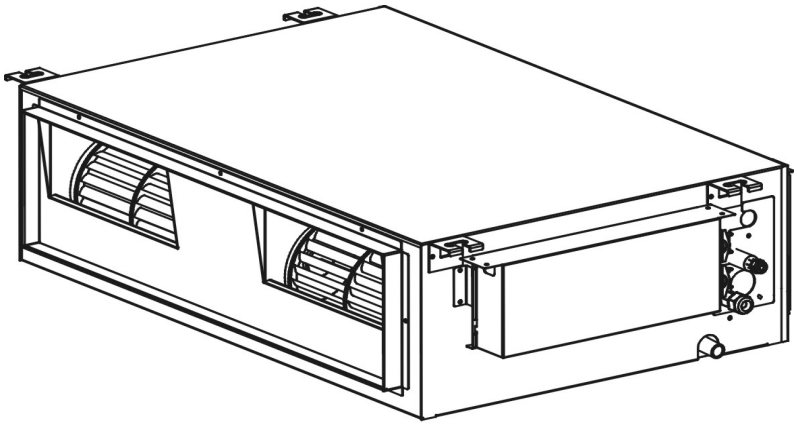
TECHNICAL DATA
& SERVICE MANUAL

INDOOR UNIT: **AD609HL**
ADR609HL
AD612HL
ADR612HL

SPLIT SYSTEM AIR CONDITIONER

Model No.	Product Code No.
AD609HL	387006984
ADR609HL	387006976
AD612HL	387006985
ADR612HL	387006977



0.8180.300.1 12/2003

IMPORTANT!
Please read before installation

This air conditioning system meets strict safety and operating standards.
For the installer or service person, it is important to install or service the system so that it operates safely and efficiently.

For safe installation and trouble-free operation, you must:
- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.
- The unit must be supplied with a dedicated electrical line.

WARNING

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

CAUTION

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If necessary, get help
These instructions are all you need for most installation sites and maintenance conditions.
If you require help for a special problem, contact our sale/service outlet or your certified dealer for additional instructions.

In case of improper installation
The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

- During installation, connect before the refrigerant system and then the wiring one; proceed in the reverse orden when removing the units.

WARNING **When wiring**

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY QUALIFIED, EXPERIENCED ELECTRICIANS SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked, to ensure the grounding.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring.
  Improper connections and inadequate grounding can cause **accidental injury and death**.
- **Ground the unit** following local electrical codes.
- The Yellow/Green wire cannot be used for any connection different from the ground connection.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.
- Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.
- Do not use multi-core cable when wiring the power supply and control lines. Use separate cables for each type of line.

When transporting
Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminium fins on the air conditioner can cut your fingers.

When installing...

… In a ceiling
Make sure the ceiling is strong enough to hold the unit-weight. It may be necessary to build a strong wooden or metal frame to provide added support.

… In a room
Properly insulate any tubing run inside a room to prevent "sweating", which can cause dripping and water damage to walls and floors.

... In moist or uneven locations
Use a raised concrete base to provide a solid level foundation for the outdoor unit. This prevents damage and abnormal vibrations.

... In area with strong winds
Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

... In a snowy area (for heat pump-type systems)
Install the outdoor unit on a raised platform that is higher then drifting snow. Provide snow vents.

When connecting refrigerant tubing

- Keep all tubing runs as short as possible.
- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them; screw by hand and then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

NOTE:
Depending on the system type, liquid and gas lines may be either narrow or wide. Therefore, to avoid confusion, the refrigerant tubing for your particular model is specified as narrow tube for liquid, wide tube for gas.

When servicing
- Turn the power OFF at the main power board before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after the work, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.
- Ventilate the room during the installation or testing the refrigeration system; make sure that, after the installation, no gas leaks are present, because this could produce toxic gas and dangerous if in contact with flames or heat-sources.

Table of Contents

1. SPECIFICATIONS

1-1 Unit Specifications

AD609HL

Power source	220 - 240V ~ 50Hz

Voltage rating	230V

Performance		Cooling	Heating
Capacity		See catalogue with the requested matching	
Air circulation (High/Med./Low)	m³/h	600/510/440	
External static pressure (High)	Pa (mm W.G.)	49(5) at shipment - 69 (7) with booster cable	

Features			
Controls/Temperature controls			Microprocessor/ I.C. thermostat
Control unit			Wireless remote control unit
Timer			ON/OFF 24 hours & Daily program, 1-hour OFF
Fan speed			3 and Auto /1(Hi)
Air Filter			Washable
Operation sound (*)	High/Med./Low	dB-A	54/52/49
Refrigerant tubing connections			Flare type
Refrigerant	Narrow tube	mm(in.)	6,35 (1/4)
tube diameter	Wide tube	mm(in.)	9,52 (3/8)
Refrigerant			R22

Dimensions & Weight				
Dimensions	Unit	Height	mm	266
		Width	mm	571
		Depth	mm	852
Package dimensions	Unit	Height	mm	365
		Width	mm	745
		Depth	mm	1086
		Volume	m3	0,3
Weight	Unit	Net	kg	30
		Shipping	kg	34

DATA SUBJECT TO CHANGE WITHOUT NOTICE

(*) Power level measured at operating conditions (HIGH speed / 5mmH20 external static pressure) and inside discharge air duct

ADR609HL

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Capacity		See catalogue with the requested matching	
Air circulation (High/Med./Low)	m^3/h	600/510/440	
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tube diameter	Wide tube	mm(in.)	9,52 (3/8)
Refrigerant			R407C

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Fan speed			3 and Auto /1(Hi)
Air Filter			Washable
Operation sound (*)	High/Med./Low	dB-A	54/52/49
Refrigerant tubing connections			Flare type
Refrigerant	Narrow tube	mm(in.)	6,35 (1/4)
tube diameter	Wide tube	mm(in.)	12,7 (1/2)
Refrigerant			R22

Dimensions & Weight				
Dimensions	Unit	Height	mm	266
		Width	mm	571
		Depth	mm	852
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1-2 Major Component Specifications

AD609HL

Controller PCB			
	Part No.		XR99EH-(AR)
	Controls		Microprocessor
	Control circuit fuse		250 V - 3,15 A

Remote Control Unit			RCS-6HPN4E-G

Fan & Fan Motor				
	Type			Centrifugal fan
	Q'ty ……. Dia. and lenght		mm	2…. Ø 160 / L 240
	Fan motor model…Q'ty			3RGB-CO-45-30 5V/1….1
	No. Of poles…rpm (230 V) (*)			4 … 1060/1000/910
	Running Amps (HIGH speed)		A	0,45
	Power input (HIGH speed)		W	110
	Coil resistance (Ambient temp. 20 °C)		Ω	BLU-BRN: 95 BRN-BLK: 37 BLK-GRY: 15 GRY-VLT: 15 WLT-RED: 30 RED-YEL: 101
	Safety devices	Type		Internal thermal protector - 7AM 037 A 5
		Operating temp. Open	°C	150 ± 5K
	Run capacitor		µF	1,8
			VAC	450

Heat Exch. Coil			
	Coil		Aluminium plate fin / Copper tube
	Rows		2
	Fin pitch	mm	1,6
	face area	m2	0,126

DATA SUBJECT TO CHANGE WITHOUT NOTICE

(*) Fan speeds: H / M / L measured at operating conditions(HIGH speed / 5mmH20 external static pressure)

ADR609HL

Controller PCB		
Part No.		XR99EH-(SA)
Controls		Microprocessor
Control circuit fuse		250 V - 3,15 A

Remote Control Unit	RCS-6HPN4E-G

Fan & Fan Motor			
Type			Centrifugal fan
Q'ty ……. Dia. and lenght		mm	2…. Ø 160 / L 240
Fan motor model…Q'ty			3RGB-CO-45-30 5V/1….1
No. Of poles…rpm (230 V) (*)			4 … 1060/1000/910
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(*) Fan speeds: H / M / L measured at operating conditions(HIGH speed / 5mmH20 external static pressure)

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(*) Fan speeds: H / M / L measured at operating conditions(HIGH speed / 5mmH20 external static pressure)

1-3 Other Component Specifications

AD-ADR609HL
AD-ADR612HL

Trasformer		**ATR-J105**
Rating	Primary	AC 230V, 50/60Hz
	Secondary	19V - 0.526A
	Capacity	10 VA
Coil resistance	Ω (at 21°C)	Primary (WHT-WHT): 205 ± 10% Secondary (BRN-BRN): 2,0 ± 10%
Thermal cut-off temp.		150°C

Thermistor (Coil sensor TH1)		**PBC-41E-S14**
Resistance	KΩ	0 °C 15,3 ± 5%

Thermistor (Room sensor TH2)		**DTN-TKS134B**
Resistance	KΩ	25 °C 5,0 ± 3%

Drain pump		
Model		PC 309564003
Rating	Voltage	220/240V - 50Hz
	Input	14W
Total head capacity		0,4 l/min

Safety float switch	
Model	BI 1300 2725
Contact rating	230V AC/DC - 0,5A

1-4 Indoor Fan Performance

If external static pressure is too great (due to long extension of ducts, for example), the air flow volume may drop too low at each air outlet. This problem may be solved by increasing the fan speed using the following procedure:

(1) Remove the screw on the electrical component box and remove the cover plate.

(2) Disconnect the fan motor sockets in the box.

(3) Take out the booster cable (sockets at both ends) clamped in the box.

(4) Securely connect the booster cable sockets between the disconnected fan motor sockets in step 2 as shown in the Fig. 1-1.

(5) Place the cable neatly in the box and reinstall the cover plate.

