Service Manual

Temperature Chamber (Industrial Oven)

PV(H)-211, 221, 231, 331

4022105000330

⚠ This Service Manual has been compiled specifically for service-people trained or certified by ESPEC ENGINEERING CORP. Because of the dangers involved, service described herein should not be performed by other persons.

ESPEC ENGINEERING CORP.

Introduction

This service manual provides a clear, comprehensible description of the types of troubles which may possibly arise with your temperature chamber. There are also some suggested actions to be taken.

In the event of trouble, do not panic and stick closely to the appropriate procedure. You may use User's Manual in conjunction with this service manual to gain a more comprehensive understanding of the unit as a whole. For details not contained in this manual, and when trouble reoccurs despite taking the prescribed remedial action, contact ESPEC CORP.

Contents

Chapter 1 Fault diagnosis

* This chapter contains a list of precautions to observe when trouble occurs and while troubleshooting.

Chapter 2 Chamber configuration

* This chapter explains equipment configuration. When trouble occurs with your chamber, read this section carefully before investigating the cause or taking remedial action.

Chapter 3 Troubleshooting

* This chapter uses flow charts to explain how to deal with troubles occurring in equipment usage. Investigate the cause and take remedial action in accordance with the appropriate flow chart.

Chapter 4 Replacement and adjustment of parts

* This chapter explains how to replace and adjust parts including necessary preparations and incidental work.

Chapter 1 Fault diagnosis

1. When a fault occurs during operation, first check whether an alarm code has been displayed or not.
2. If an alarm code is displayed, diagnose the fault according to the troubleshooting flow charts given in Chapter 3, 3-1.
3. If an alarm code is not displayed, diagnose the fault according to the troubleshooting flow charts given in Chapter 3, 3-2.

Note 1: Investigate the cause of a fault systematically, according to the appropriate flow chart indicated in this manual. Do not skip over steps to solve problems more quickly.

Note 2: Safety precautions

Take the necessary safety precautions and be sure to ground equipment where instructed in troubleshooting procedures to check the chamber under power before proceeding.

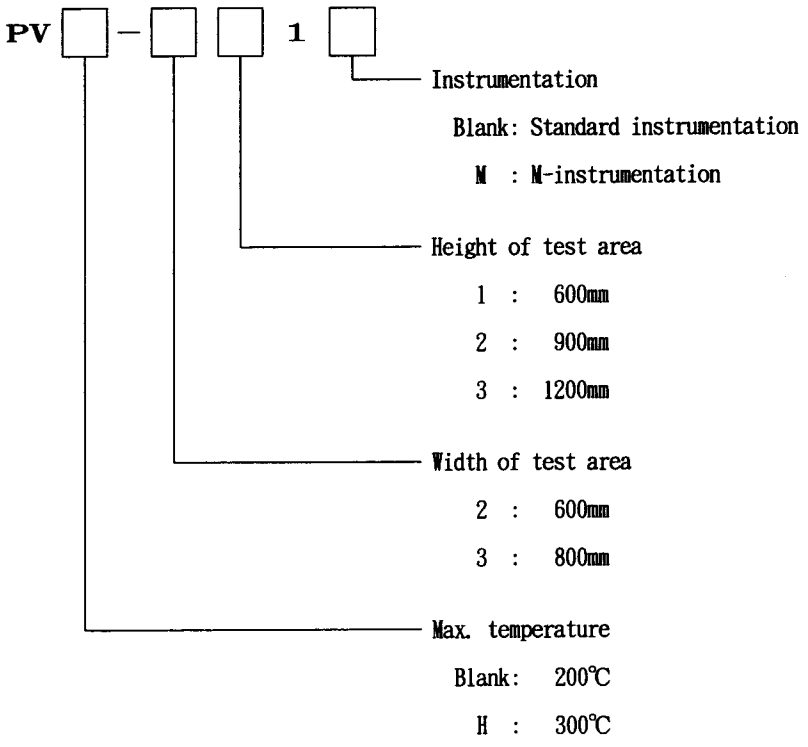
Note 3: Where parts need to be replaced, contact ESPEC CORP. with the part name. When delivered, replace parts as described in this manual.

Note 4: If trouble reoccurs despite your taking the prescirbed remedial action, contact ESPEC CORP.

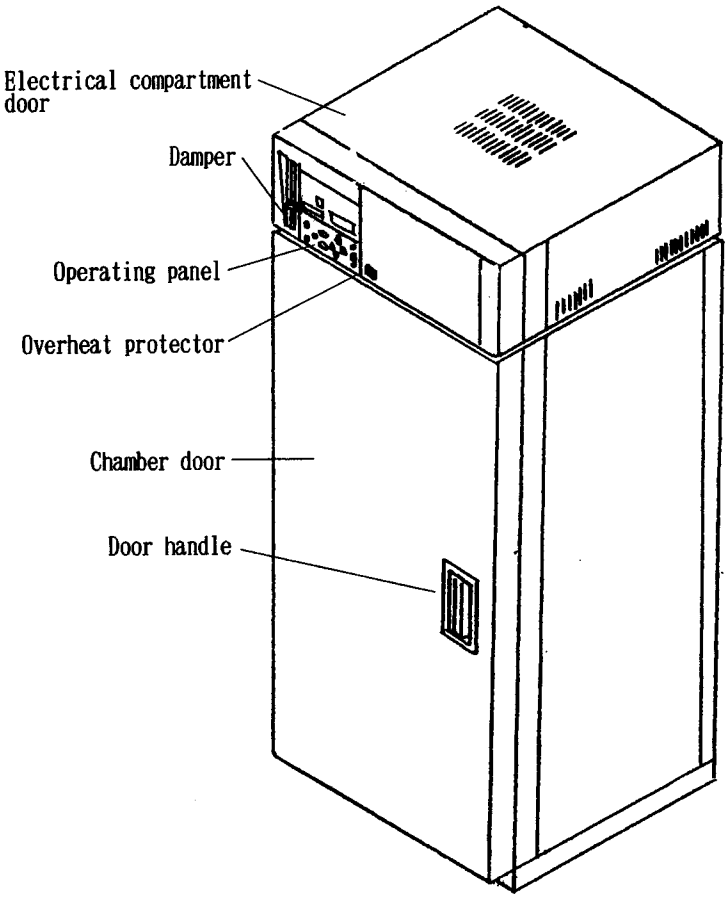
Chapter 2 Chamber configuration

2-1 Temperature chamber models

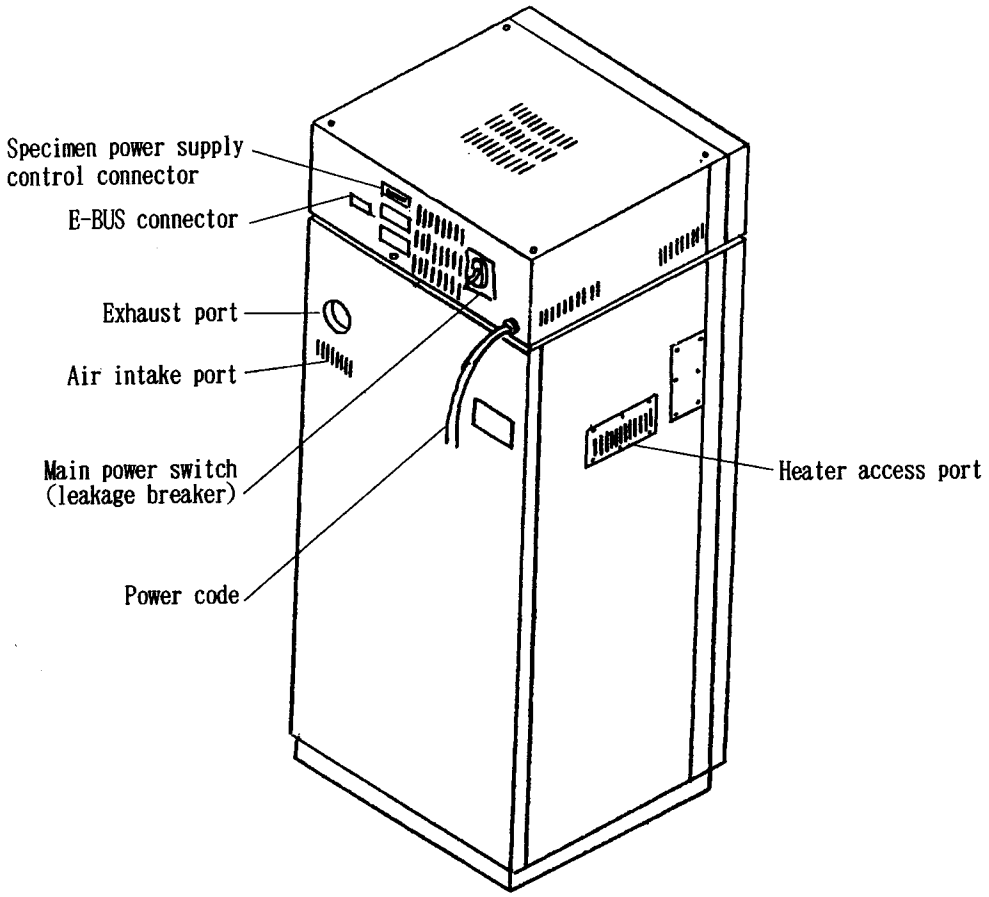
Explanations given in this manual may regard functions not provided with your chamber. You should therefore, familiarize yourself with the type and model of chamber(s) you are using.



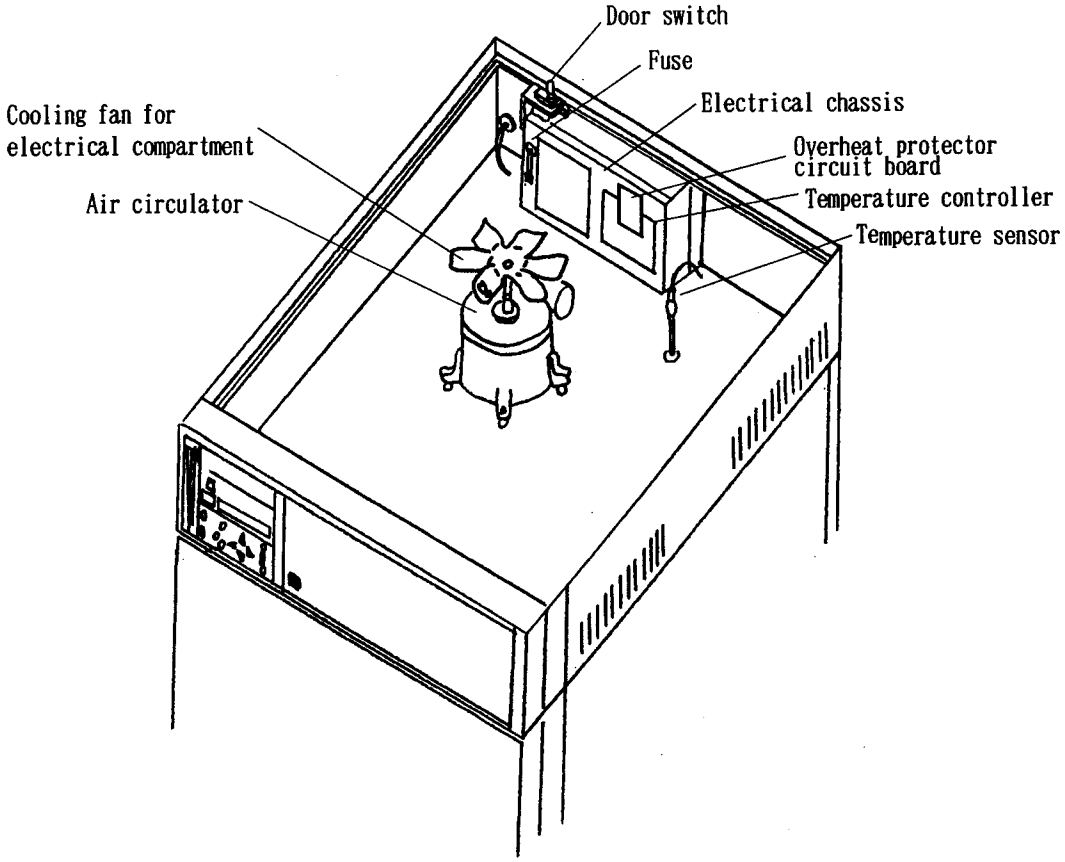
2-2 Names of chamber parts



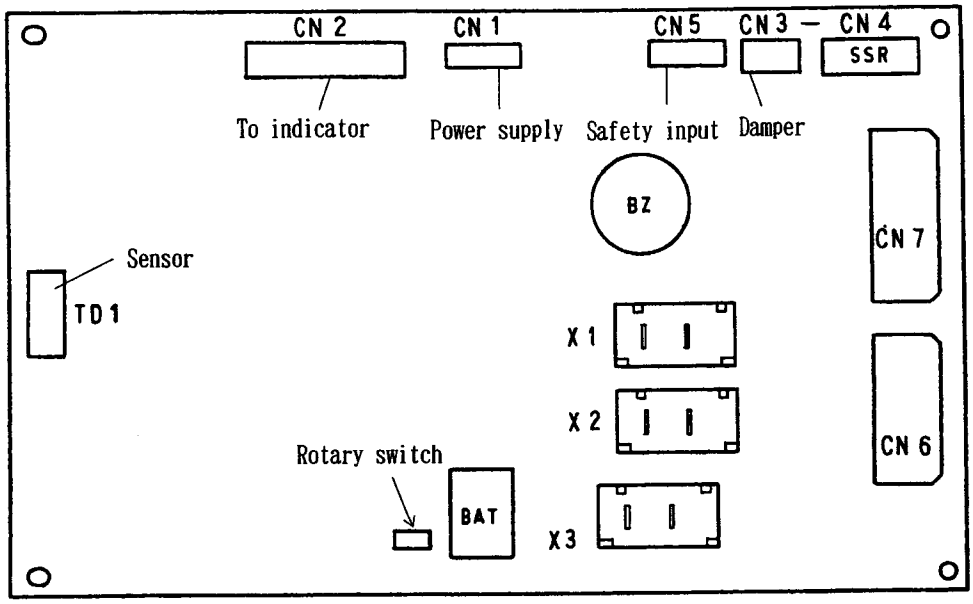
Chamber front view



Chamber rear view



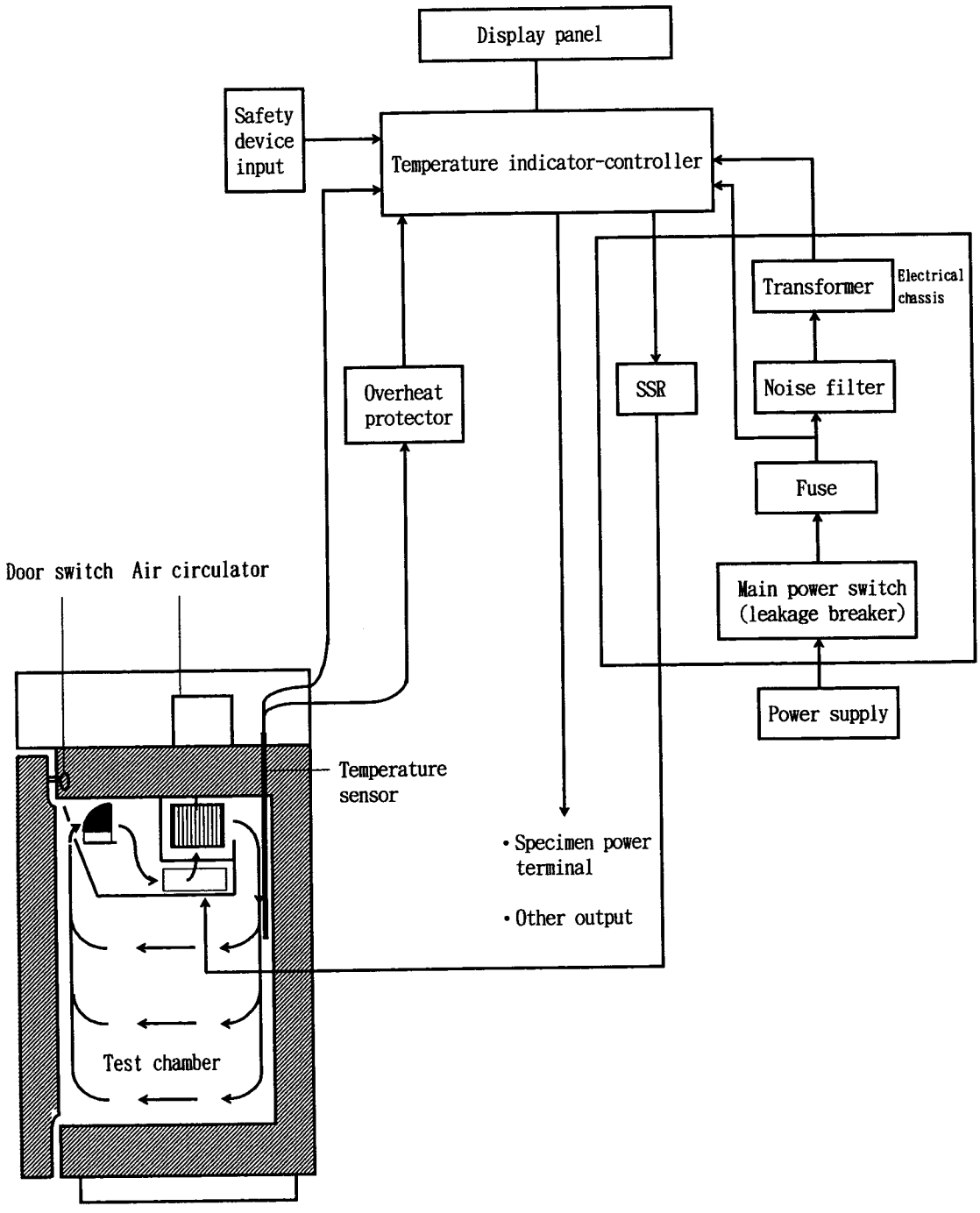
Electrical compartment



Temperature controller circuit board (control board)

2-3 Control system

The basic system is shown in the below figure. For details, check your schematic circuit diagrams.



