# Part 3
# Troubleshooting



**What is in this part?** This part contains the following chapters:

# 1 Troubleshooting

## 1.1 What Is in This Chapter?

**Introduction**

When a problem occurs, you have to check all possible malfunctions. This chapter gives a general idea of where to look for malfunctions.

Not all repair procedures are described. Some procedures are considered common practice.

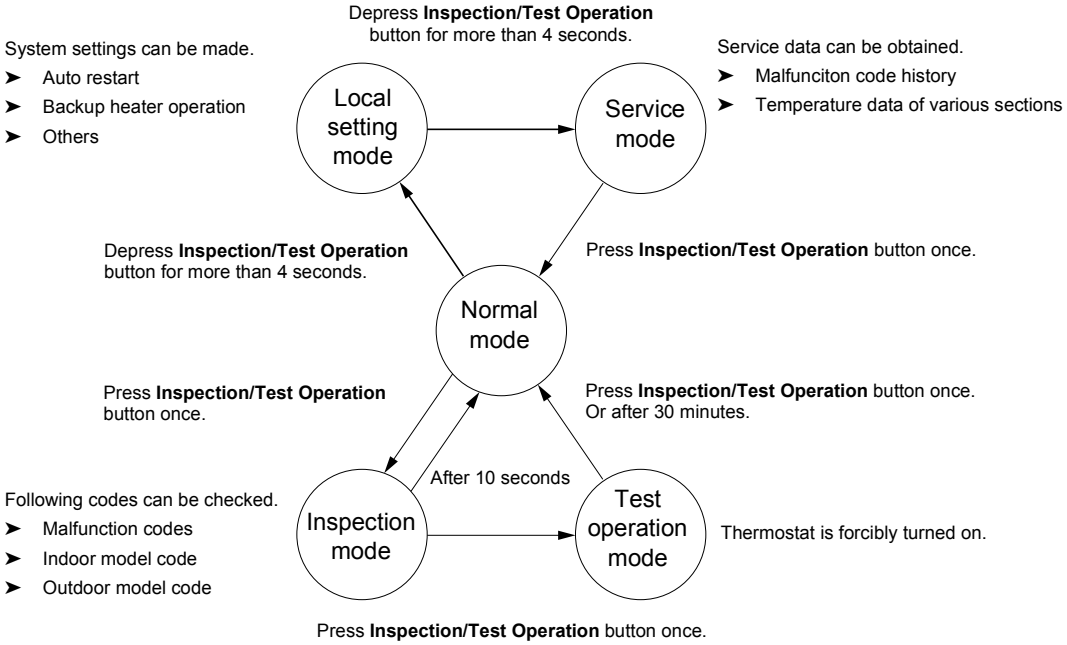
**Overview**

This chapter contains the following topics:

## 1.2 Procedure of Self-Diagnosis by Remote Controller

**The inspection/test button**

The following modes can be selected by using the [Inspection/Test Operation] button on the remote control.



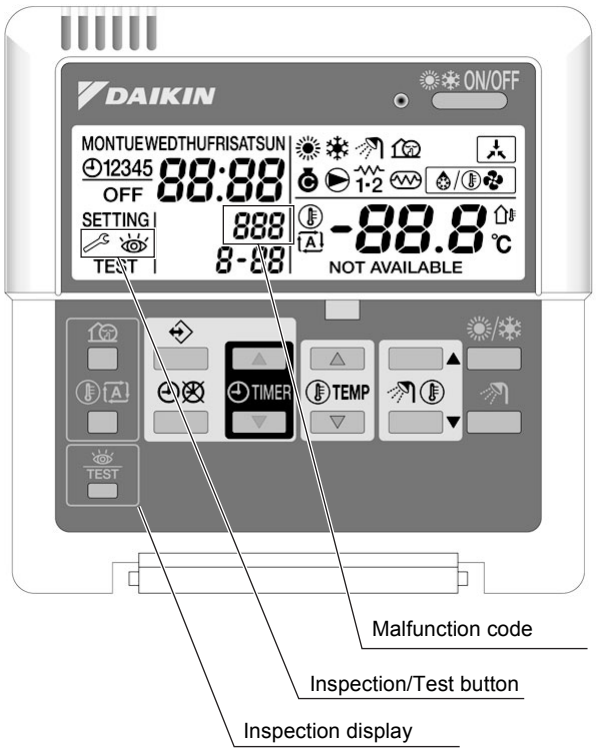

**Remark**

Above information is general. Not all settings are applicable for ALTHERMA.

## 1.3 Fault-diagnosis by Remote Controller

**Explanation**

If operation stops due to malfunction, the remote controller's operation LED blinks, and malfunction code is displayed. (Even if stop operation is carried out, malfunction contents are displayed when inspection mode is entered.) The malfunction code enables you to tell what kind of malfunction caused operation to stop. See page 3-6 for malfunction code and malfunction contents.



## 1.4 Overview of Error Codes

| | Malfunction code | Malfunction contents | See page |
|---|---|---|---|
| Hydro-box | 80 | Inlet water temperature thermistor abnormality | 3–10 |
| | 81 | Outlet water temperature thermistor abnormality | 3–10 |
| | 89 | Water heat exchanger freez-up abnormality | ?? |
| | 7H | Flow abnormality | ?? |
| | 8H | Outlet water temperature too high | ?? |
| | AA | Booster heater thermal protector is open | ?? |
| | A1 | Hydro-box PCB abnormality | 3–8 |
| | A5 | Freez-up protection or High pressure control | 3–9 |
| | C0 | Flow switch abnormality | ?? |
| | C4 | Heat exchanger thermistor abnormality | 3–10 |
| | EC | Sanitary water temperature too high | ?? |
| | HC | Sanitary water temperature thermistor abnormality | 3–10 |
| Outdoor Unit | E1 | Outdoor unit PCB abnormality | 3–12 |
| | E5 | OL Activation (compressor overload) | 3–13 |
| | E6 | Compressor lock | 3–15 |
| | E7 | DC fan lock | 3–16 |
| | E8 | Input over current | 3–17 |
| | EA | Heating / Cooling switching failure | 3–19 |
| | F3 | Discharge pipe temperature control | 3–21 |
| | F6 | Too high condensing pressure | 3–23 |
| | H0 | Sensor abnormailty | 3–25 |
| | H6 | Compressor start up failure | 3–27 |
| | H8 | CT or related abnormailty | 3–29 |
| | H9 | Outdoor temperature thermistor or related abnormality | 3–31 |
| | J3 | Discharge pipe thermistor failure | 3–31 |
| | J6 | Heat exchanger thermistor or related abnormality | 3–31 |
| | P4 | Radiation fin thermistor or related abnormality | 3–31 |
| | L3 | Switch box temperature rize | 3–33 |
| | L4 | Radiation fin (power transistor) temperature rize | 3–35 |
| | L5 | Output over current (inverter PCB) | 3–37 |
| System malfunctions | U0 | Refrigerant failure | 3–42 |
| | U2 | Low-voltage or over-voltage detection | 3–44 |
| | U4 | Signal transmission error (indoor outdoor unit) | 3–45 |
| | U7 | Signal transmission error (indoor outdoor unit) | 3–47 |
| | UA | Combination error (indoor outdoor unit) or spare parts PCB | ?? |

# 2 Error Codes: Hydro-box

## 2.1 What Is in This Chapter?

**Introduction**

In the first stage of the troubleshooting sequence, it is important to correctly interpret the error code on the remote controller display. The error code helps you to find the cause of the problem.

**Shutdown**

For some errors, the system only shuts down when the error occurs several times. This means that you have to wait until the system shuts down to be able to see the flashing LED on the front panel and the error code on the remote controller.

**Overview**

This chapter contains the following topics:

## 2.2 "A1" Hydro-box PCB Abnormality

**Error code**

A1

**Method of malfunction detection**

Evaluation of zero-cross detection of power supply by hydro-box.

**Malfunction decision conditions**

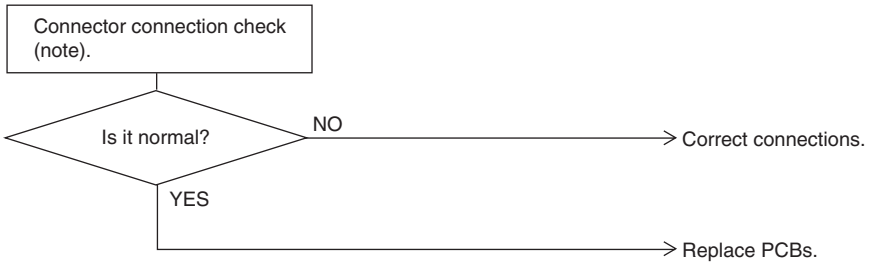
When there is no zero-cross detection in approximately 10 continuous seconds.

3

**Supposed causes**

- Faulty hydro-box PCB
- Faulty connector connection

**Troubleshooting**




**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 2.3 "A5" Freeze-up Protection Control or High Pressure Control

**Error code**

A5

**Method of malfunction detection**

- High pressure control (heat pump model only)

  During heating operations, the temperature detected by the hydro-box heat exchanger thermistor is used for the high pressure control (stop, outdoor fan stop, etc.)
- The freeze-up protection control (operation halt) is activated during cooling operation according to the temperature detected by the hydro-box heat exchanger thermistor.

**Malfunction decision conditions**

- High pressure control

  During heating operations, the temperature detected by the hydro-box heat exchanger thermistor is above 65°C
- Freeze-up protection

  When the hydro-box heat exchanger temperature is below 0°C during cooling operation.

**Supposed causes**

- Detection error due to faulty hydro-box heat exchanger thermistor.
- Detection error due to faulty hydro-box PCB.

**Troubleshooting**


See also "Check No.06" on page 3-53.

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 2.4 "C4, 81, 80, HC" Thermistor or Related Abnormality (Hydro-box)

**Error code**

C4, 81, 80, HC

**Method of malfunction detection**

The temperatures detected by the thermistors are used to determine thermistor errors.

**Malfunction decision conditions**

When the thermistor input is more than 4.96 V or less than 0.04 V during compressor operation*.
* (reference)

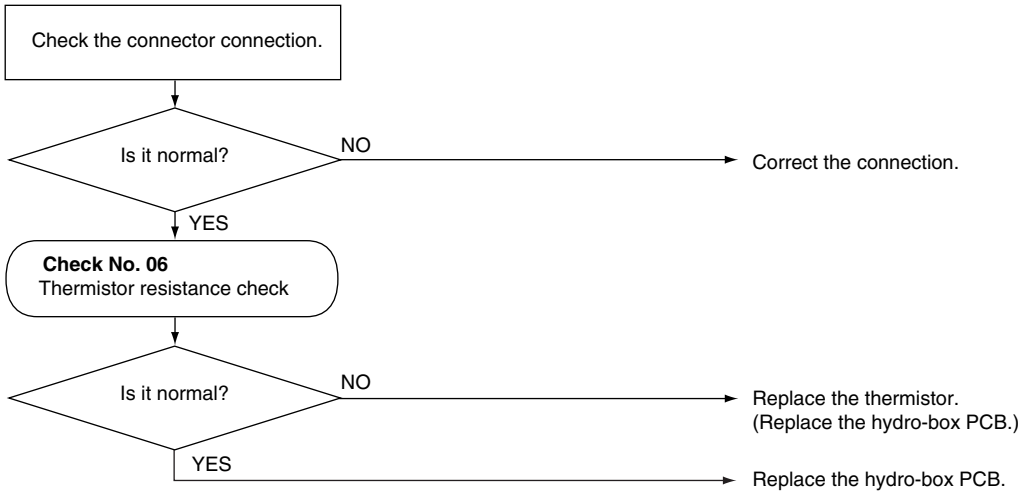
When above about 212°C (less than 120 ohms) or below about –50°C (more than 1,860 kohms).

**Note:** The values vary slightly in some models.

**Supposed causes**

- Faulty connector connection
- Faulty thermistor
- Faulty PCB

**Troubleshooting**




C4: Hydro-box heat exchanger thermistor
81: Outlet water temperature thermistor
80: Inlet water temperature thermistor
HC: Sanitary water temperature thermistor

See also "Check No.06" on page 3-53.

# 3 Error Codes: Outdoor Units

## 3.1 What Is in This Chapter?

**Introduction**

In the first stage of the troubleshooting sequence, it is important to correctly interpret the error code on the remote controller display. The error code helps you to find the cause of the problem.



**Overview**

This chapter contains the following topics:

## 3.2 "E1" Outdoor Unit PCB Abnormality

**Error code**

E1

**Method of malfunction detection**

➤ Detect within the programme of the microcomputer that the programme is in normal running order.

**Malfunction decision conditions**

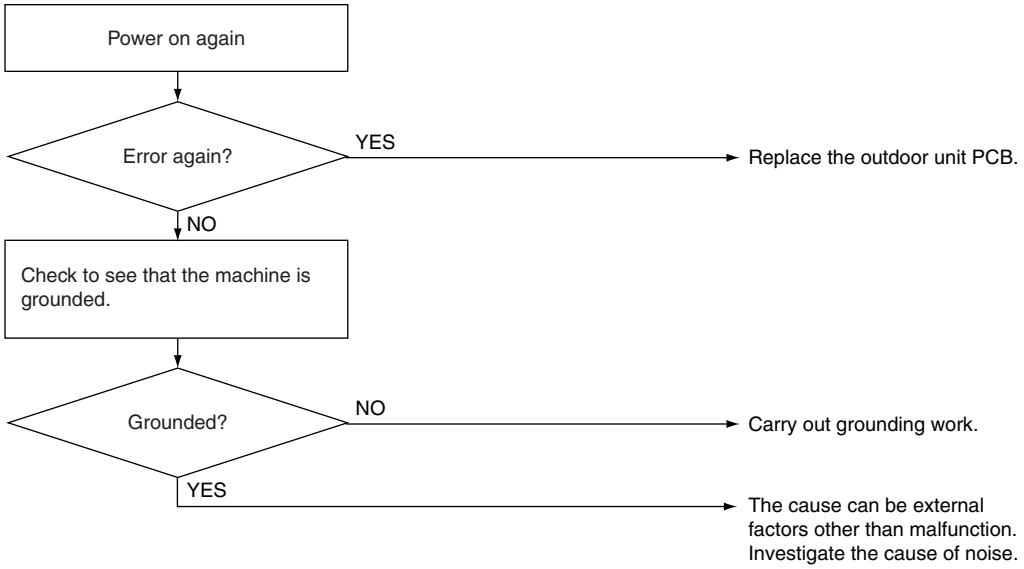
➤ When the programme of the microcomputer is in abnormal running order.

