10. TROUBLESHOOTING

10-1. Precautions before Performing Inspection or Repair

- After checking the self-diagnostics monitor, turn the power OFF before starting inspection or repair.
- High-capacity electrolytic capacitors are used inside the outdoor unit controller (inverter). They retain an electrical charge (charging voltage DC 310V) even after the power is turned OFF, and some time is required for the charge to dissipate. Be careful not to touch any electrified parts before the controller LED (red) turns OFF.

  If the outdoor controller is normal, approximately 30 seconds will be required for the charge to dissipate. However, allow at least 5 minutes for the charge to dissipate if there is thought to be any trouble with the outdoor controller.

10-2. Method of Self-Diagnostics

Follow the procedure below to perform detailed trouble diagnostics.

NOTE

1: If the operation lamp blinks every 0.5 seconds immediately when the power is turned ON, there is an external ROM (OTP data) failure on the indoor circuit board, or a ROM socket insertion problem, or the ROM has not been installed.

2: The failure mode is stored in memory even when the power is not ON. Follow the procedure below to perform diagnostics.

PROCEDURE

After turning on power to the air conditioner, use the remote controller and follow the steps below to execute self-diagnostics.

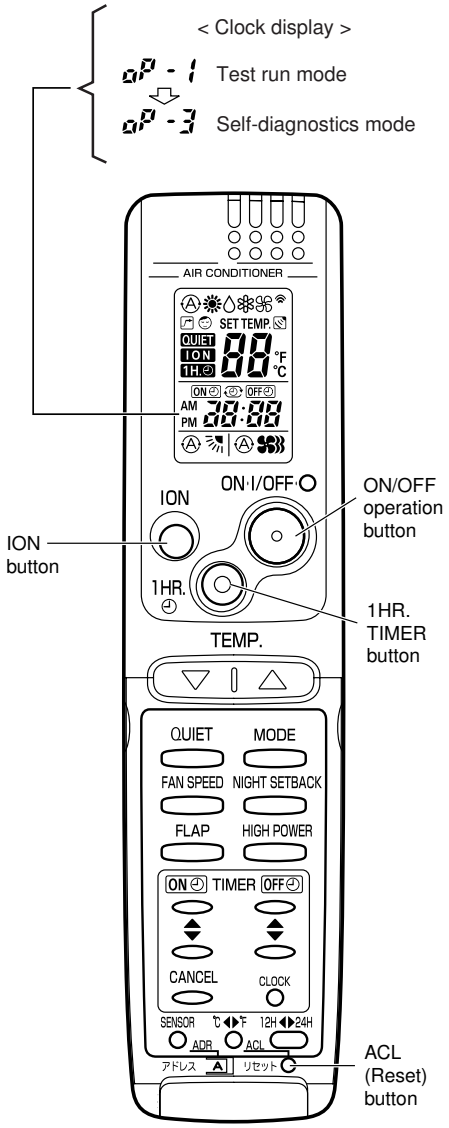
Step 1: Press and hold the remote controller ION button and 1 HR TIMER button. At the same time, press the ACL (reset) button. Use a pointed object such as the tip of a pen to press the ACL button. When this has been done, "oP-1" (test run) appears, blinking, in the remote controller clock display area.

Step 2: Next, press the 1 HR TIMER button once to change the display from "oP-1" to "oP-3" (self-diagnostics). (The display continues to blink.)

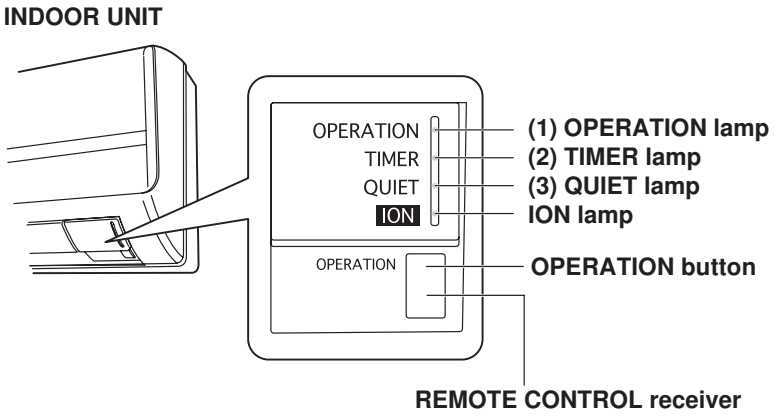
Step 3: Finally press the ON/OFF button to engage self-diagnostics mode.