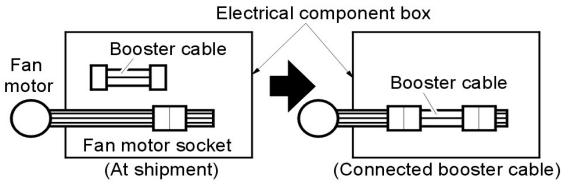
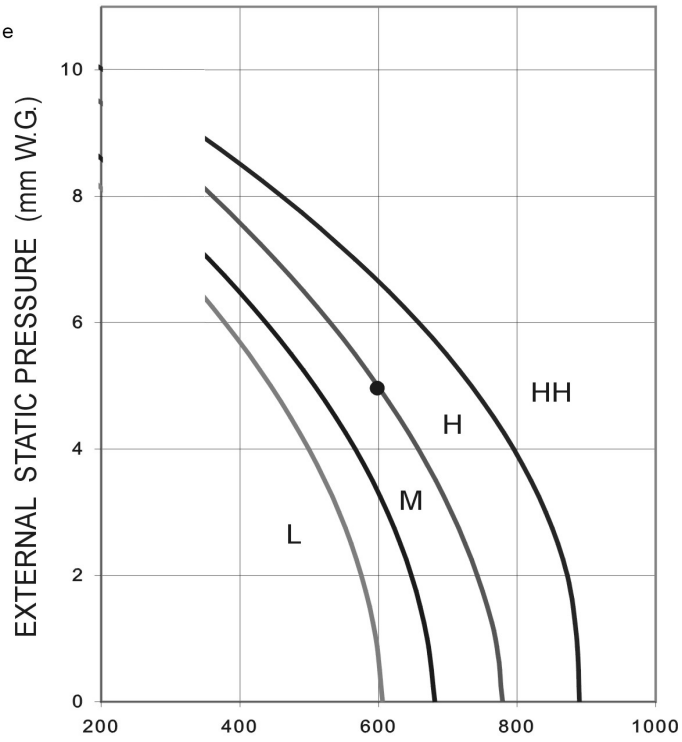


Fig. 1-1



NOTE

HH: Using the booster cable

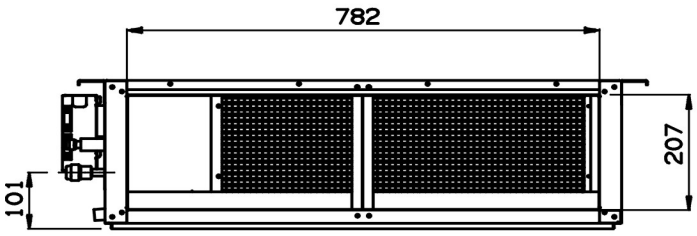
H : At shipment

Fig. 1-2

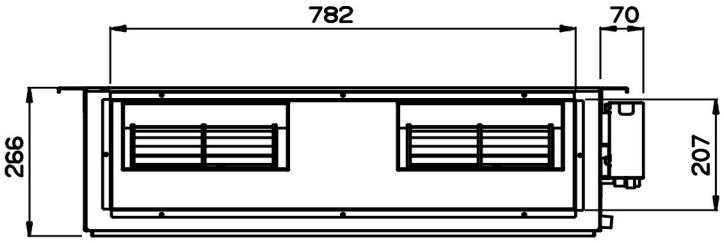
- How to read the diagram

The vertical axis is the external static pressure (Pa) while the horizontal one is the AIR FLOW RATE (m3/h).The characteristic curves for HH, H, M and L fan speed are shown.
The nameplate values shown are based on the H air flow rate. For the type 09/12 flow rate is 600m3/h while the external static pressure is 49 Pa at H position. If external static pressure is too great (due, for example, to long duct extension), the air flow rate may drop too much at each air outlet.
This problem can be solved increasing the fan speed with the booster cable.

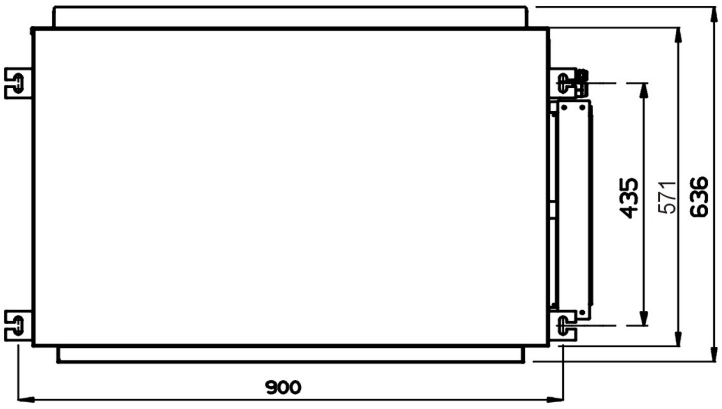
2. DIMENSIONAL DATA



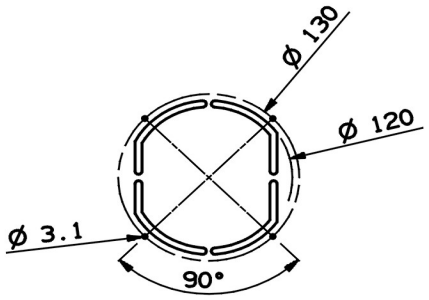
REAR VIEW



FRONT VIEW

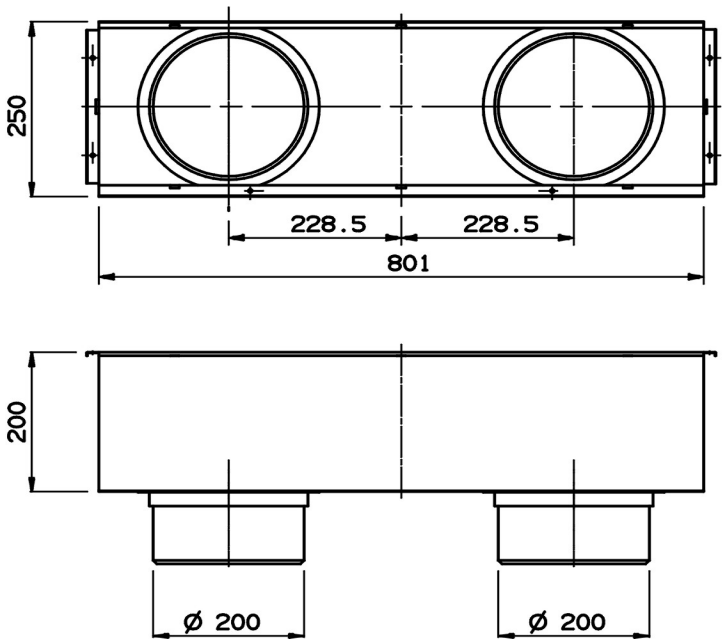


TOP VIEW

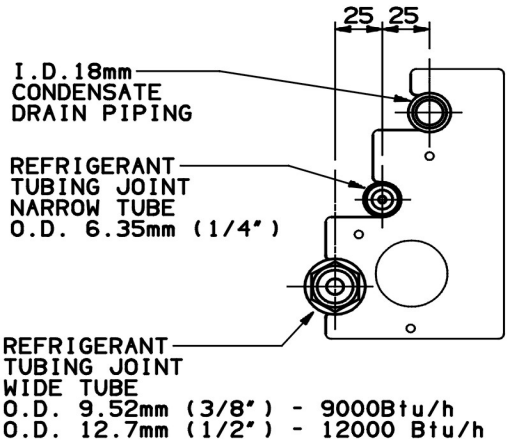


FRESH AIR INTAKE PORT

AIR CONVEYOR
(OPTIONAL PART)



