Changes for the Better

MITSUBISHI ELECTRIC

SPLIT-TYPE, HEAT PUMP AIR CONDITIONERS

HFC utilized R410A

November 2013

No. OCH502
REVISED EDITION-C

TECHNICAL & SERVICE MANUAL

Outdoor unit
[Model Name] **[Service Ref.]**

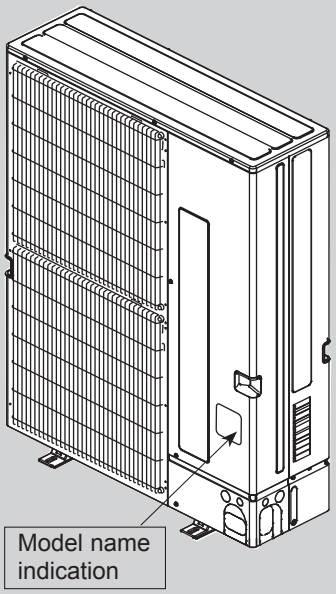
PUMY-P60NKMU **PUMY-P60NKMU**

PUMY-P60NKMU-BS **PUMY-P60NKMU-BS**

Revision:
- Replaced troubleshooting table with flow chart in REVISED EDITION-C.
- Some descriptions have been modified.

- Please void OCH502 REVISED EDITION-B.

Note :
- This service manual describes technical data of outdoor unit. As for indoor units, refer to its service manual.



OUTDOOR UNIT

CONTENTS

PARTS CATALOG (OCB502)

Intertek 33223

CITY MULTI

1 SAFETY PRECAUTION

CAUTIONS RELATED TO NEW REFRIGERANT

Cautions for units utilizing refrigerant R410A

Use new refrigerant pipes.

Avoid using thin pipes.

Make sure that the inside and outside of refrigerant piping is clean and it has no contaminants such as sulfur, oxides, dirt, shaving particles, etc, which are hazard to refrigerant cycle.
In addition, use pipes with specified thickness.

Contamination inside refrigerant piping can cause deterioration of refrigerant oil etc.

Store the piping indoors, and both ends of the piping sealed until just before brazing.
(Leave elbow joints, etc. in their packaging.)

If dirt, dust or moisture enters into refrigerant cycle, that can cause deterioration of refrigerant oil or malfunction of compressor.

The refrigerant oil applied to flare and flange connections must be ester oil, ether oil or alkylbenzene oil in a small amount.

If large amount of mineral oil enters, that can cause deterioration of refrigerant oil etc.

Charge refrigerant from liquid phase of gas cylinder.

If the refrigerant is charged from gas phase, composition change may occur in refrigerant and the efficiency will be lowered.

Do not use refrigerant other than R410A.

If other refrigerant (R22 etc.) is used, chlorine in refrigerant can cause deterioration of refrigerant oil etc.

Use a vacuum pump with a reverse flow check valve.

Vacuum pump oil may flow back into refrigerant cycle and that can cause deterioration of refrigerant oil etc.

Use the following tools specifically designed for use with R410A refrigerant.

The following tools are necessary to use R410A refrigerant.

Tools for R410A	
Gauge manifold	Flare tool
Charge hose	Size adjustment gauge
Gas leak detector	Vacuum pump adaptor
Torque wrench	Electronic refrigerant charging scale

Handle tools with care.

If dirt, dust or moisture enters into refrigerant cycle, that can cause deterioration of refrigerant oil or malfunction of compressor.

Do not use a charging cylinder.

If a charging cylinder is used, the composition of refrigerant will change and the efficiency will be lowered.

Ventilate the room if refrigerant leaks during operation. If refrigerant comes into contact with a flame, poisonous gases will be released.

Use the specified refrigerant only.

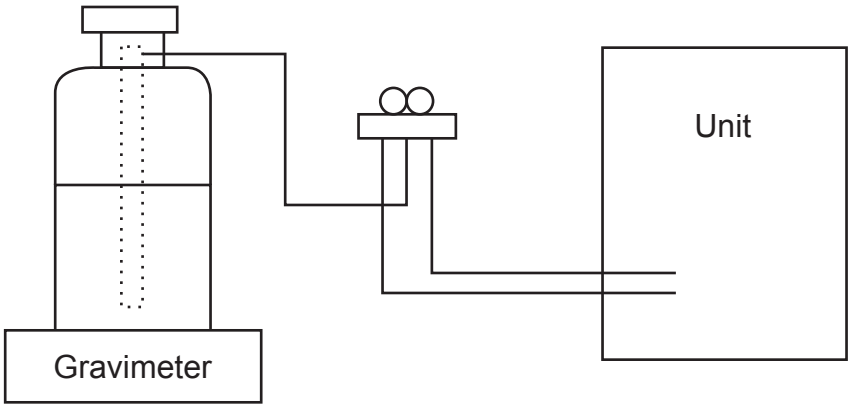
Never use any refrigerant other than that specified.
Doing so may cause a burst, an explosion, or fire when the unit is being used, serviced, or disposed of.
Correct refrigerant is specified in the manuals and on the spec labels provided with our products.
We will not be held responsible for mechanical failure, system malfunction, unit breakdown or accidents caused by failure to follow the instructions.

[1] Cautions for service

(1) Perform service after recovering the refrigerant left in unit completely.
(2) Do not release refrigerant in the air.
(3) After completing service, charge the cycle with specified amount of refrigerant.
(4) When performing service, install a filter drier simultaneously.
Be sure to use a filter drier for new refrigerant.

[2] Additional refrigerant charge

When charging directly from cylinder
· Check that cylinder for R410A on the market is syphon type.
· Charging should be performed with the cylinder of syphon stood vertically. (Refrigerant is charged from liquid phase.)



[3] Service tools

Use the below service tools as exclusive tools for R410A refrigerant.

No.	Tool name	Specifications
①	Gauge manifold	· Only for R410A
		· Use the existing fitting specifications. (UNF1/2)
		· Use high-tension side pressure of 5.3MPa·G or over.
②	Charge hose	· Only for R410A
		· Use pressure performance of 5.09MPa·G or over.
③	Electronic scale	—
④	Gas leak detector	· Use the detector for R134a, R407C or R410A.
⑤	Adaptor for reverse flow check	· Attach on vacuum pump.
⑥	Refrigerant charge base	—
⑦	Refrigerant cylinder	· Only for R410A · Top of cylinder (Pink) · Cylinder with syphon
⑧	Refrigerant recovery equipment	—

Cautions for refrigerant piping work

New refrigerant R410A is adopted for replacement inverter series. Although the refrigerant piping work for R410A is same as for R22, exclusive tools are necessary so as not to mix with different kind of refrigerant. Furthermore as the working pressure of R410A is 1.6 times higher than that of R22, their sizes of flared sections and flare nuts are different.

① Thickness of pipes

Because the working pressure of R410A is higher compared to R22, be sure to use refrigerant piping with thickness shown below. (Never use pipes of 0.7 mm or below.)

Diagram below: Piping diameter and thickness

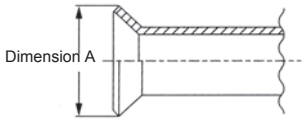
Nominal dimensions(inch)	Outside diameter (mm)	Thickness (mm)	
		R410A	R22
1/4	6.35	0.8	0.8
3/8	9.52	0.8	0.8
1/2	12.70	0.8	0.8
5/8	15.88	1.0	1.0
3/4	19.05	1.0 *	1.0

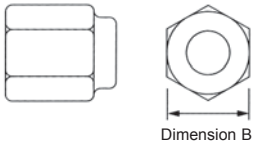
* Use 1/2H or H pipes.

② Dimensions of flare cutting and flare nut

The component molecules in HFC refrigerant are smaller compared to conventional refrigerants. In addition to that, R410A is a refrigerant, which has higher risk of leakage because its working pressure is higher than that of other refrigerants. Therefore, to enhance airtightness and intensity, flare cutting dimension of copper pipe for R410A has been specified separately from the dimensions for other refrigerants as shown below. The dimension B of flare nut for R410A also has partly been changed to increase intensity as shown below. Set copper pipe correctly referring to copper pipe flaring dimensions for R410A below. For 1/2 and 5/8 inch, the dimension B changes.

Use torque wrench corresponding to each dimension.





Flare cutting dimensions

Nominal dimensions(inch)	Outside diamer (mm)	Dimension A ($^{+0}_{-0.4}$) (mm)	
		R410A	R22
1/4	6.35	9.1	9.0
3/8	9.52	13.2	13.0
1/2	12.70	16.6	16.2
5/8	15.88	19.7	19.4
3/4	19.05	—	23.3

Flare nut dimensions

Nominal dimensions(inch)	Outside diameter(mm)	Dimension B(mm)	
		R410A	R22
1/4	6.35	17.0	17.0
3/8	9.52	22.0	22.0
1/2	12.70	26.0	24.0
5/8	15.88	29.0	27.0
3/4	19.05	—	36.0

③ Tools for R410A (The following table shows whether conventional tools can be used or not.)

Tools and materials	Use	R410A tools	Can R22 tools be used?	Can R407C tools be used?
Gauge manifold	Air purge, refrigerant charge and operation check	Tool exclusive for R410A	×	×
Charge hose		Tool exclusive for R410A	×	×
Gas leak detector	Gas leak check	Tool for HFC refrigerant	×	○
Refrigerant recovery equipment	Refrigerant recovery	Tool exclusive for R410A	×	×
Refrigerant cylinder	Refrigerant charge	Tool exclusive for R410A	×	×
Applied oil	Apply to flared section	Ester oil, ether oil and alkylbenzene oil (minimum amount)	×	Ester oil, ether oil: ○ Alkylbenzene oil: minimum amount
Safety charger	Prevent compressor malfunction when charging refrigerant by spraying liquid refrigerant	Tool exclusive for R410A	×	×
Charge valve	Prevent gas from blowing out when detaching charge hose	Tool exclusive for R410A	×	×
Vacuum pump	Vacuum drying and air purge	Tools for other refrigerants can be used if equipped with adapter for reverse flow check	△ (Usable if equipped with adapter for reverse flow)	△ (Usable if equipped with adapter for reverse flow)
Flare tool	Flaring work of piping	Tools for other refrigerants can be used by adjusting flaring dimension	△ (Usable by adjusting flaring dimension)	△ (Usable by adjusting flaring dimension)
Bender	Bend the pipes	Tools for other refrigerants can be used	○	○
Pipe cutter	Cut the pipes	Tools for other refrigerants can be used	○	○
Welder and nitrogen gas cylinder	Weld the pipes	Tools for other refrigerants can be used	○	○
Refrigerant charging scale	Refrigerant charge	Tools for other refrigerants can be used	○	○
Vacuum gauge or thermistor vacuum gauge and vacuum valve	Check the degree of vacuum. (Vacuum valve prevents back flow of oil and refrigerant to thermistor vacuum gauge)	Tools for other refrigerants can be used	○	○
Charging cylinder	Refrigerant charge	Tool exclusive for R410A	×	—

× : Prepare a new tool. (Use the new tool as the tool exclusive for R410A.)

△ : Tools for other refrigerants can be used under certain conditions.

○ : Tools for other refrigerants can be used.

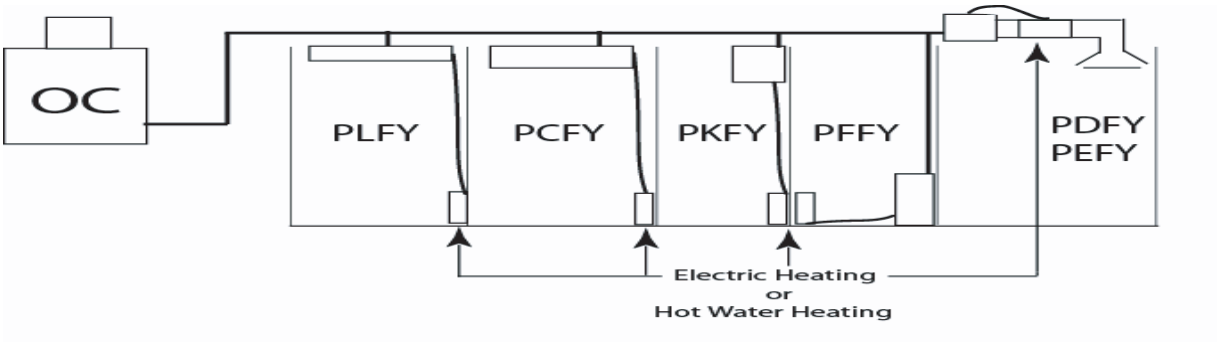
2 OVERVIEW OF UNITS

2-1. Auxiliary HEATING ON/OFF CONTROL SET-UP

(1) Auxiliary heating operation controls another heat source that depends on the main system's operations, which means the interlock operation shown in "b)" will be possible.

a) Indoor unit must be R410A UL model for this function to operate.

b) Different Indoor unit applications that can be applied:



(2) Outdoor unit DIPSW5-4 for auxiliary heating control:

Set DIPSW5-4 when power is turned off at unit.

OFF: Disable auxiliary Heating Function (Initial setting)

ON : Enable auxiliary Heating Function

(3) Determine required indoor fans speed during defrost mode:

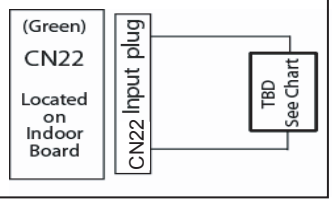
a) With no auxiliary heating output the Indoor fan normally goes off to prevent cold drafts during the defrost cycles.

b) With auxiliary heating control the auxiliary heat will be on during defrost mode, thus cold drafts will not be present. (Ducted units only)

c) For models PEFY and PDFY (Ducted) recommended to use "Black" (20K) connector.

d) For models PLFY, PCFY, PKFY and PFFY (Ductless) recommended "None", no connector required.

e) To set the fan airflow rate to be used during defrost operation, insert the resistance that is packed within the optional adaptor cable kit (PAC-YU24HT-F) into the CN22 sensor input.
You can choose at what speed the indoor fan operates during defrost cycles bases on chart below.