- The self-diagnostics function utilizes the 3 indicator lamps on the main unit, in combinations of ON lamps, blinking lamps, and OFF lamps, to report the existence of sensor trouble or a protective operation. (The lamps blink or remain ON for 5 seconds, then turn OFF for 2 seconds.) Self-diagnostics is completed when the buzzer sounds 3 short beeps.
- A maximum of 3 self-diagnostics reports are displayed, for 5 seconds each, beginning with the most recent report. Following this display the lamps turn OFF. In order to view the self-diagnostics results again, press the ON/OFF button again.
- The 3 lamps remain OFF if no trouble has occurred.

<IMPORTANT> After self-diagnostics is completed, be sure to press the ACL (reset) button to return to normal mode. The air conditioner will not operate if this is not done.



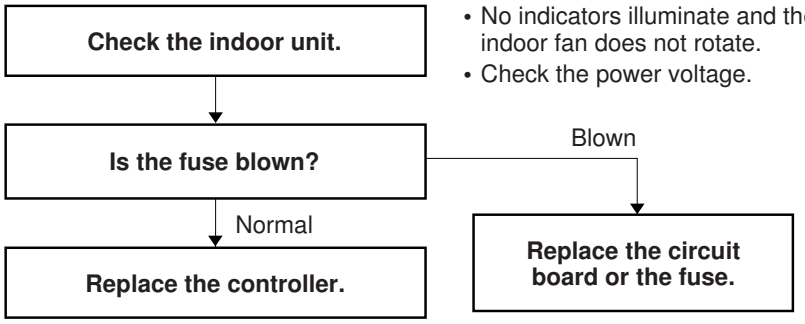
(1) Self-diagnostics Lamps



• Since the indications cover various units, the corresponding parts listed below may not be present in some models.

Indication on indoor unit				×···· OFF ◑···· Blinking ☼···· ON (Illuminated)	
Quiet (3)	Timer (2)	Operation (1)	Code	Diagnostics item	Diagnostics contents
×	×	◑	S01	Room temperature sensor failure	(1) Sensor open circuit or short circuit (2) Contact failure at connector or open circuit at terminal crimping location (short-circuit detection only for the humidity sensor) (3) Indoor/outdoor circuit board failure
×	◑	×	S02	Indoor heat exchanger sensor failure	
×	◑	◑	S03	Humidity sensor failure	
◑	×	×	S04	Compressor temperature sensor failure	(1) Sensor open circuit or short circuit (2) Contact failure at connector or open circuit at terminal crimping location (3) Outdoor circuit board failure
◑	×	◑	S05	Outdoor heat exchanger sensor failure	
◑	◑	×	S06	Outdoor air temperature sensor failure	
◑	◑	◑	S07	Outdoor electrical current detection failure	Outdoor circuit board failure
×	×	☼	E01	Indoor/outdoor communications failure (serial communications)	(1) Mis-wiring (2) AC power failure (3) Blown fuse (4) Power relay failure (5) Indoor or outdoor circuit board failure
×	☼	×	E02	• HIC circuit failure • Power Tr (transistor) circuit failure	(1) HIC or power Tr failure (2) Outdoor fan does not turn. (3) Instantaneous power outage (4) Service valve not opened. (5) Outdoor fan blocked. (6) Continuous overload operation (7) Compressor failure (8) Outdoor circuit board failure
×	☼	☼	E03	Outdoor unit external ROM (OTP data) failure	(1) External ROM data failure (2) Outdoor circuit board failure
☼	×	×	E04	Peak current cut-off	(1) Instantaneous power outage (2) HIC or power transistor failure (3) Outdoor circuit board failure
☼	×	☼	E05	• PAM circuit failure • Active circuit failure	(1) Outdoor circuit board failure (2) Outdoor power supply voltage failure
☼	☼	×	E06	Compressor discharge overheat prevention activated.	(1) Electric expansion valve failure (2) Capillaries choked (3) Shortage of refrigerant (4) Continuous overload operation (5) Outdoor fan does not rotate (6) Outdoor circuit board failure
☼	☼	☼	E07	Indoor fan operating failure	(1) Fan motor failure (2) Contact failure at connector (3) Indoor circuit board failure
◑	◑	☼	E08	• 4-way valve switching failure • Indoor zero-cross failure	(1) 4-way valve failure (heat pump model only) (2) Outdoor circuit board failure
◑	☼	◑	E09	No-refrigerant protection	(1) Service valve not opened. (2) Shortage of refrigerant
◑	☼	☼	E10	DC compressor drive circuit failure	(1) Open phase (2) Outdoor circuit board failure
☼	◑	◑	E11	Outdoor fan operating failure	(1) Fan motor failure (2) Contact failure at connector (3) Outdoor circuit board failure
☼	◑	☼	E12	• Outdoor system communications failure • Outdoor high-pressure SW • OLR operation • Outdoor power supply open phase • Outdoor coil freezing	(1) Mis-wiring (2) Blown fuse (3) Power relay failure (4) Open phase (5) Outdoor circuit board failure (6) Compressor failure
☼	☼	◑	E13	Freeze-prevention operation activated.	(1) Indoor fan system failure (2) Shortage of refrigerant (3) Low-temperature operation

