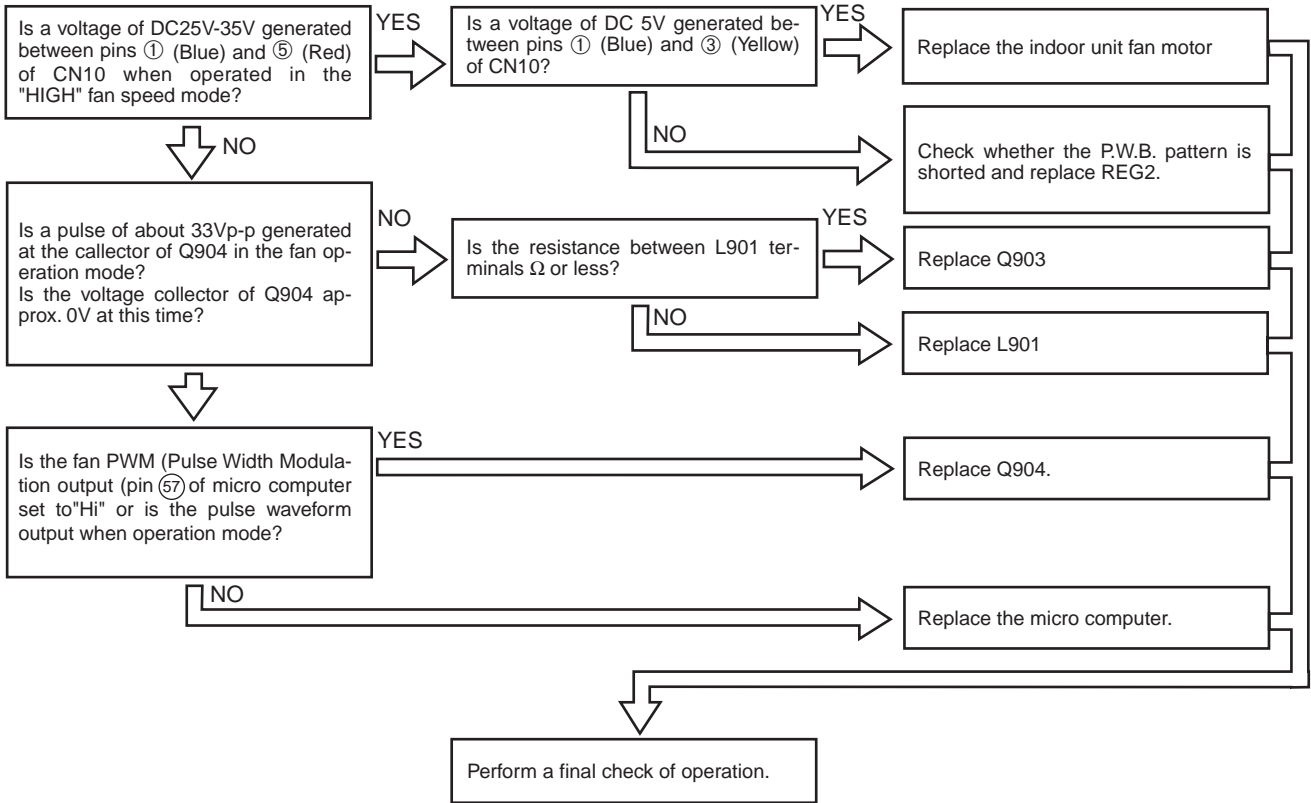
(NOTE 1)
LD301 BLINKING 9 TIMES MODE OCCURS NOT ONLY BECAUSE OF COMMUNICATIONS ERROR, BUT ALSO WHEN FALL SIGNAL IS SENT TO INDOOR UNIT 8 TIMES WITHIN 30 MINUTES. CHECK WHETHER OR NOT DEHUMIDIFYING LAMP ON INDOOR UNIT IS BLINKING.



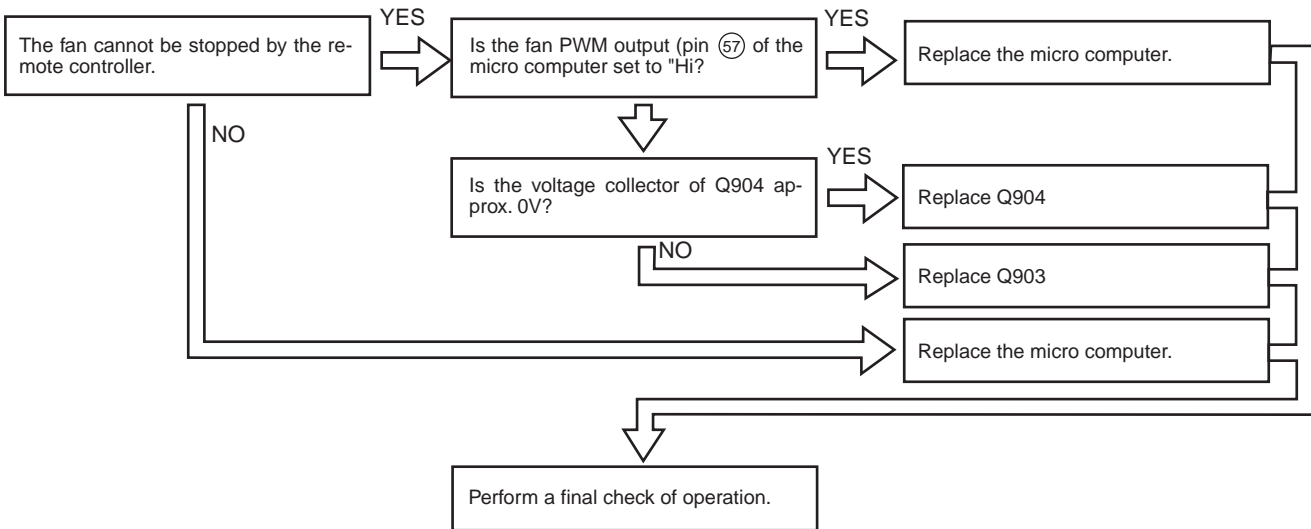
3. The outdoor unit does not operate (remote control command can be received).



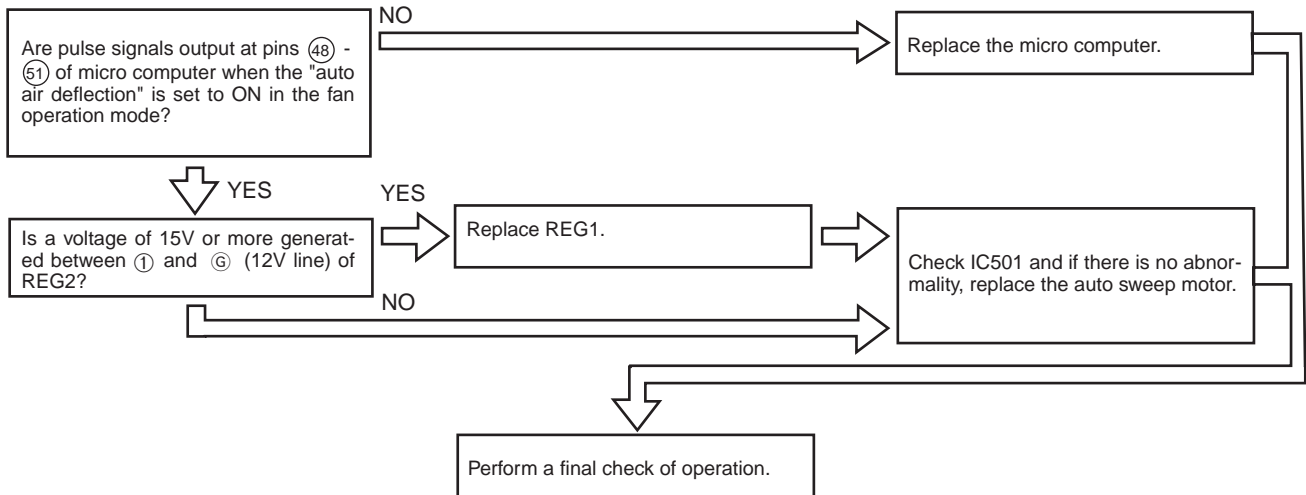
4. Only the indoor unit fan does not operate (other functions are normal).



