TECHNICAL & SERVICE MANUAL

AWR218CLE - AER218SC

SPLIT SYSTEM AIR CONDITIONER

0.8180.028.0 05/99

Important!

Please Read Before Starting

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so 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.

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 sales/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

WARNING When Wiring

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

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- 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 or death.
- Ground the unit following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

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 aluminum fins on the air conditioner can cut your fingers.

When Installing…

…In a Ceiling or Wall

Make sure the ceiling/wall is strong enough to hold the units weight. It may be necessary to construct a strong wood or metal frame to provide added support.

…In a Room

Properly insulate any tubing run inside a room to prevent “sweating” that can cause dripping and water damage to walls and floors.

…In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

…In an Area with High 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 than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

When Servicing

- Turn the power off at the main power box (mains) 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 you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

Others

CAUTION

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm upon completing installation that no refrigerant gas is leaking. If escaped gas comes in contact with a stove, gas water heater, electric room heater or other heat source, it can produce dangerously toxic gas.

Table of Contents

1. OPERATING RANGE

● **For COOLING ONLY models : AER218SC**

	Temperature	Indoor Air Intake Temp.	Outdoor Air Intake Temp.
Cooling	Maximum	32°C D.B. / 23°C W.B.	43°C D.B.
	Minimum	19°C D.B. / 14°C W.B.	19°C D.B.

2. SPECIFICATION

2-1. Unit Specifications

Indoor Unit **AWR218CLE**
Outdoor Unit **AER218SC**

Power Source				220 – 240 V ~ 50 Hz	
Performance				Cooling	
	Capacity		kW	5.10	
			BTU/h	17,401	
	Air circulation (High)		m^3/h	800	
	Moisture removal (High)		Liters/h	2.7	
Electrical Rating	Voltage rating		V	220 / 230 / 240	
	Available voltage range		V	198 to 264	
	Running amperes		A	10.1 / 10 / 10	
	Power input		W	2,200 / 2,260 / 2,320	
	Power factor		%	99 / 98 / 97	
	C.O.P.		W/W	2.3 / 2.3 / 2.2	
	Compressor locked rotor amperes		A	45 / 46 / 48	
Features	Controls / Temperature control			Microprocessor / I.C. thermostat	
	Control unit			Wireless remote control unit	
	Timer			ON/OFF 24-hours & Daily Program	
	Fan speeds		Indoor / Outdoor	3 and Auto / Auto (Hi , Lo)	
	Airflow direction (Indoor)		Horizontal	Manual	
			Vertical	Auto	
	Air filter			Washable, Anti-Mold	
	Compressor			Rotary (Hermetic)	
	Refrigerant / Amount charged at shipment		g	R407C / 1,915	
	Refrigerant control			Capillary tube	
	Operation sound	Indoor – Hi / Me / Lo	dB-A	45 / 41 / 36	
		Outdoor – Hi	dB-A	51	
	Refrigerant tubing connections			Flare type	
	Max. allowable tubing length at shipment		m	10	
	Refrigerant tube diameter	Narrow tube	mm (in.)	6.35 (1/4)	
		Wide tube	mm (in.)	12.7 (1/2)	
	Refrigerant tube kit / Accessories			Optional / Hanging wall bracket	
Dimensions & Weight				Indoor Unit	Outdoor Unit
	Unit dimensions	Height	mm	360	630
		Width	mm	1,000	830
		Depth	mm	205	305
	Package dimensions	Height	mm	282	713
		Width	mm	1,080	994
		Depth	mm	443	413
	Weight	Net	kg	13.5	52.0
		Shipping	kg	17.7	57.0
	Shipping volume		m^3	0.13	0.29

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks: Rating conditions are:
Indoor air temperature 27°C DB/19°C WB
Outdoor air temperature 35°C DB/24°C WB

2-2. Major Component Specifications

2-2-1. Indoor Unit

Indoor Unit **AWR218CLE**

Controller PCB	Part No.				POW-K185QS-N
	Controls				Microprocessor
	Control circuit fuse				250 V – 3 A
Remote Control Unit					RCS - 2S1
Fan & Fan Motor	Type				Cross - flow
	Q'ty ... Dia. and length			mm	1 ... ø100 / L760
	Fan motor model ... Q'ty				UF2T-21A5PA-S ... 1
	No. of poles ... rpm (230 V, High)				2 ... 1,560
	Nominal output			W	20
	Coil resistance (Ambient temp. 20°C)			Ω	WHT – BRN : 163.7 WHT – VLT : 68.8 VLT – YEL : 33.2 YEL – PNK : 117.3
	Safety devices	Type			Internal type
		Operating temp.	Open	°C	130 ± 8
			Close		Automatic reclosing
	Run capacitor			μF	1.5
				VAC	440
Louver Motor	Model				M2LJ24ZE31
	Rating				AC 230 V, 50 Hz
	No. of poles ... rpm				8 ... 2.5
	Nominal output			W	3
	Coil resistance (Ambient temp. 20°C)			kΩ	16.45 ± 15%
Heat Exch. Coil	Coil				Aluminum plate fin / Copper tube
	Rows				2
	Fin pitch			mm	1.8
	Face area			m^2	0.192

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2-2-2.Outdoor Unit

Outdoor Unit **AER218SC**

Compressor	Type				Rotary (Hermetic)
	Compressor model				C-2RN170H5W 80807045
	Nominal output			W	1,700
	Compressor oil ... Amount			cc	FV68S ... 800
	Coil resistance (Ambient temp. 25°C)			Ω	C – R : 1.353 C – S : 3.422
	Safety devices	Type			Internal protector
		Overload relay			—
		Operating temp.	Open	°C	Automatic opening
			Close	°C	Automatic reclosing
		Operating amp.(Ambient temp. 25°C)			—
	Run capacitor			μF	40.0
				VAC	400
Fan & Fan Motor	Type				Propeller
	Q'ty ... Dia.			mm	1 ... ø400
	Fan motor model ... Q'ty				SG6S-51B5P ... 1
	No. of poles ... rpm (230 V)				6 ... 910
	Nominal output			W	50
	Coil resistance (Ambient temp. 20°C)			Ω	WHT – BRN : 89.1 WHT – YEL : 111.8 YEL – PNK : 55.9
	Safety devices	Type			Internal type
		Operating temp.	Open	°C	130 ± 8
			Close		Automatic reclosing
	Run capacitor			μF	2.0
				VAC	440
Heat Exch. Coil	Coil				Aluminum plate fin / Copper tube
	Rows				2
	Fin pitch			mm	1.8
	Face area			m^2	0.508

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

2-3. Other Component Specifications

2-3-1. Indoor Unit

Transformer (TR)		ATR-H85
Rating	Primary	AC 230V, 50Hz
	Secondary	11V, 0.727A
	Capacity	8VA
Coil resistance	Ω (at 21°C)	Primary (WHT – WHT): 214 ± 10%
		Secondary (BRN – BRN): 1.58 ± 10%
Thermal cut-off temp.		145°C, 2A, 250V

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Thermistor (Coil sensor TH1)		PBC–41E–S4			
Resistance	kΩ	–20°C	40.1± 5%	20°C	6.5± 5%
		–10°C	24.4± 5%	30°C	4.4± 5%
		0°C	15.3± 5%	40°C	3.0± 5%
		10°C	9.9± 5%	50°C	2.1± 5%

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Thermistor (Room sensor TH2)		KTEC-35-S6			
Resistance	kΩ	10°C	10.0 ± 4%	30°C	4.0 ± 4%
		15°C	7.9 ± 4%	35°C	3.3 ± 4%
		20°C	6.3 ± 4%	40°C	2.7 ± 4%
		25°C	5.0 ± 4%	50°C	1.8 ± 4%

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2-3-2. Outdoor Unit

Power Relay (PR)		G7L-2A-TUB
Coil rating		AC 200–240V, 50/60Hz
Coil resistance	Ω (at 23°C)	21 ± 15%
Contact rating		AC 220V, 25A

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Thermostat (Fan Speed Control 23S)		MQT5S-27YZJ
Switching temp.	°C	high → LOW 23.5°C ± 1.5
		low → HIGH 27.0°C $^{+0}_{-3}$
Contact rating		AC 220V, 3A

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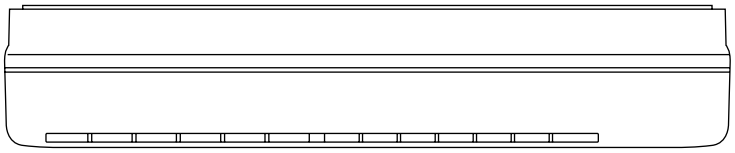
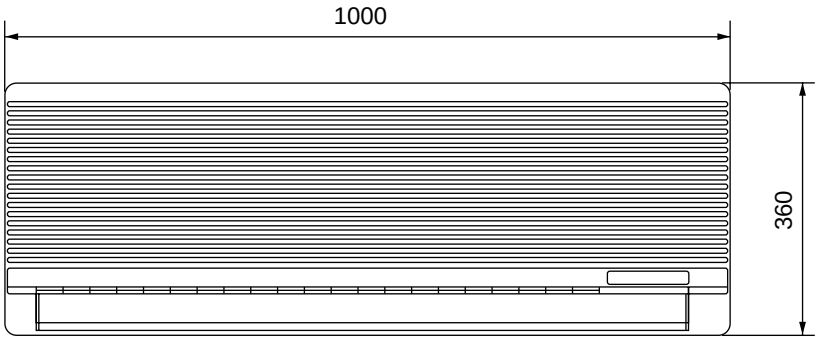
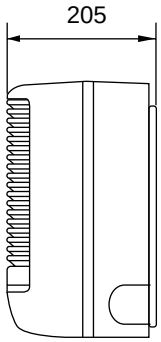
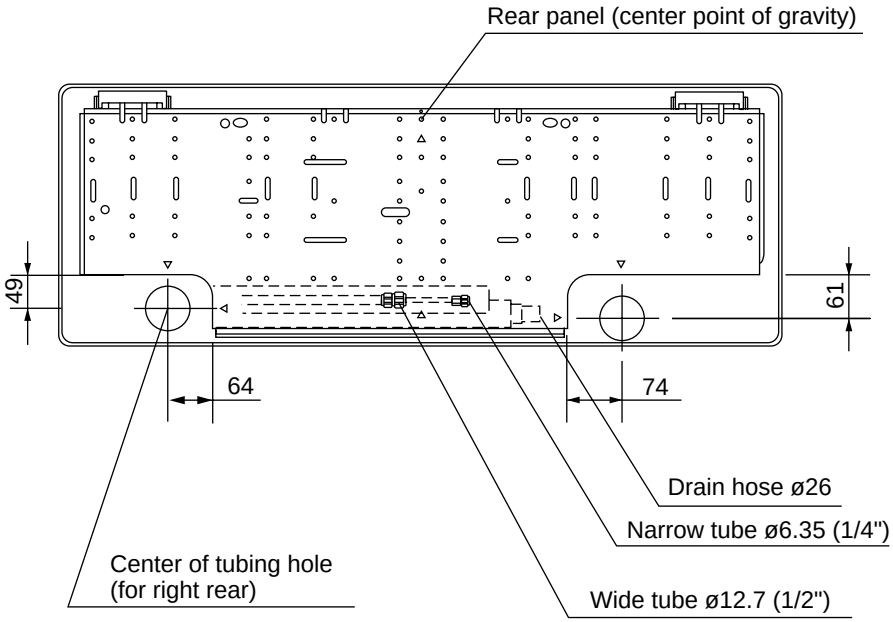
3. DIMENSIONAL DATA