3

**Supposed causes**

➤ Out of control of microcomputer caused by external factors
  ➤ Noise
  ➤ Momentary fall of voltage
  ➤ Momentary power loss
➤ Defective outdoor unit PCB

**Troubleshooting**




**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.3 "E5" OL Activation (Compressor Overload)

**Error code**

E5

**Method of malfunction detection**

A compressor overload is detected through compressor OL.

**Malfunction decision conditions**

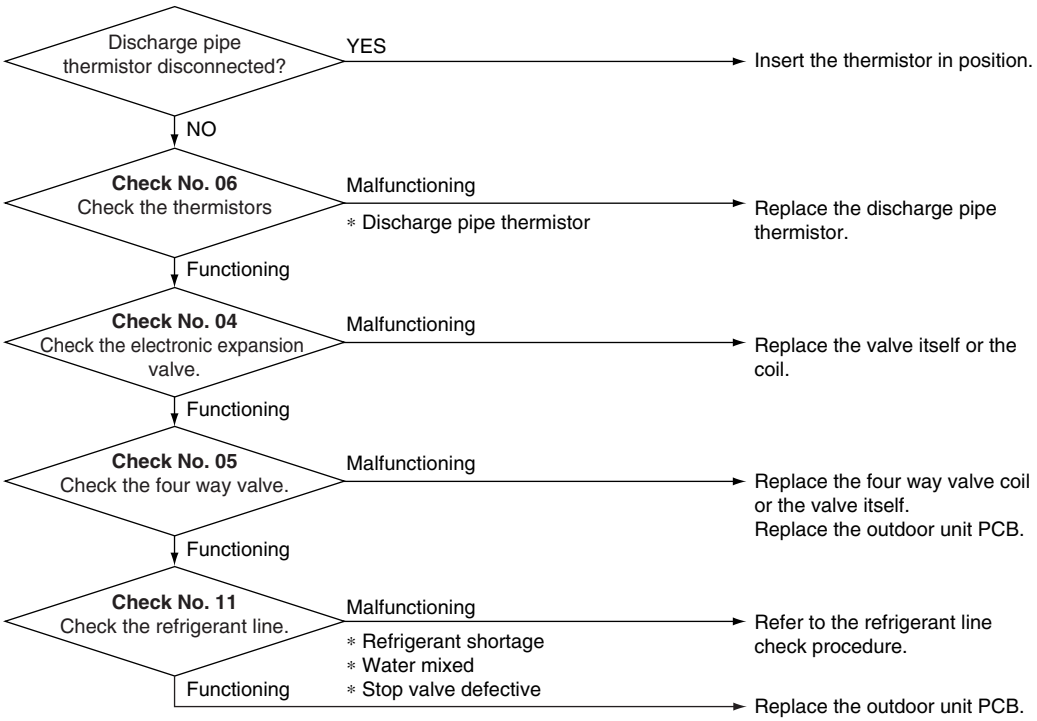
- ➤ If the compressor OL is activated twice, the system will be shut down.
- ➤ The error counter will reset itself if this or any other error does not occur during the following 60-minute compressor running time (total time).

* The operating temperature condition is not specified.

**Supposed causes**

- ➤ Refrigerant shortage
- ➤ Four way valve malfunctioning
- ➤ Outdoor unit PCB defective
- ➤ Water mixed in the local piping
- ➤ Electronic expansion valve defective
- ➤ Stop valve defective

**Troubleshooting**




See also:

- "Check No.04" on page 3-51
- "Check No.05" on page 3-52
- "Check No.06" on page 3-53
- "Check No.11" on page 3-59

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.4 "E6" Compressor Lock

**Error code**

E6

**Method of malfunction detection**

A compressor lock is detected by checking the compressor running condition through the position detection circuit.

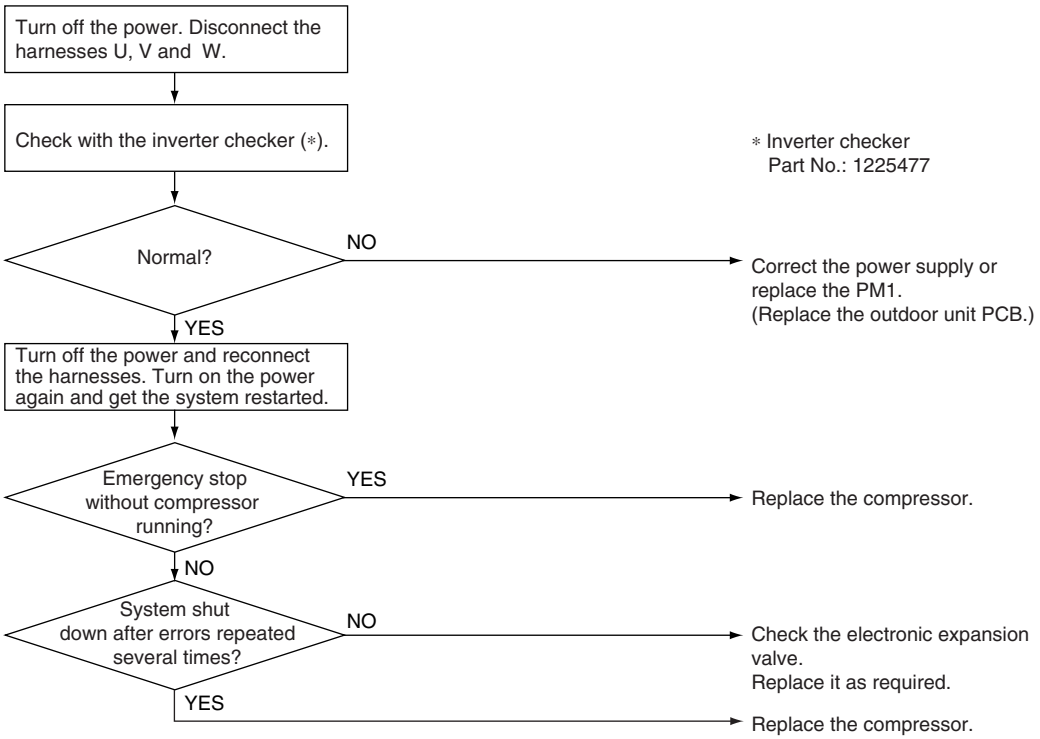
**Malfunction decision conditions**

- Judging from current waveform generated when high-frequency voltage is applied to the compressor.
- The system will be shut down if the error occurs 16 times.
- Clearing condition: Continuous run for about 5 minutes (normal)

**Supposed causes**

- Compressor locked

**Troubleshooting**




**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.5 "E7" DC Fan Lock

**Error code**

E7

**Method of malfunction detection**

A fan motor or related error is detected by checking the high-voltage fan motor rpm being detected by the Hall IC.

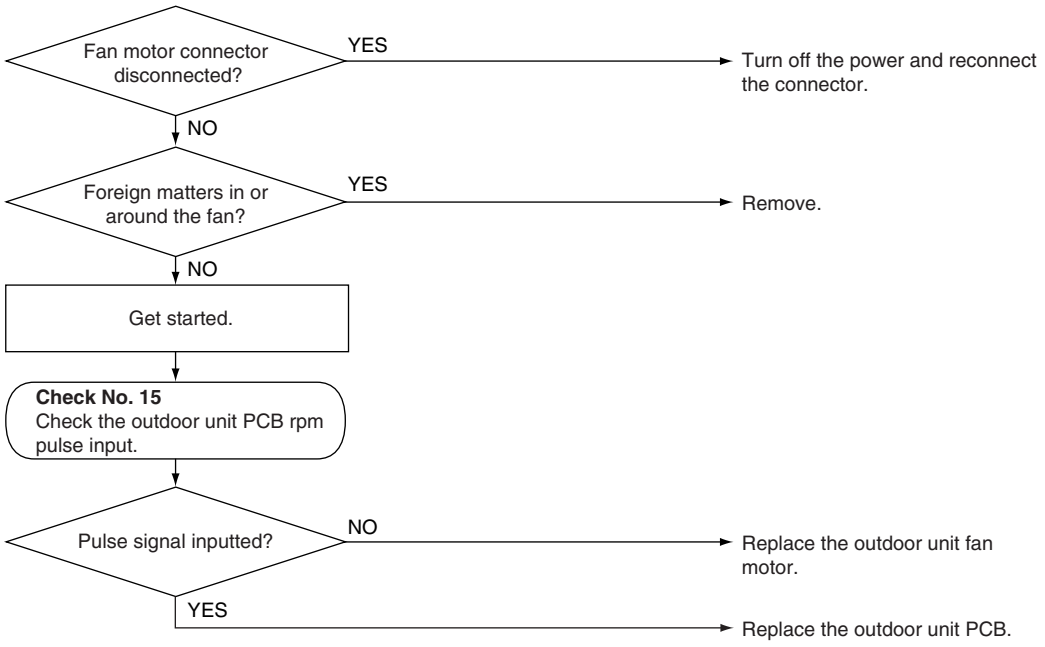
**Malfunction decision conditions**

- The fan does not start in 30 seconds even when the fan motor is running.
- The system will be shut down if the error occurs 16 times.
- Clearing condition: Continuous run for about 5 minutes (normal)

**Supposed causes**

- Fan motor breakdown
- Harness or connector disconnected between fan motor and PCB or in poor contact
- Foreign matters stuck in the fan

**Troubleshooting**




See also: "Check No.15" on page 3-63

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.6 "E8" Input Over Current Detection

**Error code**

E8

**Method of malfunction detection**

An input over-current is detected by checking the input current value being detected by CT with the compressor running.

**Malfunction decision conditions**

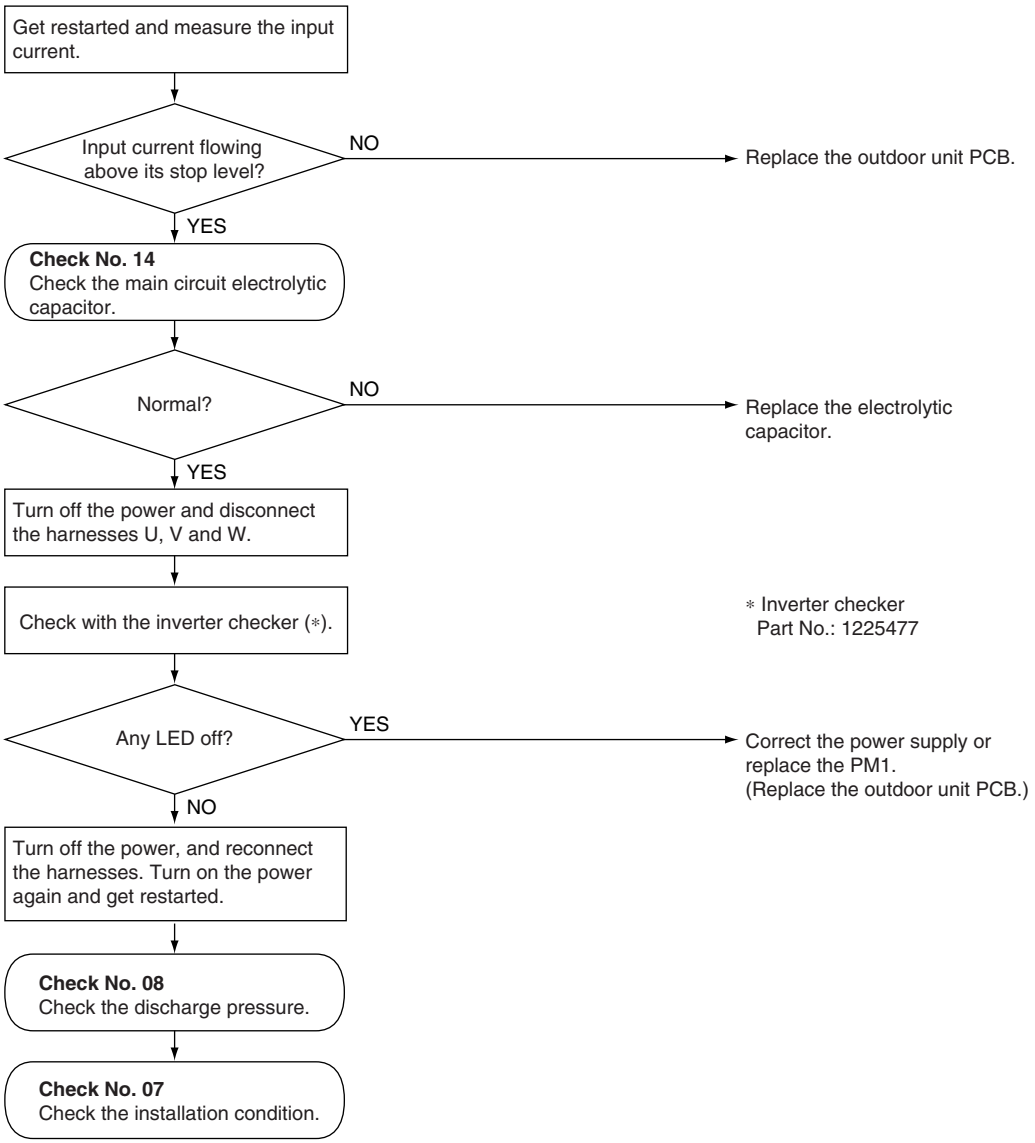
- The following CT input with the compressor running continues for 2.5 seconds.
  CT input: Above 20 A
- The system will be shut down if the error occurs 16 times.
- Clearing condition: Continuous run for about 5 minutes (normal)

**Supposed causes**

- Over-current due to compressor failure
- Over-current due to defective power transistor
- Over-current due to defective inverter main circuit electrolytic capacitor
- Over-current due to defective outdoor unit PCB
- Error detection due to outdoor unit PCB
- Over-current due to short-circuit

**Troubleshooting**

An input over-current may result from wrong internal wiring. If the wires have been disconnected and reconnected for part replacement, for example, and the system is interrupted by an input over-current, take the following procedure:




See also:

- "Check No.07" on page 3-55
- "Check No.08" on page 3-56
- "Check No.14" on page 3-62

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.7 "EA" Four Way Valve Abnormality

**Error code**

EA

**Method of malfunction detection**

The indoor air temperature thermistor, the hydro-box heat exchanger thermistor, the outdoor temperature thermistor and the outdoor unit heat exchanger thermistor are checked to see if they function within their normal ranges in the operating mode.

**Malfunction decision conditions**

A following condition continues over 10 minute after operating 5 minutes.