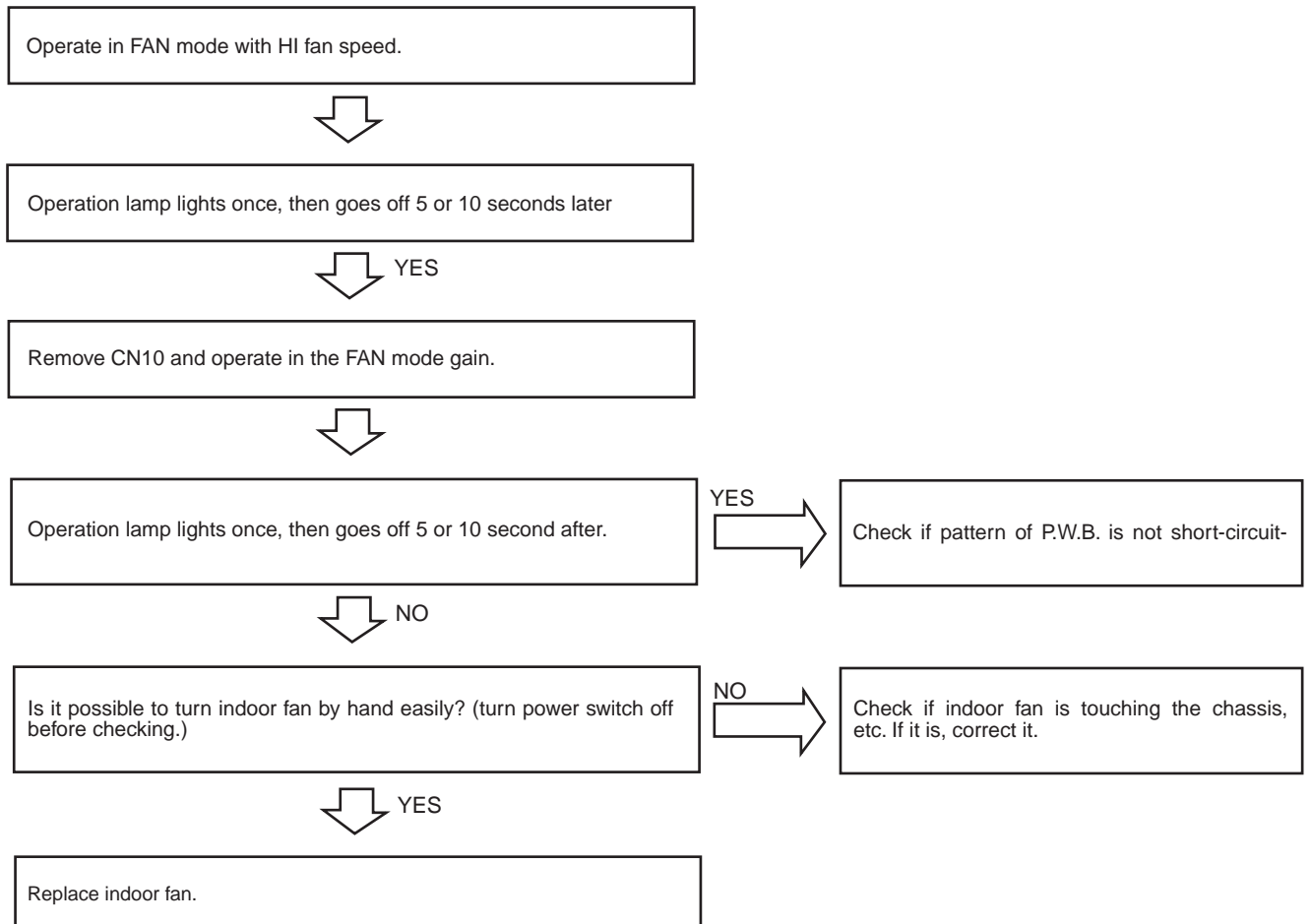
4. The fan speed of the indoor unit fan cannot be changed (other functions are normal)



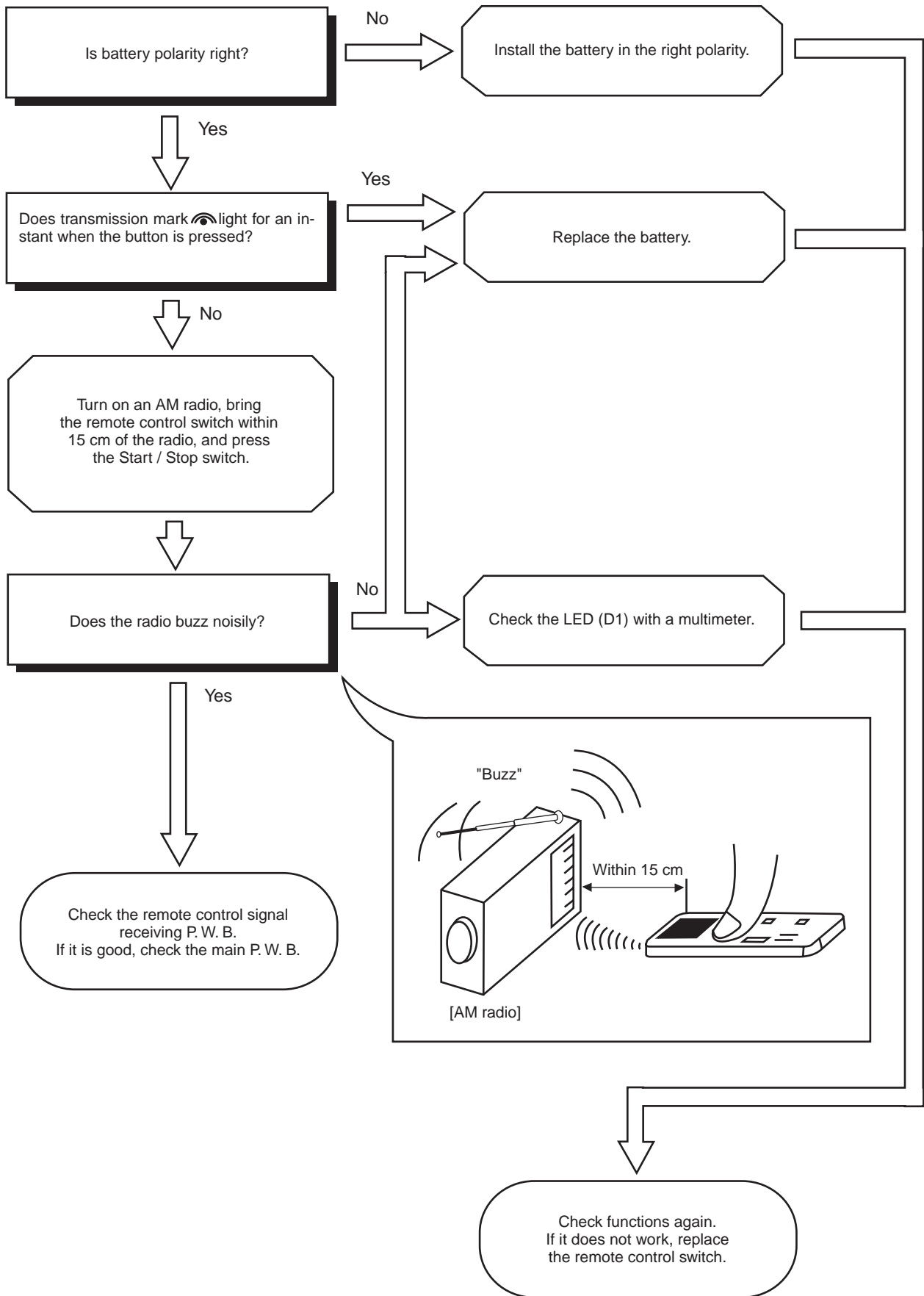
6. The air deflector cannot be moved (other functions are normal)