Indoor Unit **AWR218CLE**

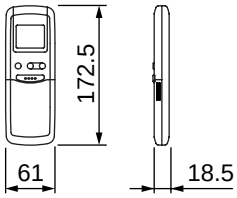






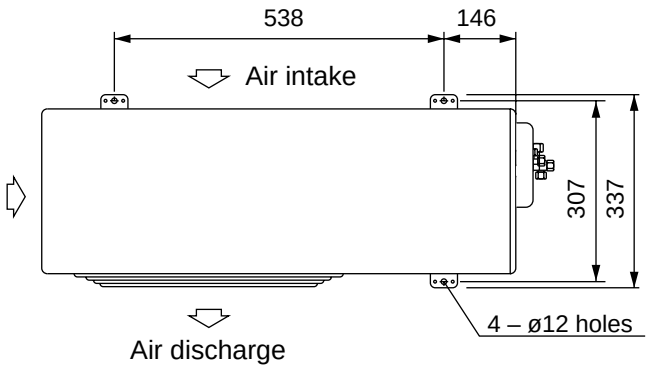


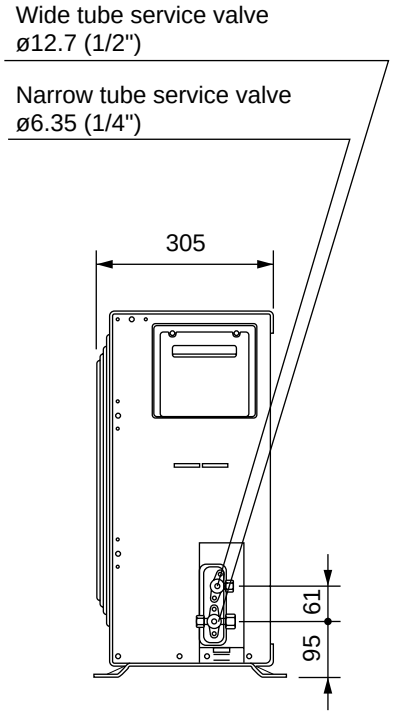
Remote control unit

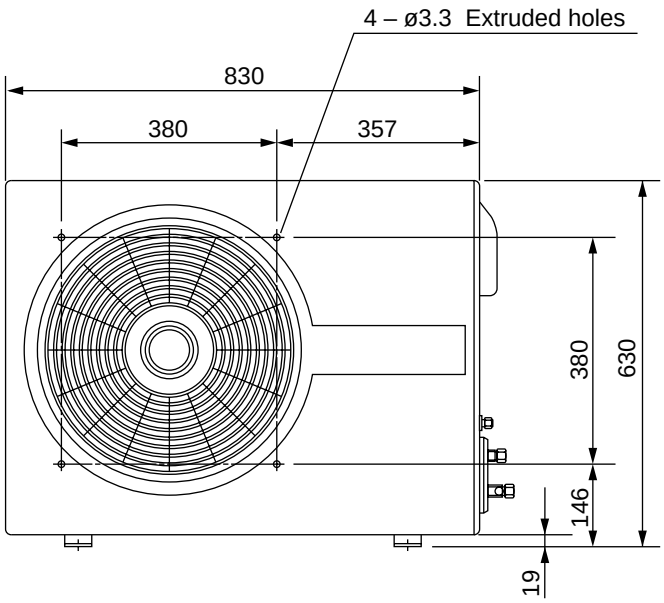


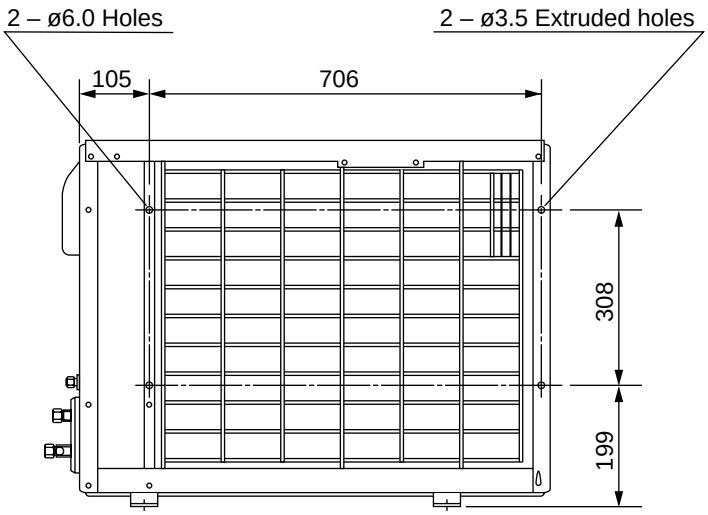
Unit : mm

Outdoor Unit **AER218SC**





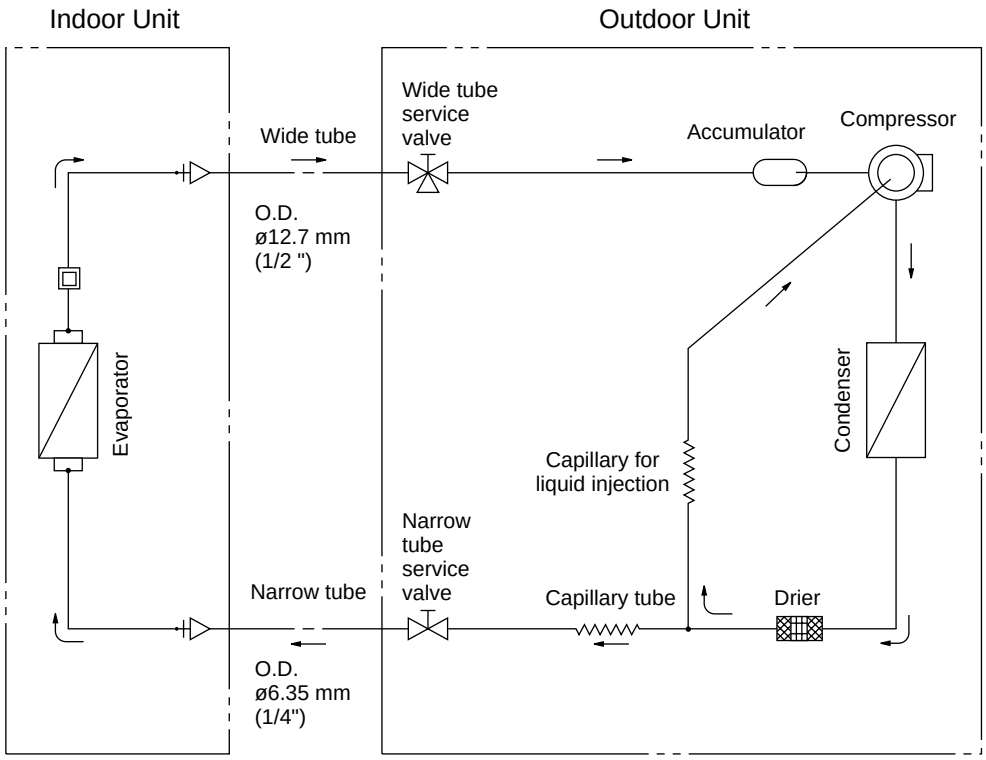




Unit : mm

4. REFRIGERANT FLOW DIAGRAM

Indoor Unit **AWR218CLE** Outdoor Unit **AER218SC**

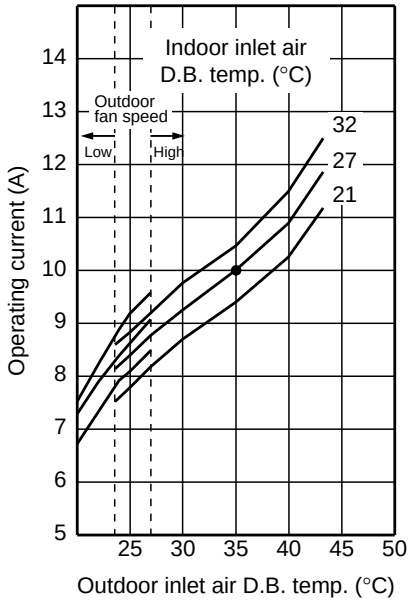


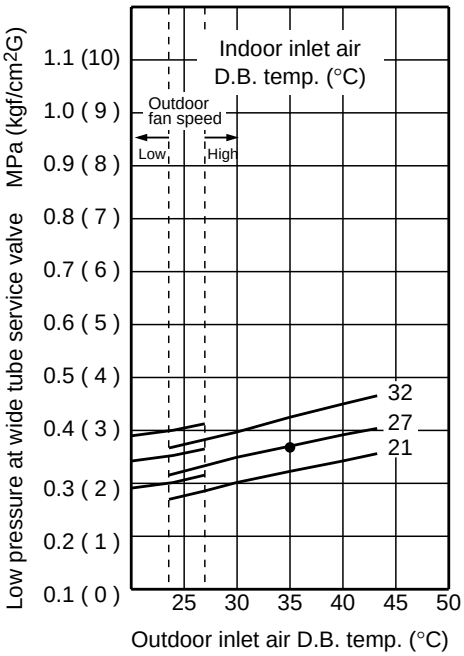
5. PERFORMANCE DATA

5-1. Performance charts

Indoor Unit **AWR218CLE**
Outdoor Unit **AER218SC**

■ Cooling Characteristics





NOTE

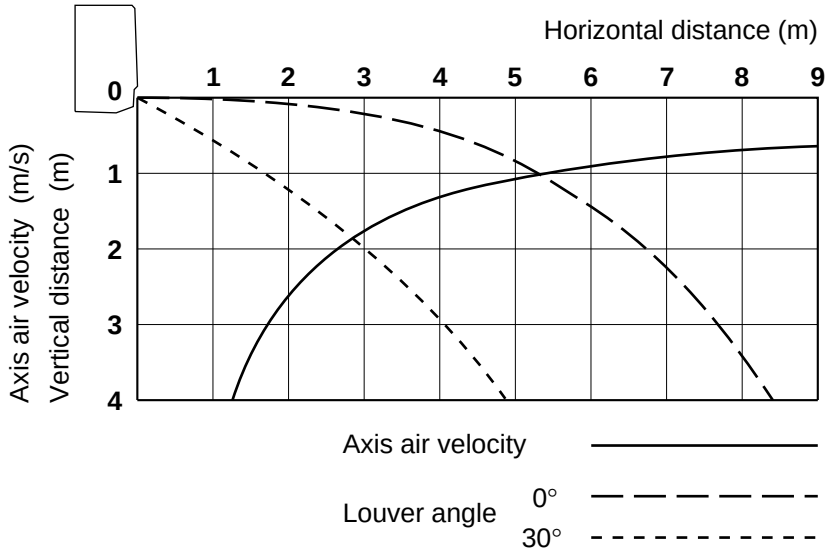
● ..... Points of Rating condition
Black dots in above charts indicate the following rating conditions.

Cooling: Indoor air temperature 27°C D.B./19°C W.B.
Outdoor air temperature 35°C D.B./24°C W.B.