- ➤ Cooling

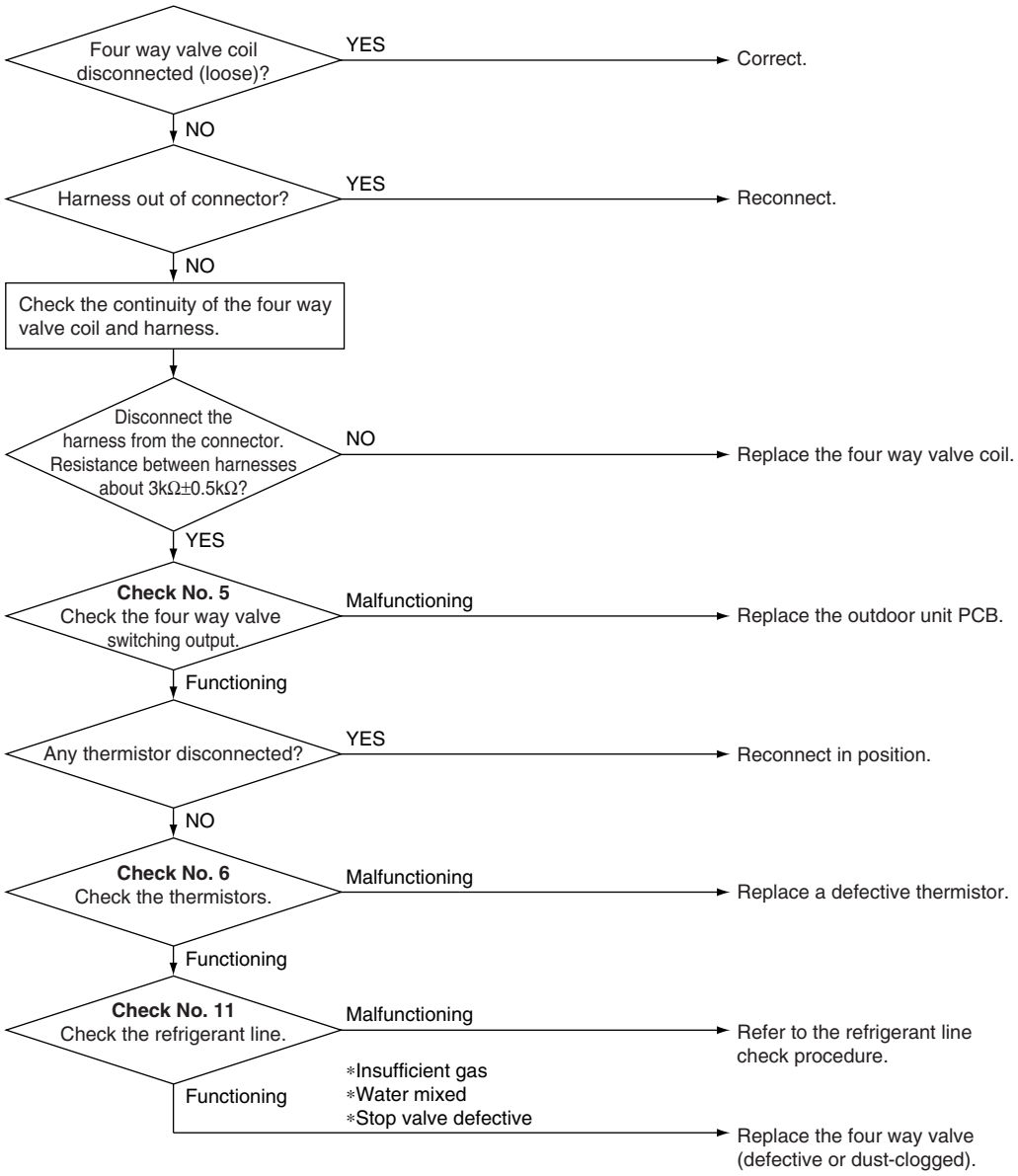
  (Outlet water temperature – hydro-box heat exchanger temperature) < -10°C
- ➤ Heating

  (Hydro-box heat exchanger temperature – Outlet water temperature) < -10°C

**Supposed causes**

- ➤ Connector in poor contact
- ➤ Thermistor defective
- ➤ Outdoor unit PCB defective
- ➤ Four way valve coil or harness defective
- ➤ Four way valve defective
- ➤ Foreign substance mixed in refrigerant
- ➤ Insufficient gas

**Troubleshooting**




See also:

- "Check No.05" on page 3-52
- "Check No.06" on page 3-53
- "Check No.11" on page 3-59

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.8 "F3" Discharge Pipe Temperature Control

**Error code**

F3

**Method of malfunction detection**

The discharge pipe temperature control (stop, frequency drooping, etc.) is checked with the temperature being detected by the discharge pipe thermistor.

**Malfunction decision conditions**

- If a stop takes place 6 times successively due to abnormal discharge pipe temperature, the system will be shut down.
- If the temperature being detected by the discharge pipe thermistor rises above Ⓐ °C, the compressor will stop. (The error is cleared when the temperature has dropped below Ⓑ °C.

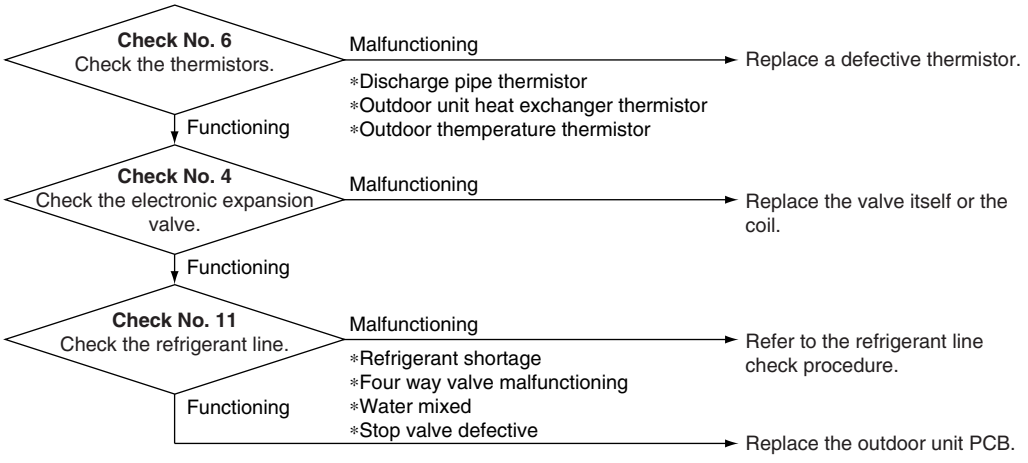
| | 71 class |
|---|---|
| Ⓐ | 120 |
| Ⓑ | 107 |

- The error counter will reset itself if this or any other error does not occur during the following 60-minute compressor running time (total time).

**Supposed causes**

- Refrigerant shortage
- Four way valve malfunctioning
- Discharge pipe thermistor defective
  (heat exchanger or outdoor temperature thermistor defective)
- Outdoor unit PCB defective
- Water mixed in the local piping
- Electronic expansion valve defective
- Stop valve defective

**Troubleshooting**




See also:

- "Check No.04" on page 3-51
- "Check No.06" on page 3-53
- "Check No.11" on page 3-59

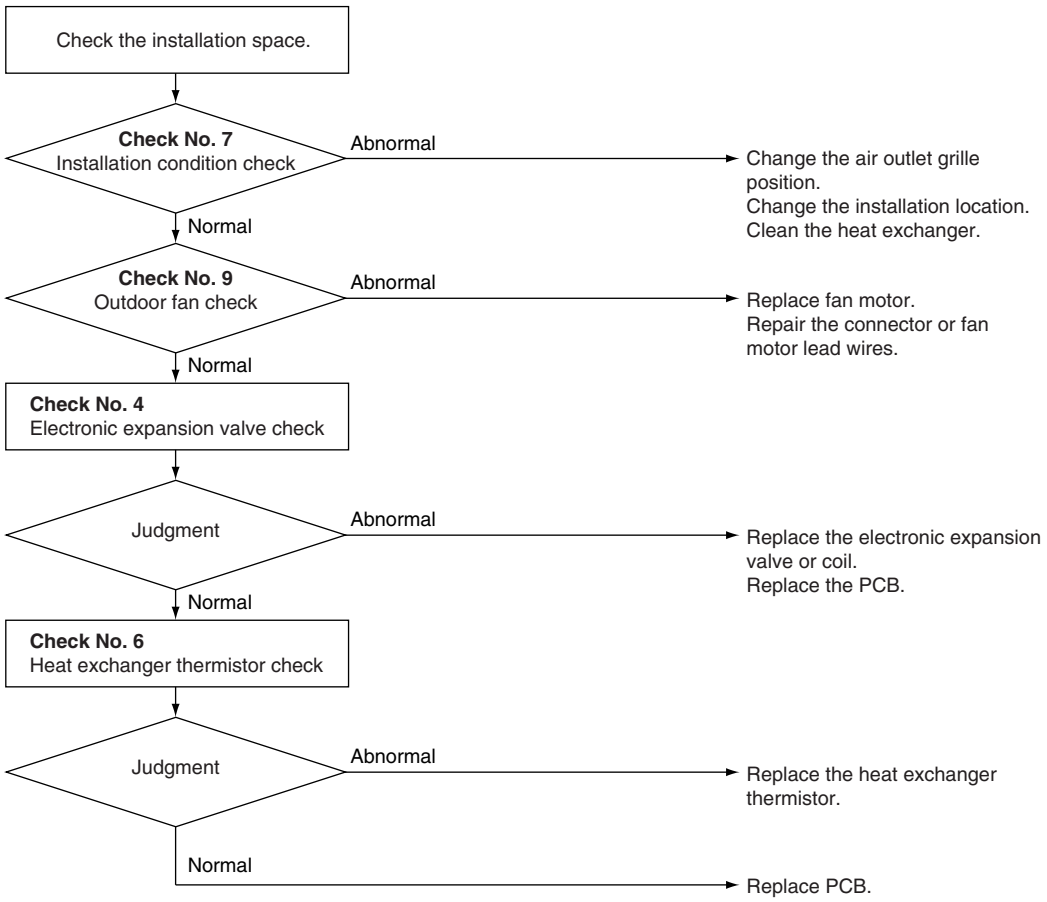
**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.9 "F6" High Pressure Control in Cooling

| | |
|---|---|
| **Error code** | F6 |
| **Method of malfunction detection** | High-pressure control (stop, frequency drop, etc.) is activated in the cooling mode if the temperature being sensed by the heat exchanger thermistor exceeds the limit. |
| **Malfunction decision conditions** | Activated when the temperature being sensed by the heat exchanger thermistor rises above 60°C. (Deactivated when the said temperature drops below 50°C) |
| **Supposed causes** | ➤ The installation space is not large enough.<br>➤ Faulty outdoor unit fan<br>➤ Faulty electronic expansion valve<br>➤ Faulty defrost thermistor<br>➤ Faulty outdoor unit PCB<br>➤ Faulty stop valve<br>➤ Dirty heat exchanger |

**Troubleshooting**




See also:

- "Check No.04" on page 3-51
- "Check No.06" on page 3-53
- "Check No.07" on page 3-55
- "Check No.09" on page 3-57

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.10 "H0" Compressor Sensor System Abnormality

**Error code**

H0

**Method of malfunction detection**

- Fault condition is identified by the supply voltage and the DC voltage which is detected before the compressor startup.
- Fault condition is identified by compressor current which is detected right after the compressor startup.

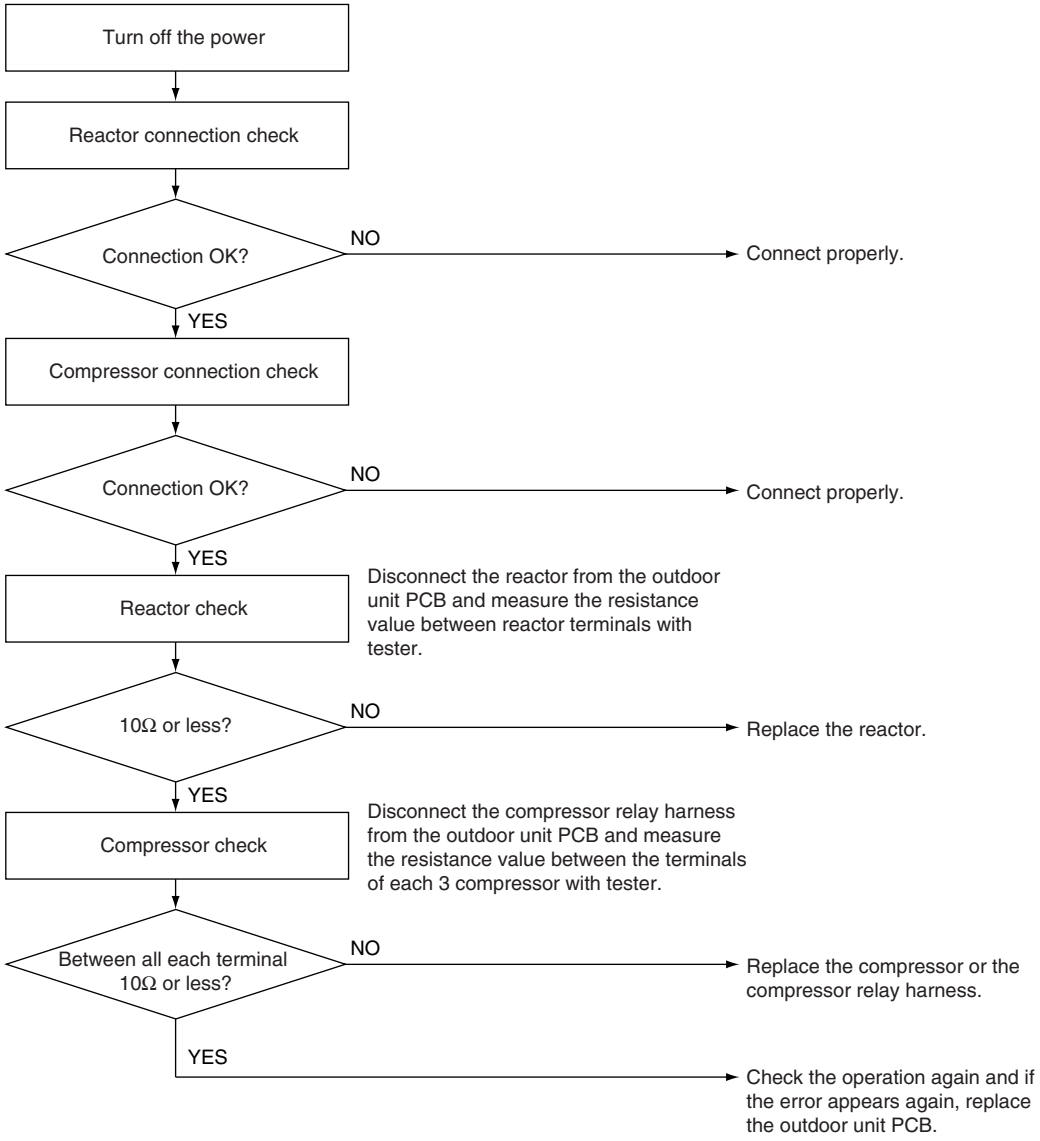
**Malfunction decision conditions**

- The detected valve of the supply voltage and the DC voltage is obviously low or high.
- The compressor current doesn't run when the compressor is started.