7. Operation completely stops within a few seconds minutes after starting. (All displays also go off.)



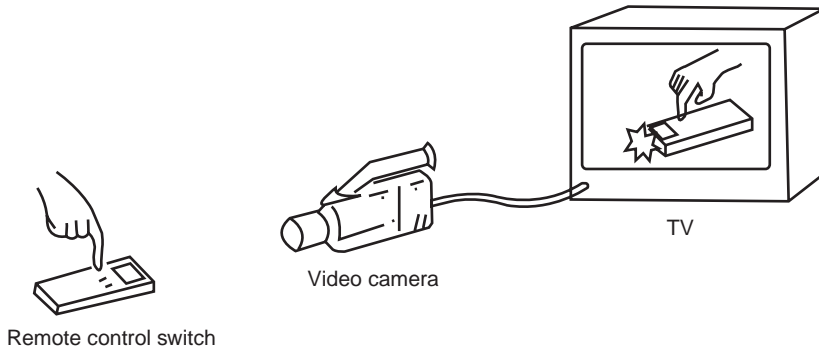
CHEKING THE REMOTE CONTROL SWITCH



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

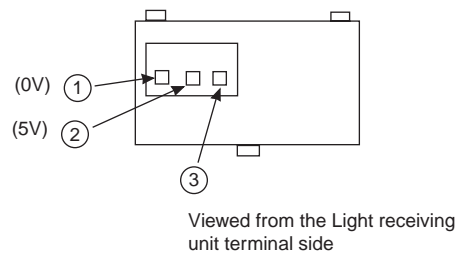
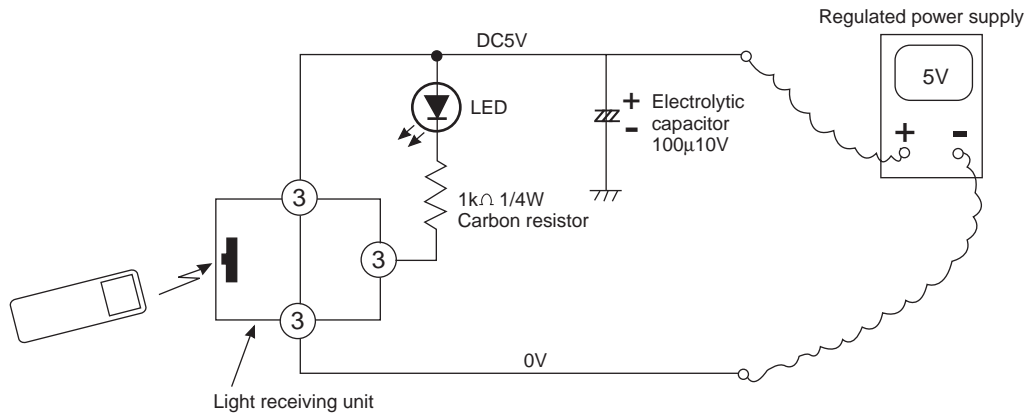
(1) Using a video monitor

Connect a video camera to a TV and aim at the remote control switch. If infrared rays are emitted from the switch, you will see a flash in violet on the monitor screen.

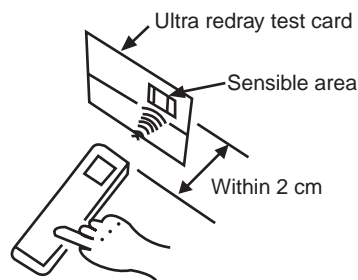


(2) Using a Checker

You can make a checker by yourself. Its circuit diagram is shown below.