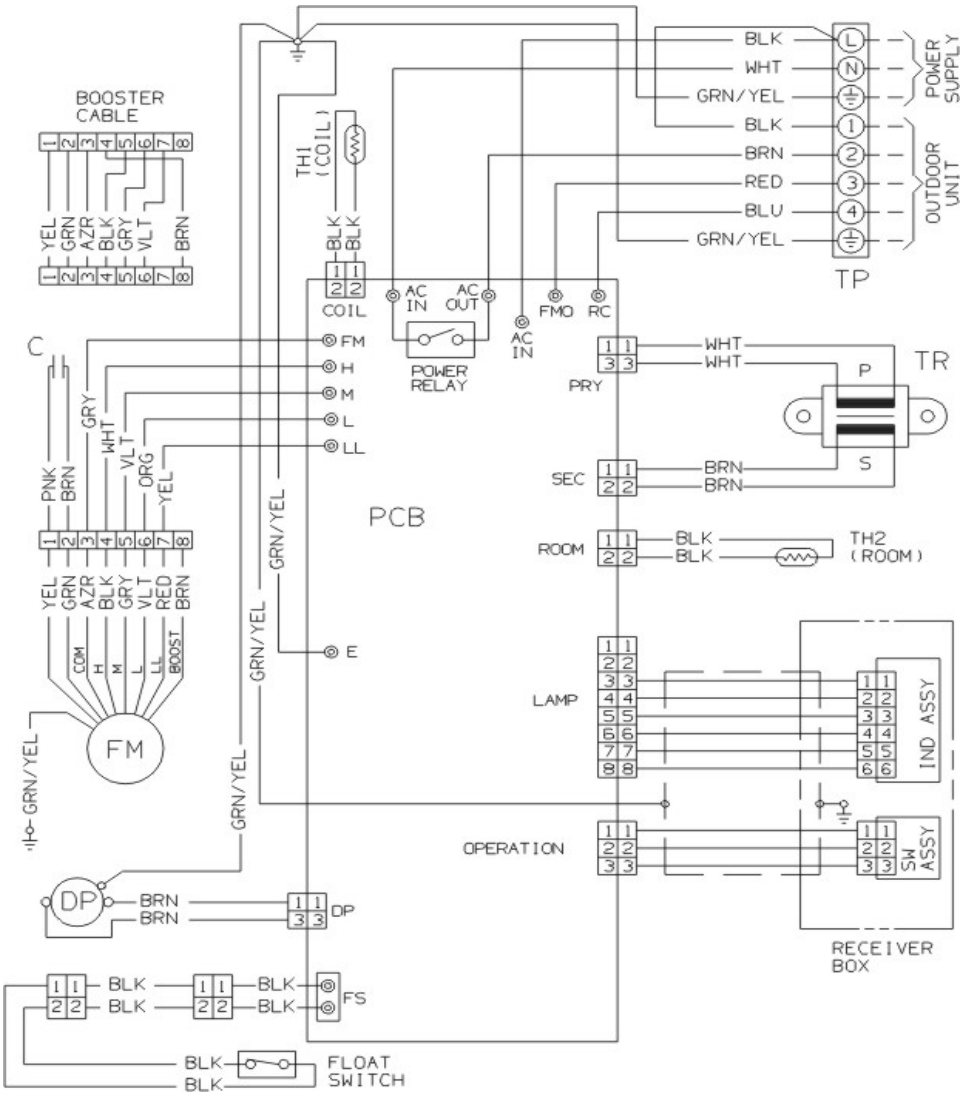
REFRIGERANT TUBING SIDE



Units: mm

3. ELECTRICAL DATA

3-1 Electric Wiring Diagrams

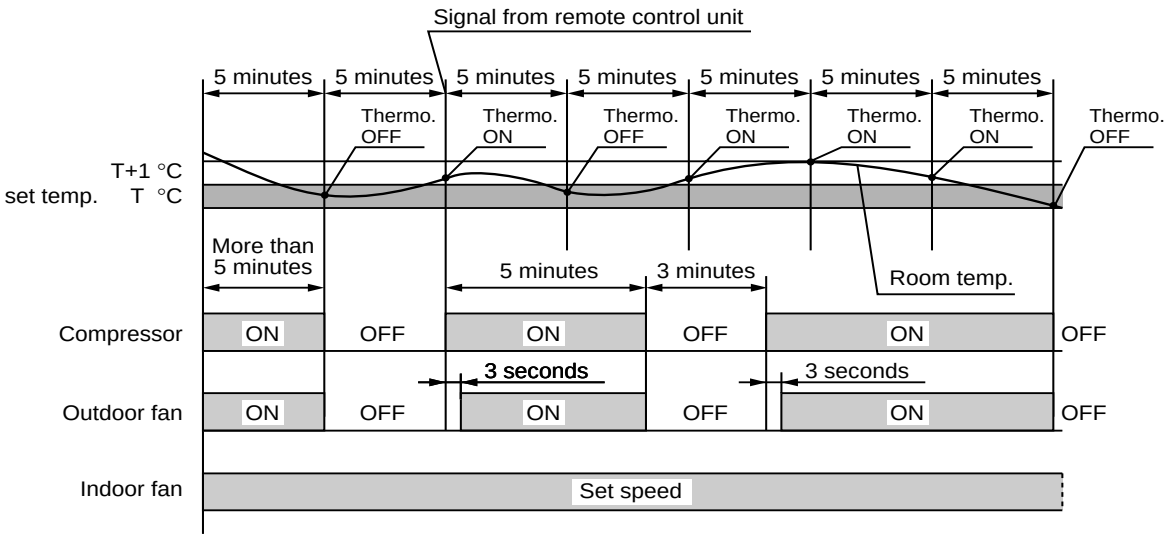


4. FUNCTION

4-1. Room Temperature Control

■ Cooling

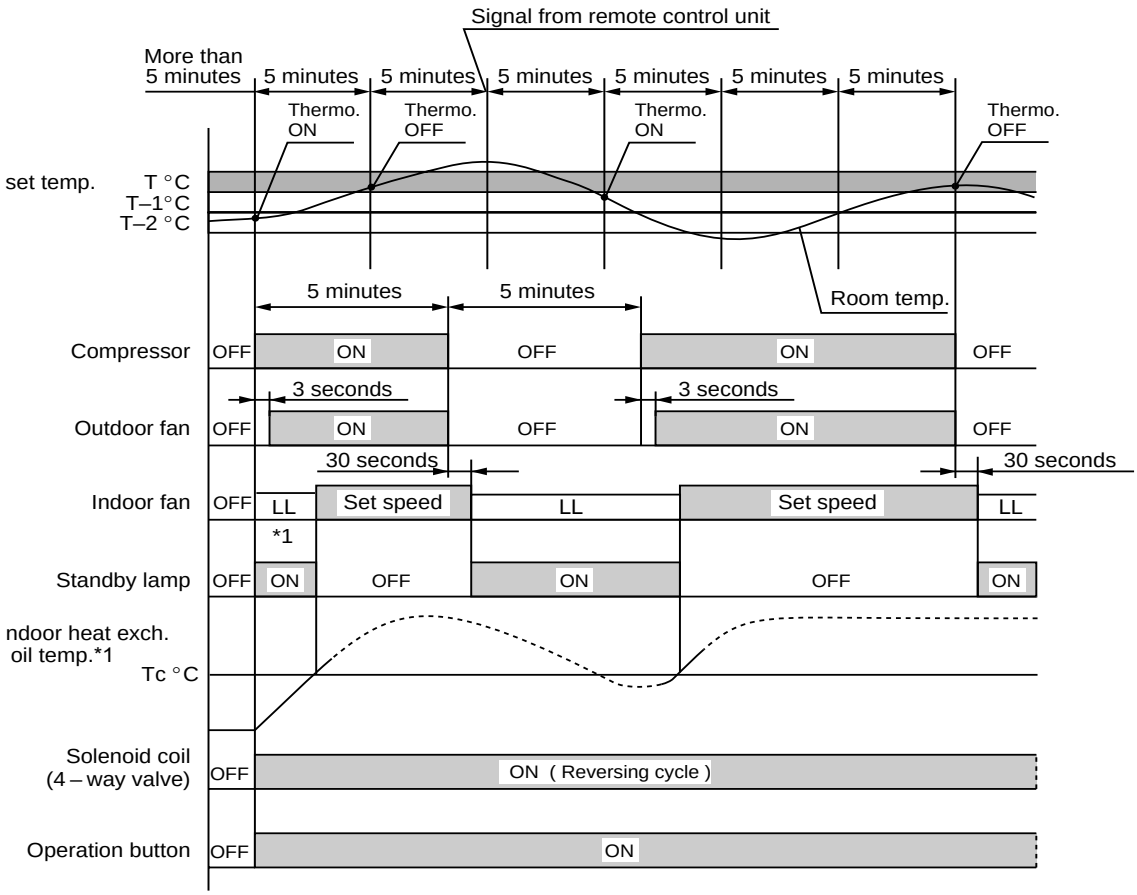
- Room temperature control is obtained by cycling the compressor ON and OFF under control of the room temperature sensor in the remote control unit.
- The room temperature (and other information) is transmitted every 5 minutes by the remote control unit to the controller in the indoor unit.



- The control circuit will not attempt to turn the compressor ON until the compressor has been OFF for at least 3 minutes. To protect the compressor from stalling out when trying to start against the high side refrigerant pressure, the control circuit has a built-in automatic time delay to allow the internal pressure to equalize.
- As a protective measure, the control circuit switches the compressor OFF not before than 5 minutes of compressor operation.
- Thermo. ON : When the room temperature is above T + 1°C (T°C is set temperature).
  Compressor → ON
- Thermo. OFF : When the room temperature is equal to or below set temperature T°C.
  Compressor → OFF

■ Heating

- Room temperature control is obtained by cycling the compressor ON and OFF under control of the room temperature sensor in the remote control unit.
- The room temperature (and other information) is transmitted every 5 minutes by the remote control unit to the controller in the indoor unit.



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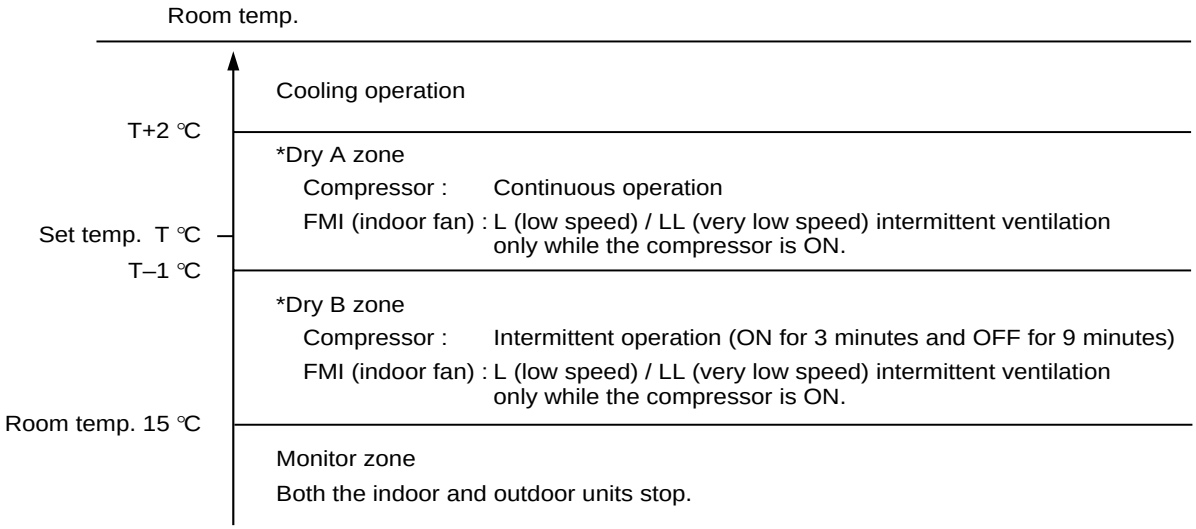
- Thermo. ON : When the room temperature is below T – 1°C (T°C is set temperature).
  Compressor → ON
- Thermo. OFF : When the room temperature is equal to or above set temperature T°C.
  Compressor → OFF

NOTE

*1: Refer to "4-7 Cold Draft Prevention".

4-2. Dry Operation (Dehumidification)

- Dry operation uses the ability of the cooling cycle to remove moisture from the air, but by running at low level to dehumidify without greatly reducing the room temperature. The air conditioner repeats the ON/OFF cycle automatically as shown in the chart below according to the room temperature.



NOTE

- Intermittent ventilation occurs by switching the indoor fan speed between L ↔ LL.
- Dry operation does not occur when the room temperature is under 15°C, which is the monitor zone.
- When the compressor stops, the indoor fan stops as well.

4-3. Automatic Switching between Cooling and Heating

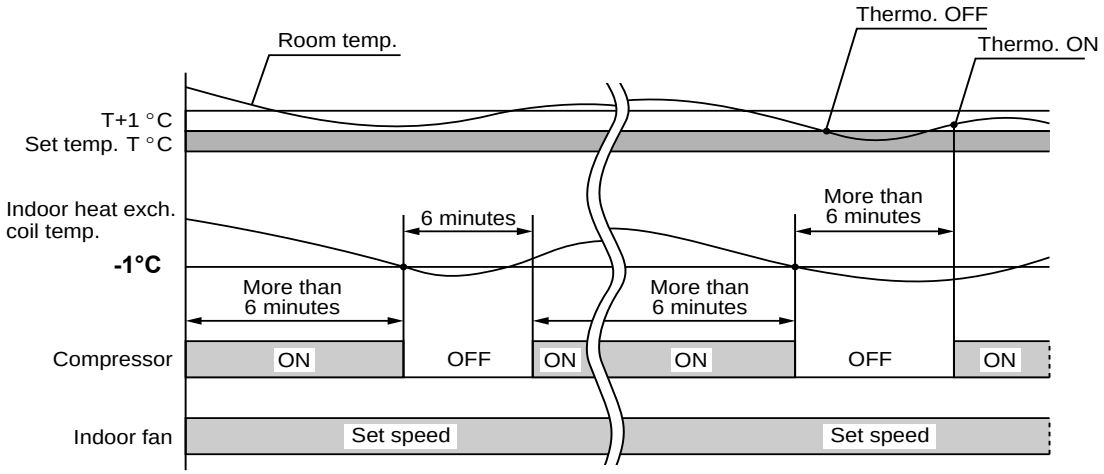
- When AUTO mode is selected, the microprocessor calculates the difference between the set temperature and the room temperature, and automatically switches to COOLING or HEATING mode to maintain the desired temperature.

Room temp. ≥ Set temp. → COOL
Room temp. < Set temp. → HEAT

This means that if the room temperature is **higher than** or **equal to** the set temperature, **COOLING** operation begins. If the room temperature is **lower than** the set temperature, **HEATING** operation begins.

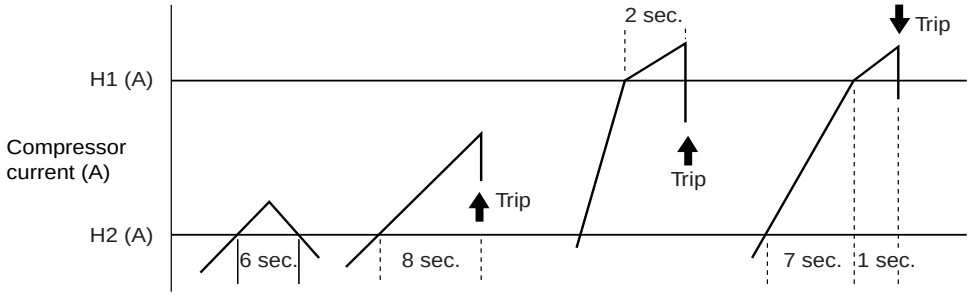
4-4. Freeze Prevention (Cooling and Dry)

- This function prevents freezing of the indoor heat exchange coil.
- When the compressor has been running for 6 minutes or more and the temperature of the indoor heat exchange coil falls below **-1°C,** the control circuit stops the compressor for at least 6 minutes. The compressor does not start again until the temperature rises above 8°C or 6 minutes has elapsed.