5-2. Air Throw Distance Chart

Indoor Unit **AWR218CLE**

Room air temp. : 27°C
Fan speed : High



5-2. Cooling capacity

Indoor Unit **AWR218CLE**
Outdoor Unit **AER218SC**

240V Single Phase 50Hz

RATING CAPACITY 5.10 kW AIR FLOW RATE 800 m^3/h						
EVAPORATOR		CONDENSER				
ENT. TEMP. ℃		OUTDOOR AMBIENT TEMP. ℃				
W.B.	D.B.		30	35	40	45
15		TC	4.69	4.47	4.20	3.86
		CM	1.90	2.04	2.15	2.25
	21	SHC	3.17	3.05	2.92	2.75
	23	SHC	3.55	3.44	3.30	3.14
	25	SHC	3.94	3.82	3.69	3.52
	27	SHC	4.33	4.21	4.07	3.86
	29	SHC	4.69	4.47	4.20	3.86
	31	SHC	4.69	4.47	4.20	3.86
17		TC	5.03	4.79	4.51	4.15
		CM	1.95	2.09	2.21	2.31
	21	SHC	2.77	2.66	2.52	2.36
	23	SHC	3.16	3.04	2.91	2.74
	25	SHC	3.55	3.43	3.29	3.13
	27	SHC	3.93	3.81	3.68	3.51
	29	SHC	4.32	4.20	4.06	3.90
	31	SHC	4.70	4.59	4.45	4.15
19		TC	5.36	# 5.10	4.79	4.41
		CM	2.01	2.16	2.28	2.38
	21	SHC	2.36	2.24	2.11	1.94
	23	SHC	2.74	2.63	2.49	2.33
	25	SHC	3.13	3.01	2.88	2.71
	27	SHC	3.51	3.40	3.26	3.10
	29	SHC	3.90	3.78	3.65	3.48
	31	SHC	4.28	4.17	4.03	3.87
21		TC	5.68	5.41	5.08	4.68
		CM	2.07	2.22	2.34	2.45
	23	SHC	2.32	2.21	2.07	1.91
	25	SHC	2.70	2.59	2.46	2.30
	27	SHC	3.09	2.98	2.84	2.68
	29	SHC	3.48	3.36	3.23	3.07
	31	SHC	3.86	3.75	3.61	3.45
23		TC	6.01	5.68	5.31	4.94
		CM	2.12	2.28	2.41	2.52
	25	SHC	2.25	2.12	1.99	1.85
	27	SHC	2.64	2.51	2.37	2.24
	29	SHC	3.03	2.90	2.76	2.62
	31	SHC	3.41	3.28	3.14	3.01

TC : Total Cooling Capacity (kW)
SHC : Sensible Heat Capacity (kW)
CM : Compressor Input (kW)

Rating conditions (#Mark) are
Outdoor Ambient Temp. 35℃ D.B.
Indoor Unit Entering Air Temp. 27℃ D.B. / 19℃ W.B.

6. ELECTRICAL DATA

6-1. Electrical Characteristics

Indoor Unit **AWR218CLE**
Outdoor Unit **AER218SC**

			Indoor Unit	Outdoor Unit		Complete Unit
			Fan Motor	Fan Motor	Compressor	
Performance at			220 / 240V Single phase 50Hz			
Rating Conditions	Running Amps.	A	0.28 / 0.30	0.40 / 0.42	9.42 / 9.29	10.1 / 10.0
	Power Input	kW	0.062 / 0.072	0.082 / 0.091	2.056 / 2.157	2.20 / 2.32
Full Load Conditions	Running Amps.	A	0.28 / 0.30	0.40 / 0.42	11.32 / 10.79	12.0 / 11.5
	Power Input	kW	0.062 / 0.072	0.082 / 0.091	2.486 / 2.517	2.63 / 2.68

Rating Conditions : Indoor Air Temperature 27℃ D.B. / 19℃ W.B.
Outdoor Air Temperature 35℃ D.B.
Full Load Conditions : Indoor Air Temperature 32℃ D.B. / 23℃ W.B.
Outdoor Air Temperature 43℃ D.B.

6-2. Electric Wiring Diagrams

Indoor Unit **AWR218CLE**
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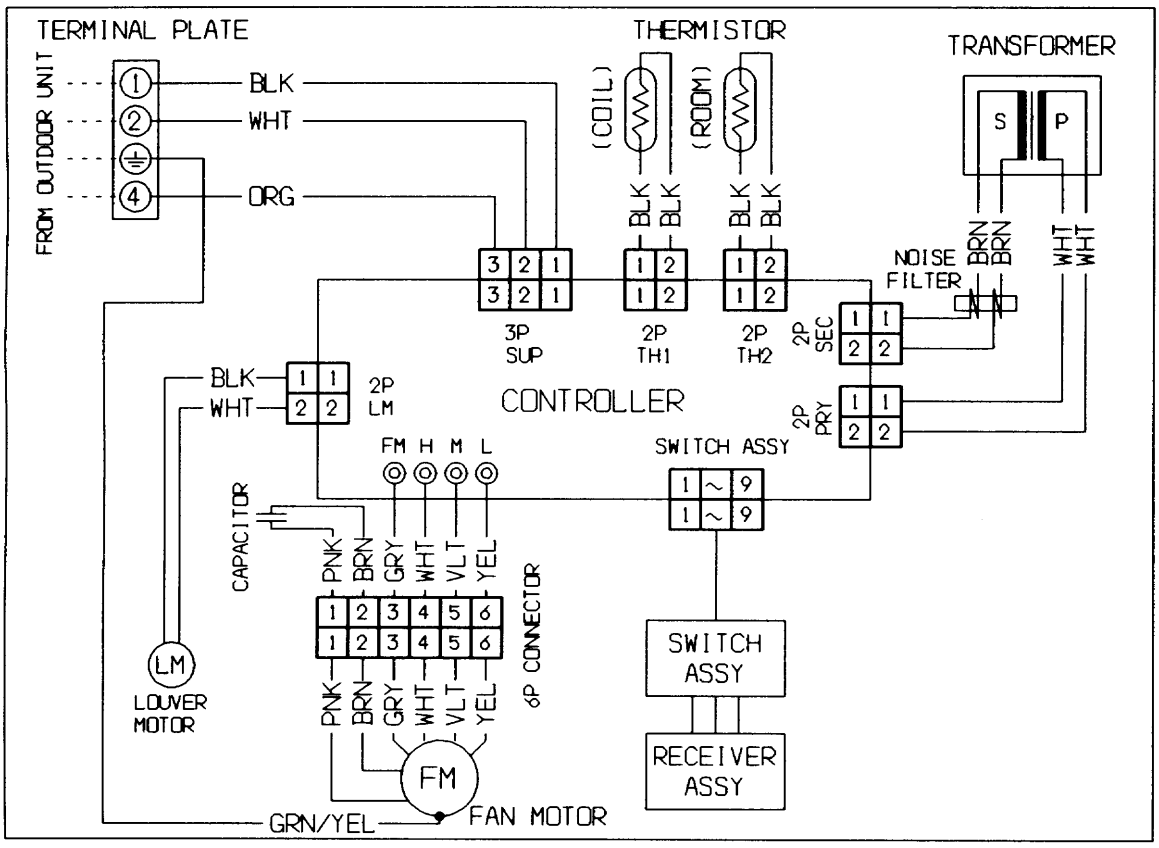
WARNING ***To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.***



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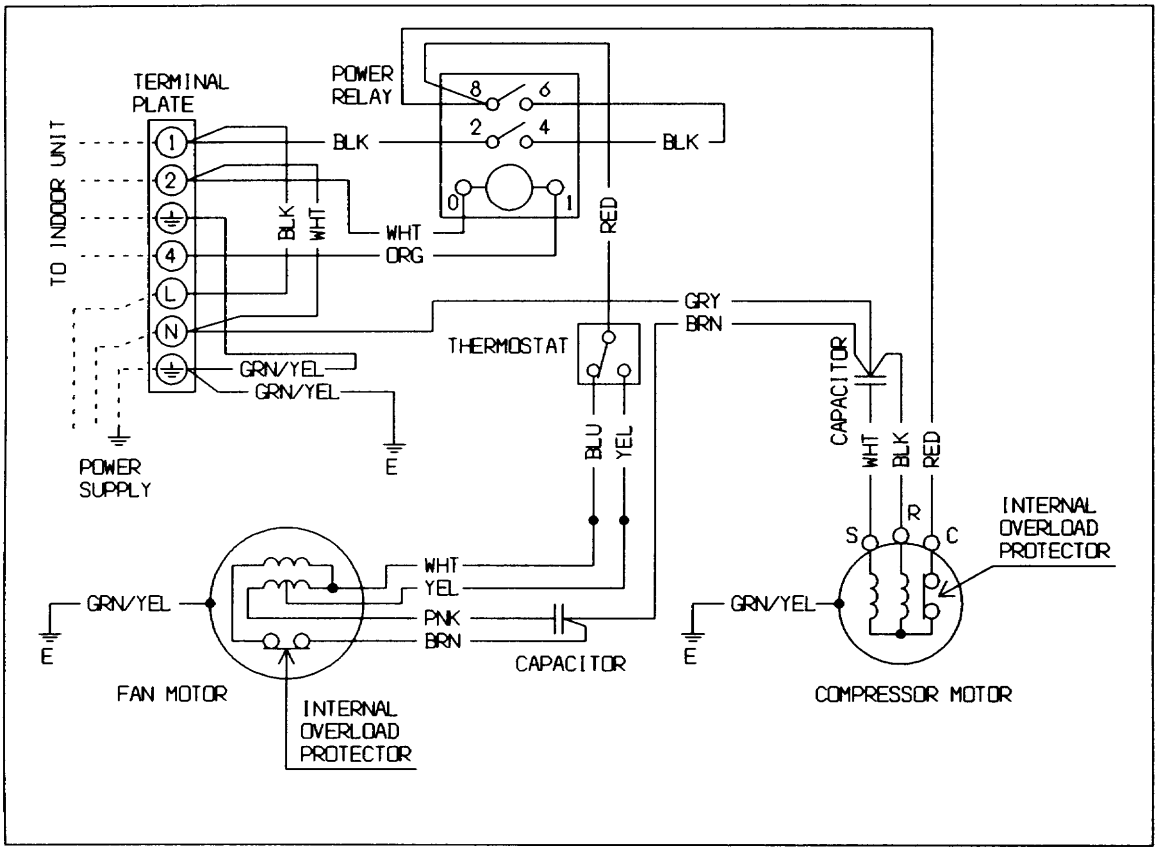
Outdoor Unit **AER218SC**

WARNING ***To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.***



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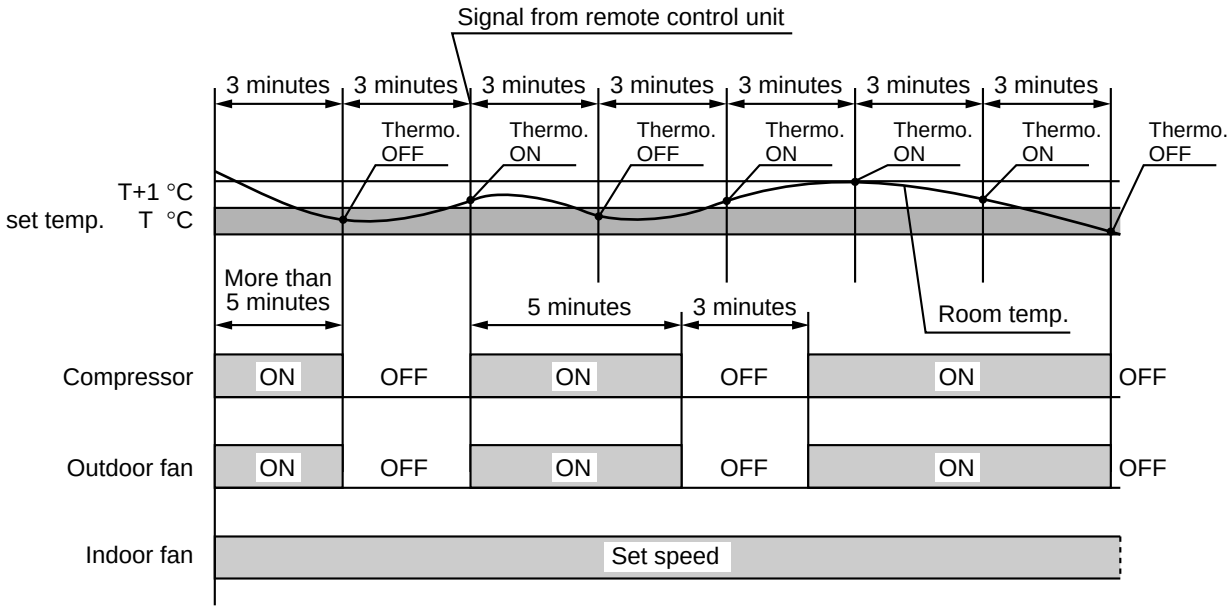
7. FUNCTION