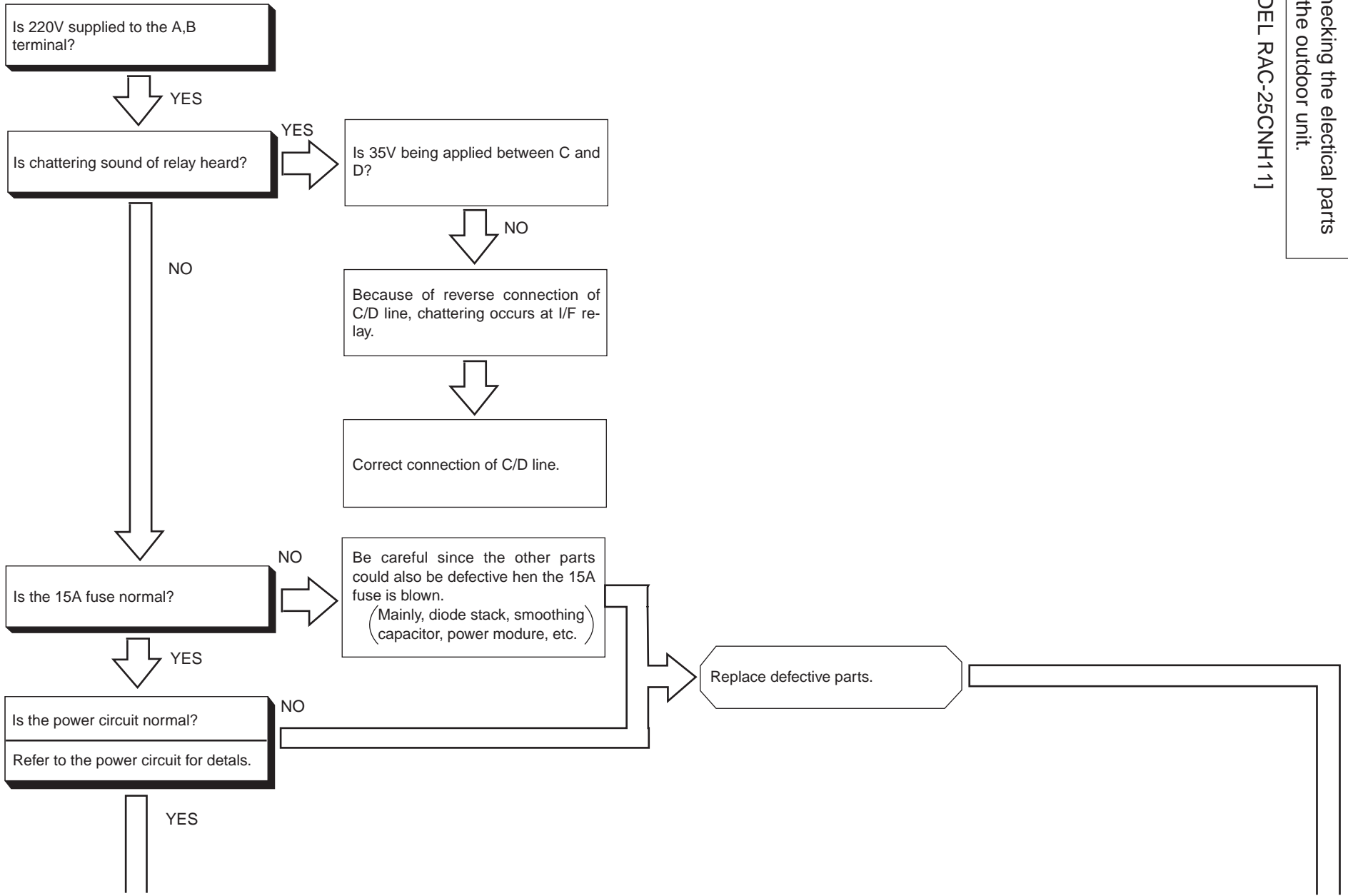


(3) Using the test card

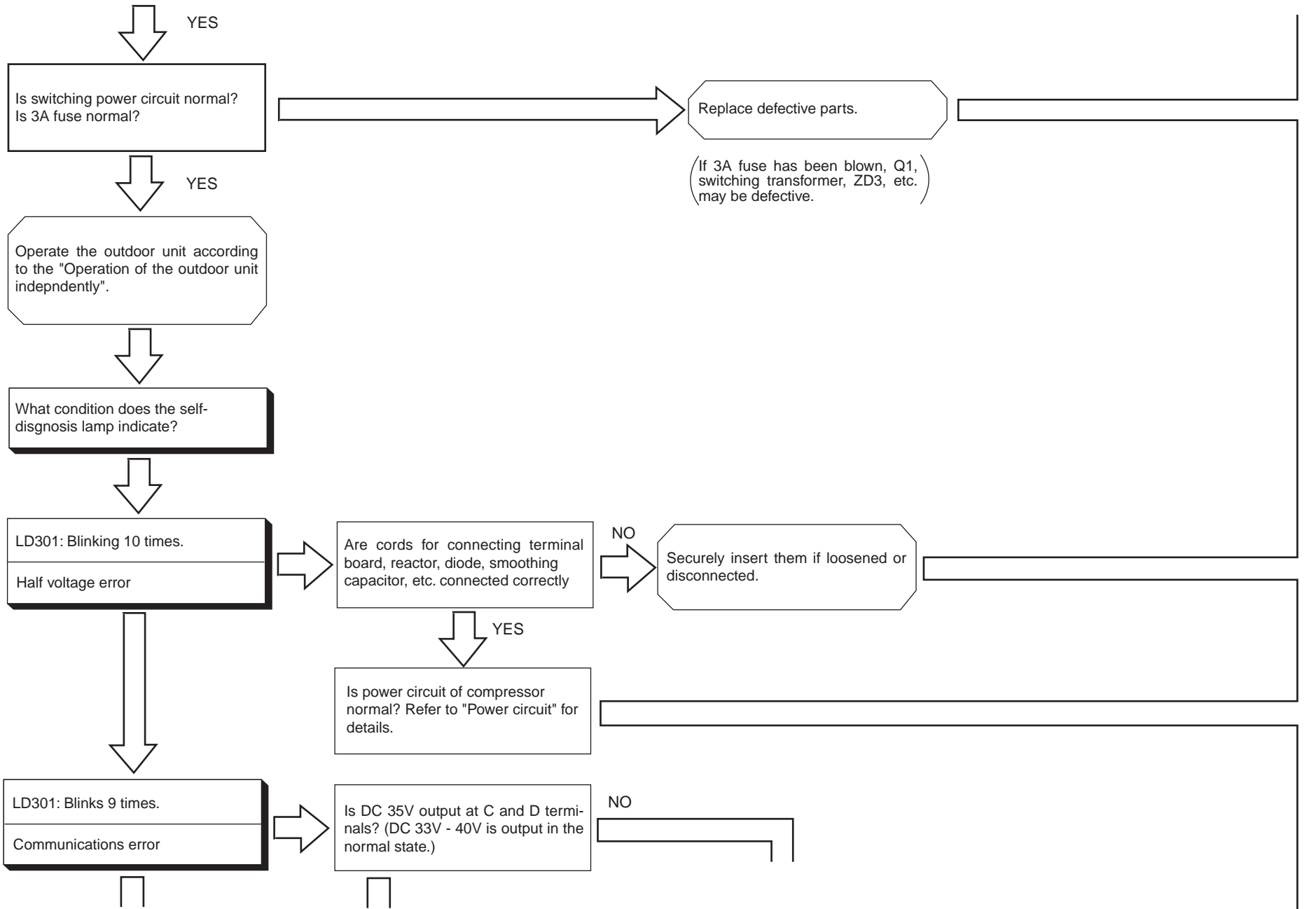


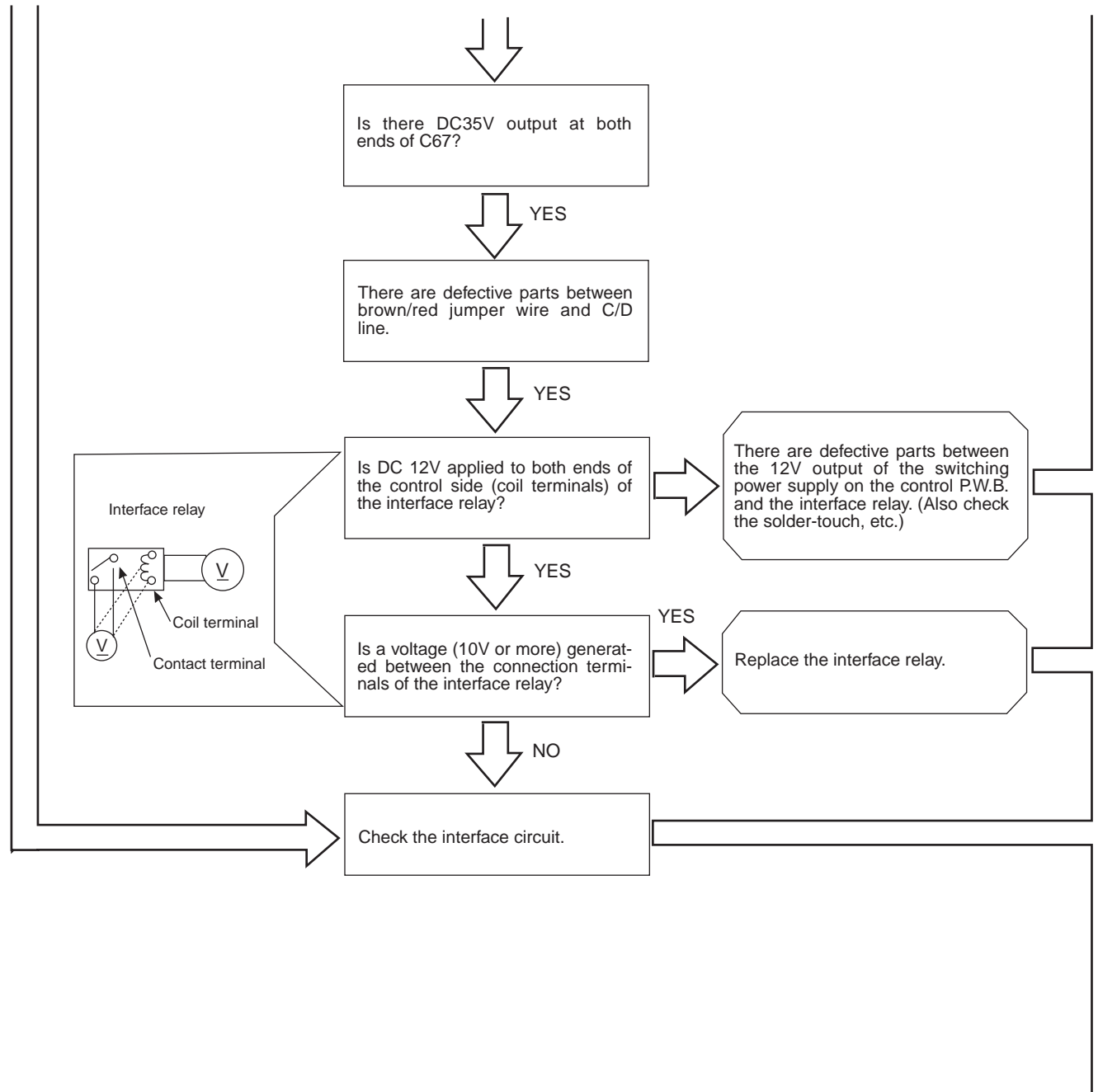
The sensible area should flash in orange when you operate the remote control unit if it is good.

