ESIE98-07

Service Manual
Split Inverter
RX25GV1NB, RX35GV1NB
FTX25GV1NB, FTX35GV1NB

Daikin Europe NV

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1 Introduction

1.1 About This Manual

Split Inverter

The Split Inverter room air conditioners contain an outdoor unit RX25GV1NB controlling indoor unit FTX25GV1NB or an outdoor unit RX35GV1NB controlling indoor unit FTX35GV1NB. They are designed for cooling and heating applications.

Before starting up the unit for the first time, make sure it has been properly installed. Consult the Installation manual and ‘Pre-Test Run Checks’ on page 4-3.

You will find the following tools at the back of the manual:

- a list of drawings. Refer to Appendix Drawings.
- an index. Refer to Index.

Usage of the manual

The present service manual gives you all the information you need to do the necessary repair and maintenance tasks for the Split Inverter room air conditioners. It is intended for and should only be used by qualified engineers.
It is not intended to replace the technical know-how acquired through training and experience.

Using icons

Icons are used to attract your attention to specific information. The meaning of each icon is described in the table below:

Icon	Type of information	Description
	Note	A ‘note’ provides information that is not indispensable, but may nevertheless be valuable to you such as tips and tricks.
	Caution	A ‘caution’ is used when there is danger that you, through incorrect manipulation, may damage equipment, loose data, get an unexpected result or have to restart (part of) a procedure.
	Warning	A ‘warning’ is used when there is danger of personal injury.
	Reference	A ‘reference’ guides you to other places in this binder or in this manual, where you will find additional information on a specific topic.

Using symbols

The following symbols are used to clarify the troubleshooting part:

Symbol	Description
●	LED is off
○	LED is on
◑	Flashing LED
✻	Varies depending on the cases.
_	Not used for troubleshooting.

Part 1
System Outline

Introduction

This part outlines all the relevant elements in an installation of the Split Inverter room air conditioners. Once all the elements of the installation are described in short and the installation set-up is understood, a functional description of all elements will be given in the next parts of this book.

What is in this part?

This part contains the following chapters:

1 General Outline

1.1 What Is in This Chapter

Introduction

In this chapter you will find the outlook drawing and the installation outline of the indoor units FTX25GV1NB, FTX35GV1NB and the outdoor units RX25GV1NB, RX35GV1NB.

Overview

This chapter covers the following topics:

1

1.2 Technical Specifications

Unit combination

In the following table you will find the technical specifications of the total units:

Indoor units		**FTX25GV1NB**		**FTX35GV1NB**	
Outdoor units		**RX25GV1NB**		**RX35GV1NB**	
cooling capacity	min./nominal/max.	0.9/2.6/3.1 kW		0.9/3.5/3.6 kW	
heating capacity	min./nominal/max.	0.9/3.6/4.6 kW		0.9/4.2/5.1 kW	
moisture removal		1.4 l/h	-	2.3 l/h	-
running current	cooling/heating	4.0 A	4.9 A	6.4 A	6.2 A
power consumption		865 W	1,075 W	1,410 W	1,420 W
power factor		94.0 %	95.4 %	95.8 %	96.8 %
COP		3.01	3.35	2.48	3.04
piping connections	liquid	ø 6.4 mm		ø 6.4 mm	
	gas	ø 9.5 mm		ø 12.7 mm	
	drain	ø 18.0 mm		ø 18.0 mm	
maximum interunit piping length		25 m (20 g/m additional charge for piping length exceeding 10 m)			
minimum interunit piping length		2.5 m			
maximum installation level difference		15 m			
heat insulation		both liquid and gas pipe			
n° of wiring connections		3 for power supply, 4 for interunit wiring			

Cooling capacity

The cooling capacity is based on indoor temperature of 27 °CDB, 19 °CWB and outdoor temperature of 35 °CDB, 24 °CWB. Equivalent reference piping length 7.5 m.

Heating capacity

The heating capacity is based on indoor temperature of 20 °CDB and outdoor temperature of 7 °CDB, 6 °CWB. Equivalent reference piping length 7.5 m.

Indoor units

In the following table you will find the technical specifications for the indoor units:

Features			**FTX25GV1NB**		**FTX35GV1NB**	
front panel colour			almond white			
air flow rate	cooling/heating	H	7.5 m³/min	8.4 m³/min	7.9 m³/min	8.4 m³/min
		M	6.4 m³/min	7.1 m³/min	6.8 m³/min	7.1 m³/min
		L	5.3 m³/min	5.9 m³/min	5.7 m³/min	5.9 m³/min
fan	type		cross flow fan			
	motor output		13 W		13 W	
	speed		5 steps and auto			
air direction control			right, left, horizontal and downwards			
air filter			removable / washable / mildew proof			
running current	cooling/heating		0.16 A			
power consumption	cooling/heating		35 W			
power factor	cooling/heating		95.1 %			
temperature control			microcomputer control			
dimensions (HxWxD)			250 x 750 x 180 mm³			
weight			7 kg			
sound pressure level (H/L)	cooling/heating		38/30 dBA	38/30 dBA	39/31 dBA	39/31 dBA

1

Outdoor units

In the following table you will find the technical specifications of the outdoor units:

Features		**RX25GV1NB**		**RX35GV1NB**	
casing colour		ivory white			
compressor	type	hermetically sealed swing type			
	model	1YC23ZXD			
	motor output	750 W		1,000 W	
refrigerant oil	model	SUNISO 4GS-DI			
	charge	0.35 l		0.35 l	
refrigerant	model	R-22			
	charge	0.9 kg		0.9 kg	
air flow rate	cooling/heating	24.5/14.5 m³/min	21/12.5 m³/min	24.5/14.5 m³/min	21/12.5 m³/min
fan	type	propeller			
	motor output	22 W			
running current	cooling/heating	3.84 A	4.74 A	6.24 A	6.04 A
power consumption	cooling/heating	830 W	1,040 W	1,375 W	1,385 W
power factor	cooling/heating	94.0 %	95.4 %	95.8 %	96.8 %
starting current	cooling/heating	4.9 A		6.4 A	
dimensions (HxWxD)		550 x 695 x 245 mm³			
weight		36 kg		36 kg	
sound pressure level	cooling/heating	45 dBA	46 dBA	46 dBA	47 dBA

1.3 Electrical Specifications

Unit combination

The following table gives an overview of the electrical specifications of the indoor-outdoor unit combinations:

Indoor unit		**FTX25GV1NB**	**FTX35GV1NB**
Outdoor unit		**RX25GV1NB**	**RX35GV1NB**
frequency		50 Hz	
voltage		230 V	
power voltage	voltage range	207-253 V	
	minimum circuit amperage (MCA)	11.5 A	
	maximum fuse amperage (MFA)	12 A	
compressor	rated load amperage (RLA)	3.16 A	5.96 A
outdoor fan motor (OFM)	fan motor rated output	22 W	
	full load amperage (FLA)	0.28 A	
indoor fan motor (IFM)	fan motor rated output	13 W	
	full load amperage (FLA)	0.16 A	

Note

The following list explains some of the items in the table above:

- The rated load amperage (RLA) is based on the following conditions:
  indoor temperature: 27 °CDB / 19 °CWB
  outdoor temperature: 35 °CDB.
- Maximum allowable voltage (MFA) imbalance between phases is 2 %.
- Select the wire size based on a larger value of the minimum circuit amperage (MCA) or total overcurrent amperage (TOCA).
- Instead of a fuse, use a circuit breaker.
- Voltage range:
  The units are suitable for use on electrical systems where the voltage supplied to unit terminals is not below or above listed operation limits.

1

1.4 Outlook Drawing

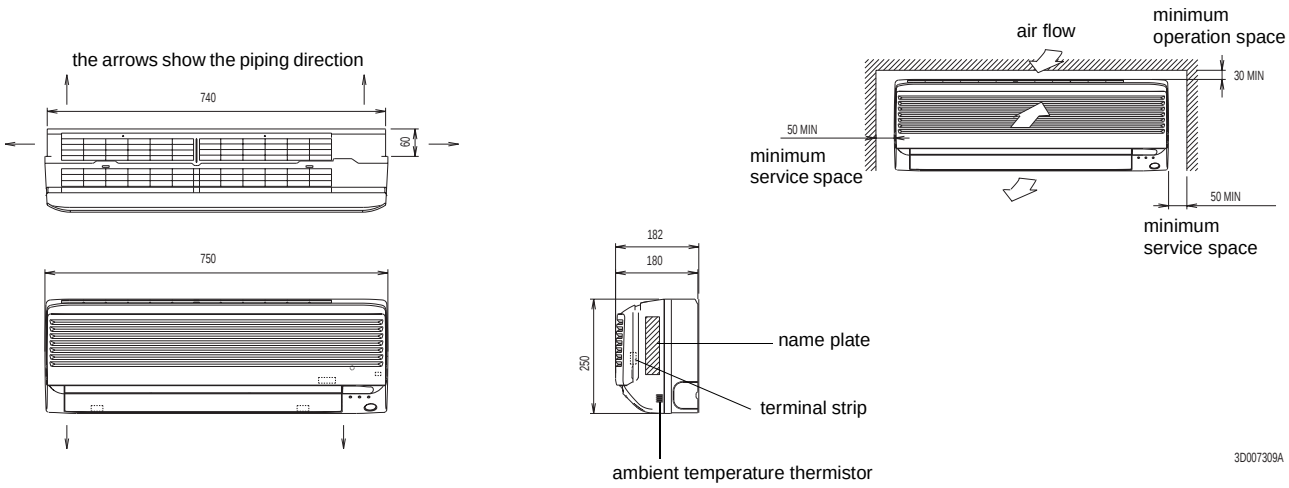
Drawings

The following drawings indicate the following important items:

- dimensions
- service space
- operation space

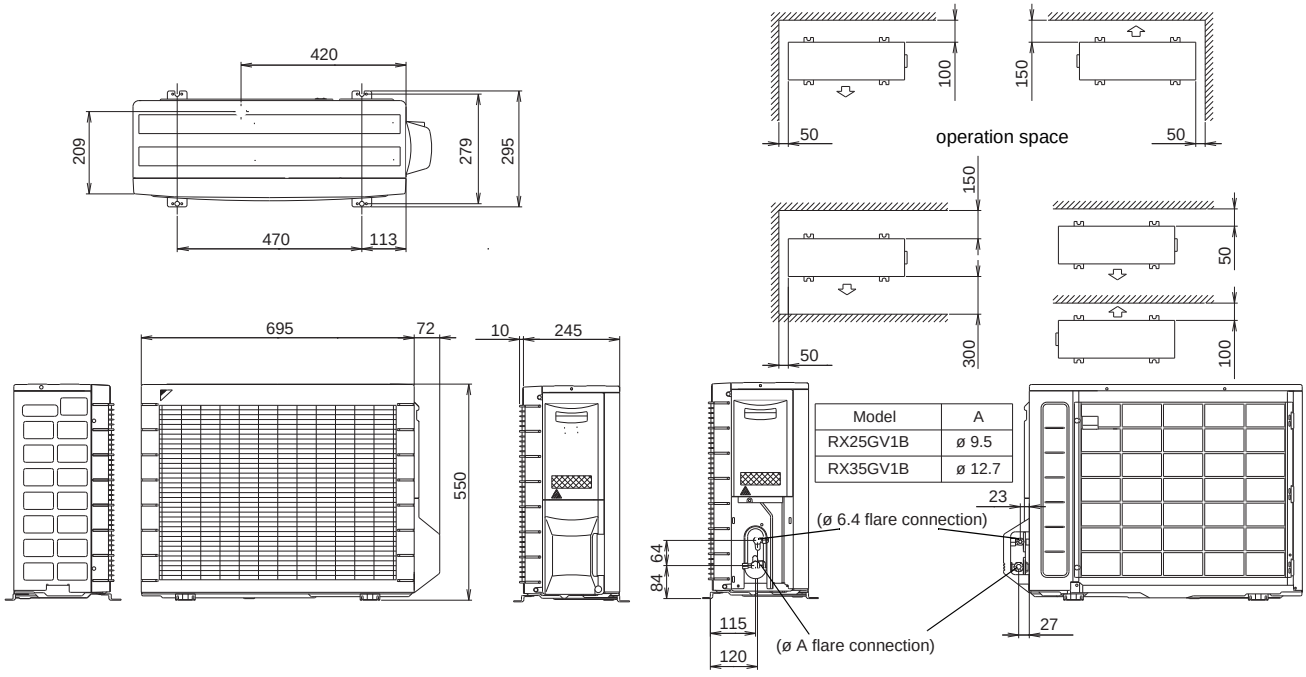
Indoor unit, FTX25GV1NB, FTX35GV1NB

The figure below displays the outlook of the indoor unit FTX25GV1NB and FTX35GV1NB:



Outdoor unit RX25GV1NB, RX35GV1NB

The figure below displays the outlook of the outdoor unit RX25GV1NB and RX35GV1NB:



2 Piping Layout

2.1 What Is in This Chapter

Introduction

This chapter explains the different parts of the internal refrigeration circuit.

Overview

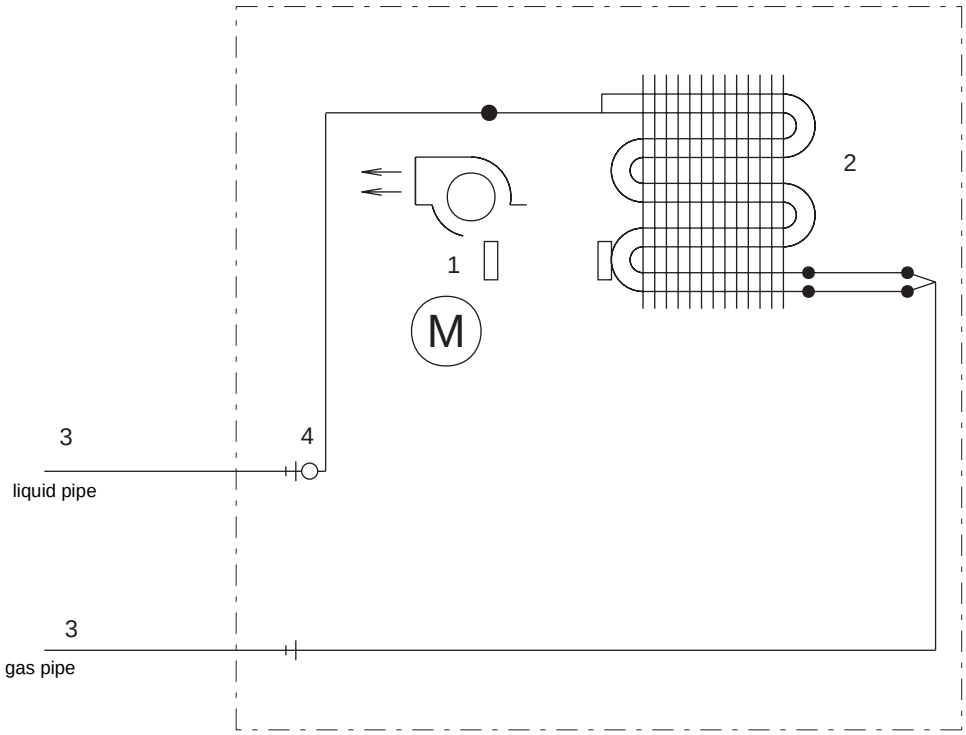
This chapter covers the following topics:

1

2.2 Functional Diagram Refrigeration Circuit

Functional diagram indoor unit

The figure below displays the functional diagram of the refrigeration circuit of the indoor units FTX25GV1NB and FTX35GV1NB:



Main parts refrigeration circuit

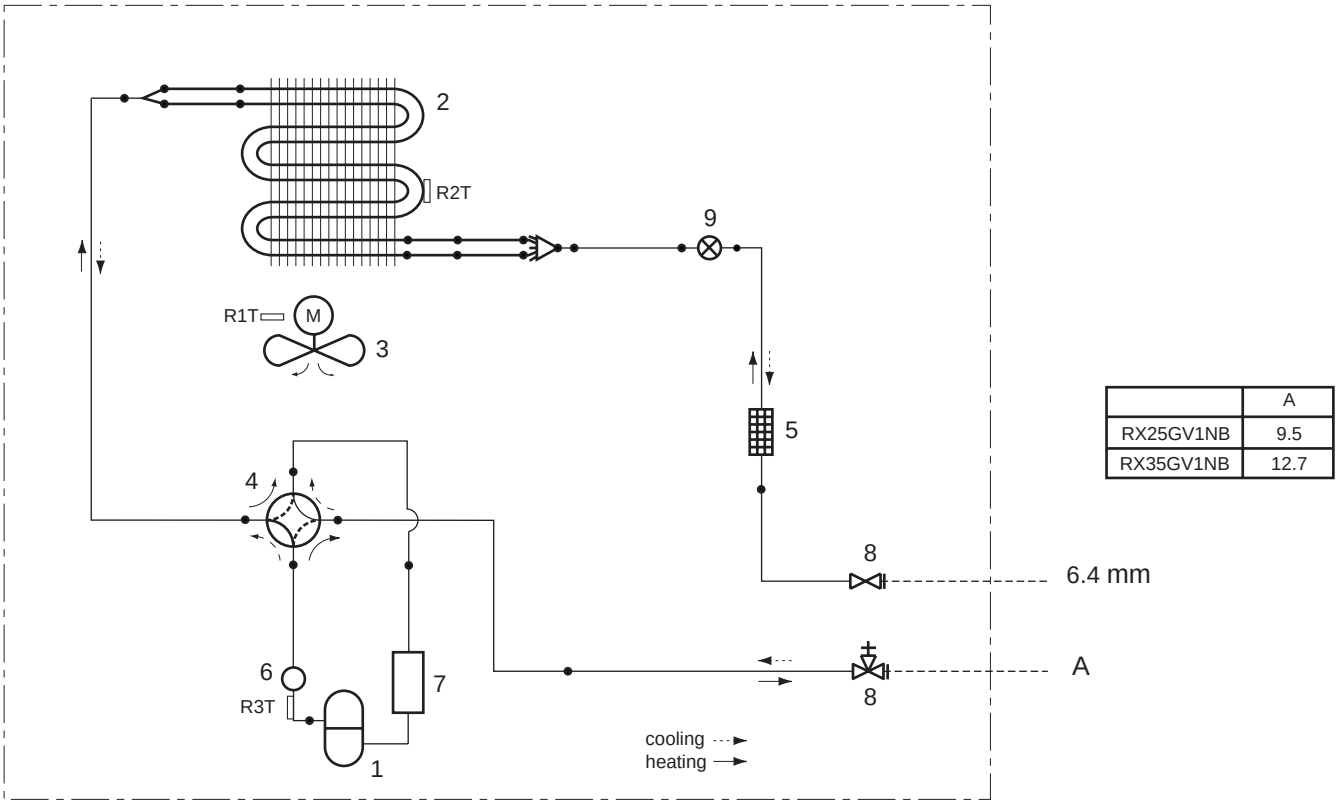
The numbers in the table below refer to the numbers in the piping diagram above:

N°	Part name	Function
1	Fan motor	The fan motor is a phase controlled 5 step motor. An automatic control is available.
2	Heat exchanger	The heat exchanger is of the multi louvre fin type. Hi-X-tubes and coated waffle louvre fins are used.
3	Field piping connections	The copper tube of the field piping depends on the model of the indoor unit:
4	Muffler	The muffler is used to absorb the refrigerant noise and is installed in FTX35GV1NB and FTX25GV1ND.

Models	Copper tube liquid pipe	Copper tube gas pipe
FTX25GV1NB	6.4 mm	9.5 mm
FTX35GV1NB	6.4 mm	12.7 mm

Functional diagram outdoor unit

The figure below displays the functional diagram of the refrigeration circuit of the outdoor units RX25GV1B and RX35GV1NB:



	A
RX25GV1NB	9.5
RX35GV1NB	12.7

Main parts refrigeration circuit

The numbers in the table below refer to the numbers in the piping diagram above.

N°	Part name	Function
1	Compressor	The compressor is of the vertical hermetically sealed swing type operated by inverter control.
2	Heat exchanger	The heat exchanger is of the multi louvre fin type. Hi-X-tubes and coated waffle louvre fins are used.
3	Fan motor	Double-speed motor.
4	Four-way valve	The four-way valve is energized during cooling and defrosting.
5	Filter	The filter collects impurities, which may enter the system during installation and also avoids blockage of the capillaries and other fine mechanical parts of the unit.
6	Muffler	The muffler absorbs the refrigerant noise from the compressor.
7	Accumulator	The accumulator separates the gas from the liquid in order to protect the compressor against liquid pumping.
8	Gas line stop valve	The gas line stop valves are used as shut-off valves in case of a pump-down. The gas line stop valves are equipped with connectors to measure the pressure.
9	Motor operated expansion valve	The opening of the expansion valve is electronically controlled to enable a good performance.

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3 Wiring Layout

3.1 What Is in This Chapter

Introduction

This chapter guides you through the switch box and the wiring diagrams.

Overview

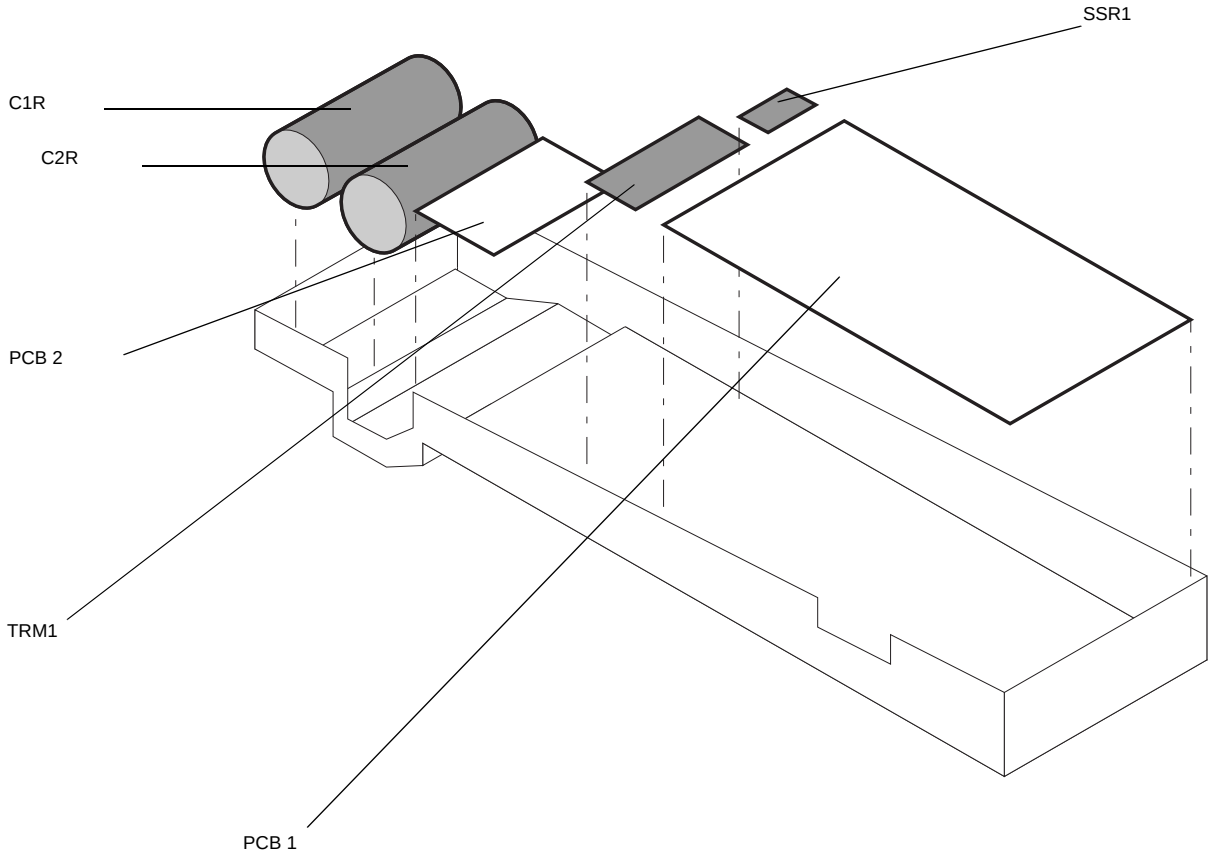
This chapter covers the following topics:

1

3.2 Switch Box Layout

Location

The following drawing shows the main components of the switch box:



Functionality

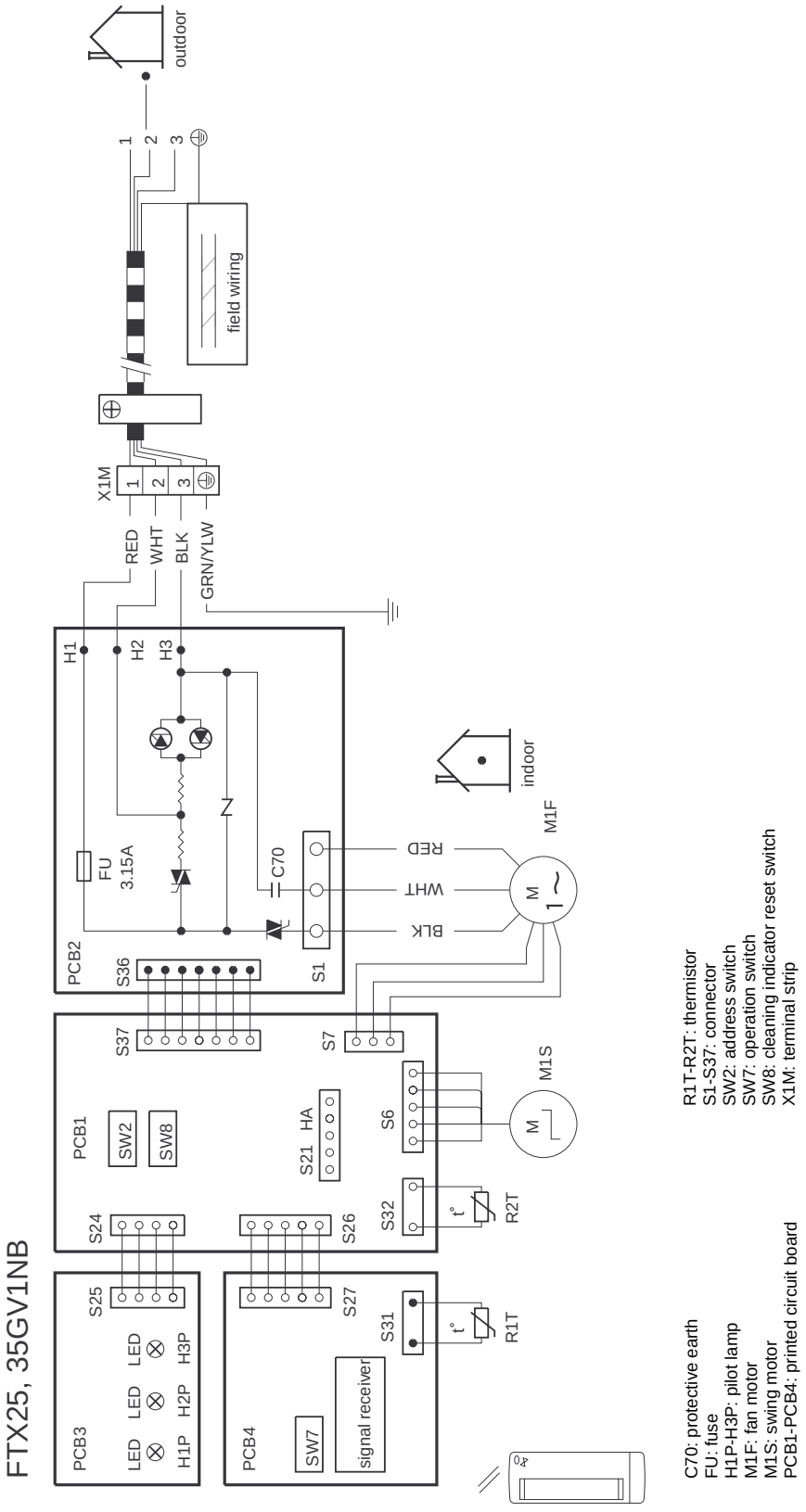
The following table explains the items in the drawing above:

Item	Explanation
C1R, C2R	capacitors. Refer to ‘Capacitor voltage check’ on page 3-63.
PCB 1	printed circuit board 1. Refer to ‘Main board PCB 1’ on page 1-20.
PCB 2	printed circuit board 2. Refer to ‘Main board PCB 2’ on page 1-21.
TRM1	transistor module. Refer to ‘Power transistor check’ on page 3-63,‘Power transistor output current check’ on page 3-64 and ‘Power transistor output voltage check’ on page 3-65.
SSR1	solid state relay. Refer to ‘SSR1 check’ on page 3-68.

3.3 Wiring Diagrams

Wiring diagram FTX25GV1NB, FTX35GV1NB

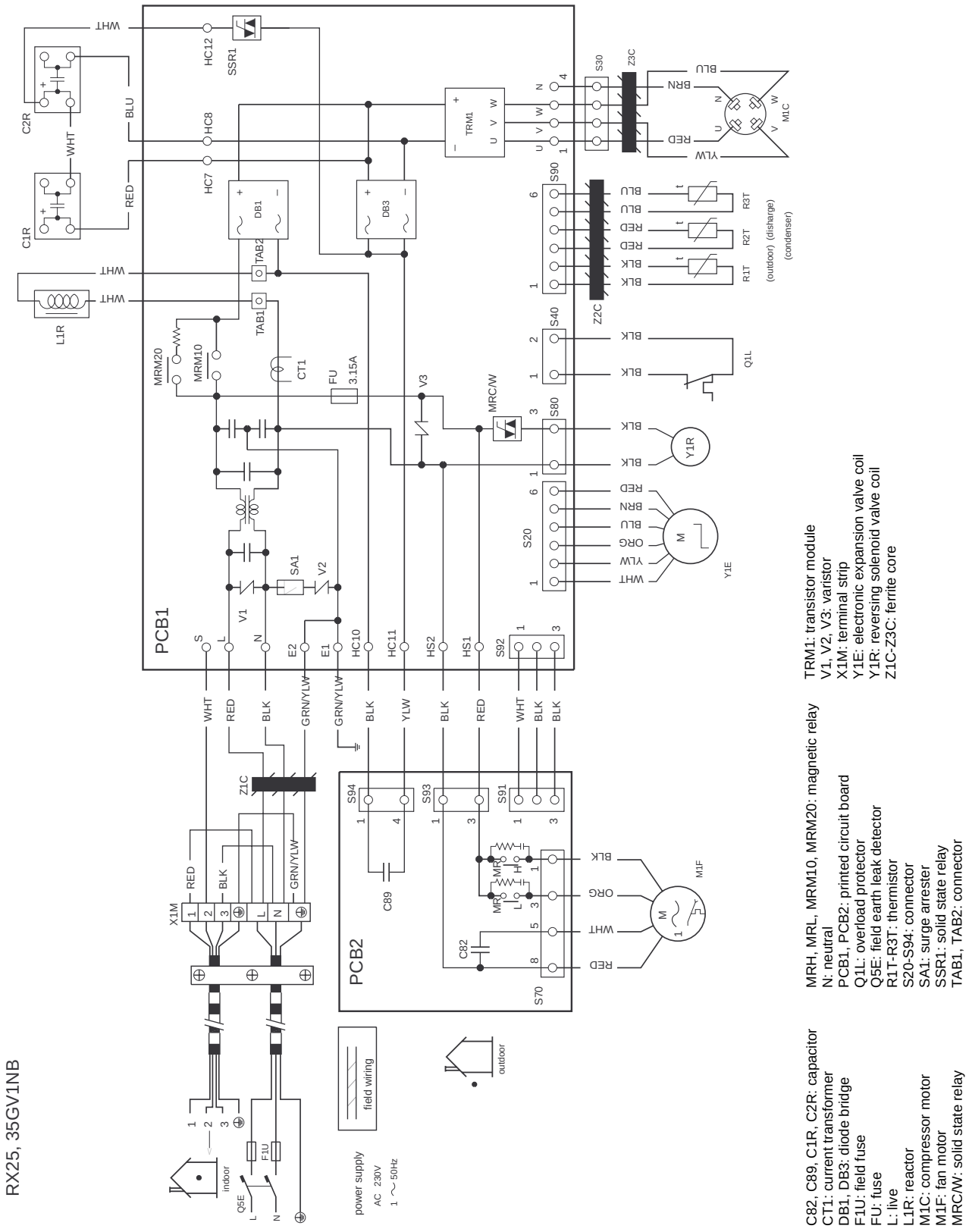
The following diagram shows the wirings and the electrical parts of the indoor units FTX25GV1NB and FTX35GV1NB:



1

Wiring diagram RX25GV1NB, RX35GV1NB

The following diagram shows the wirings and the electrical parts of the outdoor units RX25GV1NB and RX35GV1NB:



C82, C89, C1R, C2R: capacitor
CT1: current transformer
DB1, DB3: diode bridge
F1U: field fuse
FU: fuse
L: live
L1R: reactor
M1C: compressor motor
M1F: fan motor
MRC/W: solid state relay

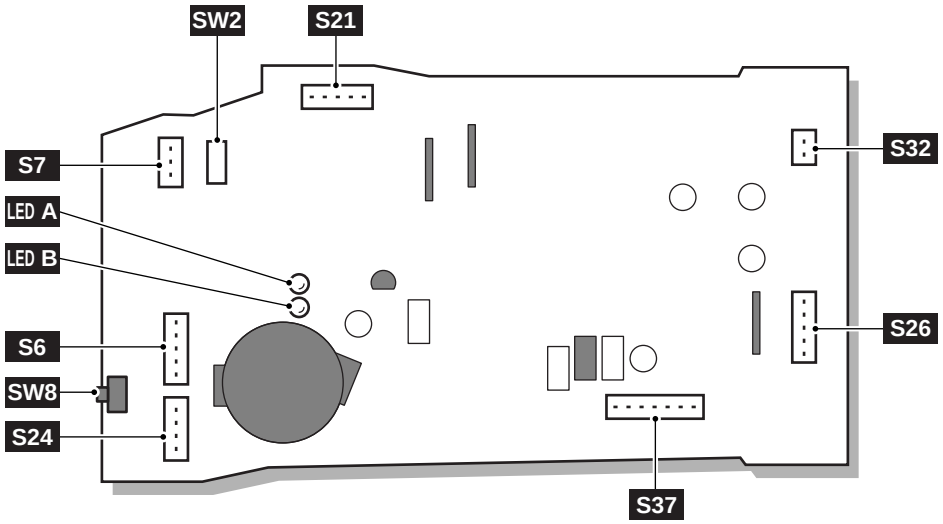
MRH, MRL, MRM10, MRM20: magnetic relay
N: neutral
PCB1, PCB2: printed circuit board
Q1L: overload protector
Q5E: field earth leak detector
R1T-R3T: thermistor
S20-S94: connector
SA1: surge arrester
SSR1: solid state relay
TAB1, TAB2: connector

TRM1: transistor module
V1, V2, V3: varistor
X1M: terminal strip
Y1E: electronic expansion valve coil
Y1R: reversing solenoid valve coil
Z1C-Z3C: ferrite core

3.4 Main PCB Layout for Indoor Units FTX25GV1NB and FTX35GV1NB

Main board PCB 1

The drawing below shows PCB 1 of the indoor units FTX25GV1NB and FTX35GV1NB:



Symbol	Description
S6	connector for swing motor (lower horizontal flap) M1S
S7	connector for control of fan speed M1F
S21	connector for centralized control to 5-rooms KRC72
S24	communication connector between PCB 1 and PCB 3
S26	communication connector between PCB 1 and PCB 4
S32	connector for indoor heat exchanger thermistor R2T
S37	communication connector between PCB 1 and PCB 2
SW2	address switch
SW8	reset switch for air filter
LED A	fault indication
LED B	fault indication

Refer to ‘Wiring diagram FTX25GV1NB, FTX35GV1NB’ on page 1-15 for more information concerning this PCB board.