7-1. Room Temperature Control

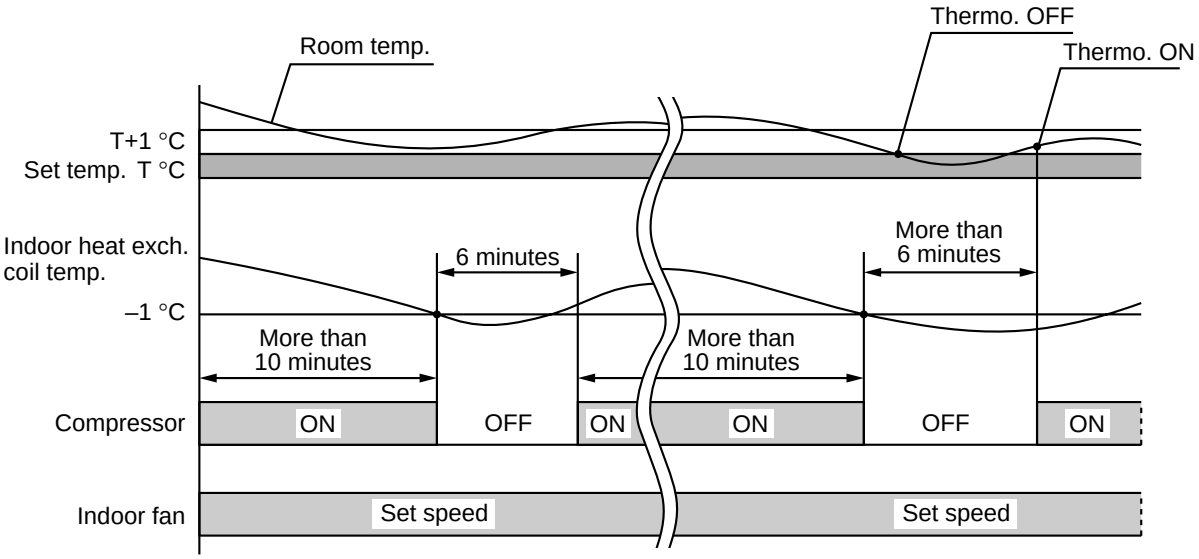
- Room temperature control is obtained by cycling the compressor ON and OFF under control of the room temperature sensor in the remote control unit.
- The room temperature (and other information) is transmitted every 3 minutes by the remote control unit to the controller in the indoor unit.



- 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 after 5 minutes or more 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

7-2. Freeze Prevention

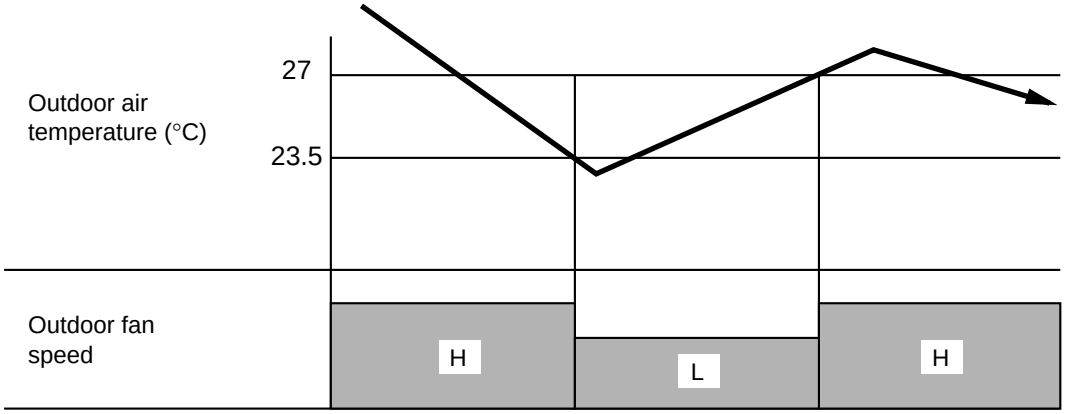
- This function prevents freezing of the indoor heat exchange coil.
- When the compressor has been running for 10 minutes or more and the temperature of the indoor heat exchange coil falls below –1°C, the control circuit stops the compressor for at least 6 minutes. The compressor does not start again until the temperature rises above 8°C or 6 minutes has elapsed.

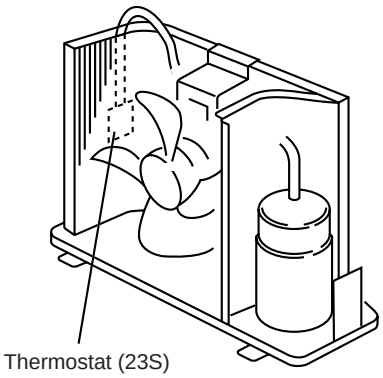


7-3. Outdoor Fan Speed Control

7-3-1. Switching to either HIGH or LOW speed

- To optimize performance of the air conditioner, the outdoor fan speed is switched automatically either to HIGH or LOW speed according to the outdoor temperature detected by the thermostat (23S).
- If the outdoor air temperature falls below 23.5°C, the fan speed switches to LOW.
- If the outdoor air temperature rises above 27°C, the fan speed switches to HIGH.





(AER218SC)

8. TROUBLESHOOTING

8-1. Check before and after troubleshooting

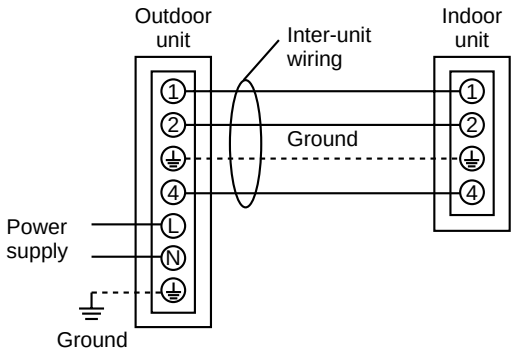
WARNING

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

8-1-1. Check power supply wiring.

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

Power supply:
50Hz,single-phase
220-240V



8-1-2. Check inter-unit wiring.

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

8-1-3. Check power supply.

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

8-1-4. 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.

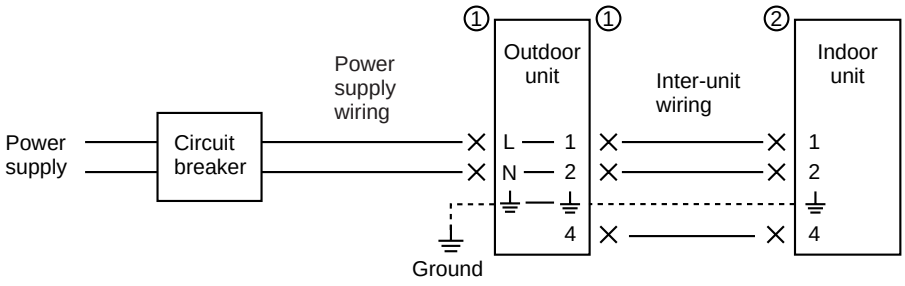
8-2. Air conditioner does not operate.

8-2-1. Circuit breaker trips (or fuse blows).

A. When the circuit breaker is set to ON, it is tripped soon. (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 both power supply wires and 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.
- 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.

- Check capacity of circuit breaker.

  Capacity of circuit breaker is suitable.

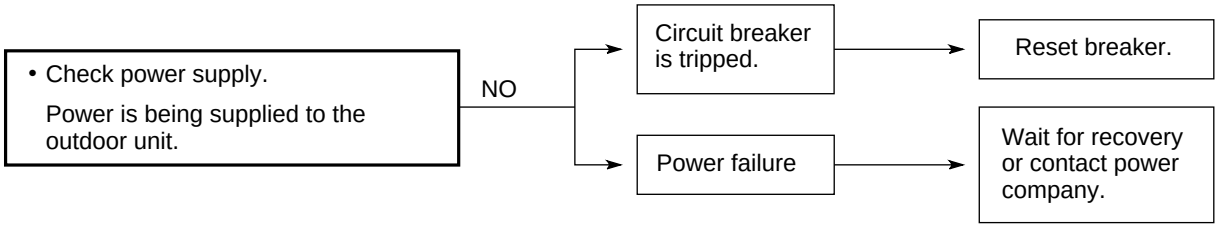
NO → Replace with suitable one (larger capacity).

- Measure resistance of compressor motor winding.

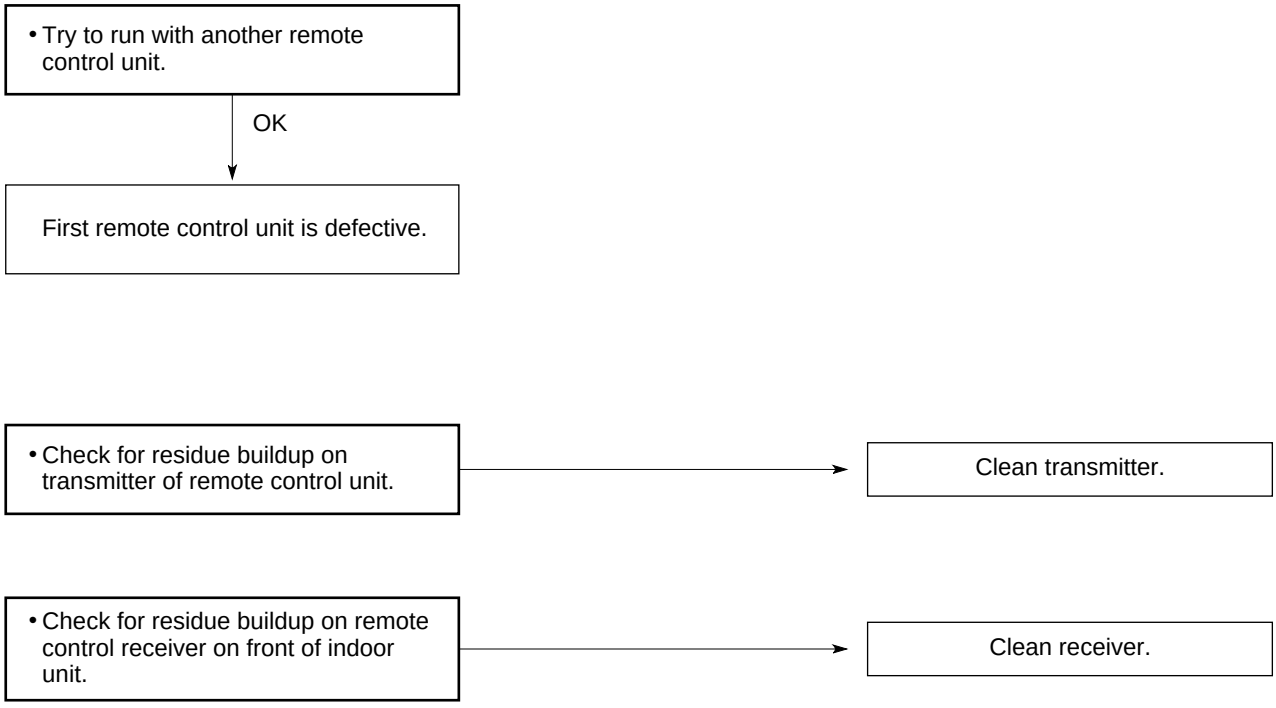
- Measure resistance of outdoor fan motor winding.