**Supposed causes**

- Reactor disconnection
- Compressor disconnection
- Outdoor unit PCB defective
- Compressor defective

**Troubleshooting**




**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.11 "H6" Compressor Startup Failure

**Error code**

H6

**Method of malfunction detection**

A compressor startup failure is detected by checking the compressor running condition through the position detection circuit.

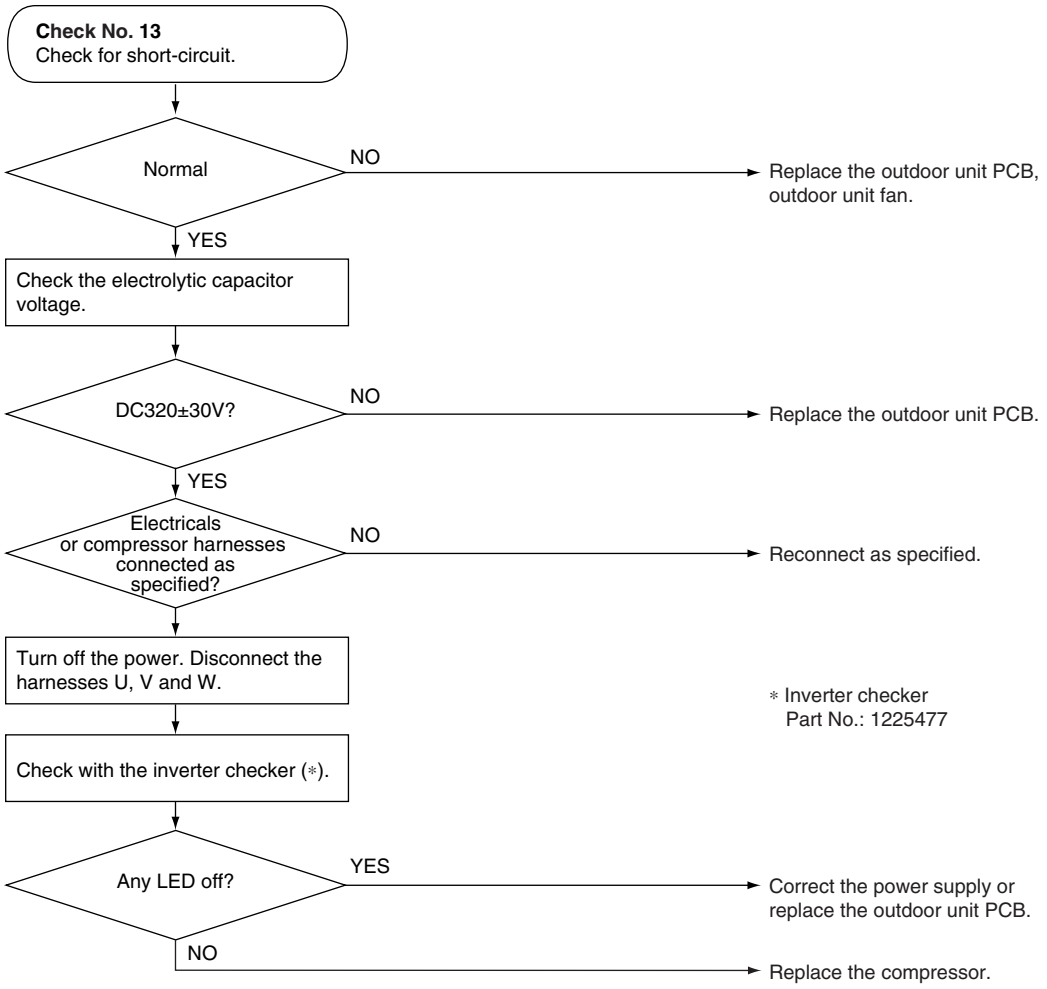
**Malfunction decision conditions**

- ➤ The compressor fails to start in about 15 seconds after the compressor run command signal is sent.
- ➤ Clearing condition: Continuous run for about 5 minutes (normal)
- ➤ The system will be shut down if the error occurs 8 times.

**Supposed causes**

- ➤ Compressor relay cable disconnected
- ➤ Compressor itself defective
- ➤ Outdoor unit PCB defective
- ➤ Stop valve closed
- ➤ Input voltage out of specification

**Troubleshooting**




See also: "Check No.13" on page 3-61

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.12 "H8" CT or Related Abnormality

**Error code**

H8

**Method of malfunction detection**

A CT or related error is detected by checking the compressor running frequency and CT-detected input current.

**Malfunction decision conditions**

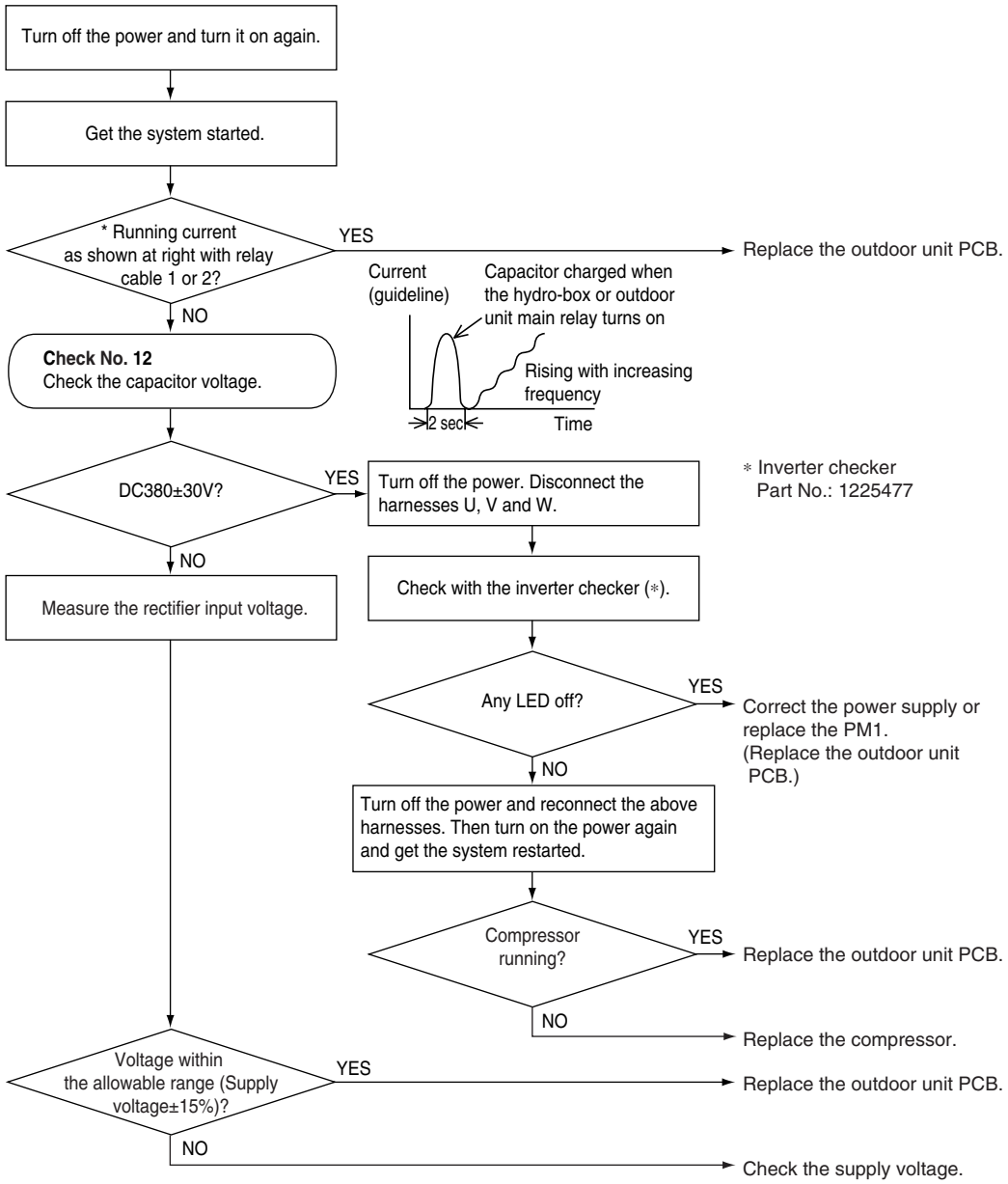
The compressor running frequency is below 55 Hz and the CT input is below 0.1 V.
(The input current is also below 0.5 A.)

- ➤ If this error repeats 4 times, the system will be shut down.
- ➤ The error counter will reset itself if this or any other error does not occur during the following 60-minute compressor running time (total time).

**Supposed causes**

- ➤ Power transistor defective
- ➤ Internal wiring broken or in poor contact
- ➤ Reactor defective
- ➤ Outdoor unit PCB defective

**Troubleshooting**




See also: "Check No.12" on page 3-60

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.13 "P4, J3, J6, H9" Thermistor or Related Abnormality (Outdoor Unit)

**Error code**

P4, J3, J6, H9

**Method of malfunction detection**

This type of error is detected by checking the thermistor input voltage to the microcomputer.
[A thermistor error is detected by checking the temperature.]

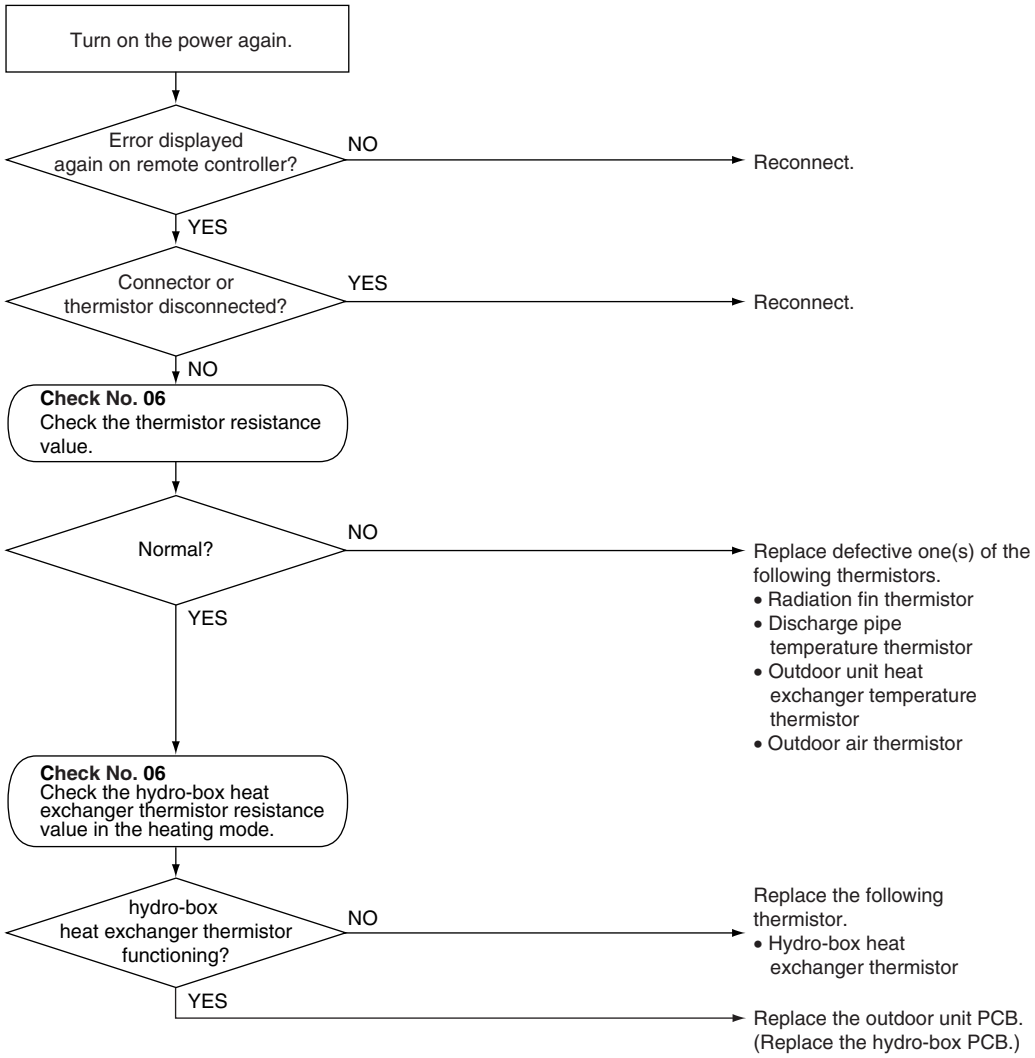
**Malfunction decision conditions**

The thermistor input is above 4.96 V or below 0.04 V with the power on.
Error J3 is judged if the discharge pipe thermistor temperature is smaller than the condenser thermistor temperature.