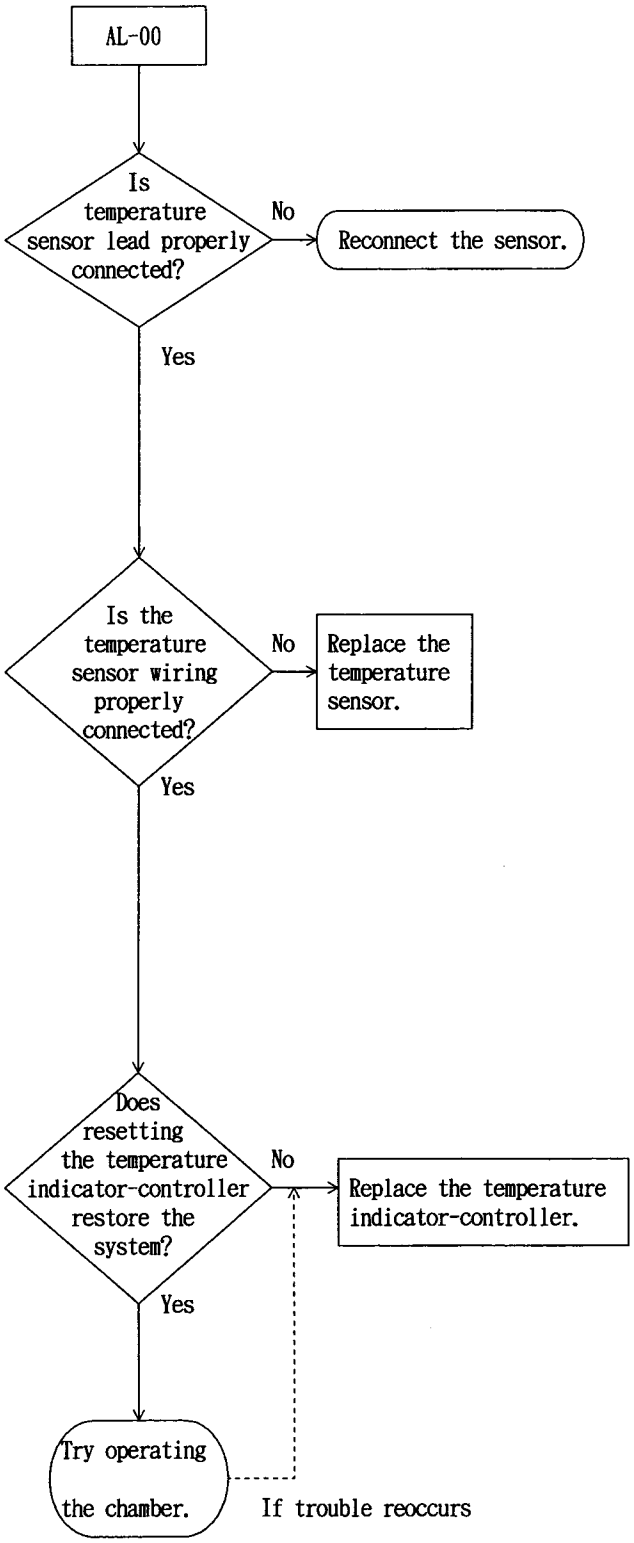
Chapter 3 Troubleshooting

This chapter uses flow charts to explain troubles that may occur with your chamber druing usage and the corresponding remedial action. The flow charts themselves name various parts, some of which may not pertain to the type of chamber you are using. Read "Chapter 2 Chamber configuration" carefully, before attempting to investigate the cause of a fault. Refer to "2-2 Names of chamber parts" to locate parts mentioned in the flow charts.
Note also that the position of certain parts may vary depending on the model of chamber you are using.

3-1 Faults displayed with an alarm code

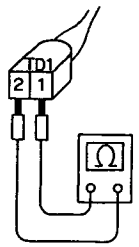
AL00 Temperature sensor disconnection or broken wire

[Diagnostic method]



- Check temperature sensor leads connections.
  No disconnection nor faulty contact should be detected in connector TD_1 of temperature indicator-controller TC_1.

- Check the temperature sensor leads for broken wires.
  Disconnect connector TD_1 from temperature indicator-controller TC_1, and measure resistance at both sensor terminals.

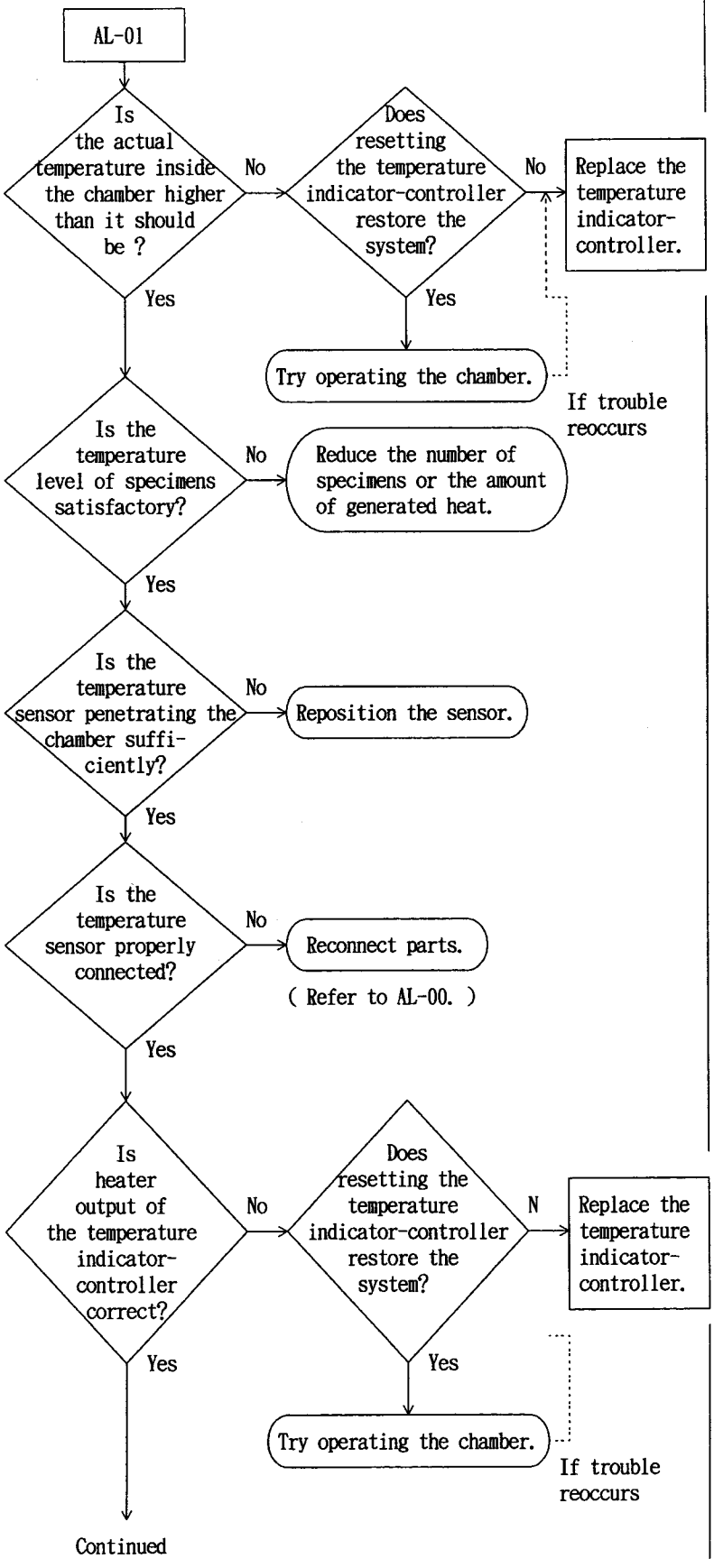


Power ON/OFF	Measured terminal		Passing mark
OFF	⊕	⊖	Good: approx. 10Ω
	Red	White	Bad: ∞Ω

- For details on replacing the temperature sensor, refer to chapter 4.
- For details on resetting the temperature indicator-controller, refer to chapter 4.
- For details on replacing the temperature indicator-controller, refer to chapter 4.

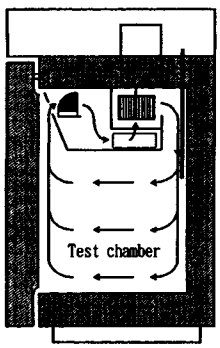
AL-01 : The indicated temperature is 10℃ higher than the temperature setting. (1/2)

[Diagnostic method]



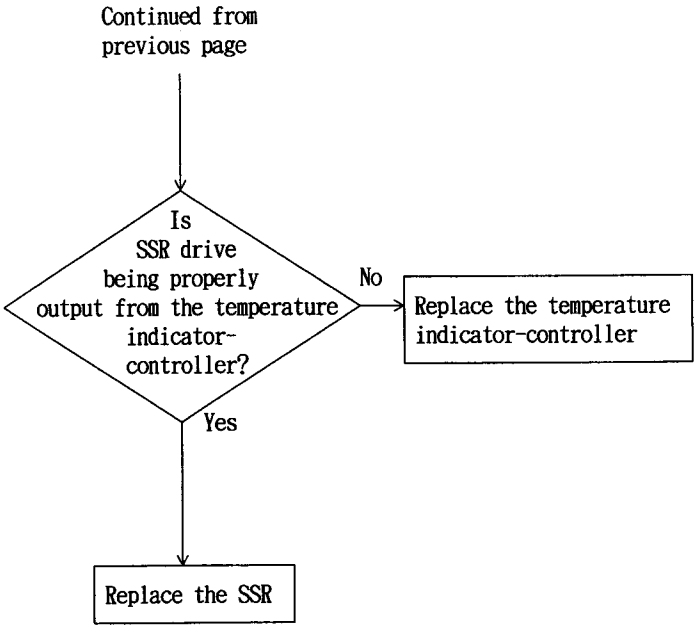
- For details on resetting the temperature indicator-controller, refer to chapter 4.

- Check the temperature sensor is sufficiently penetrating the chamber.

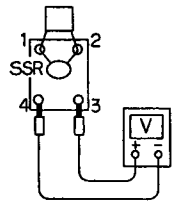


- Check heater output.
  Check heater output as explainednder "Monitoring" in User's Manual(Standard-/M-instrumentation)
  Heater OFF: 0%
  Heater ON :1-100%

AL 0 : The indicated temperature is 10℃ higher than the temperature setting. (2/2)	[Diagnostic method]

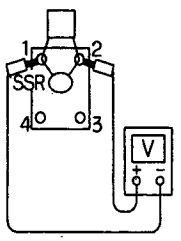


- Check SSR drive output (DC range) from the temperature indicator-controller. Measure input voltage at SSR input terminals ③ and ④.



Power ON/OFF	Measured terminal	Passing mark
Heater ON	+ −	Approx. 24V DC
Heater OFF	Terminal ③ ④	Approx. 0V DC

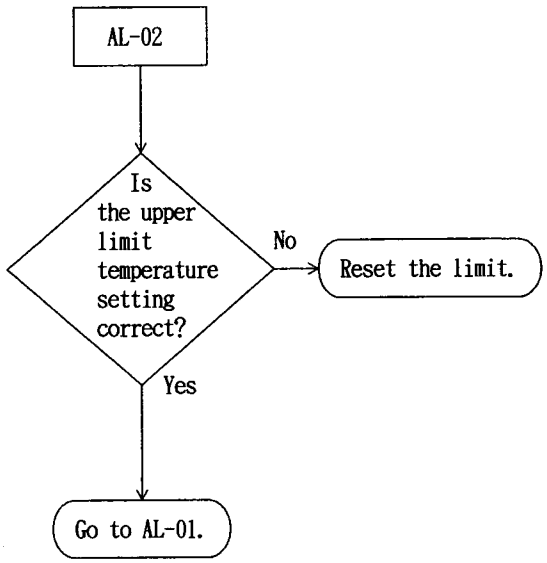
- Check the SSR is functioning properly. Measure voltage at SSR output terminals (1) and (2).



Power ON/OFF	Measured terminal	Passing mark
Heater ON	Terminal ① ②	0V AC
Heater OFF	Wire No. (4) (5)	200-240V AC

- For details on replacing the SSR, refer to chapter 4.
- For details on replacing the temperature indicator-controller, refer to chapter 4.

AL02 The indicated temperature is higher than the upper limit temperature setting.	[Diagnostic method]

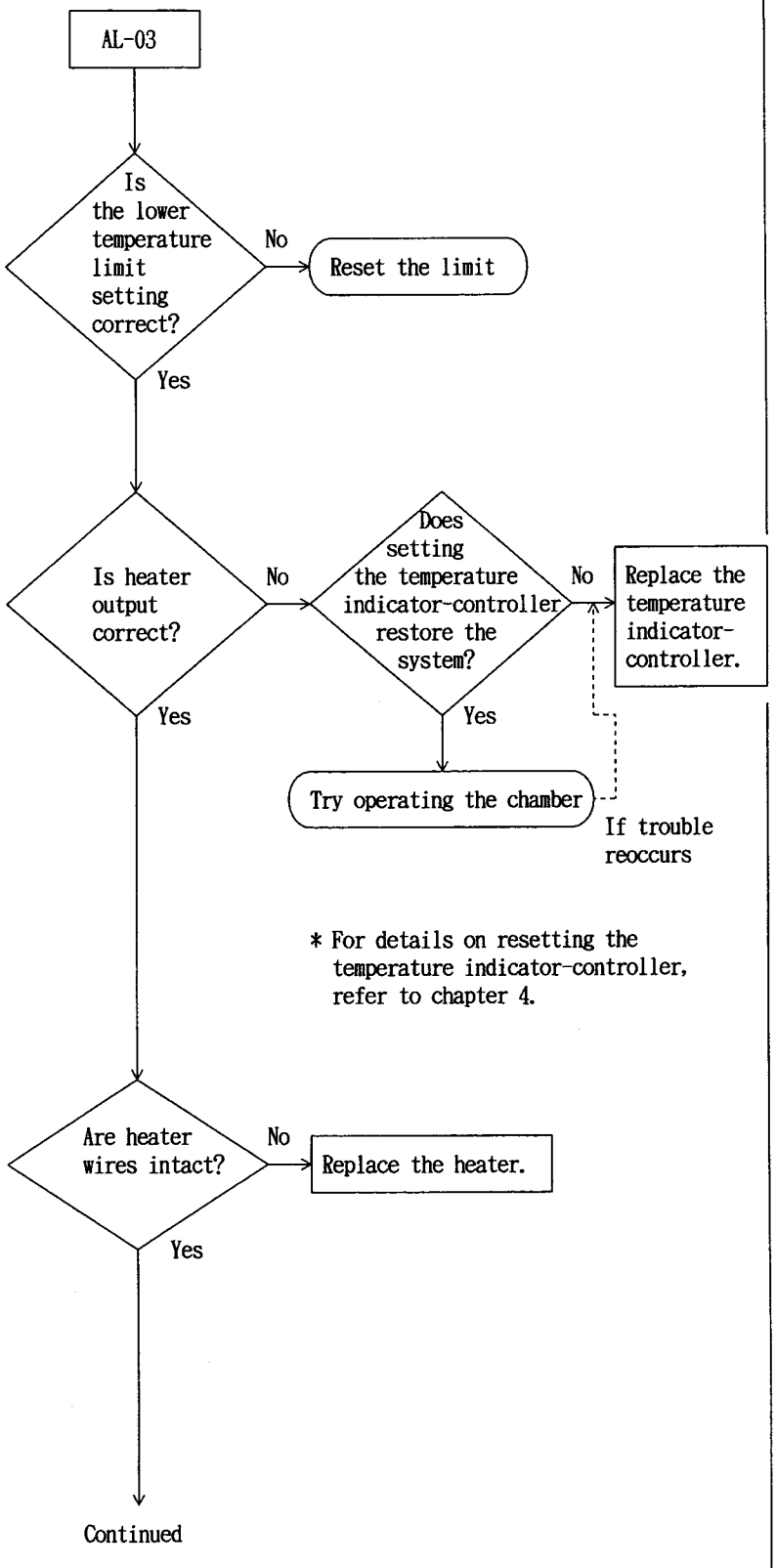


Set the upper limit temperature as described under "Temp. limit settings" in User's Manual (Standard-/M-instrumentation).