8-2-2. Neither indoor nor outdoor unit runs.

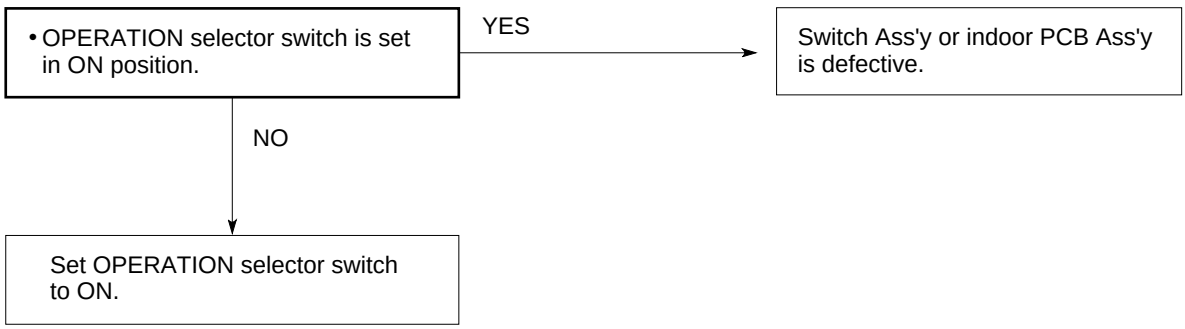
A. Power is not supplied.



B. Check remote control unit.



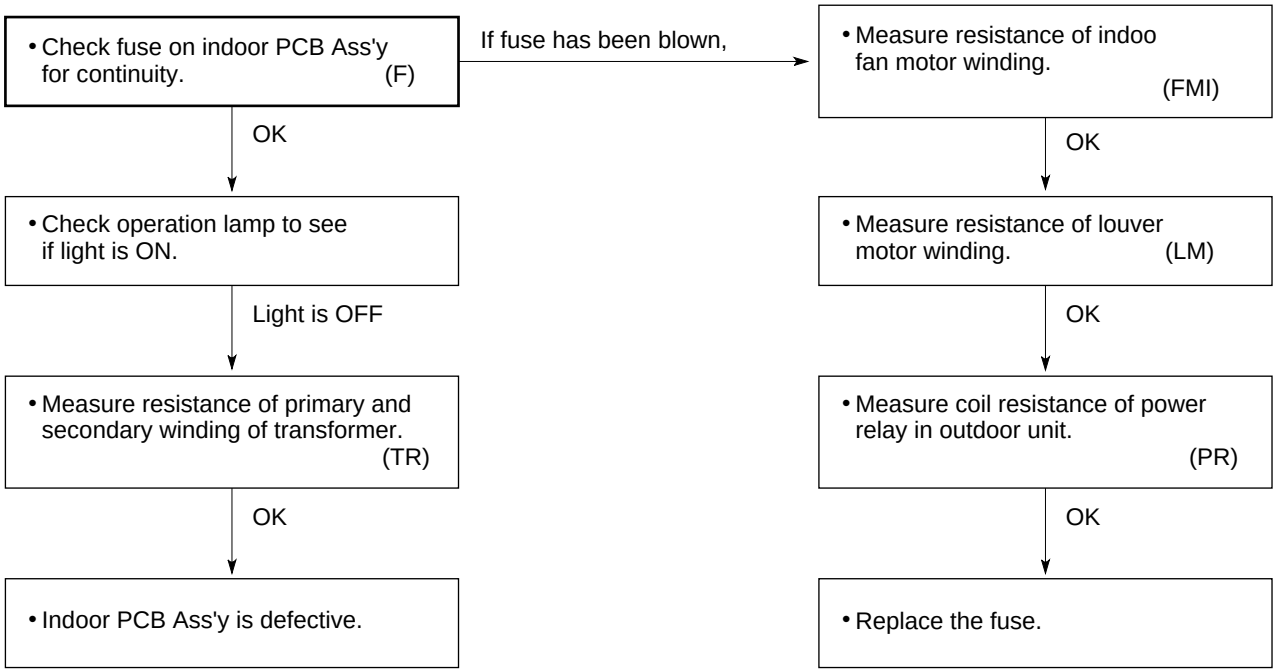
C. Check "OPERATION selector" switch in the indoor unit.



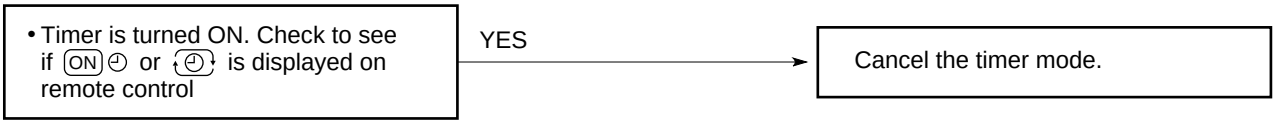
D. Check transformer in indoor unit.

- Measure resistance of primary and secondary winding. (TR)

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

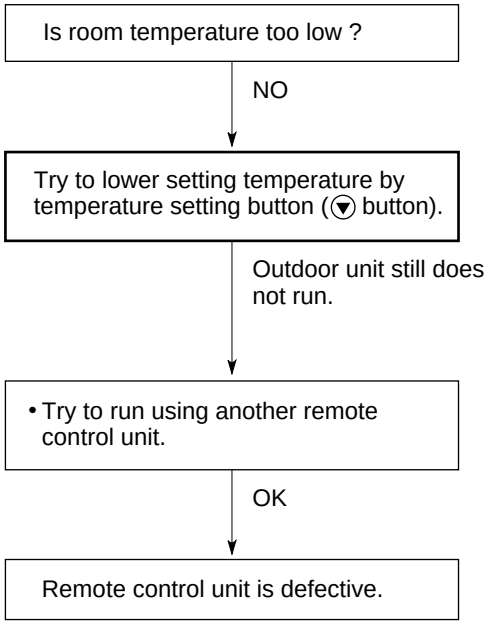


F. Check TIMER on the remote control unit.

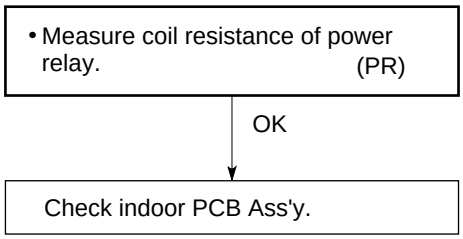


8-2-3. Only outdoor unit does not run.

A. Check setting temperature.

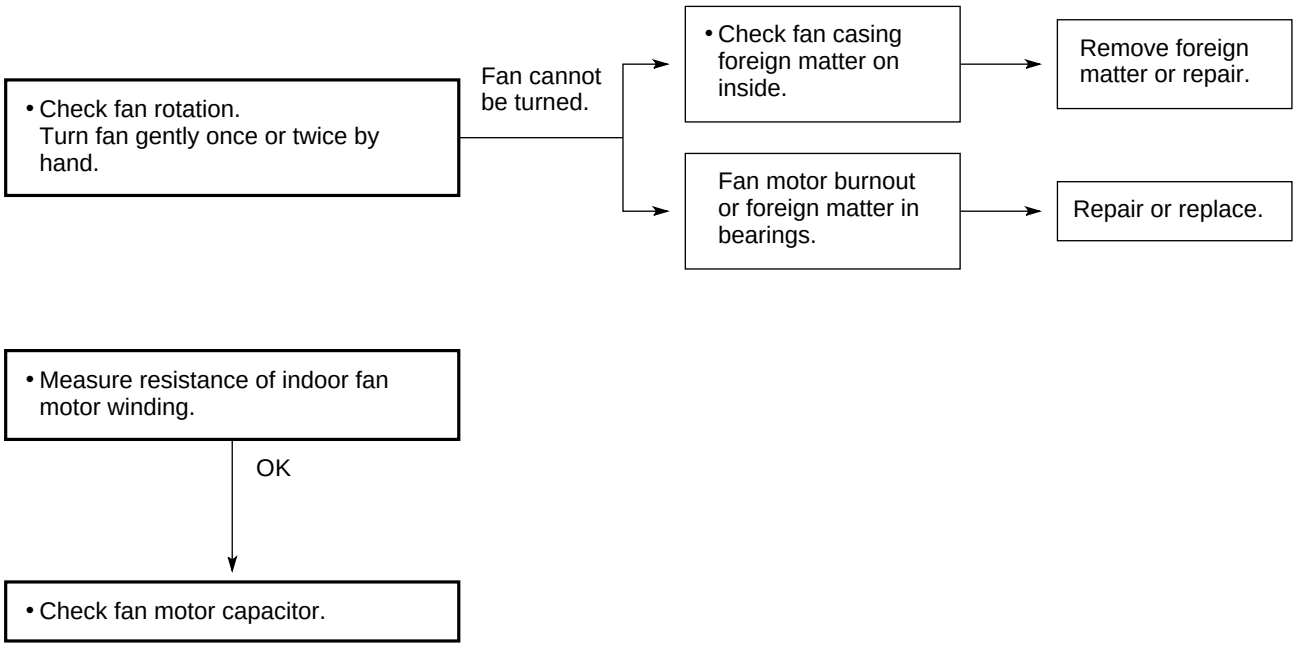


B. Check power relay in outdoor unit.

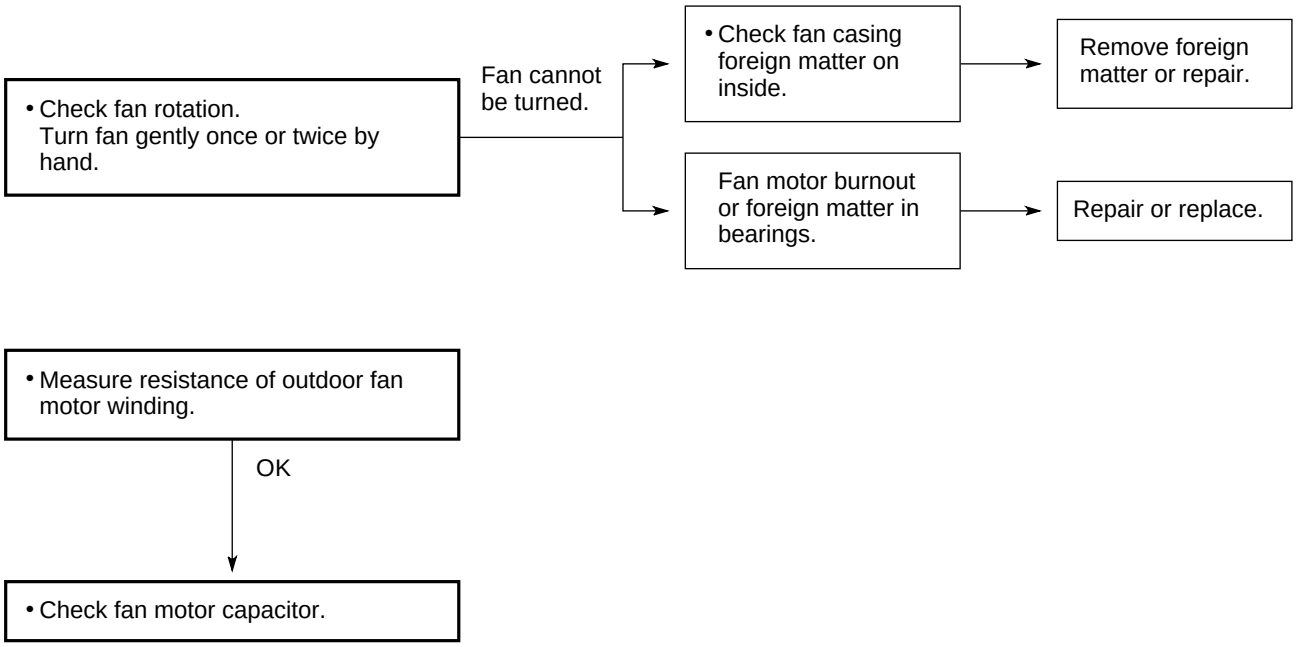


8-3. Some part of air conditioner does not operate.