**Supposed causes**

- Connector in poor contact
- Thermistor defective
- Outdoor unit PCB defective
- Hydro-box PCB defective
- Condenser thermistor defective in the case of J3 error (outdoor unit heat exchanger thermistor in the cooling mode, or hydro-box heat exchanger thermistor in the heating mode)

**Troubleshooting**




P4: Radiation fin thermistor
J3: Discharge pipe thermistor
J6: Outdoor heat exchanger thermistor
H9: Outdoor air thermistor

See also: "Check No.06" on page 3-53

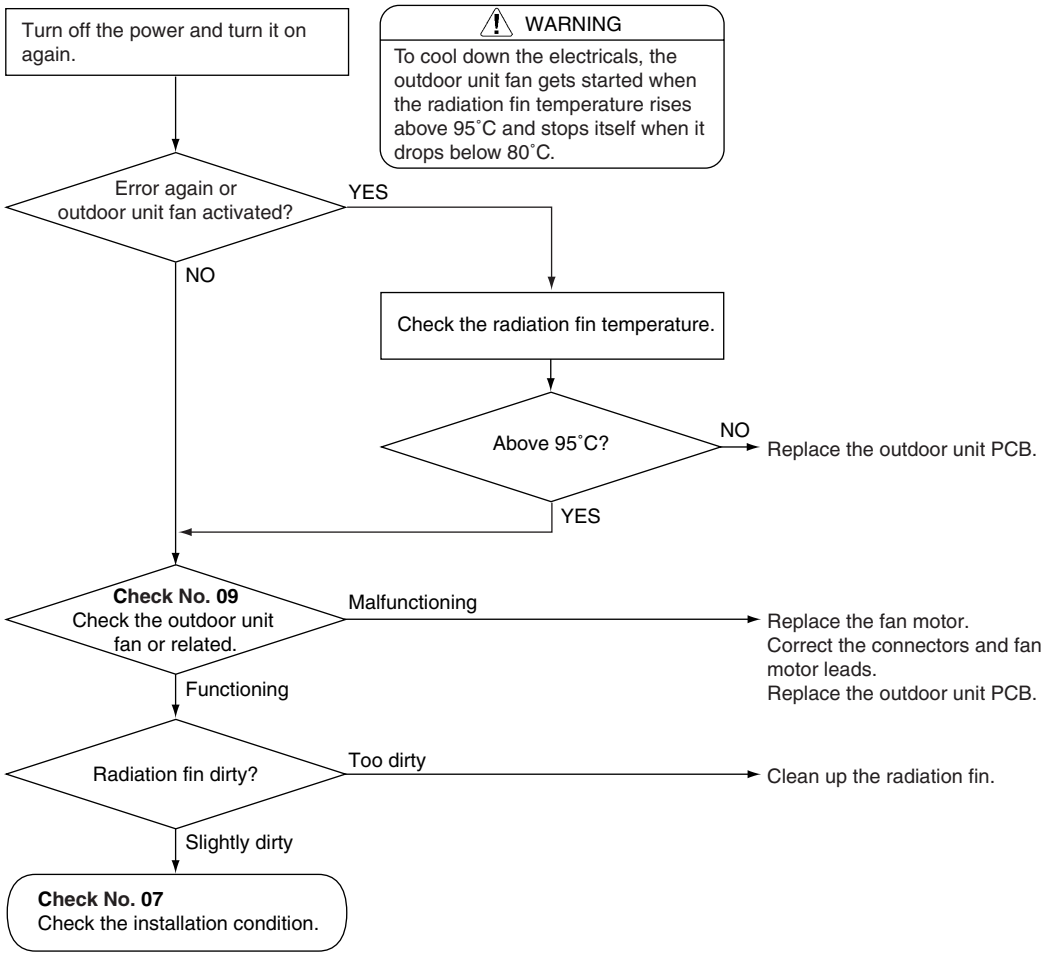
**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.14 "L3" Switch Box Temperature Rise

| | |
|---|---|
| **Error code** | L3 |
| **Method of malfunction detection** | An electrical box temperature rise is detected by checking the radiation fin thermistor with the compressor off. |
| **Malfunction decision conditions** | With the compressor off, the radiation fin temperature is above 95°C. (Reset is made when the temperature drops below 80°C.) |
| **Supposed causes** | ➤ Fin temperature rise due to defective outdoor unit fan<br>➤ Fin temperature rise due to short-circuit<br>➤ Fin thermistor defective<br>➤ Connector in poor contact<br>➤ Outdoor unit PCB defective |

**Troubleshooting**




See also:

- "Check No.06" on page 3-53
- "Check No.07" on page 3-55
- "Check No.09" on page 3-57

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.15 "L4" Radiation Fin Temperature Rise

**Error code**

L4

**Method of malfunction detection**

A radiation fin temperature rise is detected by checking the radiation fin thermistor with the compressor on.

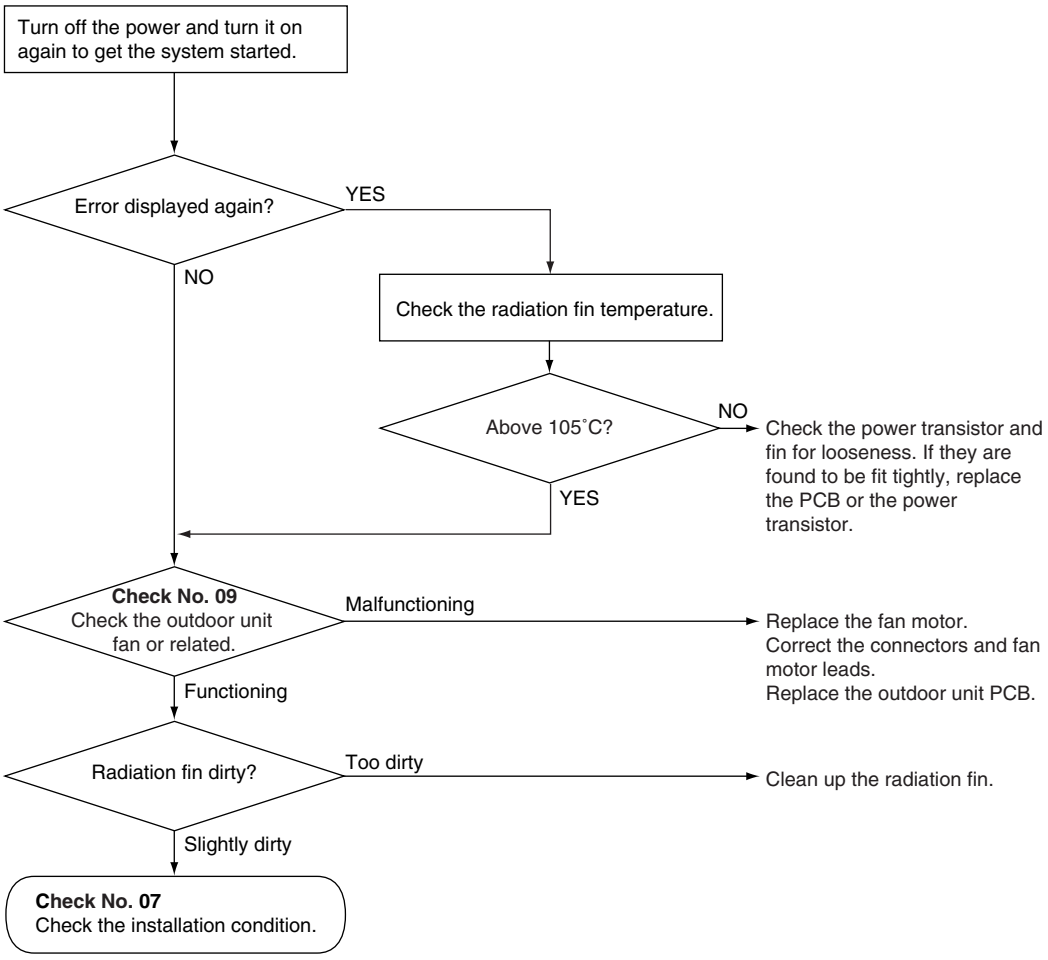
**Malfunction decision conditions**

- If the radiation fin temperature with the compressor on is above 105°C,
- The error is cleared when the temperature drops below 99°C.
- If a radiation fin temperature rise takes place 4 times successively, the system will be shut down.
- The error counter will reset itself if this or any other error does not occur during the following 60-minute compressor running time (total time).

**Supposed causes**

- Fin temperature rise due to defective outdoor unit fan
- Fin temperature rise due to short-circuit
- Fin thermistor defective
- Connector in poor contact

**Troubleshooting**




See also:

- "Check No.06" on page 3-53
- "Check No.07" on page 3-55
- "Check No.09" on page 3-57

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 3.16 "L5" Output Over Current Detection

**Error code**

L5

**Method of malfunction detection**

An output over-current is detected by checking the current that flows in the inverter DC section.

**Malfunction decision conditions**

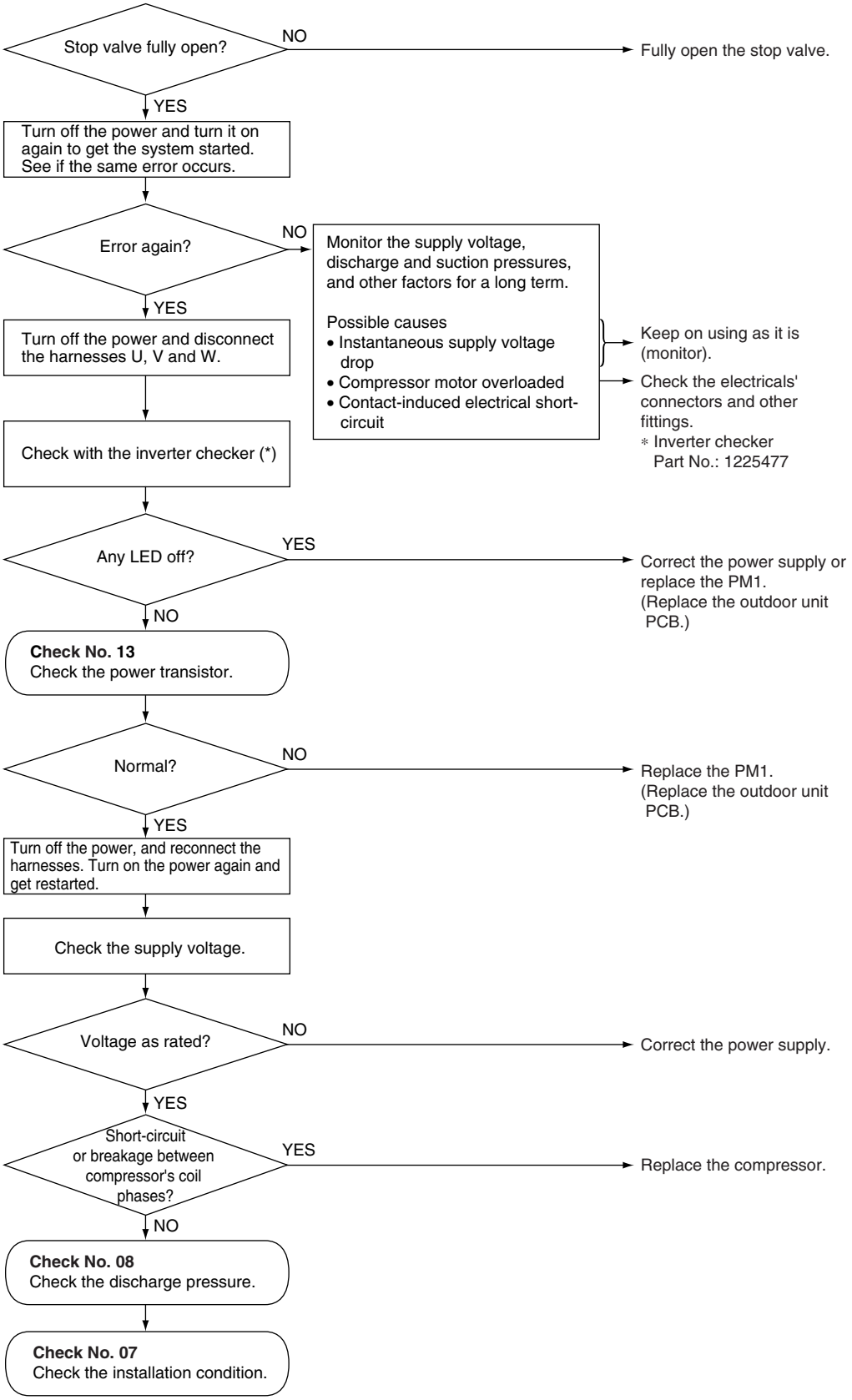
- ➤ A position signal error occurs while the compressor is running.
- ➤ A speed error occurs while the compressor is running.
- ➤ An output over-current input is fed from the output over-current detection circuit to the microcomputer.
- ➤ The system will be shut down if the error occurs 16 times.
- ➤ Clearing condition: Continuous run for about 5 minutes (normal)

**Supposed causes**

- ➤ Over-current due to defective power transistor
- ➤ Over-current due to wrong internal wiring
- ➤ Over-current due to abnormal supply voltage
- ➤ Over-current due to defective PCB
- ➤ Error detection due to defective PCB
- ➤ Over-current due to closed stop valve
- ➤ Over-current due to compressor failure
- ➤ Over-current due to poor installation condition

**Troubleshooting 1**

An output over-current may result from wrong internal wiring. If the wires have been disconnected and reconnected for part replacement, for example, and the system is interrupted by an output over-current, take the following procedure:



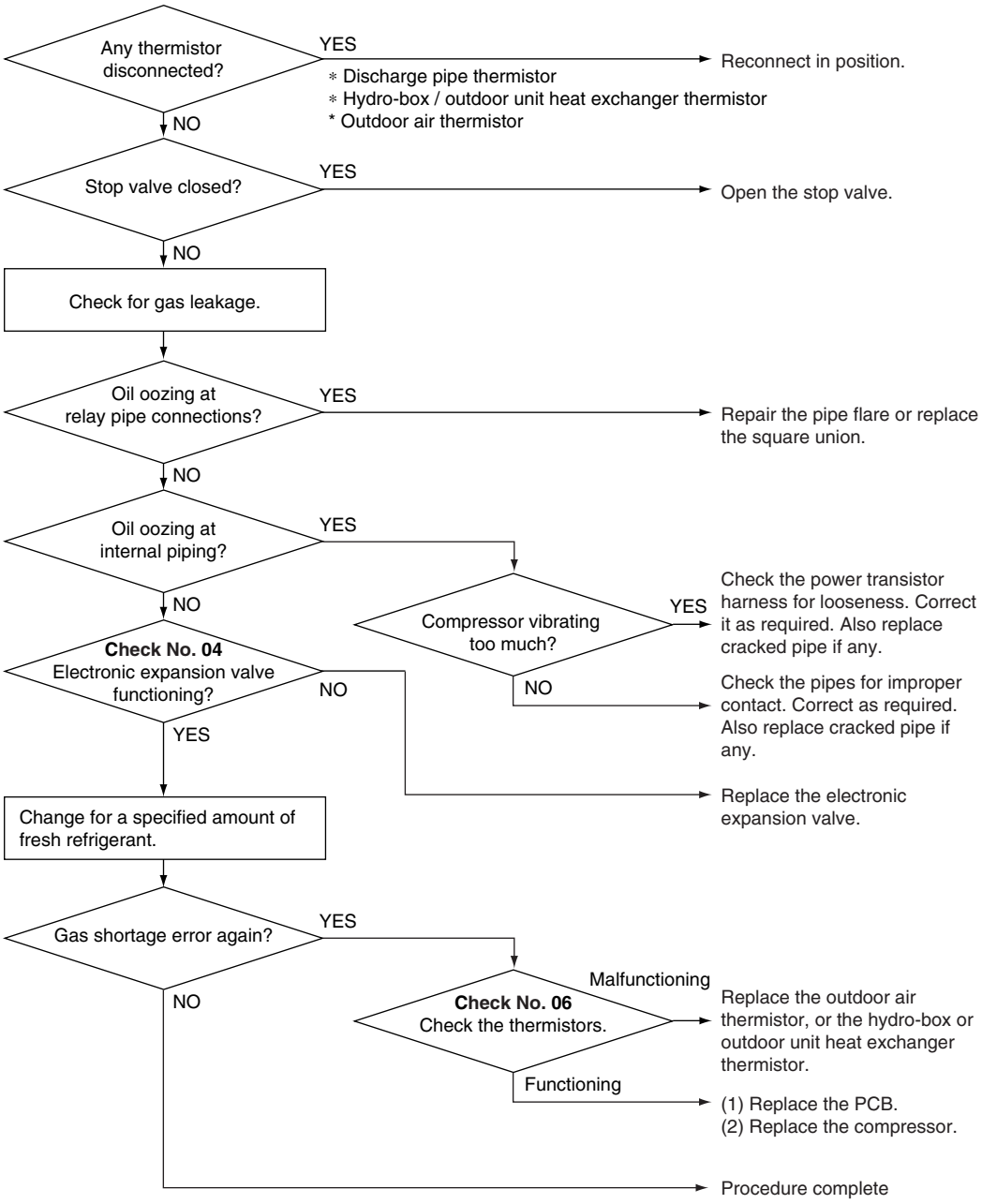
See also:


- ➤ "Check No.07" on page 3-55
- ➤ "Check No.08" on page 3-56
- ➤ "Check No.13" on page 3-61


**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

**Troubleshooting 2**




See also:

- "Check No.04" on page 3-51
- "Check No.06" on page 3-53

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

# 4 Error Codes: System Malfunctions

## 4.1 What Is in This Chapter?

**Introduction**

In the first stage of the troubleshooting sequence, it is important to correctly interpret the error code on the remote controller display. The error code helps you to find the cause of the problem.