4-5. Compressor Overcurrent Protection (Cooling, Dry and Heating)

- This function prevents the compressor from being damaged by overcurrent.
- When the compressor current exceeds either **H1**(A) for **2 seconds** or **H2**(A) for **8 seconds**, both compressor and outdoor fan stop (**Trip**). At the same time, operation lamp in front of the indoor unit flashes.
- After 3 minutes, this function automatically releases and resumes operation until tripping repeats 8 times. If the tripping repeats 9 times or more, the unit stops its operation.



NOTE

The compressor current shown as **H1** and **H2** in the chart differ by models.

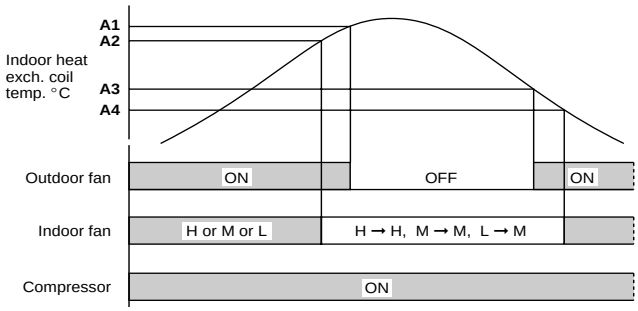
	AD/ADR609HL	AD/ADR612HL
H1	16 A	22 A
H2	7 A	10 A

4-6. Overload Prevention (Heating)

- Overload prevention avoids overheating of the indoor heat exchange coil. This function works either when the temperature of indoor heat exchange coil rises up or compressor current rises to a certain level.

■ Temperature of indoor heat exchange coil sensor

- When the temperature of the indoor heat exchange coil rises above **A2**°C, and if the indoor fan is L (low speed), the fan speed changes from L (low speed) to M (medium speed).
- When the temperature of the indoor heat exchange coil rises above **A1**°C, the outdoor fan stops.



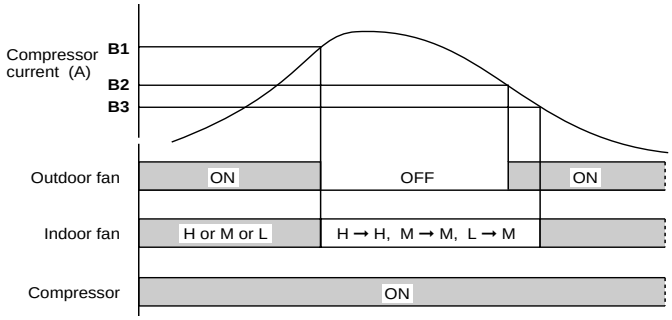
NOTE

The operation temperatures shown as **A1**, **A2**, **A3** and **A4** in the chart differs by models.

	AD/ADR609HL	AD/ADR612HL
A1	54°C	58°C
A2	52°C	56°C
A3	45°C	50°C
A4	42°C	

■ Compressor current detection

- When the compressor current rises above **B1**(A), and if the indoor fan is L (low speed), the fan speed changes from L (low speed) to M (medium speed). At the same time the outdoor fan stops its operation.
- When the compressor current drops to **B2**(A), the outdoor fan resumes its operation.
- When the compressor current drops below **B3**(A), indoor fan returns to operate in set speed.



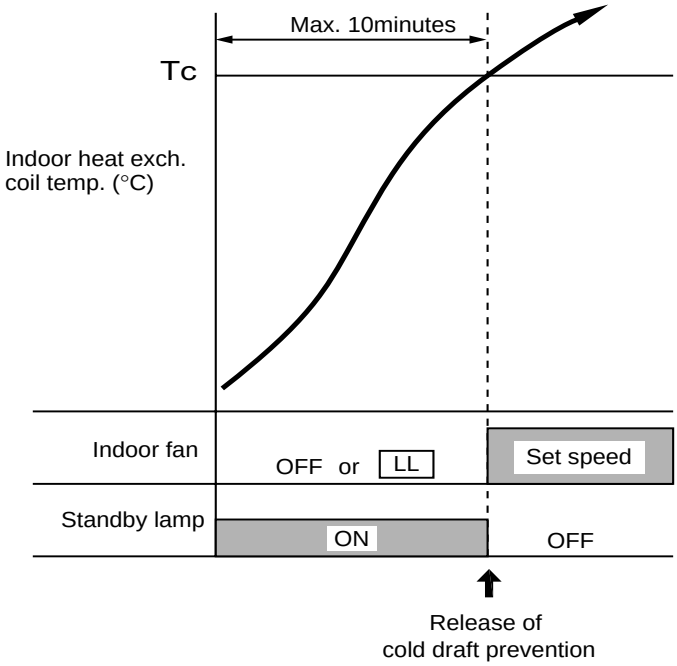
NOTE

The compressor current shown as **B1**, **B2** and **B3** in the chart differs by models.

	AD/ADR609HL	AD/ADR612HL
B1	6,5 A	9,5 A
B2	4,4 A	6,5 A
B3	4,4 A	6,5 A

4-7. Cold Draft Prevention (Heating)

- This function controls indoor fan speed so that strong draft of cold air could not blow out before the indoor heat exchange coil have sufficiently warmed up.
- STANDBY lamp of the indoor unit lights up when this function is working.
- Indoor fan operates in LL until indoor heat exchange coil temperature reaches 32°C.
- After releasing the defrosting, indoor fan halt its operation until the coil temperature reach 32°C.
- When the coil temperature rises above **Tc°C**, indoor fan operates in set speed.



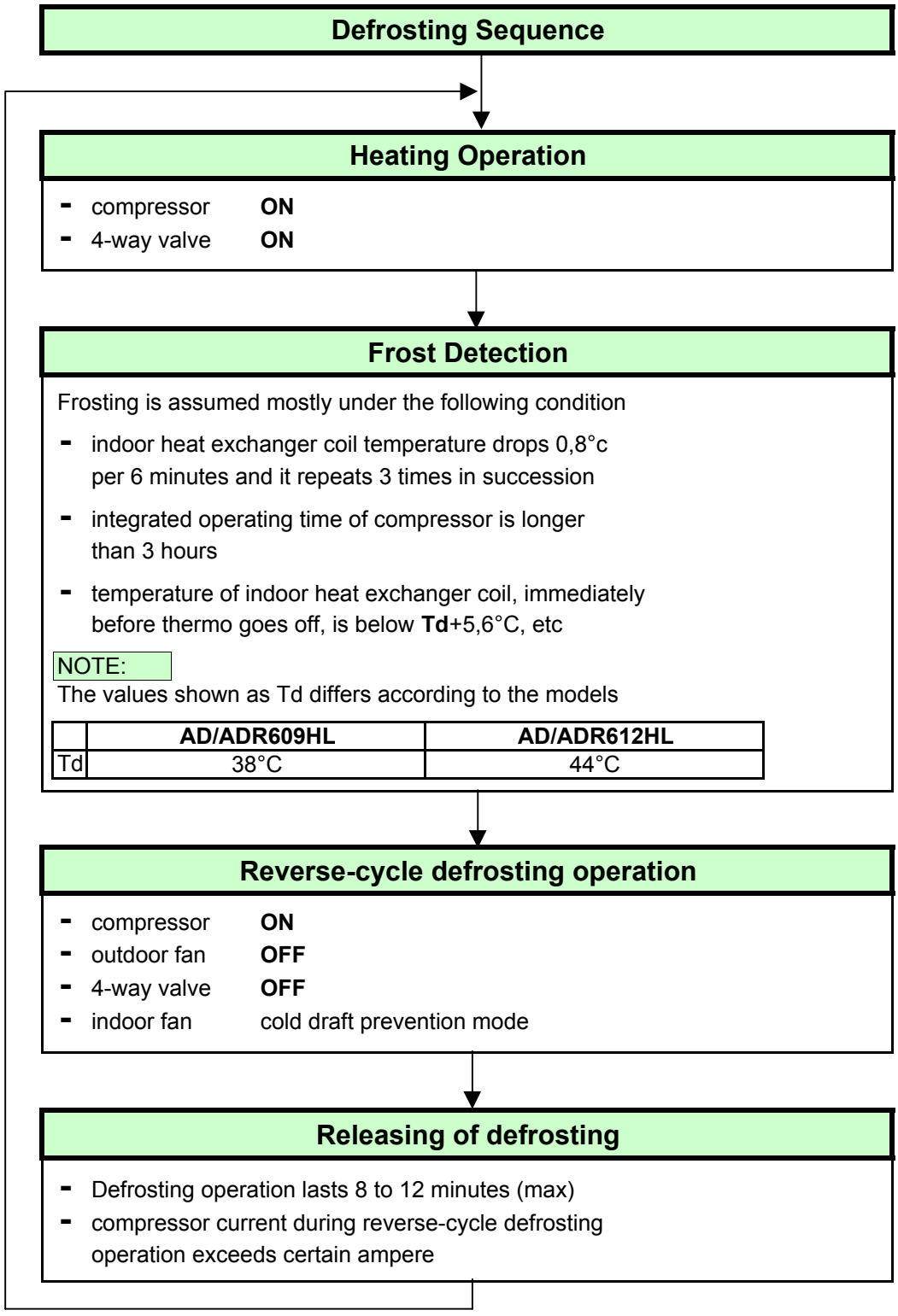
NOTE

The operation temperature shown as **Tc** in the chart differ by models.

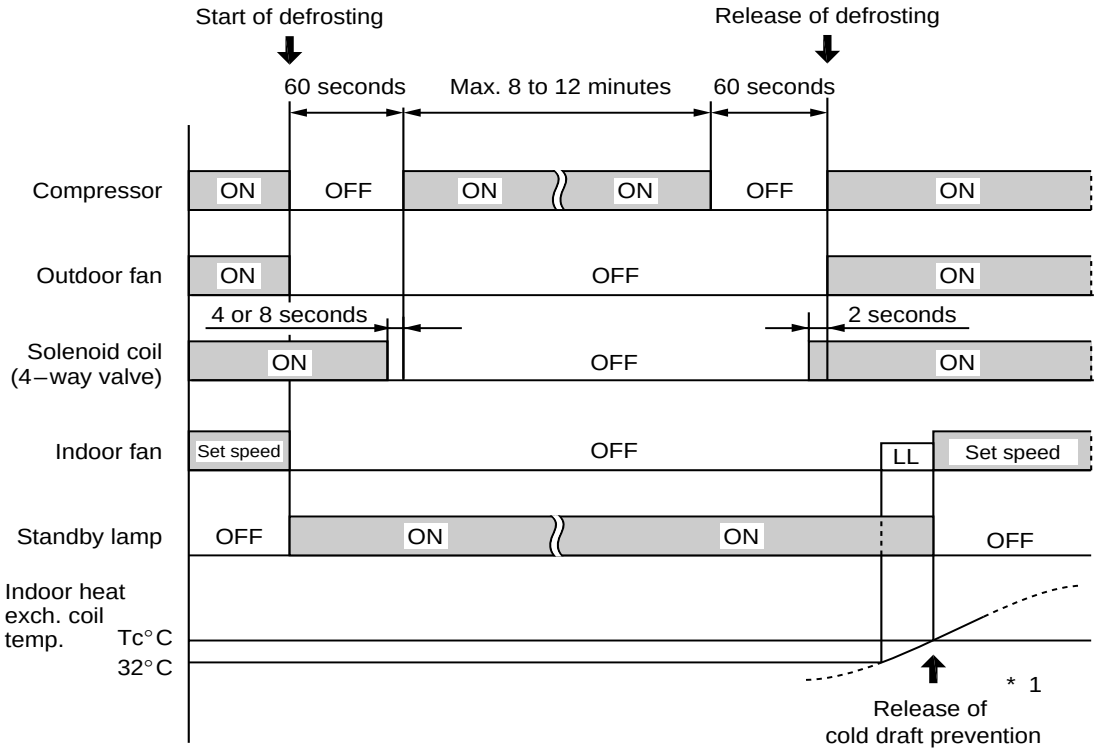
	AD/ADR609HL	AD/ADR612HL
Tc	33°C	34°C

4-8. Defrosting Operation (Heating)