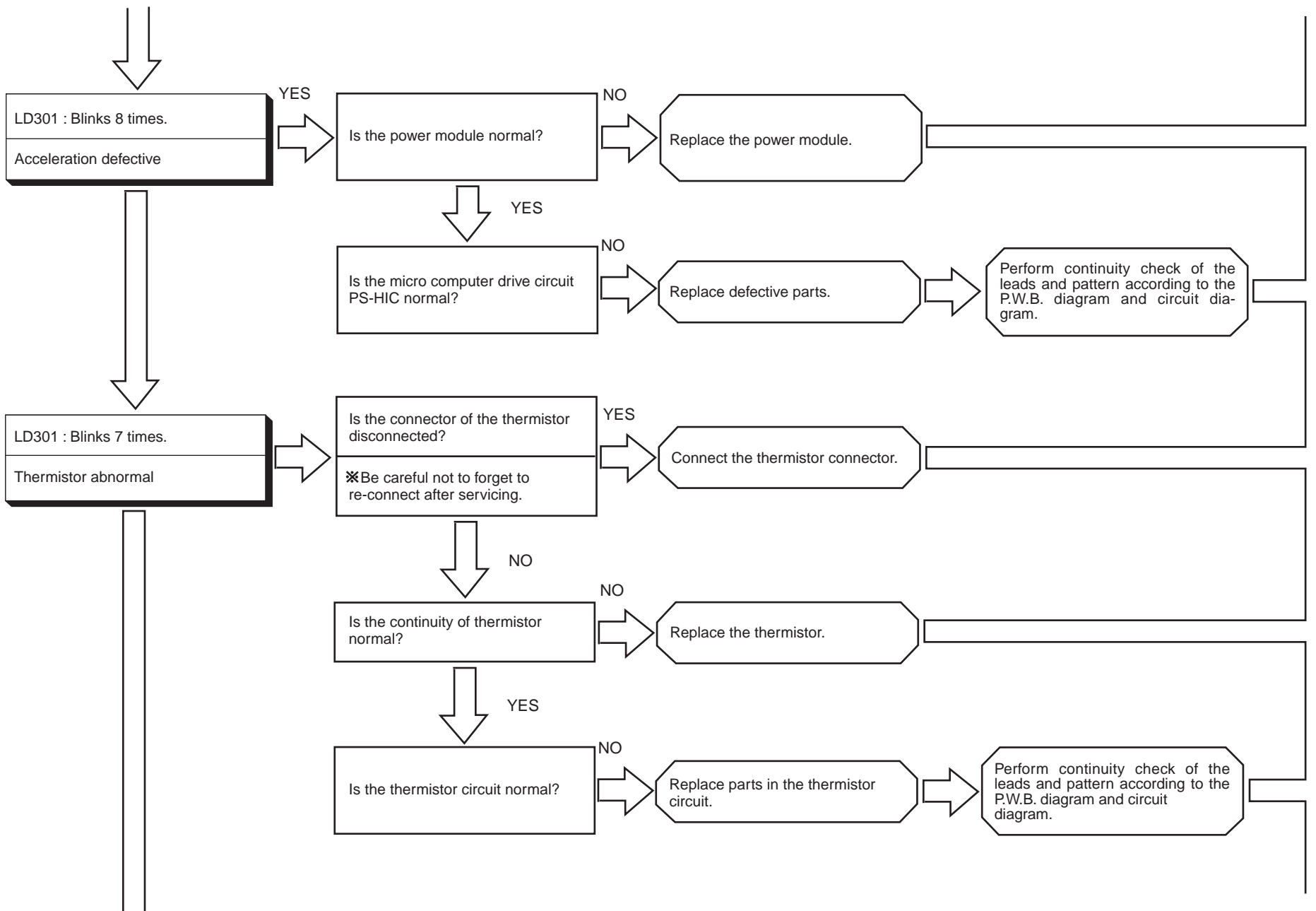
[The air conditioner does not operate at all or cannot be operated correctly]