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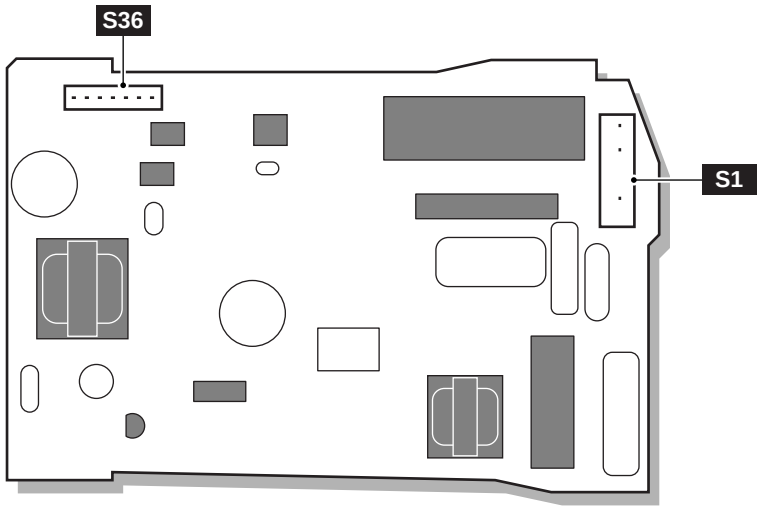
Main board PCB 2

The drawing below shows PCB 2 of the indoor units FTX25GV1NB and FTX35GV1NB:

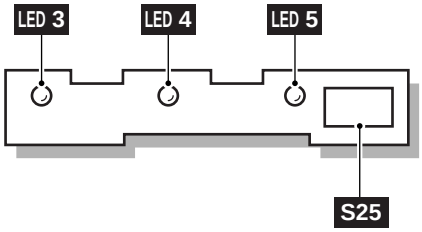


Symbol	Description
S1	connector fan motor M1F
S36	communication connector between PCB 2 and PCB 1

Refer to ‘Wiring diagram FTX25GV1NB, FTX35GV1NB’ on page 1-15 for more information concerning this PCB board.

Main board PCB 3

The drawing below shows PCB 3 of the indoor units FTX25GV1NB and FTX35GV1NB:

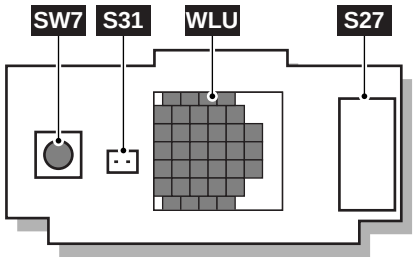


Symbol	Description
S25	communication connector between PCB 3 and PCB 1
LED 3	ON / OFF indication (H1P on wiring)
LED 4	time clock indication (H2P on wiring)
LED 5	filter indication (H3P on wiring)

Refer to ‘Wiring diagram FTX25GV1NB, FTX35GV1NB’ on page 1-15 for more information concerning this PCB board.

Main board PCB 4

The drawing below shows PCB 4 of the indoor units FTX25GV1NB and FTX35GV1NB:



Symbol	Description
S27	communication connector between PCB 4 and PCB 1
S31	connector for indoor ambient temperature thermistor R1T
SW7	emergency operation switch
WLU	signal receiver

Refer to ‘Wiring diagram FTX25GV1NB, FTX35GV1NB’ on page 1-15 for more information concerning this PCB board.

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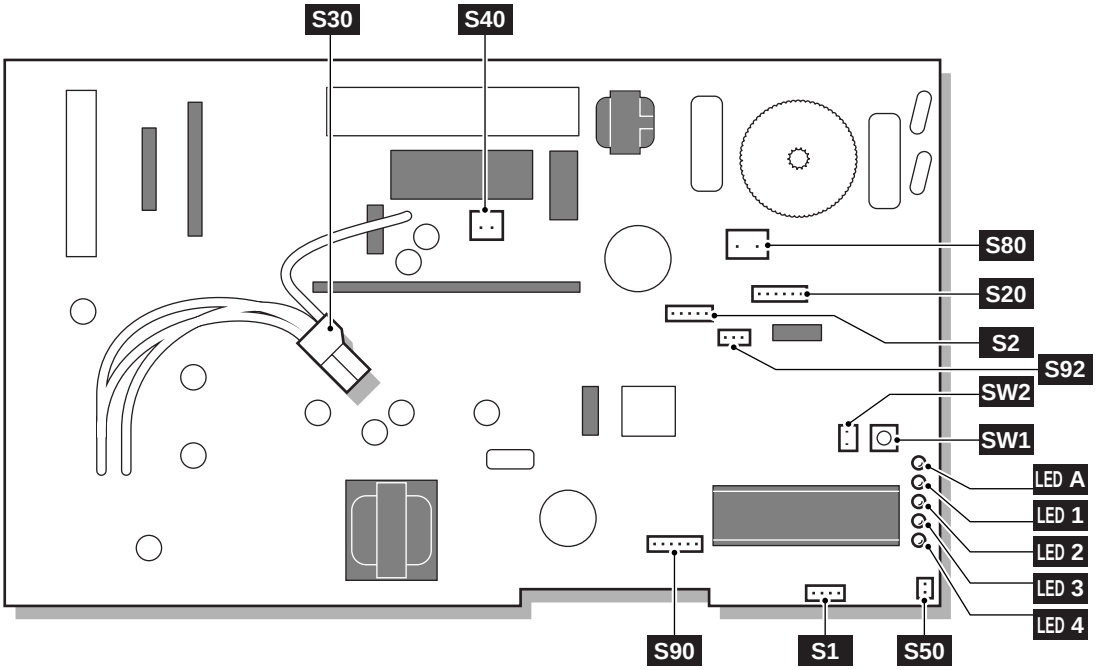
3.5 Main PCB Layout for Outdoor Units RX25GV1NB and RX35GV1NB

Main board PCB 1 The drawing below shows PCB 1 of the outdoor units RX25GV1NB and RX35GV1NB:

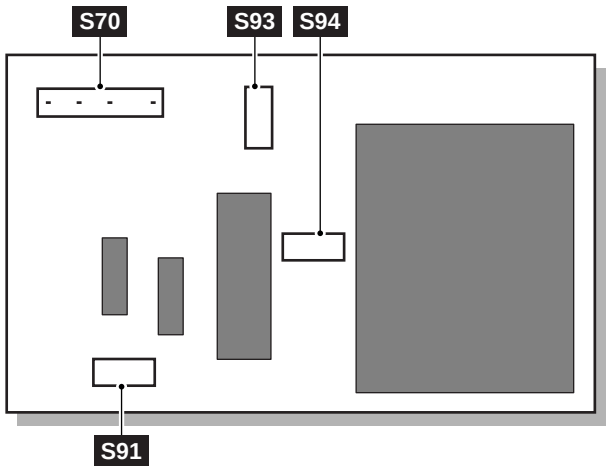


Symbol	Description
S1	factory use
S2	factory use
S20	connector for expansion valve of room Y1E
S30 (floating)	connector for compressor motor M1C
S40	connector for overload protector Q1L
S50	cutting wire for long pipe
S80	connector for 4-way valve Y1R
S90	connector for outdoor ambient temperature thermistor R1T (1-2)
	connector for outdoor heat exchanger thermistor R2T (3-4)
	connector for discharge pipe thermistor R3T (5-6)
S92	communication connector between PCB 1 and PCB 2
SW1	forced operation switch (ON/OFF)
SW2	forced operation connector (cooling/heating)
LED A	fault indication
LED 1	
LED 2	
LED 3	
LED 4	

Refer to ‘Wiring diagram RX25GV1NB, RX35GV1NB’ on page 1-16 for more information concerning this PCB board.

Main board PCB 2

The drawing below shows PCB 2 of the outdoor units RX25GV1NB and RX35GV1NB:



Symbol	Description
S70	connector for fan motor M1F
S91	communication connector between PCB 2 and PCB 1
S93	communication connector between PCB 2 and PCB 1
S94	communication connector between PCB 2 and PCB 1

Refer to ‘Wiring diagram RX25GV1NB, RX35GV1NB’ on page 1-16 for more information concerning this PCB board.

1

Part 2
Functional Description

Introduction

This part gives more detailed information on the functions and controls in the unit. This information is used as background information for troubleshooting.

What is in this part?

This parts contains the following chapters:

1 General Functionality

1.1 What Is in This Chapter

Introduction

This chapter details on the control functions of the system. Understanding these functions is vital when diagnosing a malfunction is related to the functional control.

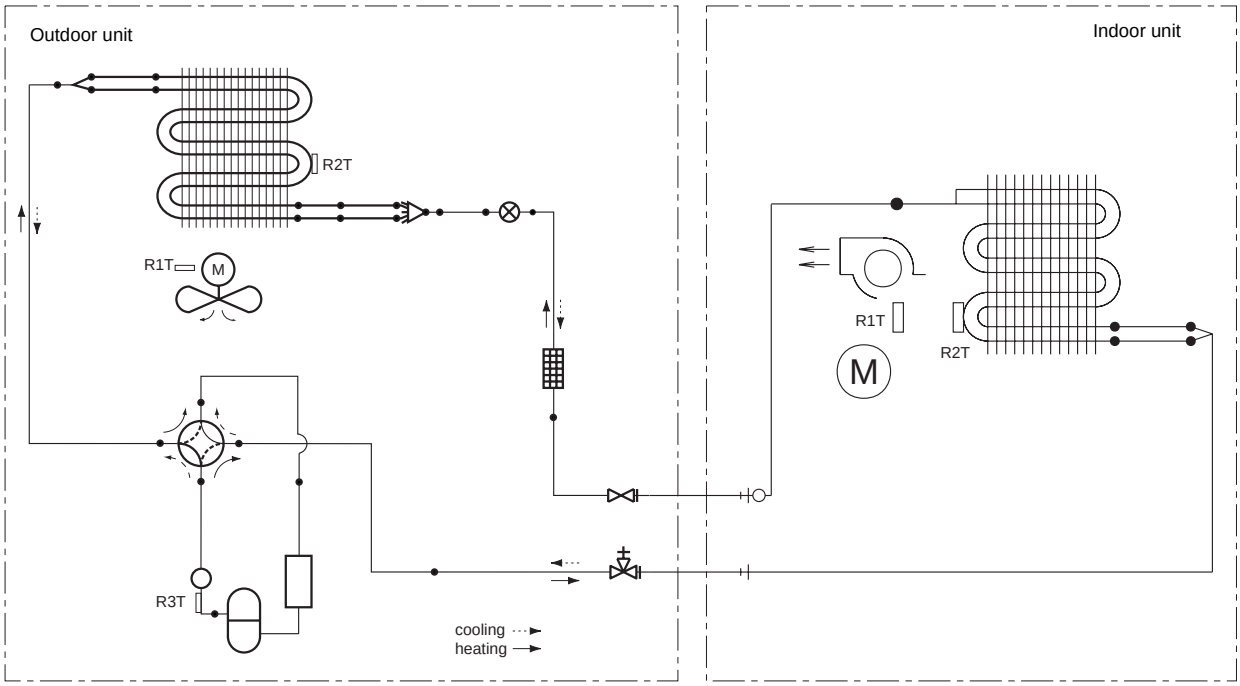
Overview

This chapter covers the following topics:

1.2 Functions of Thermistors

Location of thermistors

The thermistors on the drawing below are used to control the system. This control secures a proper cooling and prevents problems of the unit:



Frequency control

The following table shows the thermistors that control the frequency:

Controls	switch box thermistor	Discharge pipe thermistor	Outdoor heat exchanger thermistor	Outdoor ambient temperature thermistor	Indoor ambient temperature thermistor	Indoor heat exchanger thermistor
Symbol	R4T	R3T	R2T	R1T	R1T	R2T
Discharge temperature control. Refer to page 2-23.	–	○	–	–	–	–
Freeze-up prevention. Refer to page 2-23.	–	–	–	–	○	–
Peak cut off. Refer to page 2-23.	–	–	–	–	○	–
Control temperature switch box. Refer to page 2-26.	○	–	–	–	–	–
Maximum frequency control in function of outdoor ambient temperature. Refer to page 2-23.	–	–	○	–	–	–

Controls	switch box thermistor	Discharge pipe thermistor	Outdoor heat exchanger thermistor	Outdoor ambient temperature thermistor	Indoor ambient temperature thermistor	Indoor heat exchanger thermistor
Defrost. Refer to page 2-14.	_	_	○	○	_	○
High pressure limitation in heating. Refer to page 2-23.	_	_	○	_	_	○

with ○: available functions and _: no available functions.

Expansion valve control

The following table shows the thermistors that control the expansion valve:

Thermistors	Symbol	Defrost operation	Disconnected discharge pipe control	High discharge temperature	Feed back control
Outdoor ambient temperature thermistor	R1T	○	_	_	○
Outdoor heat exchanger thermistor	R2T	○	○ (cooling)	_	_
Discharge pipe thermistor	R3T	_	○	○	○
switch box thermistor	R4T	_	_	_	_
Indoor ambient temperature thermistor	R1T	_	_	_	_
Indoor heat exchanger thermistor	R2T	_	○ (heating)	_	○

with ○: available functions and _: no available functions.

1.3 Operating Modes

Modes

There are two operating modes:

- normal operating mode
- forced operating mode.

Overview

The following table shows the different control modes of the Split inverter room air conditioners:

Mode	Item
Normal operating mode	Cooling
	Dry keep
	Heating
	Defrosting (automatic)
	Stop mode: ■ Pre-heat operation. Refer to ‘Pre-heat operation’ on page 2-21. ■ Stop
Forced operating mode	Forced cooling
	Forced heating

The outdoor unit retains the operating mode, when the thermostat is switched off.

1.4 Frequency Principle

Main control parameters

The compressor is frequency-controlled during normal operation. The target frequency is set by the following 2 parameters coming from the operating indoor unit:

- the load condition of the operating indoor unit
- the difference between the room temperature and the set temperature.

Additional control parameters

The target frequency is adapted by additional parameters in the following cases:

- frequency limits
- initial settings
- forced cooling/heating operation.

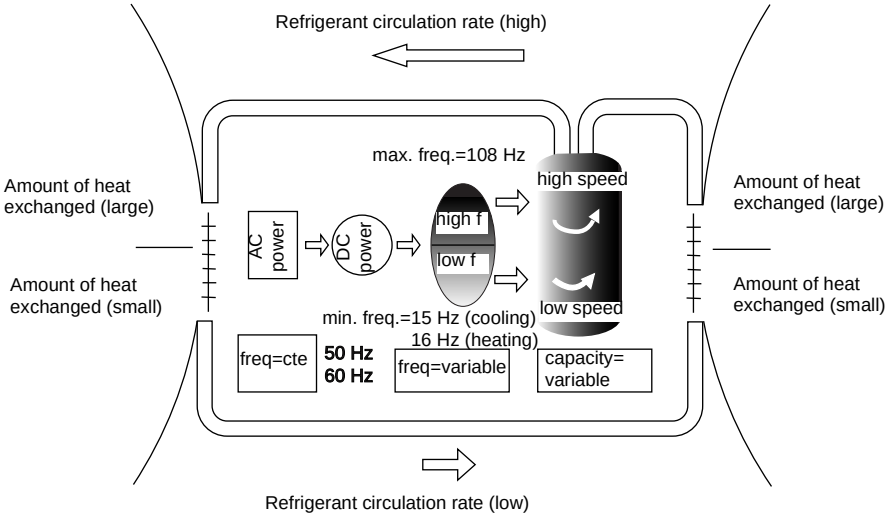
Inverter principle

To regulate the capacity, a frequency control is needed. The inverter makes it possible to vary the rotation speed of the compressor. The following table explains the conversion principle:

Phase	Description
1	The single phase power supply in AC is converted into DC.
2	The single phase power supply DC is converted into a three phase shopped DC voltage with a variable frequency. ■ When the frequency increases, the rotation speed of the compressor increases resulting in an increased refrigerant circulation. This leads to a higher amount of the heat exchange per unit. ■ When the frequency decreases, the rotation speed of the compressor decreases resulting in a decreased refrigerant circulation. This leads to a lower amount of the heat exchange per unit.

Drawing of inverter

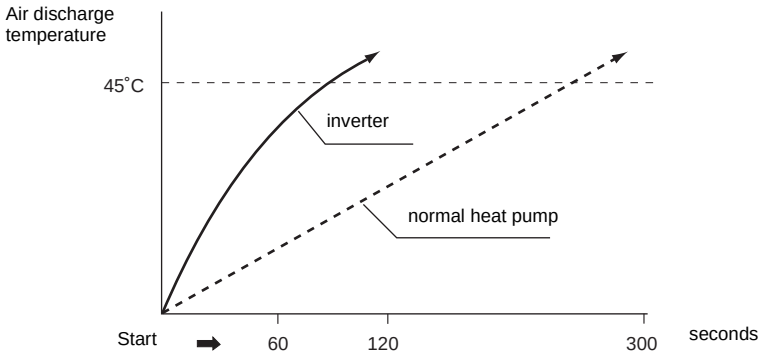
The following drawing shows a schematic view of the inverter principle:



Inverter features

The inverter provides the following features:

- The regulating capacity can be changed according to the changes in the outside temperature and cooling/heating load.
- Quick heating and quick cooling
  The compressor rotational speed is increased when starting the heating (or cooling). This enables a quick set temperature.



- Even during extreme cold weather, the high capacity is achieved. It is maintained even when the outside temperature is 0°C.
- Comfortable air conditioning
  A detailed adjustment is integrated to ensure a fixed room temperature. It is possible to air condition with a small room temperature variation.
- Energy saving heating and cooling
  Once the set temperature is reached, the energy saving operation enables to maintain the room temperature at low power.

Frequency limits

The following table shows the functions that define the minimum and maximum frequency:

Frequency limits	Limited during the activation of following functions
Low	■ four way valve operation compensation. Refer to page 2-26. ■ compressor lock prevention. ■ DC inverter control.
High	■ high fin temperature control. Refer to page 2-23. ■ discharge pipe temperature control. Refer to page 2-23. ■ low outdoor temperature control. Refer to page 2-23. ■ high pressure limitation. Refer to page 2-23. ■ peak cut off. Refer to page 2-23. ■ freeze-up prevention. Refer to page 2-23. ■ defrost control. Refer to page 2-14.

Initial setting

The initial frequency is automatically set in the following cases:

- compressor start (except for defrost)
- compressor start after defrost reset
- change-over from cooling to heating based on the outdoor ambient temperature and discharge pipe temperature.

Forced cooling/heating operation

For more information, refer to ‘Forced mode’ on page 2-15.

1.5 Swing Compressor

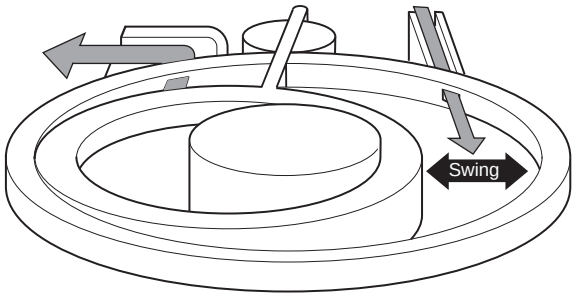
Features

The following list shows the features of the swing compressor:

- The roller and blade are integrated to prevent friction. This eliminates refrigerant leakage and provides high energy efficiency. The suction and compression process is performed by a swinging movement of the roller.
- The swing compressor has 1 piston.
- The innovative structure adapts the use of HFC-refrigerant by effective lubrication of sliding surfaces. For rotary compressors, adaptation to HFC requires major modifications.
- The compressor uses a DC motor.

Drawing

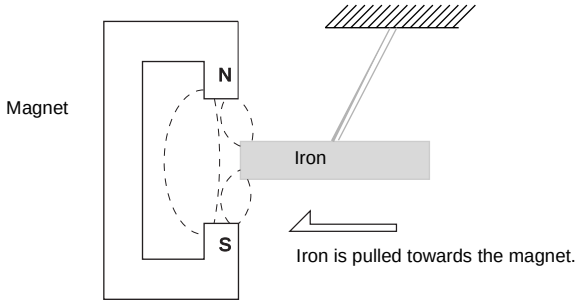
The following drawing shows the swing compressor:



1.6 Reluctance DC Motor

Definition

A measure of opposition presented to magnetic flux in a magnetic circuit, analogous to resistance in an electric circuit. It is equal to a magnetomotive force divided by magnetic flux. Also known as magnetic reluctance.

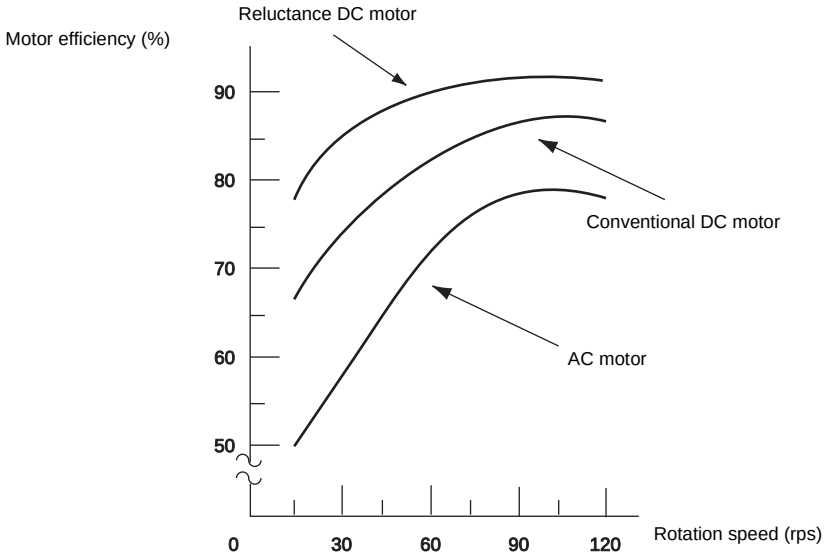


Introduction

The reluctance DC motor uses a neodymium magnet (= a magnet with a higher magnetic power than the ferrite magnet) which produces a magnetic torque and a reluctance torque (= a rotating force created by the change in the attraction between iron and magnet). The combined force generates a powerful rotation. The motor is especially effective in saving energy consumption in the low frequency range.

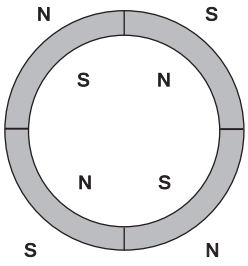
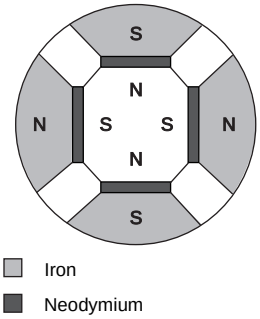
Motor efficiency

The following drawing shows the difference in efficiency between the reluctance DC motor, the DC motor and AC motor:



Rotor structure

The following drawings show the difference in structure between the conventional DC motor and the reluctance DC motor:

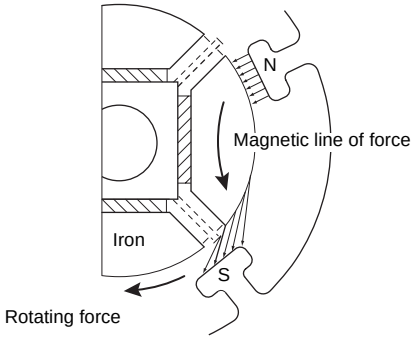
Conventional DC motor	Reluctance DC motor
Ferrite surface magnet	Embedded neodymium magnet
	
Magnetic torque	Powerful magnetic torque + Reluctance torque

Principle

Magnetic lines produced by electromagnets pass through iron easily but not through air or magnet. When magnets are embedded deep into the rotor of a motor, the magnetic lines of force on the south pole of the magnet extend tangentially. The bent magnetic lines evoke a force in order to straighten. This creates a second rotating force which a conventional motor does not generate. Since this force is generated by the difference in resistance against magnetic lines, it is called a reluctance torque.

Working

The following drawing shows the working principle:



1.7 Defrost Control

Principle

Defrost control is carried out by reversing the cycle from heating to cooling.

Start conditions

Defrost control is set by the following conditions:

- during heating
- 6 minutes after the compressor has started up
- when condition 1 or 2 in the table below are applicable:

Condition	Description
1	■ 40 minutes of accumulated runtime ■ not yet 90 minutes of accumulated runtime ■ condition 1 or 2 or 3 in the table below
2	■ 90 minutes of accumulated runtime ■ condition 1 or 4 or 5 in the table below

Conditions

The following table shows the different conditions on which defrost control is based:

Conditions	Description
1	$T_{outdoor\ heat\ exchanger} < -15\ °C$
2	■ $T_{ambient\ outdoor} < 5\ °C$ ■ $T_{outdoor\ heat\ exchanger} < (-5 + T_{ambient\ outdoor} \times 0,4)$ ■ check if $T_{indoor\ heat\ exchanger}$ decreases 6 times every 10 seconds
3	■ $T_{ambient\ outdoor} \geq 5\ °C$ ■ $T_{outdoor\ heat\ exchanger} < -3\ °C$ ■ check if $T_{indoor\ heat\ exchanger}$ decreases 6 times every 10 seconds
4	■ $T_{ambient\ outdoor} < 5\ °C$ for 60 seconds ■ $T_{outdoor\ heat\ exchanger} < (-5 + T_{ambient\ outdoor} \times 0,4)$ for 60 seconds
5	■ $T_{ambient\ outdoor} \geq 5\ °C$ for 60 seconds ■ $T_{outdoor\ heat\ exchanger} < -3\ °C$ for 60 seconds

Stop conditions

Defrost control is reset by the following conditions:

- $T_{heat\ exchanger} > 4\ °C$ if $T_{ambient\ outdoor} < 19\ °C$
- $T_{heat\ exchanger} > 18\ °C$ if $T_{ambient\ outdoor} < -3\ °C$
- $T_{heat\ exchanger} > -1\ °C \times (T_{ambient\ outdoor} + 15)$ if $-3\ °C < T_{ambient\ outdoor} < 19\ °C$.

1.8 Forced Operation Mode

Forced mode

The following table explains the different forced operation modes, forced cooling and forced heating:

Item	Forced cooling	Forced heating
Conditions	■ not in the 3-minute stand-by mode ■ normal operation mode ■ outdoor unit off ■ no malfunction in the outdoor unit ■ forced mode: cooling mode.	■ not in the 3-minute stand-by mode ■ normal operation mode ■ outdoor unit off ■ no malfunction in the outdoor unit ■ forced mode: heating mode.
Start Adjustment	Press the forced operation switch SW2 to start the following items: ■ command frequency: 66 Hz ■ expansion valve opening: depending on capacity of operating room ■ timer: 60-minute ■ fan speed: H ■ swing flap: preservation of last setting ■ indoor adjustment: send forced mode to unit.	Press the forced operation switch SW2 to start the following items: ■ command frequency: 66 Hz ■ expansion valve opening: depending on capacity of operating room ■ timer: 60-minute ■ fan speed: H ■ swing flap: preservation of last setting ■ indoor adjustment: send forced mode to unit.
Reset	Press the forced operation switch again or after 60 minutes.	Press the forced operation switch again or after 60 minutes.

The protective functions overrule the forced mode.

1.9 Wide-angle Flaps, Diffuser, Louvres and Autoswing

Wide-angle flap

The large flaps send a large volume of air downwards to the floor. The flap provides an optimum control in cooling, heating and dry mode.

Diffuser

The diffuser enables the air coming out of the indoor unit to reach all surfaces in cooling mode.

Heating mode

During heating mode, the large flap enables direct warm air straight downwards. The diffuser presses the warm air above the floor to reach the entire room.

Cooling mode

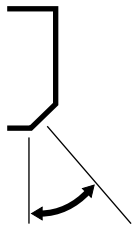
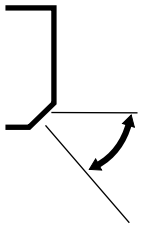
During cooling mode, the diffuser retracts into the indoor unit. This enables a distribution of cooled air throughout the entire room.

Louvres

The louvres, made of elastic synthetic resin, provide a wide range of airflow that guarantees a comfortable air distribution.

Autoswing

The following table explains the autoswing process for heating and cooling:

Item	Description	Drawing
heating	The flap swings up and down as shown in the drawing alongside.	
cooling	The flap swings up and down as shown in the drawing alongside.	

1.10 Step Flow

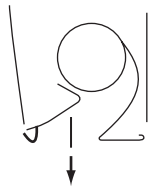
Flow

The heating process starts by sending warm air downwards. When the walls and floor are sufficiently warm, the air flow angle and volume change according to the settings.

Refer to the operation manual.

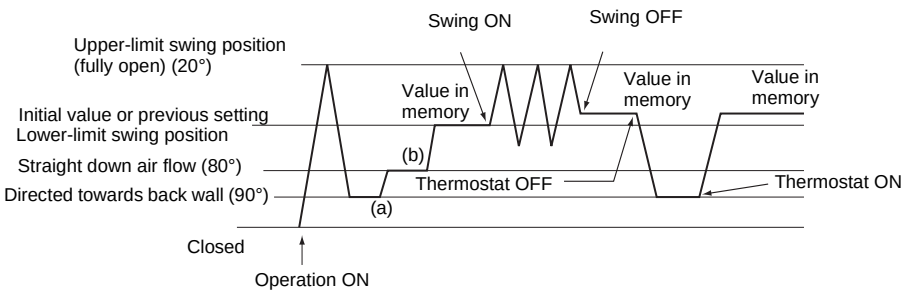
Steps

The following table shows the 3-step flow:

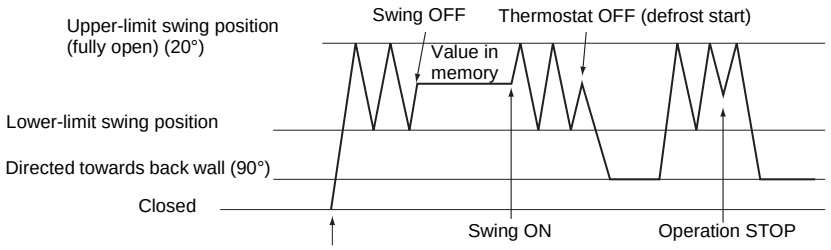
Step	Description	Process
1	The upper flap is in straight-down position. The lower flap is fixed at 90°.	
2	When the heat exchanger reaches 34°C or higher, the flap moves to send air straight down. Refer to (a) in the drawing below.	
3	When the room temperature reaches 15°C or higher, the flap moves to the set angle. Refer to (b) in the drawing below.	

Example

The following example explains the difference between a swing-off start and a swing-on start for heating mode.

Item	Process
swing-off start	

2

Item	Process
swing-on start	

- The movements of the large and small flap are not linked. They move with a time delay of several seconds.
- The diffuser and flaps cover the air outlet when the unit is not operating.

1.11 Fan Speed Control for Indoor Units

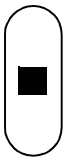
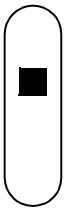
Control mode

The airflow rate can be automatically controlled depending on the difference between the set temperature and the room temperature. This is done through phase control and Hall IC control.

For more information about Hall IC, refer to ‘Hall IC check (A6)’ on page 3-60.

Phase steps

Phase control and fan speed control contains 8 steps: LLL, LL, L, ML, M, HM, H and HH.

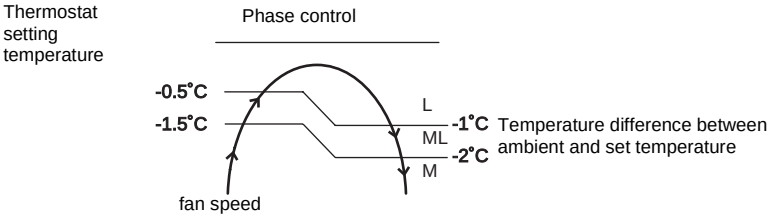
Step	Cooling	Heating	Dry mode
LLL			510 - 780 rpm
LL			
L			
ML			
M			
MH			
H			
HH			

= Within this range the airflow rate is automatically controlled when the AIRFLOW ADJUSTING button is set to AUTOMATIC

= Refer to automatic airflow rate control.

Automatic air flow control for heating

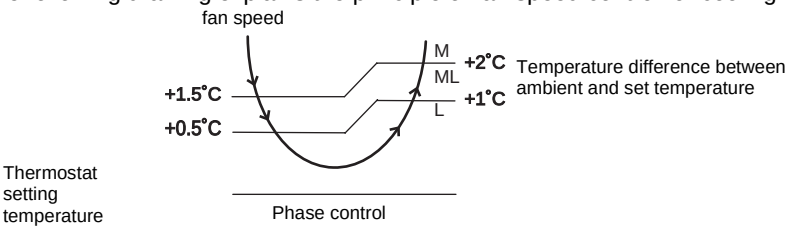
The following drawing explains the principle for fan speed control for heating:



When there is no operation and the night set mode turns on, the step is low. Refer to ‘Night set mode’ on page 2-21.