Test chamber	set temp.	Max. temp. allowable with specimen
<		<

* In normal usage, make your upper limit setting no more than 15℃ higher than max. test temperature.

AL03 The indicated temperature is below the lower limit temperature setting. (1/2)



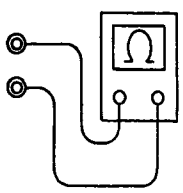
[Diagnostic method]

- **Set the lower limit temperature.**
  Set the lower limit temperature as described under "Temp. limit settings" in User's Manual (Standard-/M-instrumentation).

- **Check heater output.**
  Check heater output as explained under "Monitoring" in User's Manual (Standard-/M-instrumentation).
  Heater OFF: 0%
  Heater ON : 1-100%

* When the temperature setting stabilizes, heater output will rise and the panel indication will change in range from 1% to 99%.

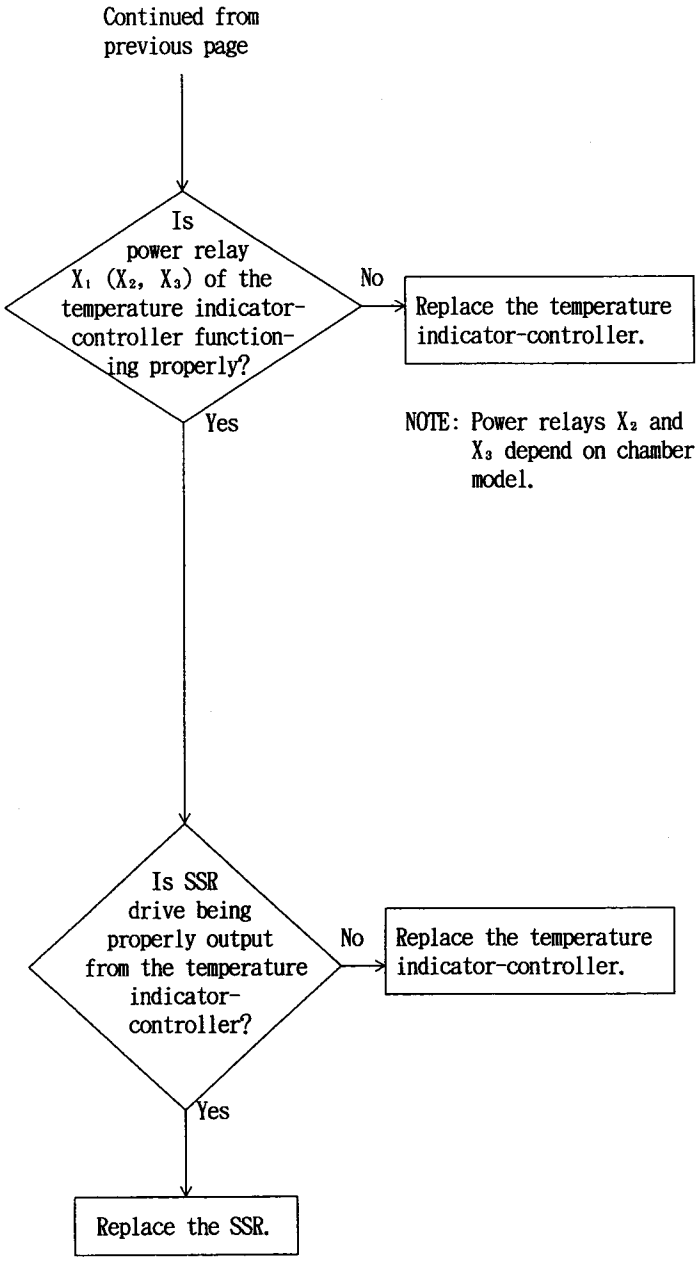
- **Check the heater for broken wires.**
  Measure resistance across heater terminals.
  Disconnect all heater leads before testing.



Passing mark: 200Ω or less

AL03 The indicated temperature is below the lower limit temperature setting. (2/2)

[Diagnostic method]



- Check power relay X_1 (X_2, X_3) is functioning properly. Check contact on the temperature indicator-controller circuit board is properly made.

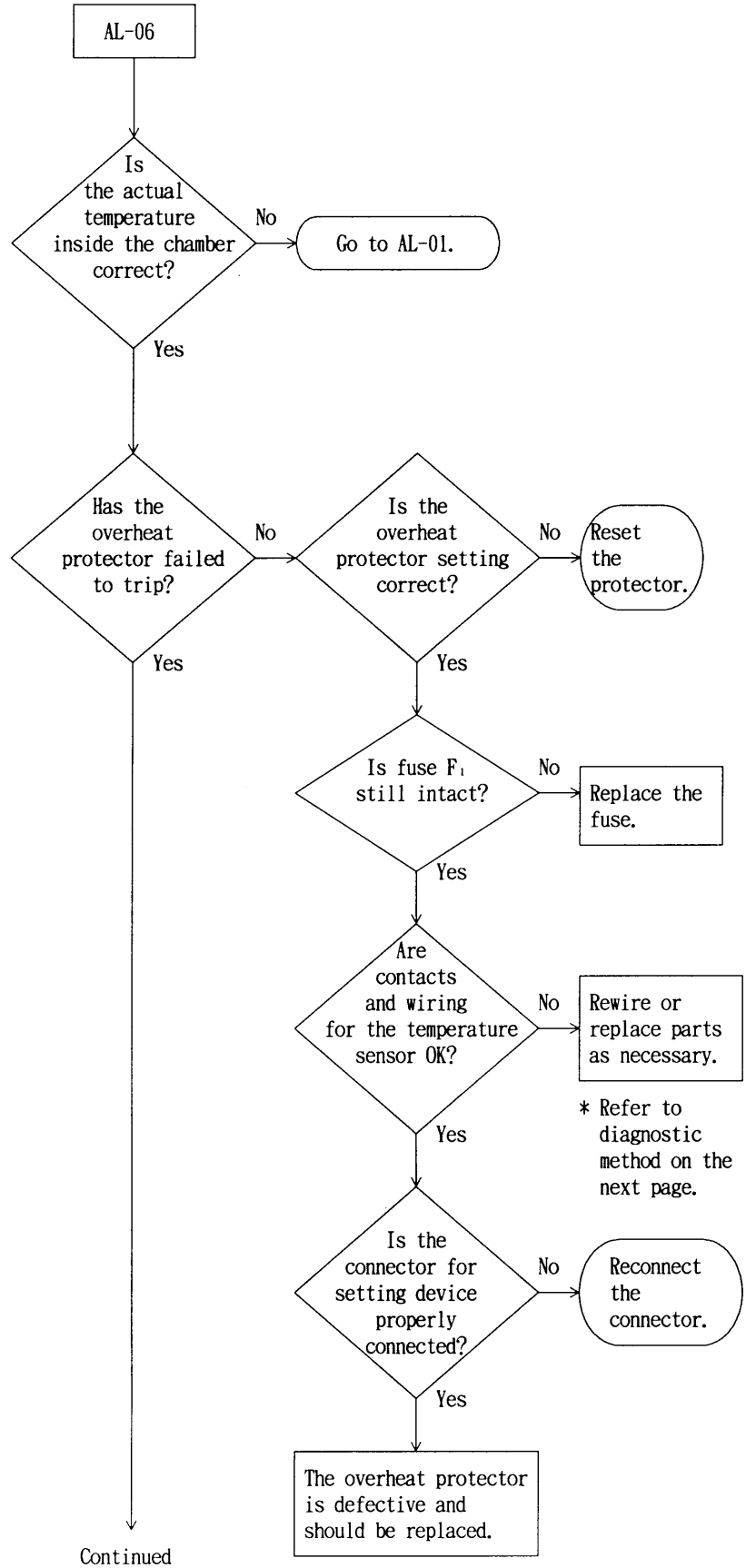
Power ON/OFF	Passing mark
ON	0V AC
OFF	200V~240V AC

- For details on checking SSR drive output and SSR functioning, refer to AL-01.

AL06

Blown thermal fuse or tripped overheat protector (1/2)

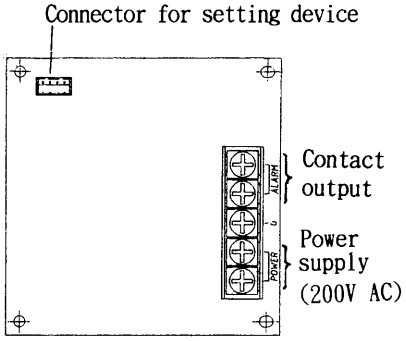
[Diagnostic method]



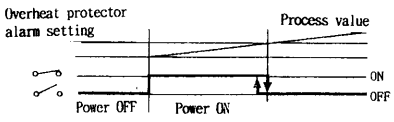
- Check whether the overheat protector has tripped or not.

(1) Check the overheat protector OHP_1 for continuity (200V AC).

(2) Check the overheat protector is functioning properly. Check the contact output.



OHP_1 detail

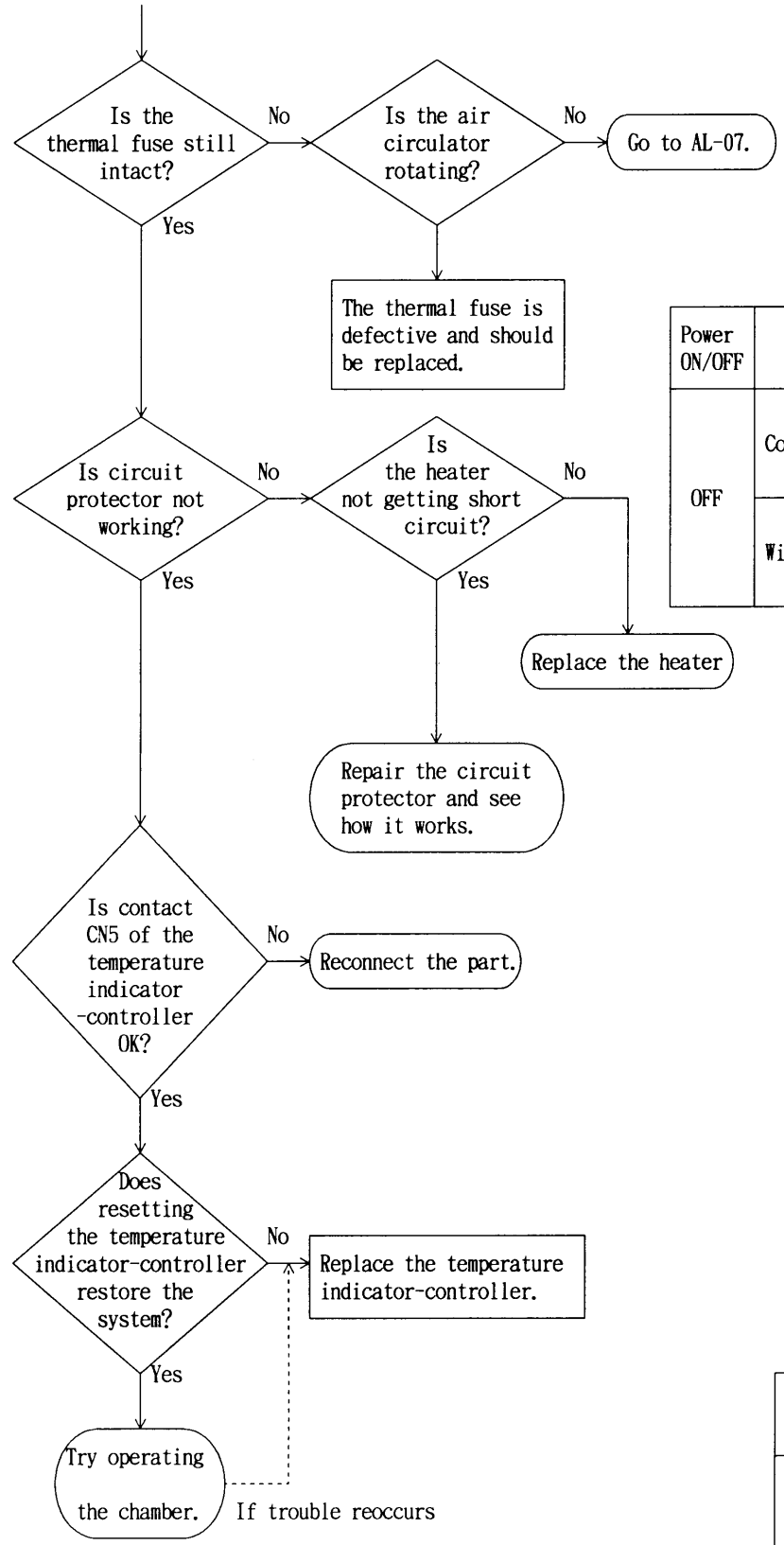


Overheat protector alarm function

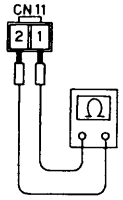
AL06

Blown thermal fuse or tripped overheat protector (2/2)

[Diagnostic method]



- Disconnect thermal fuse connector CN11 and measure resistance on the thermal fuse side.



Power ON/OFF	Measured terminal		Passing mark
OFF	Connector No.	① ②	Good: Continuity detected
	Wire No.	17D-19D	Bad: Continuity not detected

- **Check connector CN5 of temperature indicator-controller TC1.**
  Check for disconnection and faulty contacts in connector CN5 of temperature indicator-controller TC1.

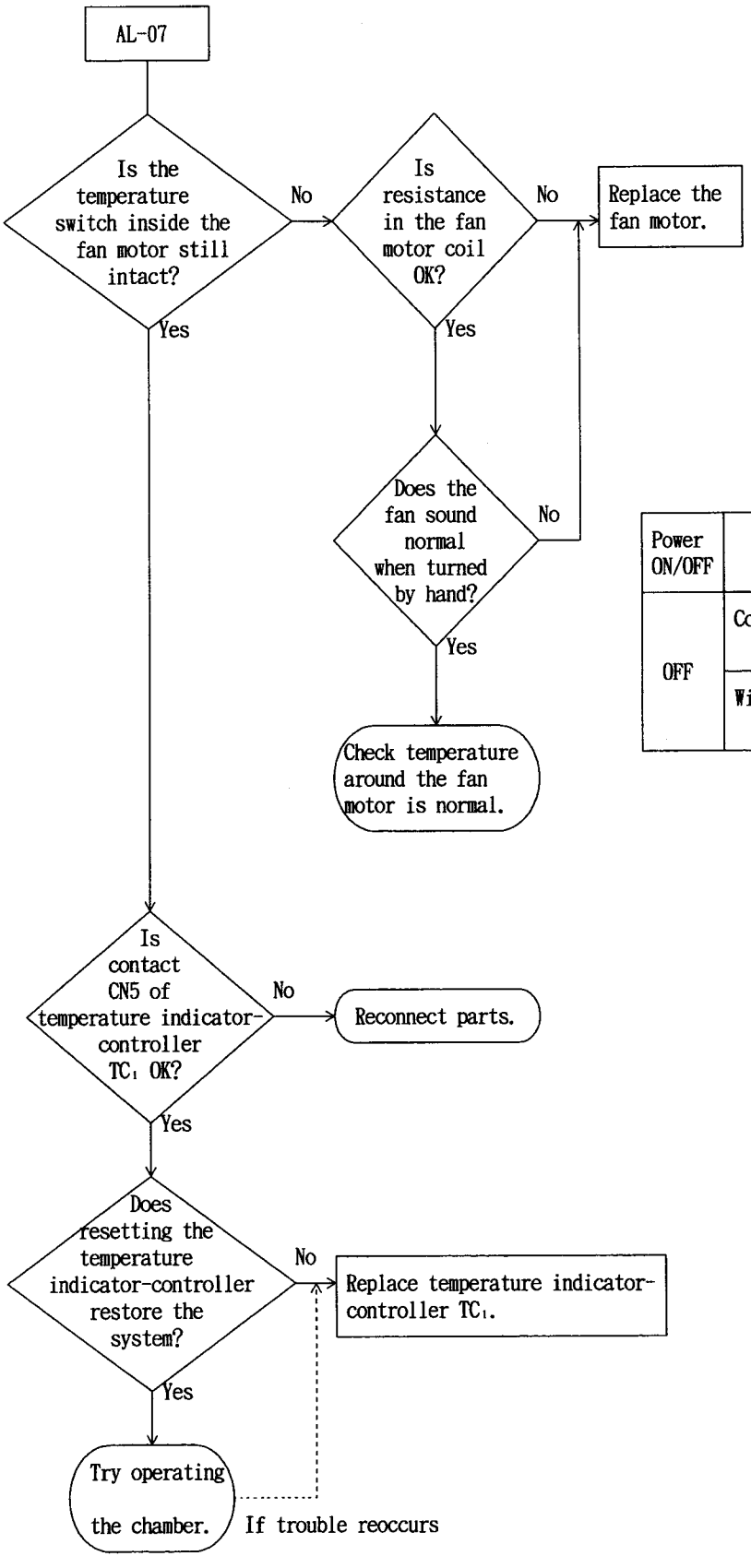
- If a faulty contact occurs at CN5, alarms AL-07 and AL-09 may be generated at the same time.