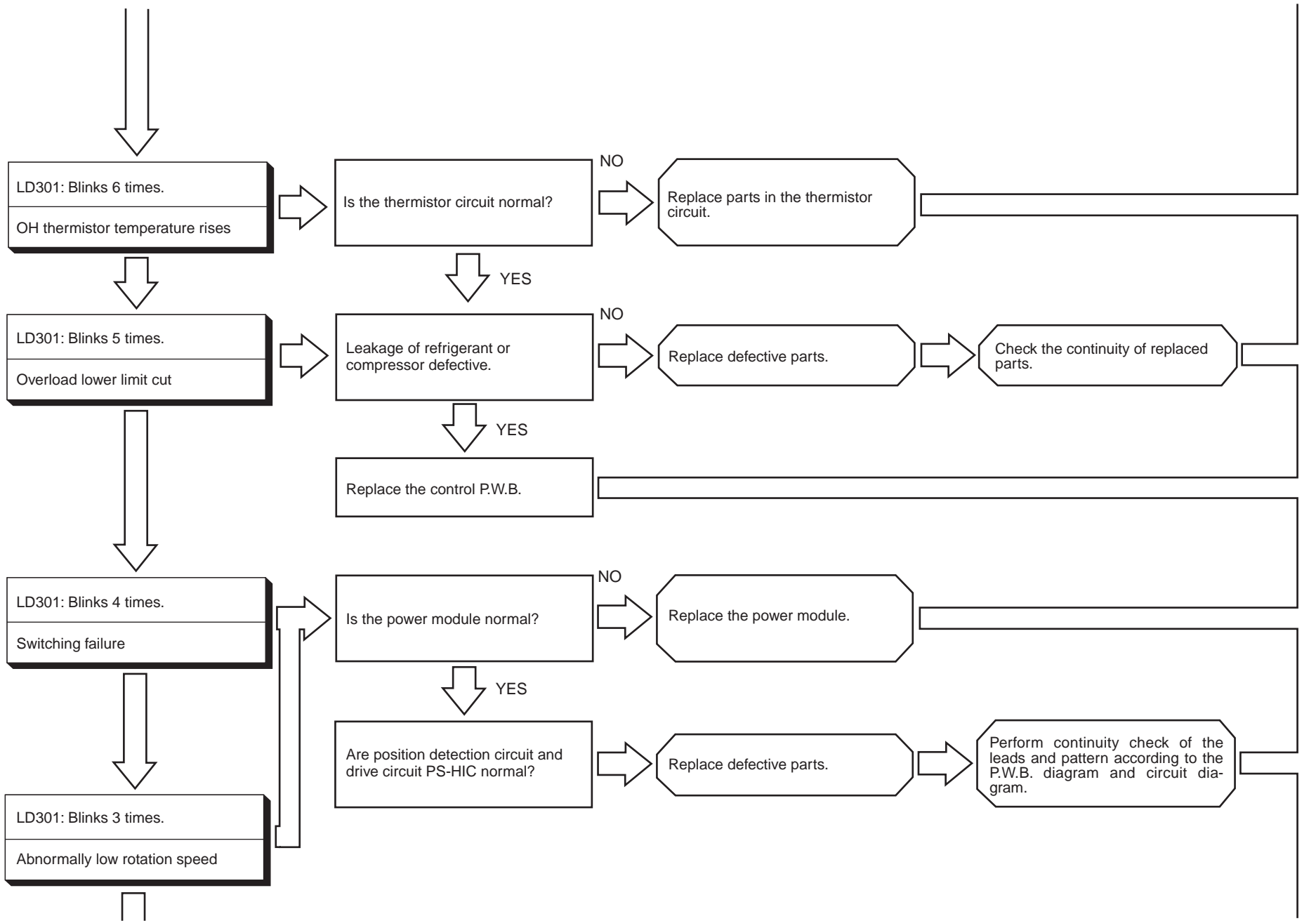


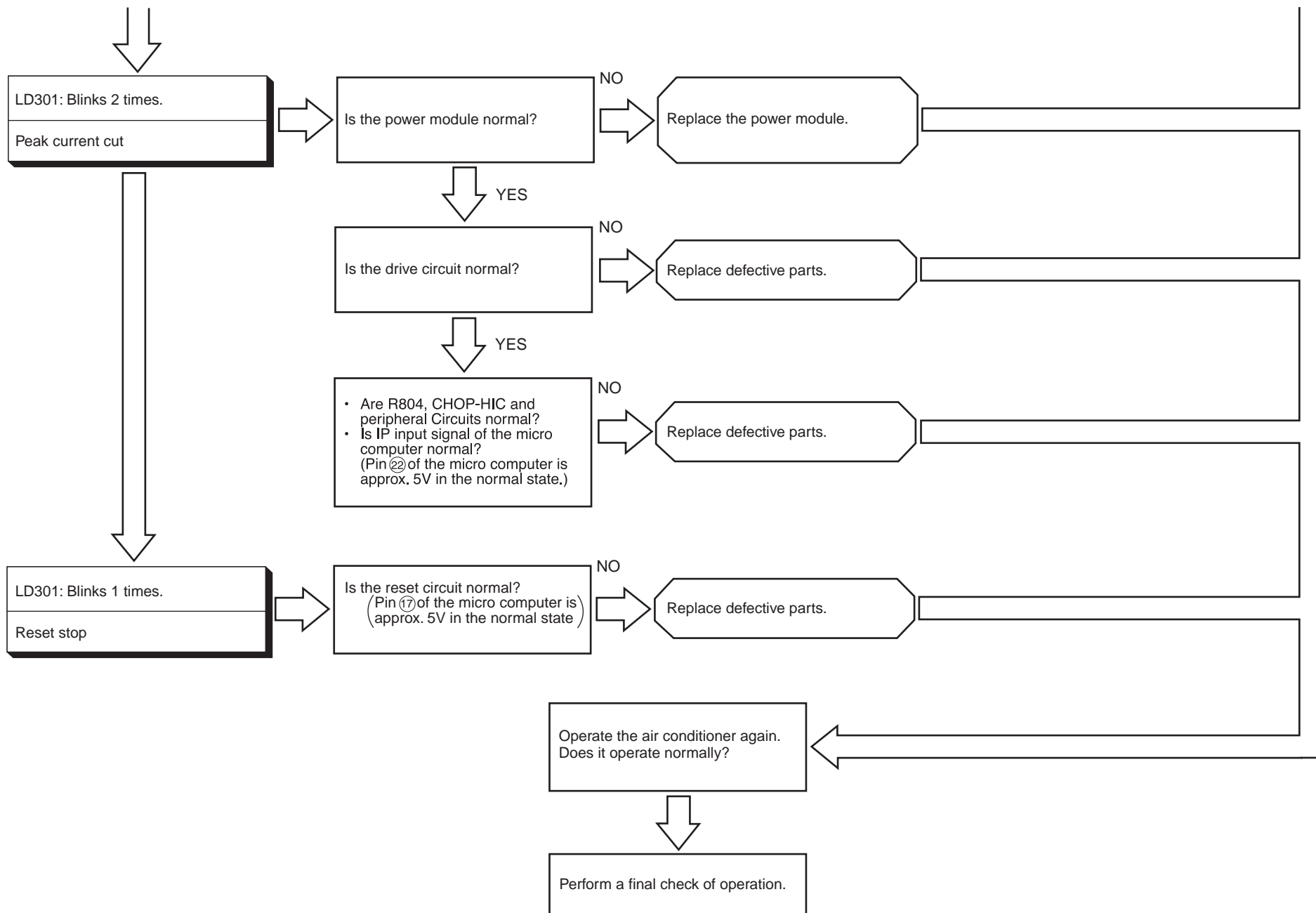
Checking the electrical parts
in the outdoor unit.
[MODEL RAC-25CNH11]



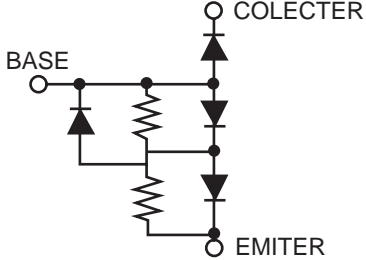
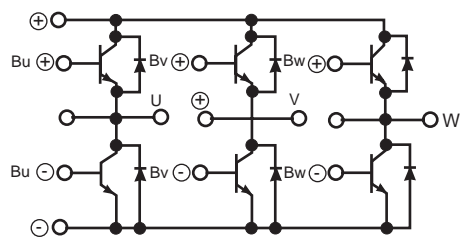
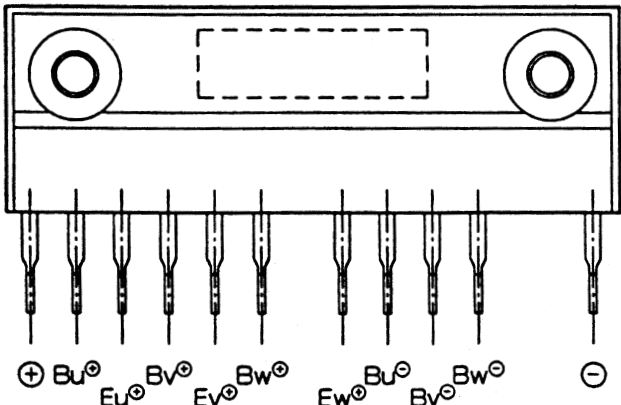








Method for diagnosis of power module

<p>MODEL</p>	<p>MP 6501</p>
<p>Circuit diagram of the device (excepting the reflux diode.)</p>	
<p>Circuit diagram of the module</p>	
<p>Terminals symbol mark of the module</p> <p>※ See next page for measuring value using tester</p>	<p><u>POWER MODULE P.W.B.</u></p> 

How to check Power module

Checking power module using tester

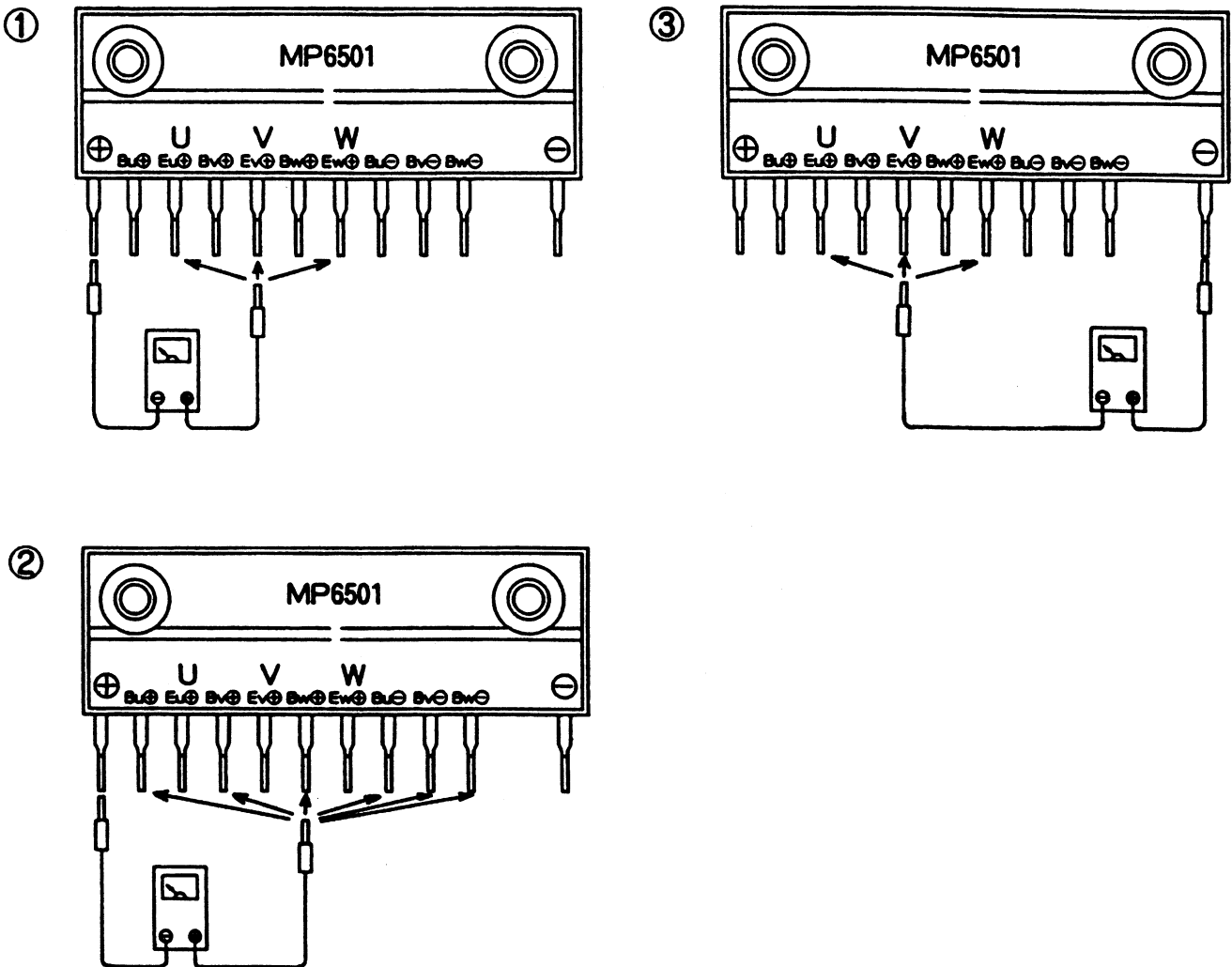
Set tester to resistance range(x100).

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

(In case of digital tester, since built-in battery is set in reverse direction, ⊕ and ⊖ terminals are reversed.)