Automatic air flow control for cooling

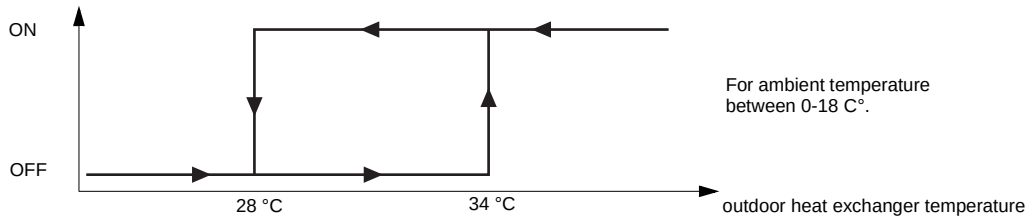
The following drawing explains the principle of fan speed control for cooling:



1.12 Fan Speed Control for Outdoor Units

Control

The following drawing explains the fan speed control:



Fan off delay

When the compressor turns off and $T_{outdoor\ ambient}$ > 20 °C, the outdoor fan stays running at the same speed for 30 seconds.

Fan speed modes

The following table explains the fan control in normal and forced mode:

Mode	Fan speed
Normal (cooling/heating)	H/L
Forced	H

Fan control in cooling mode

The following table explains the fan steps in cooling mode:

$T_{ambient\ outdoor}$	Frequency		
	> 0 Hz and ≤ 44 Hz	> 44 Hz and ≤ 84 Hz	Frequency > 84 Hz
> 37 °C	H	H	H
> 18 °C and ≤ 37 °C	L	H	H
> 0 °C and ≤ 18 °C	L	L	H
< 0 °C	STOP	STOP	STOP

Fan control in heating mode

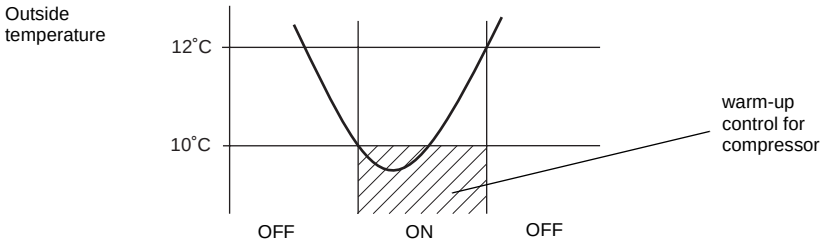
The following table explains the fan steps in heating mode:

$T_{ambient\ outdoor}$	Frequency	
	≤ 44 Hz	> 44 Hz
≤ 5 °C	H	H
> 5 °C	L	H

1.13 General Functions

Pre-heat operation

When the equipment has stopped and $t_{outside}$ < 10 °C, the compressor is warmed-up by passing a single-phase current through the compressor motor to speed up the start. The power consumption is 30-40 W.

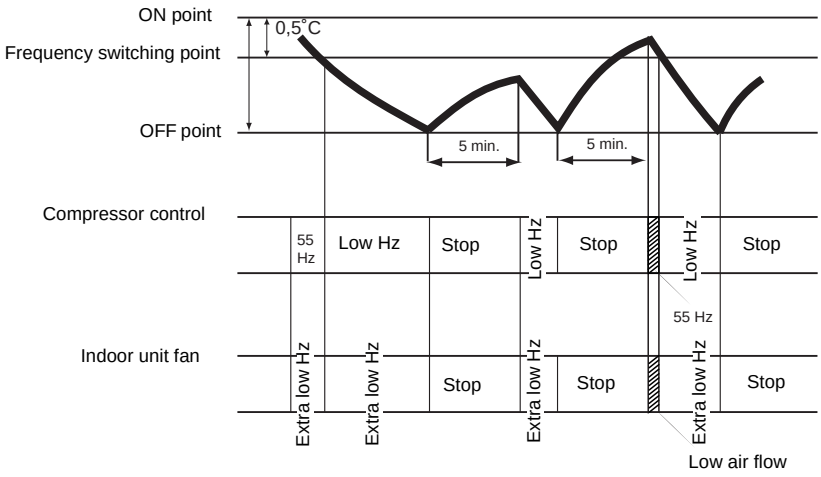


Hot start function

During defrosting or when the thermostat is on in heating mode, the indoor heat exchanger temperature is measured to avoid cold draft.

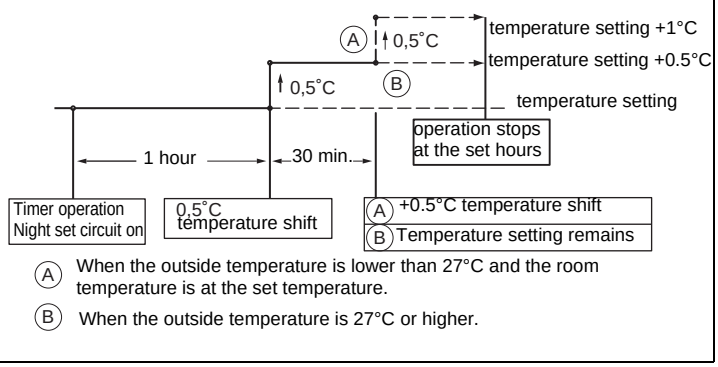
Dry mode

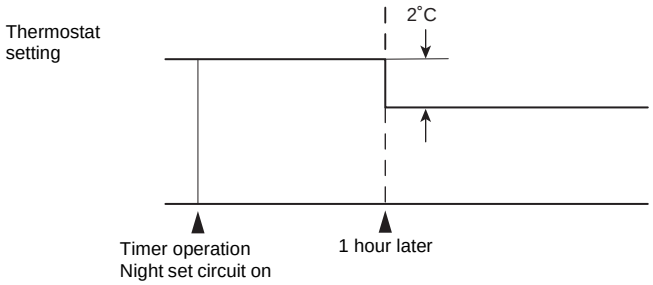
The dry mode removes humidity while maintaining the room temperature. The temperature and fan cannot be regulated during dry mode.



Night set mode

The night set mode is activated when the off timer is set. It switches the fan speed to low, to minimize the noise.

Item	Description	Drawing
cooling	The set temperature stays on for one hour, then decreases slightly for economical operation.	

Item	Description	Drawing
heating	The set temperature stays on for one hour, then increases slightly for economical operation.	

1.14 Frequency Control

Frequency controlled functions

The following table shows the different functions, which are controlled by decreasing or increasing the frequency:

Function	Sensor Thermistor	Why?	How?	Set	Reset	Malfunction
High fin temperature control	switch box thermistor (R4T)	To protect the switch box against a high temperature.	By setting a high frequency limit.	$T_{fin} > 82$ °C	$T_{fin} > 75$ °C	-
Discharge temperature control	discharge temperature thermistor (R3T)	To protect the compressor.	By setting a high frequency limit.	$T_{discharge\ pipe} > 115$ °C	$T_{discharge\ pipe} < 107$ °C	$T_{discharge\ pipe} > 124$ °C UNIT STOP
Low outdoor temperature control	outdoor ambient thermistor (R1T)	To avoid condensation in cooling mode. ⚠ This control is not executed when the unit is in forced cooling mode or in test mode.	By setting a high frequency limit.	$T_{outdoor\ ambient} < 25$ °C	$T_{outdoor\ ambient} > 33$ °C	-
High pressure limitation in heating	■ outdoor temperature thermistor (R1T) ■ indoor heat exchanger thermistor (R2T)	To control the pressure.	By setting a high frequency limit.	■ heating mode ■ $T_{outdoor} > 16$ °C ■ $T_{indoor\ heat\ exchanger} > 22$ °C ■ compressor on	■ compressor stop ■ timer delay (70 s) has passed	-
Freeze-up prevention	indoor heat exchanger thermistor (R2T)	To prevent the freezing up of the indoor unit in cooling mode.	By setting a high frequency limit.	■ during cooling ■ 0 °C < $T_{indoor\ heat\ exchanger} < 13$ °C	$T_{indoor\ heat\ exchanger} > 13$ °C for 2 seconds	$T_{indoor\ heat\ exchanger} < 0$ °C (result: compressor stop)
Peak cut off	indoor heat exchanger thermistor (R2T)	To prevent an abnormal high temperature on the indoor heat exchanger in heating mode.	By setting a high frequency limit.	■ during heating ■ 50 °C < $T_{indoor\ heat\ exchanger} < 67$ °C	$T_{indoor\ heat\ exchanger} < 50$ °C for 2 seconds	$T_{indoor\ heat\ exchanger} > 67$ °C (result: compressor stop)

1.15 Expansion Valve Control

Control

Expansion valve control is used to maintain a constant discharge pipe temperature and to regulate an equalized pressure in the system. The expansion valve is set by the frequency and the outdoor ambient temperature.

Initialization

The expansion valve is initialized when the power is switched on. The initialization contains:

- the closure of the expansion valve by 650 pulses (current opening = 0).
- after closure of the expansion valve, it opens again by 150 pulses for normal working.

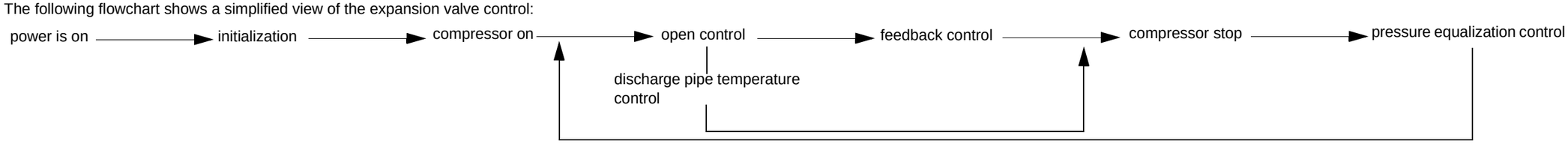
Limits

The following table shows the limits of the expansion valve opening:

Room situation	Minimum limit	Maximum limit
dry mode	95 pulses	450 pulses
cooling/ heating mode	72 pulses	450 pulses

Sequence

The following flowchart shows a simplified view of the expansion valve control:



Open control

The following table shows the functions of open control:

Function	Sensor Thermistor	Why?	How?	Set	Reset
Expansion valve control during high discharge pipe temperature	discharge pipe thermistor (R3T)	To protect the compressor.	By opening the expansion valve for 10 pulses every 30 seconds.	$T_{discharge\ pipe} > 112\ °C$	$T_{discharge\ pipe} < 107\ °C$

Disconnected discharge thermistor control

The following table shows the functions of disconnected discharge thermistor control:

Function	Sensor Thermistor	Why?	How?	Set	Reset
Disconnected discharge pipe control	■ discharge pipe thermistor (R3T) ■ outdoor heat exchanger thermistor (R2T) ■ indoor heat exchanger thermistor (R1T)	To detect disconnection of the discharge pipe thermistor.	By checking the difference between the discharge pipe temperature and the coil temperature.	$T_{discharge\ pipe} < T_{outdoor}$ during cooling $T_{discharge\ pipe} > T_{outdoor}$ during heating	$T_{discharge\ pipe} > T_{coil}$ This control is executed 5 times before going into failure.

Feedback control

The following table shows the functions of feedback control:

Function	Sensor Thermistor	Why?	How?	Set	Reset
feedback control	■ discharge pipe thermistor (R3T) ■ outdoor heat exchanger (R1T) ■ indoor heat exchanger thermistor (R2T)	To calculate an optimum discharge temperature.	By checking the outdoor ambient temperature and the indoor heat exchanger temperature in order to calculate an optimum discharge temperature.	-	-
discharge temperature control	discharge pipe thermistor (R3T)	To protect the compressor.	By reducing the frequency.	■ at compressor start: $T_{discharge\ pipe}$ >115 °C ■ at compressor stop: $T_{discharge\ pipe}$ >124 °C	$T_{discharge\ pipe}$ < 107 °C

1.16 Other Control

Other control functions

The following table shows the other different functions, which are not frequency or expansion valve controlled:

Function	Sensor Thermistor	Why?	How?	Set	Reset	Malfunction
four-way valve operation	-	To cool and defrost.	By energizing the coil of the four-way valve.	■ start of cooling operation ■ start of defrost operation ■ forced cooling	■ compressor stop ■ start of heating operation	-
fin temperature control	switch box thermistor (R4T)	To protect the inverter system.	By switching off the compressor and turning on the outdoor fan into H-mode.	T_{fin} > 87 °C	T_{fin} < 72 °C (FAN STOP)	-
switch box control	switch box thermistor (R4T)	To protect the inverter system.	By switching the outdoor fan into H-mode.	■ compressor off ■ T_{fin} > 78 °C ■ crankcase heater off	T_{fin} > 78 °C (FAN STOP)	T_{fin} > 80 °C

Part 3
Troubleshooting

Introduction

The purpose of this chapter is to explain the fault codes on the remote controller and how you can trace and correct errors.

What is in this part?

This parts contains the following chapters:

1 Troubleshooting

1.1 What Is in This Chapter

Introduction

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

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

Overview

This chapter covers the following topics:

Topic	See page...
1.2 – Overview of General Cases	page 3-4
1.3 – Safeties	page 3-6

1.2 Overview of General Cases

No direct operation start

The operation does not start directly, when:

- you press the ON/OFF button after operation stop.
- you re-select the mode.

This is to protect the air conditioner. You should wait for about 3 minutes.

No direct hot air

After starting the heating operation, hot air does not flow out directly.
You should wait 1 to 4 minutes, because the air conditioning is warming up to prevent cold draft.

3

Sounds

The following table explains the different sorts of sounds:

Sounds	Explanation
flowing sound	Refrigerant gas is flowing in the air conditioner.
gissing sound	The refrigerant flow stops or changes inside the unit.
snapping sound	The indoor unit shrinks or expands slightly due to temperature changes.

Heating operation stops suddenly

The heating operation can stop suddenly emitting a flowing sound, because the system is defrosting.
You should wait for about 3 to 8 minutes.

Water or steam escapes out the outdoor unit

The following table explains why water or steam can escape out of the outdoor unit:

Case	Explanation
heating mode	The frost on the outdoor unit melts into water or steam when the air conditioner is in defrost operation.
cooling or dry mode	Moisture in the air condenses into water on the cool surface of the outdoor unit piping and starts dripping. The problem can be eliminated by insulating the service valves and piping connections.

Mist escapes out the indoor unit

Mist can come out the indoor unit, when the air in the room is cooled into mist by the cold air flow during cooling operation.

Odour escapes out of the indoor unit

An odour can escape out of the indoor unit when smells of the room, furniture or cigarettes are absorbed into the unit and discharged with the air flow. You should:

- Clean oil
- Change filter
- Check drain

If the problem is not solved, contact your dealer.

Outdoor fan rotates when no operation

The following table explains why the outdoor fan may rotate:

Case	Explanation
After operation stop	The outdoor fan continues rotating for another 30 seconds to cool the electronics.
While the air conditioner is not in operation	When the outdoor temperature is 49 °C, the outdoor fan starts rotating to protect the system.

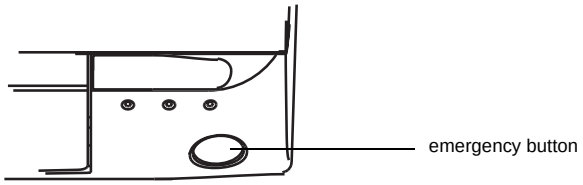
Operation stops suddenly (operation lamp on)

To protect the system, the air conditioner may stop operating on a sudden large voltage fluctuation. It automatically starts operation in about 3 minutes.

1.3 Safeties

Emergency button

You can use the emergency button on the front panel of the indoor unit when the remote controller is not available or its batteries have run out. Press the emergency button to start automatic mode (automatic fan speed, temperature set point of 22 °C and preservation of the last swing flap position) and press the button again to stop.



3

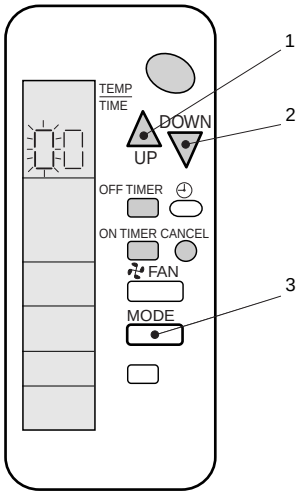
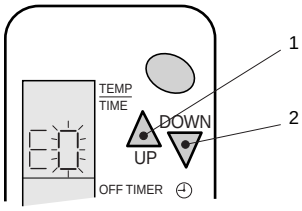
Operation lamp

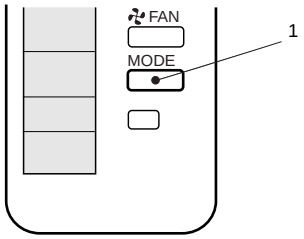
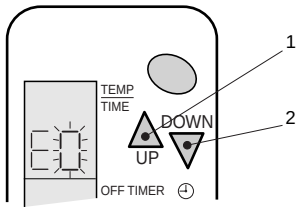
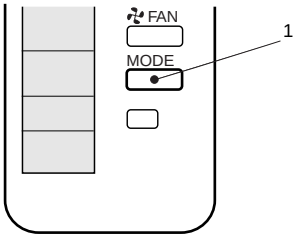
The operation lamp flashes when the following errors are detected:

- When the unit is disabled because of activation of a protection device or malfunction of the thermistors. Refer to ‘Overview of Fault Indications on Indoor Units’ on page 3-23 and ‘Overview of Fault Indications on Outdoor Units’ on page 3-35.
- When a transmission error occurs between the indoor and outdoor unit.

Service check

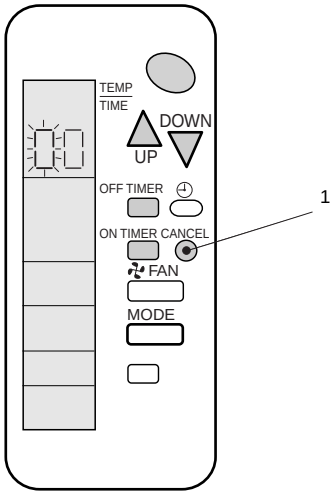
To find the malfunction code, proceed as follows:

Step	Action	
1	Set the diagnostic mode by pressing the UP (1), DOWN (2) and MODE (3) button simultaneously. The display starts to blink.	
2	Operate the room temperature switch by pressing the buttons UP (1) and DOWN (2) until the remote controller starts beeping (short beep).	

Step	Action	
3	Set the diagnostic mode again by pressing the MODE button (1). The display starts to blink.	
4	Operate the room temperature switch by pressing the UP (1) and DOWN (2) button until the remote controller starts beeping (long beep).	
5	Press the MODE button (1) again to go to test mode (30 minutes). To end test mode directly, press the ON/OFF button.	

Fault indication

To execute a fault diagnosis, proceed as follows:

Step	Action	
1	Press the timer CANCEL button (1) for 5 seconds. The display starts to blink.	
2	Press the timer cancel button repeatedly until a continuous beep is produced.	
3	Refer to ‘Overview of Fault Indications on Indoor Units’ on page 3-23 and ‘Overview of Fault Indications on Outdoor Units’ on page 3-35 to analyse the fault. Press the timer cancel button for 5 seconds to cancel the code display. The code display also cancels itself when it is not pressed for 1 minute.	

2 Overview of General Problems

2.1 What Is in this Chapter

Introduction

This chapter explains the troubleshooting sequence of problems that can occur without fault indication.

Overview

This chapter covers the following topics:

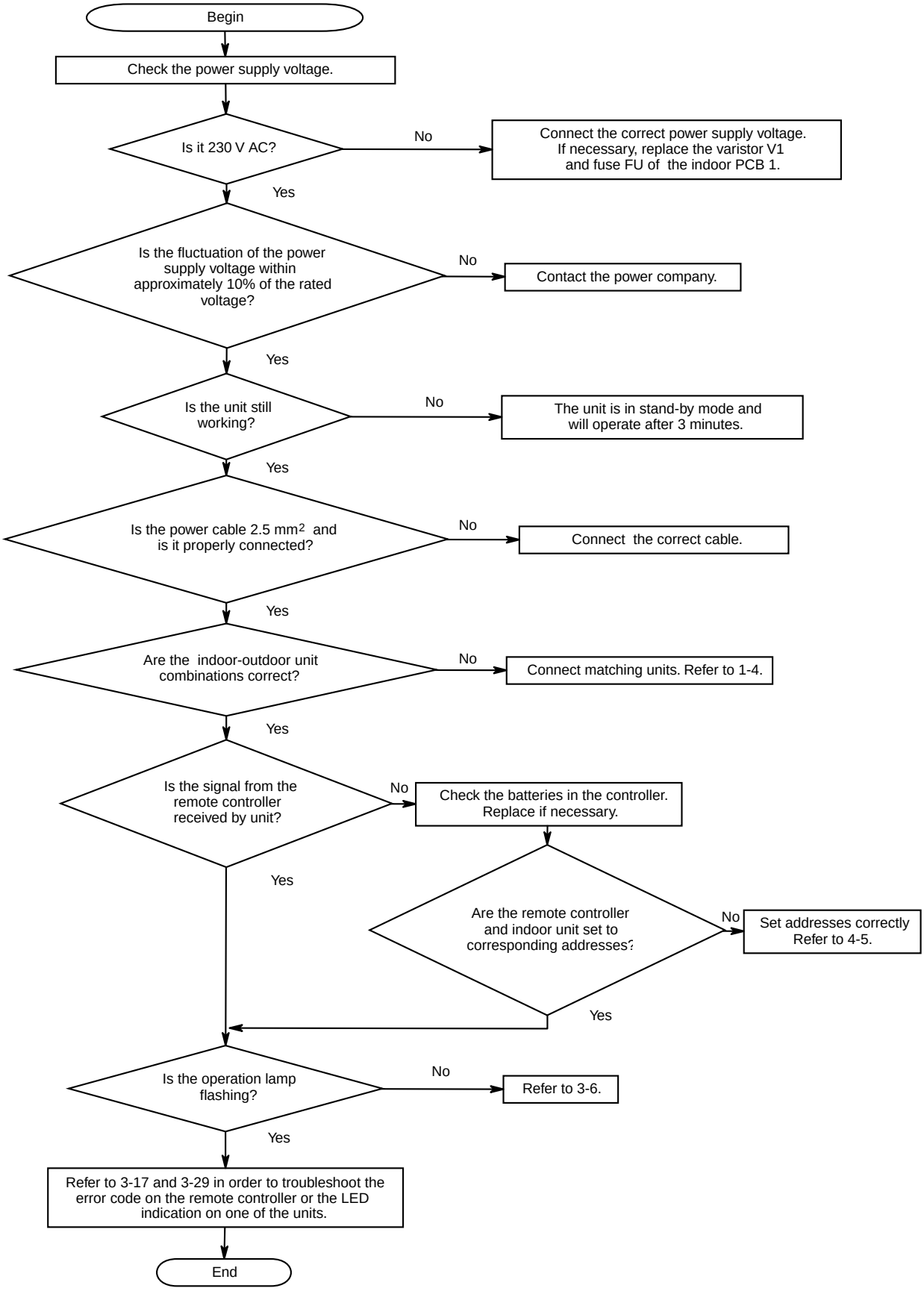
2.2 No Operation (Operation Lamp Off)

Possible causes

The following list shows the possible causes:

- The fuse or breaker has blown.
- The power switch is not turned on.
- Incorrect power supply voltage. Refer to ‘Electrical Specifications’ on page 1-7.
- Wrong connection cable.
- Incorrect indoor-outdoor unit combination. Refer to ‘Technical Specifications’ on page 1-4.
- Empty batteries in the remote controller.
- Incorrect address setting. Refer to ‘Setting the Remote Controller’ on page 4-5.
- Activation of protection device (e.g. dirty air filter, refrigerant shortage, mixing of air due to overcharge). Refer to ‘Overview of Fault Indications on Indoor Units’ on page 3-23 and ‘Overview of Fault Indications on Outdoor Units’ on page 3-35.
- The timer is not set correctly.

Procedure The following flow chart shows the troubleshooting procedure:



2.3 Poor Cooling or Heating Effect

Possible causes

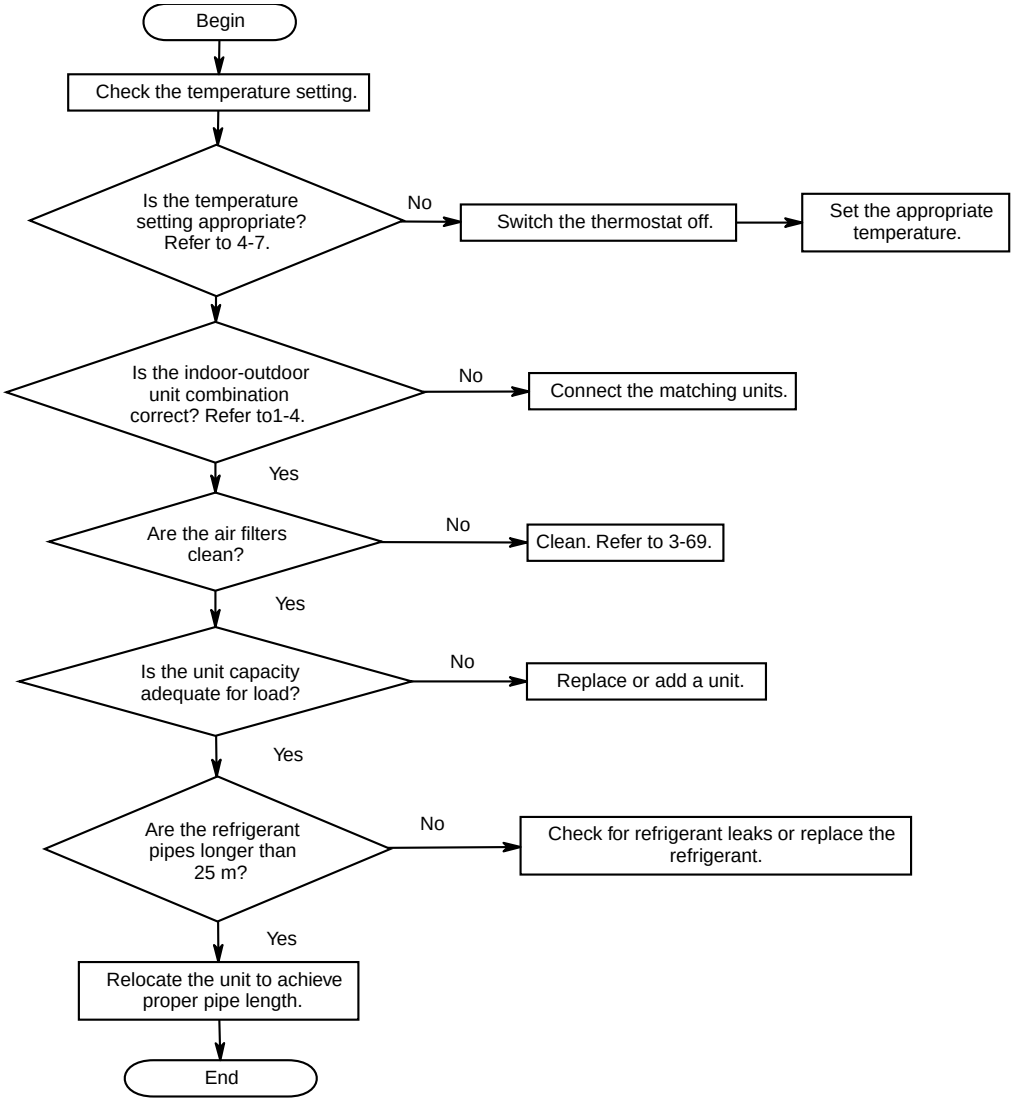
The following list shows the possible causes:

- Incorrect temperature setting. Refer to ‘Test Run & Operation Data’ on page 4-7.
- Incorrect indoor-outdoor unit combination. Refer to ‘Technical Specifications’ on page 1-4.
- Clogged air filters.
- Insufficient capacity.
- Blockage of air inlet or outlet of the indoor and outdoor unit.
- The windows and doors are not closed. Bad ventilation.
- Verify if the air flow and air direction are set correctly. Refer to ‘Outlook Drawing’ on page 1-8.
- Too long refrigerant pipes . The maximum interunit piping length is 25 m.
- Incorrect charge.

Charge an additional refrigerant amount of 20g/m for a pipe is longer than 10 m. When the pipe is longer than 10m, cut jumper S50 refer to page 1-17.

Procedure

The following flowchart shows the troubleshooting procedure:



2.4 Operation Stop Through Breaker

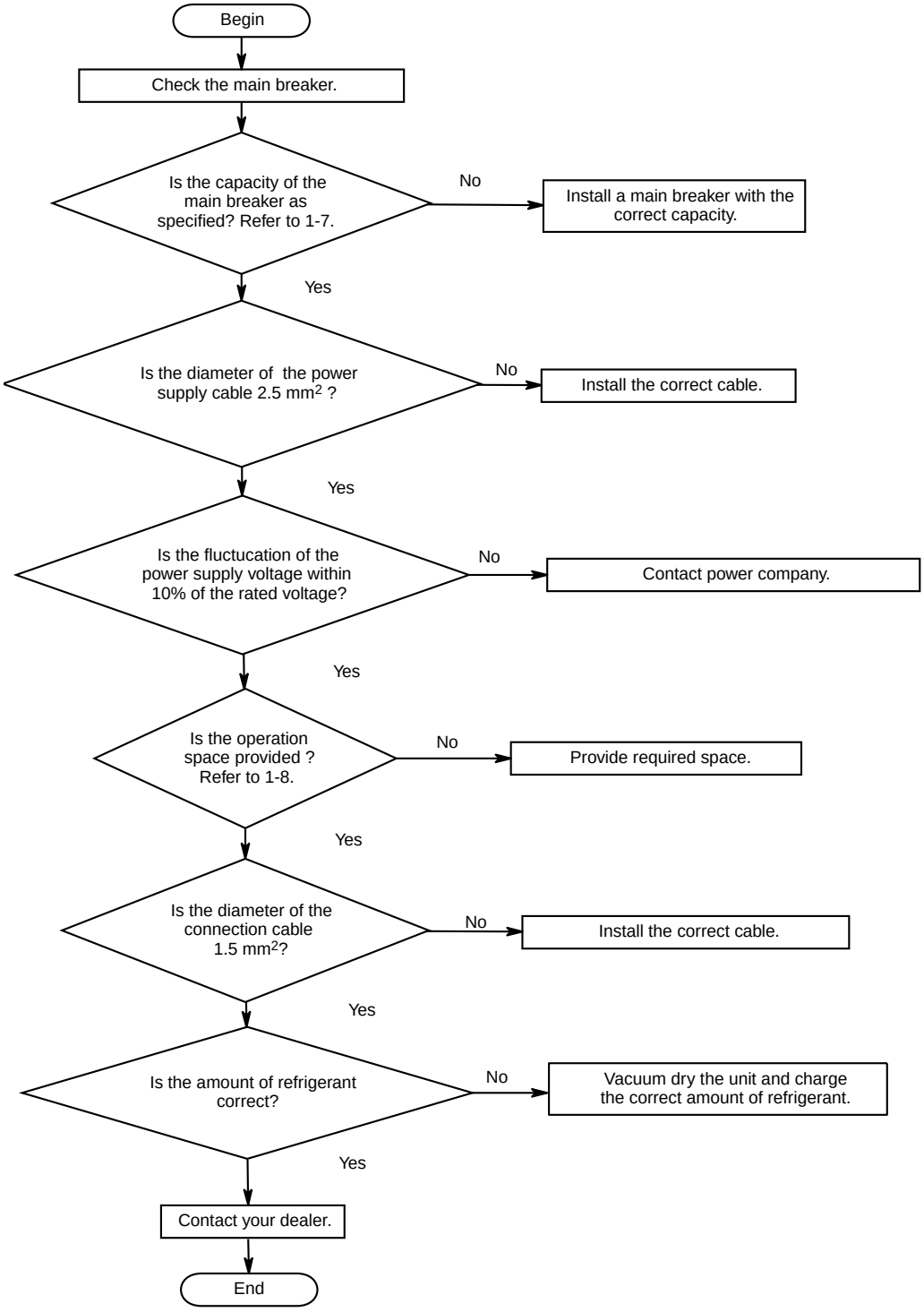
Possible causes

The following list shows the possible causes:

- Insufficient capacity of the main breaker. Refer to ‘Electrical Specifications’ on page 1-7.
- Section of the power supply cable is too small.
- Supply voltage fluctuation is more than ± 10 % of the rated voltage (230 V).
- Section of the connection cable is too small (indoor unit power supply).
- Short circuit of air. Refer to ‘Outlook Drawing’ on page 1-8.
- Refrigerant overcharge.