- Reverse-cycle Defrosting



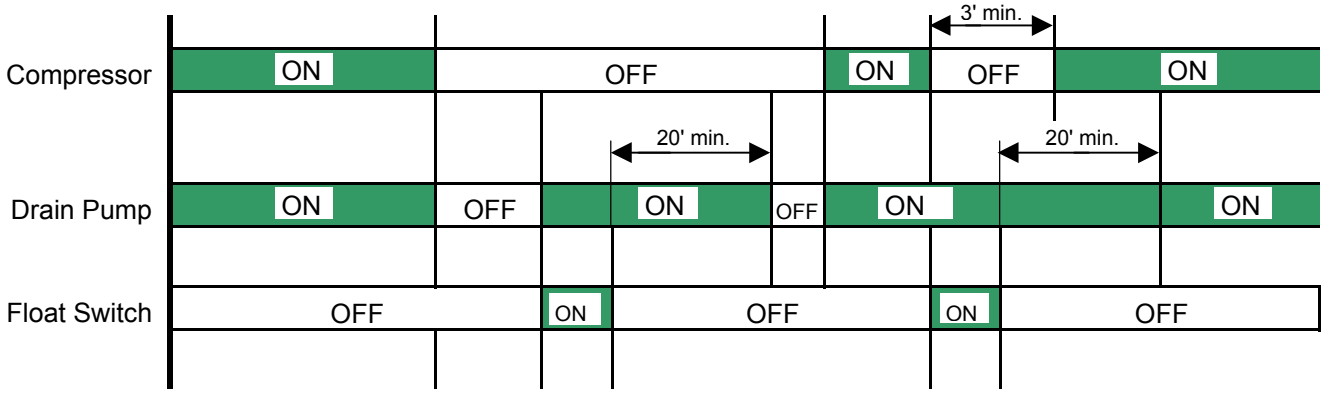
■ **Defrosting Mode Timing Chart**



NOTE

*** 1: Refer to "4- 7 Cold Draft Prevention"**

4-9 Drain Pump and Float Switch



NOTE:

Either in Heating or another mode or the unit is stopped, when the float switch is turned ON, the drain pump operates for 20 minutes minimum

5. TROUBLESHOOTING

5-1. Check before and after troubleshooting

WARNING

Hazardous voltage can cause ELECTRIC SHOCK or DEATH. Disconnect power or turn off circuit breaker before you start checking or servicing.

5-1-1. Check power supply wiring.

- Check that power supply wires are correctly connected to terminals **L** and **N** on the terminal plate in the indoor unit.

5-1-2. Check inter-unit wiring.

- Check that inter-unit wiring is correctly connected to the outdoor unit from the indoor unit.

5-1-3. Check power supply.

- Check that voltage is in specified range (±10% of the rating).
- Check that power is being supplied.

5-1-4. Check lead wires and connectors in indoor and outdoor units.

- Check that coating of lead wires is not damaged.
- Check that lead wires and connectors are firmly connected.
- Check that wiring is correct.

5-2. Air conditioner does not operate.

5-2-1. Circuit breaker trips (or fuse blows).

A. When the circuit breaker is set to ON, it trips immediately. (Resetting is not possible.)

- There is a possibility of ground fault.
- Check insulation resistance.

If resistance value is 2MΩ or less, insulation is defective (“NO”).

WARNING

*Set circuit breaker to OFF.

① Remove inter-unit wires from terminal plate in outdoor unit.
• Measure insulation resistance of outdoor unit.

NO → Insulation of outdoor unit is defective.

• Measure insulation resistance of electrical parts in outdoor unit.

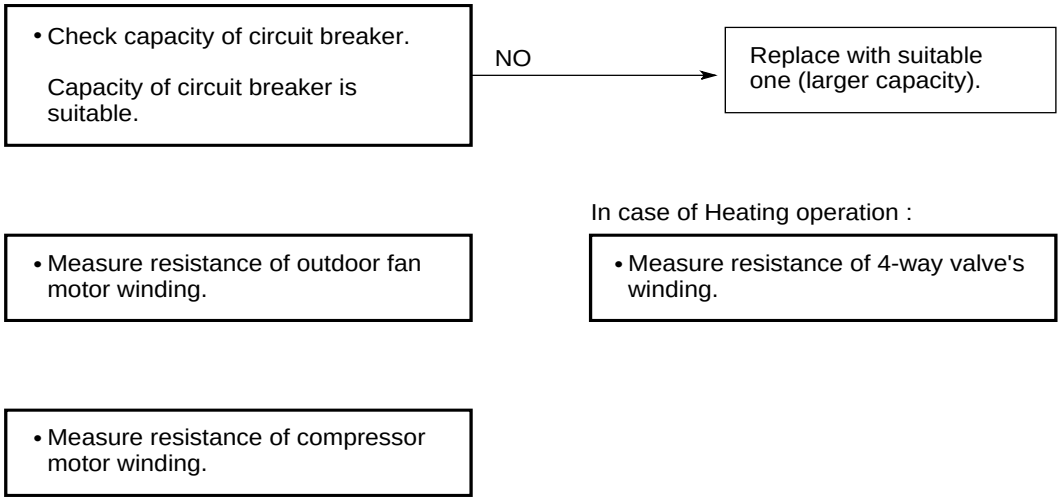
② Remove inter-unit wires from terminal plate in indoor unit. Then, pull the power plug out of the wall outlet
• Measure insulation resistance of indoor unit.

NO → Insulation of indoor unit is defective.

• Measure insulation resistance of electrical parts in indoor unit.

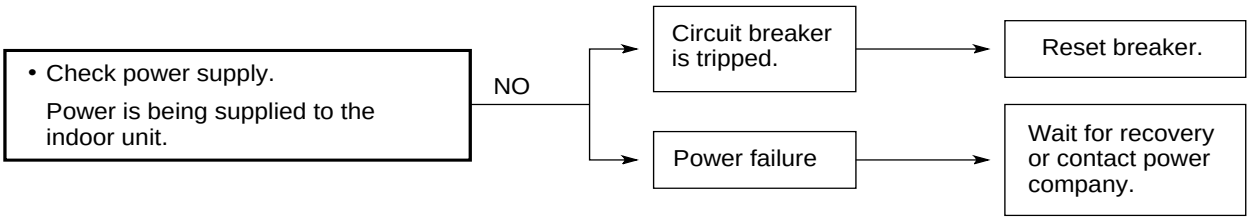
B. Circuit breaker trips in several minutes after turning the air conditioner on.

● There is a possibility of short circuit.

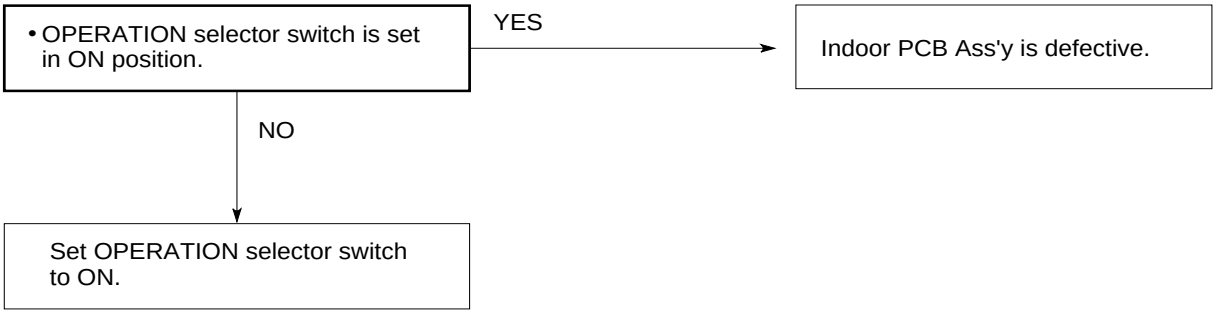


5-2-2. Neither indoor nor outdoor unit runs.

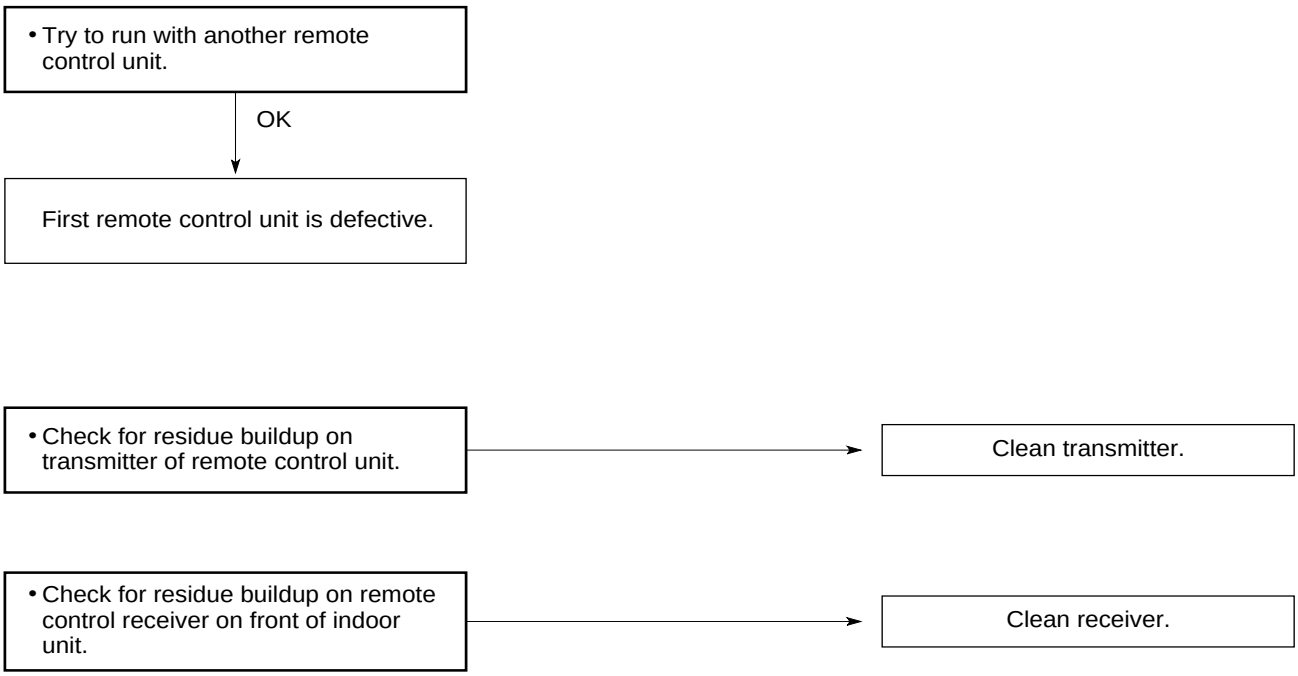
A. Power is not supplied.