⚠ CAUTION

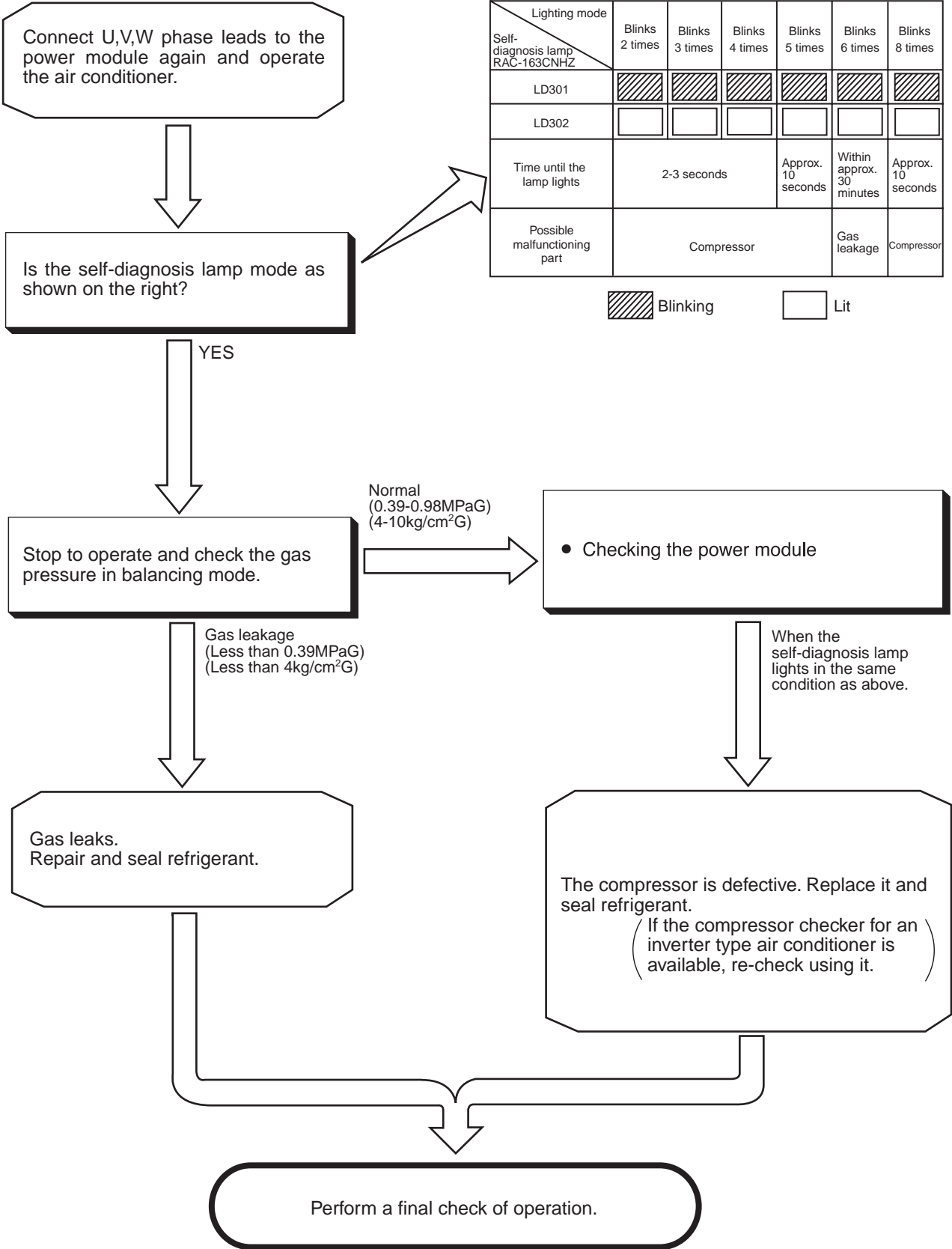
If inner circuit of power module is disconnected (open), the indicator of tester will not swing and this may assumed as normal. In this case, if indicator swings when ⊕ and ⊖ terminals are connected in reverse of diagram below, it is normal. Furthermore, compare how indicator swings at U, V and W phases.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



CHECKING THE REFRIGERATING CYCLE

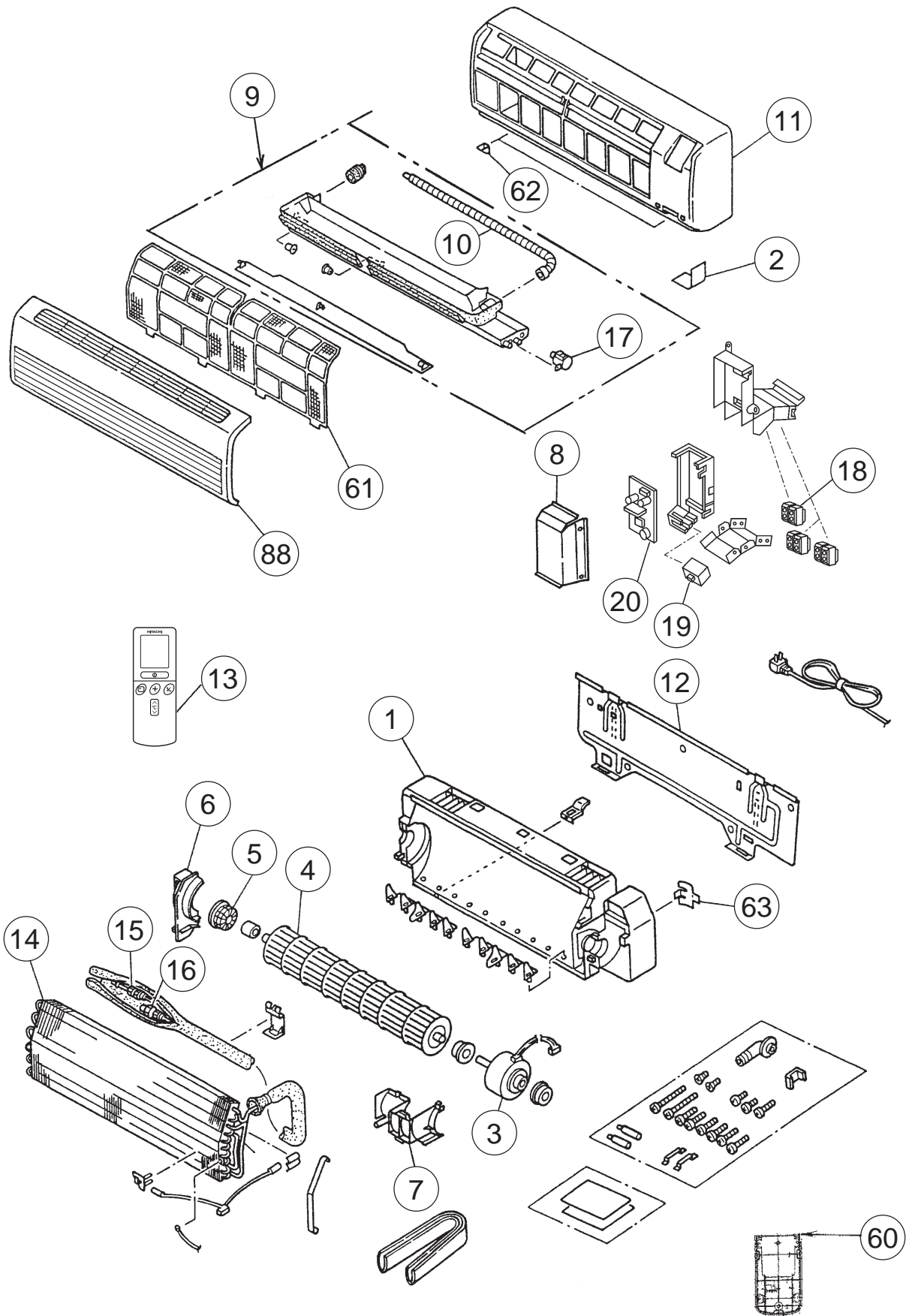
(JUDGING BETWEEN GAS LEAKAGE AND COMPRESSOR DEFECTIVE)