Fan airflow rate setting During defrost operation	OFF	ON				Wiring
CN22 input resistance (Ω)	0	20k	27k	39k	62K	
CN22 input (cable color)	None	Black	Blue	White	Red	
Fan speed setting	Stopped	Setting on remote controller	Very Low	Low	High	

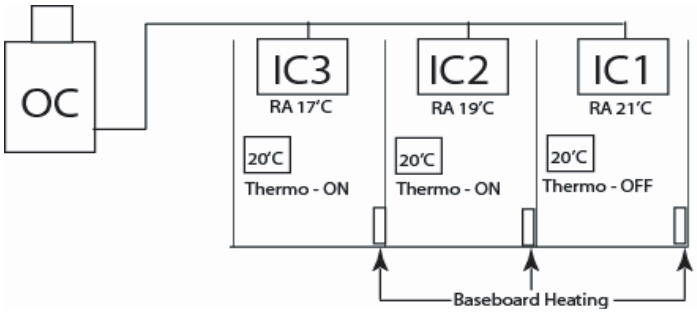
Note: The setting will be disabled "when Heater contact signal is OFF".

(4) Determine fan airflow setting during indoor thermo-OFF conditions:

a) These settings are done within Indoor DIPSW1-7 and DIPSW1-8, see chart below for options.

b) Recommended SW1-7 OFF and SW1-8 ON will determine airflow based on "Setting on the remote controller".

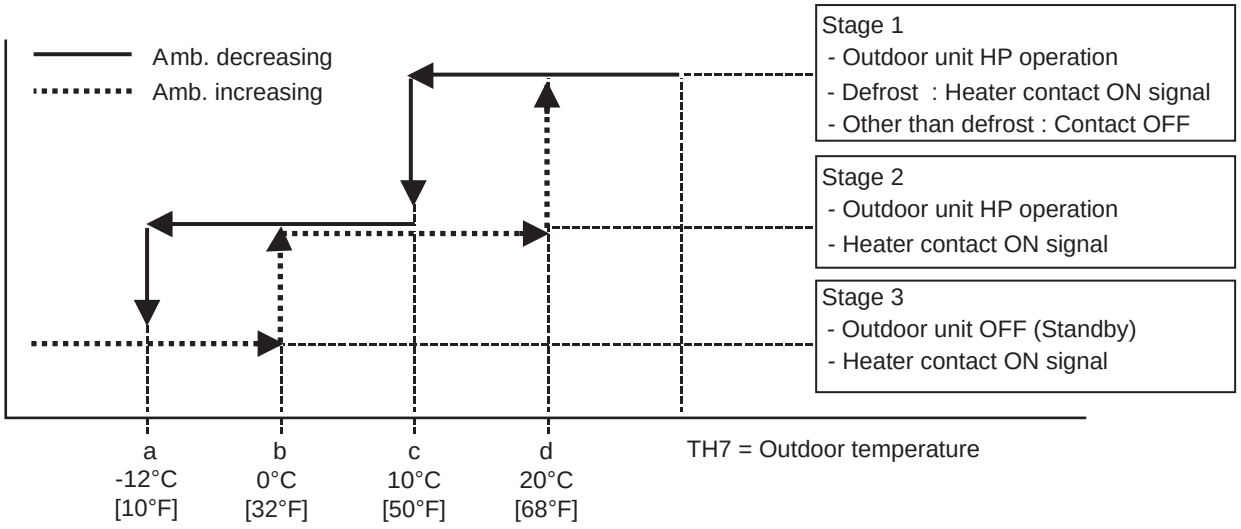
Auxiliary heating signal		Fan speed setting	Fan speed setting
Thermo condition		OFF	ON
SW1-7	SW1-8		
OFF	OFF	Very low	Setting on remote controller
ON	OFF	Low	
OFF	ON	Setting on remote controller	
ON	ON	Stopped	



(5) Setting outdoor unit and auxiliary heat switch over temperatures.

When the DIPSW 5-4 is set to "ON", the outdoor unit and the contact output operates as shown below.

a) Outdoor default setting and operations are shown below:



When the set temperature ranges overlap, the previously set pattern (1,2 or 3) has a priority.
The stage 1 has the highest priority, 2 the second and then 3.

b) Based on above chart listed the sequence of operation on "On ambient decrease"

Stage 1 :(TH7 = > 10℃) : the outdoor unit runs in HP mode.
Stage 2 :(TH7 = 10℃ to -12℃) : the outdoor unit runs in HP mode with auxiliary heating.
Stage 3 :(TH7 = < -12℃) : Auxiliary heating only (Outdoor unit is OFF).

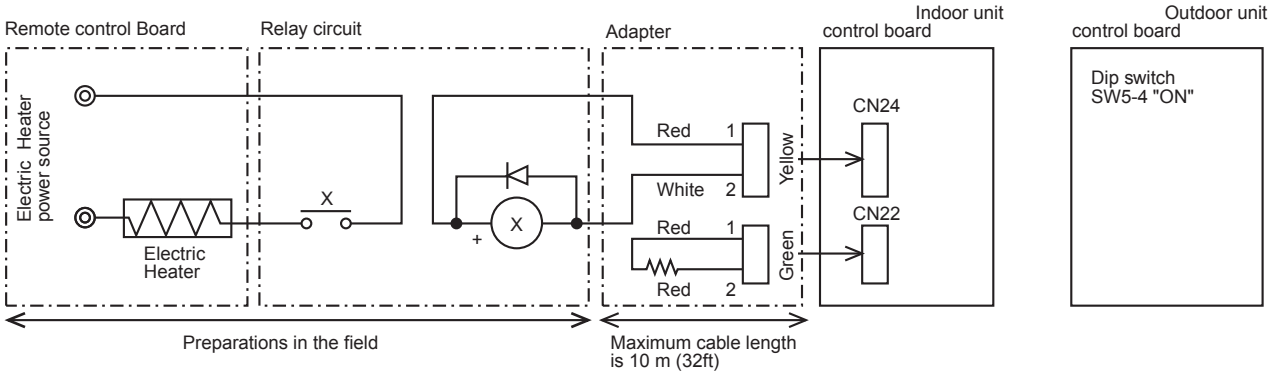
c) Based on above chart listed the sequence of operation on "On ambient increase"

Stage 3 :(TH7 = < 0℃) : Auxiliary heating only (Outdoor unit is OFF).
Stage 2 :(TH7 = > 0℃ to 20℃) : Auxiliary heating with outdoor unit in HP mode.
Stage 1 :(TH7 = > 20℃) : Outdoor unit in HP mode only.

(6) Locally procured wiring

A basic connection method is shown.

(i.e. interlocked operation with the electric heater with the fan speed setting on high)



For relay X use the specifications given below operation coil

Rated voltage : 12VDC

Power consumption :0.9W or less

*Use the diode that is recommended by the relay manufacturer at both ends of the relay coil.

The length of the electrical wiring for the PAC-YU24HT is 2 meters (6-1/2 ft)

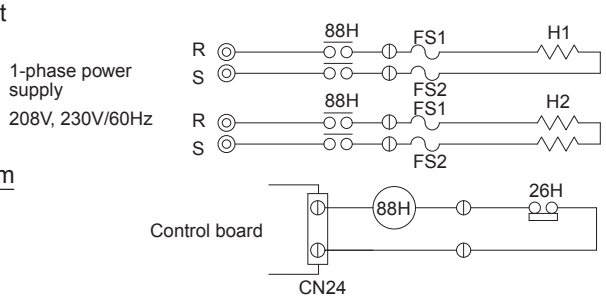
To extend this length, use sheathed 2-core cable.

Control cable type : CVV, CVS, CPEV or equivalent.

Cable size : 0.5 mm^2 to 1.25 mm^2 (AWG22 to AWG16)

Do not extend the cable more than 10 meters (32ft).

Recommended circuit



Wiring diagram

FS1, 2 ----- Thermal fuse

H1, H2 ----- Heater

26H --------- Overheat protection thermostat

88H --------- Electromagnetic contactor

2-2. UNIT CONSTRUCTION

Outdoor unit		P60
Indoor unit that can be connected	Capacity	Type 06 ~ Type 72
	Number of units	1~ 12 unit
	Total system wide capacity	50% ~130% of outdoor unit capacity

↓

	CMY-Y62-G-E	CMY-Y64-G-E	CMY-Y68-G-E
Branching pipe components	Branch header (2 branches)	Branch header (4 branches)	Branch header (8 branches)

↓

Model / Capacity	Ceiling Cassette			Ceiling Concealed			Ceiling mounted built-in	Wall Mounted			Ceiling Suspended	Floor Standing		Ceiling Concealed (Fresh Air)*	Vertical concealed
	4-way flow		1-way flow									Exposed	Concealed		
	PLFY-P		PMFY-P	PEFY-P			PDFY-P	PKFY-P			PCFY-P	PFFY-P		PEFY-P	PVFY-P
	NCMU-E	NBMU-E	NBMU-E	NMAU-E	NMHU-E	NMSU-E	NMU-E	NBMU-E	NHMU-E	NKMU-E	NKMU-E	NEMU-E	NRMU-E	NMHU-E-F	E00A
06	—	—	○	○	—	○	○	○	—	—	—	○	○	—	—
08	○	—	○	○	—	○	○	○	—	—	—	○	○	—	—
12	○	○	○	○	—	○	○	—	○	—	—	○	○	—	○
15	○	○	○	○	○	○	○	—	○	—	○	○	○	—	—
18	—	○	—	○	○	○	○	—	○	—	—	○	○	—	○
24	—	○	—	○	○	○	○	—	—	○	○	○	○	—	○
27	—	—	—	○	○	—	○	—	—	—	—	—	—	—	—
30	—	○	—	○	○	—	○	—	—	○	○	—	—	○	○
36	—	○	—	○	○	—	○	—	—	—	○	—	—	—	○
48	—	—	—	○	○	—	○	—	—	—	—	—	—	—	○
54	—	—	—	○	○	—	—	—	—	—	—	—	—	○	○
72	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—

Decorative panel

↓

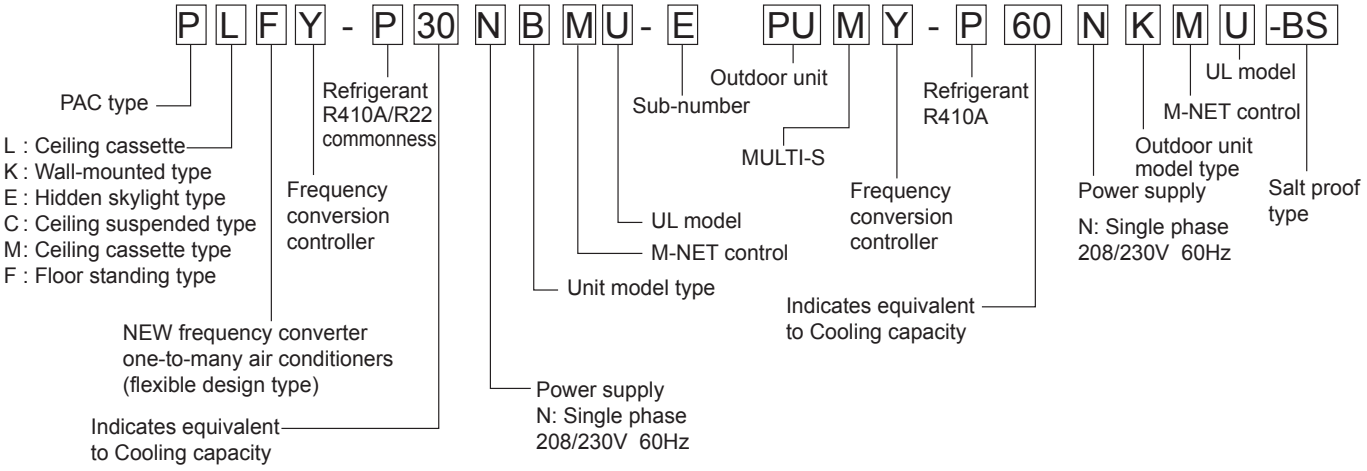
Remote controller	Name	M-NET remote controller	MA remote controller
	Model number	PAR-F27MEA-US	PAR-21MAAU-J, PAR-30MAAU-J
	Functions	• A handy remote controller for use in conjunction with the Melans centralized management system. • Addresses must be set.	• Address setting is not necessary.

*It is possible only by 1:1 system.
(1 indoor unit of Fresh Air type is connected with 1 outdoor unit.)
Operating temperature range (outdoor temperature) for fresh air type indoor units differ from other indoor units.
Refer to 2-2(2).

2-3. UNIT SPECIFICATIONS

(1) Method for identifying MULTI-S model

■ **Indoor unit < When using Model 30 >**



■ **Outdoor unit <When using model 60 >**

(2) Operating temperature range

	Cooling	Heating
Indoor-side intake air temperature	W.B. 15 - 24°C [59 - 75°F]	D.B. 15 - 27°C [59 - 81°F]
Outdoor-side intake air temperature	D.B. −5 - 46°C [23 - 115°F]*	W.B. −20 - 15°C [−4 - 60°F]

Notes D.B. : Dry Bulb Temperature
W.B. : Wet Bulb Temperature

*10 - 46°C DB [50 - 115°FDB] : In the case of connecting PKFY-P06/P08 type indoor unit.

■ In the case of connecting fresh air type indoor unit

	Capacity of Fresh air type indoor	Cooling	Heating
Indoor-side and Outdoor-side intake air temperature	P30	D.B.21 - 43℃ [70 - 109°F] ** W.B.15.5 - 35℃ [60 - 95°F]	D.B.−10 - 20℃ [14 - 68°F] ***
	P54	D.B.21 - 43℃ [70 - 109°F] ** W.B.15.5 - 35℃ [60 - 95°F]	D.B.−5 - 20℃ [23 - 68°F] ***

** Thermo-off (FAN-mode) automatically starts if the outdoor temp. is lower than 21℃ D.B.[70°FD.B.].
***Thermo-off (FAN-mode) automatically starts if the outdoor temp. is higher than 20℃ D.B.[68°FD.B.].