Procedure

The following flow chart shows the troubleshooting procedure:



2.5 Abnormal Operation Sound and Vibration

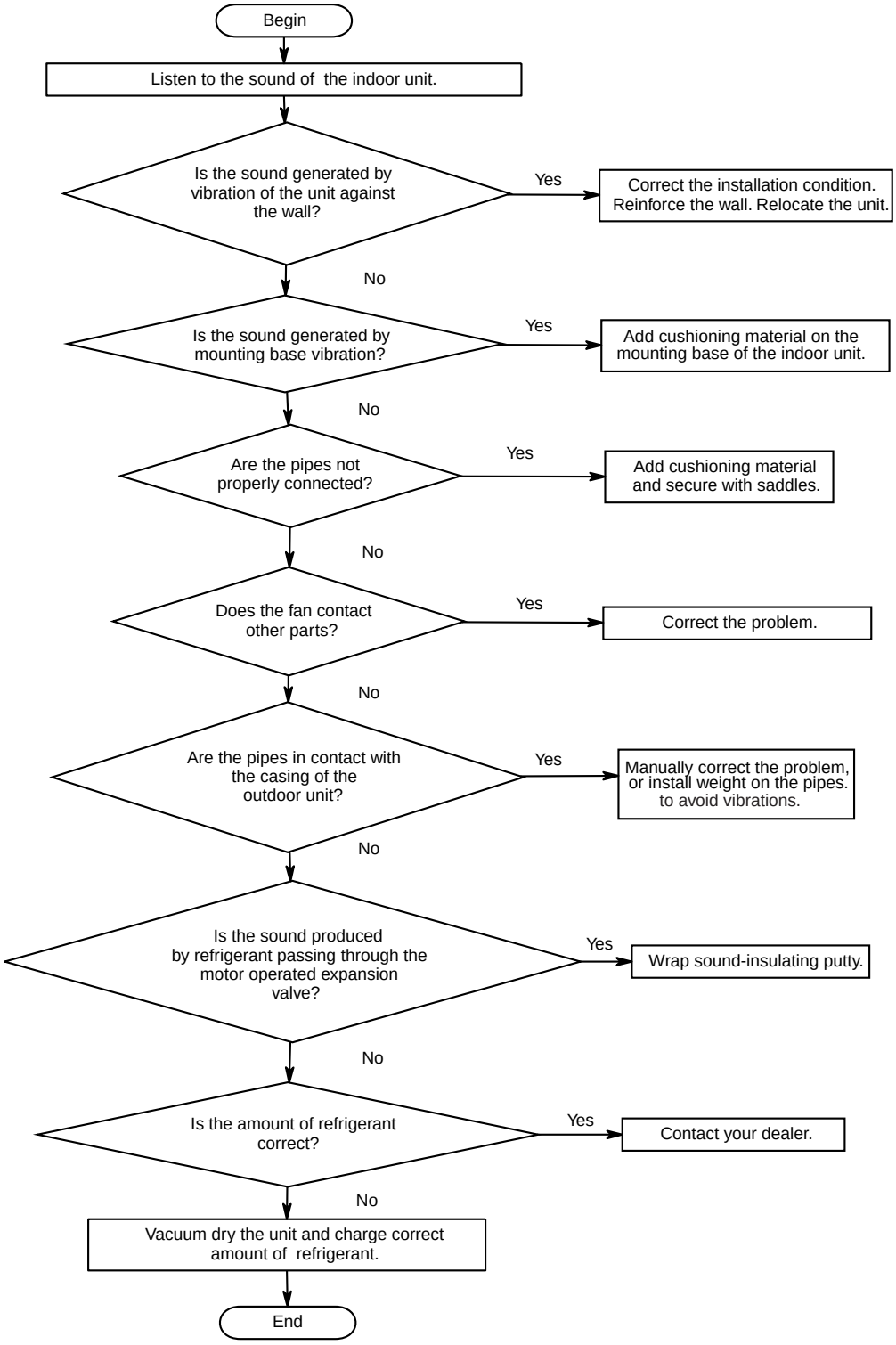
Possible causes

The following list shows the possible causes:

- Pipes are too short (< 2.5 m)
- Mounting wall is too thin.
- Inadequate isolation to prevent vibration.
- Product shape deformation.
- Insufficient refrigerant.
- Short circuit of air. Refer to ‘Outlook Drawing’ on page 1-8.

Procedure

The following flow chart shows the troubleshooting procedure:



2.6 Other Problems

Operation stops suddenly (operation lamp flashes)

The following list explains what the possible causes can be:

- Verify if the air filters are clean. If not, refer to page 3-69 ‘Cleaning the air filters’.
- Verify if there is no blockage of the air inlet and outlet of the indoor and outdoor units.
- Check if the remote controller does not indicate a fault code. Refer to ‘Overview of Fault Indications on Indoor Units’ on page 3-23 and ‘Overview of Fault Indications on Outdoor Units’ on page 3-35.

Abnormal functioning

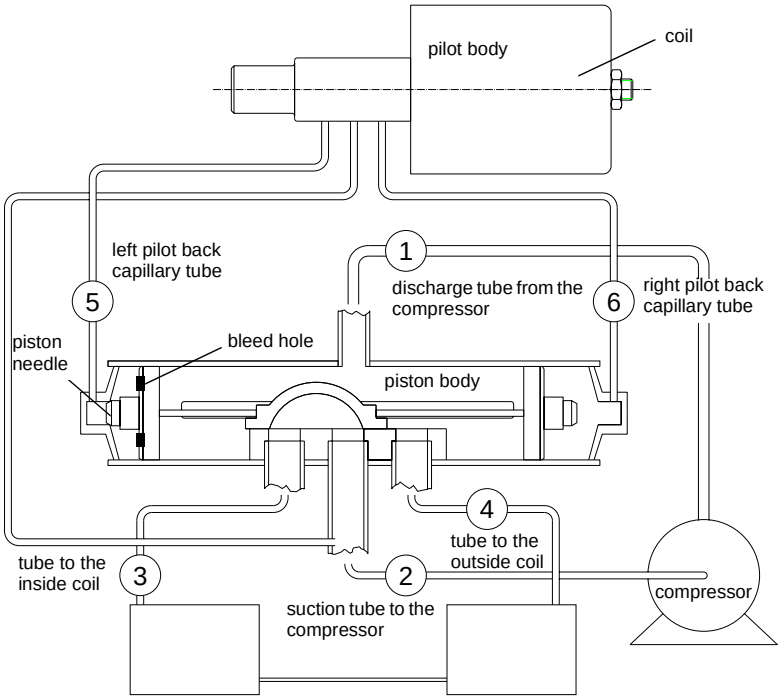
The air conditioner may malfunction with lightning or radio waves. To check, proceed as follows:

Step	Action
1	Switch the breaker off.
2	Switch it back on.
3	Check the operation by trying to operate using the remote controller. If there is still no operation, check the remote controller. Refer to ‘Overview of Fault Indications on Indoor Units’ on page 3-23 and ‘Overview of Fault Indications on Outdoor Units’ on page 3-35.

2.7 Faulty Four-way Valve

Four-way valve

The following drawing indicates the main components necessary to execute a good troubleshooting:



Normal cooling

The following table explains the normal condition of the four-way valve in cooling mode:

Discharge tube 1	Suction tube 2	Tube to inside coil 3	Tube to outside coil 4	Left pilot back capillary tube 5	Right pilot front capillary tube 6
Hot	Cool	Cool as in column 2	Hot as in column 1	Temperature of valve body	Temperature of valve body

Normal heating

The following table explains the normal condition of the four-way valve in heating mode:

Discharge tube 1	Suction tube 2	Tube to inside coil 3	Tube to outside coil 4	Left pilot back capillary tube 5	Right pilot front capillary tube 6
Hot	Cool	Hot as in column 1	Cool as in column 2	Temperature of valve body	Temperature of valve body

The valve will not shift from cooling to heating

The following list explains what the possible causes can be:

- Check the electrical circuit. If there is no voltage to the coil, repair it.
- Check the coil. If it is defective, replace it.
- Check the refrigerant charge. If the charge is low, repair it and recharge the system. If the pressure differential is too high, recheck the system.
- Check the following operation conditions to find the cause of the malfunction. The numbers in the columns refer to the numbers in the drawing on the previous page:

1	2	3	4	5	6	Description
Hot	Cool	Cool as in column 2	Hot as in column 1	Temperature of valve body	Hot	The pilot valve works correctly. There is dirt in one bleed hole. To resolve: **1** Deenergize the solenoid. **2** Raise the head pressure. **3** Reenergize the solenoid to loosen the dirt. **4** If unsuccessful, remove the valve and wash it out. Check on air before reinstalling. If there is still no movement, replace the valve, add a new strainer to the discharge tube and mount the valve horizontally.
						The piston cup head leaks. To resolve: **1** Stop the unit. **2** After pressure equalization, restart with energized solenoid. **3** If the valve shifts, reattempt with the compressor on. If there is no reversal, replace the valve.
Hot	Cool	Cool as in column 2	Hot as in column 1	Temperature of valve body	Temperature of valve body	The pilot tubes are clogged. To resolve: **1** Raise the head pressure. **2** Operate the solenoid to free the dirt. **3** If there is still no shift, replace the valve.
Hot	Cool	Cool as in column 2	Hot as in column 1	Hot	Hot	Both parts of pilot are still open. To resolve: **1** Raise the head pressure. **2** Operate the solenoid to free the partially clogged port. **3** If there is still no shift, replace the valve.
Warm	Cool	Cool as in column 2	Hot as in column 1	Temperature of valve body	Warm	The compressor is defective.

The valve starts to shift but does not complete the reversal

The following list explains what the possible causes can be. The numbers in the columns refer to the numbers in the drawing: refer to page 3-18:

1	2	3	4	5	6	Description
Hot	Warm	Warm	Warm	Temperature of valve body	Hot	There is not enough pressure differential at start of stroke or not enough flow to maintain the pressure differential. To resolve: **1** Check the unit for correct operating pressure and charge. **2** Raise the head pressure. **3** If there is still no shift, replace the valve.
						There is body damage. Replace the valve.
Hot	Warm	Warm	Hot	Hot	Hot	Both parts of pilot are still open. To resolve: **1** Raise the head pressure. **2** Operate the solenoid to free the partially clogged port. **3** If there is still no shift, replace the valve.
Hot	Hot	Hot	Hot	Temperature of valve body	Hot	There is body damage. Replace the valve.
						The valve hung up at mid-stroke. The pumping volume of the compressor is not sufficient to maintain the reversal. To resolve: **1** Raise the head pressure. **2** Operate the solenoid. **3** If there is still no shift, replace the valve.
Hot	Hot	Hot	Hot	Hot	Hot	Both parts of pilot are still open. To resolve: **1** Raise the head pressure. **2** Operate the solenoid to the free partially clogged port. **3** If there is still no shift, replace the valve.

The valve will not shift from heating to cooling

The following list explains what the possible causes can be. The numbers in the columns refer to the numbers in the drawing: refer to page 3-18:

1	2	3	4	5	6	Description
Hot	Cool	Hot as in column 1	Cool as in column 1	Temperature of valve body	Temperature of valve body	The pressure differential is too high. To resolve: **1** Raise the head pressure. The valve will reverse during pressure equalization period. **2** Recheck the system.
						The pilot tubes are clogged. To resolve: **1** Raise the head pressure. **2** Operate the solenoid to free the dirt. **3** If there is still no shift, replace the valve.
Hot	Cool	Hot as in column 1	Cool as in column 1	Hot	Temperature of valve body	There is dirt in one bleed hole. To resolve: **1** Raise the head pressure. **2** Operate the solenoid. **3** If unsuccessful, remove the valve and wash it out. Check on air before reinstalling. If there is still no movement, replace the valve, add a new strainer to the discharge tube and mount the valve horizontally.
Hot	Cool	Hot as in column 1	Cool as in column 1	Hot	temperature of valve body	The piston cup head leaks. To resolve: **1** Stop the unit. **2** After pressure equalization, restart with the solenoid deenergized. **3** If the valve shifts, reattempt with the compressor on. If there is no reversal, replace the valve.
Hot	Cool	Hot as in column 1	Cool as in column 1	Hot	Hot	The pilot is defective, replace the valve.
Warm	Cool	Warm as in column 1	Cool as in column 1	Warm	Temperature of valve body	The compressor is defective.

Leak when heating mode

The following list explains what the possible causes can be. The numbers in the columns refer to the numbers in the drawing: refer to page 3-18:

1	2	3	4	5	6	Description
Hot	Cool	Hot as in column 1	Cool as in column 1	Temperature of valve body	Warmer than valve body	At the end of the slide, the piston needle is leaking. To resolve: **1** Operate the valve several times. **2** Recheck. **3** If there is an excessive leak, replace the valve.
Hot	Cool	Hot as in column 1	Cool as in column 1	Warmer than valve body	Warmer than valve body	The piston needle and pilot needle are leaking. To resolve: **1** Operate the valve several times. **2** Recheck. **3** If there is an excessive leak, replace the valve.

3 Overview of Fault Indications on Indoor Units

3.1 What Is in this Chapter

Introduction

In the first stage of the troubleshooting sequence it is important to interpret the fault indication on the remote controller display. This will help you to find the cause of the problem for the indoor units.

- The fault indication of the indoor unit has priority on the outdoor unit.
- Some of the faults are not directly indicated on the remote controller, because they need to be generated several times. If you want to check immediately, you can check the LED indication on the indoor PCB.

Overview

This chapter covers the following topics:

Topic	Fault code	See page...
3.2 – Faulty Indoor PCB	A1 or ✻	3-24
3.3 – Freeze-up Prevention or High Pressure Control	A5	3-26
3.4 – Fan Motor Abnormality	A6	3-28
3.5 – Thermistor Abnormality	C4, C9	3-30
3.6 – Faulty Power Supply or Indoor PCB	✻ or U4	3-31
3.7 – Signal Transmission Error	U4	3-33

3.2 Faulty Indoor PCB

Fault code

A1 or ✻

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED B (green)	Refer to...
normal	◑	◑	-
fault 1	●	●	Error method 1 on this page.
fault 2	○	✻	Error method 2 on this page.
fault 3	◑	○	Error method 3 on the following page.

Error method 1

The indoor unit evaluates the zero-cross detection of the power supply.

Error generation 1

The error is generated when there is no zero-cross detection for ± 10s.

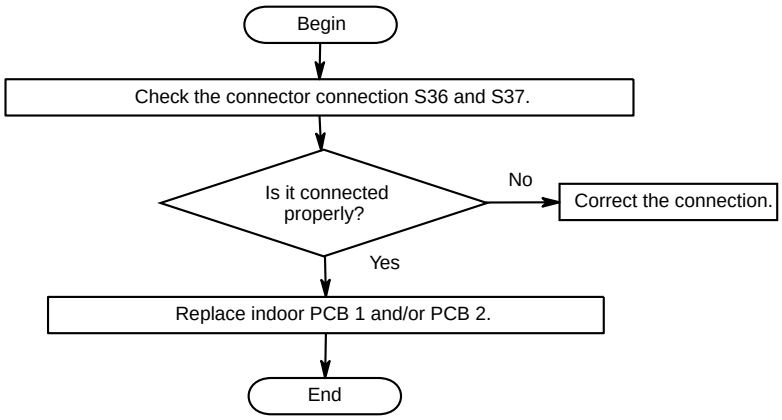
Causes

The following list shows the possible causes:

- Faulty indoor PCB 1 or PCB 2.
- Faulty connector connection (S36/S37).

Procedure

The following flow chart shows the troubleshooting procedure:



Error method 2

The internal program checks the working of the microcomputer to detect this error.

Error generation 2

The error is generated when the microcomputer program does not function properly.

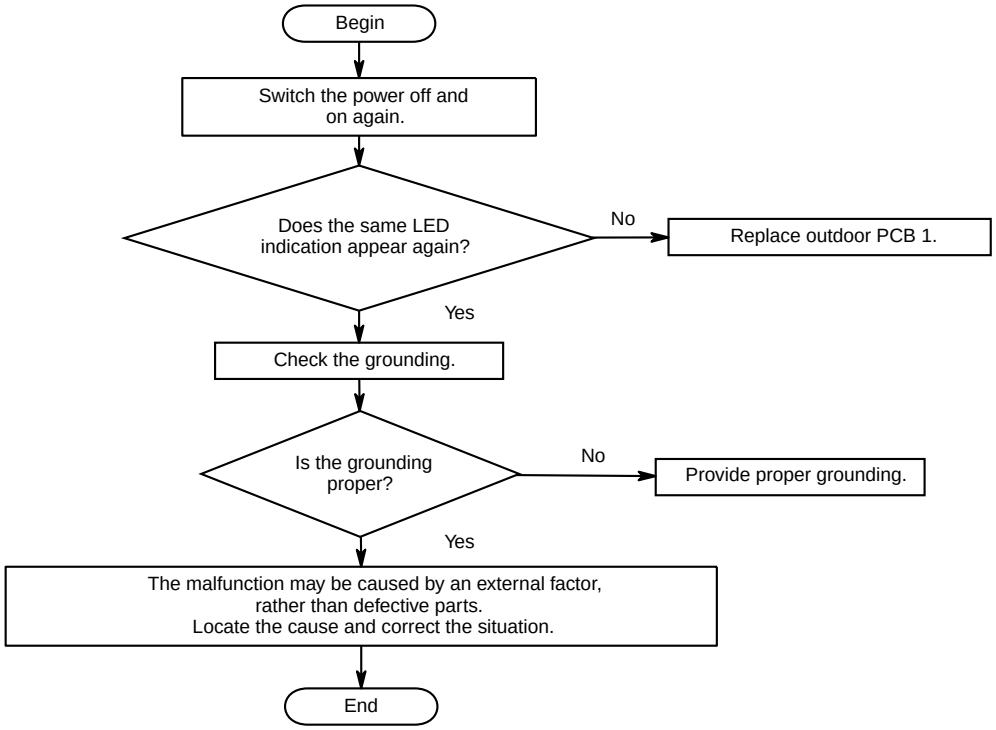
Causes

The following list shows the possible causes:

- The microcomputer program is in abnormal condition due to an external factor like noise, momentary voltage drop, momentary power failure etc.
- Faulty indoor PCB 1.

Procedure

The following flow chart shows the troubleshooting procedure:



Error method 3

The system checks the communication signal between the indoor and outdoor unit.

Error generation 3

The error is generated when the transmission circuit remains on.

Causes

The cause for this error can be a faulty indoor unit PCB 1.

Process

Replace the PCB to correct the problem.

3.3 Freeze-up Prevention or High Pressure Control

Fault code

A5

LED indication

The following table shows the LED indication of the indoor unit

Condition	LED A (green)	LED B (green)
normal	◑	◑
fault	◑	◑

3

Error

The following table explains the 2 possibilities:

Error method	Error generation
During the cooling operation, freeze-up prevention is activated according to the temperature detected by the indoor heat exchanger thermistor (R2T).	During the cooling operation, the error is generated when $T_{indoor\ heat\ exchanger} < 0°C$.
During the heating operation, high pressure control is activated according to the temperature detected by the indoor heat exchanger thermistor (R2T).	During the heating operation, the error is generated when $T_{indoor\ heat\ exchanger} > 67°C$.

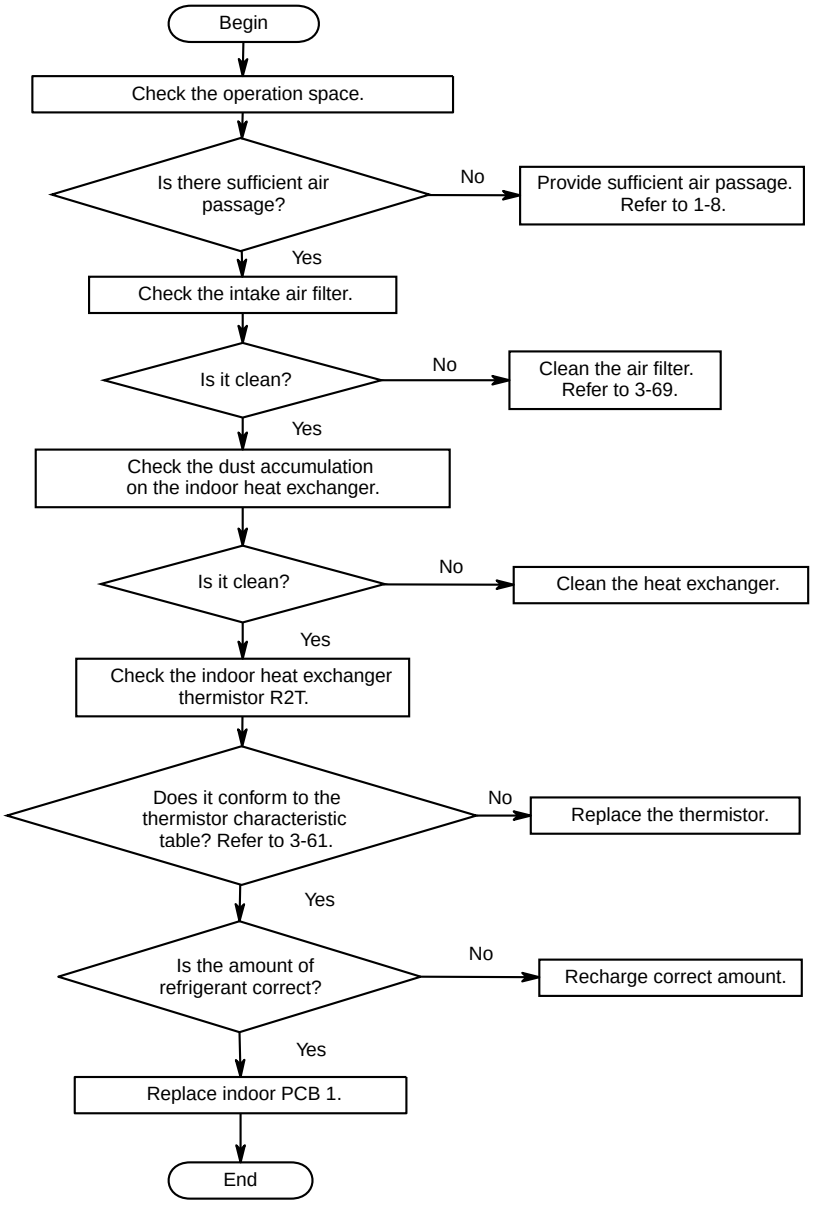
Causes

The following list shows the possible causes:

- Operation halt due to a clogged air filter. Refer to ‘Cleaning the air filters’ on page 3-69.
- Operation halt due to dust accumulation on the indoor heat exchanger.
- Operation halt due to insufficient air passage. Refer to ‘Outlook Drawing’ on page 1-8.
- Detection error due to a faulty indoor heat exchanger thermistor (R2T).
- Detection error due to a faulty indoor unit PCB 1.
- Incorrect refrigerant charge.

Procedure

The following flow chart shows the troubleshooting procedure:



3.4 Fan Motor Abnormality

Fault code

A6

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED B (green)
normal	◑	◑
fault	◑	◑

3

Error method

During fan motor operation, hall IC detects the rotation speed to determine abnormal fan motor operation.

Error generation

During maximum fan motor speed, the error is generated when the detected speed is less than 50% of the power full mode.

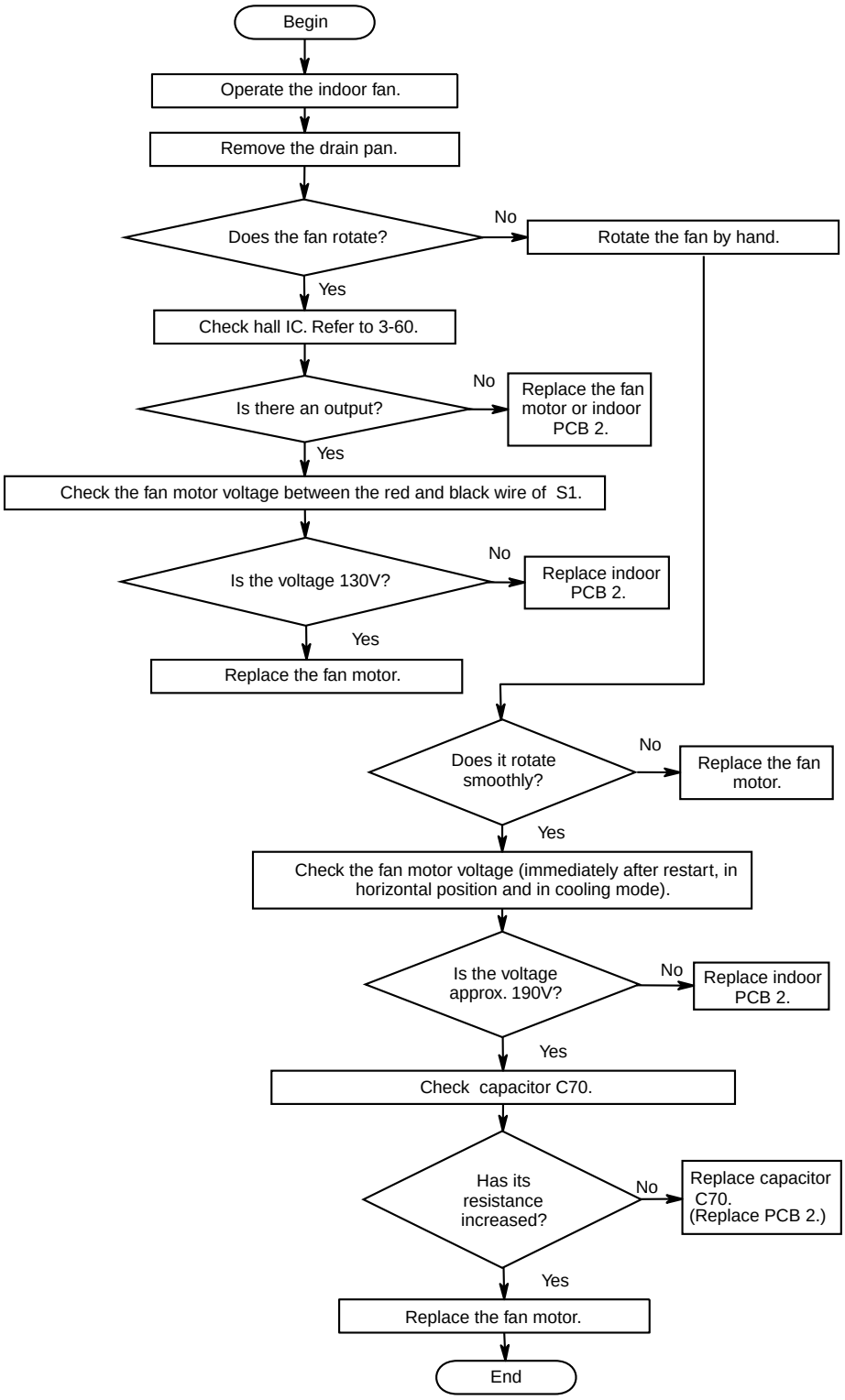
Causes

The following list shows the possible causes:

- Operation halt due to short circuit inside the fan motor winding.
- Operation halt due to a broken wire inside the fan motor.
- Operation halt due to broken fan motor lead wires.
- Operation halt due to faulty capacitor C70 of the fan motor.
- Detection error due to faulty indoor unit PCB 1.
- Detection error due to faulty indoor unit PCB 2.

Procedure

The following flow chart shows the troubleshooting procedure:



3.5 Thermistor Abnormality

Fault code

C4, C9

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED B (green)
normal	◑	◑
fault	◑	◑

3

Error method

The relation between the temperatures detected by the thermistors and the resistance of the thermistors is used to determine the errors.

Error generation

During compressor operation, the error is generated when the thermistor input is more than 4.96 V or less than 0.04 V.

Causes

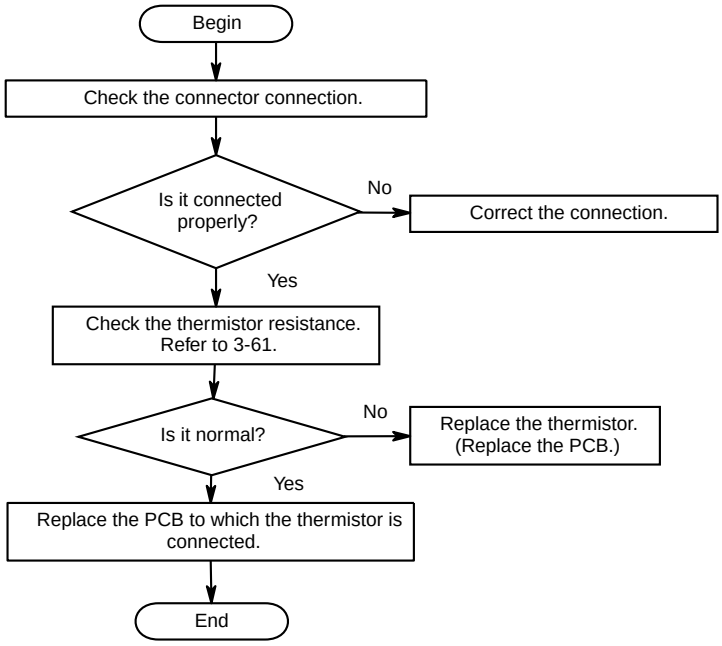
The following list shows the possible causes:

- Faulty connector connection.
- Faulty thermistor.
- Faulty PCB.

Procedure

The following flow chart shows the troubleshooting procedure:

C4: Indoor heat exchanger thermistor (R2T).
C9: Indoor ambient temperature thermistor (R1T).



3.6 Faulty Power Supply or Indoor PCB

Fault code

✻ or U4

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED B (green)
normal	◑	◑
fault	●	✻

Error

The following table explains the 2 possibilities:

Error method	Error generation
The internal program checks the working of the microcomputer to detect this error.	The error is generated when the microcomputer program does not function properly.
During indoor-outdoor communication, the indoor unit detects the signals coming from the outdoor unit.	During indoor-outdoor communication, the error is generated when the indoor unit receives a faulty signal from the outdoor unit.

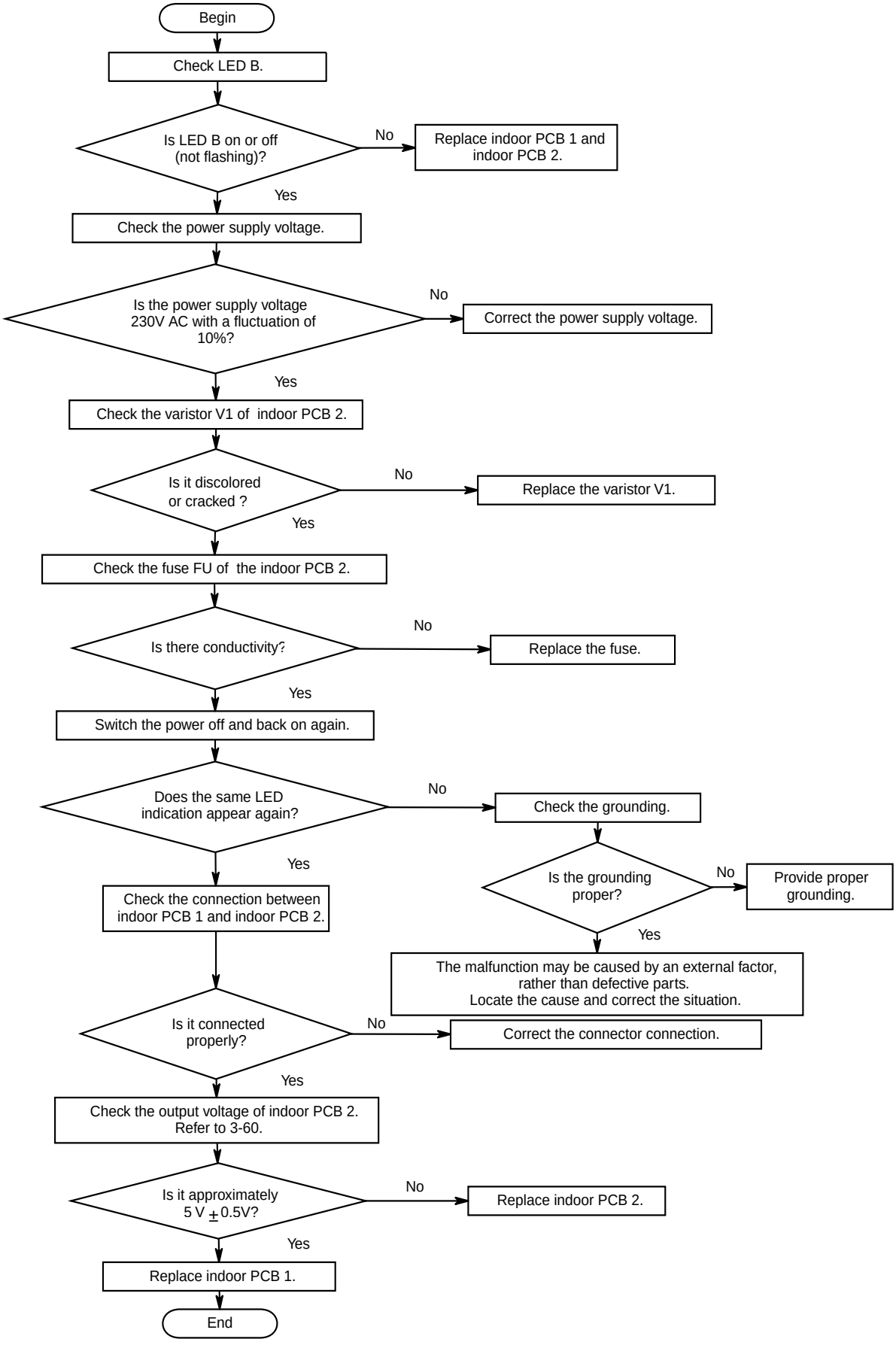
Causes

The following list shows the possible causes:

- Display disabled by faulty power supply.
- Faulty signal transmitting/receiving circuit in indoor PCB 1 and PCB 2.
- The microcomputer program is in abnormal condition due to an external factor such as noise, momentary voltage drop, momentary power failure, etc.
- Faulty indoor PCB 1 and PCB 2.

Procedure

The following flow chart shows the troubleshooting procedure:



3.7 Signal Transmission Error

Fault code

U4

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED B (green)
normal	◑	◑
fault	◑	●

Error method

The data received from the outdoor unit through the indoor-outdoor signal transmission is checked to detect transmission errors.

Error generation

The error is generated when the data from the outdoor unit cannot be received normally or when the content of the data is abnormal.