(2) If the self-diagnostics function fails to operate



10-3. Checking the Indoor and Outdoor Units

(1) Checking the indoor unit

No.	Control	Check items (unit operation)
1	Use the remote controller to operate the unit in "TEST run" mode. To determine whether the mode is currently in "TEST run" mode, check the 3 indicator lamps on the unit. If all 3 are blinking, the current mode is "TEST run."	• The rated voltage must be present between inter-unit wirings 1 and 2. • Connect a 5 k ohm resistor between inter-unit wirings 2 and 3. When the voltage at both ends is measured, approximately 12 to 15V DC must be output and the multimeter pointer must bounce once every 8 seconds. Or instead of measuring the voltage, you can insert an LED jig and check that the LED flickers once every 8 seconds.

- If there are no problems with the above, then check the outdoor unit.
- For the "Test run" procedure, refer to 7.4" How to Test Run the Air Conditioner".

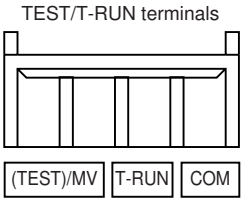
(2) Checking the outdoor unit

No.	Control	Check items (unit operation)
1	Apply the rated voltage between outdoor unit terminals 1 and 2.	• The control panel LED (red) must illuminate.
2	Short-circuit the outdoor unit COM terminal to the T-RUN terminal.	• The compressor, fan motor, and 4-way valve must all turn on.

- If there are no problems with the above, then check the indoor unit.

● Using the TEST/T-RUN terminals

T-RUN : Test run (compressor and fan motor turn ON).
TEST/MV : Compresses time to 1/60th (accelerates operation by 60 times faster than normal).



(3) Checking the serial communications

→ Control 1 → Control 2 ×···· **OFF** ◑···· **Blinking** ☼···· **Illuminated**

Initial self-diagnostics			Short-circuit terminals 2 and 4 on the indoor unit terminal plate.			Short-circuit terminals 2 and 4 on the outdoor unit terminal plate.			Probable location of malfunction
Quiet (3)	Timer (2)	Operation (1)	Quiet (3)	Timer (2)	Operation (1)	Quiet (3)	Timer (2)	Operation (1)	
×	×	☼	×	×	☼	—	—	—	Indoor unit circuit board failure
			☼	◑	☼	☼	◑	☼	Outdoor unit circuit board failure
			☼	◑	☼	×	×	☼	Failure (open circuit, contact failure, etc.) in the inter-unit wirings
☼	◑	☼	—	—	—	—	—	—	Outdoor unit circuit board failure

- Turn the power OFF before performing short circuiting procedures.
- Refer to the previous pages when performing system self-diagnostics.
- So that the check can be made quickly, indicators blink at first communication after power ON.
- Before performing the above checks, perform “TEST run” operation, and check that the rated voltage is output to terminals 1 and 2 on the outdoor unit. If it is not output, there is a failure related to the indoor unit power.