(3) Guaranteed voltage

198 - 253V, 60Hz

3 SPECIFICATIONS

Item \ Service Ref.			PUMY-P60NKMU(-BS)
Cooling Capacity		Btu/h	60,000
Heating Capacity		Btu/h	66,000
Input (Cool)***		kW	4.80
Input Current (Cool)***		A	21.5
Power factor (Cool)***		%	97.0
Input (Heat)***		kW	6.15
Input Current (Heat)***		A	27.6
Power factor (Heat) ***		%	97.0
EER (Cool)***		Btu/h/W	12.5
COP (Heat)***		W/W	3.14
Connectable indoor units (Max.)			12
Max. Connectable Capacity		Btu/h	78,000(130%)
Power Supply			Single phase , 60Hz , 208/230V
Breaker Size			40A
Max. fuse size			42A
Min.Circuit.Ampacity			25A
Sound level (Cool/Heat)		dB	58 / 59
External finish			Munsell 3Y 7.8/1.1
Refrigerant control			Linear Expansion Valve
Compressor			Hermetic
	Model		ANB66FFZMT
	Motor output	kW	3.0
	Capacity control	%	Cooling 38-100 Heating 29-100
	Starting method		Inverter
Crankcase heater		W	—
Heat exchanger			Plate fin coil (Anti corrosion fin treatment)
Fan	Fan(drive) × No.		Propeller fan × 2
	Fan motor output	kW	0.16 + 0.16
	Airflow	m^3/min [CFM]	140 [4,940]
Dimensions (H×W×D)	W	mm [in]	1,050 [41-5/16]
	D	mm [in]	330+30 [13+1-3/16]
	H	mm [in]	1,338 [52+11/16]
Weight		kg [lb]	142 [313]
Refrigerant			R410A
	Charge	kg [lb]	5.1 [11.2]
	Oil (Model)	L [oz]	2.3 [73] (FV50S)
Protection devices	High pressure protection		HP switch
	Compressor protection		Compressor thermo, Over current detection
	Fan motor protection		Overheating/Voltage protection
Total Piping length (Max.)		m [ft]	150 [492]
Farthest		m [ft]	80 [262]
Max Height difference		m [ft]	50 [164] *
Chargeless length		m [ft]	0 [0]
Piping diameter	Liquid	ϕmm[in]	9.52 [3/8]
	Gas	ϕmm[in]	19.05 [3/4]
Guaranteed operation range		(cool)	−5 - 46℃ DB [23 - 115°F DB]**
		(heat)	−20 - 15℃ WB [−4 - 60°F WB]

Rating conditions

Cooling Indoor : D.B. 26.7°C / W.B. 19.4°C [D.B. 80°F / W.B. 67°F]
Outdoor : D.B. 35°C [D.B. 95°F]

Heating Indoor : D.B. 21.1°C [D.B. 70°F]
Outdoor : D.B. 8.3°C / W.B. 6.1°C [D.B. 47°F / W.B. 43°F]

*40m [140ft] : In the case of installing outdoor unit lower than indoor unit.
**10 - 46°C [50 - 115°F]DB : In the case of connecting PKFY-P06/P08 type indoor unit.
***Electrical data is for only outdoor unit.
(In case of connecting 4 indoor units of PKFY-P06NBMU×2 and PKFY-P24NKMU×2)

Btu/h=kW × 3,412 CFM=m^3/min × 35.31 lbs=kg/ 0.4536

Note: Above specification data is subject to rounding variation.

4 DATA

4-1. COOLING AND HEATING CAPACITY AND CHARACTERISTICS

4-1-1. Method for obtaining system cooling and heating capacity:

To obtain the system cooling and heating capacity and the electrical characteristics of the outdoor unit, first add up the ratings of all the indoor units connected to the outdoor unit (see table below), and then use this total to find the standard capacity with the help of the tables on 4-2. STANDARD CAPACITY DIAGRAM.

(1) Capacity of indoor unit

Model number for indoor unit	Model 06	Model 08	Model 12	Model 15	Model 18	Model 24	Model 27	Model 30	Model 36	Model 48	Model 54	Model 72
Model Capacity	6	8	12	15	18	24	27	30	36	48	54	72

(2) Sample calculation

① System assembled from indoor and outdoor unit (in this example the total capacity of the indoor units is greater than that of the outdoor unit)

- Outdoor unit PUMY-P60NKMU
- Indoor unit PKFY-P08NAMU-E × 2 , PLFY-P18NBMU-E × 3

② According to the conditions in ①, the total capacity of the indoor unit will be: 8 × 2 + 18 × 3 = 70

③ The following figures are obtained from the 52 total capacity row of the standard capacity table (4-2.):

Capacity (Btu/h)		Outdoor unit power consumption (kW)		Outdoor unit current (A)/230V	
Cooling	Heating	Cooling	Heating	Cooling	Heating
Ⓐ 62,000	Ⓑ 68,000	4.62	5.91	20.3	26.0

4-1-2. Method for obtaining the heating and cooling capacity of an indoor unit:

(1) The capacity of each indoor unit (Btu/h) = the capacity Ⓐ (or Ⓑ) × $\frac{\text{model capacity}}{\text{total model capacity of all indoor units}}$

(2) Sample calculation (using the system described above in 4-1-1. (2)):

During cooling:

• The total model capacity of the indoor unit is:
8000 × 2 + 18000 × 3 = 70000Btu/h
Therefore, the capacity of PKFY-P08NAMU-E and PLFY-P18NBMU-E will be calculated as follows by using the formula in 4-1-2. (1):

Model 08= 62,000 × $\frac{8000}{70000}$ = 7,090 Btu/h

Model 18= 62,000 × $\frac{18000}{70000}$ = 15,940 Btu/h

During heating:

• The total model capacity of indoor unit is:
9000 × 2 + 20000 × 3 = 78000 Btu/h
Therefore, the capacity of PKFY-P08NAMU-E and PLFY-P18NBMU-E will be calculated as follows by using the formula in 4-1-2. (1):

Model 08= 68,000 × $\frac{9000}{78000}$ = 7,850 Btu/h

Model 18= 68,000 × $\frac{20000}{78000}$ = 17,440 Btu/h

4-2. STANDARD OPERATION DATA (REFERENCE DATA)

Operation				Outdoor unit model	
				PUMY-P60NKMU(-BS)	
Operating conditions	Ambient temperature	Indoor	DB/WB	26.7°C/19.4°C [80°F/67°F]	21.1°C/— [70°F/—]
		Outdoor		35°C/— [95°F/—]	8.3°C/6.1°C [47°F/43°F]
	Indoor unit	No. of connected units	Unit	4	
		No. of units in operation		4	
		Model	—	06×2/24×2	
	Piping	Main pipe	m [ft]	5 [16-3/8]	
		Branch pipe		2.5 [8-1/4]	
		Total pipe length		15 [49-1/4]	
	Fan speed		—	Hi	
	Amount of refrigerant		kg [lbs-oz]	8.5 [18]	
Outdoor unit	Electric current		A	21.4	27.4
	Voltage		V	230	
	Compressor frequency		Hz	45	56
LEV opening	Indoor unit		Pulse	171 (P06)/426 (P24)	215 (P06)/534 (P24)
Pressure	High pressure/Low pressure		MPa [psi]	2.83/0.94 [411/136]	2.93/0.66 [425/95]
Temp. of each section	Outdoor unit	Discharge	°C [°F]	74 [165]	68 [154]
		Heat exchanger outlet		38 [100]	3 [37]
		Accumulator inlet		13 [55]	0 [32]
		Compressor inlet		14 [57]	−1 [30]
		Compressor shell bottom		74 [165]	68 [154]
	Indoor unit	LEV inlet		27 [81]	40 [104]
		Heat exchanger inlet		10 [50]	61 [142]

4-3. STANDARD CAPACITY DIAGRAM

PUMY-P60NKMU **PUMY-P60NKMU-BS**

Total capacity of indoor units	Capacity (Btu/h)		Power consumption (kW)		EER / COP		Current (A) / 230V		Current (A) / 208V	
	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
6	6000	7000	0.71	1.06	8.45	1.94	3.1	4.6	3.4	5.1
7	7000	8100	0.82	1.15	8.56	2.06	3.6	5.1	4.0	5.6
8	8000	9200	0.92	1.24	8.67	2.18	4.0	5.4	4.5	6.0
9	9000	10300	1.03	1.32	8.77	2.28	4.5	5.8	5.0	6.4
10	10000	11400	1.13	1.40	8.86	2.38	5.0	6.2	5.5	6.8
11	11000	12500	1.23	1.48	8.95	2.47	5.4	6.5	6.0	7.2
12	12000	13600	1.33	1.56	9.04	2.56	5.8	6.8	6.5	7.6
13	13000	14700	1.43	1.63	9.12	2.64	6.3	7.2	6.9	7.9
14	14000	15800	1.52	1.71	9.20	2.71	6.7	7.5	7.4	8.3
15	15000	16900	1.62	1.78	9.27	2.77	7.1	7.8	7.9	8.7
16	16000	18000	1.71	1.86	9.34	2.83	7.5	8.2	8.3	9.0
17	17000	19100	1.81	1.94	9.40	2.89	7.9	8.5	8.8	9.4
18	18000	20200	1.90	2.02	9.46	2.94	8.3	8.9	9.2	9.8
19	19000	21300	2.00	2.09	9.52	2.98	8.8	9.2	9.7	10.2
20	20000	22400	2.09	2.18	9.58	3.02	9.2	9.6	10.1	10.6
21	21000	23500	2.18	2.26	9.63	3.05	9.6	9.9	10.6	11.0
22	22000	24600	2.27	2.34	9.68	3.08	10.0	10.3	11.0	11.4
23	23000	25700	2.36	2.43	9.73	3.10	10.4	10.7	11.5	11.8
24	24000	26800	2.45	2.51	9.78	3.12	10.8	11.0	11.9	12.2
25	25000	27900	2.54	2.60	9.82	3.14	11.2	11.4	12.3	12.6
26	26000	29000	2.63	2.70	9.87	3.15	11.6	11.8	12.8	13.1
27	27000	30100	2.72	2.79	9.92	3.16	11.9	12.3	13.2	13.5
28	28000	31200	2.81	2.88	9.96	3.17	12.3	12.7	13.6	14.0
29	29000	32300	2.90	2.98	10.01	3.17	12.7	13.1	14.1	14.5
30	30000	33400	2.98	3.08	10.05	3.18	13.1	13.5	14.5	15.0
31	31000	34500	3.07	3.18	10.10	3.18	13.5	14.0	14.9	15.5
32	32000	35600	3.15	3.29	10.14	3.17	13.8	14.4	15.3	16.0
33	33000	36700	3.24	3.39	10.19	3.17	14.2	14.9	15.7	16.5
34	34000	37800	3.32	3.50	10.24	3.16	14.6	15.4	16.1	17.0
35	35000	38900	3.40	3.61	10.29	3.16	14.9	15.9	16.5	17.5
36	36000	40000	3.48	3.72	10.35	3.15	15.3	16.4	16.9	18.1
37	37000	41100	3.56	3.84	10.40	3.14	15.6	16.9	17.3	18.6
38	38000	42200	3.63	3.95	10.46	3.13	15.9	17.4	17.6	19.2
39	39000	43200	3.71	4.06	10.52	3.12	16.3	17.8	18.0	19.7
40	40000	44300	3.78	4.17	10.59	3.11	16.6	18.3	18.4	20.3
41	41000	45400	3.85	4.29	10.65	3.10	16.9	18.8	18.7	20.8
42	42000	46500	3.92	4.41	10.73	3.09	17.2	19.4	19.0	21.4
43	43000	47600	3.98	4.52	10.80	3.08	17.5	19.9	19.3	22.0
44	44000	48700	4.04	4.64	10.88	3.08	17.7	20.4	19.6	22.5
45	45000	49800	4.10	4.75	10.97	3.07	18.0	20.9	19.9	23.1
46	46000	50900	4.16	4.86	11.06	3.07	18.3	21.4	20.2	23.6
47	47000	52000	4.21	4.98	11.15	3.06	18.5	21.8	20.4	24.2
48	48000	53100	4.26	5.08	11.25	3.06	18.7	22.3	20.7	24.7
49	49000	54200	4.31	5.18	11.36	3.06	18.9	22.8	20.9	25.2
50	50000	55300	4.36	5.28	11.48	3.07	19.1	23.2	21.2	25.7
51	51000	56400	4.40	5.38	11.59	3.07	19.3	23.6	21.4	26.1
52	52000	57500	4.44	5.46	11.72	3.08	19.5	24.0	21.6	26.5
53	53000	58600	4.47	5.55	11.86	3.10	19.6	24.4	21.7	26.9
54	54000	59700	4.50	5.62	12.00	3.11	19.8	24.7	21.9	27.3
55	55000	60800	4.53	5.69	12.14	3.13	19.9	25.0	22.0	27.6
56	56000	61900	4.55	5.75	12.30	3.15	20.0	25.2	22.1	27.9
57	57000	63000	4.57	5.80	12.47	3.18	20.1	25.5	22.2	28.2
58	58000	64100	4.59	5.84	12.64	3.21	20.2	25.7	22.3	28.4
59	59000	65200	4.60	5.87	12.82	3.25	20.2	25.8	22.3	28.5
60	60000	66000	4.60	5.95	13.04	3.25	20.2	26.1	22.3	28.9
61	60200	66200	4.61	5.90	13.05	3.29	20.2	25.9	22.4	28.6
62	60400	66400	4.61	5.90	13.09	3.30	20.2	25.9	22.4	28.6
63	60600	66600	4.61	5.90	13.13	3.31	20.2	25.9	22.4	28.7
64	60800	66800	4.62	5.90	13.17	3.31	20.3	25.9	22.4	28.7
65	61000	67000	4.62	5.91	13.21	3.32	20.3	25.9	22.4	28.7
66	61200	67200	4.62	5.91	13.26	3.33	20.3	26.0	22.4	28.7
67	61400	67400	4.62	5.91	13.30	3.34	20.3	26.0	22.4	28.7
68	61600	67600	4.62	5.91	13.34	3.35	20.3	26.0	22.4	28.7
69	61800	67800	4.62	5.91	13.38	3.36	20.3	26.0	22.4	28.7
70	62000	68000	4.62	5.91	13.42	3.37	20.3	26.0	22.4	28.7
71	62200	68200	4.62	5.91	13.47	3.38	20.3	26.0	22.4	28.7
72	62400	68400	4.62	5.91	13.51	3.39	20.3	26.0	22.4	28.7
73	62600	68600	4.62	5.91	13.56	3.40	20.3	26.0	22.4	28.7
74	62800	68800	4.62	5.91	13.60	3.41	20.3	26.0	22.4	28.7
75	63000	69000	4.62	5.91	13.64	3.42	20.3	26.0	22.4	28.7
76	63200	69200	4.62	5.91	13.69	3.43	20.3	26.0	22.4	28.7
77	63400	69400	4.62	5.91	13.74	3.44	20.3	26.0	22.4	28.7
78	63600	69600	4.61	5.91	13.78	3.45	20.2	25.9	22.4	28.7

4-4. CORRECTING COOLING AND HEATING CAPACITY

4-4-1. Correcting changes in air conditions

(1) The performance curve charts (Figure 1, 2) show the ratio by the temperature condition change when the rated capacity (total capacity) and the rated input are presumed 1, under standard length (7.6 m [25 ft]) and standard temperature condition.