**Overview**

This chapter contains the following topics:

## 4.2 "U0" Insufficient Gas

**Error code**

U0

**Method of malfunction detection**

**Gas shortage detection I:**

A gas shortage is detected by checking the CT-detected input current value and the compressor running frequency.

**Gas shortage detection II:**

A gas shortage is detected by checking the difference between hydro-box heat exchanger temperature and room temperature as well as the difference between outdoor unit heat exchanger temperature and room temperature.

3

**Malfunction decision conditions**

**Gas shortage detection I :**

DC current ≤ 𝔸 (A/Hz) × Output frequency + 𝔹
However, when the status of running frequency > 55 (Hz) is kept on for a certain time.

Note: The values are different from model to model.

| | 𝔸 | 𝔹 |
|---|---|---|
| **71 class** | 27 / 1000 | 2.5 |

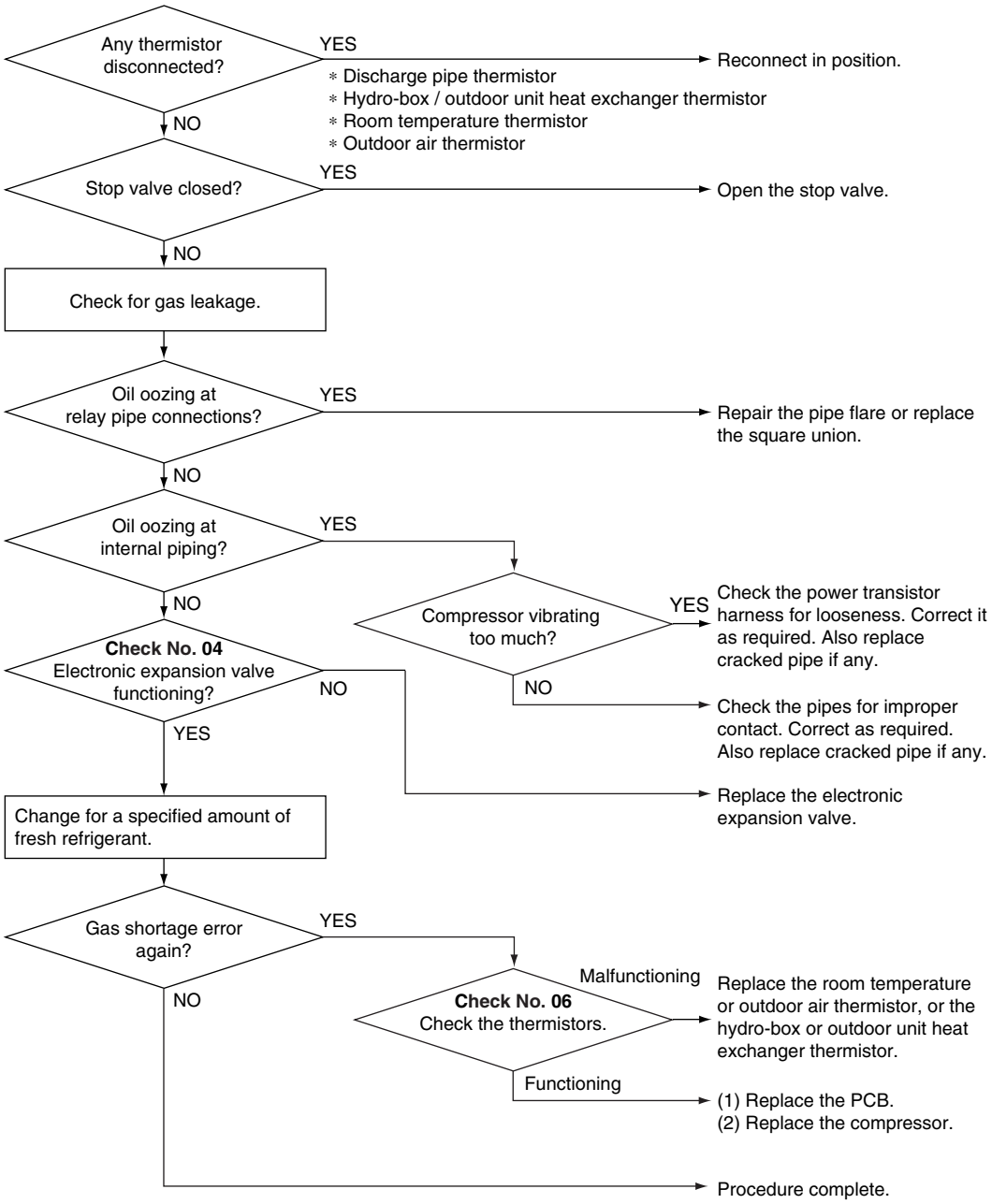
**Gas shortage detection II :**

If a gas shortage error takes place 4 times successively, the system will be shut down. The error counter will reset itself if this or any other error does not occur during the following 60-minute compressor running time (total time).

**Supposed causes**

- ➤ Refrigerant shortage (refrigerant leakage)
- ➤ Poor compression performance of compressor
- ➤ Discharge pipe thermistor disconnected, or hydro-box or outdoor unit heat exchanger thermistor disconnected, room or outside air temperature thermistor disconnected
- ➤ Stop valve closed
- ➤ Electronic expansion valve defective

**Troubleshooting**




See also:

➤ "Check No.04" on page 3-51

➤ "Check No.06" on page 3-53

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 4.3 "U2" Low-voltage Detection or Over-voltage Detection

**Error code**

U2

**Method of malfunction detection**

An abnormal voltage rise or drop is detected by checking the detection circuit or DC voltage detection circuit.

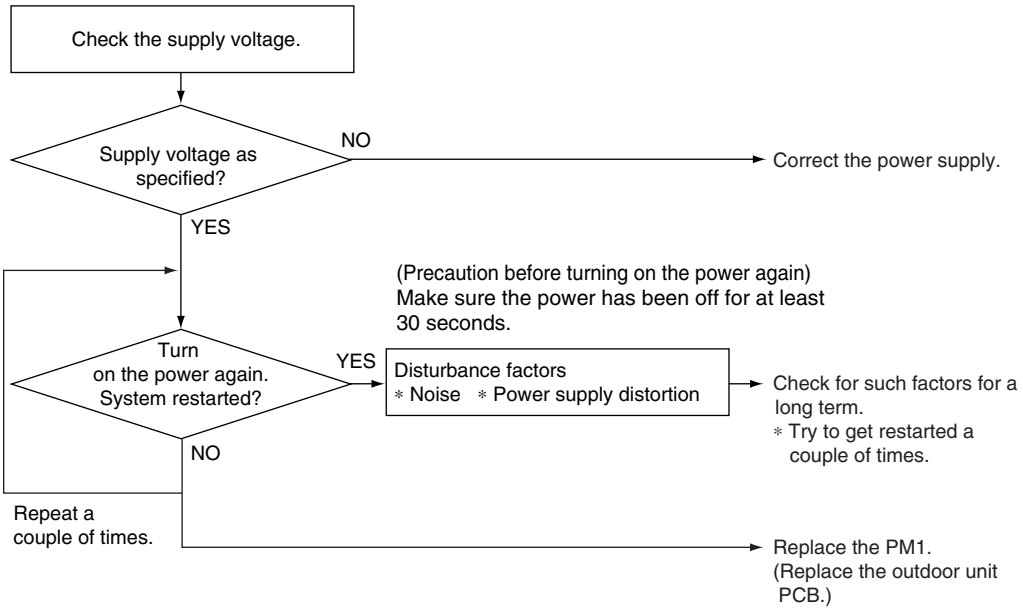
**Malfunction decision conditions**

- An over-voltage signal is fed from the over-voltage detection circuit to the microcomputer, or the voltage being detected by the DC voltage detection circuit is judged to be below 150 V for 0.1 second.
- The system will be shut down if the error occurs 16 times.
- Clearing condition: Continuous run for about 60 minutes (normal)

**Supposed causes**

- Supply voltage not as specified
- Over-voltage detector or DC voltage detection circuit defective
- PAM control part(s) defective

**Troubleshooting**




**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 4.4 "U4" Signal Transmission Error (between Hydro-box and Outdoor Units)

**Error code**

U4

**Method of malfunction detection**

The data received from the outdoor unit in hydro-box-outdoor unit signal transmission is checked whether it is normal.

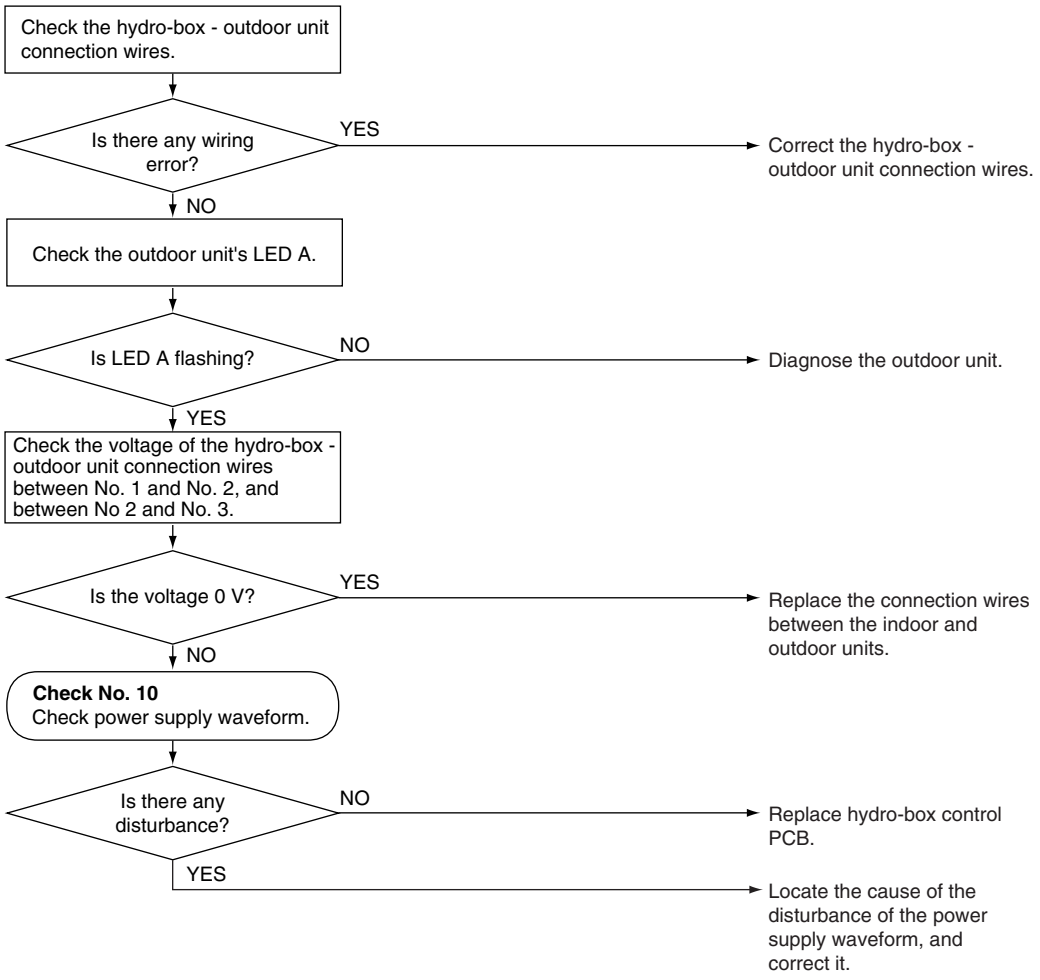
**Malfunction decision conditions**

When the data sent from the outdoor unit cannot be received normally, or when the content of the data is abnormal.

**Supposed causes**

- ➤ Faulty outdoor unit PCB.
- ➤ Faulty hydro-box PCB.
- ➤ Hydro-box-outdoor unit signal transmission error due to wiring error.
- ➤ Hydro-box-outdoor unit signal transmission error due to disturbed power supply waveform.
- ➤ Hydro-box-outdoor unit signal transmission error due to breaking of wire in the connection wires between the Hydro-box and outdoor units.

**Troubleshooting**




See also: "Check No.10" on page 3-58

**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

## 4.5 "U7" Malfunction of Transmission between Remote Controller and Control box

**Error code**

U7

**Method of malfunction detection**

Communication error between microcomputer mounted on the main microcomputer and PM1.