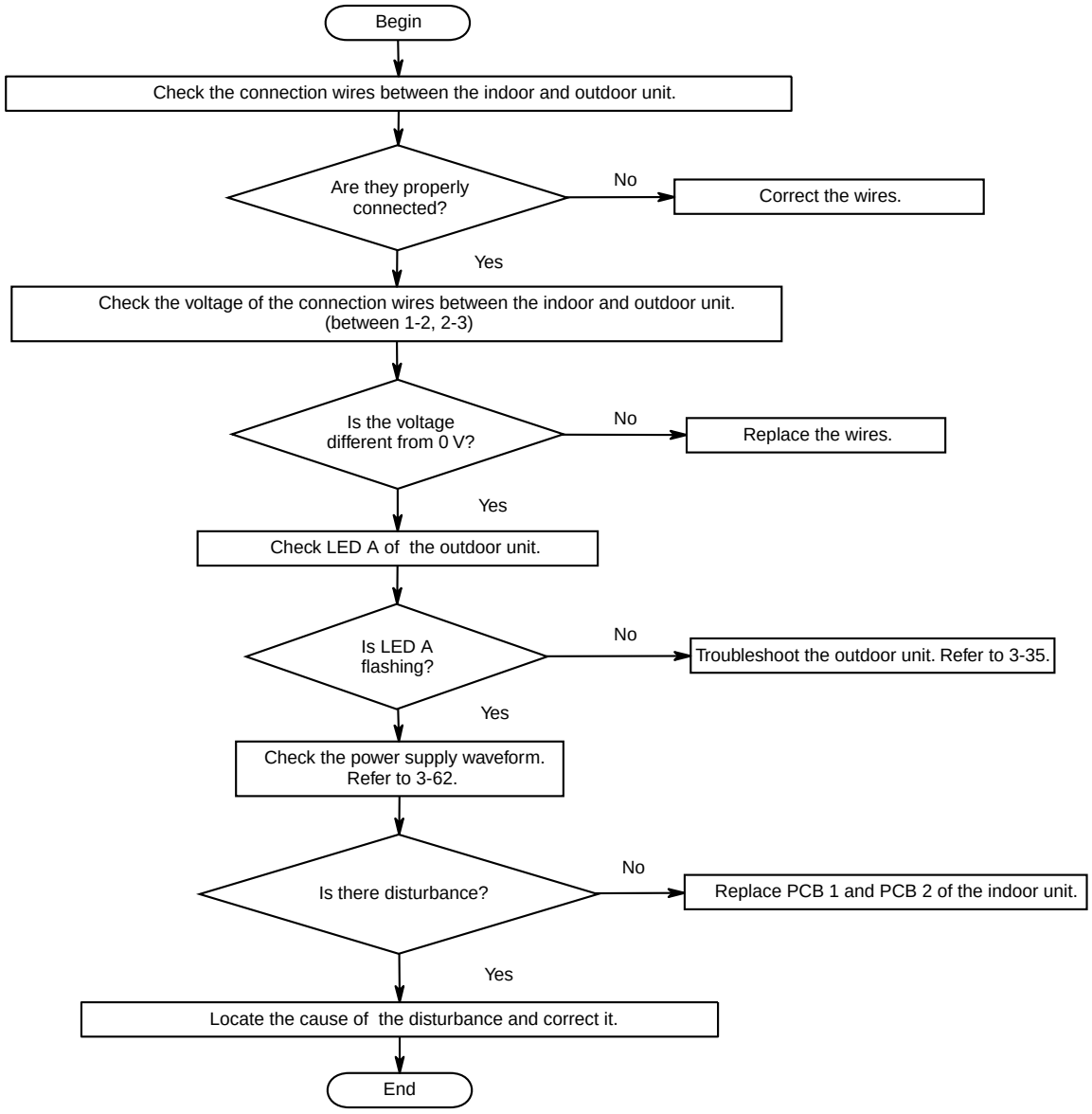
Causes

The following list shows the possible causes:

- Faulty indoor PCB 1.
- Faulty outdoor PCB 1.
- Indoor-outdoor signal transmission error due to a wiring error.
- Indoor-outdoor signal transmission error due to a disturbed power supply waveform. Refer to ‘Power supply waveform check’ on page 3-62.
- Indoor-outdoor signal transmission error due to a broken connection wire between the indoor and the outdoor units.

Procedure

The following flow chart shows the troubleshooting procedure:



4 Overview of Fault Indications on Outdoor Units

4.1 What Is in this Chapter

Introduction

In the first stage of the troubleshooting sequence, it is important to interpret the fault indication on the remote controller display. This will help you to find the cause of the problem for the outdoor units.

- The fault indication of the indoor unit has priority. Refer to ‘Overview of Fault Indications on Indoor Units’ on page 3-23.
- Some of the faults are not directly indicated on the remote controller, because they need to be generated several times. If you want to check immediately, you can check the LED indication on the indoor PCB.

Overview

This chapter covers the following topics:

Topic	Fault code	Shutdown after...	See page...
4.2 – Insufficient Gas Detection	U0	4 times	page 3-36
4.3 – Low Voltage or Main Circuit Overvoltage	U2	16 times	page 3-38
4.4 – Overload Activation	E5	2 times	page 3-40
4.5 – Discharge Pipe Temperature Abnormality	F3	4 times	page 3-42
4.6 – Compressor Start-up Error	E6	16 times	page 3-43
4.7 – Radiation Fin Temperature Rise	L4	4 times	page 3-45
4.8 – Current Transformer Error	H8	4 times	page 3-47
4.9 – Output Current Error	L5	16 times	page 3-49
4.10 – Input Overcurrent Error	-	1 time	page 3-51
4.11 – Electrical Box Temperature Rise	-	1 time	page 3-53
4.12 – Faulty Outdoor PCB	*	1 time	page 3-55
4.13 – Thermistor Abnormality	P4,J3,J6,H9	4 times	page 3-56
4.14 – Faulty Outdoor PCB and Transmitting-receiving Circuit	*	1 time	page 3-57

4.2 Insufficient Gas Detection

Fault code

U0

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	●	●	○	○

3

Error method

The input current checked by the current transformer and the frequency control are used to detect gas shortage.

Error generation

The error is generated during a check of the input current, when:

$I_{input} < [12/256\ (A/Hz) \times f_{operating} - 1.75]$ when $f_{operating} > 74$ Hz for a period of 14 seconds.

The system shuts down when the error is confirmed 4 times.

The timer automatically resets when one of the following errors does not occur within a period of 60 minutes of accumulated runtime after the first error generation:

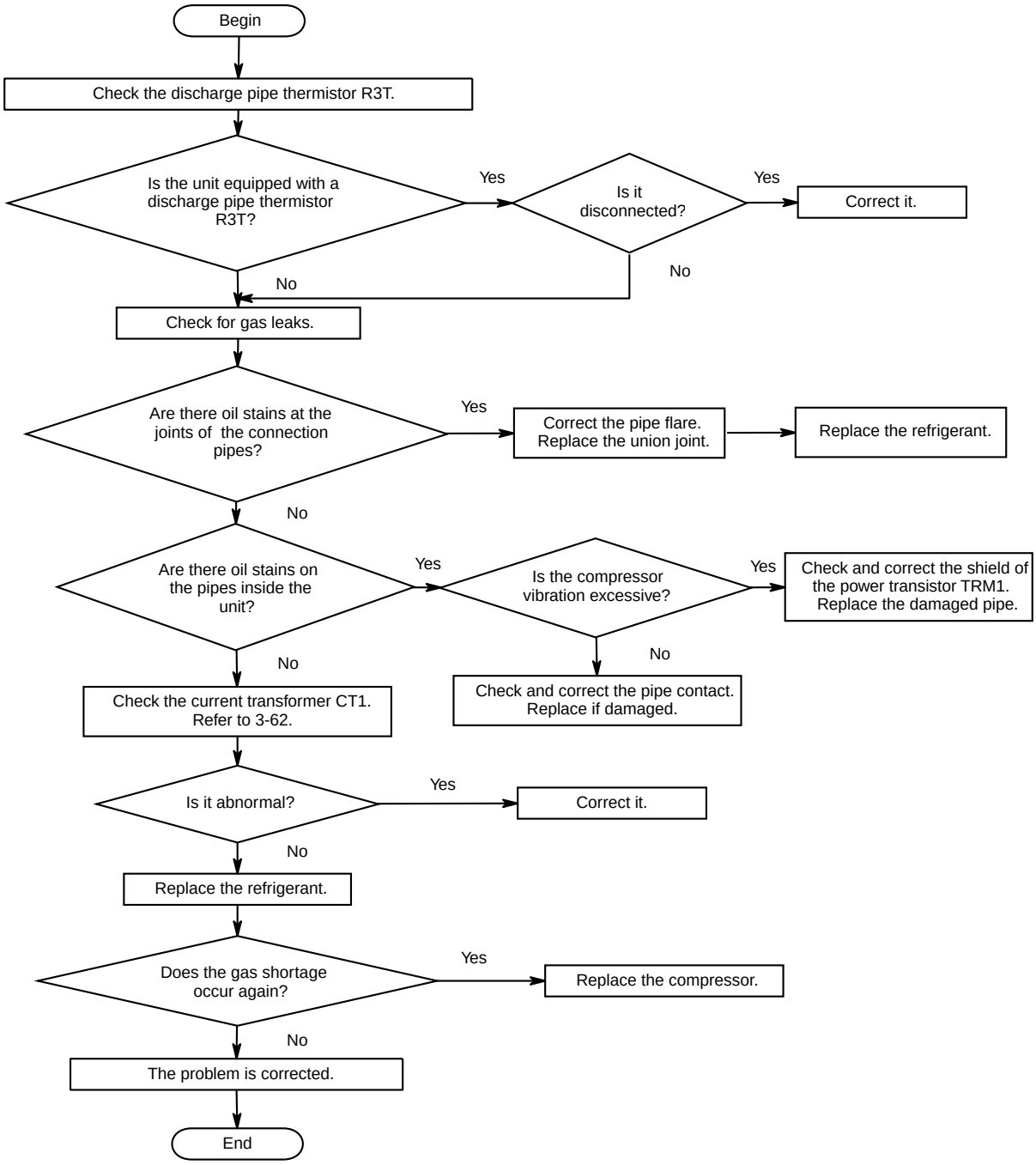
- overload activation E5
- radiation fin temperature rise L4
- gas shortage detection U0
- compressor start-up error E6
- current transformer error H8
- thermistor abnormality J3.

Causes

The following list shows the possible causes:

- gas shortage due to refrigerant leaks.
- Input current decrease due to inadequate compression of the compressor.

Procedure The following flow chart shows the troubleshooting procedure:



4.3 Low Voltage or Main Circuit Overvoltage

Fault code

U2

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	○	●	●	○

3

Error method

The error is detected by a momentary voltage drop, an irregular compressor rotation due to power failure, or by overvoltage detection circuit on PCB.

Error generation

The system shuts down when the error is confirmed 16 times.

The timer automatically resets when the compressor operates normally for 8 seconds.

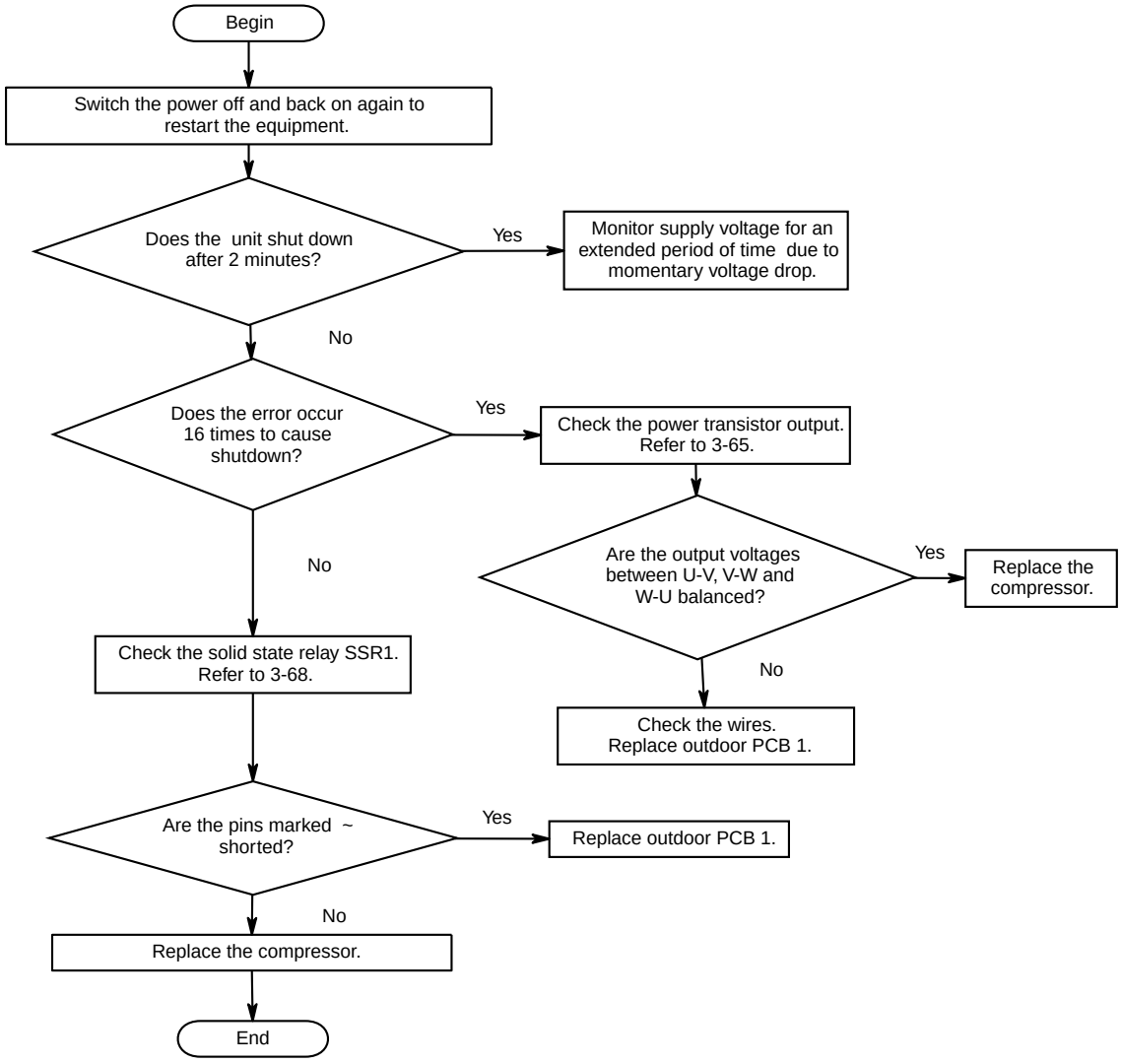
Causes

The following list shows the possible causes:

- Momentary voltage drop.
- No power supply due to faulty main circuit relay.
- Faulty power supply on outdoor PCB 1.
- Broken circuit pattern on outdoor PCB 1.
- Malfunction of capacitors C1R and C2R.
- Faulty compressor.
- Malfunction of the solid state relay SSR1 on outdoor PCB 1. Refer to ‘SSR1 check’ on page 3-68.

Procedure

The following flow chart shows the troubleshooting procedure:



4.4 Overload Activation

Fault code

E5

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	○	●	○	●

Error method

Internal protection of the compressor is detected using the open condition of the internal protector of the compressor.

Error generation

The error is generated when the internal protection activation is sent from the internal protection circuit to the microcomputer. The contact opens at 120 °C ± 3 °C and closes at 95°C ± 10°C.

The system shuts down when the activation of the internal protector is detected 2 times.

The timer automatically resets when one of the following errors does not occur within a period of 60 minutes of accumulated runtime after the first error generation:

- the radiation fin temperature rise L4
- gas shortage detection U0
- compressor start-up error E6.

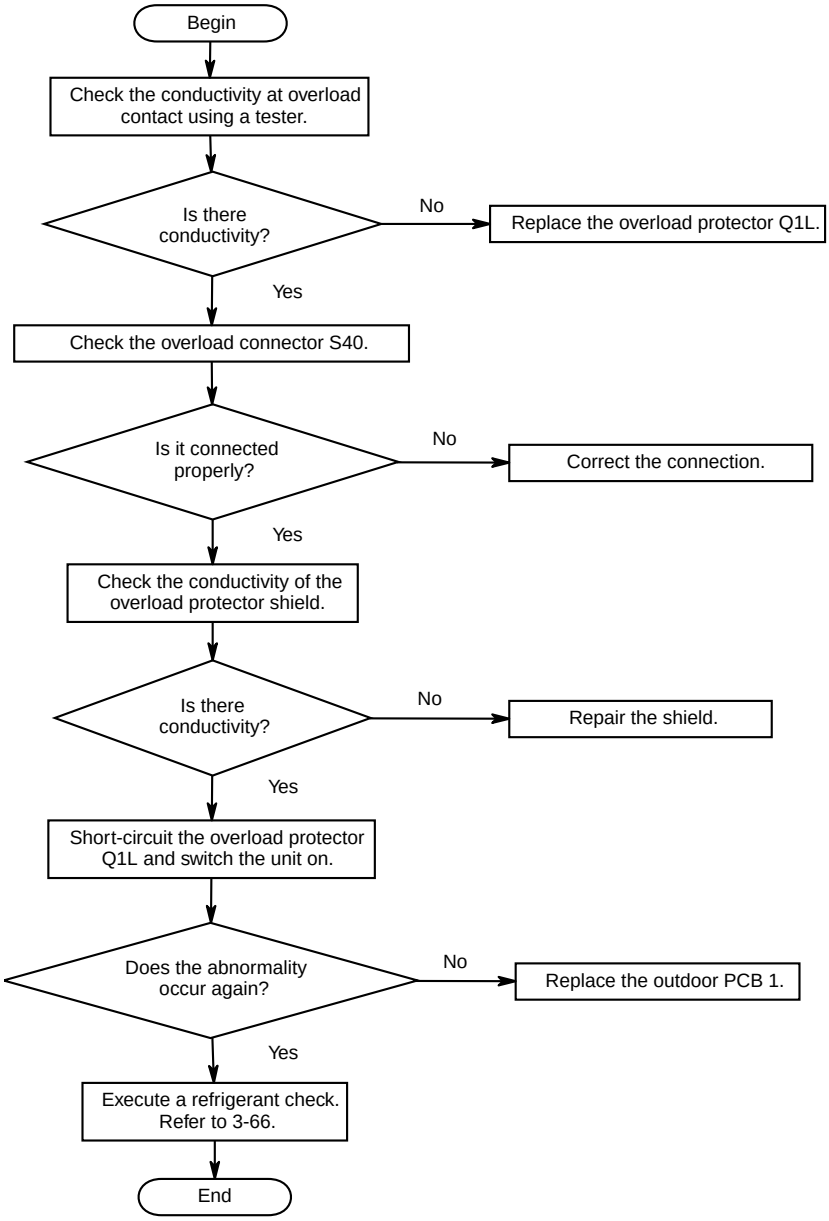
Causes

The following list shows the possible causes:

- Overload activation due to insufficient refrigerant.
- Error detection due to a faulty overload contact.
- Overload activation due to a faulty 4-way valve. Refer to ‘Faulty Four-way Valve’ on page 3-18.
- Error detection due to a faulty connector S40.
- Detection error due to a broken wire in the internal protector Q1L shield.
- Detection error due to faulty outdoor PCB 1.
- Error detection due to insufficient vacuuming in the pipes.

Procedure

The following flow chart shows the troubleshooting procedure:



4.5 Discharge Pipe Temperature Abnormality

Fault code

F3

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	○	●	○	●

3

Error method

The error is detected through the discharge pipe thermistor R3T.

Error generation

The error is generated when the discharge pipe thermistor is disconnected.

The system shuts down when the error is generated 4 times.

The timer automatically resets when no other abnormality occurs within a period of 60 minutes of accumulated runtime after the first error generation.

Causes

The cause can be a disconnected discharge thermistor R3T.

Procedure

The following flow chart shows the troubleshooting procedure:

4.6 Compressor Start-up Error

Fault code

E6

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	●	○	○	●

Error method

Compressor start-up errors are detected using the rotation data from the motor windings of the compressor

Error generation

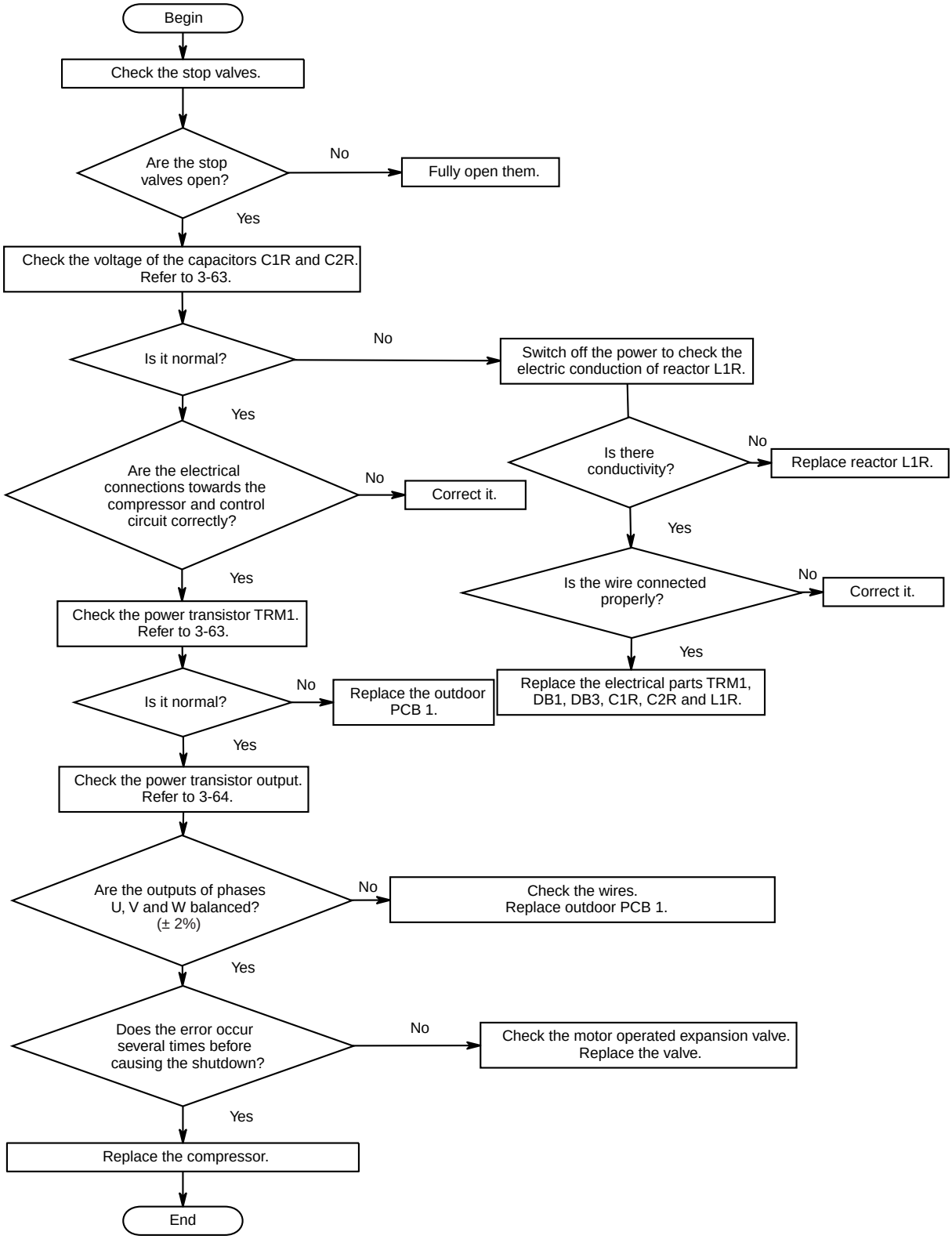
The error is generated when the compressor tries to restart 16 times within a time range of 60 minutes.

Causes

The following list shows the possible causes:

- Start-up error due to a disconnected junction cable of the compressor.
- Start-up error due to faulty compressor.
- Start-up error due to faulty outdoor PCB 1.
- Start-up error due to closed stop valve.
- Start-up error due to faulty motor operated expansion valve.

Procedure The following flow chart shows the troubleshooting procedure:



4.7 Radiation Fin Temperature Rise

Fault code

L4

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	●	●	●	○

Error method

During compressor operation, the radiation fin temperature rise is detected using the temperature of the radiation switch box thermistor R4T.

Error generation

During compressor operation, the error is generated when $T_{radiation\ fin}$ > 87 °C.

The system shuts down when the error is detected 4 times.

The timer automatically resets when one of the following errors does not occur within a period of 60 minutes of accumulated runtime after the first error generation:

- the radiation fin temperature rise L4
- gas shortage detection U0
- compressor start-up error E6.

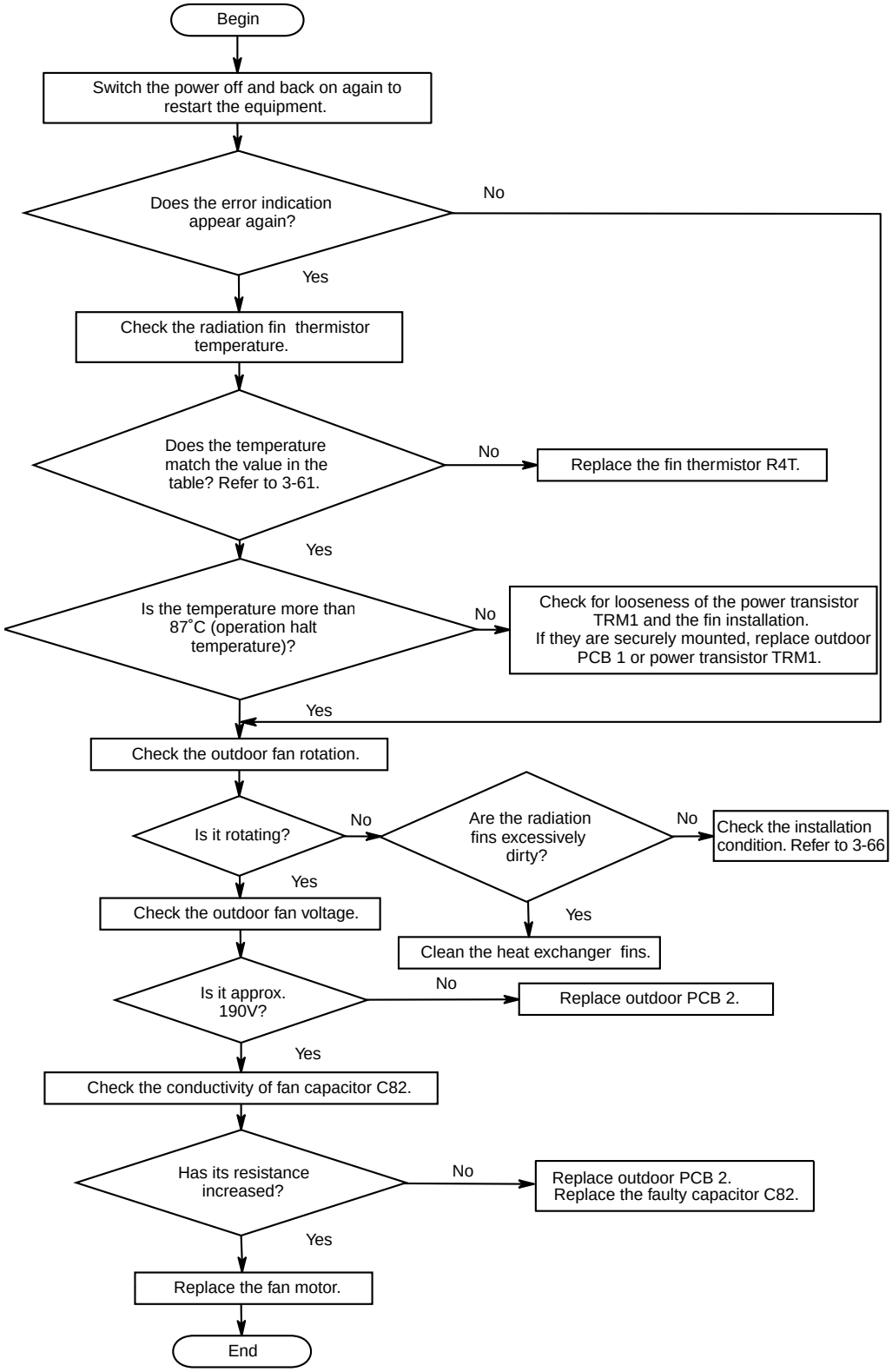
Causes

The following list shows the possible causes:

- Fin temperature rise due to faulty outdoor fan.
- Fin temperature rise due to short circuit.
- Detection due to faulty radiation switch box thermistor (R4T).
- Detection error due to faulty connector connection.
- Detection error due to faulty outdoor PCB 1 or PCB 2.

Procedure

The following flow chart shows the troubleshooting procedure:



4.8 Current Transformer Error

Fault code

H8

LED indication

The following table shows the LED indication of the outdoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	○	○	●	●

Error method

Current transformer errors are detected using the operating frequency of the compressor and the input current of CT1.

Error generation

The error is generated when the operating frequency of the compressor is more than 56 Hz and the current transformer input is less than 0.08 V.

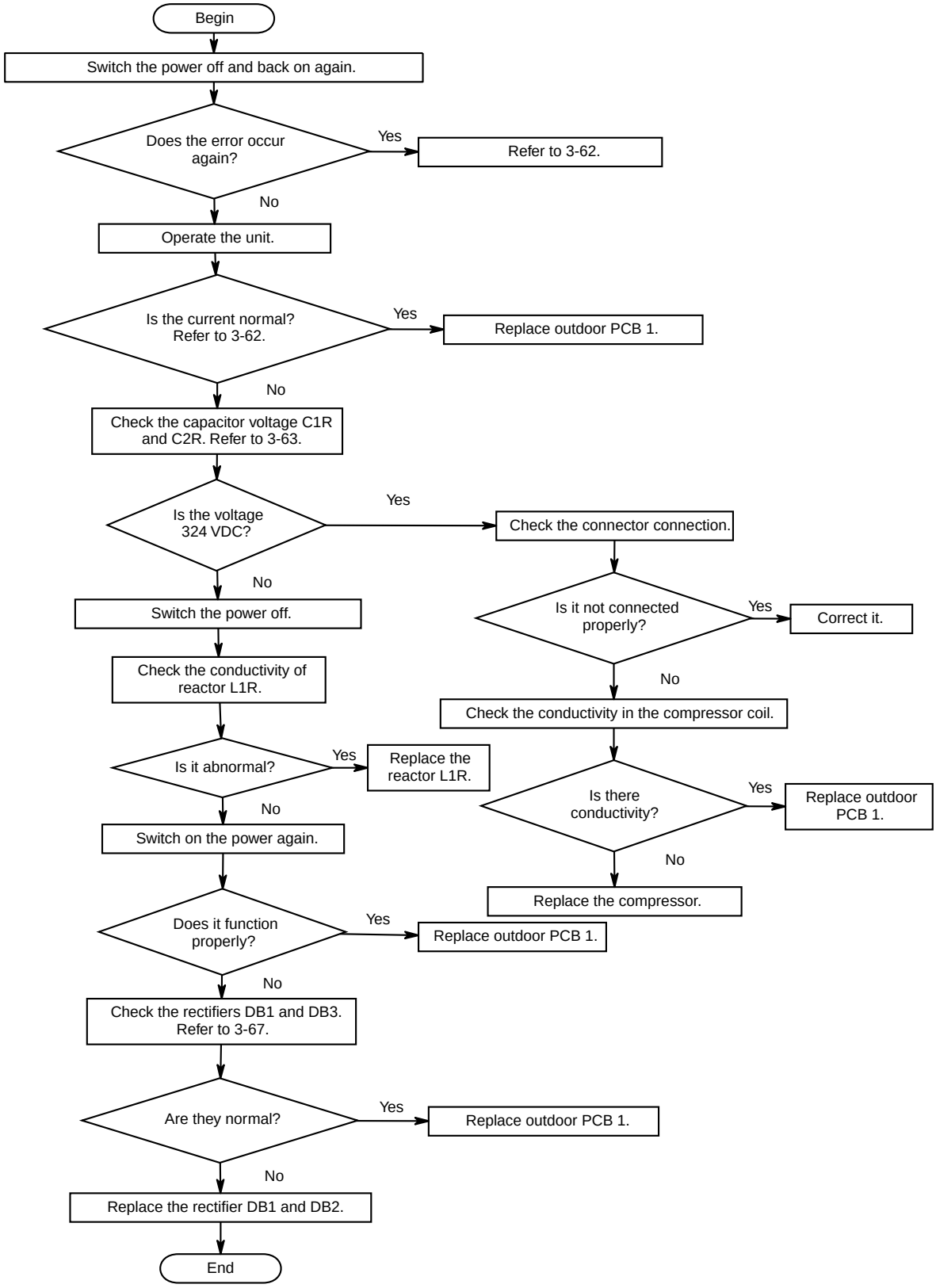
The system shuts down when the current transformer error is generated 4 times.

Causes

The following list shows the possible causes:

- Faulty power transistor TRM1.
- broken wire or faulty connection of internal wiring.
- Faulty reactor L1R.
- Faulty outdoor PCB 1.

Procedure The following flow chart shows the troubleshooting procedure:



4.9 Output Current Error

Fault code

L5

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	●	○	○	○

Error method

The output overcurrent is detected by the current flowing in the current transformer CT1.

Error generation

The error is generated when the output overcurrent detection circuit sends an output overcurrent signal to the microcomputer.

The system shuts down when the error is confirmed 16 times.

The timer automatically resets when the compressor operates for 8 minutes without low voltage, fan lock or output overcurrent.

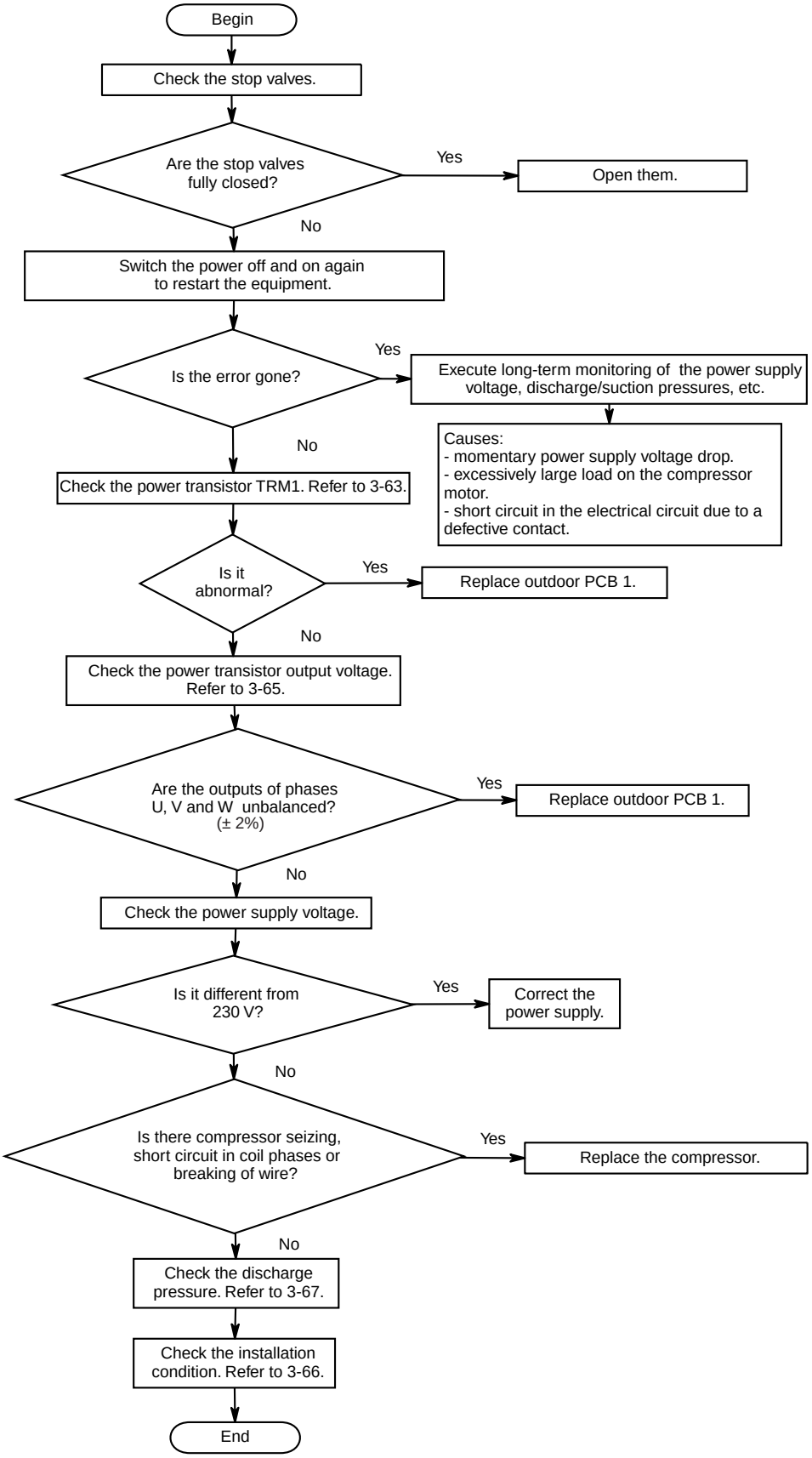
Causes

The following list shows the possible causes:

- Overcurrent due to a faulty power transistor TRM1.
- Overcurrent due to a faulty internal wiring.
- Overcurrent due to a faulty power supply voltage.
- Overcurrent due to a faulty outdoor PCB 1.
- Overcurrent due to a closed stop valve.
- Overcurrent due to a faulty compressor.
- Overcurrent due to a faulty installation condition.