- **Check the temperature sensor for faulty contacts and broken wires.**
  Check wires are properly connected to the input terminal on the overheat protector setting device.
  Disconnect the temperature sensor from the terminal and measure resistance at both ends.
  If the temperature sensor is disconnected or there is an open circuit in the sensor, a burnout indication appears on the setting device display.

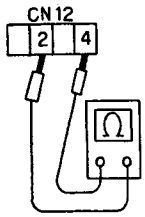
Power ON/OFF	Measured terminal		Passing mark
OFF	⊕ Red	⊖ White	Good: approx. 10Ω Bad: ∞Ω

AL07 The temperature switch protecting the fan motor coil tripped.

[Diagnostic method]



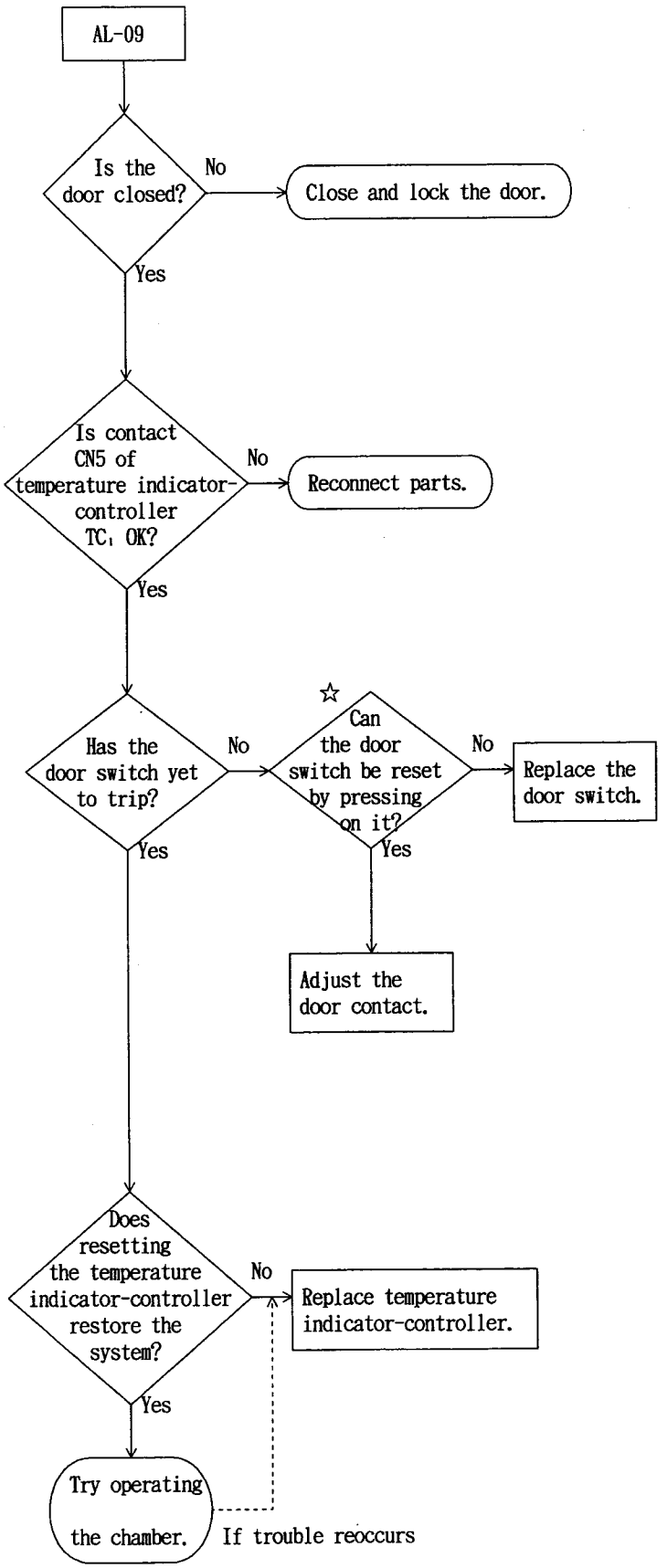
- Check whether temperature switch inside the fan motor has tripped or not.
  Disconnect relay connector CN12, and measure resistance at terminals (2) and (4) (wire Nos. 13D and 15D) on the motor side.



Power ON/OFF	Measured terminal		Passing mark
OFF	Connector No.	②−④	0Ω: Not tripped
	Wire No.	13D-15D	∞Ω: Tripped

AL 09

Tripped door switch.

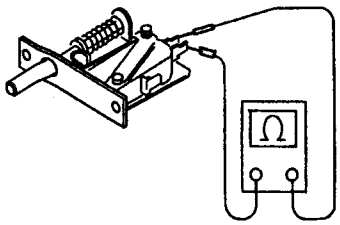


[Diagnostic method]

- AL-09 is displayed if the door is left open for 3 minutes or more.

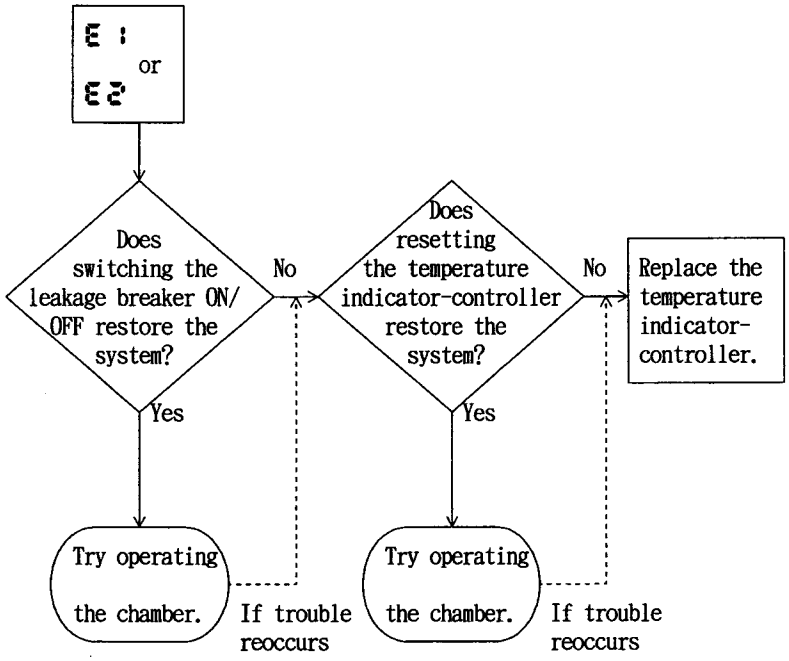
- Check connector CN5 on the temperature controller circuit board.

- Check the door switch is functioning properly. Disconnect the door switch wires and check the switch for continuity.

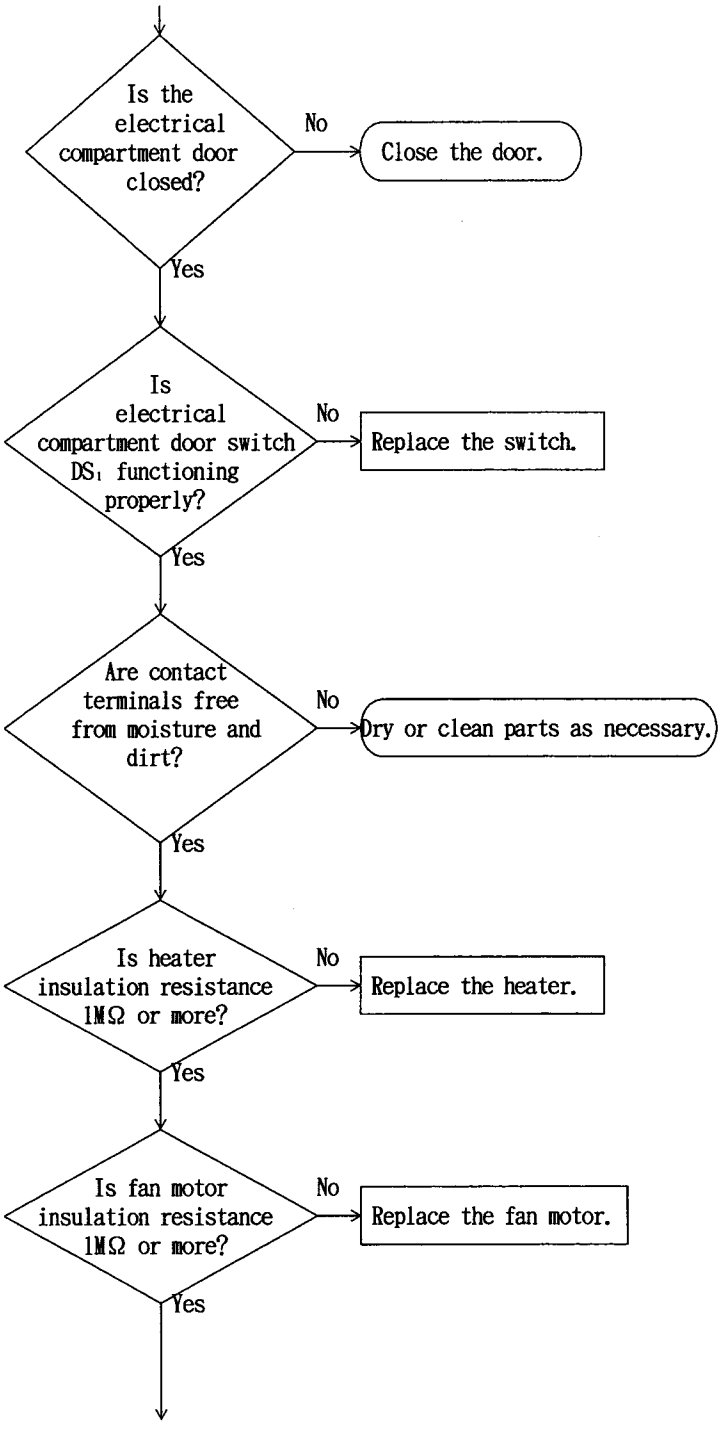


Good: 0Ω

E 1 E2 Memory error	[Diagnostic method]



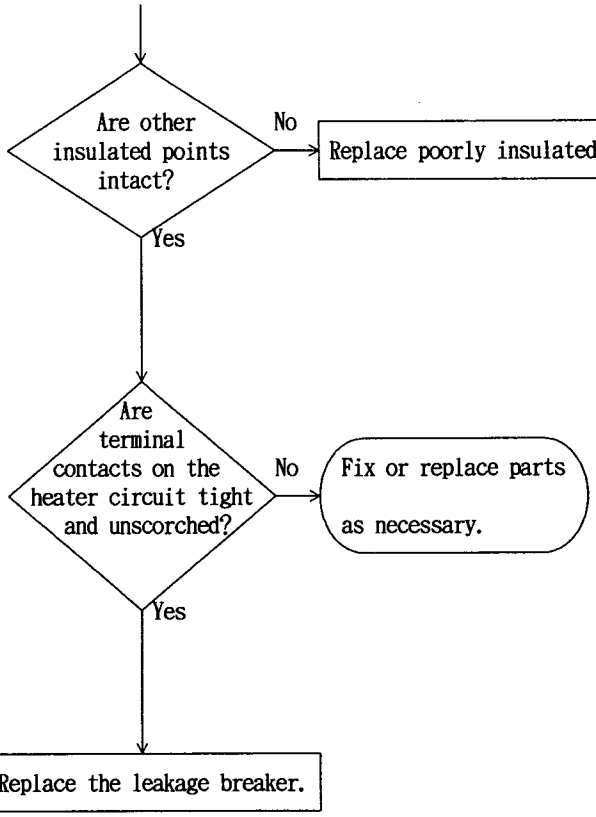
3-2 Faults without an alarm code

Tripped leakage breaker (1/2)	[Diagnostic method]
	• Check switch contact when the electrical compartment door is closed. • A catching sound should be heard when pressing the door switch by your hand, but it is better to check operation by measuring resistance at both ends of the switch with a tester. • If moisture has penetrated the equipment, find and eliminate the cause and prevent its reoccurrence. • Check heater insulation. Measure resistance across the heater terminal and the heater with a 500V DC insulation resistance tester. Good: 1MΩ or more. • Check fan motor insulation. Measure resistance across the fan motor terminal and the motor with a 500V DC insulation resistance tester. Good: 1MΩ or more.

Tripped leakage breaker (2/2)

[Diagnostic method]

Continued from the previous pagbe



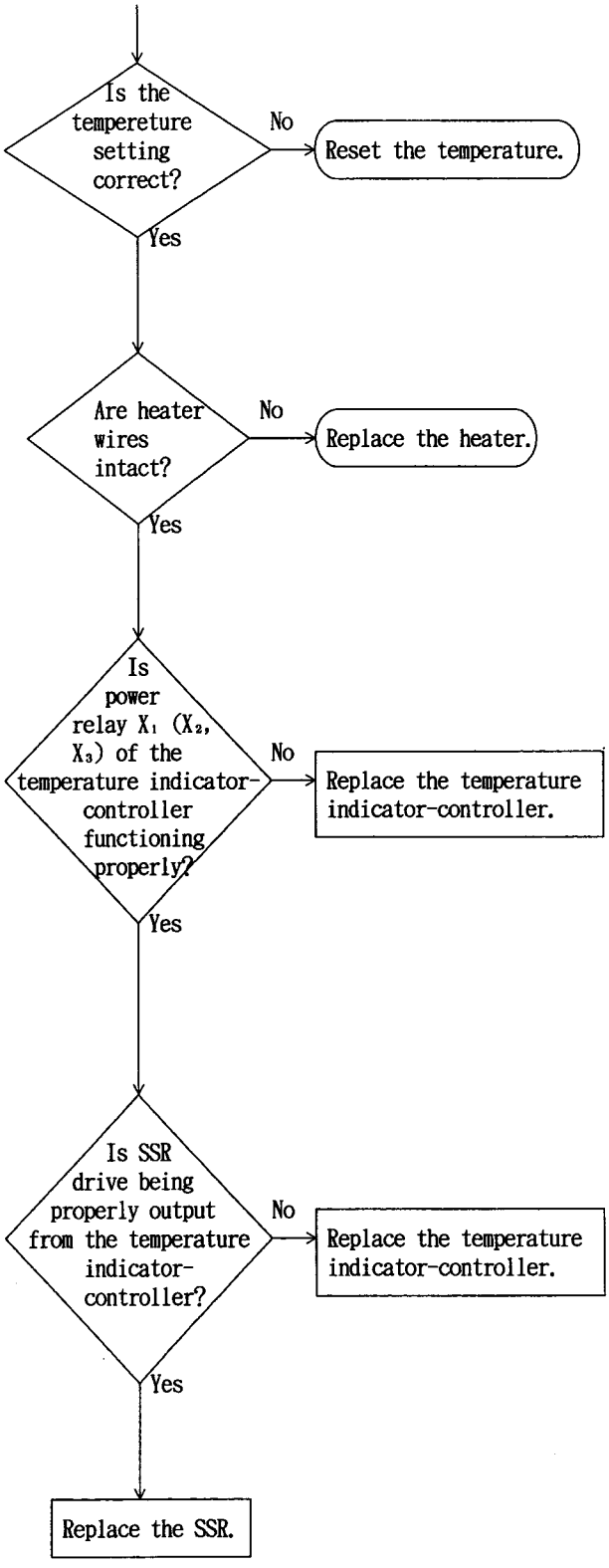
NOTE: When measuring insulation (500V DC insulation resistance tester), be sure to disconnect the connector and measure at the loaded side.