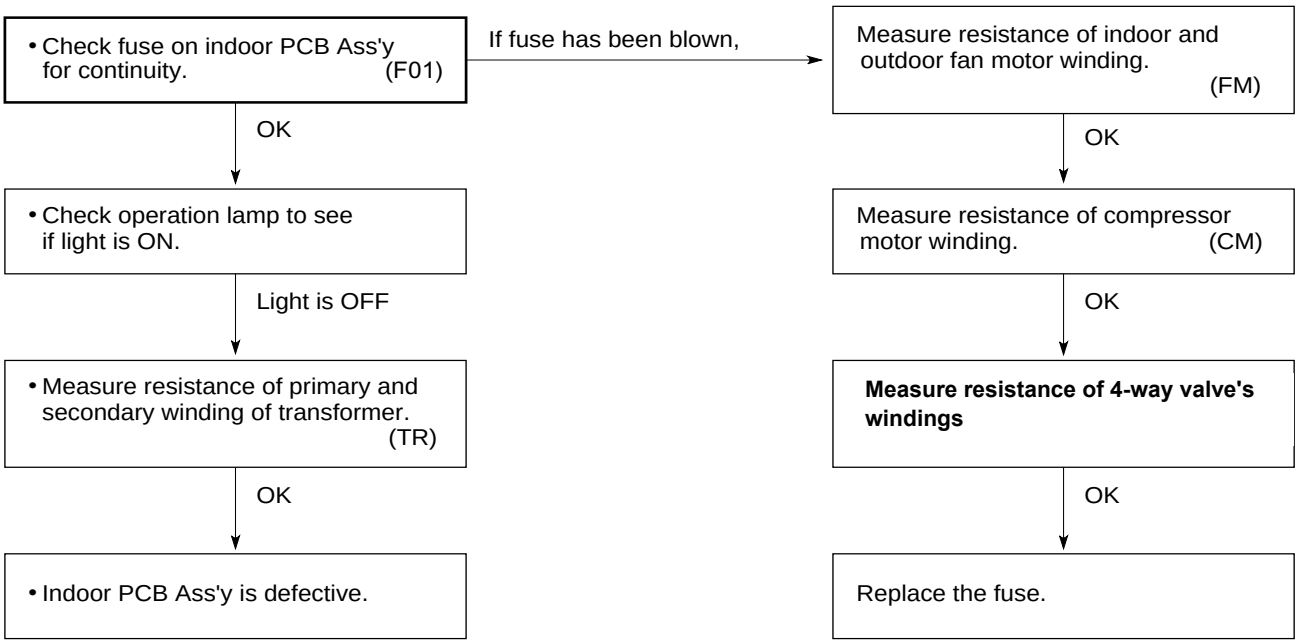
B. Check "OPERATION selector" switch in the receiver



C. Check remote control unit.



D. Check fuse on the indoor PCB Ass'y.

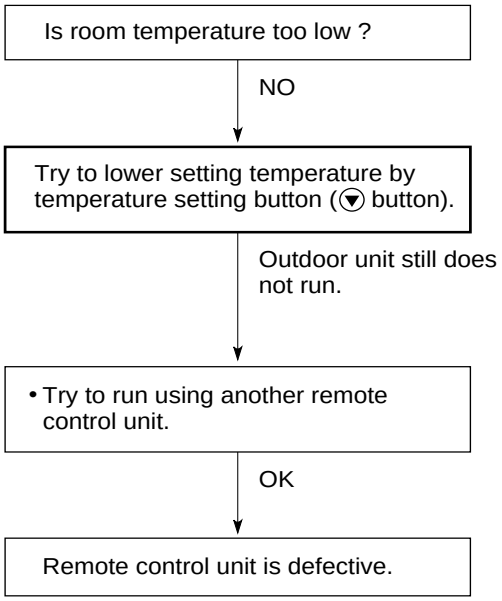


E. Check TIMER on the remote control unit.

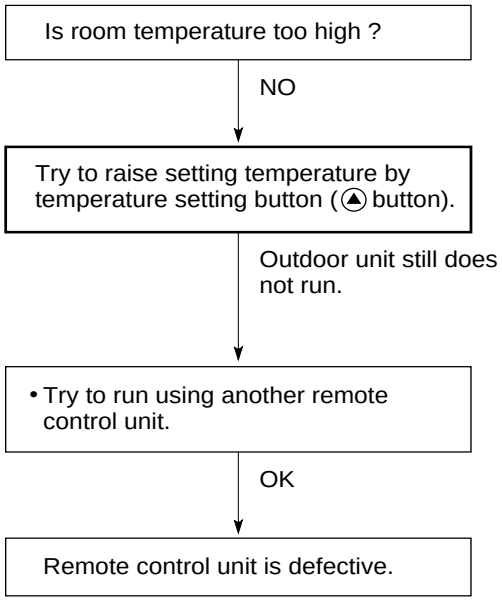
5-2-3. Only outdoor unit does not run.

A. Check setting temperature.

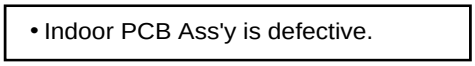
COOL



HEAT

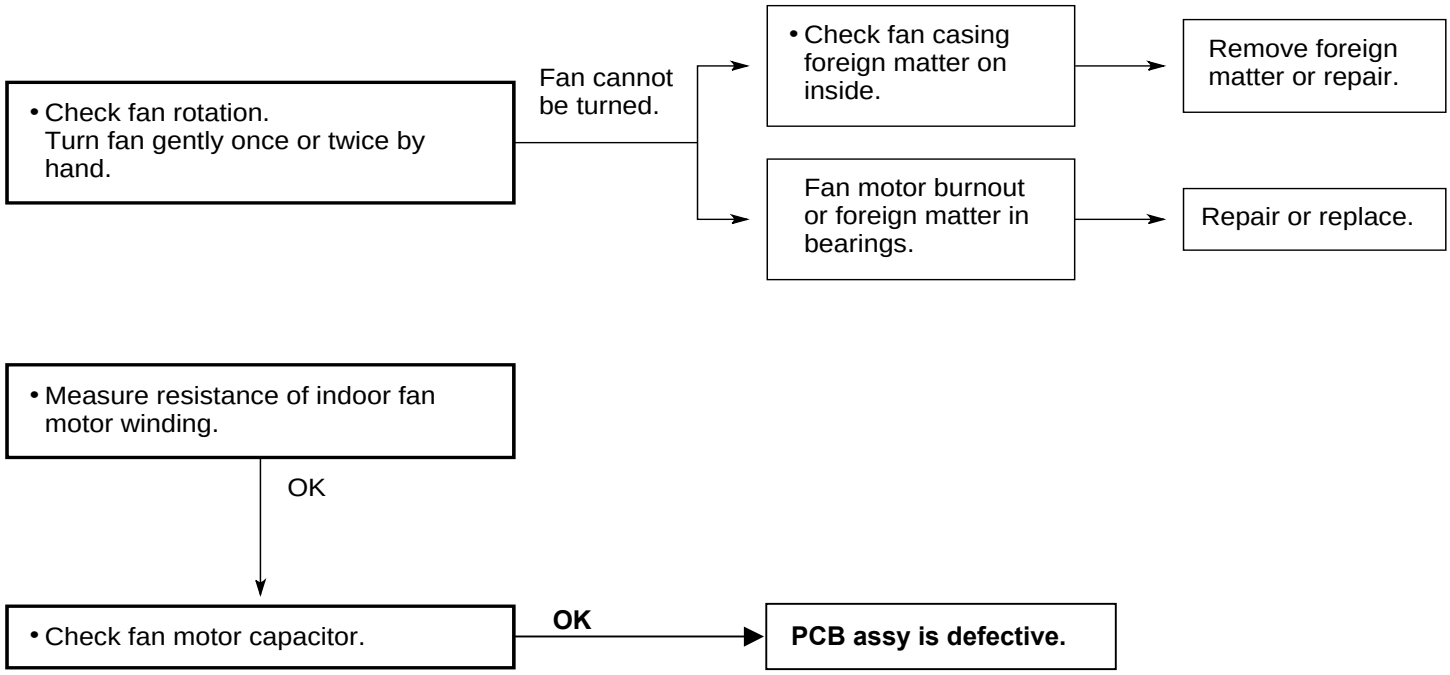


5-2-4. Only Indoor unit does not run.

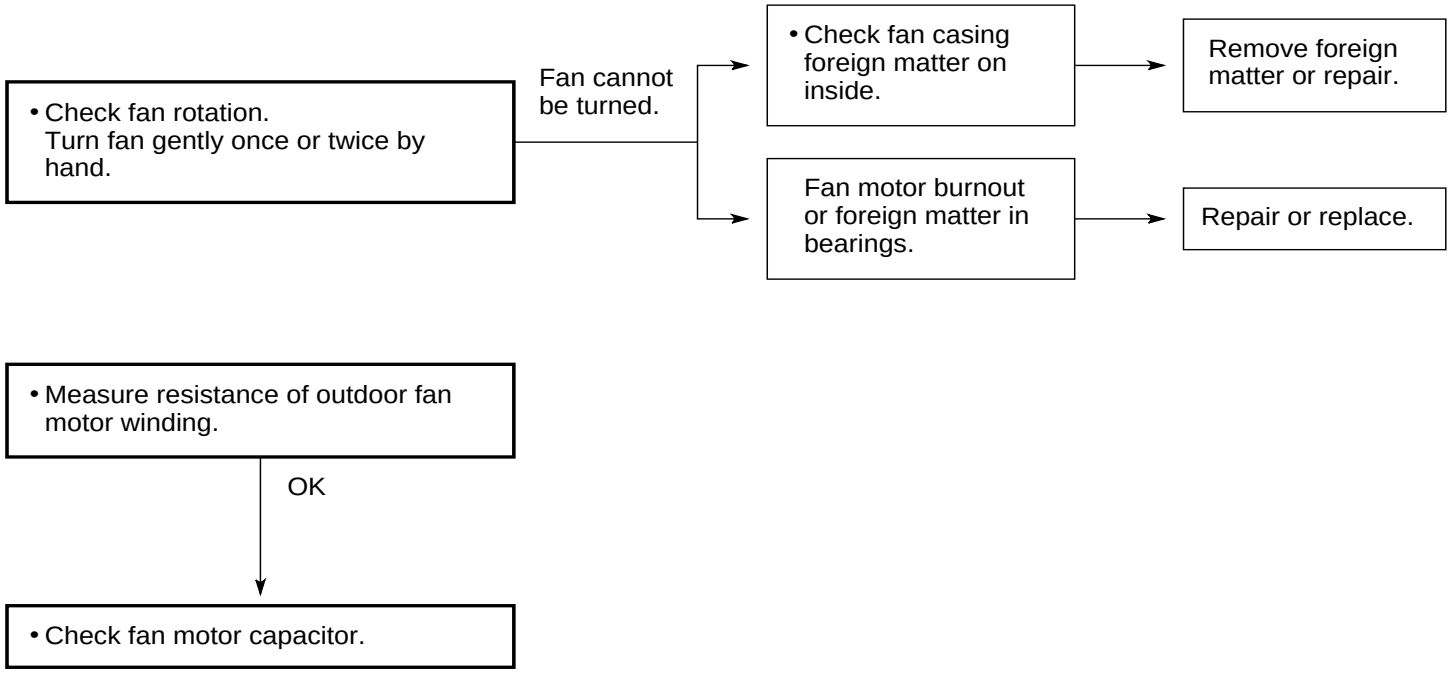


5-3. Some part of air conditioner does not operate.