• Standard conditions:

Rated cooling capacity	Indoor D.B. 26.7°C / W.B. 19.4°C [D.B.80°F / W.B.67°F] Outdoor D.B. 35°C [D.B.95°F]
Rated heating capacity	Indoor D.B. 21.1°C [D.B.70°F] Outdoor D.B. 8.3°C / W.B. 6.1°C [D.B.47°F / W.B.43°F]

• Use the rated capacity and rated input given in “4-2.”.

• The input is the single value on the side of the outdoor unit; the input on the sides of each indoor unit must be added to obtain the total input.

(2) The capacity of each indoor unit may be obtained by multiplying the total capacity obtained in (1) by the ratio between the individual capacity at the rated time and the total capacity at the rated time.

$$\text{Individual capacity under stated conditions} = \text{total capacity under the stated conditions} \times \frac{\text{individual capacity at the rated time}}{\text{total capacity at the rated time}}$$

(3) Capacity correction coefficient curve

Figure 1 Cooling performance curve

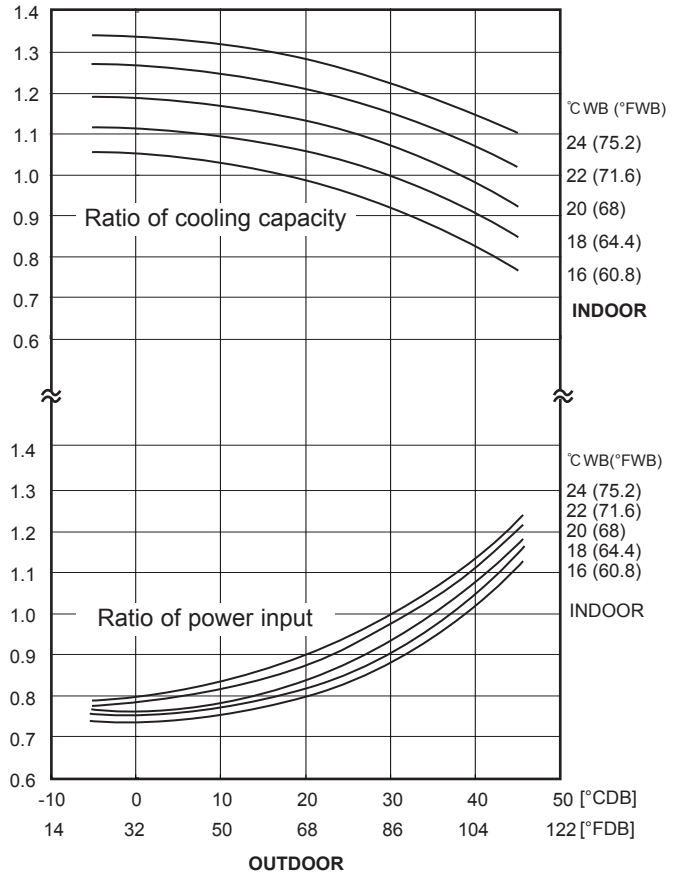


Figure 2 Heating performance curve

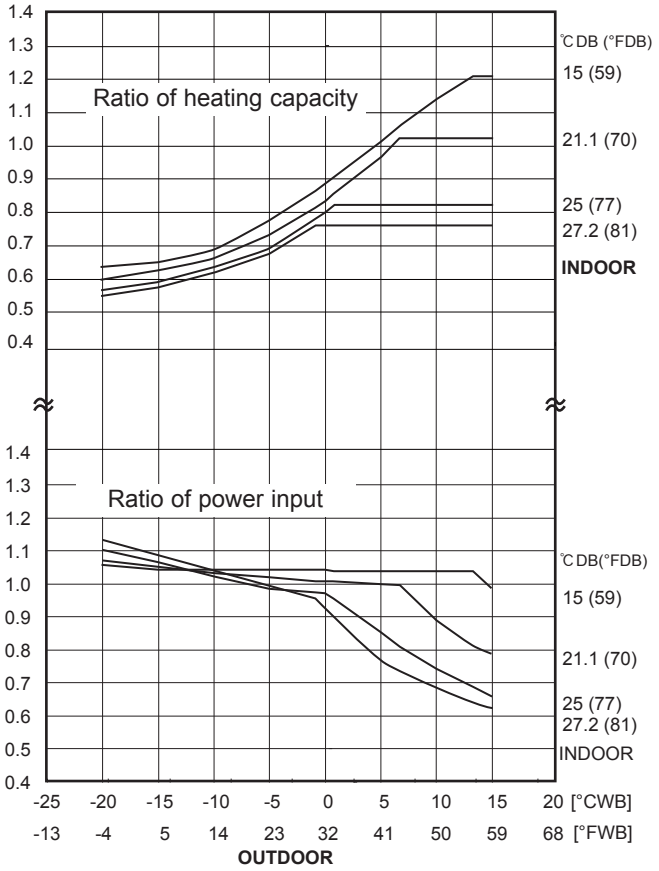
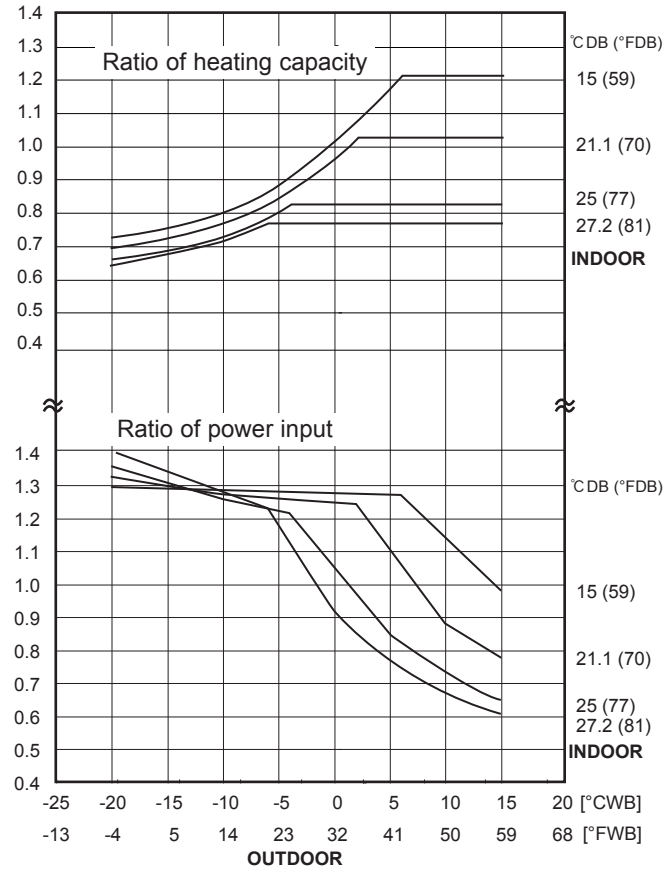


Figure 3 High heating performance curve

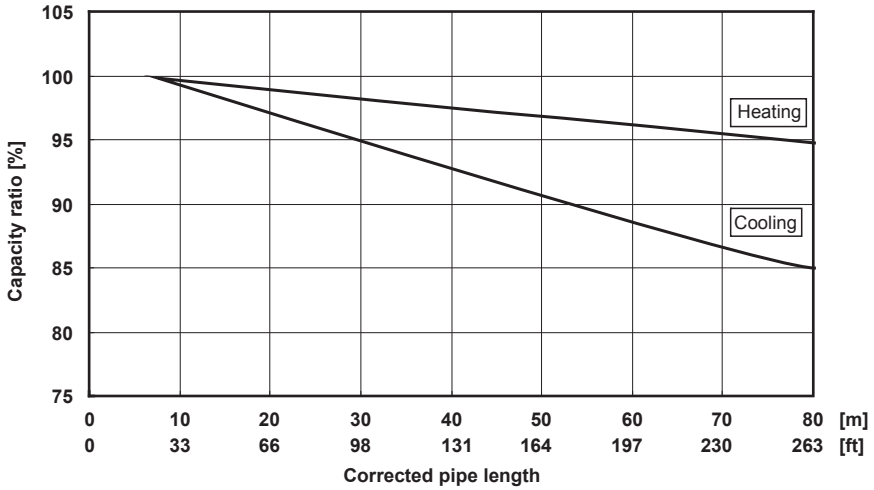


4-4-2. Correcting capacity for changes in the length of refrigerant piping

(1) During cooling, obtain the ratio (and the equivalent piping length) of the outdoor units rated capacity and the total in-use indoor capacity, and find the capacity ratio corresponding to the standard piping length from Figure 3. Then multiply by the cooling capacity from Figure 1 to obtain the actual capacity.

(2) During heating, find the equivalent piping length, and find the capacity ratio corresponding to standard piping length from Figure 3. Then multiply by the heating capacity from Figure 2 to obtain the actual capacity.

Figure 3 Capacity correction curve



• Method for obtaining the equivalent piping length

Equivalent length for type P60 = (length of piping to farthest indoor unit) + (0.3 × number of bends in the piping) (m)
Length of piping to farthest indoor unit: 80 m [262 ft]

4-4-3. Correction of heating capacity for frost and defrosting

If heating capacity has been reduced due to frost formation or defrosting, multiply the capacity by the appropriate correction factor from the following table to obtain the actual heating capacity.

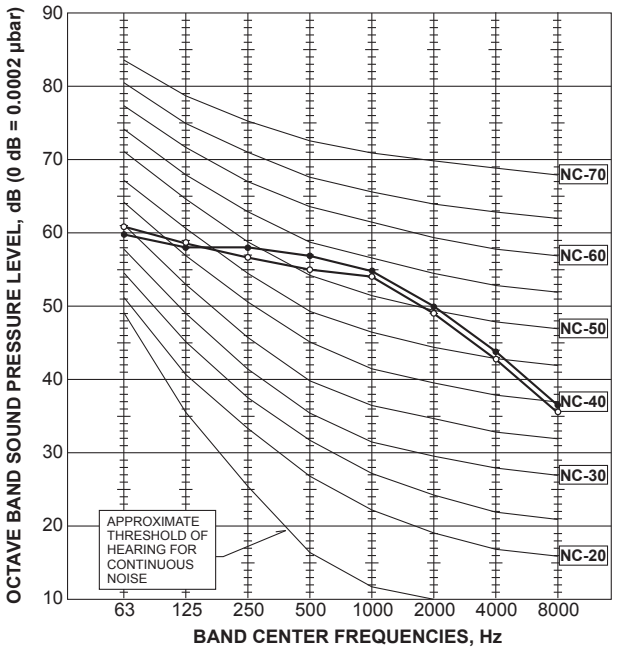
Correction factor diagram

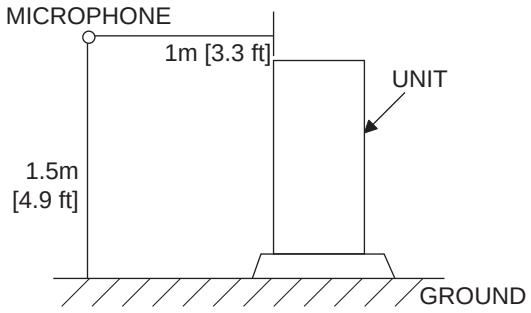
Outdoor Intake temperature (W.B.°F)	43	39	36	32	28	25	21	18	14
Outdoor Intake temperature (W.B.°C)	6	4	2	0	-2	-4	-6	-8	-10
Correction factor	1.0	0.98	0.89	0.88	0.89	0.9	0.95	0.95	0.95