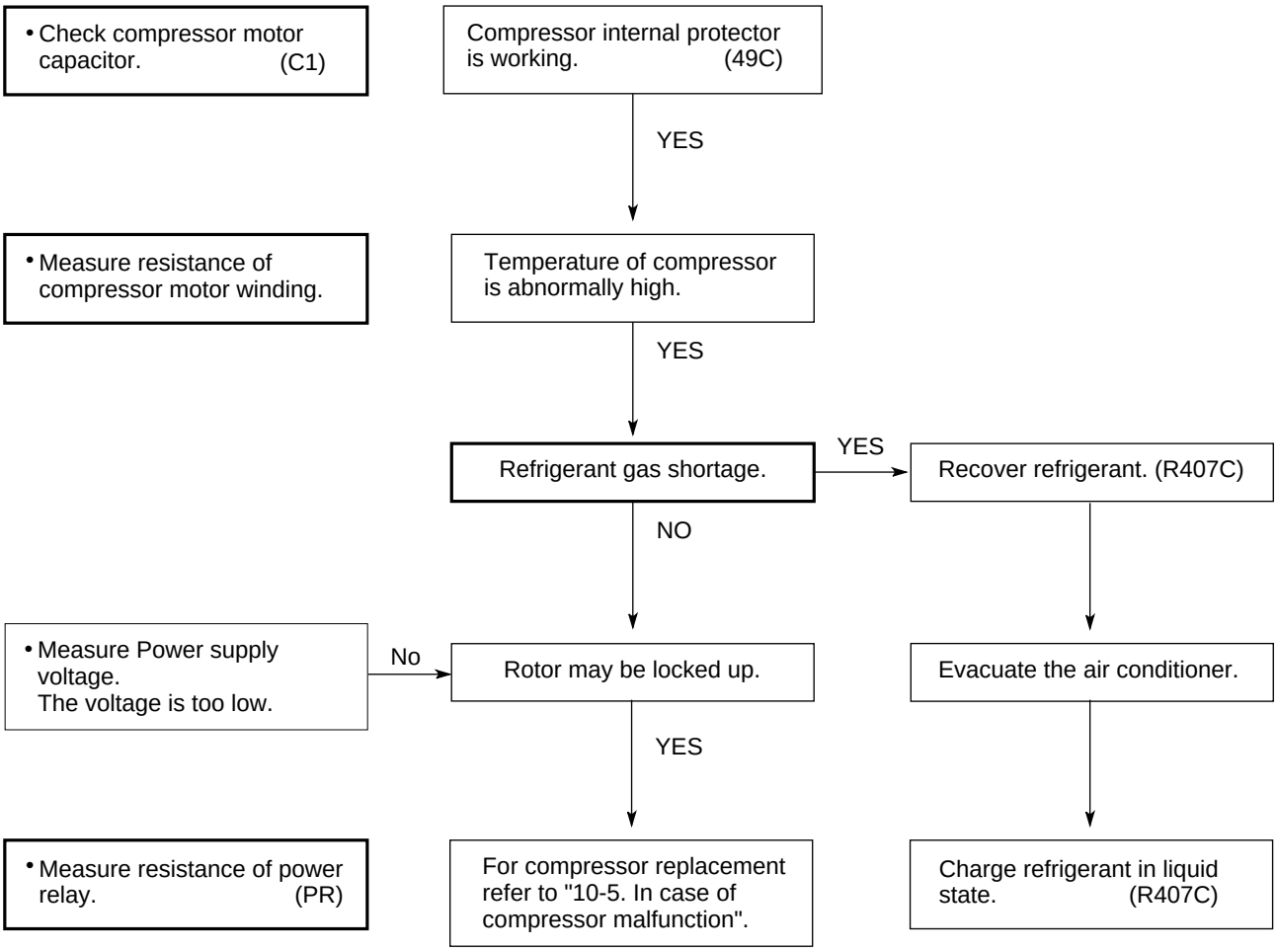
8-3-1. Only indoor fan does not run.



8-3-2. Only outdoor fan does not run.



8-3-3. Only compressor does not run.



CAUTION

In case of leakage, do not add refrigerant. The unit must be vacuumed and recharged. This is because composition of refrigerant in the unit has been changed due to leakage. See "9-6. In case refrigerant is leaking".

8-3-4. Only louver motor does not run.

• Measure resistance of louver motor winding.

8-3-5. Function of outdoor fan speed control does not work properly.

.

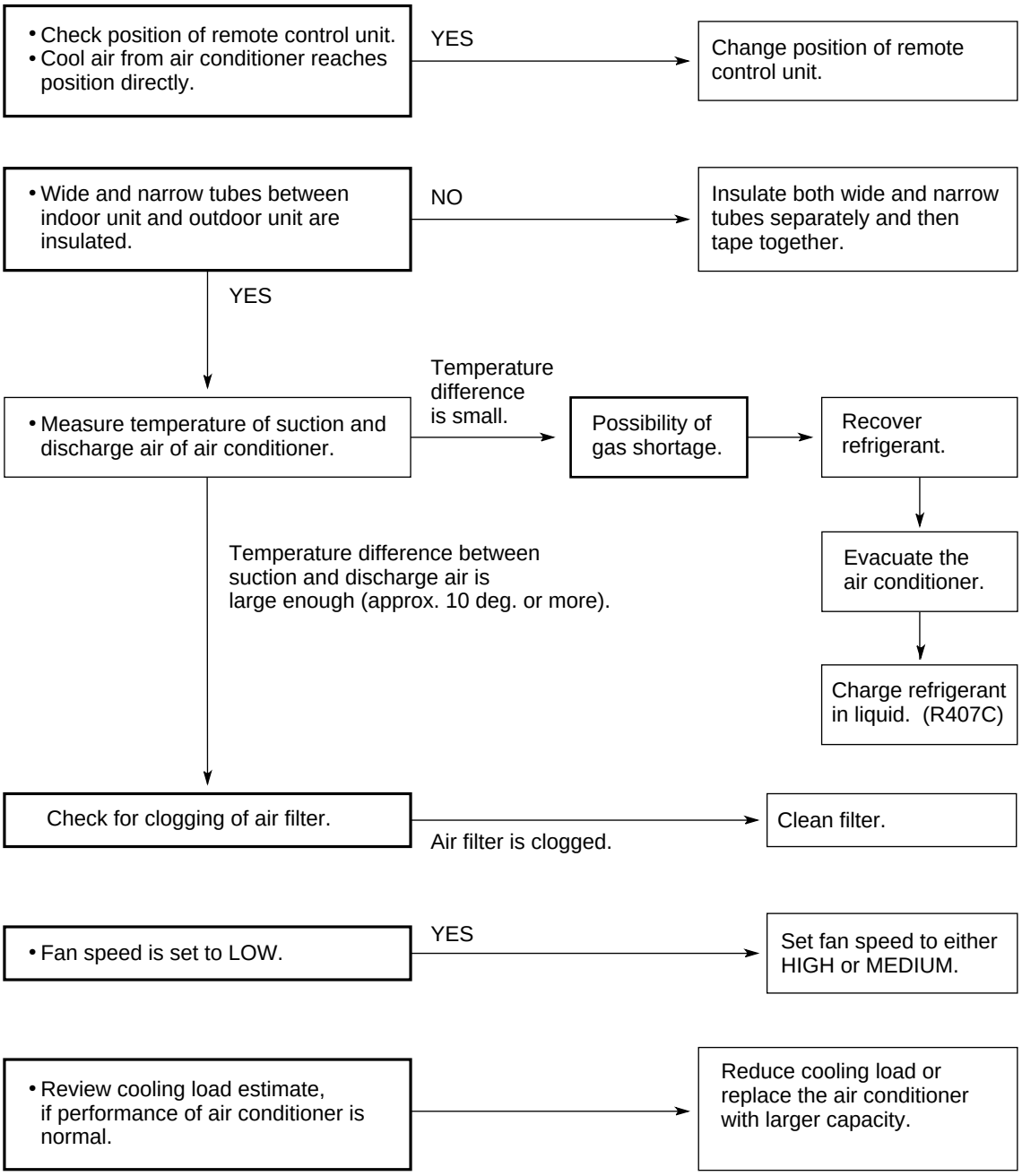
• Check thermostat in outdoor unit. (23S)

. . .

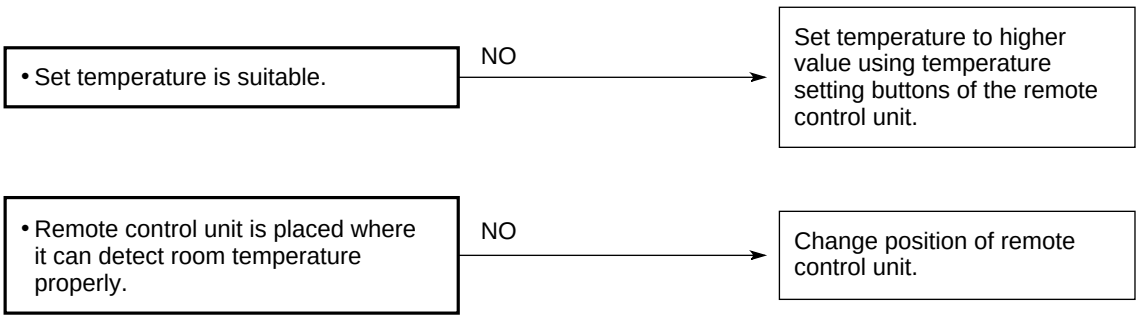
Refer to 7-3 "Outdoor Fan Speed Control."

8-4. Air conditioner operates, but abnormalities are observed.

8-4-1. Poor cooling.



8-4-2. Excessive cooling.



8-5. If a sensor is defective.

8-5-1. Indoor coil temp. thermistor (TH1) is defective.

A. Open

When thermistor opens, the air conditioner will be in the following conditions as the controller tries to detect extremely low indoor coil temperature.

In Cooling mode: Function of freeze prevention continues to work. That is, the controller turns both compressor and outdoor fan motor periodically ON and OFF for several minutes. (Refer to "7-2. Freeze Prevention")

B. Short

When thermistor is short, the air conditioner will be in the following conditions as the controller tries to detect extremely high indoor coil temperature.

In Cooling mode: Function of freeze prevention will not work even when the frost builds up on indoor heat exchanger coil

8-5-2. Room temp. thermistor (TH2) is defective.

A. Open

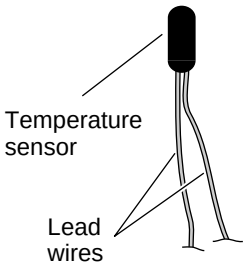
When thermistor opens, the air conditioner will be in the following conditions as the controller tries to detect extremely low room temperature.

In Cooling mode: The air conditioner soon stops and will not start again. (Thermo.OFF) Neither outdoor fan nor compressor runs.

B. Short

When thermistor is short, the air conditioner will be in the following conditions as the controller tries to detect extremely high room temperature.