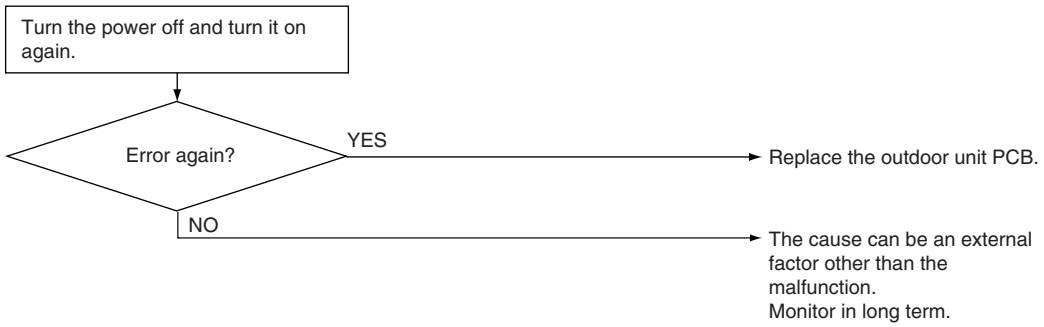
**Malfunction decision conditions**

- When the data sent from the PM1 can not be received successively for 9 sec.
- The abnormality is determined if the above fault conditions occurs once.
- Fault counter is reset when the data from the PM1 can be successfully received.

**Supposed causes**

- Defective outdoor unit PCB

**Troubleshooting**




**Caution**

Be sure to turn off power switch before connect or disconnect connector, or parts damage may be occurred.

# 5 Additional Checks for Troubleshooting

## 5.1 What Is in This Chapter?

**Introduction**

This chapter explains how you must check the units to carry out troubleshooting correctly.

**Overview**

This chapter contains the following topics:

## 5.2 Fan Motor Connector Output Check

**Check No.01**

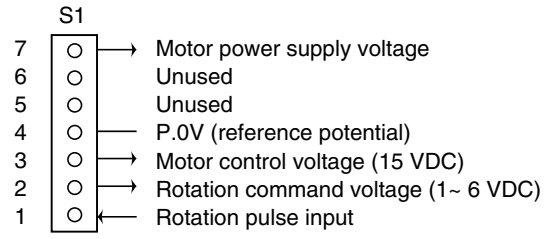
**1** Check connector connection.

**2** Check motor power supply voltage output (pins 4-7).

**3** Check motor control voltage (pins 4-3).

**4** Check rotation command voltage output (pins 4-2).

**5** Check rotation pulse input (pins 4-1)



## 5.3 Electronic Expansion Valve Check

**Check No.04**

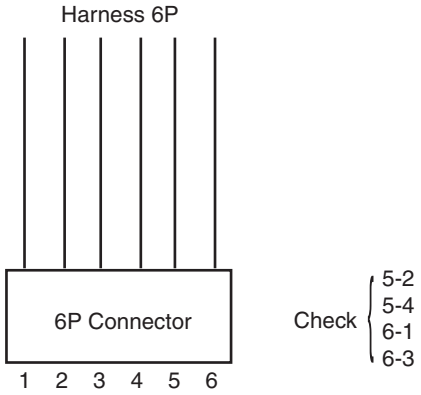
Conduct the followings to check the electronic expansion valve (EV).

**1** Check to see if the EV connector is correctly inserted in the PCB. Compare the EV unit and the connector number.

**2** Turn the power off and back on again, and check to see if all the EVs generate latching sound.

**3** If any of the EVs does not generate latching noise in the above step 2, disconnect that connector and check the conductivity using a tester.

Check the conductivity between pins 1, 3 and 6, and between pins 2, 4 and 5. If there is no conductivity between the pins, the EV coil is faulty.




**4** If no EV generates latching sound in the above step 2, the outdoor unit PCB is faulty.

**5** If the conductivity is confirmed in the above step 2, mount a good coil (which generated latching sound) in the EV unit that did not generate latching sound, and check to see if that EV generates latching sound.

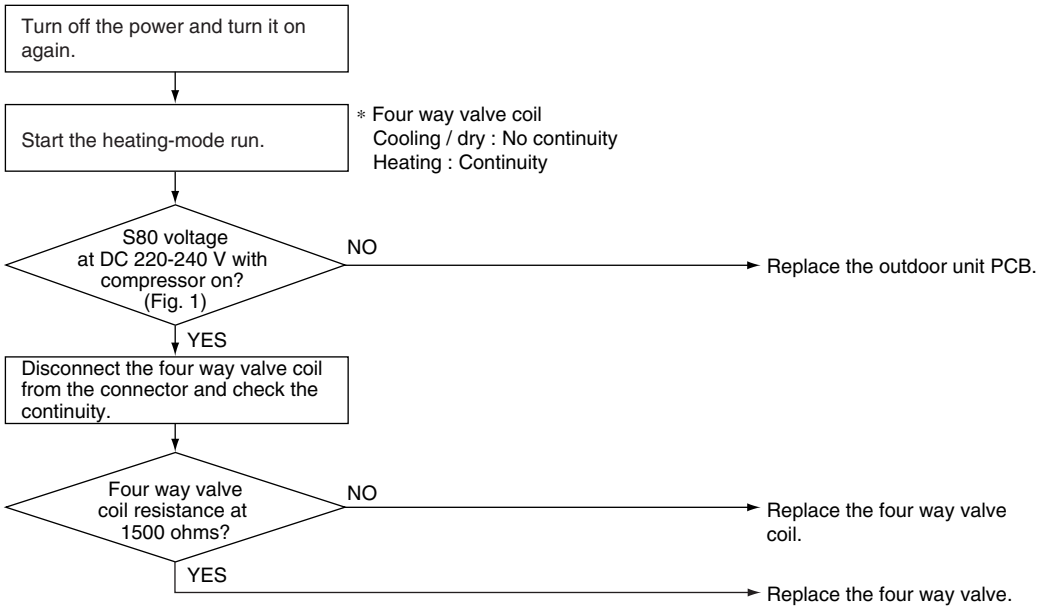
- ➤ If latching sound is generated, the outdoor unit PCB is faulty.
- ➤ If latching sound is not generated, the EV unit is faulty.

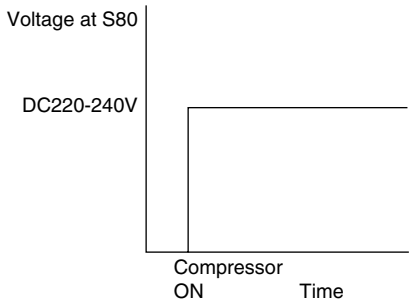
**Note**

Please note that the latching sound varies depending on the valve type.

## 5.4 Four Way Valve Performance Check

**Check No.05**



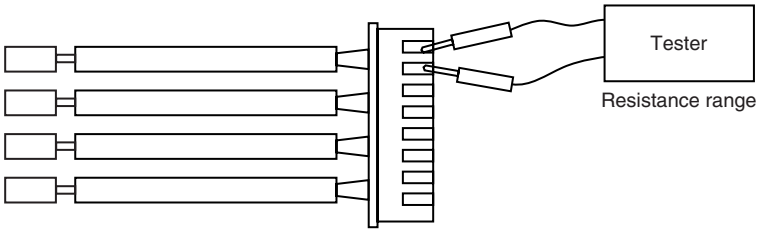
## 5.5 Thermistor Resistance Check

**Check No.06**

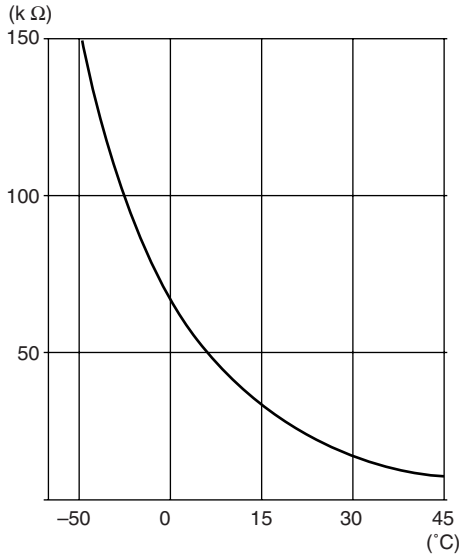
Remove the connectors of the thermistors on the PCB, and measure the resistance of each thermistor using tester.

The relationship between normal temperature and resistance is shown in the graph and the table below:

| | Hydro-box | Tank thermistor |
|---|---|---|
| | **3SA48002** | **3SA48009** |
| | **R25°C=20kΩ** | **R120=7.13Ω** |
| | **B=3990** | **B= 4177** |
| **-20** | 197.8 kΩ | 2534 kΩ |
| **-15** | 148.2 kΩ | 1877 kΩ |
| **-10** | 112.0 kΩ | 1404 kΩ |
| **-5** | 85.52 kΩ | 1059 kΩ |
| **0** | 65.84 kΩ | 806.5 kΩ |
| **5** | 51.05 kΩ | 618.9 kΩ |
| **10** | 39.91 kΩ | 478.8 kΩ |
| **15** | 31.44 kΩ | 373.1 kΩ |
| **20** | 24.95 kΩ | 292.9 kΩ |
| **25** | 19.94 kΩ | 231.4 kΩ |
| **30** | 16.04 kΩ | 184.1 kΩ |
| **35** | 12.99 kΩ | 147.4 kΩ |
| **40** | 10.58 kΩ | 118.7 kΩ |
| **45** | 8.669 kΩ | 96.13 kΩ |
| **50** | 7.143 kΩ | 78.29 kΩ |

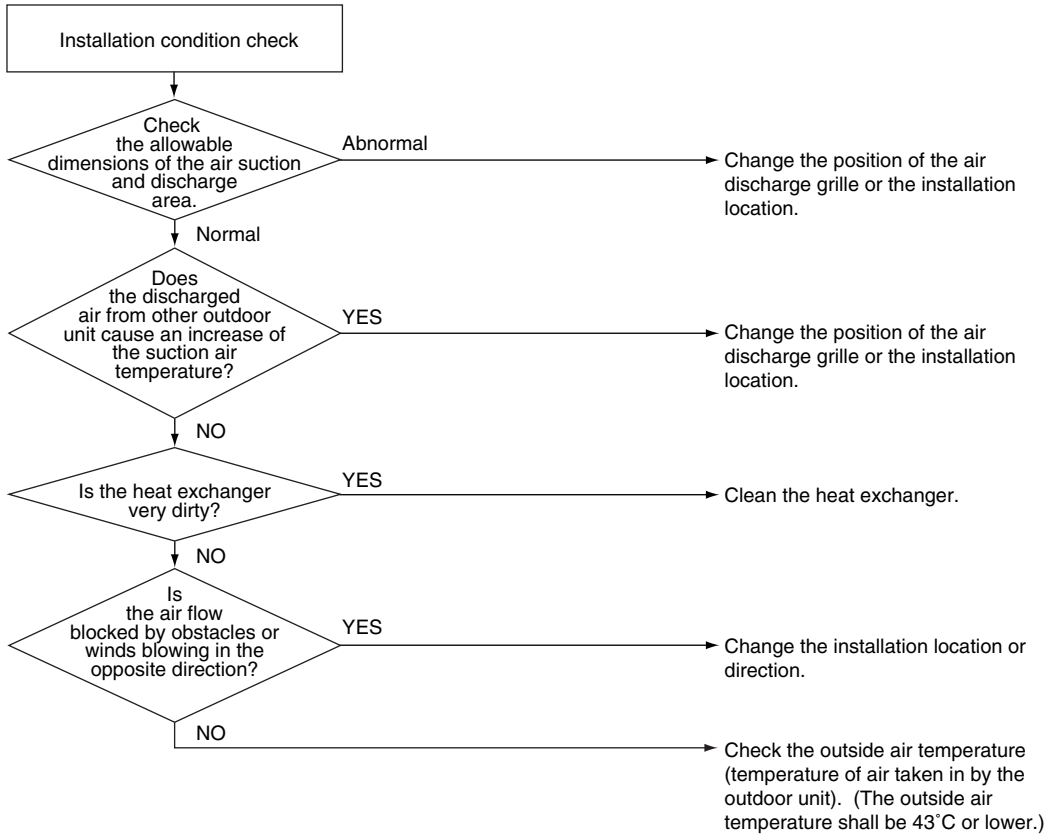



(R25 = 20k Ω , B=3950)



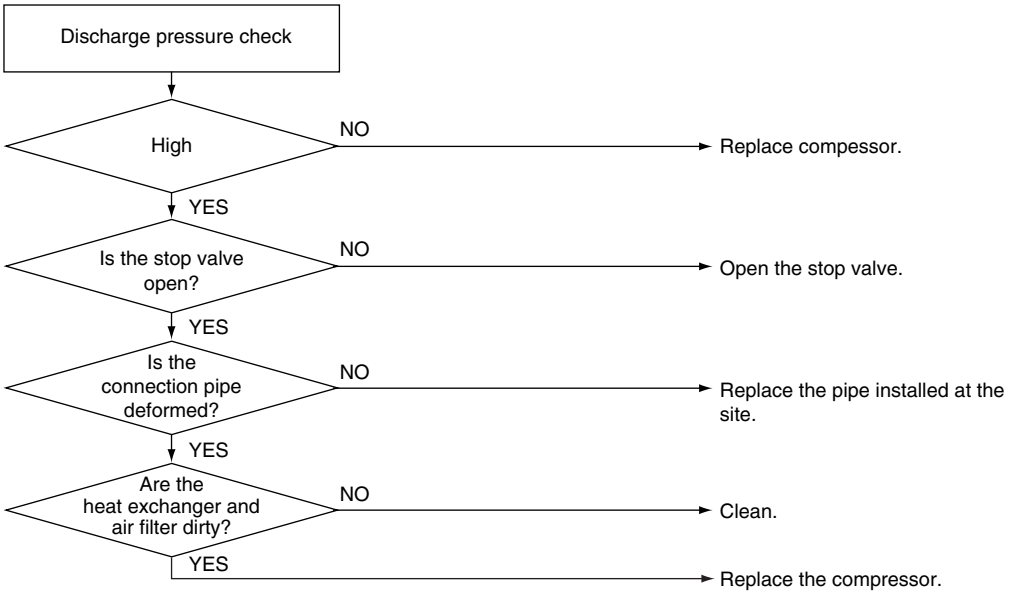
## 5.6 Installation Condition Check

**Check No.07**



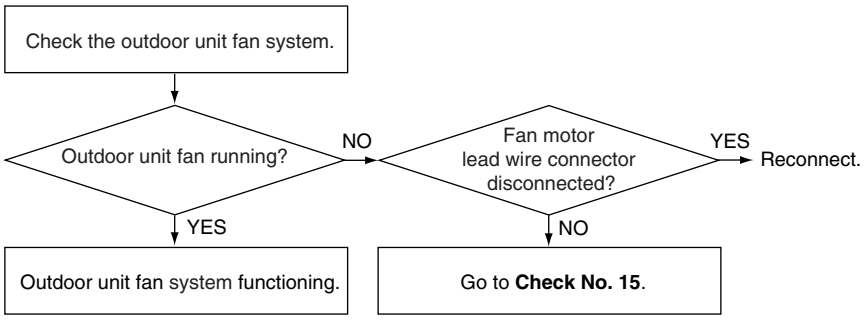
## 5.7 Discharge Pressure Check

**Check No.08**



## 5.8 Outdoor Unit Fan System Check (With DC Motor)

**Check No.09**



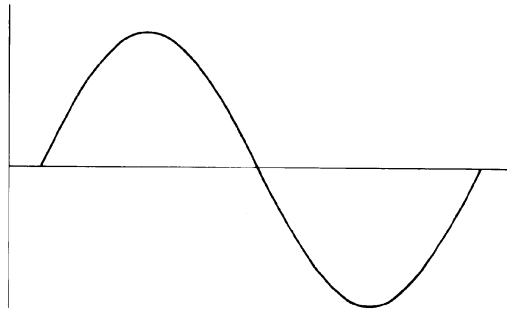

3

## 5.9 Power Supply Waveforms Check

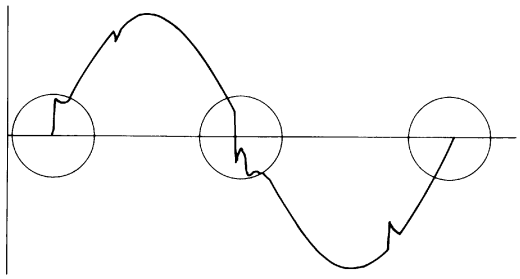
**Check No.10**

Measure the power supply waveform between pins 1 and 3 on the terminal board, and check the waveform disturbance.