4-5. NOISE CRITERION CURVES

PUMY-P60NKMU
PUMY-P60NKMU-BS

MODE	SPL(dB)	LINE
COOLING	58	○—○
HEATING	59	●—●

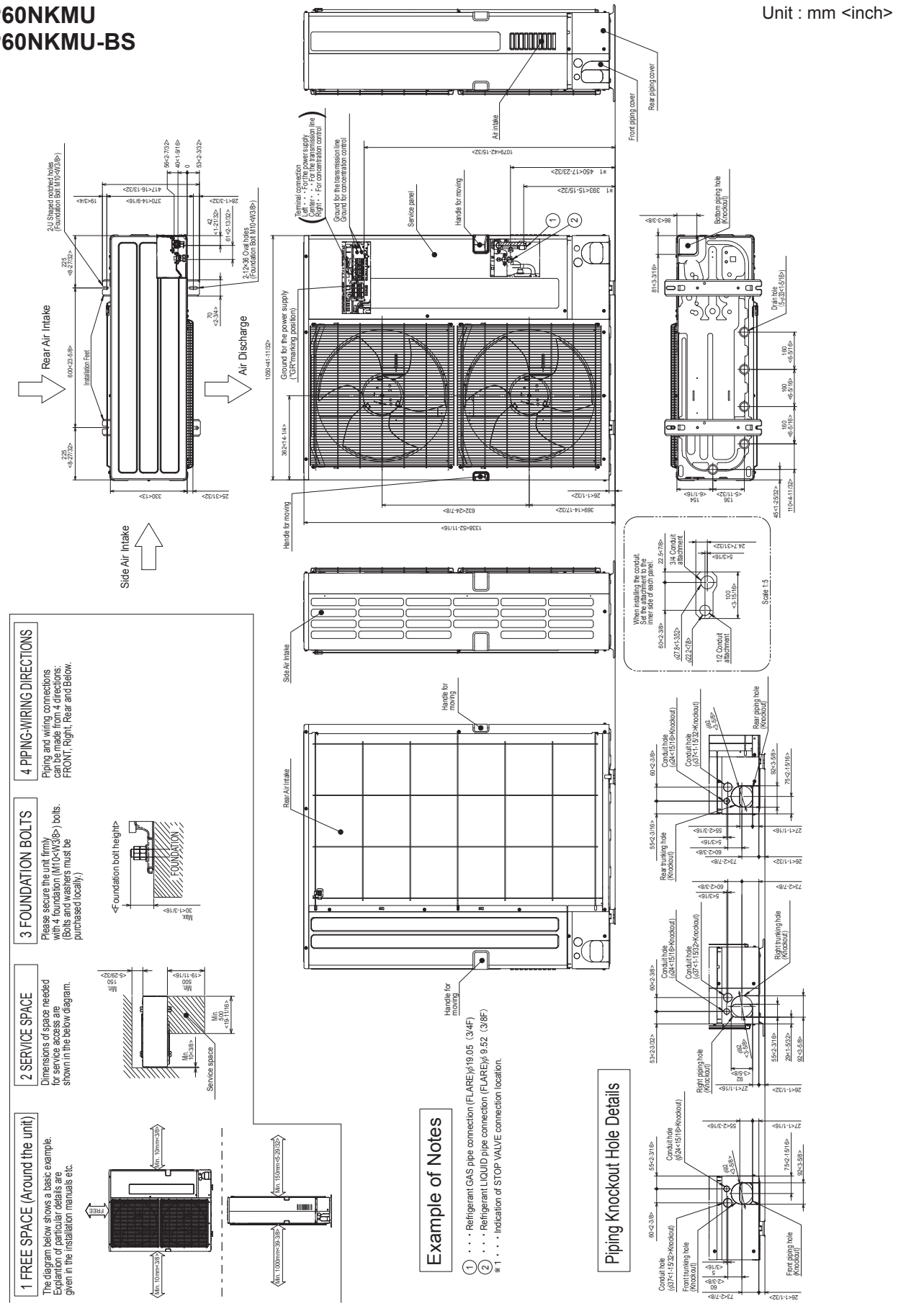




5 OUTLINES AND DIMENSIONS

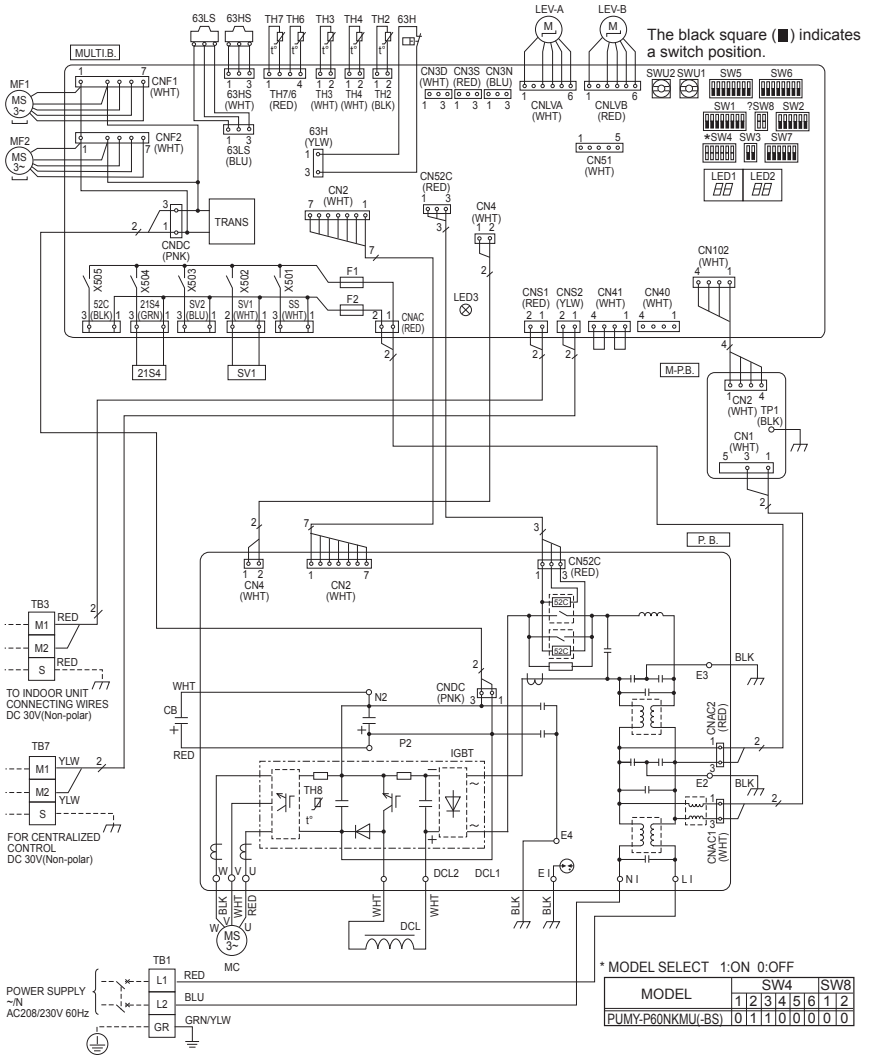
PUMY-P60NKMU
PUMY-P60NKMU-BS

Unit : mm <inch>



6 WIRING DIAGRAM

PUMY-P60NKMU
PUMY-P60NKMU-BS



SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
TB1	Terminal Block <Power Supply>	DCL	Reactor	SW7	Switch <Function Selection>
TB3	Terminal Block <Comunication Line>	CB	Main Smoothing Capacitor	SW8	Switch <Model Selection>
TB7	Terminal Block <Centralized Control Line>	P.B.	Power Circuit Board	SWU1	Switch <Unit Address Selection, 1st digit>
MC	Motor For Compressor	TABU/V/W	Connection Terminal <U/V/W-Phase>	SWU2	Switch <Unit Address Selection, 2nd digit>
MF1,MF2	Fan Motor	TABLI/NI	Connection Terminal <L/N-Phase>	SS	Connector <Connection For Option>
21S4	Solenoid Valve <Four-Way Valve>	TABP2	Connection Terminal <DC Voltage>	CN3D	Connector <Connection For Option>
63H	High Pressure Switch	TABN2	Connection Terminal <DC Voltage>	CN3S	Connector <Connection For Option>
63HS	High Pressure Sensor	DCL1,DCL2	Connection Terminal <Reactor>	CN3N	Connector <Connection For Option>
63LS	Low Pressure Sensor	IGBT	Power Module	CN51	Connector <Connection For Option>
SV1	Solenoid Valve <Bypass Valve>	EI,E2,E3,E4	Connection Terminal <Ground>	LED1,LED2	LED <Operation Inspection Display>
TH2	Thermistor <HIC Pipe>	MULTI.B.	Controller Circuit Board	LED3	LED <Power Supply to Main Microcomputer>
TH3	Thermistor <Outdoor Pipe>	SW1	Switch <Display Selection>	F1,F2	Fuse <T6. 3AL250V>
TH4	Thermistor <Compressor>	SW2	Switch <Function Selection>	X501~505	Relay
TH6	Thermistor <Low Pressure Saturated>	SW3	Switch <Test Run>	M-P.B.	M-NET Power Circuit Board
TH7	Thermistor <Outdoor>	SW4	Switch <Model Selection>	TP1	ConnectionTerminal <Ground>
TH8	Thermistor <Heat Sink>	SW5	Switch <Function Selection>		
LEV-A,LEV-B	Electronic Expansion Valve	SW6	Switch <Function Selection>		

Cautions when servicing

- ⚠WARNING: When the main supply is turned off, the voltage [340 V] in the main capacitor will drop to 20 V in approx. 2 minutes (input voltage: 230 V). When servicing, make sure that LED1, LED2 on the outdoor circuit board goes out, and then wait for at least 1 minute.
- Components other than the outdoor board may be faulty: Check and take corrective action, referring to the service manual. Do not replace the outdoor board without checking.

NOTES:

1.Refer to the wiring diagrams of the indoor units for details on wiring of each indoor unit.

Self-diagnosis function

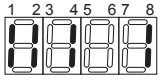
The indoor and outdoor units can be diagnosed automatically using the self-diagnosis switch (SW1) and LED1, LED2 (LED indication) found on the multi-controller of the outdoor unit.

LED indication : Set all contacts of SW1 to OFF.

- During normal operation
- The LED indicates the drive state of the controller in the outdoor unit.

Bit	1	2	3	4	5	6	7	8
Indication	Compressor operated	52C	21S4	SV1	(SV2)	—	—	Always lit

[Example]
When the compressor and SV1 are turned during cooling operation.

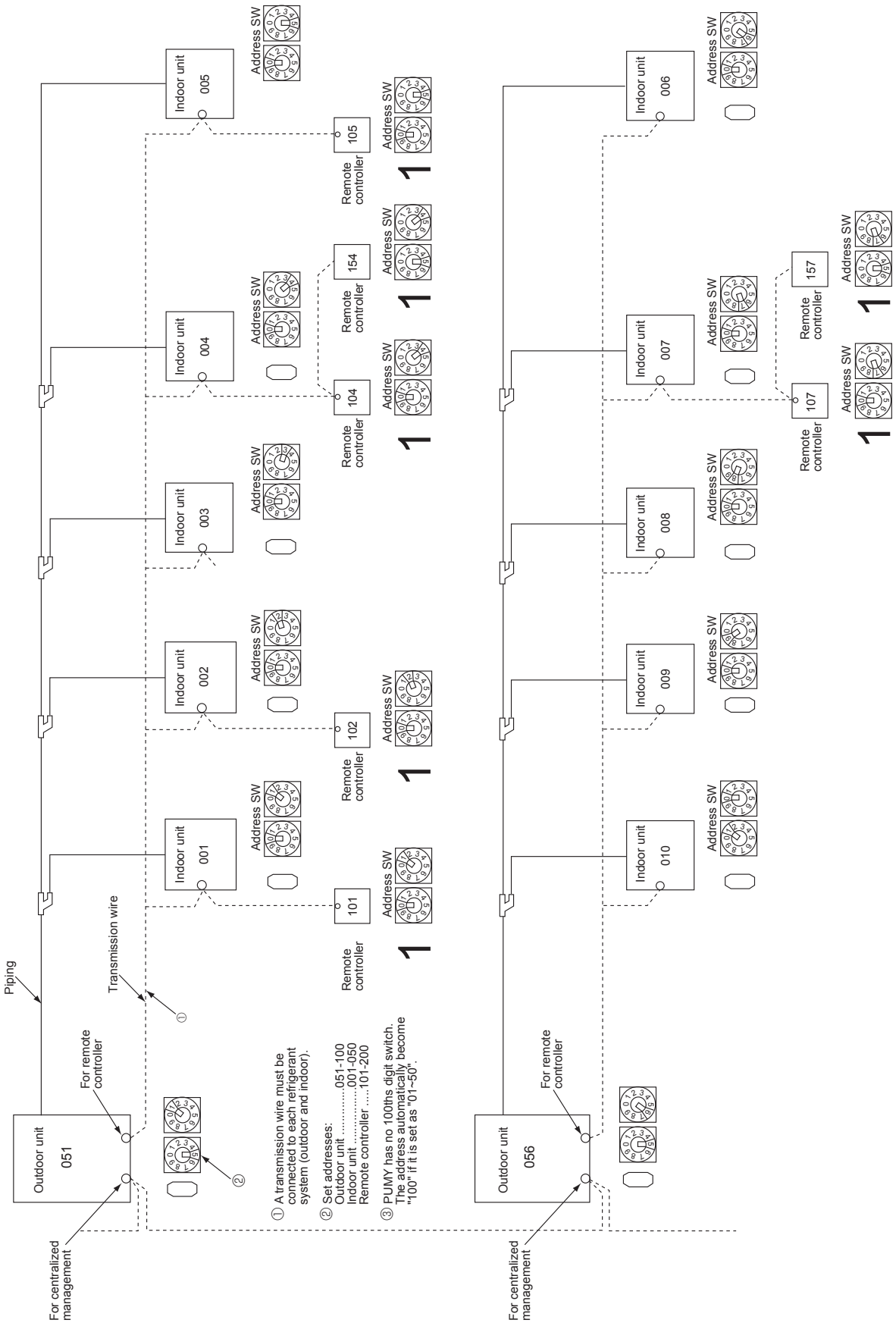


- When fault requiring inspection has occurred

The LED alternately indicates the inspection code and the location of the unit in which the fault has occurred.