In Cooling mode: The air conditioner continues to operate (Thermo.ON). Both the outdoor fan and compressor do not stop. As a result, the room becomes too cold.



Thermistor Structure

NOTE

Definition of Open or Short Circuit of Sensor (Thermistor)

Open ... A lead wire is broken or disconnected or the circuit inside the temperature sensor is open .

Short ... The protective cover of a lead wire has been damaged, and the exposed wire is touching another metal part, or both lead wires have become exposed and are touching each other. Alternatively, the circuit inside the temperature sensor is closed.

9. REFRIGERANT R407C : SPECIAL PRECAUTIONS WHEN SERVICING UNIT

9-1. Characteristics of new refrigerant R407C

9-1-1. What is new refrigerant R407C

R407C is a new refrigerant that contains three types of non-azeotropy-type mixed refrigerant which does not adversely affect the Earth's ozone layer. Its refrigeration capacity and energy efficiency are about the same level as the conventional refrigerant R22

9-1-2. Components (mixing proportions)

HFC32 (23%) / HFC125 (25%) / HFC134a (52%)

9-1-3. Characteristics

- Less toxic, more chemically stable refrigerant.
- Composition of refrigerant R407C changes whether it is in gaseous phase or liquid phase. Thus, when there is a refrigerant leak the basic performance of the air conditioner may be degraded because of a change in composition of the remaining refrigerant. ***Therefore, do not add new refrigerant.*** Instead, recover the remaining refrigerant with the refrigerant recovery unit. Then, after evacuation, totally recharge the specified amount of refrigerant with the new refrigerant at its normal mixed composition state (liquid phase).
- When refrigerant R407C is used, the composition will differ depending on whether it is in gaseous or liquid phase, and the basic performance of the air conditioner will be degraded if it is charged while the refrigerant is in gaseous state. ***Thus, always charge the refrigerant while it is in the liquid phase.***

- **Ether-type oil is used for the compressor oil for R407C-type units, which is different from the mineral oil used for R22. Thus more attention to moisture prevention and faster replacement work compared with conventional models are required.**

9-2. Checklist before servicing

- **Tubing precautions**
  Refrigerant R407C is more easily affected by dust or moisture compared with R22, thus be sure to temporarily cover the ends of the tubing with caps or tape prior to installation.

- **No addition of compressor oil for R407C**
  No additional charge of compressor oil is permitted.

- **No use of refrigerant other than R407C**
  Never use a refrigerant other than R407C.

- **If refrigerant R407C is exposed to fire**
  Through welding, etc., toxic gas may be released when R407C refrigerant is exposed to fire. Therefore, be sure to provide ample ventilation during installation work.

- **Caution in case of R407C leak**
  Check for possible leak points with the special leak detector for R407C. If a leak occurs inside the room, immediately provide thorough ventilation.

9-3. Tools specifically for R407C

● For servicing, use the following tools for R407C

Tool Distinction	Tool Name
Tools specifically for R407C	• Gauge manifold • Charging hose • Gas leak detector • Refrigerant cylinder • Charging cylinder • Refrigerant recovery unit • Vacuum pump with anti-reverse flow **(✻1)** (Solenoid valve-installed type, which prevents oil from flowing back into the unit when the power is off, is recommended.) • Vacuum pump **(✻2)** ..... can be used if the following adapter is attached. • Vacuum pump adapter (reverse-flow prevention adapter) **(✻3)**. (Solenoid valve-installed adapter attached to a conventional vacuum pump.) • Electronic scale for charging refrigerant • Flare tool
Tools which can be commonly used for R22 and R407C	• Bender • Torque wrench • Cutter, Reamer • Welding machine, nitrogen gas cylinder

CAUTION

- **The above tools specifically for R407C must not be used for R22. Doing so will cause malfunction of the unit.**
- **For the above vacuum pump (✻1, ✻2) and vacuum pump adapter (✻3) , those for R22-type units can be used for R407C-type. However, they must be used exclusively for R407C and never alternately with R22.**

9-4. For tubing installation procedures

- When the tubes are connected, ***always apply HAB oil on the flare portions to improve the sealing of tubing.***

The following is the **HAB oil** generally used:
Esso: ZERICE S32

NOTE For details on tubing installation procedures, refer to the installation manuals attached to the indoor unit and outdoor unit.

9-5. In case of compressor malfunction

CAUTION

- **Should the compressor malfunction, be sure to replace compressor as quickly as possible.**
- **Use only the tools indicated exclusively for R407C. → See "9-3. Tools specifically for R407C".**

9-5-1.Procedure for replacing compressor

(1) **Recovering refrigerant**

- Any remaining refrigerant inside the unit should not be released to the atmosphere, but recovered using the refrigerant recovery unit for R407C.
- Do not reuse the recovered refrigerant, since will contain impurities.

(2) **Replacing compressor**

- Soon after removing pinched pipes of both discharge and suction tubes of the new compressor, replace it quickly.

(3) **Checking for sealing**

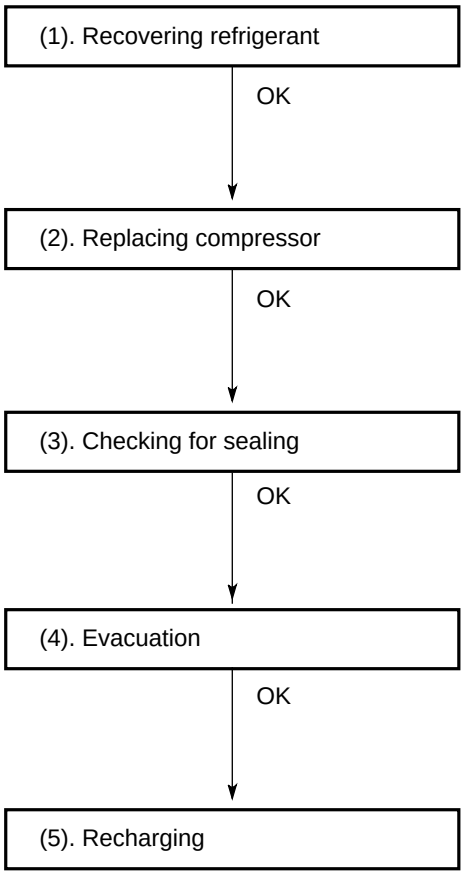
- Use nitrogen gas for the pressurized gas, and never use a refrigerant other than R407C. Also do not use oxygen or any flammable gas.

(4) **Evacuation**

- ***Use a solenoid valve-installed vacuum pump*** so that even if power is cut off in the middle of evacuation of air due to a power interruption, the valve will prevent the pump oil from flowing back.
- The equipment may be damaged if moisture remains in the tubing, thus carry out the evacuation thoroughly.
- When using a vacuum pump with exhaust air volume more than 25L/min. and ultimate vacuum pressure rate of 0.05Torr:

Standard time of evacuation

Length of tubing	Less than 10 m	More than 10 m
Time	More than 10 min.	More than 15 min.



(5) **Recharging**

- ***Be sure to charge the specified amount of refrigerant in liquid state*** using the service port of wide tube service valve. The proper amount is listed on the unit's nameplate.

  When the entire amount cannot be charged all at once, charge gradually while operating the unit in Cooling Operation.

CAUTION

- **Never charge a large amount of liquid refrigerant at once to the unit. This may cause damage to the compressor.**

- When charged with a refrigerant cylinder, use the electronic scale for charging refrigerant. In this case, if the volume of refrigerant in the cylinder becomes less than 20% of the fully-charged amount, the composition of the refrigerant starts to change. Thus, ***do not use the refrigerant if the amount in the refrigerant cylinder is less than 20%.***

  Also, charge the minimum necessary amount to the cylinder before using it for charging the air conditioning unit.

  Example:
  In case of charging refrigerant to a unit requiring 0.76Kg using a capacity of 10Kg-cylinder, the minimum necessary amount for the cylinder is:

  0.76 + 10 x 0.20 = 2.76Kg

  For the remaining refrigerant, refer to the instructions of the refrigerant manufacturer.

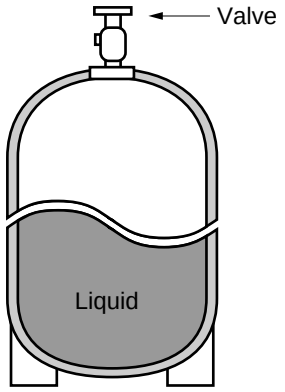
- If using a charging cylinder, transfer the specified amount of liquid refrigerant from the refrigerant cylinder to the charging cylinder.

  Prepare an evacuated charging cylinder beforehand.

CAUTION

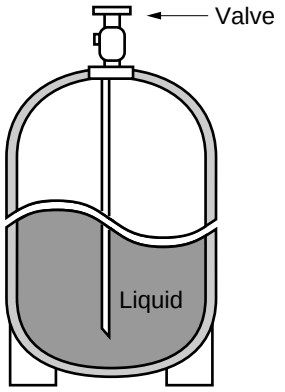
- **To prevent the composition of R407C from changing, never bleed the refrigerant gas into the atmosphere while transferring the refrigerant. (Fig. 3)**

Do not use the refrigerant if the amount in the charging cylinder is less than 20%.



Single valve
Charge the liquid refrigerant with the cylinder in the up-side-down position.

Fig. 1



Single valve (with siphon tube)
Charge with the cylinder in the normal position.

Fig. 2

Configurations and characteristics of cylinders

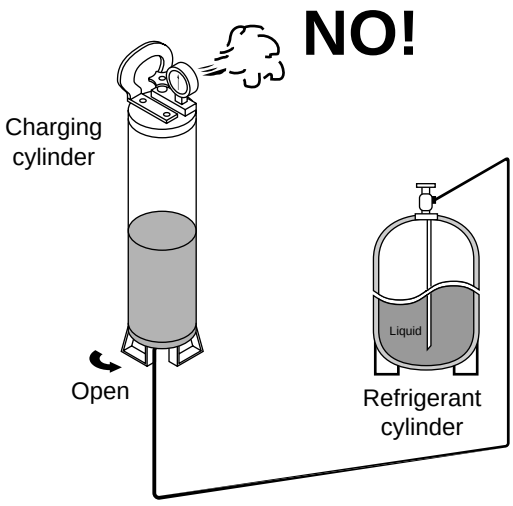


Fig.3

9-6. In case refrigerant is leaking

CAUTION

● **Never attempt to charge additional refrigerant when refrigerant has been leaking from the unit. Follow the procedure described below to locate points of leaks and carry out repairs, then recharge the refrigerant.**

(1) **Detecting Leaks**

• Use the detector for R407C to locate refrigerant leak points.

(2) **Recovering refrigerant**

• Never release the gas to the atmosphere, recover residual refrigerant using the refrigerant recovery unit for R407C, instead.

• Do not reuse the recovered refrigerant because its composition will have been altered.

(3) **Welding leaking points**

• Confirm again that no residual refrigerant exists in the unit before starting welding.

• Weld securely using flux and wax for R407C.

• Prevent oxide film from forming inside the tubes utilizing substitution with nitrogen (N2) in the refrigerant circuit of the unit. Leave ends of tubes open during welding.

(4) **Checking for sealing**

• Use nitrogen gas for the pressurized gas, and never use a refrigerant other than R407C. Also do not use oxygen or any flammable gas.