NOTE: After replacing the leakage breaker, make sure terminal connections are sufficiently tight.

After replacing the leakage breaker, press the test button and check the breaker trips properly.

Leakage breaker trouble carries the risk of electric shock or burned parts, therefore, if the described diagnostic method fails to remedy the situation, promptly contact TABAI ESPEC CORP.

Temperature fails to rise.

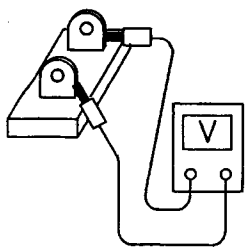


[Diagnostic method]

- Setting range
  (ambient temperature) + 20℃ to 200℃
  (200℃ type chamber)
  (ambient temperature) + 20℃ to 300℃
  (300℃ type chamber)

- For details on checking heater wiring, refer to AL-03.

- Check power relay X_1 (X_2, X_3) is functioning properly. Check contact at X_1 (X_2, X_3) on the temperature indicator-controller is properly made.

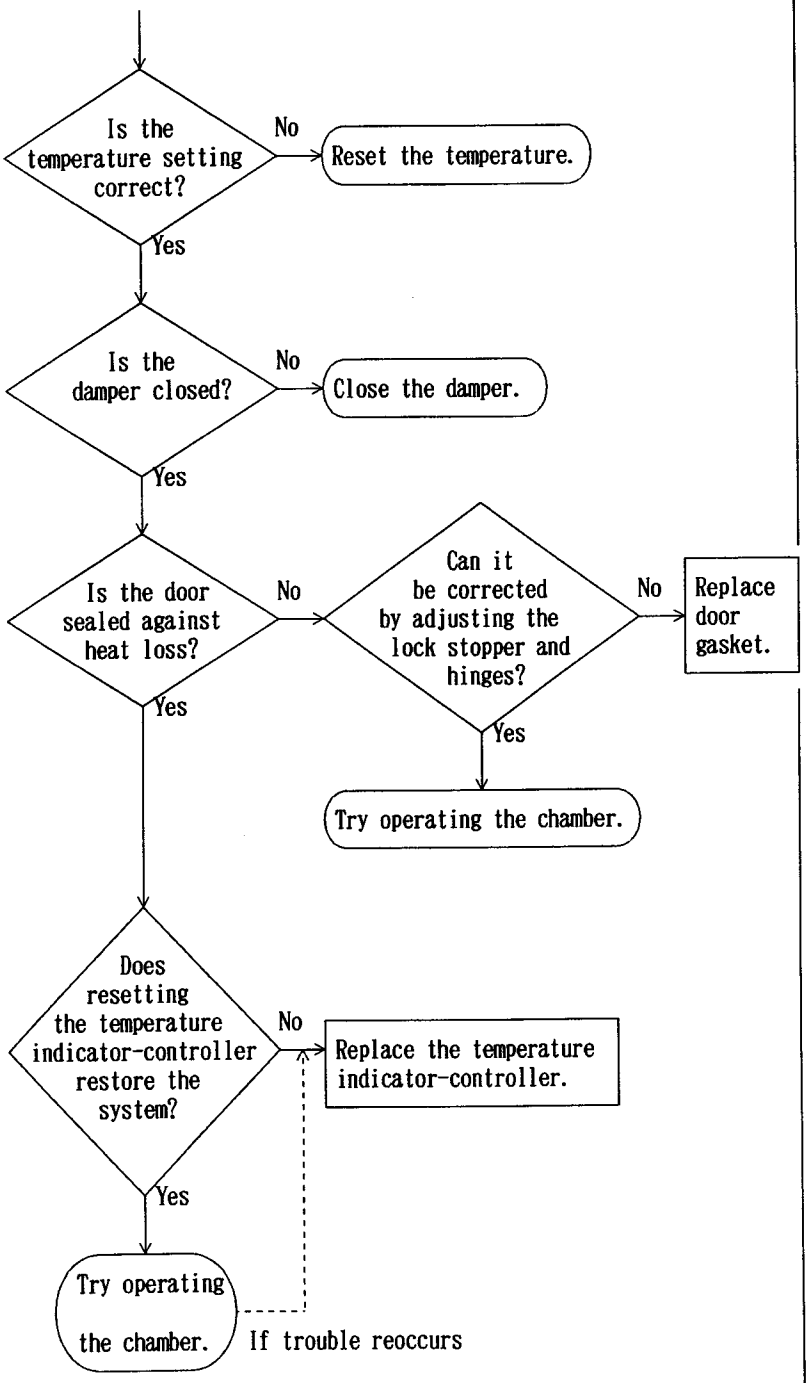


Power ON/OFF	Passing mark
ON	0V AC
OFF	200-240V AC

- For details on checking SSR drive output and SSR functioning, refer to AL-01.

Temperature rises too slowly.

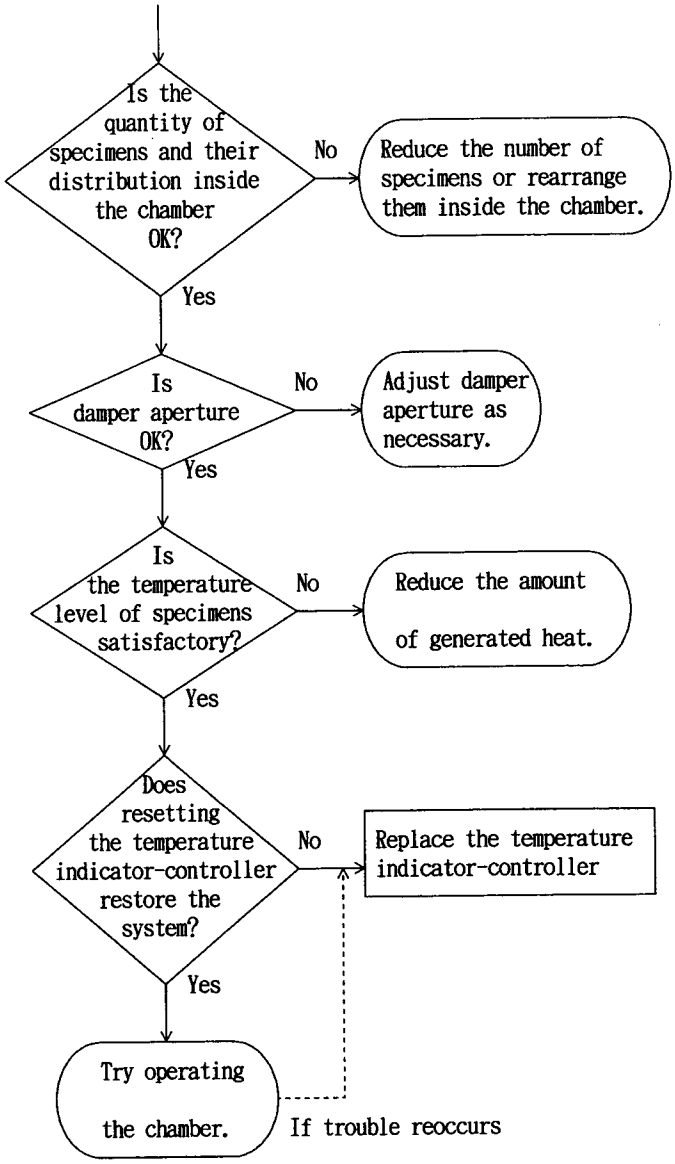
[Diagnostic method]



- Temperature heat-up rate
- PV type
  From ambient temperature to 200°C: within 40 minutes.
- PVH type
  From ambient temperature to 300°C: within 60 minutes.

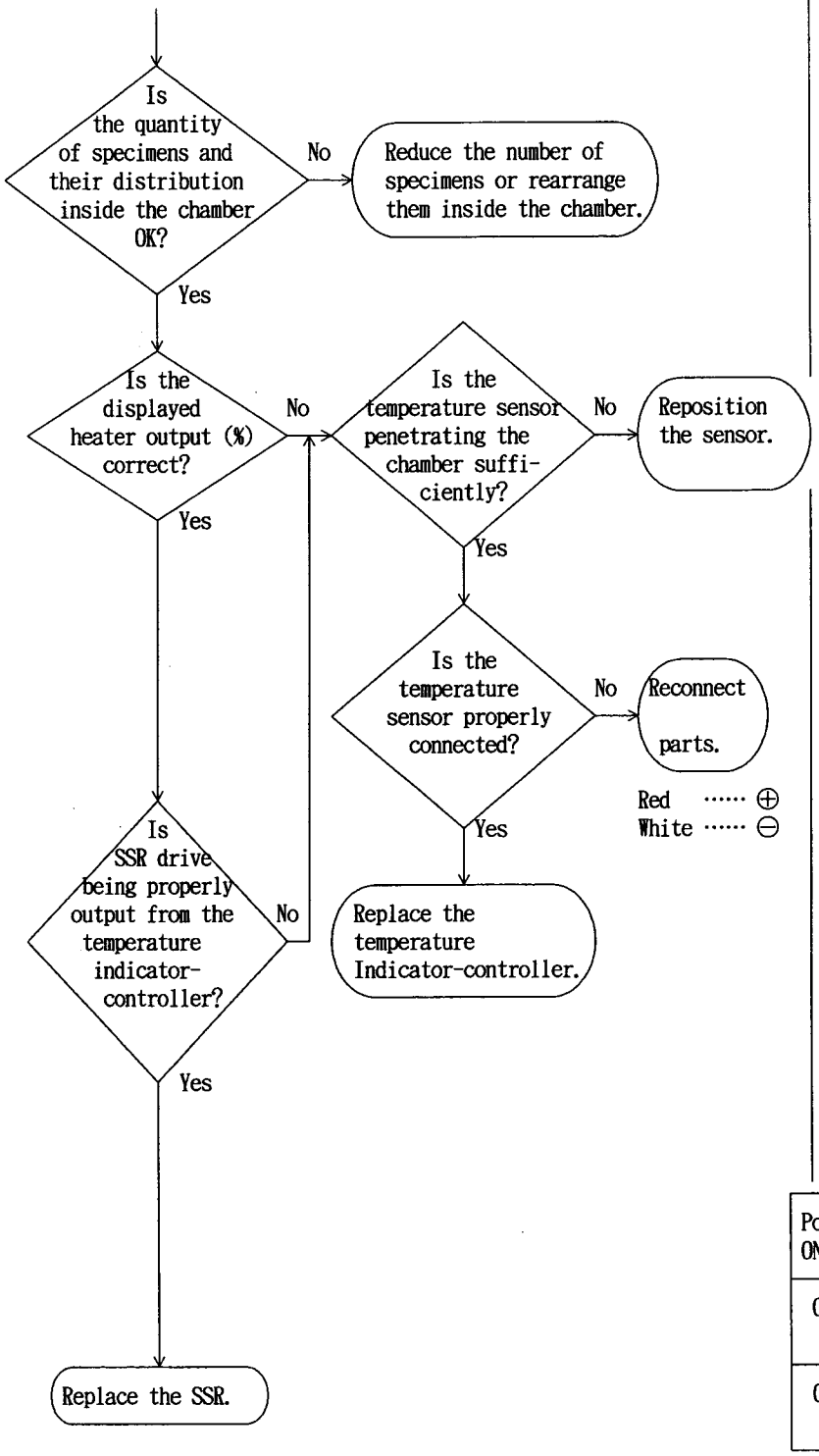
- Gap between door and chamber
  Good: 10 to 12 mm

Overshoot is too large.	[Diagnostic method]



Temperature rises too high.

[Diagnostic method]

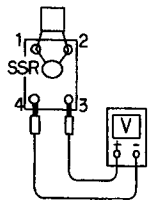


* A short may have occurred on the SSR output side (load). In such case, check the power relay X_1 (X_2, X_3) contact of the temperature indicator-controller for abnormality.

• For details on checking heater output, refer to AL-01.

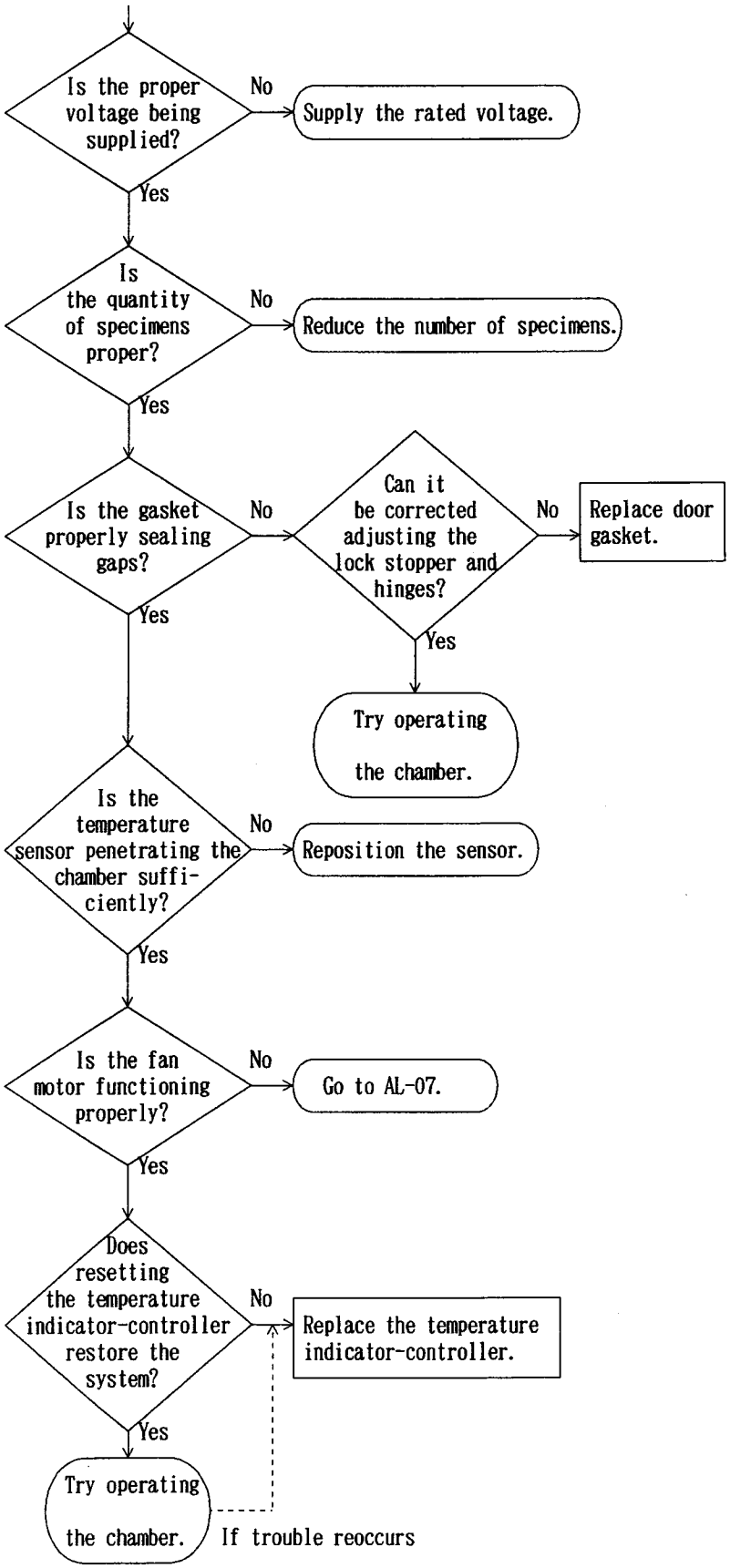
• For sensor positioning, refer to AL-01.

• Check SSR drive output (DC range) from the temperature indicator-controller. Measure input voltage at SSR input terminals (3) and (4).