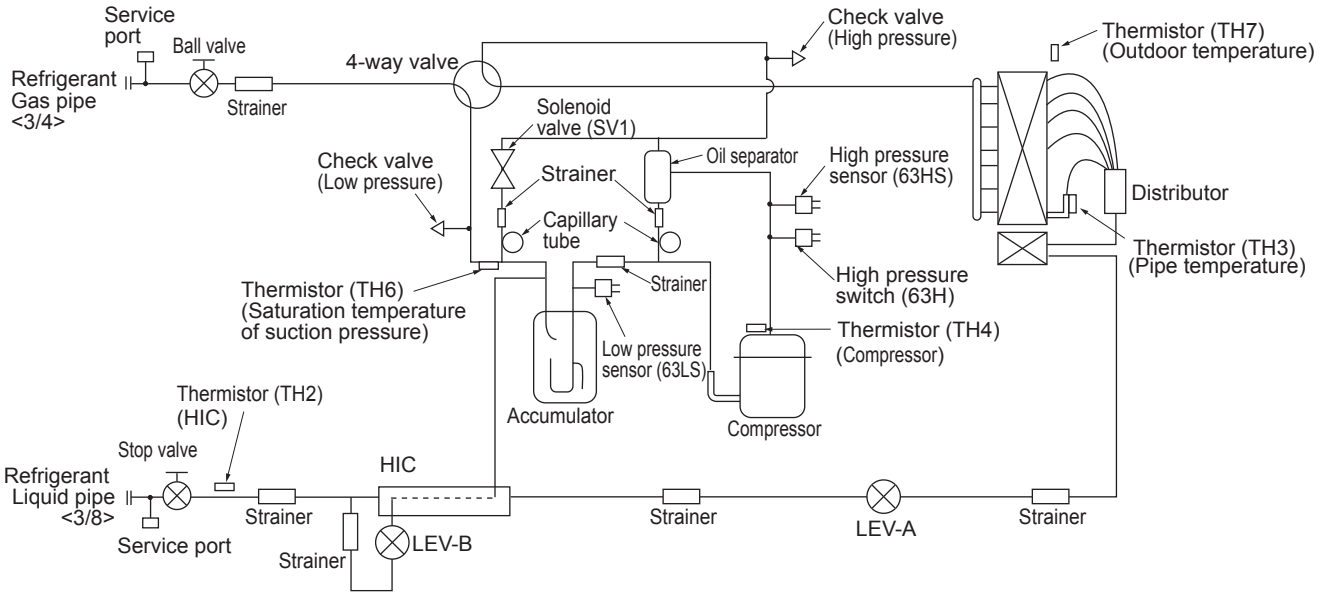
7 NECESSARY CONDITIONS FOR SYSTEM CONSTRUCTION

7-1. TRANSMISSION SYSTEM SETUP



7-2. REFRIGERANT SYSTEM DIAGRAM
PUMY-P60NKMU
PUMY-P60NKMU-BS

Unit: mm <inch>



Capillary tube for oil separator : ϕ2.5 × ϕ0.8 × L800
Capillary tube for solenoid valve : ϕ4.0 × ϕ3.0 × L500

Refrigerant piping specifications <dimensions of flared connector>

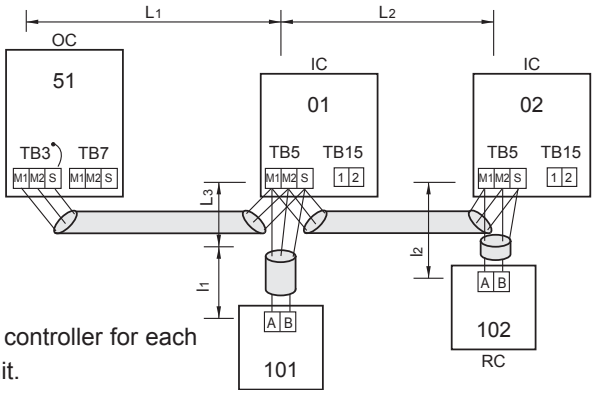
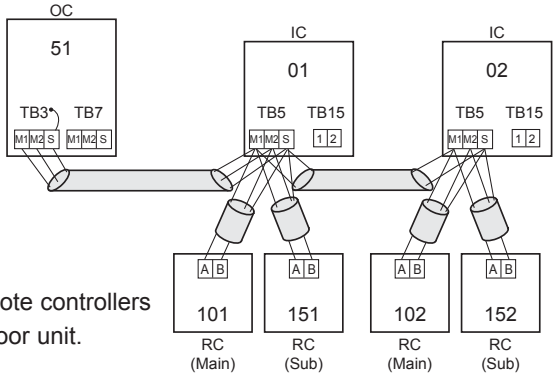
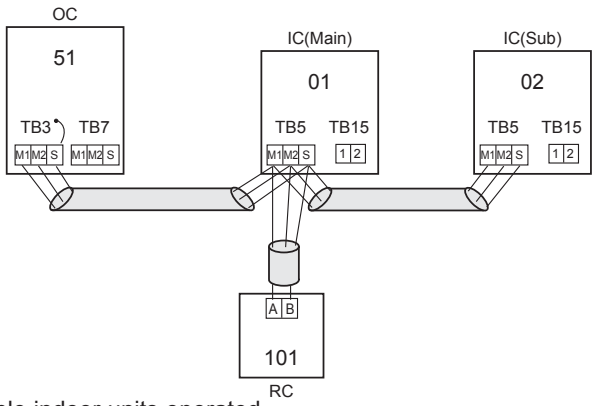
Capacity / Item		Liquid piping	Gas piping
Indoor unit	P06, P08, P12, P15, P18	ϕ6.35 <1/4>	ϕ12.7 <1/2>
	P24, P30, P36, P48, P54	ϕ9.52 <3/8>	ϕ15.88 <5/8>
	P72	ϕ9.52 <3/8>	ϕ19.05 <3/4>
Outdoor unit	P60	ϕ9.52 <3/8>	ϕ19.05 <3/4>

7-3. SYSTEM CONTROL

Example for the System

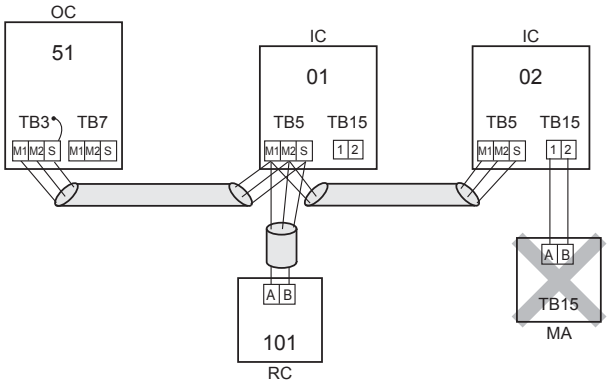
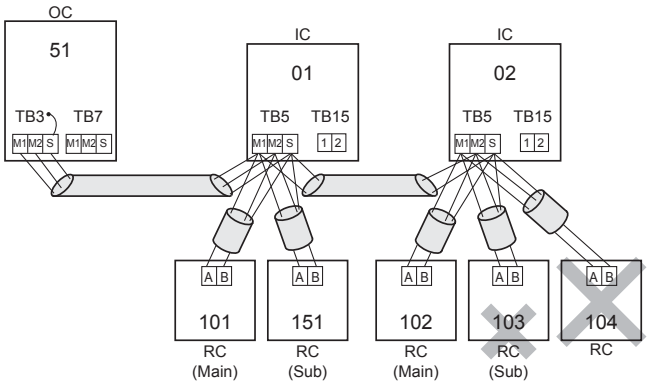
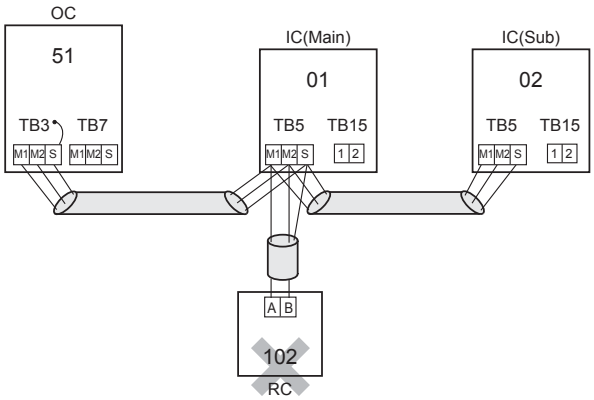
- Example for wiring control cables, wiring method and address setting, permissible lengths, and the prohibited items are listed in the standard system with detailed explanation.
  The explanation for the system in this section : Use 1 single outdoor unit and multiple outdoor units for M-NET remote control system.
  Use 1 single outdoor unit and multiple indoor units in the multiple outdoor units for the M-NET remote control system.

A. Example of a M-NET remote controller system (address setting is necessary.)

Example of wiring control cables	Wiring Method and Address Setting
1. Standard operation  • 1 remote controller for each indoor unit. • There is no need for setting the 100 position on the remote controller.	a. Use feed wiring to connect terminals M1 and M2 on transmission cable block (TB3) for the outdoor unit (OC) to terminals M1 and M2 on the transmission cable block (TB5) of each indoor unit (IC). Use non-polarized 2 wire. b. Connect terminals M1 and M2 on transmission cable terminal block (TB5) for each indoor unit with the terminal block (TB6) for the remote controller (RC). c. Set the address setting switch (on outdoor unit P.C.B) as shown below. Unit / Range / Setting Method Indoor unit (IC) / 001 to 050 / — Outdoor unit (OC) / 051 to 100 / Use the smallest address of all the indoor unit plus 50. Remote controller (RC) / 101 to 150 / Indoor unit address plus 100.
2. Operation using 2 remote controllers  • Using 2 remote controllers for each indoor unit.	a. Same as above. b. Same as above. c. Set address switch (on outdoor unit P.C.B) as shown below. Unit / Range / Setting Method Indoor Unit (IC) / 001 to 050 / — Outdoor unit (OC) / 051 to 100 / Use the smallest address of all the indoor units plus 50. Main Remote Controller (RC) / 101 to 150 / Indoor unit address plus 100. Sub Remote Controller (RC) / 151 to 200 / Indoor unit address plus 150.
3. Group operation  • Multiple indoor units operated together by 1 remote controller	a. Same as above. b. Connect terminals M1 and M2 on transmission cable terminal block (TB5) of the IC main unit with the most recent address within the same indoor unit (IC) group to terminal block (TB6) on the remote controller. c. Set the address setting switch (on outdoor unit P.C.B) as shown below. Unit / Range / Setting Method IC (Main) / 001 to 050 / Use the smallest address within the same group of indoor units. IC (Sub) / 001 to 050 / Use an address, other than that of the IC (Main) from among the units within the same group of indoor units. This must be in sequence with the IC (Main). Outdoor Unit / 051 to 100 / Use the smallest address of all the indoor units plus 50. Main Remote Controller / 101 to 150 / Set at an IC (Main) address within the same group plus 100. Sub Remote Controller / 151 to 200 / Set at an IC (Main) address within the same group plus 150. d. Use the indoor unit (IC) within the group with the most functions as the IC (Main) unit.
Combinations of 1 through 3 above are possible.	

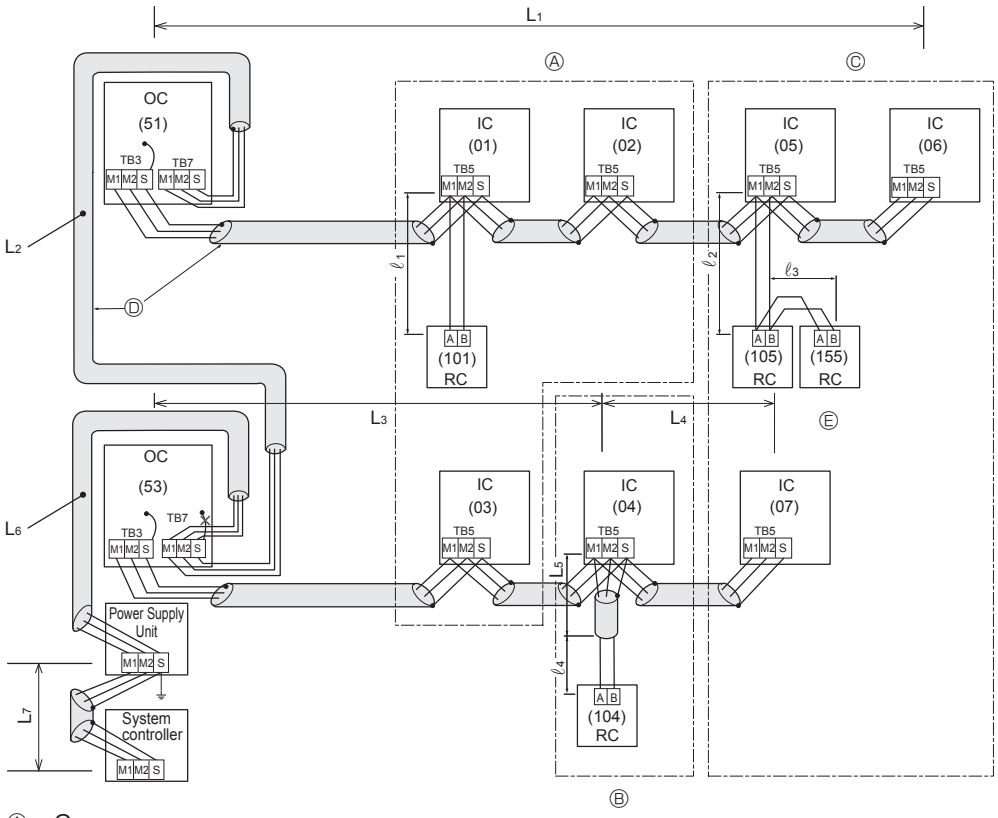
• Name, Symbol and the Maximum Remote controller Units for Connection

Name	Symbol	Maximum units for connection
Outdoor unit	OC	—
Indoor unit	IC	1 OC unit can be connected to 1-12 IC units
M-NET remote controller	RC	Maximum 2 RC for 1 indoor unit, Maximum 12 RC for 1 OC

Permissible Lengths	Prohibited items
Longest transmission cable length (1.25 mm² [AWG16]) $L_1 + L_2$, $L_2 + L_3$, $L_3 + L_1 \leqq 200$m [656ft] Remote controller cable length 1. If 0.5 to 1.25 mm² [AWG20 to AWG16] ℓ_1, $\ell_2 \leqq 10$m [33ft] 2. If the length exceeds 10 meters [33ft], the exceeding section should be 1.25 mm² [AWG16] and that section should be a value within the total extension length of the transmission cable and maximum transmission cable length. (L_3)	• M-NET remote controller (RC) and MA remote controller (MA) cannot be used together. • Do not connect anything with TB15 of indoor unit (IC). 
Same as above	 • Use the indoor unit (IC) address plus 150 as the sub remote controller address. In this case, it should be 152. • 3 or more remote controller (RC) cannot be connected to 1 indoor unit.
Same as above	 • The remote controller address is the indoor unit main address plus 100. In this case, it should be 101.

B. Example of a group operation system with 2 or more outdoor units and a M-NET remote controller.
(Address settings are necessary.)

Examples of Transmission Cable Wiring



Ⓐ : Group
Ⓑ : Group
Ⓒ : Group
Ⓓ : Shielded Wire
Ⓔ : Sub Remote Controller

Wiring Method Address Settings

a. Always use shielded wire when making connections between the outdoor unit (OC) and the indoor unit (IC), as well for all OC-OC, and IC-IC wiring intervals.
b. Use feed wiring to connect terminals M1 and M2 and the ground terminal on the transmission cable terminal block (TB3) of each outdoor unit (OC) to terminals M1 and M2 on the terminal S on the transmission cable block of the indoor unit (IC).
c. Connect terminals M1 and M2 on the transmission cable terminal block of the indoor unit (IC) that has the most recent address within the same group to the terminal block on the remote controller (RC).
d. Connect together terminals M1, M2 and terminal S on the terminal block for central control (TB7) for the outdoor unit (OC).
e. DO NOT change the jumper connector CN41 on MULTI controller board.
f. The earth processing of S terminal for the centralized control terminal block (TB7) is unnecessary. Connect the terminal S on the power supply unit with the earth.
g. Set the address setting switch as follows.