Procedure

The following flow chart shows the troubleshooting procedure:



4.10 Input Overcurrent Error

Fault code

-

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	●	○	●	○

Error method

During compressor operation, the input overcurrent is checked by the input current detected by the current transformer CT1.

Error generation

During compressor operation, the error is generated when the input current remains above 17 A for 2.5 seconds.

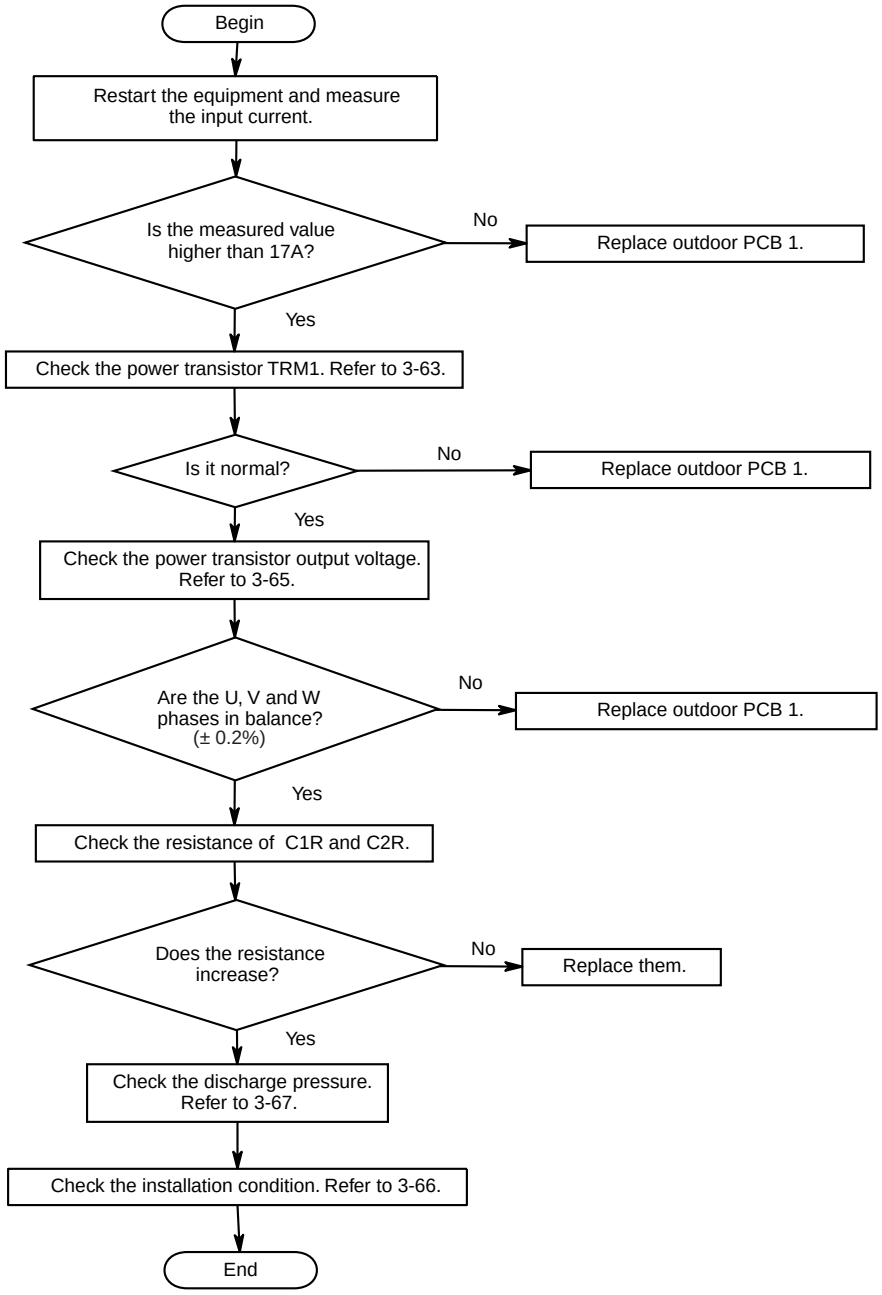
Causes

The following list shows the possible causes:

- Overcurrent due to faulty compressor.
- Overcurrent due to faulty power transistor TRM1.
- Overcurrent due to faulty electrolytic capacitor C1R or C2R of the inverter circuit.
- Overcurrent due to faulty outdoor PCB 1.
- Overcurrent due to short circuit.

Procedure

The following flow chart shows the troubleshooting procedure:



4.11 Electrical Box Temperature Rise

Fault code

-

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	○	○	●	○

Error method

During compressor operation, the electrical box temperature rise is detected by the radiation switch box thermistor R4T.

Error generation

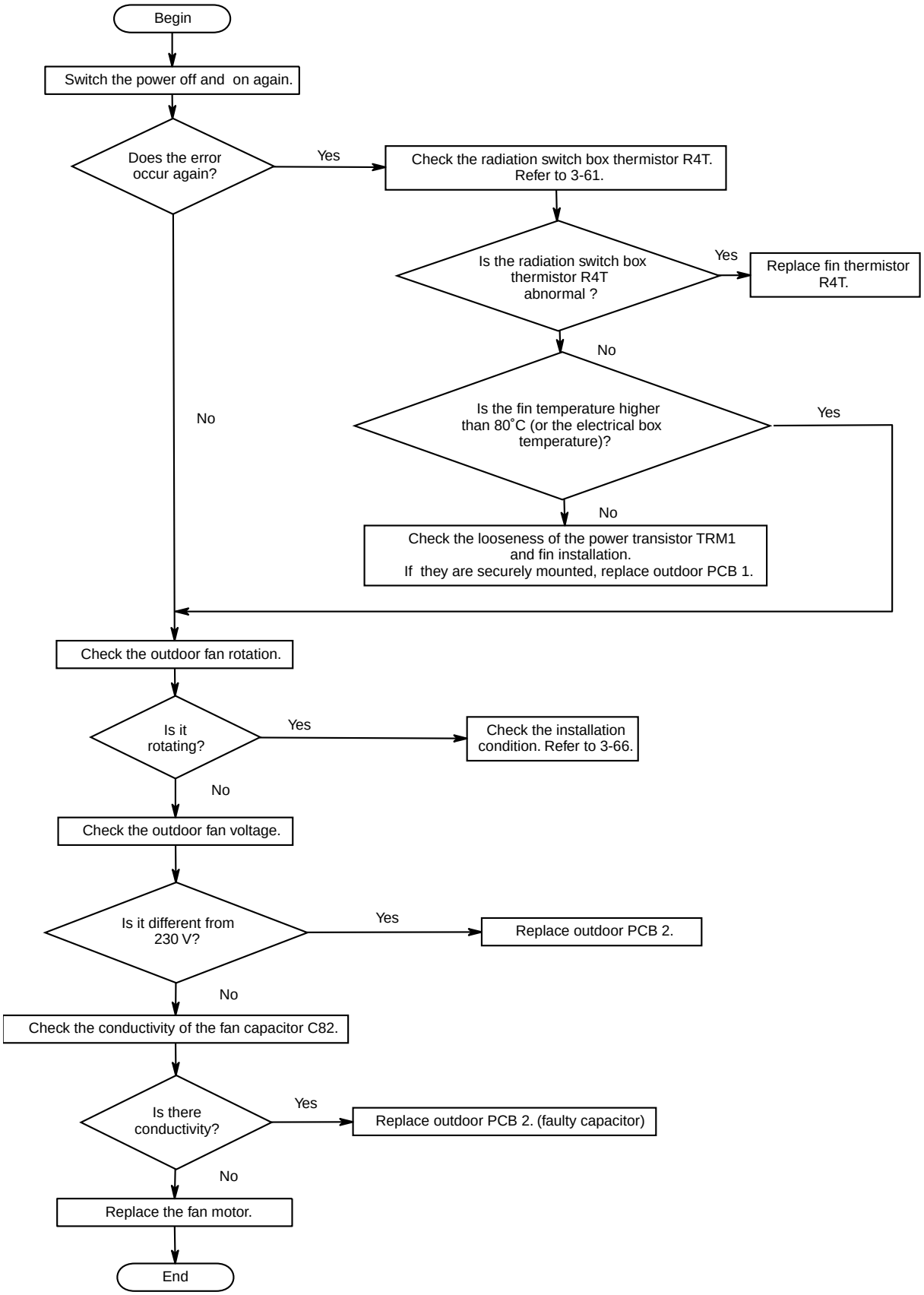
During compressor's non-operating period, the error is generated when the radiation switch box thermistor temperature reaches 80 °C.

Causes

The following list shows the possible causes:

- Electrical box temperature rise due to outdoor fan malfunctioning.
- Electrical box temperature rise due to short circuit.
- Detection error due to faulty radiation switch box thermistor (R4T).
- Detection error due to faulty connector connection.
- Detection error due to faulty outdoor PCB 1.

Procedure The following flow chart shows the troubleshooting procedure:



4.12 Faulty Outdoor PCB

Fault code

*

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	○	-	-	-	-

Error method

The internal program checks the working of the microcomputer to detect this error.

Error generation

The error is generated when the microcomputer program does not function properly.

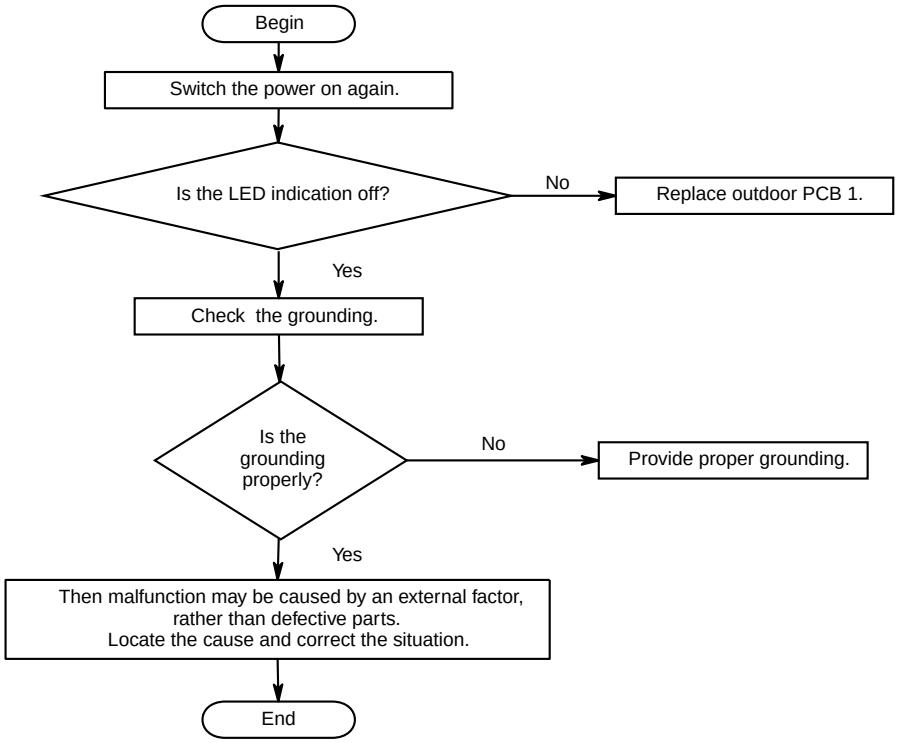
Causes

The following list shows the possible causes:

- The microcomputer program is in abnormal condition due to an external factor like noise, momentary voltage drop, momentary power failure etc.
- Faulty outdoor PCB 1.

Procedure

The following flow chart shows the troubleshooting procedure:



4.13 Thermistor Abnormality

Fault code

P4,J3,J6,H9

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	◑	○	○	●	●

3

Error method

The temperatures detected by the thermistors are used to determine this error.

Error generation

The error is generated when the thermistor input is more than 4.96 V or less than 0.04 V.

Causes

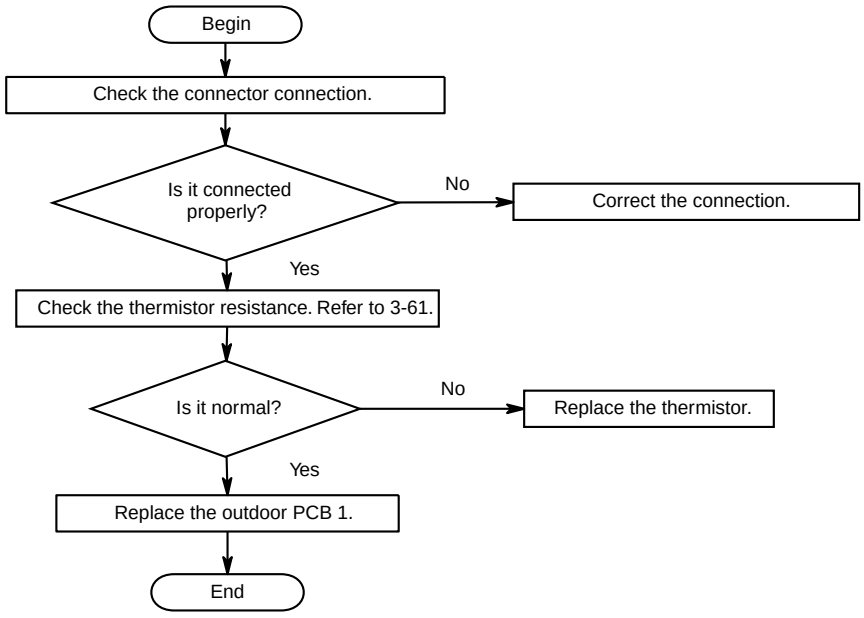
The following list shows the possible causes:

- Faulty connector connection.
- Faulty thermistor.
- Faulty outdoor PCB 1.

Procedure

The following flow chart shows the troubleshooting procedure:

P4: Radiation switch box thermistor (R4T)
J3: Discharge pipe thermistor (R3T)
J6: Outdoor heat exchanger thermistor (R2T)
H9: Outdoor ambient thermistor (R1T)



4.14 Faulty Outdoor PCB and Transmitting-receiving Circuit

Fault code

✻

LED indication

The following table shows the LED indication of the indoor unit:

Condition	LED A (green)	LED 1 (red)	LED 2 (red)	LED 3 (red)	LED 4 (red)
normal	◑	●	●	●	●
fault	●	_	_	_	_

Error

The following table explains the 2 possibilities:

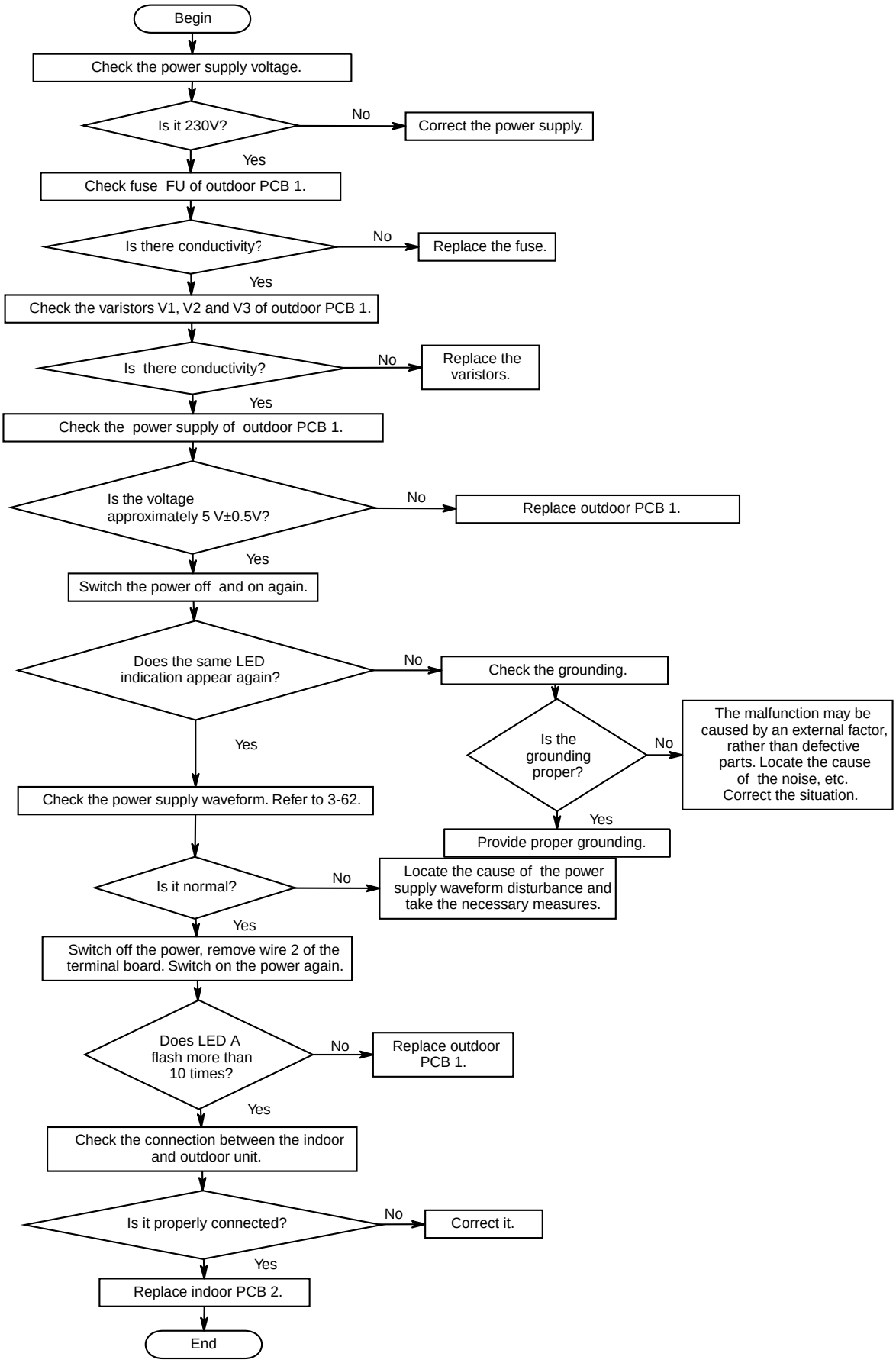
Error method	Error generation
The internal program checks the operation of the microcomputer to detect this error.	The error is generated when the microcomputer program does not function properly.
The data received from the outdoor unit through the indoor-outdoor signal transmission is checked by the indoor unit to detect this error.	The error is generated when the data transmitted by the outdoor unit cannot be received properly by the indoor unit.

Causes

The following list shows the possible causes:

- Display disabled by faulty power supply.
- Faulty signal transmitting-receiving circuit of outdoor PCB 1.
- Microcomputer program is in abnormal condition due to an external factor like noise, momentary voltage drop, momentary power failure, etc.
- Faulty outdoor PCB 1.

Procedure The following flow chart shows the troubleshooting procedure:



5 Additional Checks and Repair for Troubleshooting

5.1 What Is in This Chapter

Introduction

This chapter explains how you have to check the units to execute good troubleshooting.

Overview

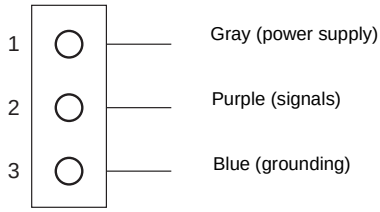
This chapter covers the following topics:

5.2 Checking the Indoor Units

Hall IC check (R6)

Check the Hall IC when fault code R6 appears on the display.

To check the Hall IC, proceed as follows:

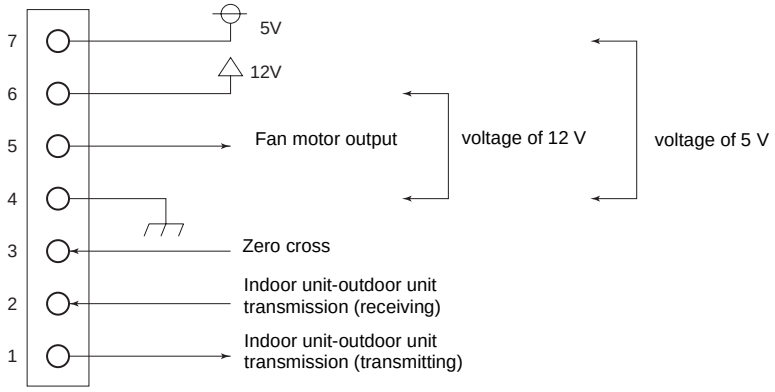
Step	Action
1	Make sure that connector indoor S7 on indoor PCB 1 is properly connected. 
2	Make sure that the power is on and that there is no operation.
3	Measure the voltage between pin 1 and 3 of S7.
4	Rotate the fan one turn by hand and measure the generated pulses between pin 2 and 3 of S7.
5	Execute the check by making a comparison:

If	then
the measured voltage between pin 1 and 3 does not equal 5 V	replace indoor PCB 1.
the generated pulses do not equal 3 pulses	replace the fan motor.
the measured voltage does not equal 5 V and the generated pulses do not equal 3 pulses	replace indoor PCB 1.

Indoor PCB 2 output voltage check (U4)

Check the indoor PCB2 output voltage when fault code U4 appears on the display.

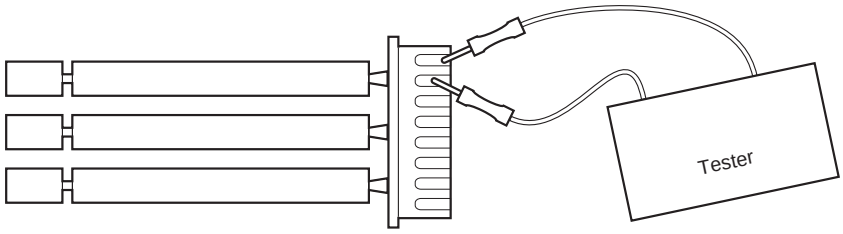
To check the output voltage of indoor PCB 2, proceed as follows:

Step	Action
1	Make sure that connector S36 on indoor PCB 2 is properly connected.
2	Measure the voltage between pin 4 and 6 and between pin 4 and 7.  If not, replace indoor PCB 2.

Thermistor resistance check (P4, J3, J6, H9)

Check the thermistor resistance when fault code P4, J3, J6, or H9 appears on the display.

To check the resistance of the thermistors, proceed as follows:

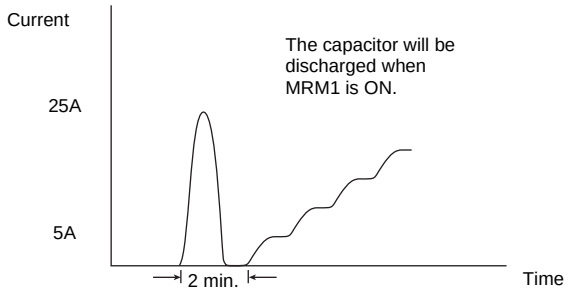
Step	Action
1	Remove the connectors of the thermistors on the PCBs. For more information about these sensors, refer to 'Wiring Diagrams' on page 1-15 and 'Functions of Thermistors' on page 2-4.
2	Read the temperature.
3	Measure the resistance. 
4	Check that the measured values correspond with the values in the table below.

Temperature	**Resistor value**
°C	**kΩ**
-20	211
-15	150
-10	116.5
-5	88
0	67.2
5	51.9
10	40
15	31.8
20	25
25	20
30	16
35	13
40	10.6
45	8.7
50	7.2

5.3 Checking the Outdoor Units

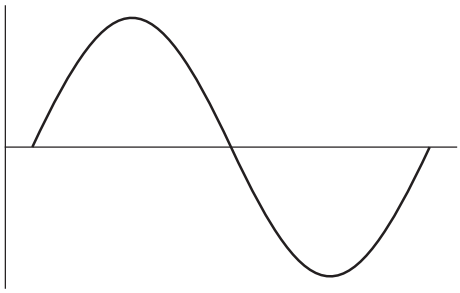
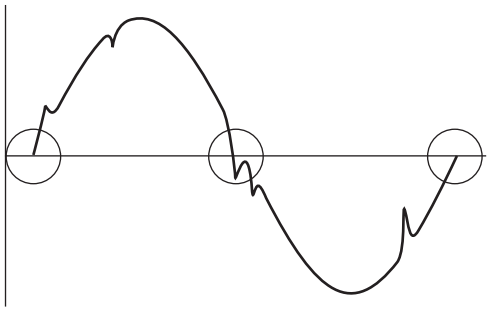
Current transformer check

Check the current of the current transformer CT1 with the oscilloscope.



Power supply waveform check

The following table explains how to check the power supply waveform:

Step	Action
1	Measure the power supply waveform between pin 1 and 3 of X1M.
2	Check whether the power supply waveform is a sine wave: 
3	Check whether there is waveform disturbance near the zero cross: 
4	Adjust the supply voltage or contact your electricity company.

Power transistor check

To check the power transistor TRM1, proceed as follows:

Before checking, make sure that the voltage between (+) and (-) of the power transistor is approximately 0 V.

Step	Action
1	Disconnect S30 from outdoor PCB 1.
2	Execute the following check with a tester:

Negative (-) terminal of analog tester / Positive terminal (+) of digital tester	Positive (+) terminal of analog tester / Negative terminal (-) of digital tester	Normal resistance range	Unacceptable resistance range
power transistor (+) side	U-V-W	kΩ to MΩ	short (0Ω) or open
U-V-W	power transistor (-) side		
power transistor (-) side	U-V-W		
U-V-W	power transistor (+) side		

Capacitor voltage check

To check the voltages of the capacitors C1R and C2R, proceed as follows:

Step	Action
1	Operate the unit for several minutes.
2	Shut down using the main circuit breaker. When you shut down the unit using the remote controller, the capacitors discharge. This causes inaccurate measurement.
3	Measure between (+) and (-) of the power transistor TRM1 using a multi-tester (DC-mode). The voltage of the capacitors is measured between (+) and (-) of the power transistor TRM1, while the (+) and (-) of the capacitors are connected to the (+) and (-) of the transistor.
4	If the voltage is 130 V ± 30VDC, then the capacitors work properly.

During operation, the voltage of the capacitors C1R and C2R is 280 V.

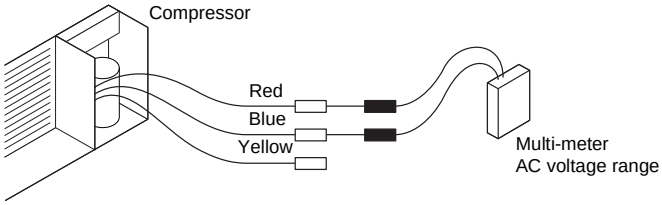
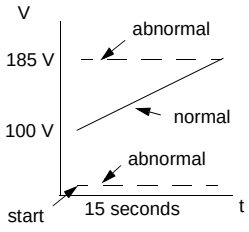
Power transistor output current check

To check the output current of the power transistor, proceed as follows:

Step	Action
1	Remove the panels.
2	Snap a clamp meter around the red (U), yellow (V) or blue (W) wires inside the compressor to measure the current. Do not short-circuit the terminals of the red, yellow and blue wires. Do not touch the terminals of the red, yellow and blue wires when the power is on.
3	Conduct forced cooling.
4	When the output frequency has stabilized, measure the output current of each phase. **If** / **then** the output currents of each phase are balanced / the situation is normal. one of the phases is out of balance / replace outdoor PCB 1. If the compressor stops before the output frequency stabilizes, measure the output voltage. Refer to ‘Power transistor output voltage check’ on page 3-65.

Power transistor output voltage check

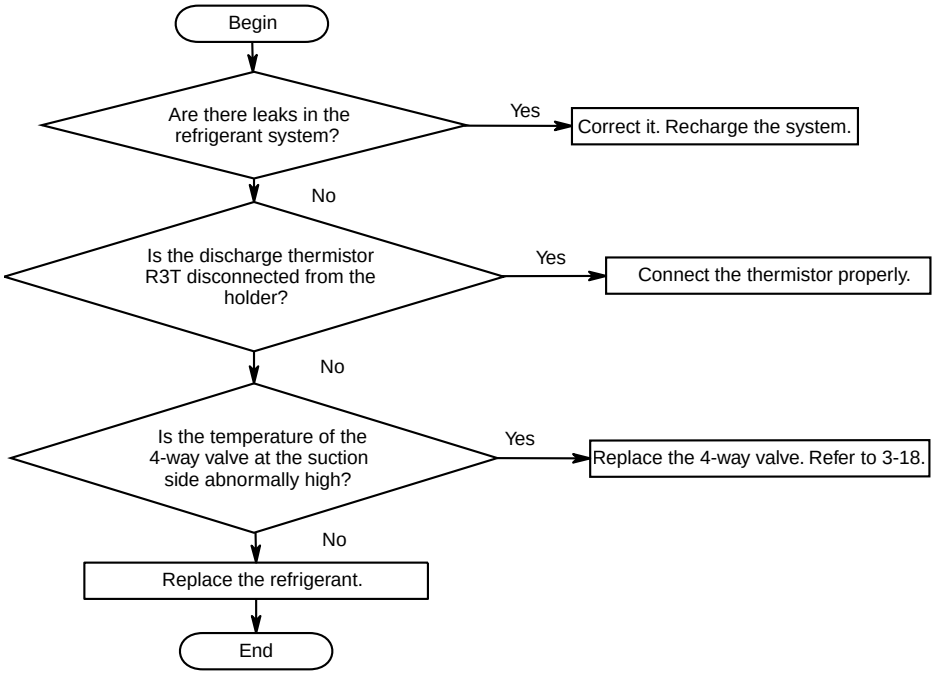
To check the output voltage of the power transistor TRM1, proceed as follows:

Step	Action
1	Remove the panels.
2	Connect a multi-meter between the red (U) and blue (W) wire on the compressor to measure the voltage:  Do not short-circuit the terminals of the red, yellow and blue wires. Do not touch the terminals of the red, yellow and blue wires when the power is on.
3	Conduct forced cooling.
4	Measure the voltage between the operation start (when the fans start rotating) and operation halt caused by a current transformer fault (after 15 seconds).
5	Reset the power.
6	Connect the multi-meter between 2 the other wire-combinations.
7	Conduct forced cooling again to measure the other phase-combinations.
8	Measure the voltage again to for other phase-combinations.
9	Compare the voltages U-V, U-W and V-W with the solid line below: 

If	then
the voltages are similar to the voltages on the solid line above	outdoor PCB 1 is normal.
one of the voltages is not similar to the voltages on the solid line above	check the cable between the power transistor and the compressor. If this is normal, replace outdoor PCB 1.