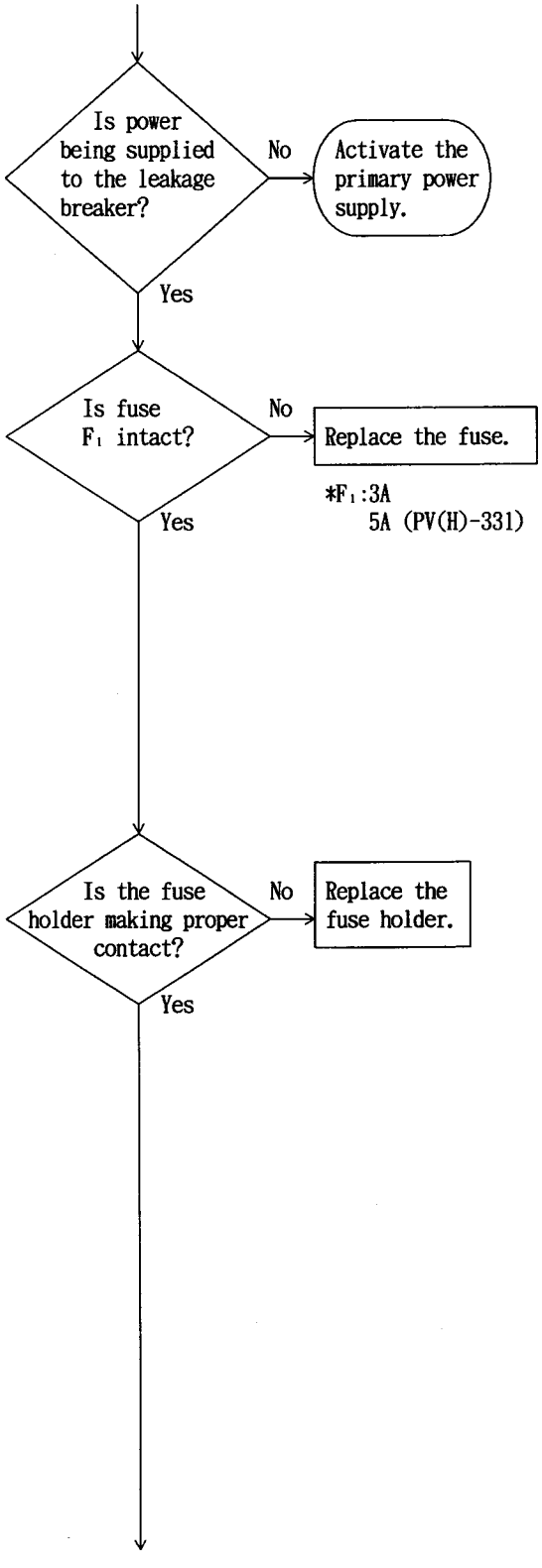
Power ON/OFF	Measure terminal	Passing mark
ON	Terminal ③ (+) ④ (−)	Approx. 24V DC
OFF		Approx. 0V DC

Temperature cannot be controlled.	[Diagnostic method]



- Power supply specifications
  Rated voltage ± 10%
- For details on replacing door gasket, refer to chapter 4.
- For sensor positioning, refer to AL-01.

No indications appear on the display. (1/2)

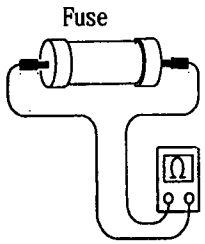


Continued

[Diagnostic method]

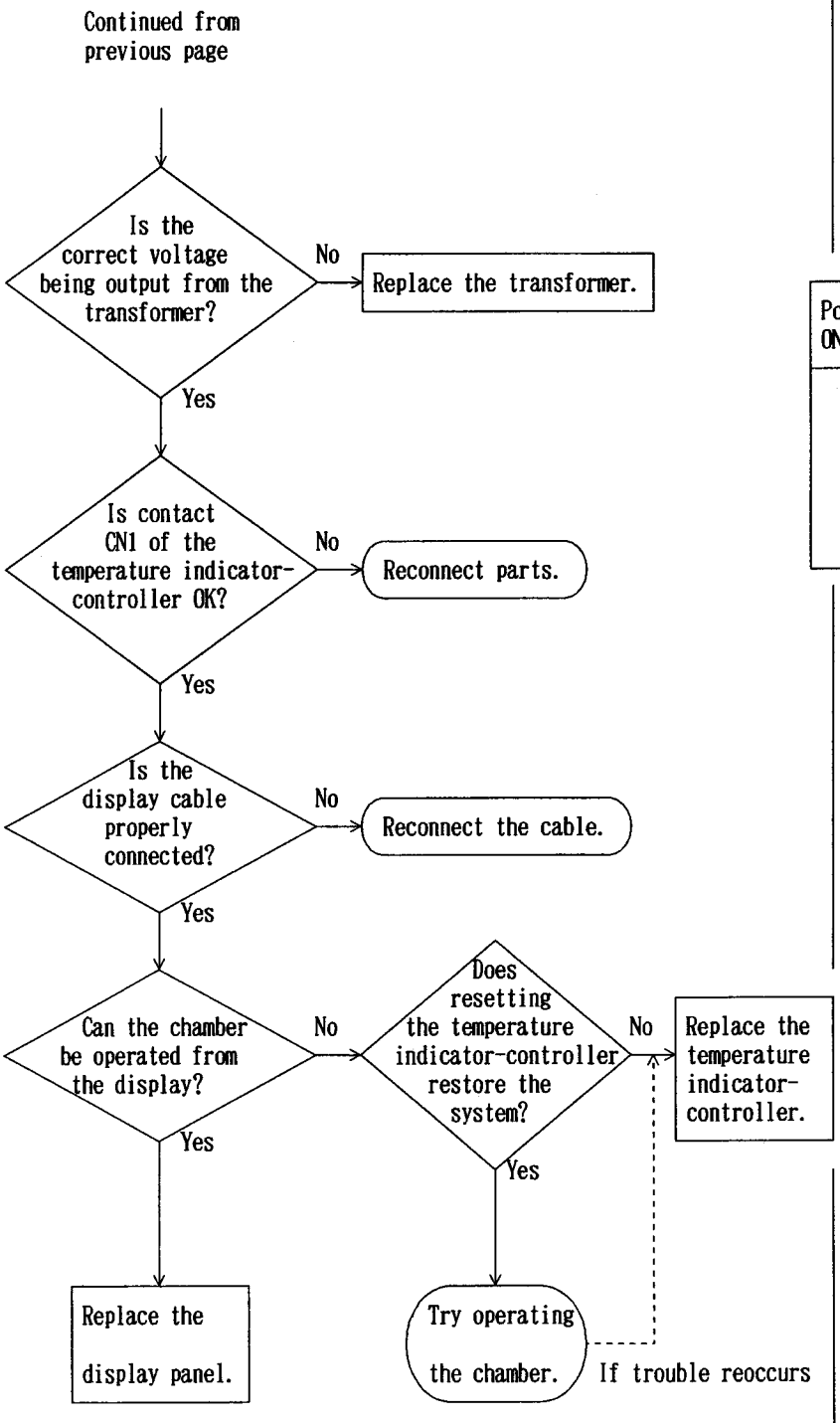
- **Check whether power is ON or OFF.**
  Press the button on the breaker. If the breaker trips, then power is being supplied. However, check voltage satisfies specifications (rated voltage ±10%), with a tester.

- **Check the fuse.**
  Remove glass body fuse F_1 from the electrical chassis, and check visually and check it for continuity.



No indications appear on the display. (2/2)

[Diagnostic method]



- **Check secondary voltage at the transformer.**
  Disconnect connector CN1 of the temperature indicator-controller, and measure voltage in all wires coming from the transformer.

Power ON/OFF	Measured terminal	Passing mark
ON	orange-black -orange	19V AC±3%
	red-red	8.5V AC±3%
	gray-gray	19V AC±3%

Chapter 4 Replacement and adjustment of parts

In the preceding chapter, troubleshooting with your chamber was explained. Now, this chapter explains the specifics of how to replace and adjust parts.

Make note of the fact that some items will be unnecessary depending on the type of chamber you use. Read "Chapter 2 Chamber configuration" carefully, before attempting to make changes to your equipment.

Be sure to turn the main power switch (leakage breaker) OFF before replacing parts.

4-1 Replacing the heater and temperature fuse

1. Remove the machine screws from the heater access port cover. ····· Phillips screwdriver
2. Remove the caps from the heater terminals.
3. Remove the hexagonal nuts (M4) from the heater terminals, followed by the heater (rounded terminal head) and thermal fuse leads. ····· Boxhead screwdriver (M4)
4. Remove the machine screws anchoring the heater unit, followed by the unit. ····· Phillips screwdriver
5. Install a new heater.

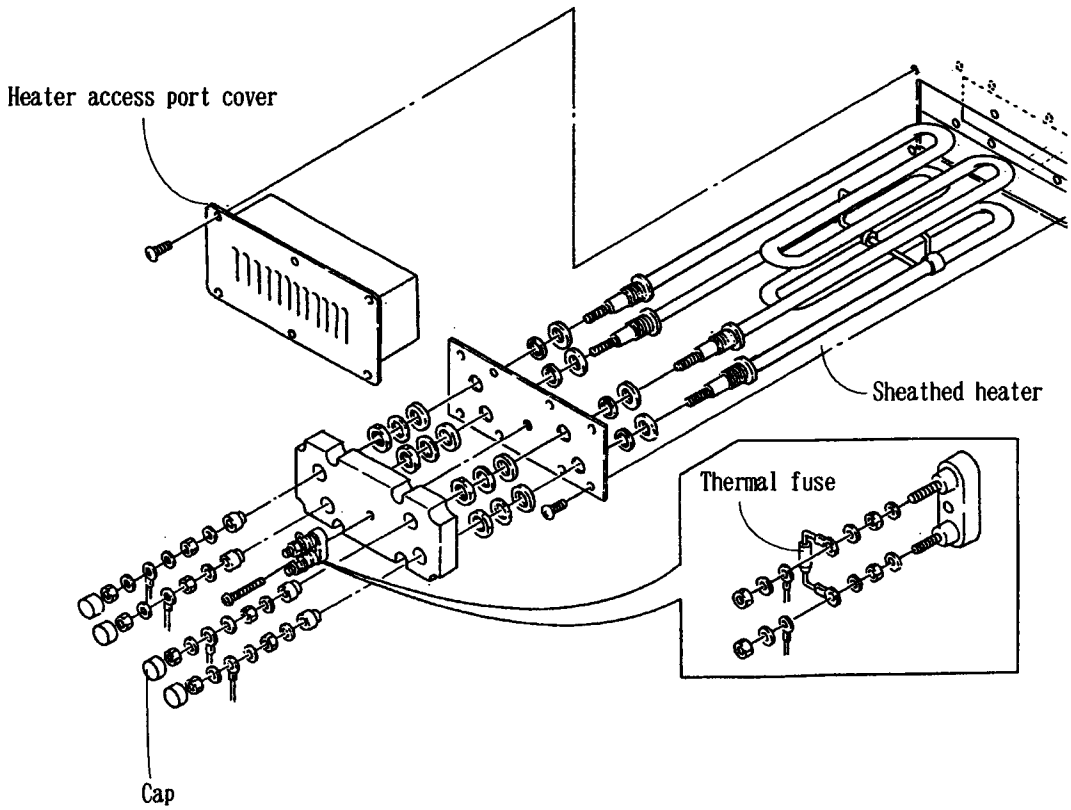


Fig. 1 Heater unit

4-2 Replacing the blower wheel

1. Remove the heater unit. ····· Refer to 4-1.
2. Remove the machine screws from the ceiling of the inner chamber. ····· Phillips screwdriver

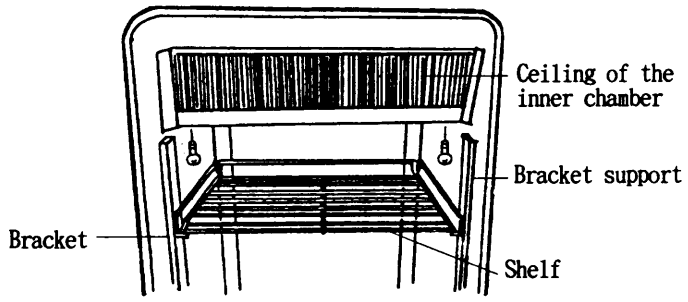


Fig. 2-1 Removing the ceiling of the inner chamber.

3. Remove the machine screws holding the air intake port in place.
····· Phillips screwdriver
4. Loosen the loose-preventing nut locking the blower wheel to the motor shaft, and pull the blower wheel downward and out. ····· Wrench (M12), spanner (Special tool, width acroos flat 27 mm)

* • Be careful not to apply excessive force on the fan blades to prevent their deforming.

• If fixing screws have soldered over, use a loosening agent like WD-40 (Rocket Chemical Co., INC.) rather than applying force to free parts.

5. Remove the blower wheel.
6. Install a new blower wheel.

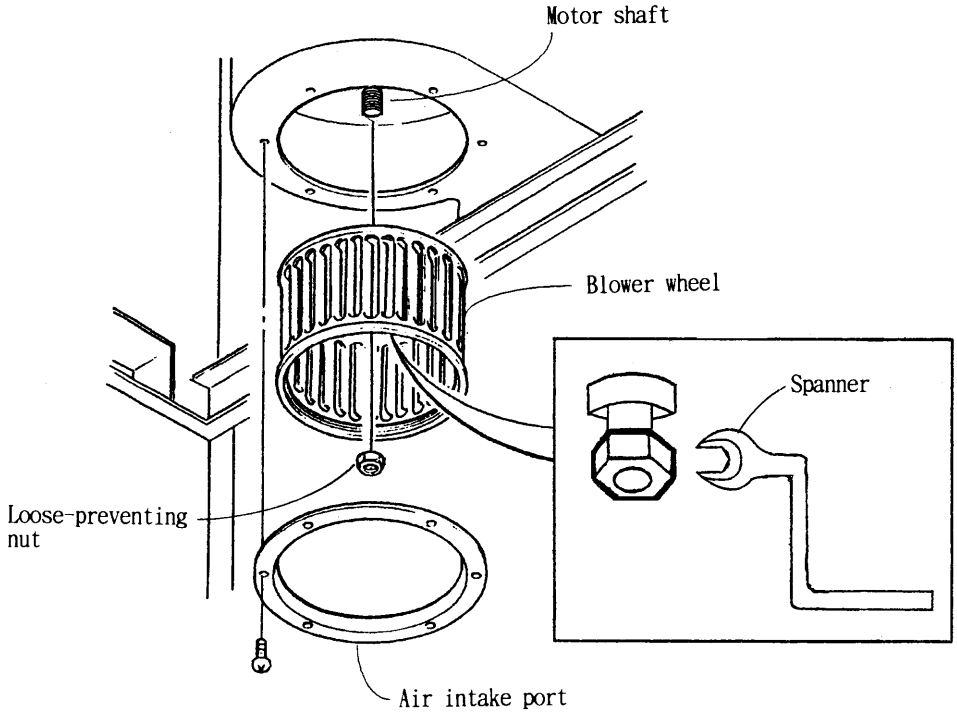


Fig. 2-2 Blower wheel

4-3 Replacing the motor

1. Remove the blower wheel. ····· Refer to 4-2
2. Remove the machine screw holding the rotor blade in place, followed by the rotor blade. ····· Phillips screwdriver
3. Disconnect the capacitor leads and remove the nut. ····· Boxhead screwdriver (M4)
4. Remove the bolts (× 4) anchoring the motor. ····· Boxhead screwdriver (M6)
5. Remove the motor.
6. Install a new motor.

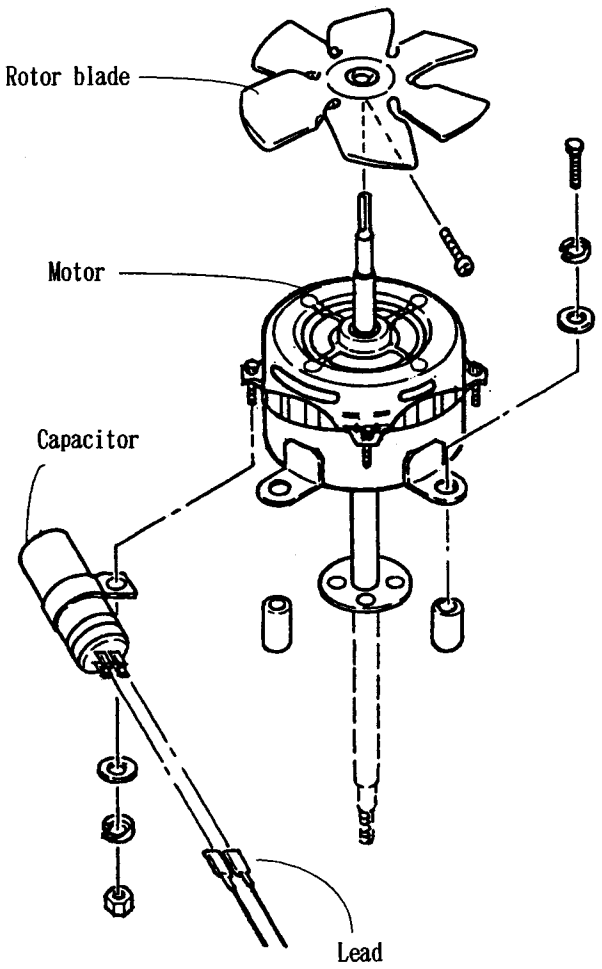


Fig. 3 Motor

4-4 Replacing the damper unit

1. Remove the damper knob. ····· Slotted screwdriver. Cushion the chamber to protect from scratches.
2. Remove the push-nut from the link, followed by the pin. ····· Slotted screwdriver for push-nut
3. Remove the machine screws holding the damper unit in place. ····· Phillips screwdriver
4. Install a new damper unit.