Unit	Range	Setting Method
IC (Main)	01 to 00	Use the smallest address within the same group of indoor units.
IC (Sub)	01 to 50	Use an address, other than the IC (Main) in the same group of indoor units. This must be in sequence with the IC (Main).
Outdoor Unit	51 to 100	Use the smallest address of all the indoor units plus 50. *The address automatically becomes “100” if it is set as “01 - 50”.
Main Remote Controller	101 to 150	Set at an IC (Main) address within the same group plus 100.
Sub Remote Controller	151 to 200	Set at an IC (Main) address within the same group plus 150.
MA Remote Controller	—	Unnecessary address setting (Necessary main/ sub setting)

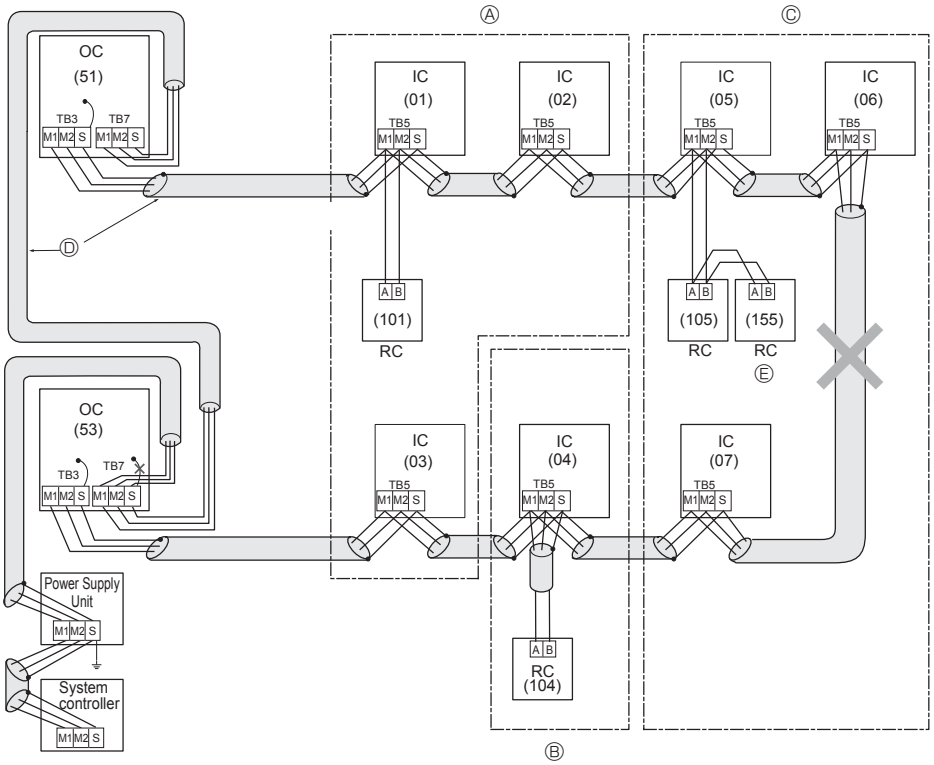
h. The group setting operations among the multiple indoor units are done by the remote controller (RC) after the electrical power has been turned on.

• Name, Symbol, and the Maximum Units for Connection

Permissible Length

- Longest length via outdoor units : $L_1+L_2+L_3+L_4$, $L_1+L_2+L_3+L_5$, $L_1+L_2+L_6+L_7 \leqq 500$ meters [1450 ft] (1.25 mm² [AWG16])
- Longest transmission cable length : L_1, L_3+L_4, L_3+L_5, L_6, L_2+L_6, $L_7 \leqq 200$ meters [656 ft] (1.25 mm² [AWG16])
- Remote controller cable length : ℓ_1, ℓ_2, $\ell_2+\ell_3$, $\ell_4 \leqq 10$ meters [33 ft] (0.5 to 1.25 mm² [AWG20 to AWG16])
  If the length exceeds 10 meters [33 ft], use a 1.25 mm² [AWG16] shielded wire. The length of this section (L_8) should be included in the calculation of the maximum length and overall length.

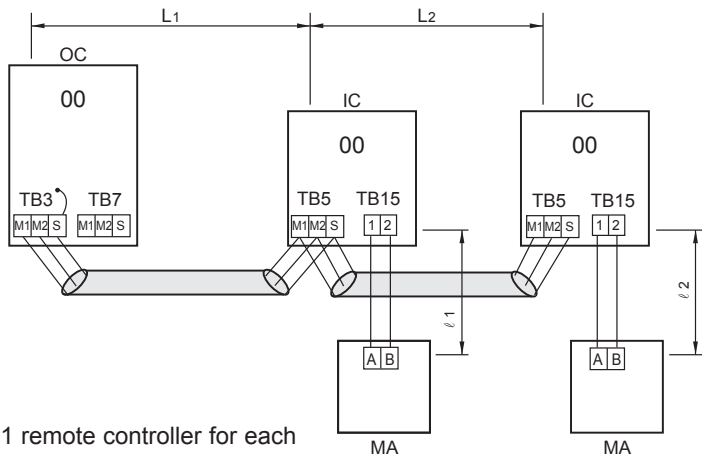
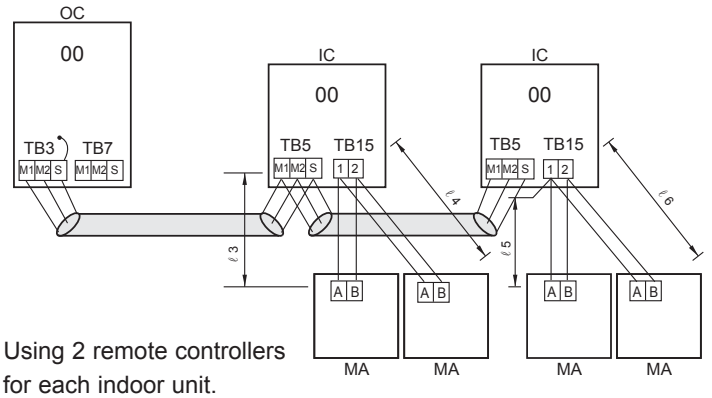
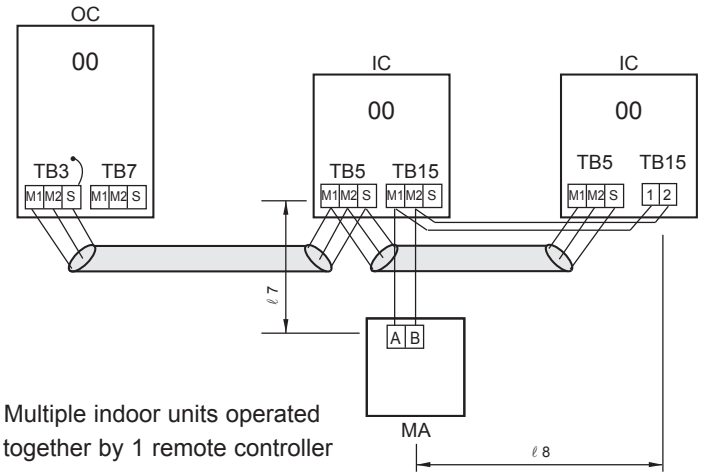
Prohibited items

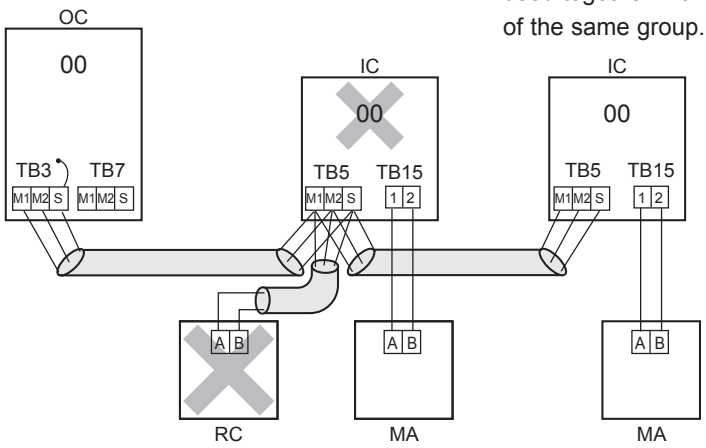
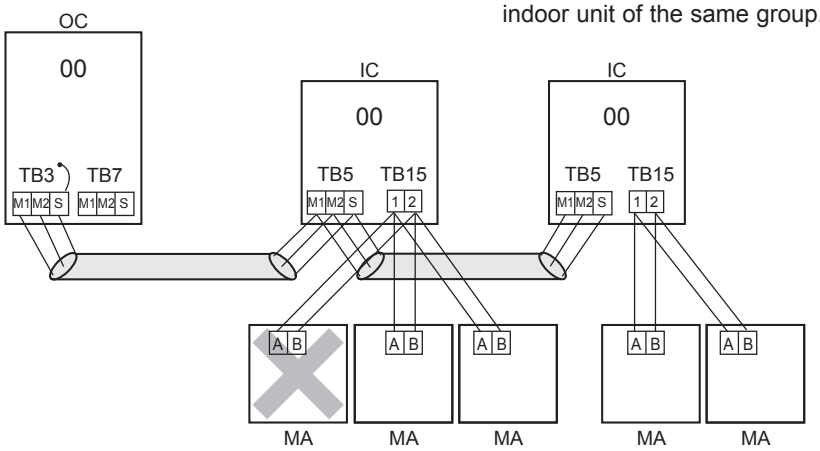
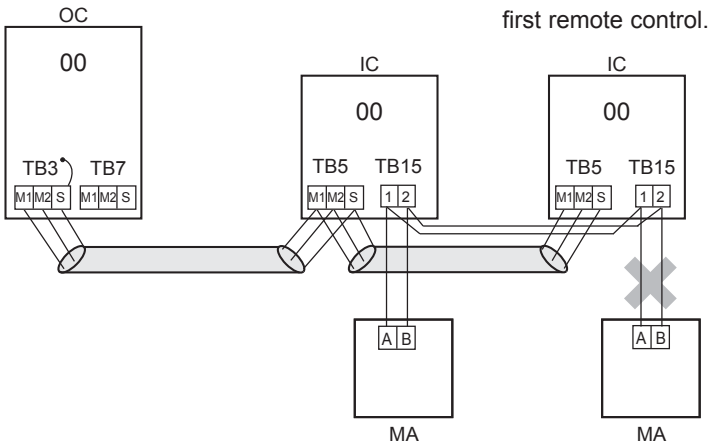


Ⓐ : Group
Ⓑ : Group
Ⓒ : Group
Ⓓ : Shielded Wire
Ⓔ : Sub Remote Controller
( ): Address

- Never connect together the terminal blocks (TB5) for transmission wires for indoor units (IC) that have been connected to different outdoor units (OC).
- Set all addresses to ensure that they are not overlapped.
- M-NET remote controller and MA remote controller cannot be connected with the indoor unit of the same group wring together

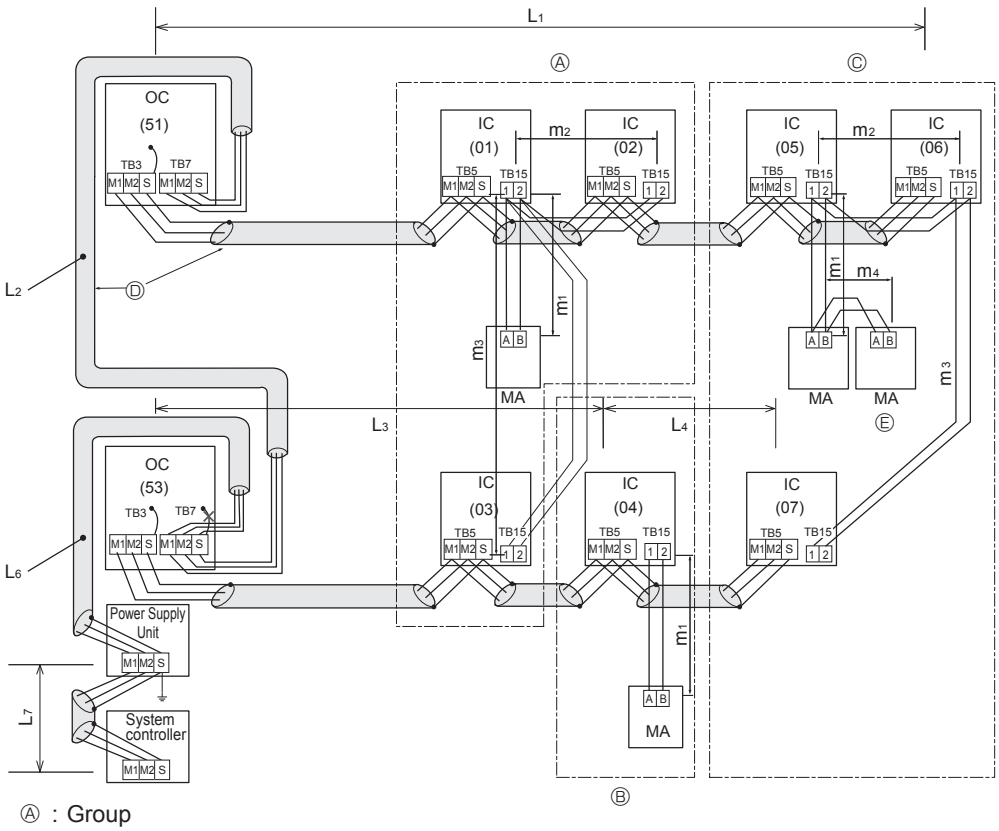
C. Example of a MA remote controller system (address setting is not necessary.)
NOTE : In the case of same group operation, need to set the address that is only main indoor unit.

Example of wiring control cables	Wiring Method and Address Setting
1. Standard operation  • 1 remote controller for each indoor unit.	a. Use feed wiring to connect terminals M1 and M2 on transmission cable block (TB3) for the outdoor unit (OC) to terminals M1 and M2 on the transmission cable block (TB5) of each indoor unit (IC). Use non-polarized 2 wire. b. Connect terminals 1 and 2 on transmission cable terminal block (TB15) for each indoor unit with the terminal block for the MA remote controller (MA).
2. Operation using two remote controllers  • Using 2 remote controllers for each indoor unit.	a. The same as above. b. The same as above. c. In the case of using 2 remote controllers, connect terminals 1 and 2 on transmission cable terminal block (TB15) for each indoor unit with the terminal block for 2 remote controllers. · Set the sub remote controller position for one of MA remote controller's main switch. Refer to the installation manual of MA remote controller
3. Group operation  • Multiple indoor units operated together by 1 remote controller	a. The same as above. b. The same as above. c. Connect terminals 1 and 2 on transmission cable terminal block (TB15) of each indoor unit, which is doing group operation with the terminal block the MA remote controller. Use non-polarized 2 wire. d. In the case of same group operation, need to set the address that is only main indoor unit. Please set the smallest address within number 01-50 of the indoor unit with the most functions in the same group.
Combinations of 1 through 3 above are possible.	