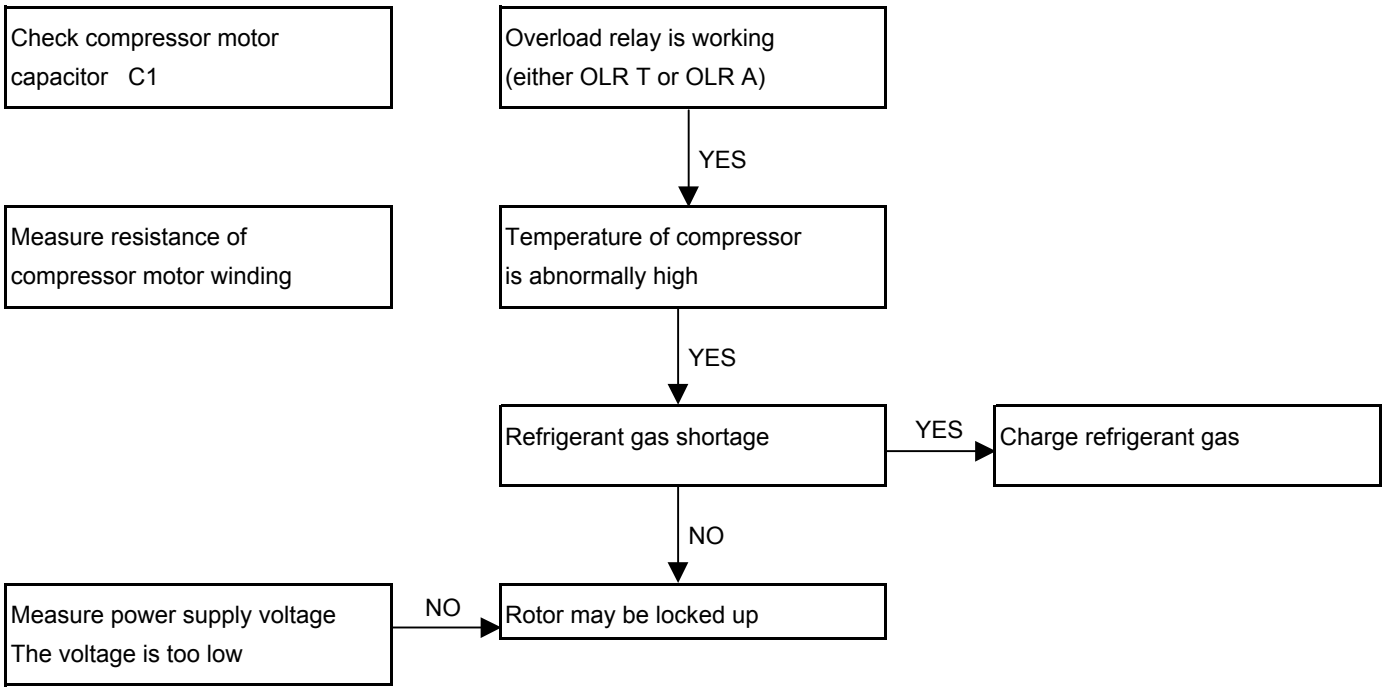
5-3-1. Only indoor fan does not run.



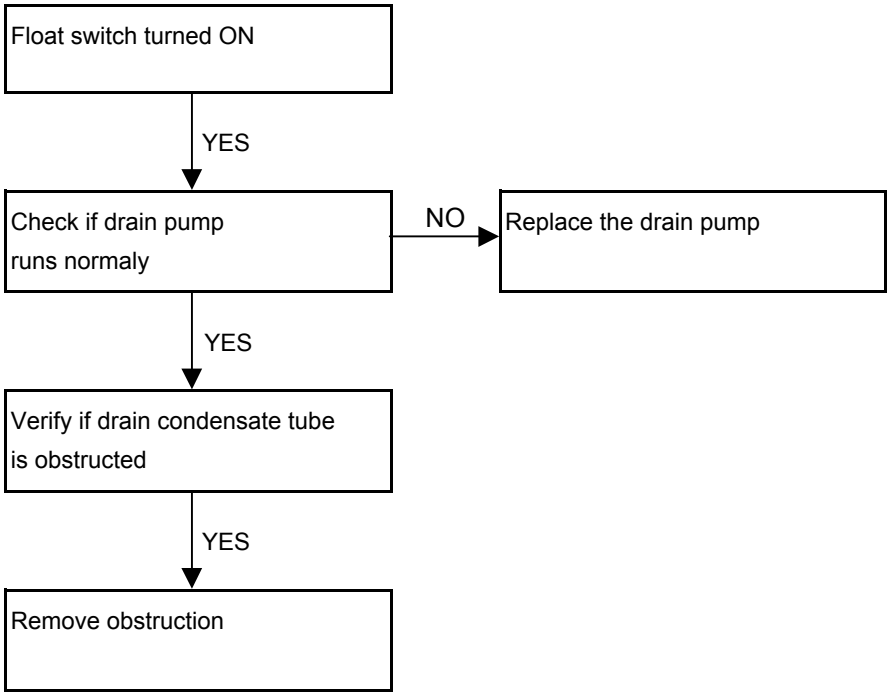
5-3-2 Only outdoor fan does not run.



5-3-3. Only compressor does not run



5-3-4. Compressor and outdoor fan do not run



5-4. Air conditioner operates, but abnormalities are observed

5-4-1. Operation does not switch from HEAT to COOL (or COOL to HEAT)

Remote control unit

may be defective

Receiver in lamp ass'y

may be defective

Measure resistance of

4-way valve's winding (20S)

COOL to HEAT

Check voltage between terminals

N°4(+) N°6 at terminal plate

(DC 24V)

OK → Outdoor PCB ass'y is defective

No voltage appears ↓

Indoor PCB ass'y is defective

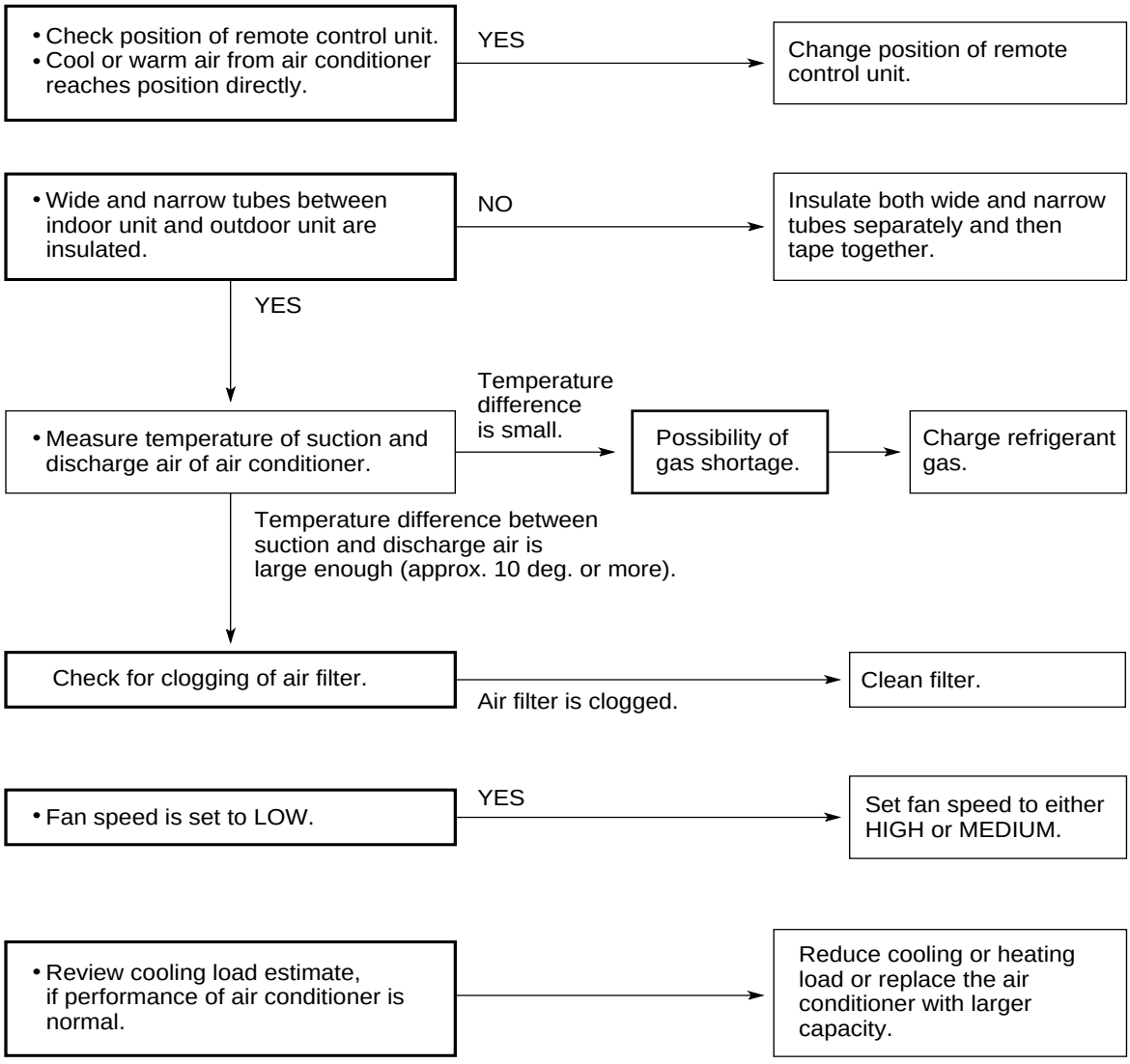
HEAT to COOL

Check voltage between terminals

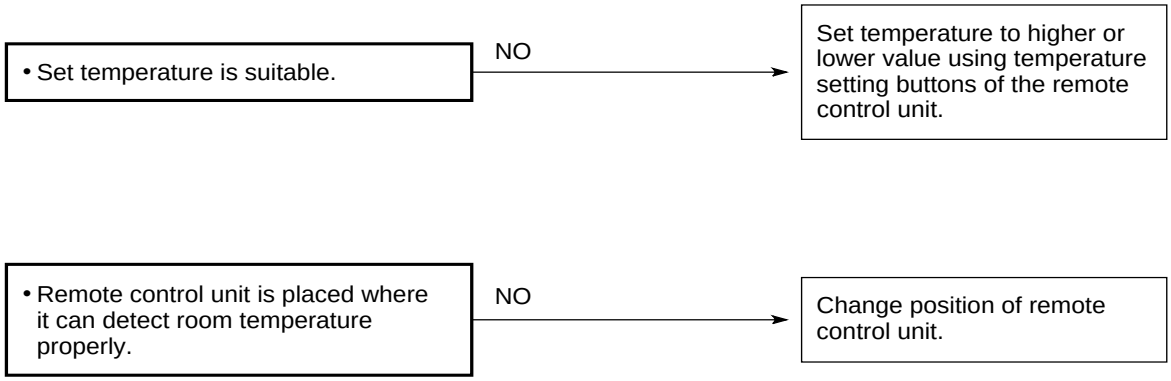
N°4(+) N°6 at terminal plate

(0V)

5-4-2. Poor cooling or heating.