➤ Check to see if the power supply waveform is a sine wave.

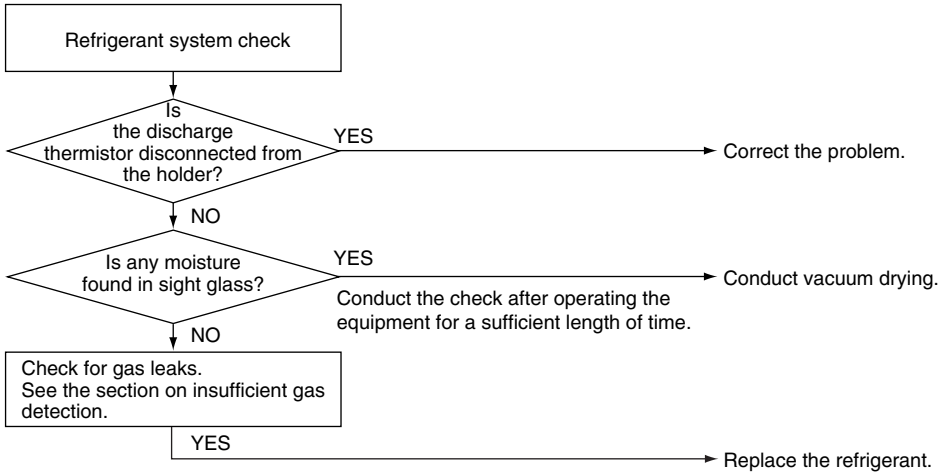


➤ Check to see if there is waveform disturbance near the zero cross (sections circled).



## 5.10 Inverter Units Refrigerant System Check

**Check No.11**



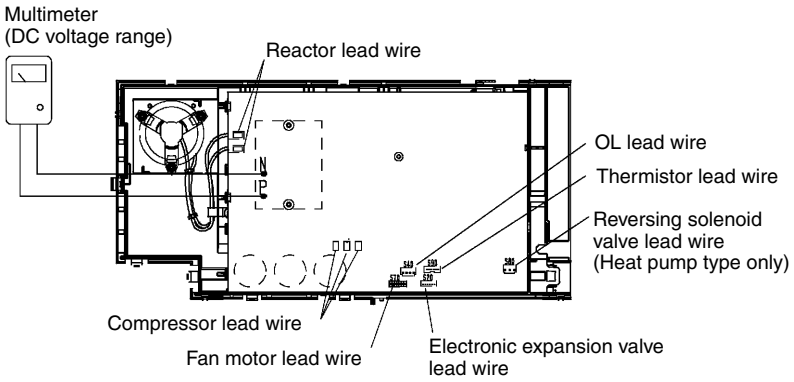
## 5.11 Capacitor Voltage Check

**Check No.12**

Before this checking, be sure to check the main circuit for short-circuit.

➤ Checking the capacitor voltage

➤ With the circuit breaker still on, measure the voltage according to the drawing of the model in question. Be careful never to touch any live parts



## 5.12 Power Transistor Check

**Check No.13**

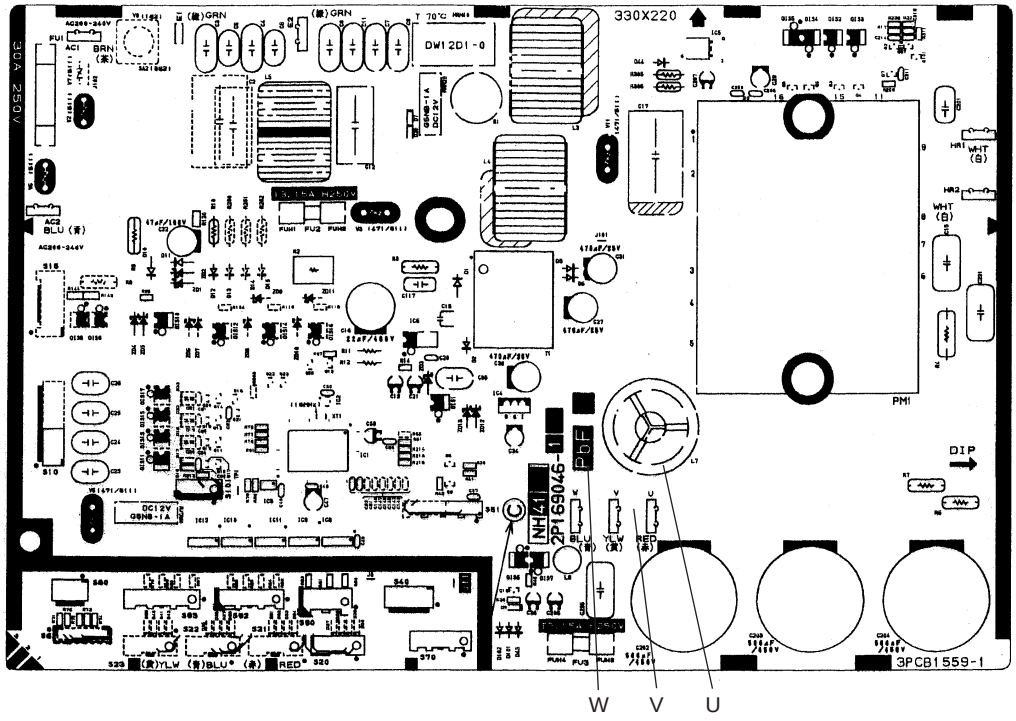
➤ Checking the power transistor

➤ Never touch any live parts for at least 10 minutes after turning off the circuit breaker.

➤ If unavoidably necessary to touch a live part, make sure the power transistor's supply voltage is below 50 V using the tester.

➤ For the UVW, make measurements at the Faston terminal on the board or the relay connector.

| Tester's negative terminal | Power transistor (+) | UVW | Power transistor (–) | UVW |
|---|---|---|---|---|
| Tester's positive terminal | UVW | Power transistor (+) | UVW | Power transistor (–) |
| Normal resistance | Several kΩ to several MΩ | | | |
| Abnormal resistance | 0 or ∞ | | | |

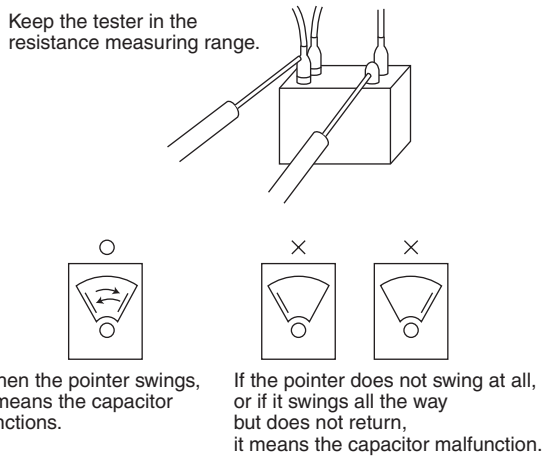


## 5.13 Main Circuit Electrolytic Capacitor Check

**Check No.14**

➤ Checking the main circuit electrolytic capacitor

- ➤ Never touch any live parts for at least 10 minutes after turning off the circuit breaker.
- ➤ If unavoidably necessary to touch a live part, make sure there is no DC voltage using the tester.
- ➤ Check the continuity with the tester. Reverse the pins and make sure there is continuity.



## 5.14 Turning Speed Pulse Input on the Outdoor Unit PCB Check

**Check No.15** **Propeller fan motor**

Make sure the voltage of 320±30V is being applied.

**1** Stop the operation first and then the power off, and disconnect the connector S70.

**2** Make sure there is about DC 320 V between pins 4 and 7.

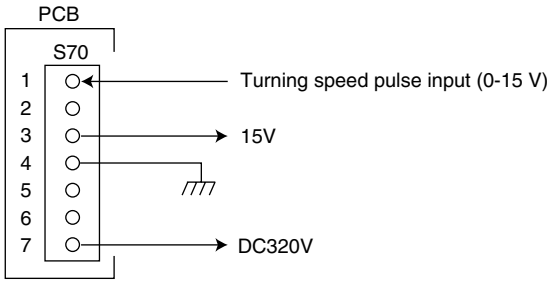
**3** With the system and the power still off, reconnect the connector S70.

**4** Make a turn of the fan motor with a hand, and make sure the pulse (0-15 V) appears twice at pins 1 and 4.

If the fuse for fan motor protection is blown out, the outdoor-unit fan may also be in trouble. Check the fan too.

If the voltage in Step (2) is not applied, it means the PCB is defective. Replace the PCB.

If the pulse in Step (4) is not available, it means the Hall IC is defective. Replace the DC fan motor.If there are both the voltage (2) and the pulse (4), replace the PCB.




∗Propeller fan motor: S70

## 5.15 “Inverter Checker” Check

**Check No.16**

**Characteristics**

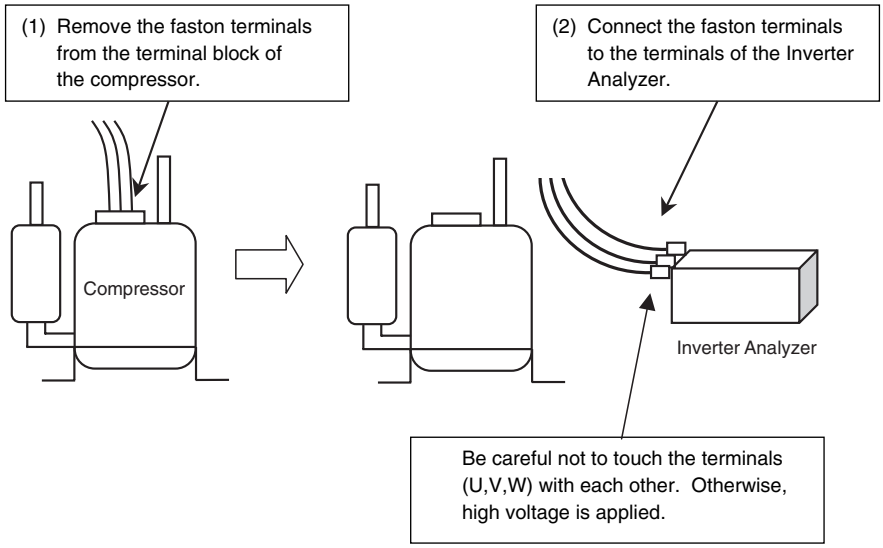
If an abnormal stop occurs due to compressor startup failure or overcurrent output when using the inverter unit, it is difficult to judge whether it results from the compressor failure or another failure (control PC Board, power transistor, etc.). The inverter analyzer makes it possible to judge the cause of trouble easily and securely. (Connect this analyzer as a quasi compressor instead of a compressor and check the output of the inverter.)

**Operation method**

**1** Be sure to turn the power off.

**2** Install the inverter analyzer instead of a compressor.

**Note:** Make sure the charged voltage of the built-in smoothing electrolytic capacitor drops to 10 VDC or below before carrying out the service work.




Reference:

If the connector terminal of the compressor is not a faston terminal (difficult to remove the wire on the terminal), it is possible to connect a wire available on site to the unit from the output side of the PCB. (Do not connect it to the compressor at the same time, otherwise it may result in incorrect detection.)

**3** Turn the power on and operate the air conditioner.

**Diagnose method**

Diagnose can be made according to 6 LEDs lighting status as follows:

**1** When all LEDs are lit uniformly, a compressor malfunction (to be replaced) has occured.

**2** When some of the LEDs are not lit (LEDs are not lit or go off, etc.), check the individual power transistor. (See "Check No.15")

- ➤ When the power transistor and the control PCB are integrated, replace the control PCB.
- ➤ When the power transistor can be checked individually, check the resistance value. (See "Check No.15")

If NG, the power transistor may have a failure. Replace the power transistor.

If the power transistor is normal, check if there is any solder cracking on the filter PCB.

- ➤ If any solder cracking is found, replace the filter PCB (or repair the soldered section)
- ➤ If the filter PCB is normal, replace the control PCB.

**Caution**

- ➤ When the output frequency is low, yhe LED flashes slowly. As the frequency increases, the LED flashes quickly. (It looks like the LED is lit.)µ
- ➤ If the operation is carried out with no load (the condition of the compressor is disconnected), some of the units may stop operation with “CT system error” (due to no electric current) or “startup failure” (because the compressor does not turn). In this case, check if the LED is flashing during “operation” to “malfunction stop”. (Refer to the Service Manual of each air conditioner to check whether the alarm LEDs for CT system, startup failure, etc. are provided or not.)
- ➤ On completion of diagnose by this checker, be sure to re-crimp the faston terminal before restting the system. (Otherwise, the terminal may be burned due to loosening.)