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



PARTS LIST AND DIAGRAM

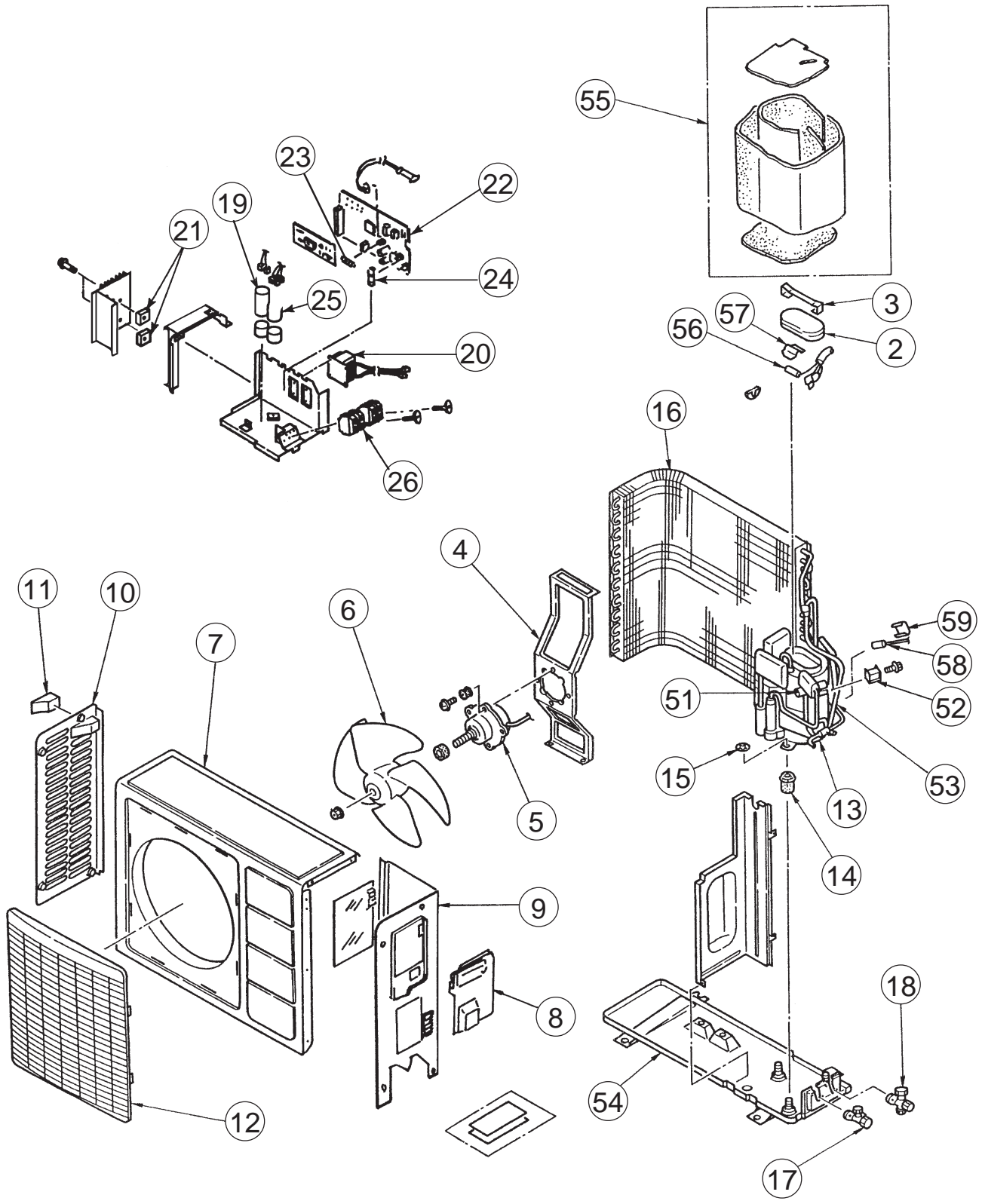
MODEL RAS-25CNH11



MODEL RAS-25CNH11

NO.	PART NO. RAS-25CNH11	Q'TY / UNIT	PARTS NAME
1	PMRAS-25CNH2 001	1	CABINET
2	PMRAS-25CNH2 002	1	LOW-COVER
3	PMRAS-25CNH2 003	1	20W MOTOR
4	PMRAS-25CNH2 004	1	TANGENTIAL FLOW FAN
5	PMRAS-25CNH2 005	1	P-BEA ASSEMBLY
6	PMRAS-25CNH2 006	1	BEARING COVER
7	PMRAS-25CNH2 007	1	FAN MOTOR SUPPORT
8	PMRAS-25CNH2 008	1	ELECTRICAL COVER
9	PMRAS-25CNH2 009	1	DRAIN PAN ASSEMBLY
10	PMRAS-25CNH2 010	1	DRAIN HOSE
11	PMRAS-25CNH2 011	1	FRONT COVER ASS'Y
12	PMRAS-25CNH2 012	1	MOUNTING PLATE
13	PMRAS-25CNH2 013	1	REMOTE CONTROL
14	PMRAS-25CNH2 014	3	EVAPORATOR
15	PMRAS-25CNH2 015	3	UNION (2)
16	PMRAS-5100C 017	1	UNION (3)
17	PMRAS-25CNH2 016	1	STEP MOTOR
60	PMRAS-25CNH2 017	1	REMOTE CONTROL HOLDER
61	PMRAS-25CNH2 018	1	FILTER
62	PMRAS-25CNH2 019	2	CAP
63	PMRAS-25CNH2 020	1	PIPE SUPPORT
18	PMRAS-07CH2 006	3	TERMINAL BOARD (2P)
19	PMRAS-10C6M 003	1	SWITCH (POWER)
20	PMRAS-25CNH11 001	1	P.W.B. (MAIN)
21	PMRAS-25CNH2 023	1	THERM-FUSE
22	PMRAS-25CNH2 024	1	THERMISTOR

MODEL RAC-25CNH11



MODEL RAC-25CNH11

NO.	PART NO. RAC-25CNH11		Q'TY / UNIT	PARTS NAME
2	RA-226	015	1	O.L.R. COVER
3	RA-226	016	1	COVER SUPPORT
4	PMRAC-05CV	901	1	FAN MOTOR SUPPORT
5	PMRAC-25CNH2	901	1	20W MOTOR
6	PMRAC-25CNH2	902	1	PROPELLER FAN
7	PMRAC-25CNH11	904	1	CABINET
8	PMRAC-05CV	905	1	ELECTRICAL COVER ASSEMBLY
9	PMRAC-05CV	906	1	SIDE PLATE (R)
10	PMRAC-05CV	907	1	SIDE PLATE (L)
11	PMRAC-05CV	908	1	HANDLE
12	PMRAC-05CV	909	1	GRILL
13	PMRAC-25CNH11	905	1	INVERTER COMPRESSOR
14	RAC-2226HV	805	3	COMPRESSOR RUBBER
15	KPNT1	001	3	PUST NUT
16	PMRAC-25CNH2	905	1	CONDENSER
17	PMRAC-07CHV1	904	1	2S-VALVE
18	PMRAC-05CV	914	1	3S-VALVE
51	PMRAC-07CHV1	920	1	REVERSING VALVE
52	PMRAC-07CHV1	921	1	COIL (REVERSING VALVE)
53	PMRAC-07CHV1	922	1	CHECK VALVE
54	PMRAC-25CNH2	906	1	BASE
55	PMRAC-25CNH2	907	1	SILENT COVER
56	PMRAC-25CNH2	908	1	THERMISTOR (OH)
57	PMRAC-25CNH2	909	1	THERMISTOR (OH) SUPPORT
58	PMRAC-25CNH2	910	1	THERMISTOR
59	PMRAC-25CNH2	911	1	THERMISTOR SUPPORT
19	PMRAC-25CNH11	903	1	SMOOTHING CAPACITOR (1000 μ F 420V)
20	PMRAC-25CNH11	902	1	COIL ASSEMBLY (REACTOR)
21	PMRAC-25CNH2	914	2	DIODE STACK
22	PMRAC-25CNH11	901	1	P.W.B. (MAIN)
23	PMRAS-5100C	013	1	FUSE (3A)
24	PMRAC-32CNH2	909	1	FUSE (15A)
25	PMRAC-25CNH11	906	1	CAPACITOR (80 μ F 420V)
26	PMRAS-07CH2	006	2	TERMINAL BOARD (2P)

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