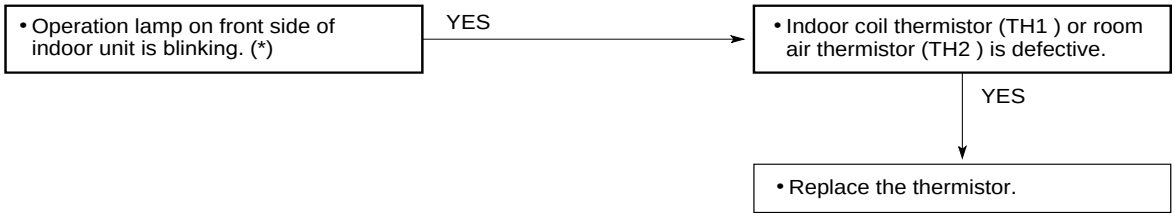


5-4-3. Excessive cooling or heating.



5-5. If a sensor is defective.

5-5-1. Thermistor (TH1 or TH2) is defective.



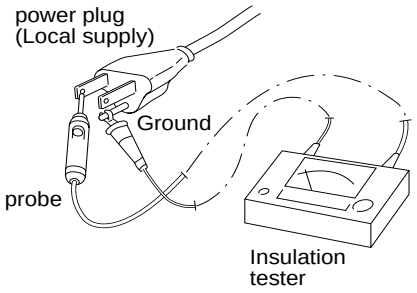
NOTE **Alarm Signal (*)**

Operation lamp on the front side of the indoor unit will blink when either indoor coil thermistor or room air thermistor is defective. At the same time the outdoor unit will stop. Indoor unit will operate only for ventilation.

6. CHECKING ELECTRICAL COMPONENTS

6-1 Measurement of Insulation Resistance

The insulation is in good condition if the resistance exceeds 2MΩ



NOTE

The shape of the power plug may differ from that of the air conditioner which you are servicing.

Fig. 1

6-1-1. Power supply wires

Clamp the grounding terminal of the power plug with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on both the two power terminals. (fig.1)

Then, also measure the resistance between the grounding and other power terminals. (fig.1)

6-1-2. Indoor Unit

Clamp a metallic part of the unit with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on each terminal screw where power supply lines are connected on the terminal plate. (fig.2)

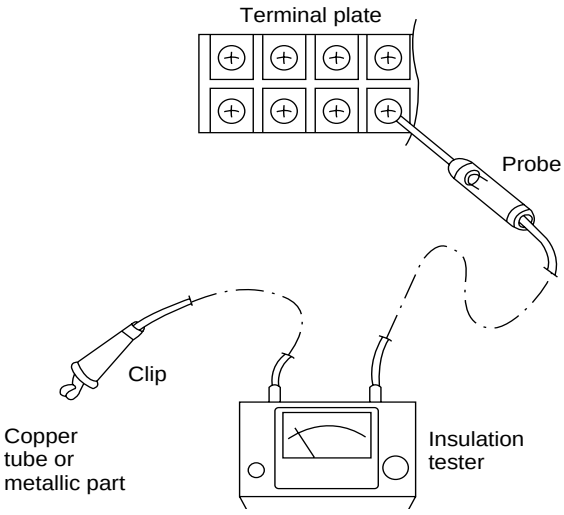


Fig. 2

6-1-3. Outdoor Unit

Clamp an aluminium plate fin or copper tube with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on each terminal screw on the terminal plate. (fig.2)
Note that the ground line terminal should be skipped for the check.

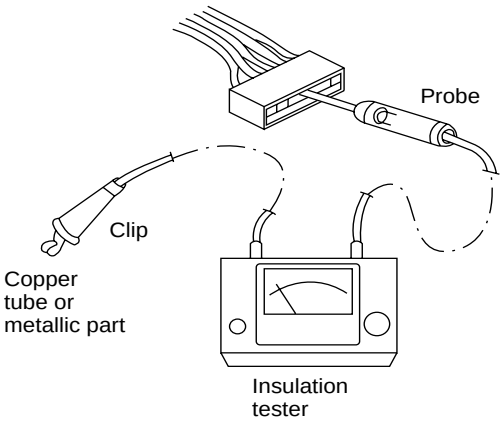


Fig. 3

6-1-4. Measurement of Insulation Resistance for Electrical Parts

Disconnect the lead wires of the desired electric part from terminal plate, capacitor, etc.
Similary disconnect the connector.
Then measure the insulation resistance. (fig.3 and 4)

NOTE: Refer to electric wiring diagram

If the probe cannot enter the poles because the hole is too narrow then use a probe with a thinner pin.

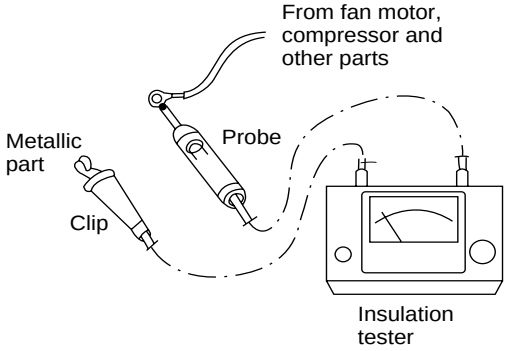


Fig. 4

6-2 Checking Continuity of Fuse on PCB Ass'y

Remove the PCB Ass'y from the electrical component box. Then pull out the fuse from the PCB Ass'y. (fig.5)

Check for continuity using a multimeter as shown in fig.6

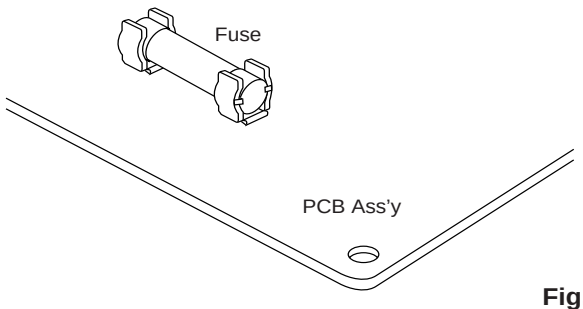


Fig. 5

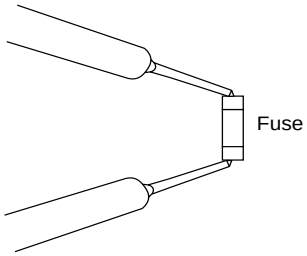


Fig. 6

6-3 Checking Motor Capacitor

Remove the lead wires from the capacitor terminals, and then place a probe on the capacitor terminals as shown in fig.7. Observe the deflection of the pointer, setting the resistance measuring range of the multimeter to the maximum value.

The capacitor is "good" if the pointer bounces to a great extent and then gradually returns to its original position.

The range of deflection and deflection time differ according to the capacity of the capacitor.

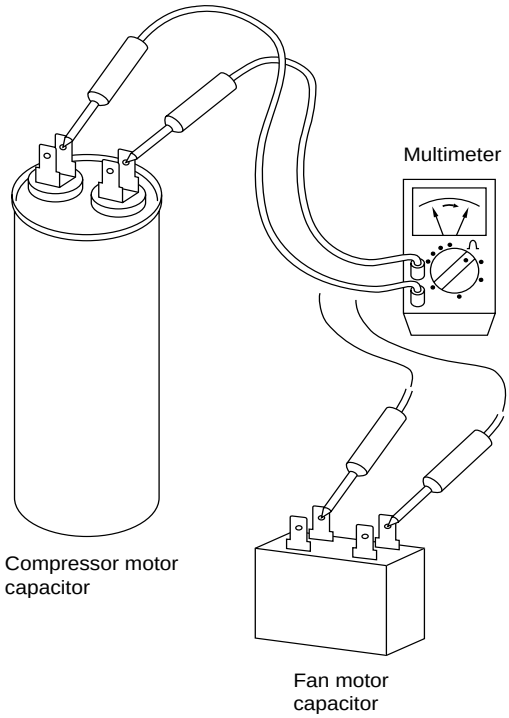


Fig. 7

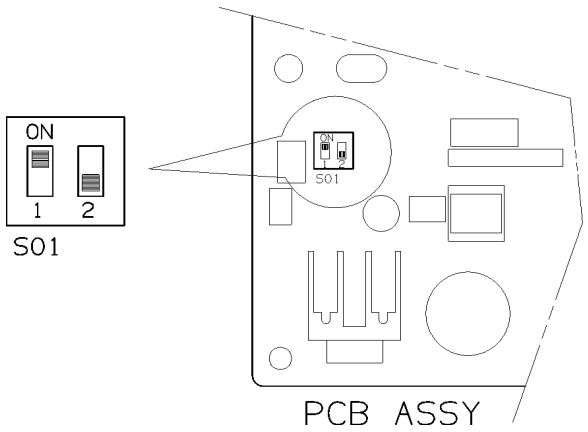
7. MAINTENANCE

7-1 Changing Address of Remote Control Unit in Indoor Unit

If you are installing more than 1 indoor unit (up to 2) in the same room, it is necessary for you to assign each unit its own address, so each can be operated by its own separate remote control unit. You assign the addresses by matching the remocon address on the PCB of each indoor unit with the switch positions of its remote control unit.

To change address on PCB

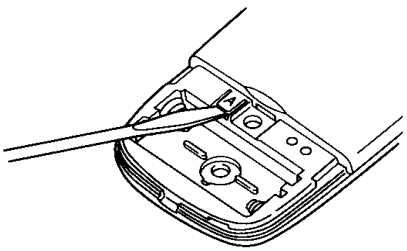
(1) Set the switch n.2 to "off" position on the address dip switch (S01)
(see detail on figure)

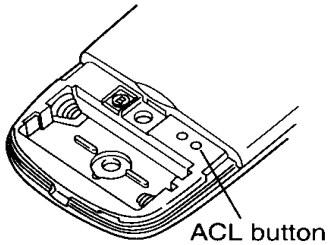


To change address on Remote Control Unit

NB.: Once changed, you cannot restore the original address

(1) Remove the batteries before changing the address
(2) Remove tab marked A to change the address of the remote control unit
(when is removed, the address is automatically set to B)
(3) After inserting the batteries, press ACL button





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