10-4. Trouble Diagnosis of Outdoor Fan Motor.....Applied for only SAP-CRV123

- This outdoor DC fan motor contains an internal control PCB. Therefore, it is not possible to measure the coil resistance, and the following procedure should be used to check the motor.
- To perform diagnosis, follow the instructions in “Checking the Outdoor Unit” on the previous page and set the outdoor unit to Test Run mode (compressor ON, outdoor fan motor ON).

  Important: (A) Turn OFF the power before connecting or disconnecting the motor connectors.

  (B) When performing voltage measurement at the outdoor controller connector for (3) in the table below, the DC motor will trip and voltage output will stop approximately 10 seconds after operation is started. For this reason, to measure the voltage again, first turn OFF the outdoor unit power, then follow the instructions in “Checking the Outdoor Unit” and again set the unit to Test Run mode.

[Trouble symptom 1] The fan does not stop when the outdoor unit stops. → Outdoor unit controller trouble

[Trouble symptom 2] The fan motor does not rotate when the outdoor unit is operating.

(Diagnostic procedure)

* Disconnect the motor connectors and measure the voltage at the DC motor connectors on the outdoor

Measurement location	Normal value
(1) Vs-Gnd: Between pin 1 and pin 4	DC 230 V or more
(2) Vcc-Gnd: Between pin 5 and pin 4	DC 14 V or more
(3) Vsp-Gnd: Between pin 7 and pin 4	After fluctuating 4 times between DC 1.0 – 4.3 V (1 sec. ON) and DC 0 V (1 sec. OFF), the DC motor trips.

(Diagnostic results)

All of the above measured values are normal. → Fan motor trouble (Replace the motor.)

Any one of the above measured values is not normal. → Outdoor unit controller trouble (Replace the controller .)

(Reference) DC motor connector pin arrangement

Pin 1: Vs (white)
Pin 2: Not used
Pin 3: Not used
Pin 4: Gnd (black)
Pin 5: Vcc (red)
Pin 6: FG (blue)
Pin 7: Vsp (yellow)

[Trouble symptom 3] Motor rotates for some time (several seconds), but then quickly stops, when the outdoor unit operates.
(There is trouble in the system that provides feedback of motor rotation speed from the motor to the outdoor unit controller.)

[Trouble symptom 4] Fan motor rotation speed does not change during outdoor unit operation.

[Trouble symptom 5] Fan motor rotation speed varies excessively during outdoor unit operation.

(Remedy for symptom 3 to 5)
It is not possible to identify whether the trouble is outdoor unit controller trouble or motor trouble.
Therefore, first replace the outdoor unit controller, then (if necessary) replace the DC motor.

10-5. Noise malfunction and electromagnetic interference

An inverter A/C operates using pulse signal control and high frequencies. Therefore, it is susceptible to the effects of external noise, and is likely to cause electromagnetic interference with nearby wireless devices.

A noise filter is installed for ordinary use, preventing these problems. However, depending on the installation conditions, these effects may still occur. Please pay attention to the points listed below.

■ Noise malfunction

This refers to the application of high-frequency noise to the signal wires, resulting in abnormal signal pulses and malfunction.

Locations most susceptible to noise	Trouble	Correction
1. Locations near broadcast stations where there are strong electromagnetic waves 2. Locations near amateur radio (short wave) stations 3. Locations near electronic sewing machines and arc-welding machines	Either of the following trouble may occur. 1. The unit may stop suddenly during operation. 2. Indicator lamps may flicker.	(The fundamental concept is to make the system less susceptible to noise.) — Insulate for noise or distance from the noise source. — 1. Use shielded wires. 2. Move unit away from the noise source.

■ Electromagnetic interference

This refers to noise generated by high-speed switching of the microcomputer and compressor. This noise radiates through space and returns to the electric wiring, affecting any wireless devices (televisions, radios, etc.) located nearby.