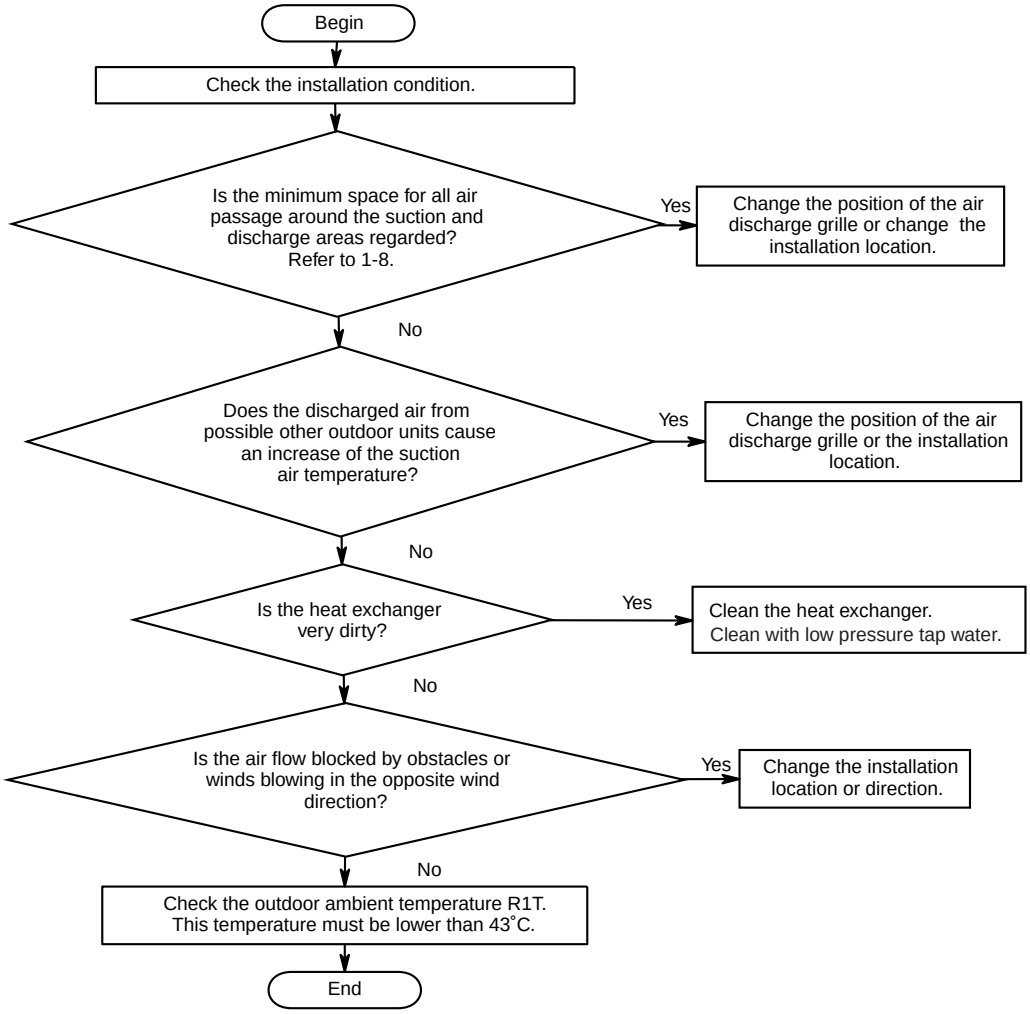
Refrigerant system check

To check the refrigerant system, proceed as follows:



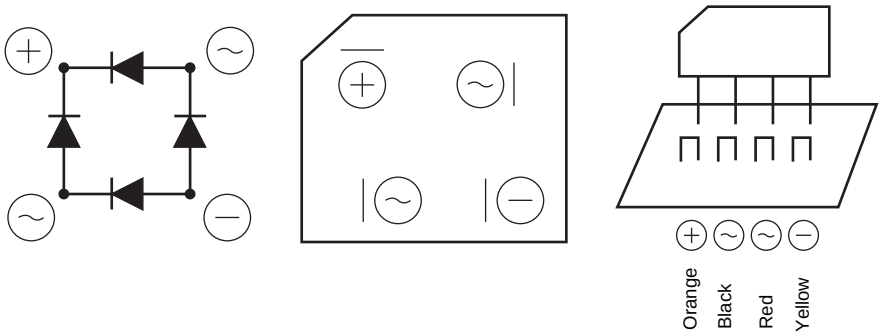
Installation condition check

To check the installation condition, proceed as follows:



Rectifier check

To check the rectifier, proceed as follows:

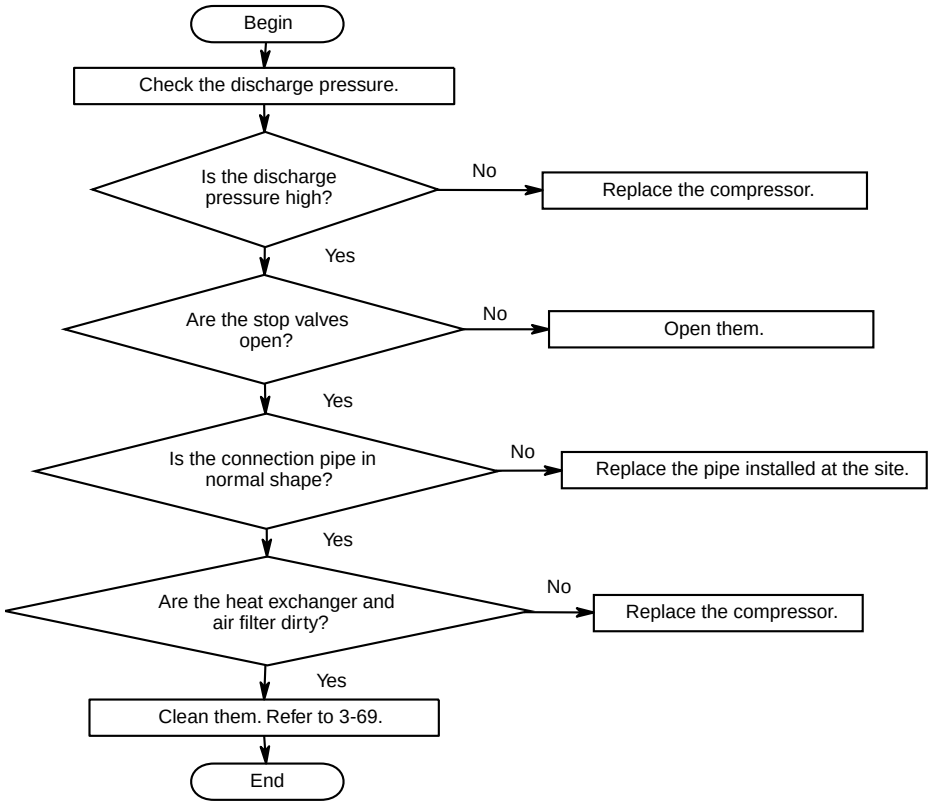


Negative (-) terminal of analog tester	Positive (+) terminal of analog tester	Normal resistance range	Unacceptable resistance range
Positive terminal (+) for digital tester	Negative terminal (-) for digital tester		
~	+	kΩ to MΩ	0 or ∞
+	~	∞	0
~	−	∞	0
−	~	kΩ to MΩ	0 or ∞

When the part is damaged, remove the terminal conductivity compound. Before installing a new rectifier, replace it by new compound.

Discharge pressure check

To check the discharge pressure, proceed as follows:

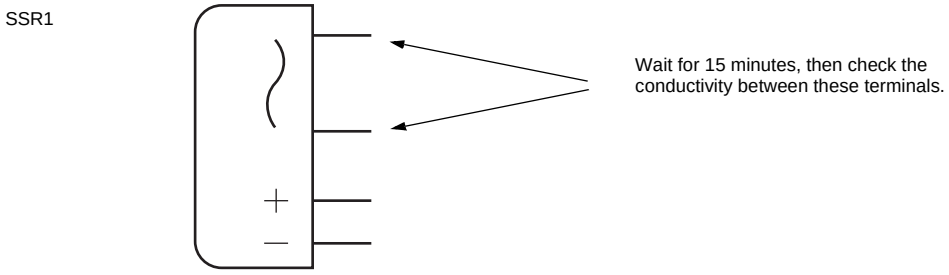


SSR1 check

To check the solid state relay SSR1, proceed as follows:

Before checking, take following precautions in account:

- Make sure that the power is turned off.
- Make sure that the electric load is discharged from C1R and C2R.



3

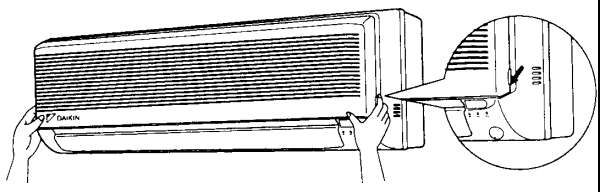
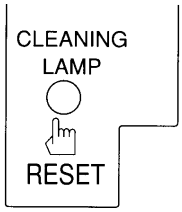
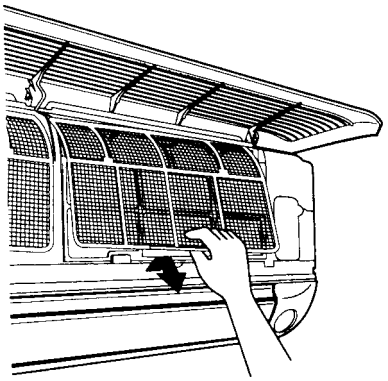
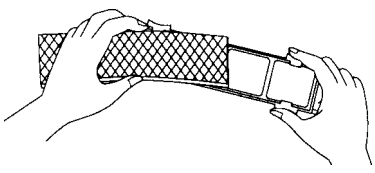
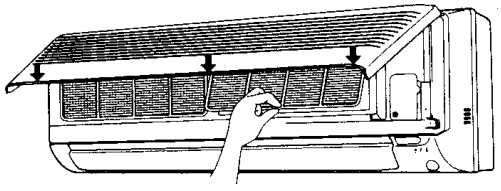
5.4 Repair for Indoor Units

Air purifying filter

The air purifying filter (electrostatic filter) catches pollen and smoke particles as small as 0.01 micron through electrostatic charging. An activated carbon deodorizing filter in net shape is also mounted to absorb and minimize fine odour particles. The filter should be cleaned when the cleaning lamp flashes. In a dusty environment, it is recommended to clean them every 2 weeks.

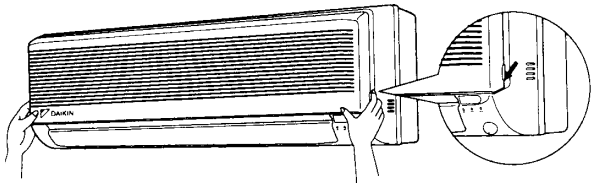
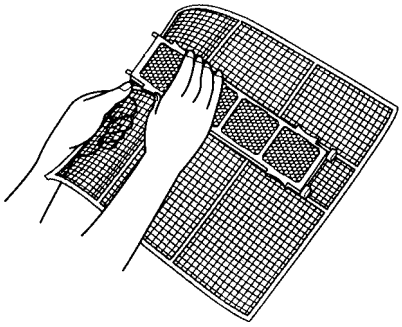
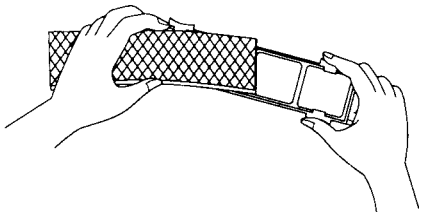
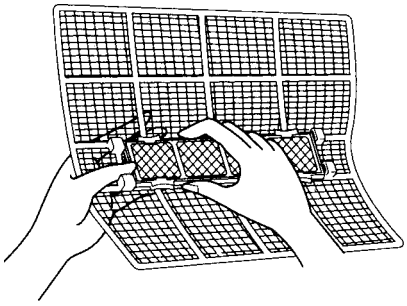
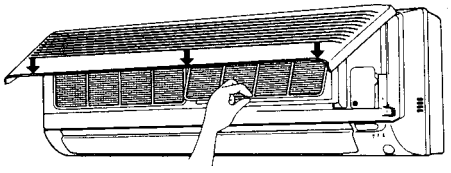
Cleaning the air filters

To clean the air filters, proceed as follows:

Step	Action	Drawing
1	Stop the operation and turn the breaker off.	
2	Open the front grille by lifting the grill by the two tabs at both sides. Lift until you hear a click.	
3	Press the cleaning lamp reset button.	
4	Take out the filters by pushing them a little upwards and then downwards.	
5	Take out the air purifying filters to clean with water or a vacuum cleaner. If dust stays on the filters, wash them with a neutral detergent thinned with water. Afterwards, dry them in the shade.	
6	Put the air purifying filters back.	
7	Close the front grille at the 3 points indicated by the arrows.	

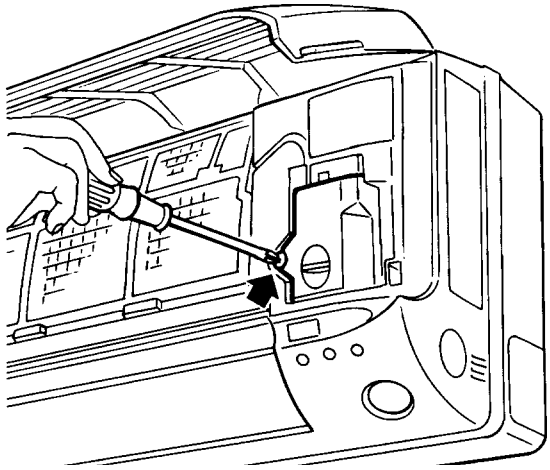
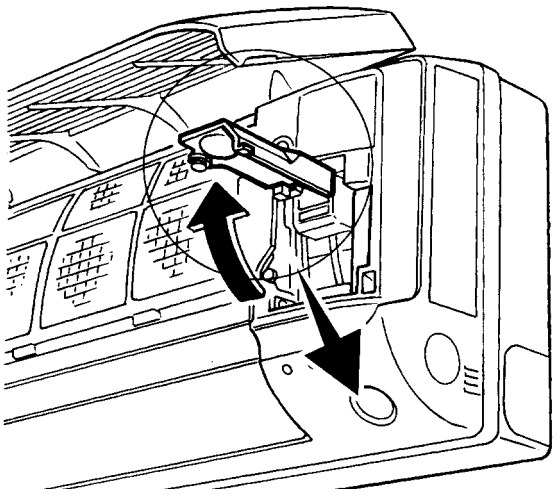
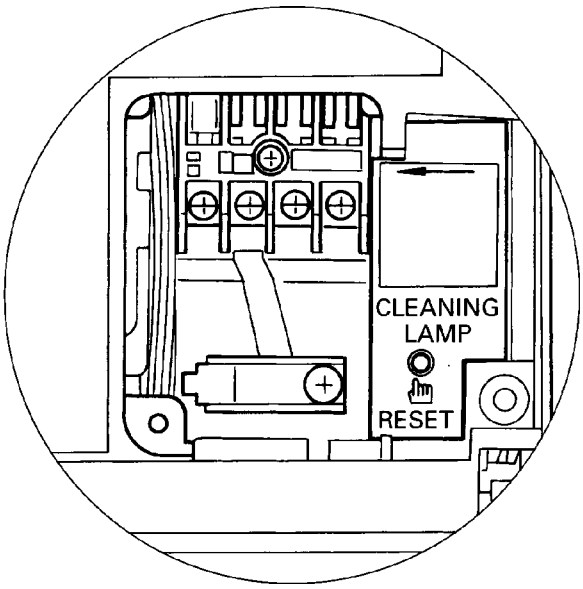
Replacing the air purifying filters

To replace the air purifying filters, proceed as follows:

Step	Action	Drawing
1	Open the front grille by lifting the grill by the two tabs at both sides. Lift until you hear a click.	
2	Take out the air purifying filters by releasing the four claws.	
3	Detach the filter element.	
4	Attach a new one. ⚠ In a dusty environment, it is recommended to replace the filters every three months. ℹ To order an air filter with frame (2 pieces/1 set), refer to number KAF918A41 and an air filter with frame (4 pieces/2 sets), refer to number KAF918A42.	
5	Attach the air purifying filter.	
6	Put the air filters back.	
7	Close the front grille at the 3 points indicated by the arrows.	

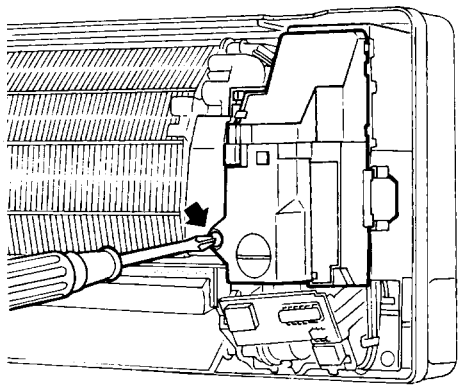
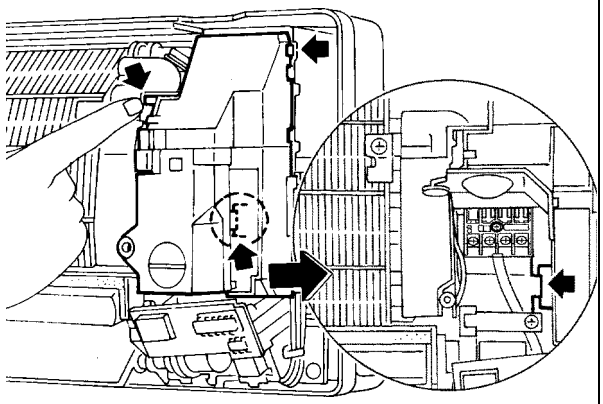
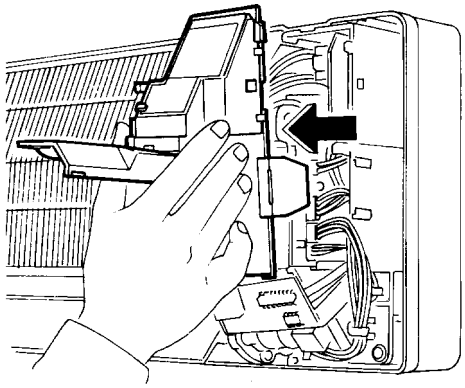
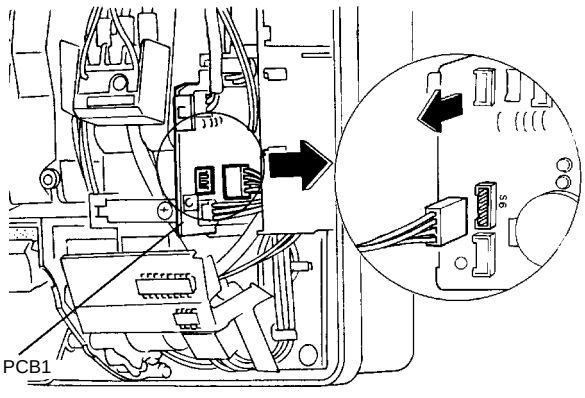
To open or close the service cover

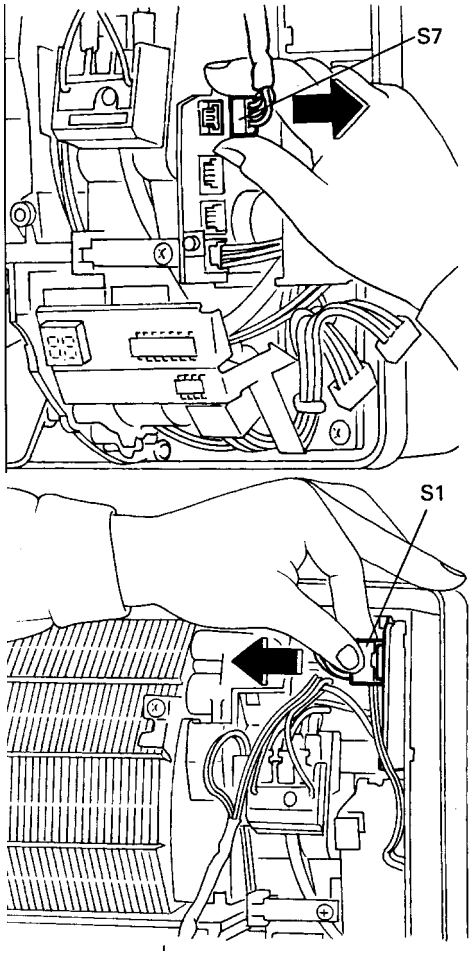
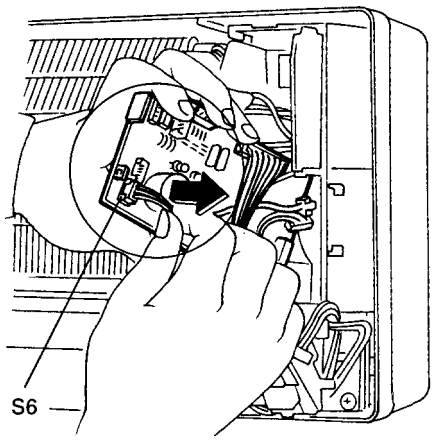
To open or close the service cover or to change the settings at installation site, proceed as follows:

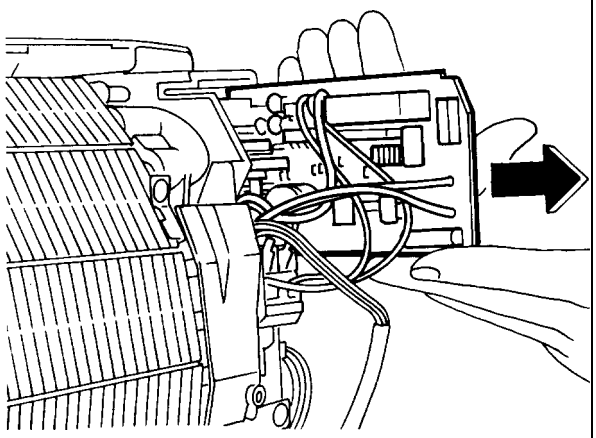
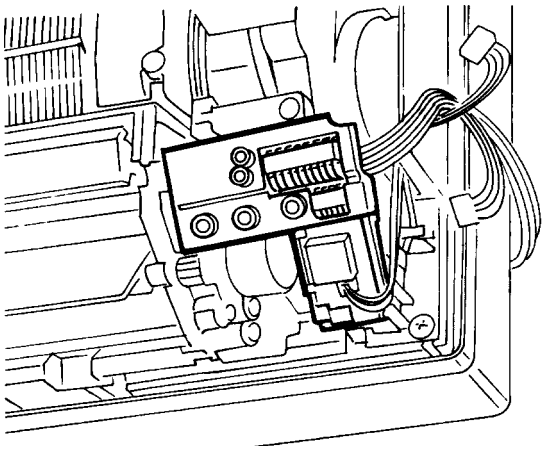
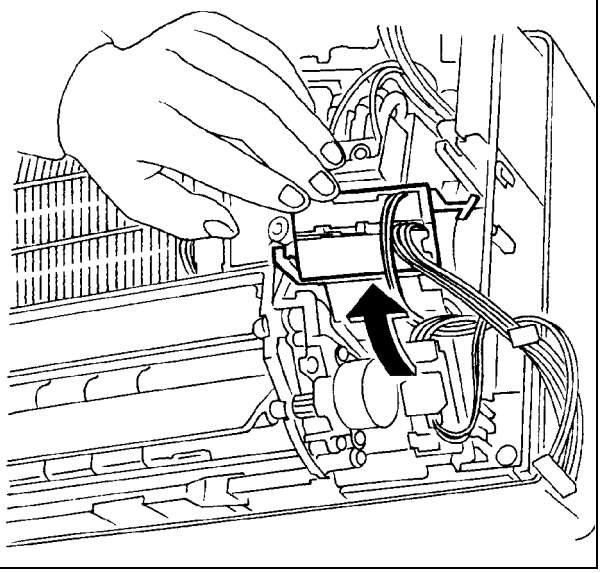
Step	Action	Drawing
1	Remove the service cover using a screwdriver.	
2	Open the service cover.	
3	Change the settings: ■ Reminder timer is set to off at the factory. ■ Filter sign can be reset. ⚠ In a dusty environment, clean the filter once every two weeks to save energy.	

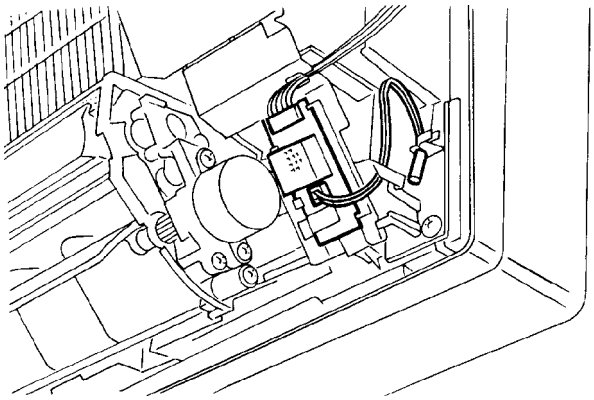
Removal of PCB

To remove the PCB, proceed as follows:

Step	Action	Drawing
1	Remove the screw of the service cover.	
2	Disengage the three catches of the electrical box.	
3	Remove the box cover.	
4	Disconnect connector S6 of indoor PCB 1. ⚠ Do not hold the lead wires of the connector while disconnecting, but pull out the connector terminal.	

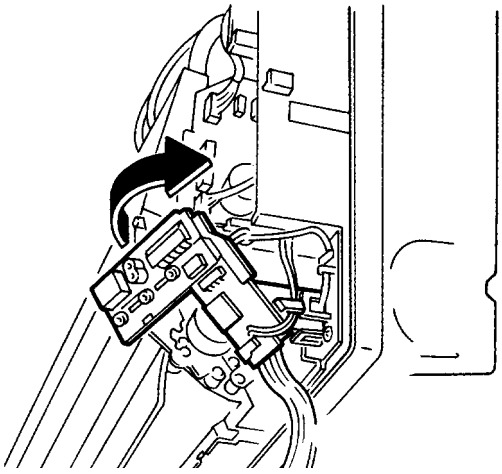
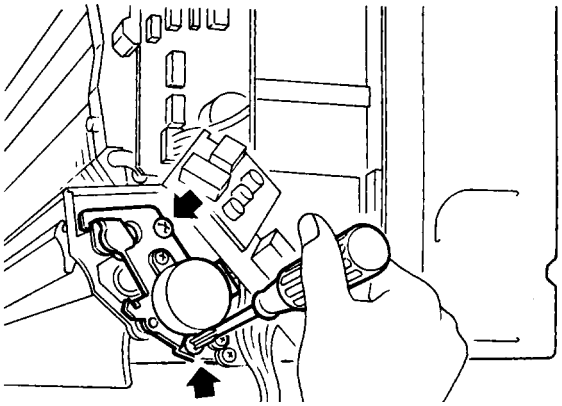
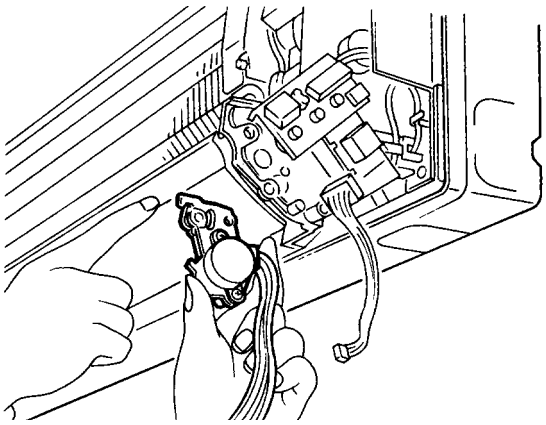
Step	Action	Drawing
5	Remove connector S7 on indoor PCB 1 and S1 on indoor PCB 2.	
6	Pull indoor PCB 1 forward to disconnect the remaining connectors.	

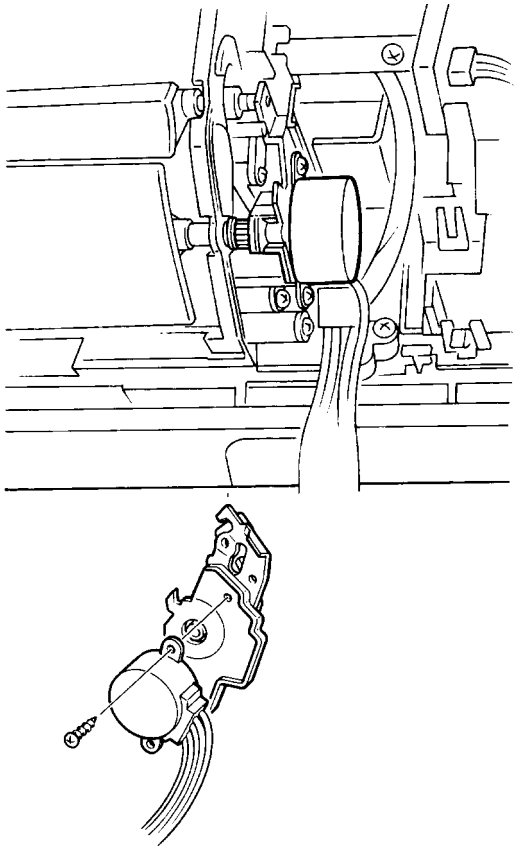
Step	Action	Drawing
7	Remove indoor PCB 2.	
8	Remove the lamp house and indoor PCB 3.	
9	Disengage hook of lamp house and open it upward.	

Step	Action	Drawing
10	Remove indoor PCB 4. ⚠ Be sure to mount the indoor ambient temperature thermistor R1T in the right direction.	

Removal of swing motor

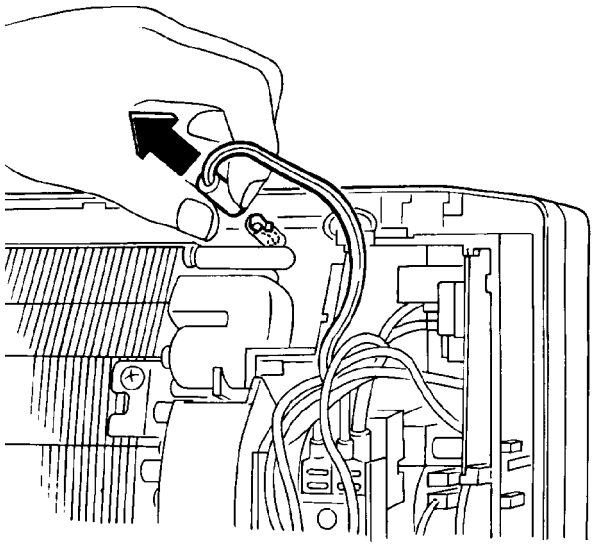
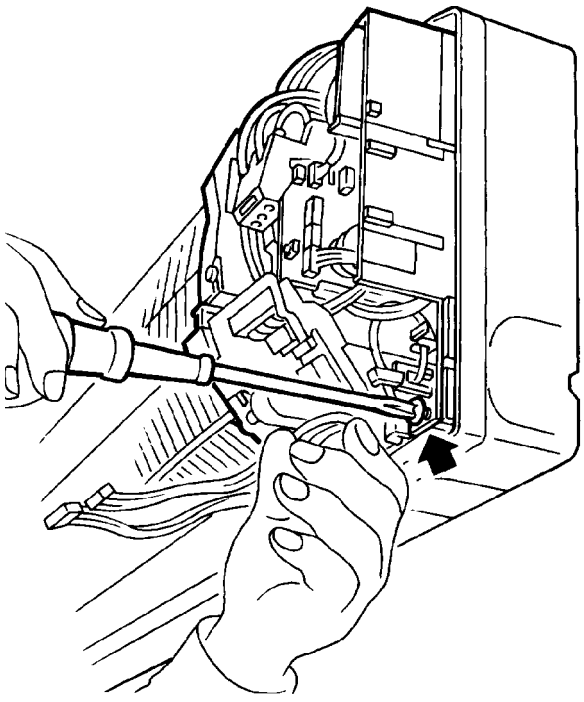
To remove the swing motor, proceed as follows:

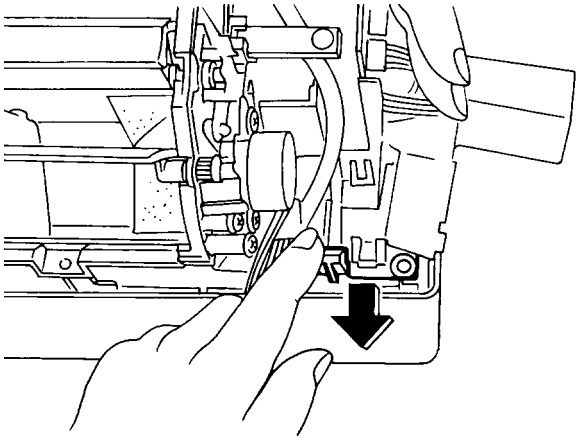
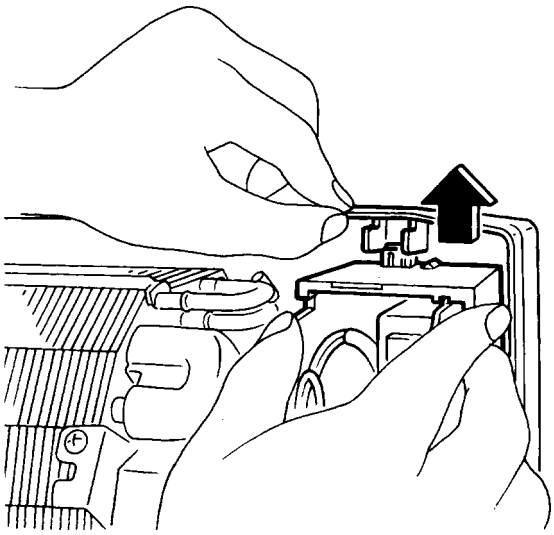
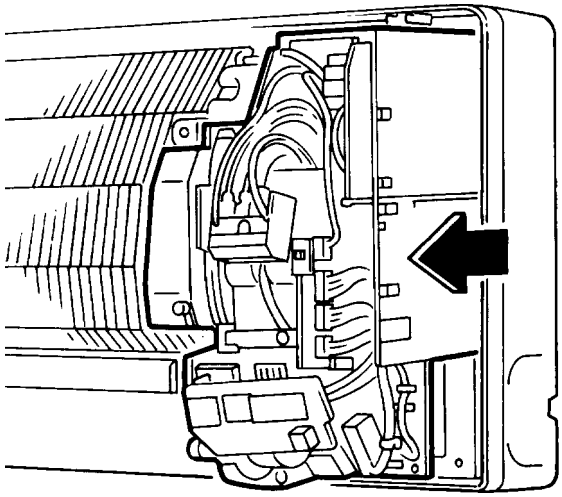
Step	Action	Drawing
1	Open lamp house assembly.	
2	Remove the 2 screws.	
3	Remove the swing box assembly. ⚠ The mounting screws for the swing box assembly are different in length from the screws of the swing motor.	

Step	Action	Drawing
4	Remove the swing motor by loosening the 2 screws.	

Removal of electrical box

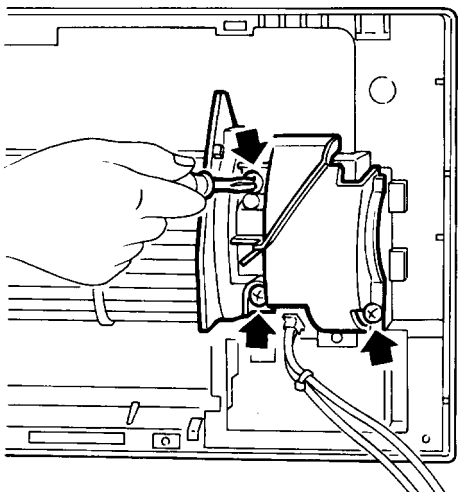
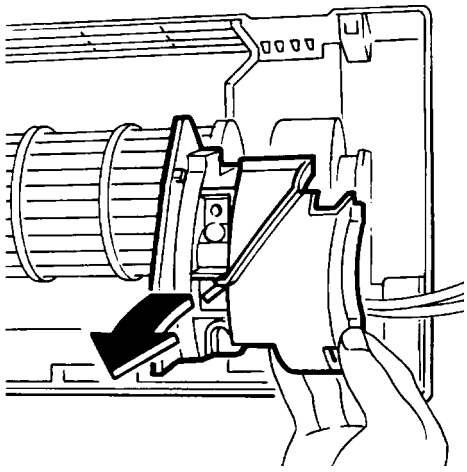
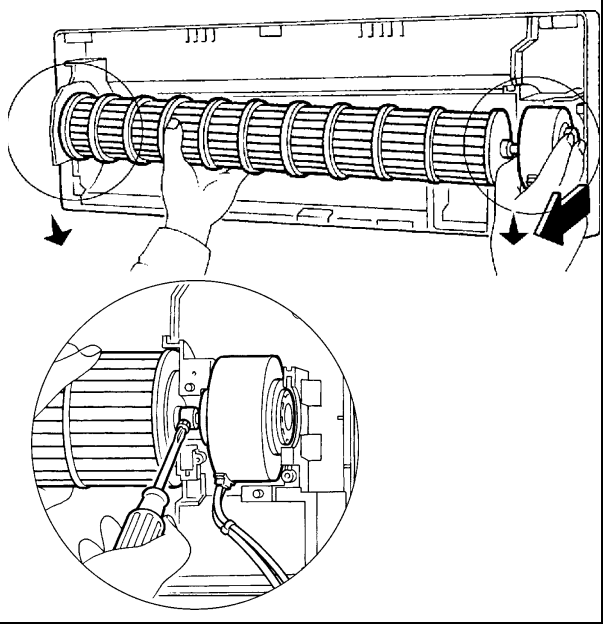
To remove the electrical box, proceed as follows:

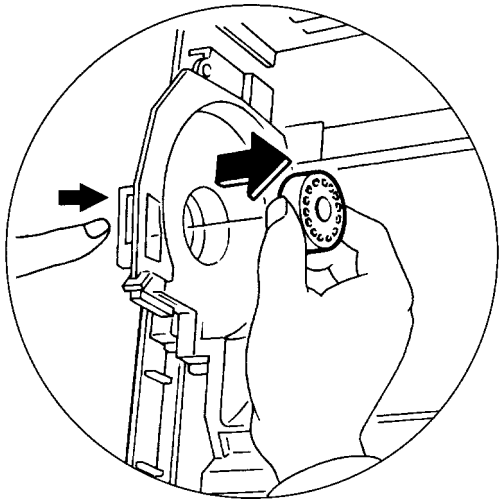
Step	Action	Drawing
1	Remove the indoor heat exchanger thermistor R2T.	
2	Disconnect S1, S7 and S6 of the electrical box. ⚠ Do not hold the lead wires of the connector while disconnecting, but pull out the connector terminal.	
3	Remove the screw located at the bottom of the electrical box.	