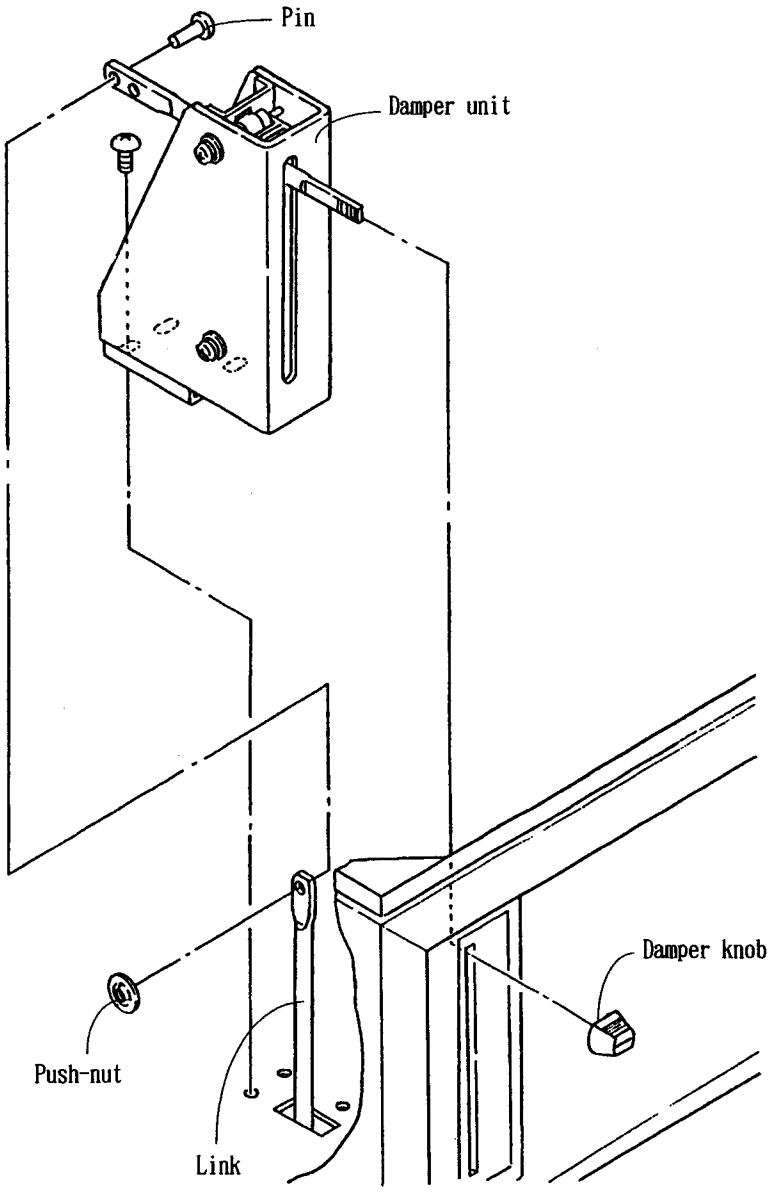


Fig. 4 Damper unit

4-5 Repositionins the lock

1. Remove the machine screws fixing the lock stopper in place ····· Phillips screwdriver.
2. Loosen and then adjust the machine screw fixing the lock holder so that 10 to 12 mm of space are found between the chamber door. ····· Phillips screwdriver.

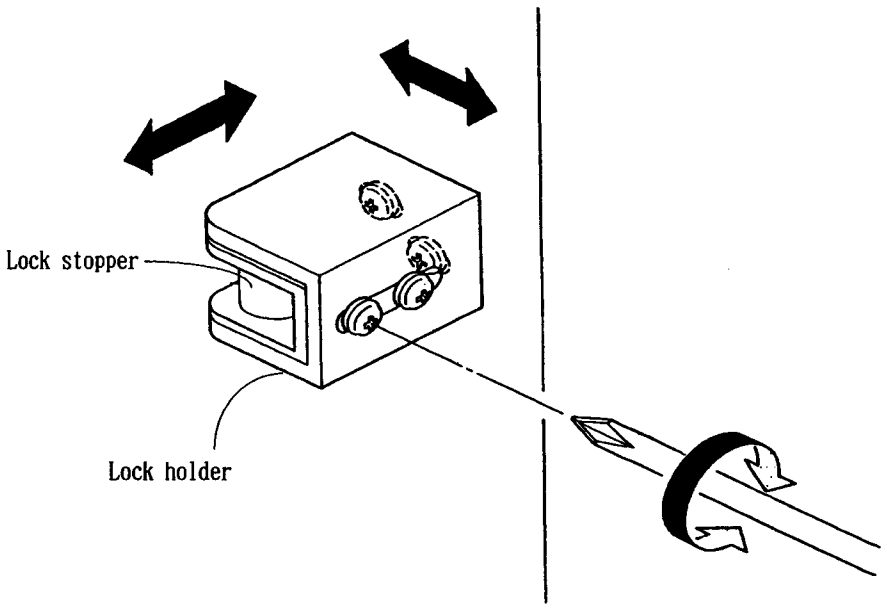


Fig. 5 Lock

4-6 Replacing door hinges

1. Remove the damper unit as described on 4-4.
2. Loosen and then adjust the bolts (top: ×3, bottom: ×4) holding the hinges in place so that 10 to 12 mm are found between the chamber and door. ····· Boxhead screwdriver (M5)
3. Tighten the bolts (top and bottom hinges) once positioned properly. ····· Boxhead screwdriver (M5)
4. Reinstall the damper unit.

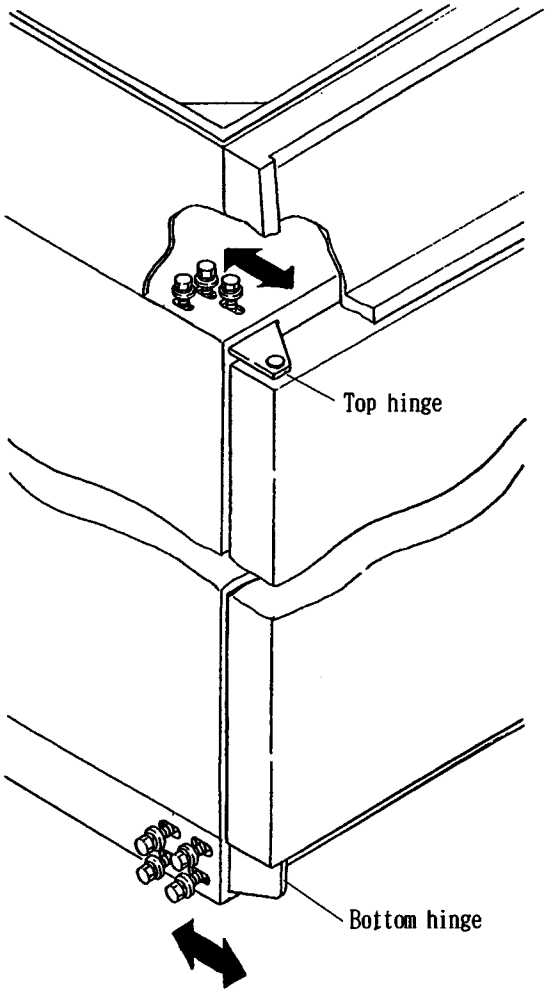


Fig. 6 Hinges

4-7 Replacing the door gasket

1. Pull hard on the cut end of the door gasket, at the bottom center of the chamber.
2. Pull off the rest of the door gasket. ····· Be careful of the gasket remaining stuck in spots.
3. Attach a new gasket ····· Push hard in the direction of the arrow to insert.

NOTE: • Door gasket for PV models: Indian red
• Door gasket for PVH models: Black, double gasket

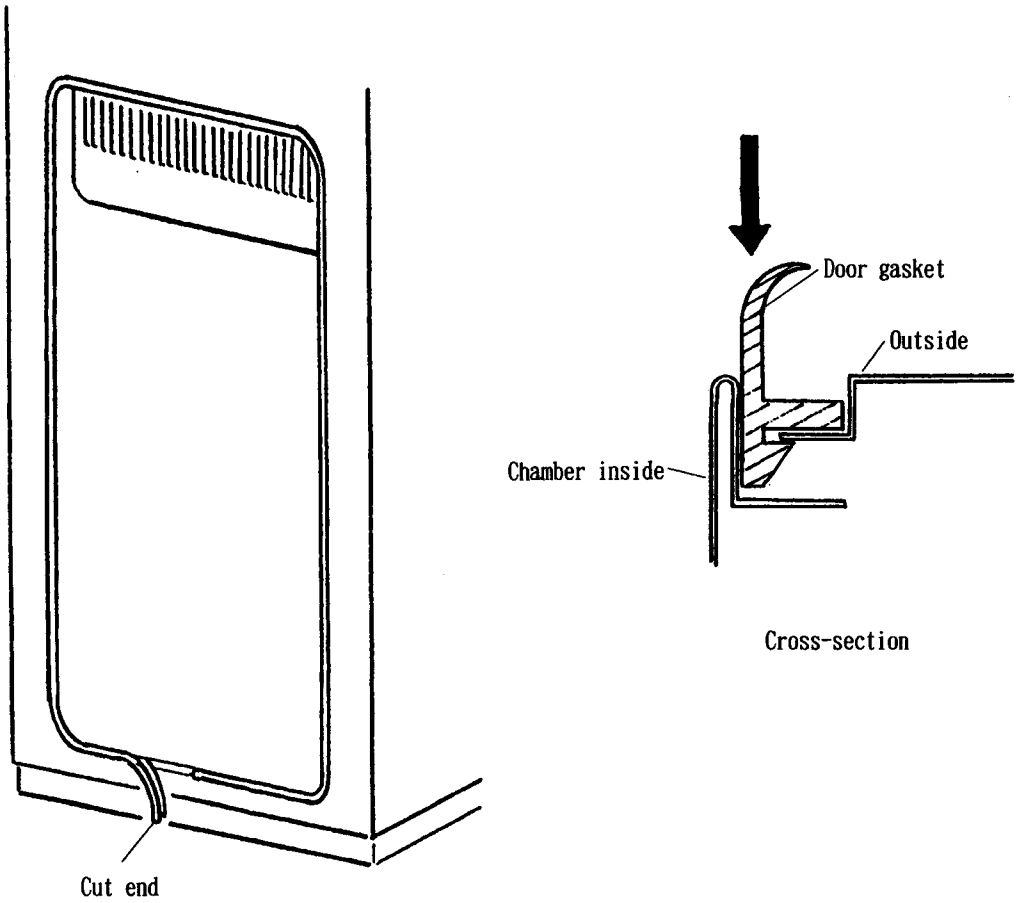


Fig. 7 Door gasket

4-8 Replacing the temperature controller circuit board (control board)

1. Turn the main power switch OFF.
2. Open the electrical compartment door.
3. Disconnect all connectors from the temperature controller.
4. Remove the connectors attached to the temperature controller.
5. Remove the circuit board while pressing on the tip of the board spacers (plastic) with nippers or similar tool.
6. Set the rotary switch on the new board to the same position as that on the old board. Refer to Table 4-1.
7. Install the new board and connect all connectors.
8. Initialize the board once installed, as described in "Initializing the temperature controller."

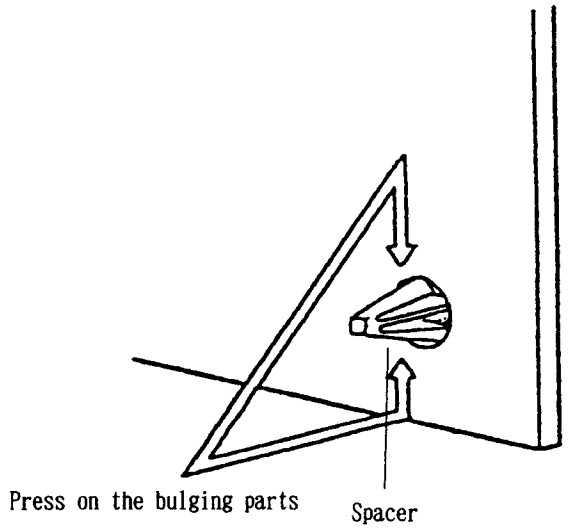


Fig. 8 Spacer

4-9 Replacing the overheat protector circit board (OHP board)

1. Turn the main power switch OFF.
2. Open the electrical compartment door.
3. Disconnect all wires to the terminal board and the connector for setting device.
4. Remove the circuit board while pressing on the tip of the board spacers (plastic) with nippers or similar tool.
5. Install a new board and reassemble parts in reverse order.

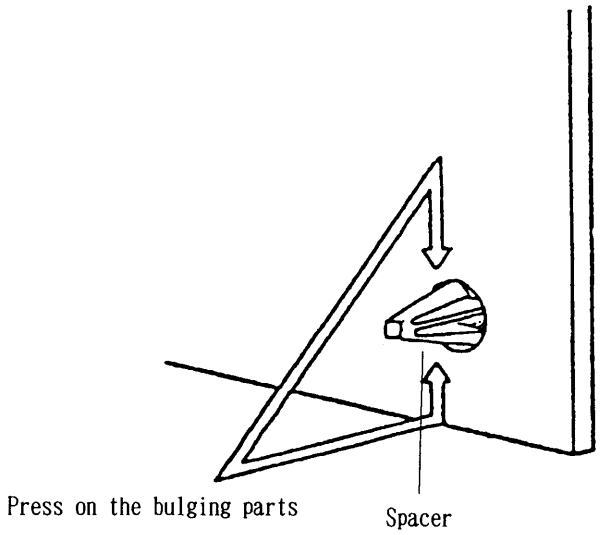


Fig. 9 Spacer

4-10 Replacing the temperature sensor

1. Turn the main power switch OFF.
2. Open the electrical compartment door.
3. Disconnect all wires to the temperature controller circuit board. Disconnect connectors before wiring.
4. Disconnect all wires to the overheat protector circuit board.
5. Pull out the temperature sensor from the electrical compartment side.
   ····· Make note that rubber bushings are coated with a silicon base sealant.
6. Adjust a new sensor as necessary and install.
   ····· After inserting the sensor, check the outer and inner rubber bushings are securely in place. Coat bushings with sealant.

• Check the temperature sensor is properly positioned.

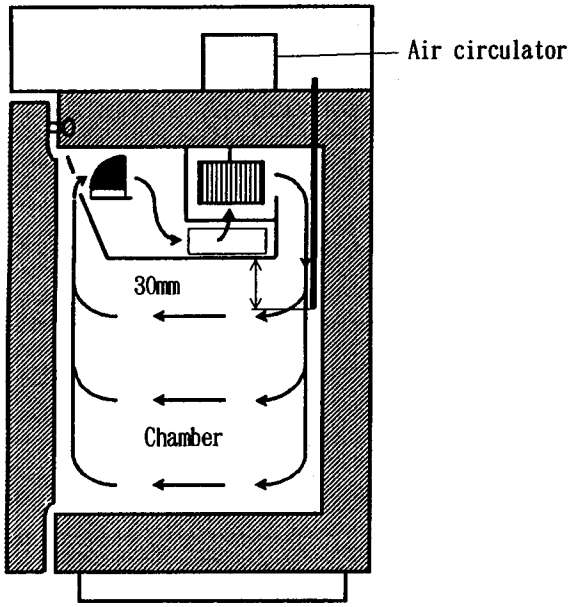


Fig. 10 Temperature sensor

4-11 Replacing the SSR

1. Disconnect all wires to the SSR. ····· Phillips screwdriver
2. Remove the screws (× 2) fixing the SSR in place, followed by the SSR.
   ····· Phillps screwdriver
3. Install a new SSR. ····· • Coat the heat sinker on the back side of the SSR before installing.
   • Keep tightening torque to 12 kg • cm.
   • Tighten screws evenly.