(5) **Evacuation**

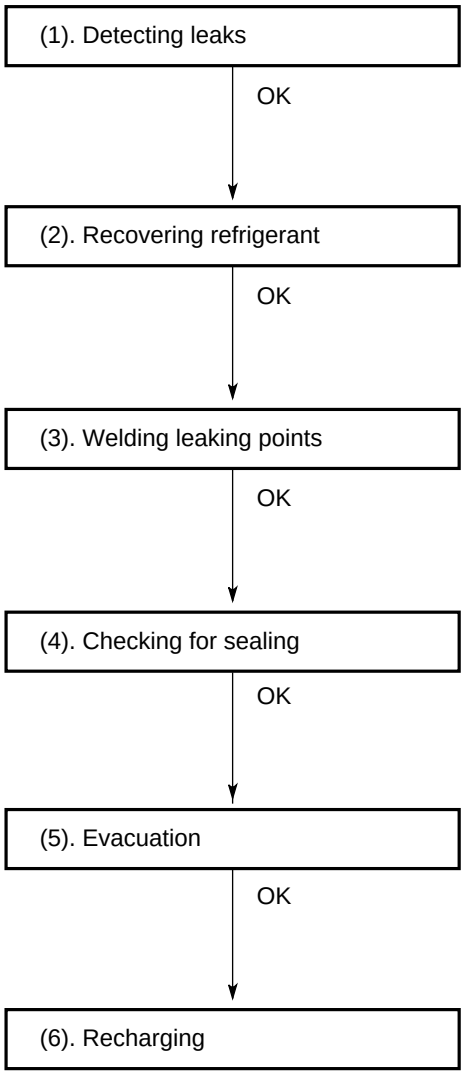
• ***Use a solenoid valve-installed vacuum pump*** so that even if power is cut off in the middle of evacuation of air due to a power interruption, the valve will prevent the pump oil from flowing back.

• The equipment may be damaged if moisture remains in the tubing, thus carry out the evacuation thoroughly.

• When using a vacuum pump with exhaust air volume more than 25L/min. and ultimate vacuum pressure rate of 0.05Torr:

Standard time of evacuation

Length of tubing	Less than 10 m	More than 10 m
Time	More than 10 min.	More than 15 min.



(6) **Recharging**

• ***Be sure to charge the specified amount of refrigerant in liquid state*** using the service port of wide tube service valve. The proper amount is listed on the unit's nameplate.

When the entire amount cannot be charged all at once, charge gradually while operating the unit in Cooling Operation.

CAUTION

● **Never charge a large amount of liquid refrigerant at once to the unit. This may cause damage to the compressor.**

• When charged with a refrigerant cylinder, use the electronic scale for charging refrigerant. In this case, if the volume of refrigerant in the cylinder becomes less than 20% of the fully-charged amount, the composition of the refrigerant starts to change. Thus, ***do not use the refrigerant if the amount in the refrigerant cylinder is less than 20%.***

Also, charge the minimum necessary amount to the cylinder before using it for charging the air conditioning unit.

Example:
In case of charging refrigerant to a unit requiring 0.76Kg using a capacity of 10Kg-cylinder, the minimum necessary amount for the cylinder is:

0.76 + 10 x 0.20 = 2.76Kg

For the remaining refrigerant, refer to the instructions of the refrigerant manufacturer.

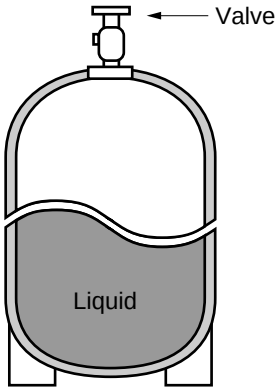
• If using a charging cylinder, transfer the specified amount of liquid refrigerant from the refrigerant cylinder to the charging cylinder.

Prepare an evacuated charging cylinder beforehand.

CAUTION

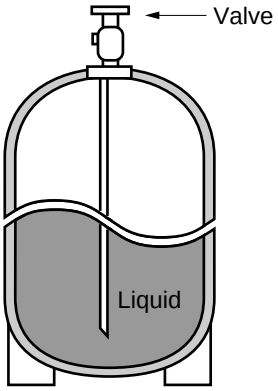
● **To prevent the composition of R407C from changing, never bleed the refrigerant gas into the atmosphere while transferring the refrigerant. (Fig. 6)**

Do not use the refrigerant if the amount in the charging cylinder is less than 20%.



Single valve
Charge the liquid refrigerant with the cylinder in the up-side-down position.

Fig. 4



Single valve (with siphon tube)
Charge with the cylinder in the normal position.

Fig. 5

Configurations and characteristics of cylinders

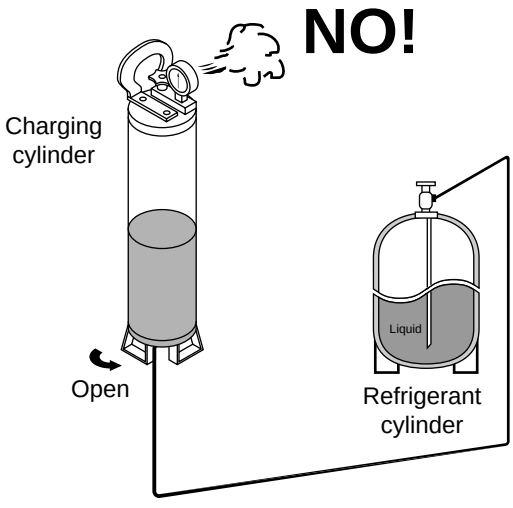


Fig. 6

9-7. Charging additional refrigerant

10-7-1.When tubes are extended

• Observe the proper amount of refrigerant as stated in this service manual or the installation manual that came with the indoor unit. ***Charge additional refrigerant in liquid state.***

CAUTION

● **Never charge additional refrigerant if refrigerant is leaking from the unit. Follow instructions given in "9-6. In case refrigerant is leaking" and completely carry out repairs. Only then should you recharge the refrigerant.**

9-8. Retro-fitting existing systems

9-8-1 Use of existing units

• ***Never use new refrigerant R407C for existing units which use R22.*** This will cause the air conditioner to operate improperly and may result in a hazardous condition.

9-8-2 Use of existing tubing

• If replacing an older unit that used refrigerant R22 with a R407C unit, ***do not use its existing tubing.*** Instead, completely new tubing must be used.

10. CHECKING ELECTRICAL COMPONENTS

10-1.Measurement of Insulation Resistance

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

10-1-1. 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 either of the two power terminals. (Fig. 1)

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

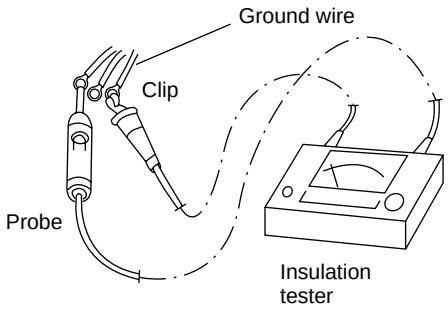


Fig. 1

10-1-2. Indoor Unit

Clamp an aluminum 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.

10-1-3. Outdoor Unit

Clamp an aluminum 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 where power supply lines are connected on the terminal plate. (Fig. 2)

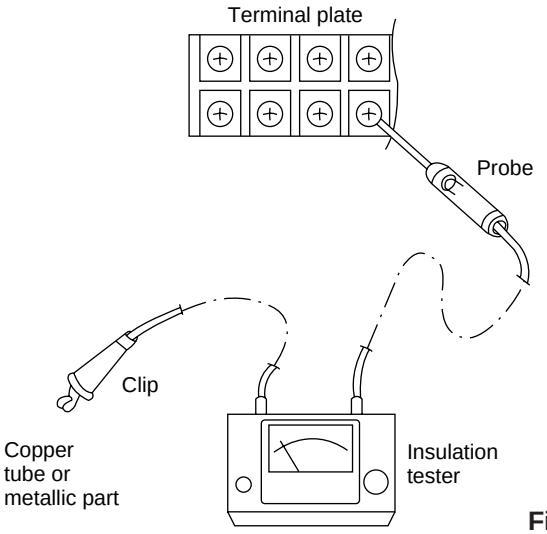


Fig. 2

10-1-4. Measurement of Insulation Resistance for Electrical Parts

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

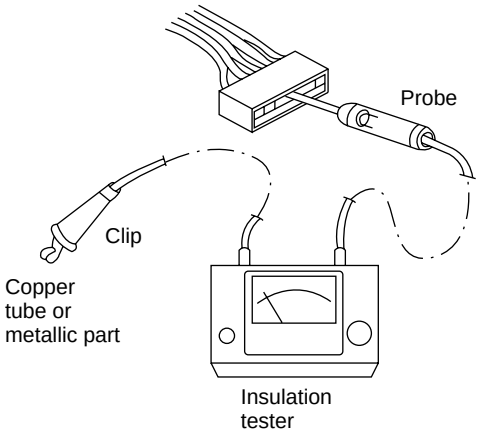


Fig. 3

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.

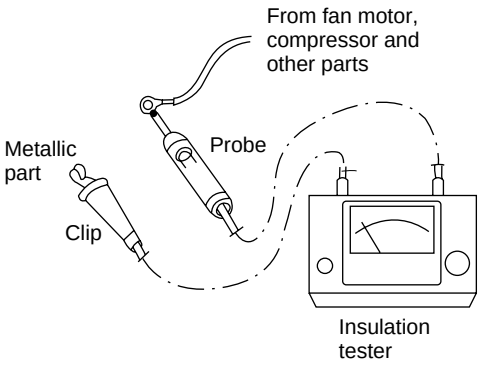


Fig. 4

10-2.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.

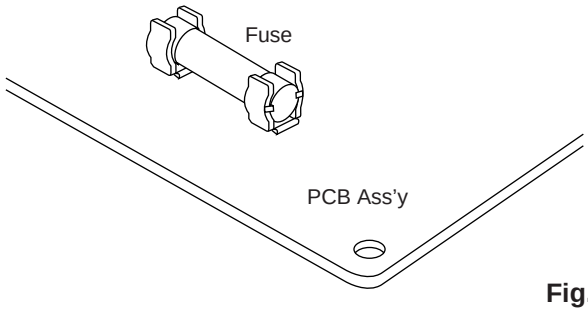


Fig. 5

10-3.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.

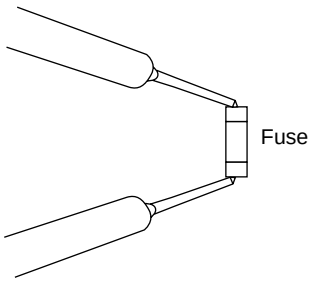


Fig. 6

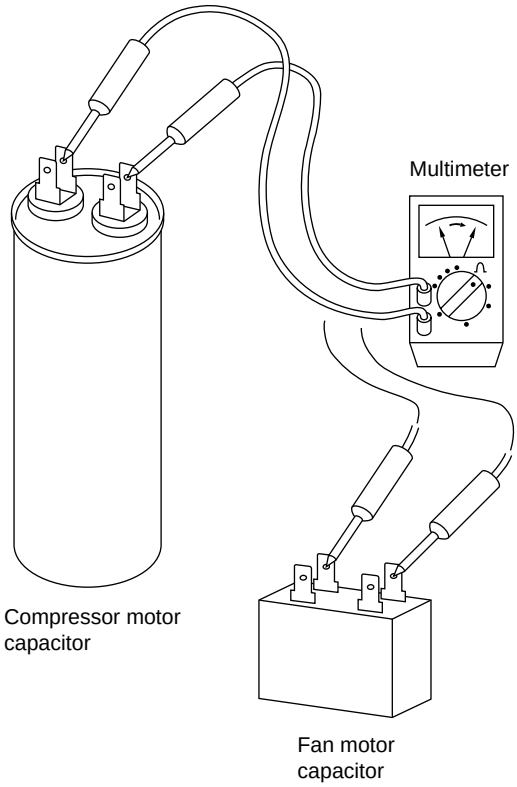


Fig. 7

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