Step	Action	Drawing
4	Lift up the electrical box slightly and disengage the catch at the bottom side.	
5	Disengage the catch at the top side.	
6	Pull forward to remove the electrical box.	

Removal of fan rotor and motor

To remove the fan rotor and motor, proceed as follows:

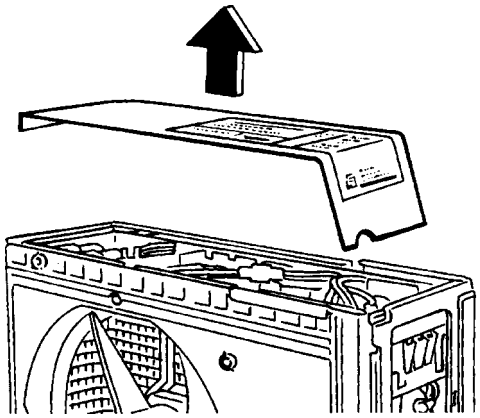
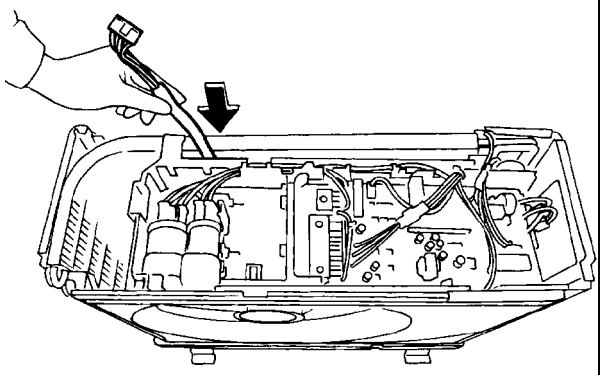
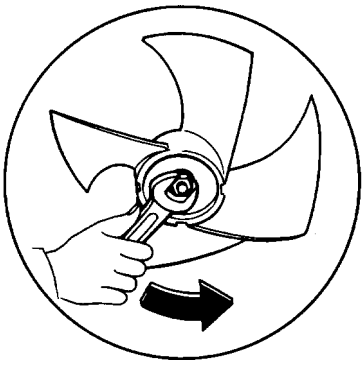
Step	Action	Drawing
1	Remove the right side panel.	
2	Remove the 3 screws.	
3	Remove the fan rotor and motor together from the unit.	
4	Loosen the hexagon head screw on the fan rotor to remove the motor.	

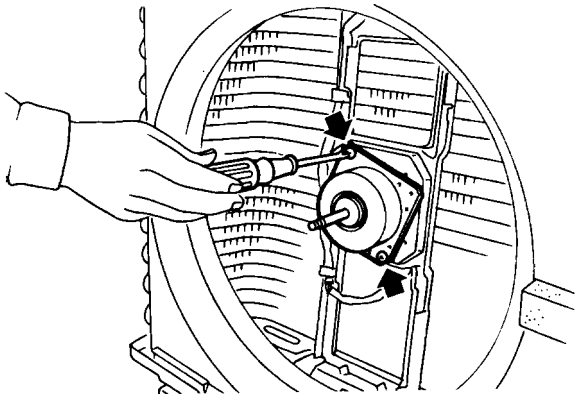
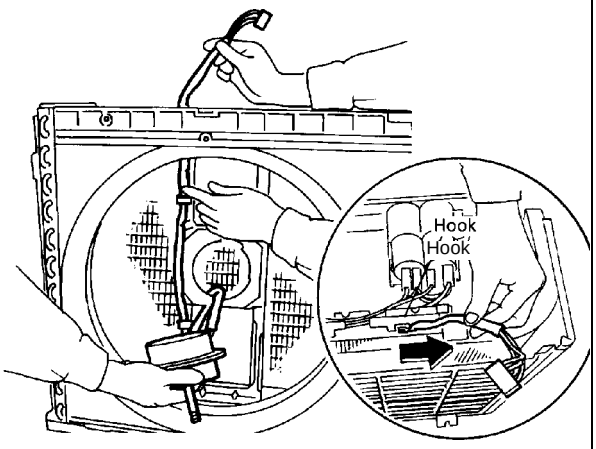
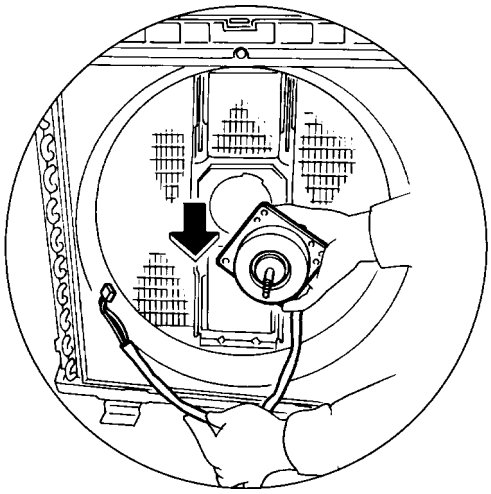
Step	Action	Drawing
5	Press the bearing with the finger from the outside to remove it.	

5.5 Repair for Outdoor Units

Removal of propeller fan and motor

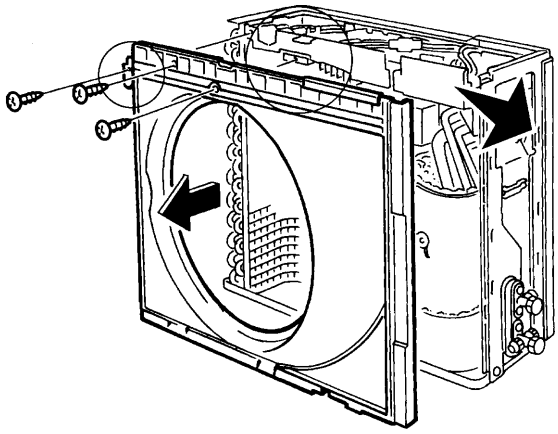
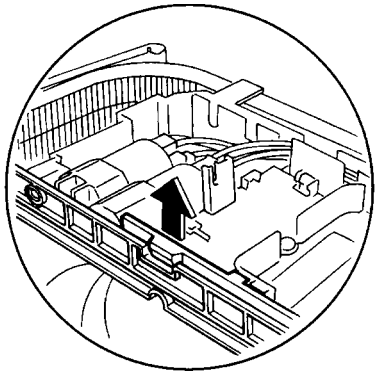
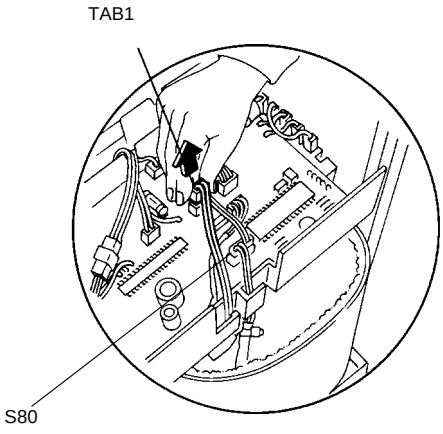
To remove the propeller fan and motor, proceed as follows:

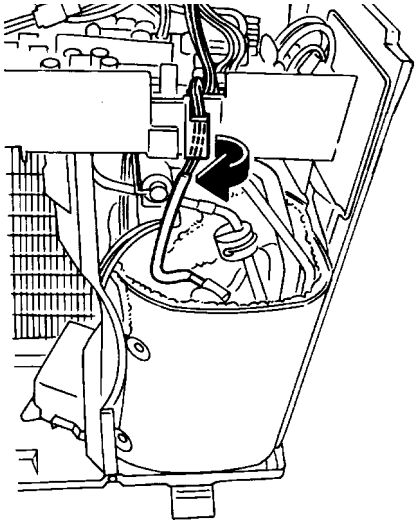
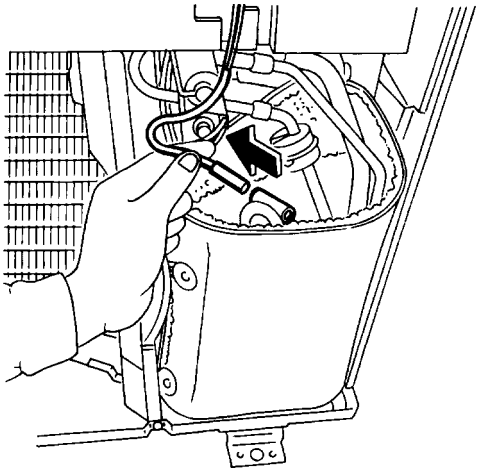
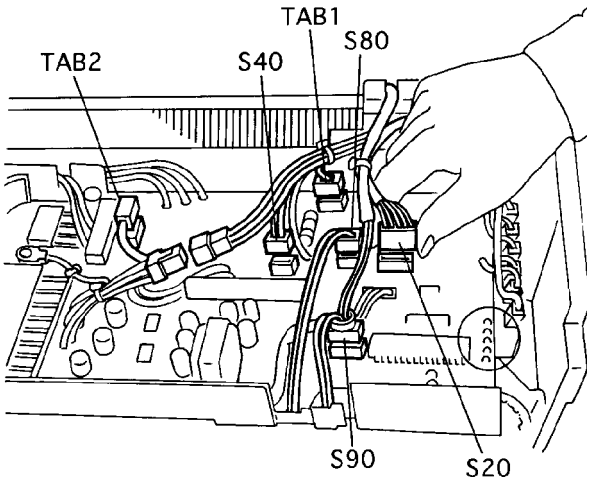
Step	Action	Drawing
1	Remove the drip proof cover for the electrical parts. ⚠ Do not break the cover.	
2	Disconnect connector S70 of PCB 2. ⚠ Do not hold the lead wires of the connector while disconnecting, but pull out the connector terminal.	
3	Remove the motor lead wire through the opening between the indoor heat exchanger temperature thermistor R3T and the electrical parts.	
4	Remove the nut to take off the propeller fan.	

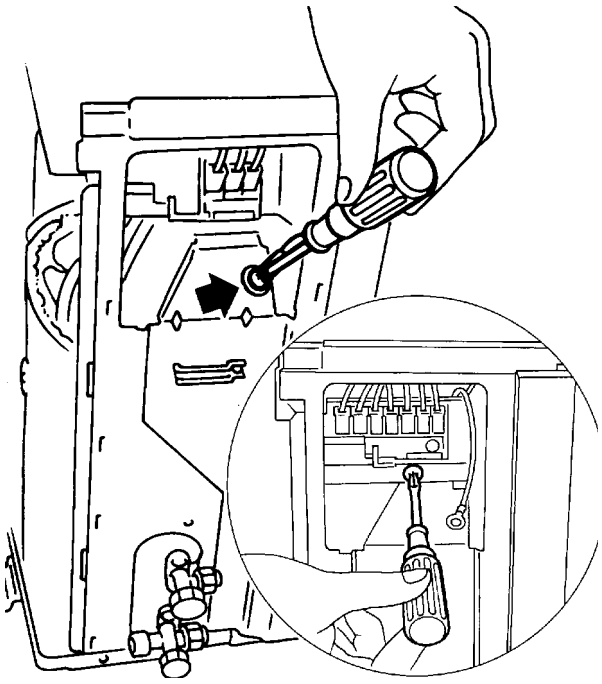
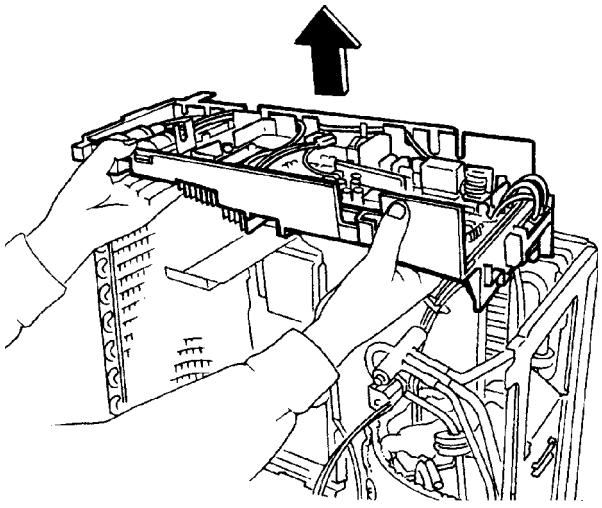
Step	Action	Drawing
5	Remove the 2 screws to take off the fan motor.	
6	Disengage the catches that fasten the motor lead wires.	
7	Remove motor. ⚠ Reassemble the motor with the specification plate upward.	

Removal of electrical parts

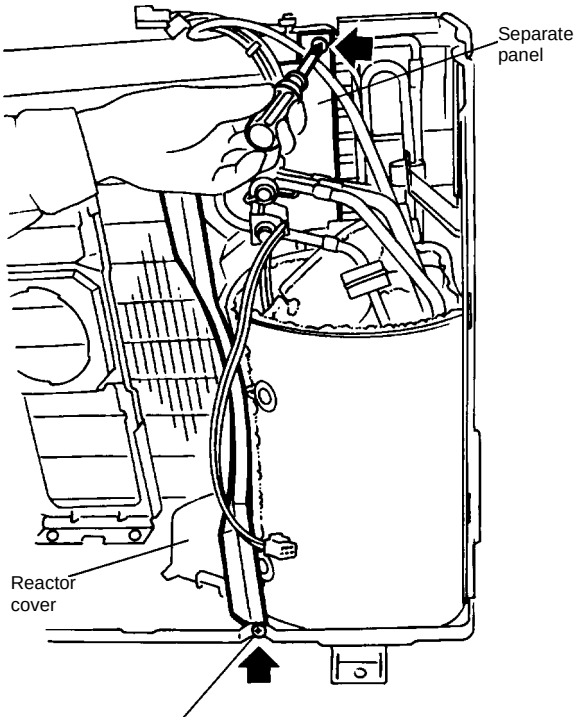
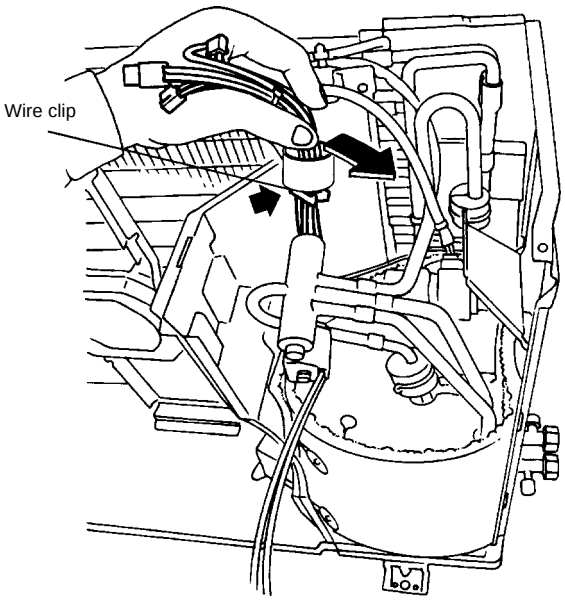
To remove the electrical parts, proceed as follows:

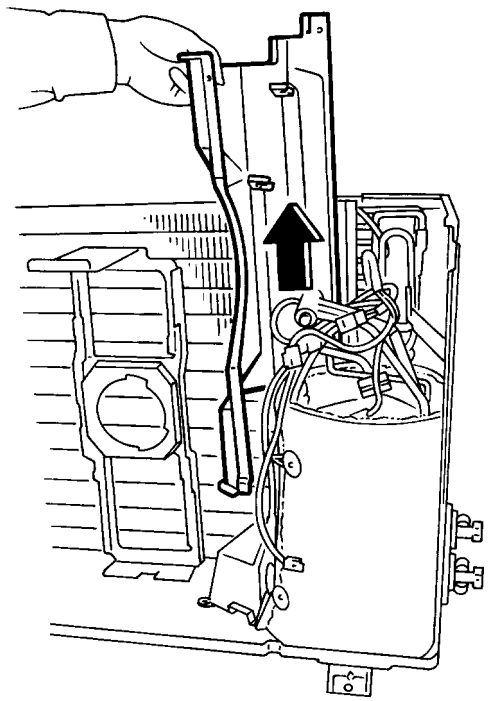
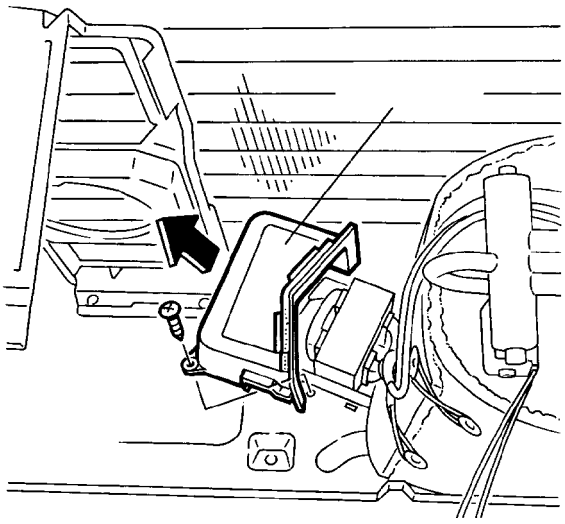
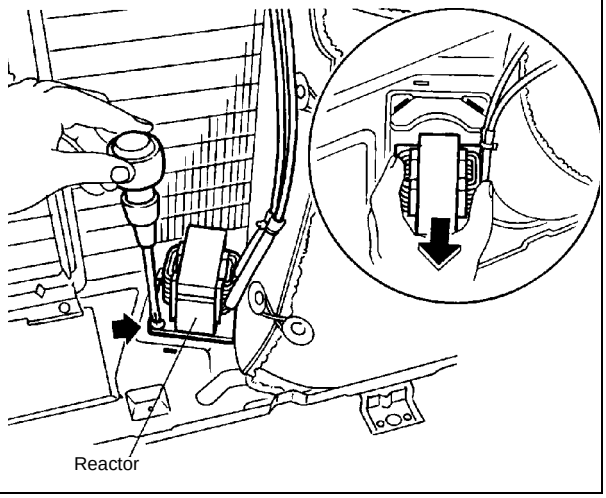
Step	Action	Drawing
1	Remove the 3 screws to take off the bell mouth.	
2	Disengage the catch at the top.	
3	Disconnect connector S80 of outdoor PCB 1. ⚠ Do not hold the lead wires of the connector while disconnecting, but pull out the connector terminal.	

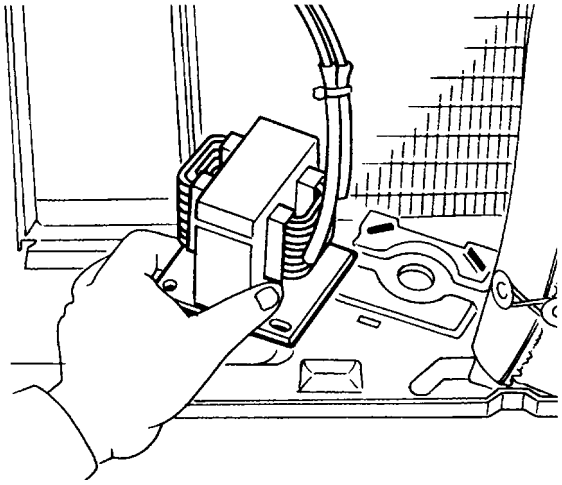
Step	Action	Drawing
4	Remove the lead wires from the clamps in the electrical box.	
5	Remove the discharge pipe thermistor R3T.	
6	Disconnect the grounding wire.	
7	Disconnect the connectors. ⚠ Do not hold the lead wires of the connector while disconnecting, but pull out the connector terminal.	

Step	Action	Drawing
8	Remove the screw that fastens the electrical box to the outdoor unit.	
9	Lift up the electrical parts box.	

Removal of reactor To remove the reactor, proceed as follows;

Step	Action	Drawing
1	Remove the 2 fixing screws.	
2	Release the lead wires of the reactor.	

Step	Action	Drawing
3	Lift up the partition plate.	
4	Remove the screw to take off the reactor cover.	
5	Remove the screw.	

Step	Action	Drawing
6	Slide the reactor to your side to remove it. The base plate of the reactor is inserted into the bottom of the frame slit.	

Part 4
Commissioning and Test Run

Introduction

Commissioning and test run are well known practices in service engineering. This part offers a systematic approach to test-run checks and test values which will guarantee a high quality installation and operation of the units. It is therefore recommended to read the chapters in this part with attention.

What is in this part?

This parts contains the following chapters:

1 Pre-Test Run Checks

1.1 What Is in This Chapter

Introduction

To assure proper operation of the unit, this chapter explains how to check before running the unit.

Overview

This chapter covers the following topics:

1.2 Checks for Test Run

Installation check

A checklist is given below:

- The indoor and outdoor unit, the interconnection and the power supply cable are at least 1 m away from televisions or radios. This is to prevent interference from the air conditioner.
- Make sure that air is distributed on the entire room.
- The wall is strong enough to bear the weight of the indoor unit.
- The unit is not exposed to direct sunlight.
- There are no obstructions for air inlet and outlet.
- The wall hole to the outdoor side for the electric wiring, the refrigerant and drain piping can be made without problems in terms of building structure.

Checks before test run

A checklist is given below:

- Measure the voltage at the primary side of the safety breaker and check that it is 230 V ± 10%.
- Check that the liquid stop valve and the gas stop valve are fully open.
- Never use a power supply shared by another appliance.

4

Test run checks

To execute a test run, make sure that following points are checked:

Checkpoints	Otherwise...
Is the unit securely installed?	-
Are all air inlets and outlets of the indoor and outdoor units unobstructed?	Poor cooling. Poor heating.
Does the drain flow out smoothly?	Water leakage.
Is the piping adequately heat-insulated?	Water leakage.
Have the connections been checked for gas leakage?	Poor cooling. Poor heating.
Is the supply voltage conform to the specifications on the name plate?	Incorrect operation.
Is the earth wire installed according to the applicable local standard?	Dangerous if electric leakage occurs.
Is the earth wire earthed?	Damage of cables.
Are the cable sizes as specified?	Damage of cables.
Are the remote controller signals received by the unit?	No operation.

1.3 Setting the Remote Controller

Address switch

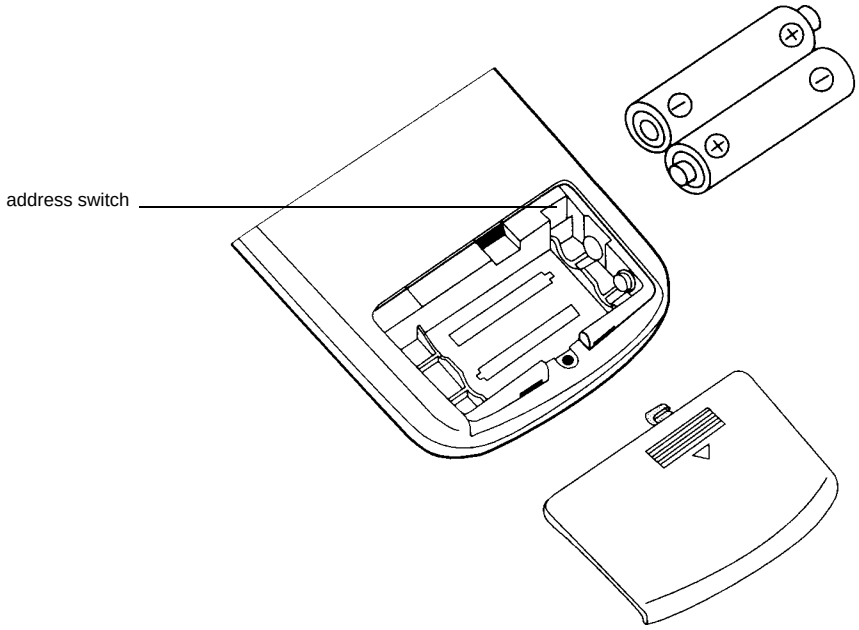
The address switch is used when one or two indoor units are installed in one room:

- one indoor unit: address switch set to 1
- two indoor units in one room: address switch set to 2.

Make sure to set the address switch on PCB 1 of the indoor unit. Refer to ‘Main board PCB 1’ on page 1-17.

Drawing

The following drawing shows the location of the address switch:



2 Test Run & Operation Data

2.1 What Is in This Chapter

Introduction

The following drawings and tables give an overview of the measurements that you can do. Use it as a guideline during commissioning.

For the location of the measurement points, we refer to the piping and wiring diagrams in Part 1.

Overview

This chapter covers the following topics:

2.2 General Operation Data

During cooling mode

During cooling mode, the operating conditions must be as follows:

Items	Operating modes	If the operation is out of this range:
Outdoor temperature	20 °C to 43 °C	■ A safety device may stop the operation. ■ Condensation may occur on the indoor unit and start dripping.
Indoor temperature	21 °C to 32 °C	
Indoor humidity	80 %	

During heating mode

During heating mode, the operating conditions must be as follows:

Items	Operating modes	If the operation is out of this range:
Outdoor temperature	-10 °C to 21 °C	A safety device may stop the operation.
Indoor temperature	maximum 27 °C	

4

During drying mode

During drying mode, the operating conditions must be as follows:

Items	Operating modes	If the operation is out of this range:
Outdoor temperature	18 °C to 43 °C	■ A safety device may stop the operation. ■ Condensation may occur on the indoor unit and start dripping.
Indoor temperature	18 °C to 32 °C	
Indoor humidity	80 %	

Recommended temperature setting

The recommended temperature settings are:

- for cooling: maximum 7 °C difference from the outdoor temperature.
- for heating: 20 °C - 24°C.

Off period

Turn the breaker off if you are not using the air conditioner for a long period.

2.3 Operation Range

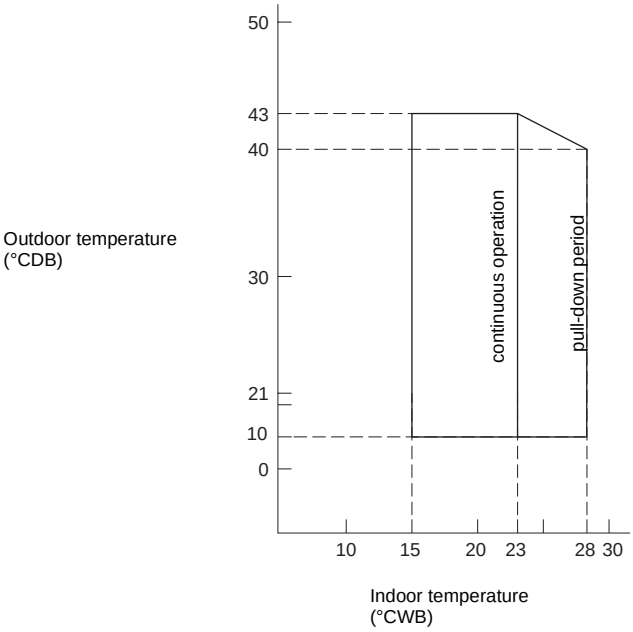
Conditions

The graphics below are based on the following conditions:

- an equivalent piping length of 5 meters
- a level difference of 0 meters
- an high-speed airflow rate.

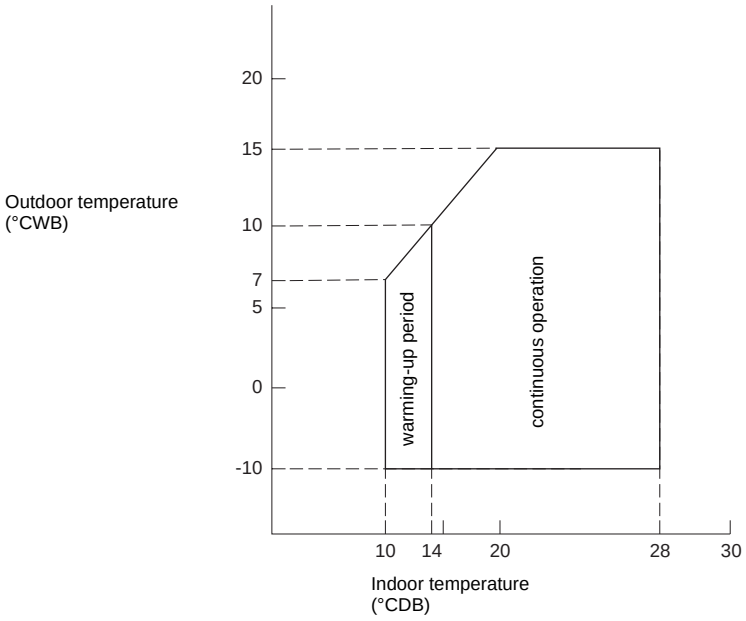
Cooling mode

The following drawing shows the operation range in cooling mode:



Heating mode

The following drawing shows the operation range in heating mode:



2.4 Test Run from the Remote Controller

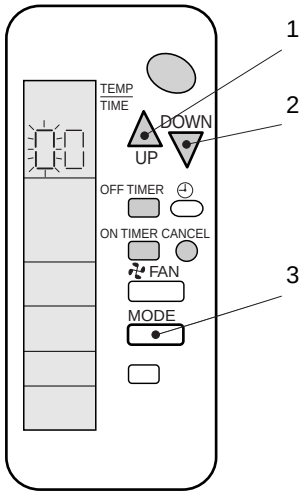
Introduction

You are able to test the air conditioner through the remote controller independent from the room temperature and the temperature setting (i.e. with the thermostat of the indoor unit bridged).

Carry out the test operation using the operation manual.

Test procedure

To run the test, proceed as follows:

Step	Action
1	Press the ON/OFF button of the remote controller to switch on the system.
2	■ Press buttons UP (1),DOWN (2) and MODE (3) simultaneously. ■ Press the MODE (3) button two times to start the test mode. 
3	Wait until the test mode terminates (approximately 60 minutes) and switches automatically into normal mode.
4	Press the ON/OFF button to exit.

If the system is not used for a certain time, switch off the circuit breaker to avoid unnecessary power consumption.

Part 5
Maintenance

Introduction

Preventive maintenance should be set up for operation at maximum capacity or to avoid damage. The following chapters explain how to or when to maintain the units.

What is in this part?

This part contains the following chapters:

5

1 Maintenance

1.1 What Is in This Chapter

Introduction

This chapter explains some basic procedures that you can use for maintenance of the indoor units.

Make sure that the power supply is turned off and turn the breaker off.

Overview

This chapter covers the following topics:

5

1.2 Maintenance for Indoor Units

Checks

To maintain the indoor unit, proceed as follows:

Item	Check	If not,...	Otherwise...
Air filter	Check whether the air filter is clean. The unit must be turned off when you change the filter.	Clean the filter and dry it with a vacuum cleaner. Refer to 'Cleaning the air filters' on page 3-69.	A dirty filter results in poor capacity.
Indoor heat exchanger	Check whether the heat exchanger is dirty.	Clean with low pressure water and a vacuum cleaner.	A dirty heat exchanger results in poor capacity.
Electrical connection	Check whether all electrical connections are tightened properly.	Tighten them.	A loose connection can result in sparks.
Fan rotor	Check whether the rotor is clean.	Remove the rotor and clean with water. Make sure it is dry.	A dirty rotor results in unbalance.
Noise level	Check whether there is no abnormal noise.	Find the problem, refer to 'Sounds' on page 3-4.	It can result in a higher noise level.
Drain	Check whether the drain is not blocked.	Unblock it.	A blocked drain results in water leakage.
Drain pump (if installed)	Check whether the operation of the drain pump is normal.	Repair it.	A faulty drain pump results in water leakage.

5

1.3 Maintenance for Outdoor Units

Checks

To maintain the indoor unit, proceed as follows:

Item	Check	If not,...	Otherwise,...
Outdoor heat exchanger	Check whether the heat exchanger is clean.	Clean with low pressure water and dry it with a vacuum cleaner.	A dirty heat exchanger results in poor capacity.
Electrical connection	Check whether all electrical connections are tightened properly.	Tighten them.	A loose connection can result in sparks.
Propeller	Check whether the propeller is in balance.	Change propeller.	An unbalanced propeller results in a higher noise level.
Casing	Check whether the casing is undamaged.	Repaint damaged parts.	Damage of casing leads to a rusty unit.
Insulation	Check whether the insulation is in normal shape.	Repair it.	A bad insulation results in poor outlook of the installation.
Noise level	Check whether there is no abnormal noise .	Find the problem, refer to ‘Sounds’ on page 3-4.	It can result in a higher noise level.
Drain (heat pump)	Check whether the drain hole is free.	Remove dirt.	A blocked drain results in water leakage.
Drain pump (if installed)	Check whether the operation of the drain pump is normal.	Repair it.	A faulty drain pump results in water leakage.

1.4 General Maintenance

Check

To execute good maintenance, proceed as follows:

Item	Check	If not,...	Otherwise
Pressure, voltage, current and temperature.	Compare with previous maintenance.	resolve the problem.	It can result in poor operation of the unit.

Appendix Drawings

Introduction

In order to find quickly the drawings inserted in this manual, appendix B offers a list with all the drawings.

Drawings table

The following table shows the page and description of all the drawings:

A

A

Index

This index is set up in three columns. In the first column you will find references to the item in general. In the second column you will find references to the indoor units and in the third column to the outdoor units.

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