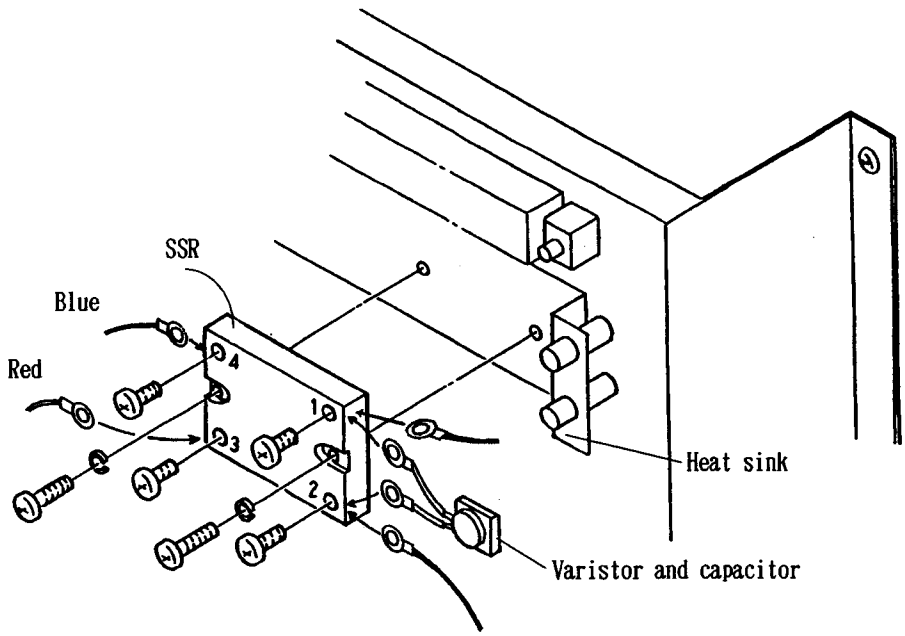


Fig. 12 SSR

4-12 Replacing the main power switch (leakage breaker) and electrical compartment door switch

1. Turn OFF the primary power supply.
2. Remove the machine screws fixing the chassis on the rear of the chamber, followed by the chassis. (Fig. 12-1) ····· Phillips screwdriver
3. Detach the electrical compartment door switch from its installation plate at the chassis bottom, and disconnect the soldered leads. (Fig. 12-2) ····· Soldering iron
4. Disconnect the cord on the main power switch (leakage breaker) and load sides. (Fig. 12-3) ····· Philips screwdriver
5. Remove the machine screws (× 2) fixing the main power switch in place, followed by the switch. ····· Phillips screwdriver
6. Install a new switch.

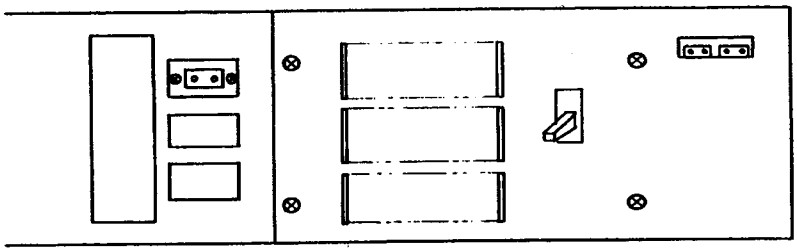


Fig. 12-1 Chamber rear

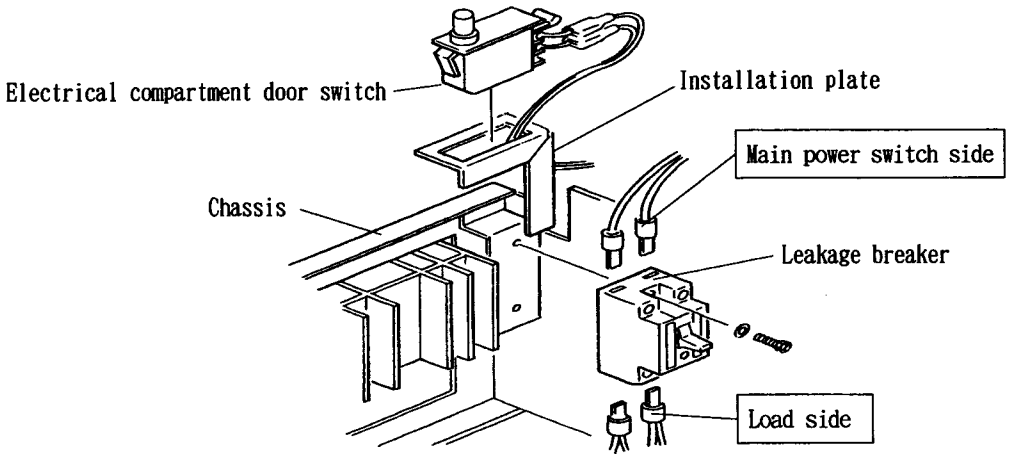


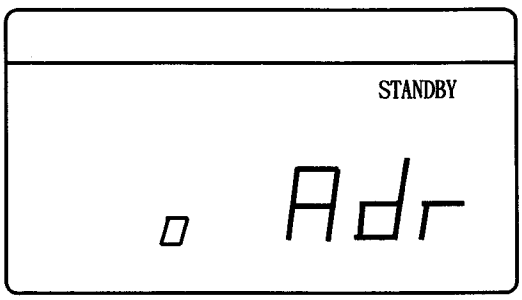
Fig. 12-2 Electrical compartment

4-13 Resetting the temperature indicator-controller

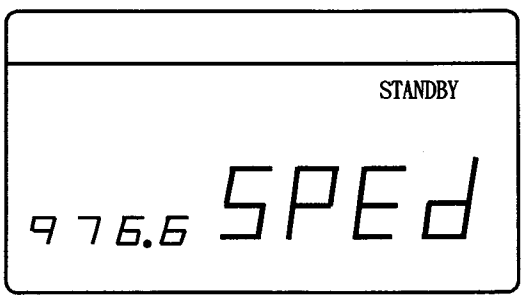
The temperature indicator-controller can be reset from the manufacturer maintenance mode.

(Engaging the manufacturer maintenance mode)

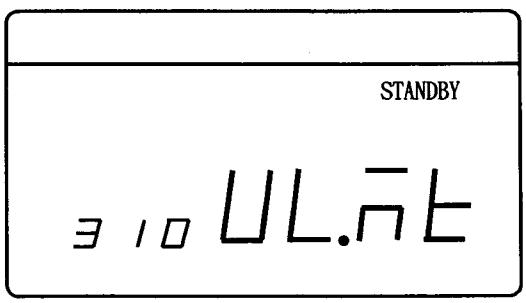
1. Turn ON the power to the panel, and select the constant mode (standby state).
2. Hold down the ◁ and ▷ keys simultaneously for 3 seconds or more. The chamber will enter the user maintenance mode.



3. Press the NEXT key and call up the E-BUS baud rate display (second display of user maintenance mode).

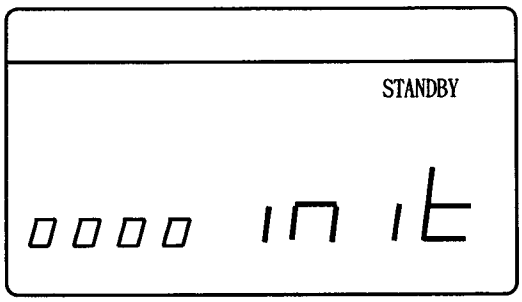


4. Hold down the ◁ and ▷ keys simulaneously for 3 seconds or more. The chamber will enter the manufacturer maintenance mode.



(Resetting)

1. Enagage the manufacturer maintenance mode, and from the upper limit setting display, press the NEXT key until the initial settings display is called up (9th screen).



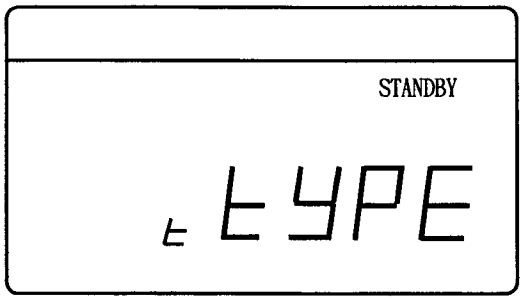
2. Make settings with the △ and ▽ keys, as shown below. Setting will be active after power has been turned off and then reactivated.

Initial setting	Reset operation
0 0 0 0	Starts up normal power supply.
0 0 0 1	Initializes the above operation and user-set variables (temperature settings, etc.).
0 0 1 1	Initializes the above operation and manufacturer-set variables (PID coefficient, etc., with exception to temperatute calibration data).
0 1 1 1	Initializes all variables (including temperature calibration data).

(Adjustments after resetting)

After resetting the chamber, make the following adjustments and/or settings.

1. Enagage the manufacturer maintenance mode and press the NEXT key until instrumentation type setting display is called up (8th screen).

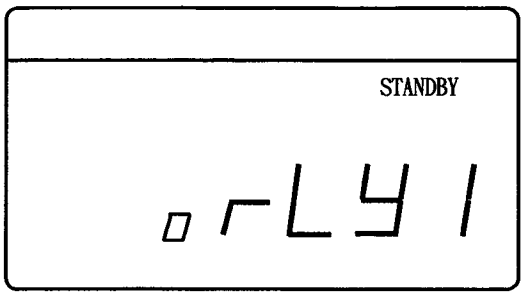


2. Select from standard instrumentation and M-instrumentation with the △ and ▽ keys.
3. Press the NEXT once more and call up the initial settings display.
4. Set "0011" with △ and ▽ keys and switch the main breaker OFF and then ON again.

   This will initialize the instrumentation settings.

If your chamber is equipped with the time-up output option, make the following adjustments and/or settings.

1. Enagage the manufacturer maintenance mode and press the NEXT key until the relay 1 display is called up (5th screen).



2. Set "2" with △ and ▽ keys.
3. Press the POWER key and turn OFF power to the operation panel.

   This will initialize the time-up output setting.

If key input is ineffective, then resetting can be forced at the rotary switch.

1. Turn the breaker OFF.
2. Set the rotary switch to "0" (refer to the temperature controller in "2-2 Names of chamber parts").
3. Turn the breaker ON and check the COND. SET and STANDBY lamps light up. Then, turn the breaker OFF again and then ON.
4. Check a numerical figure is displayed at STEP indication and the buzzer is emitted. Then, return the rotary switch to the correct setting, and turn the breaker OFF and ON again.

   This will make the equipment respond to key input.

4-14 Replacing the ROM

Replace the ROM according to the following procedure.

1. Turn the breaker OFF.
2. Remove the ROM from the temperature controller (refer to the temperature indicator-controller in "2-2 Names of chamber parts").
3. Install a new ROM.
   Check the ROM is oriented correctly and pins are properly inserted into place.
4. Check the rotary switch setting.
   Refer to Table 4-1 Rotary switch and chamber type.
5. Close the distribution panel, and turn the breaker ON.
6. Press POWER and check the equipment starts up properly.
7. Reset the chamber (refer to "Resetting the temperature indicator-controller" on the previous section).

Table 4-1 Rotary switch and chamber type

Rotary switch	Chamber model		Upper limit temperature
0	Detection mode at factory set (Do not use in normal operation.)		
1	Temperature chamber (PV) Sterilizer (KPV)		210℃
2	Temperature chamber (PVH) Sterilizer (KPVH)		310℃
3	Temperature chamber (PH) Anaerobic temperature chamber (IPH) Temperature chamber with rotating specimen rack (GPH) Sterilizer (KPH)		210℃
4	Temperature chamber (PHH) Anaerobic temperature chamber (IPHH) Temperature chamber with rotating specimen rack (GPHH) Sterilizer (KPHH)		310℃
5	High temperature chamber (STPH)		510℃
6	High temperature chamber (SSPH)		710℃
7	Temperature chamber with safety door (explosion vent) (SPH)		210℃
	With fin heater	Temperature chamber (PH) Anaerobic temperature chamber (IPH) Temperature chamber with rotating specimen rack (GPH)	
8	Temperature chamber with safety door (explosion vent) (SPHH)		310℃
	With fin heater	Temperature chamber (PHH) Anaerobic temperature chamber (IPHH) Temperature chamber with rotating specimen rack (GPHH)	
9	Clean oven (PVHC)		360℃
A(10)	Clean oven (PHHC) S type		310℃
B(11)	Clean oven (PVC)		210℃
C(12)	Temperature chamber (PHH) 350℃ specification		360℃
D(13)	Temperature chamber (PHH) 350℃ specification with fin motor		360℃
E(14)	FA clean oven (FTC)		210℃
F(15)	FA clean oven (FTHC)		310℃

4-15 Replacing the battery

Replace the battery according to the following procedure.

1. Turn the breaker OFF and remove the temperature indicator-controller.
2. Replace the battery (lithium). Specification: 3V, 650 mA
3. Reconnect the temperature indicator-controller.
4. Turn the breaker ON and check the chamber resets itself
   (refer to "4-13 Resetting the temperature indicator-controller").

> Temperature calibration data is initialized when the battery is replaced, therefore be sure to perform temperature calibration again.
>
> Refer to "Temperature calibration" on the next page.

4-16 Temperature calibration

Wire your chamber as shown in Fig. 16-1.

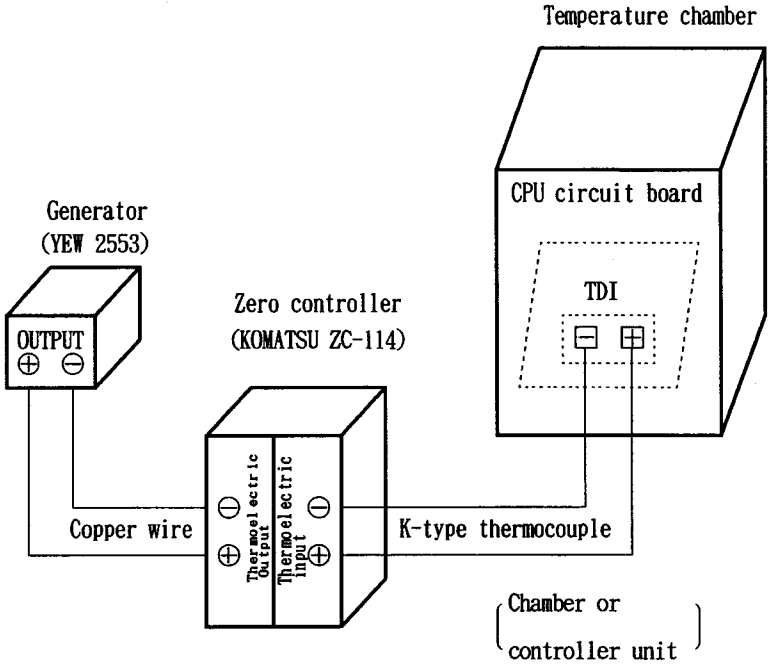


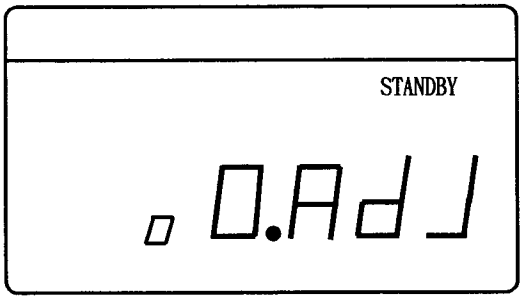
Fig. 16-1 Connections

Calibrate temperature according to the following procedure.

1. Start up all units and wait till power stabilizes (30 minutes to 1 hour).
2. Initialize the chamber's memory.
   Set "0111" on the initial settings display (manufacturer maintenance mode) and reset the chamber (refer to "4-13 Resetting the temperature indicator-controller").

3. Enagage the temperature calibration mode.

In the constant mode, and with the regular monitoring display STANDBY called up, press the NEXT key until the heater output monitor display is called up. Then, hold down the ◁ and ▷ keys simultaneously for 3 seconds or more and check the zero adjustment display is called up.



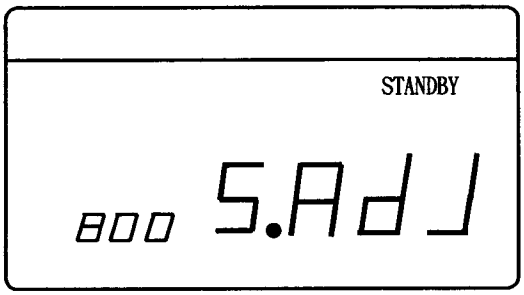
4. Perform zero adjustment.

Input "0μV" with the zero controller as an equivalent to the 0℃ of the K-type thermocouple, read at the generator. Then, press the △ key.

Registration is complete when "0" is displayed.

5. Call up the span adjustment display.

With the zero adjustment display called up, press the NEXT key once and check the span adjustment display is called up.



6. Perform span adjustment.

Input "33277μV" with the zero controller as an equivalent to the 800℃ of the K-type thermocouple, read at the generator. Then, press the △ key.

Registration is complete when"800" is displayed.

This completes temperature calibration. Press the COND. SET key to return to the monitoring display.

Service Manual

Temperature Chamber (Industrial Oven)

PV(H)-211, 221, 231, 331

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