Locations most susceptible to noise	Trouble	Correction
1. A television or radio is located near the A/C and A/C wiring. 2. The antenna cable for a television or radio is located close to the A/C and A/C wiring. 3. Locations where television and radio signals are weak.	1. Noise appears in the television picture, or the picture is distorted. 2. Static occurs in the radio sound.	1. Select a separate power source. 2. Keep the A/C and A/C wiring at least 1 meter away from wireless devices and antenna cables. 3. Change the wireless device's antenna to a high-sensitivity antenna. 4. Change the antenna cable to a BS coaxial cable. 5. Use a noise filter (for the wireless device). 6. Use a signal booster.

11. CHECKING ELECTRICAL COMPONENTS

11-1. Measurement of Insulation Resistance

- The insulation is in good condition if the resistance exceeds 1MΩ.

11-1-1. Power supply cord

Clamp the grounding wire of power cord with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power wires. (Fig. 1)

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

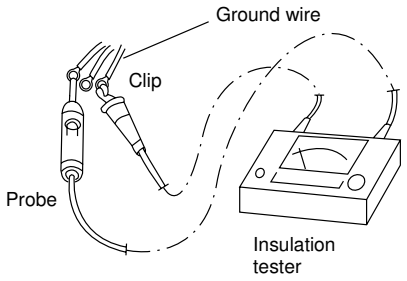


Fig. 1

11-1-2. 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 where power supply lines are connected on the terminal plate. (Fig. 2)

11-1-3. 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 on the terminal plate. (Fig. 2)

Note that the ground line terminal should be skipped for the check.

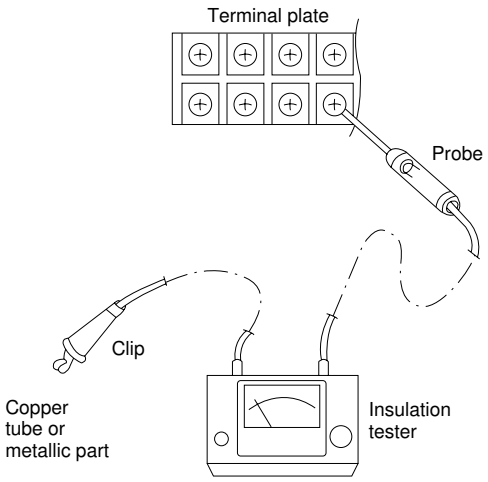


Fig. 2

11-1-4. 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. (Figs. 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.

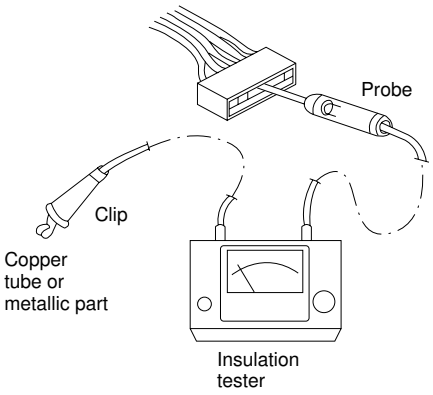


Fig. 3

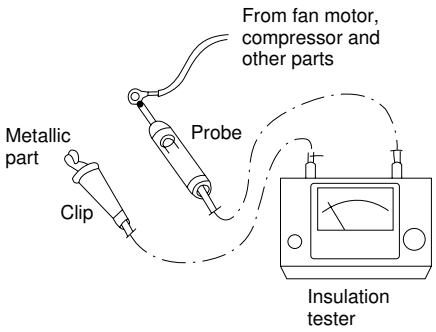


Fig. 4

11-2. 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.

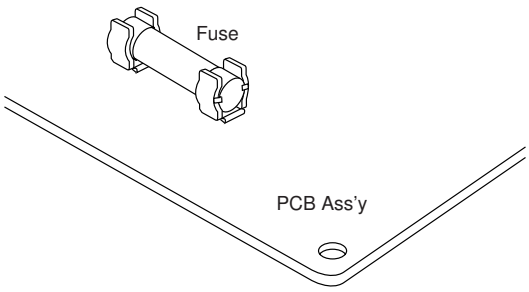


Fig. 5

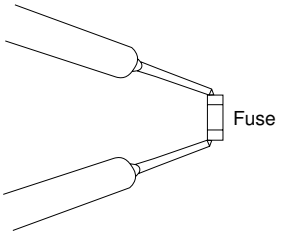


Fig. 6