Permissible Lengths	Prohibited items
Longest transmission cable length $L_1 + L_2 \leqq 200$ m [656 ft] (1.25 mm² [AWG16]) MA remote controller cable length ℓ_1, $\ell_2 \leqq 200$ m [656 ft] (0.3 ~ 1.25 mm² [AWG22 to AWG16])	The MA remote controller and the M-NET remote controller cannot be used together with the indoor unit of the same group. 
Longest transmission cable length The same as above. MA remote controller cable length $\ell_3 + \ell_4$, $\ell_5 + \ell_6 \leqq 200$ m [656 ft] (0.3 ~ 1.25 mm² [AWG22 to AWG16])	3 MA remote controller or more cannot be connected with the indoor unit of the same group. 
Longest transmission cable length The same as above. MA remote controller cable length $\ell_7 + \ell_8 \leqq 200$ m [656 ft] (0.3 ~ 1.25 mm² [AWG22 to AWG16])	The second MA remote controller is connected with the terminal block (TB15) for the MA remote controller of the same indoor unit (IC) as the first remote control. 

D. Example of a group operation with 2 or more outdoor units and a MA remote controller.
(Address settings are necessary.)

Examples of Transmission Cable Wiring



Ⓐ : Group
Ⓑ : Group
Ⓒ : Group
Ⓓ : Shielded Wire
Ⓔ : Sub Remote Controller
( ): Address

Wiring Method Address Settings

a. Always use shielded wire when making connections between the outdoor unit (OC) and the indoor unit (IC), as well for all OC-OC, and IC-IC wiring intervals.
b. Use feed wiring to connect terminals M1 and M2 and the ground terminal on the transmission cable terminal block (TB3) of each outdoor unit (OC) to terminals M1 and M2 on the terminal S on the transmission cable block of the indoor unit (IC).
c. Connect terminals M1 and M2 on the transmission cable terminal block of the indoor unit (IC) that has the most recent address within the same group to the terminal block on the remote controller (RC).
d. Connect together terminals M1, M2 and terminal S on the terminal block for central control (TB7) for the outdoor unit (OC).
e. DO NOT change the jumper connector CN41 on MULTI controller board.
f. The earth processing of S terminal for the centralized control terminal block (TB7) is unnecessary. Connect the terminal S on the power supply unit with the earth.
g. Set the address setting switch as follows.

Unit	Range	Setting Method
IC (Main)	01 to 00	Use the smallest address within the same group of indoor units.
IC (Sub)	01 to 50	Use an address, other than the IC (Main) in the same group of indoor units. This must be in sequence with the IC (Main).
Outdoor Unit	51 to 100	Use the smallest address of all the indoor units plus 50. *The address automatically becomes “100” if it is set as “01 - 50”.
Main Remote Controller	101 to 150	Set at an IC (Main) address within the same group plus 100.
Sub Remote Controller	151 to 200	Set at an IC (Main) address within the same group plus 150.
MA Remote Controller	—	Unnecessary address setting (Necessary main/ sub setting)

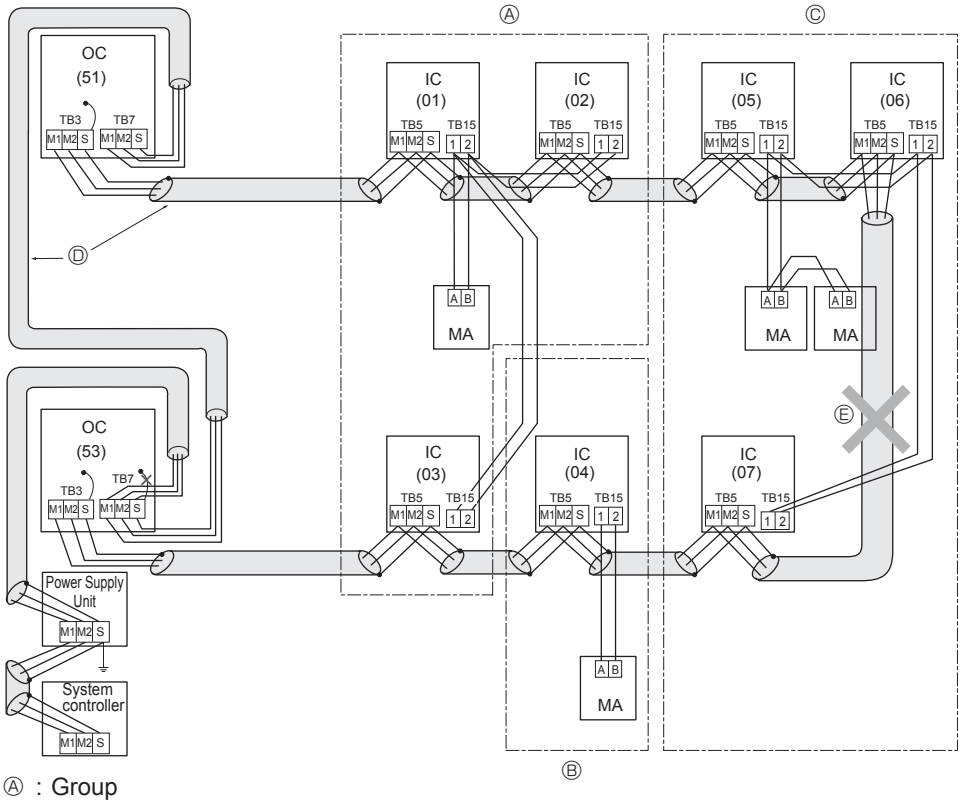
h. The group setting operations among the multiple indoor units are done by the remote controller (RC) after the electrical power has been turned on.

• Name, Symbol, and the Maximum Units for Connection

Permissible Length

Longest length via outdoor unit (M-NET cable):
$L_1+L_2+L_3+L_4$ and $L_1+L_2+L_6+L_7 \leqq 500$ m [1640 ft] (1.25 ㎟ [AWG16] or more)
Longest transmission cable length (M-NET cable):
L_1 and L_3+L_4 and L_6 and L_2+L_6 and $L_7 \leqq 200$ m [656 ft] (1.25 ㎟ [AWG16] or more)
Remote controller cable length:
m1 and m1+m2+m3 and m1+m2+m3+m4 ≦ 200 m [656 ft] (0.3 to 1.25 ㎟ [AWG22 to AWG16])

Prohibited items



Ⓐ : Group
Ⓑ : Group
Ⓒ : Group
Ⓓ : Shielded Wire
Ⓔ : Sub Remote Controller
( ): Address

• Never connect together the terminal blocks (TB5) for transmission wires for indoor units (IC) that have been connected to different outdoor units (OC).
• M-NET remote controller and MA remote controller cannot be connected with the indoor unit of the same group wring together.

8 TROUBLESHOOTING

8-1. CHECK POINTS FOR TEST RUN

8-1-1. Procedures of test run

(1) Before a test run, make sure that the following work is completed.
- Installation related :
  Make sure that the panel of cassette type and electrical wiring are done.
  Otherwise electrical functions like auto vane will not operate normally.
- Piping related :
  Perform leakage test of refrigerant and drain piping.
  Make sure that all joints are perfectly insulated.
  Check stop valves on both liquid and gas side for full open.
- Electrical wiring related :
  Check ground wire, transmission cable, remote controller cable, and power supply cable for secure connection.
  Make sure that all switch settings of address or adjustments for special specification systems are correctly settled.

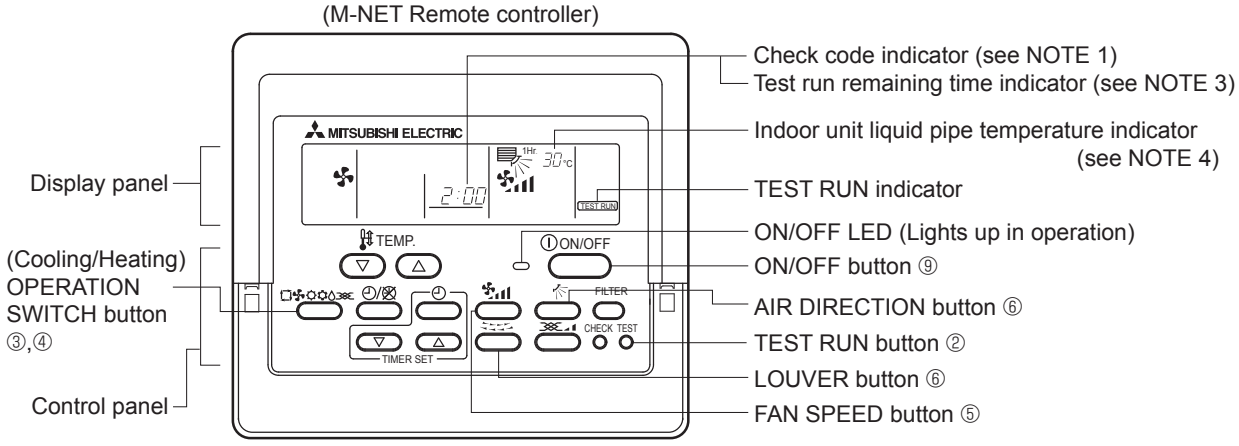
(2) Safety check :
With the insulation tester of 500V, inspect the insulation resistance.
Do not touch the transmission cable and remote controller cable with the tester.
The resistance should be over 1.0 MΩ. Do not proceed inspection if the resistance is under 1.0 MΩ.
Inspect between the outdoor unit power supply terminal block and ground first, metallic parts like refrigerant pipes or the electrical box next, then inspect all electrical wiring of outdoor unit, indoor unit, and all linked equipment .

(3) Before operation :
a) Turn the power supply switch of the outdoor unit to on for compressor protection. For a test run, wait at least 12 hours from this point.
b) Register control systems into remote controller(s). Never touch the on/off switch of the remote controller(s). Refer to " 8-1-2. Special Function Operation and Settings (for M-NET Remote Controller)" as for settings. In MA remote controller(s), this registration is unnecessary.

(4) More than 12 hours later from power supply to the outdoor unit, turn all power switch to on for the test run. Perform test run according to the "Operation procedure" table of the bottom of this page. While test running, make test run reports .

(5) When you deliver the unit after the test run, instruct the end user for proper usage of the system using owners' manual and the test run report you made to certificate normal operation. If abnormalities are detected during test run, refer to "8-1-3. Countermeasures for Error During Test Run". As for DIP switch setting of outdoor unit, refer to "8-5. INTERNAL SWITCH FUNCTION TABLE".

(M-NET Remote controller)



Operation procedure	
①	Turn on the main power supply of all units at least 12 hours before test run. "HO" appears on display panel for 3 min.
②	12 hours later, press TEST RUN button twice to perform test run. "TEST RUN " appears on display panel.
③	Press OPERATION SWITCH button to make sure that air blows out.
④	Select Cooling (or Heating) by OPERATION SWITCH button to make sure that cool (or warm) air blows out.
⑤	Press Fan speed button to make sure that fan speed is changed by the button.
⑥	Press AIR DIRECTION button or LOUVER button to make sure that air direction is adjustable (horizontal, downward, upward, and each angle).
⑦	Check outdoor fans for normal operation.
⑧	Check interlocked devices (like ventilator) for normal operation, if any. This is the end of test run operation.
⑨	Press ON/OFF button to stop and cancel test run.

Notes: 1. If error code appears on remote controller or remote controller malfunctions, refer to " 8-1-3. Countermeasures for Error During Run".
2. During test run operation, 2-hour off timer activates automatically and remaining time is on remote controller and test run stops 2 hours later.
3. During test run, the indoor liquid pipe temperature is displayed on remote controller instead of room temperature.
4. Depending on a model, "This function is not available" appears when air direction button is pressed. However, this is not malfunction.

8-1-2. Special Function Operation and Settings (for M-NET Remote Controller)

- It is necessary to perform “group settings” and “paired settings” at making group settings of different refrigerant systems (multiple outdoor unit).
  (A) Group settings: Enter the indoor unit controlled by the remote controller, check the content of entries, and clear entries, etc.
  (B) Paired settings: Used to set the linked operation of a Lossnay unit.

(1) Entering address: Follow the steps below to enter the addresses of the indoor unit using the remote controller.

a) Group settings

- Turning off the remote controller: Press the ON/OFF button to stop operation (the indicator light will go off).
- Changing to indoor unit address display mode: If the FILTER and buttons on the remote controller are pressed simultaneously and held for 2 seconds, the display shown in Figure 1 will appear.
- Changing address: Press the temperature adjustment buttons to change the displayed address to the address to be entered.
- Entering the displayed address: Press the TEST RUN button to enter the indoor unit with the displayed address.
  The type of the unit will be displayed as shown in Figure 2 if entry is completed normally.
  If a selected indoor unit does not exist, an error signal will be displayed as shown in Figure 3. When this happens, check whether the indoor unit actually exists and perform entry again.
- Returning to the normal mode after completing entry: Press the FILTER and buttons simultaneously and hold for 2 seconds to return to the normal mode.

Figure 1. (A) Group setting display

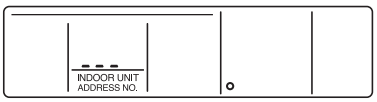
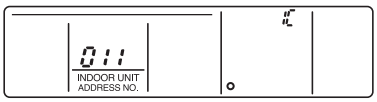
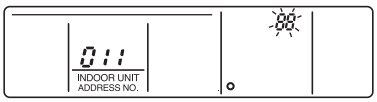


Figure 2. Normal completion of entry



Type of unit is displayed.

Figure 3. Entry error signal



Flashing “88” indicates entry error.

b) Paired Settings

- Turn off the remote controller: Press the remote controller’s ON/OFF button to turn it off (the indicator light will go off).
- Put in indoor unit address display mode: Press the FILTER and buttons on the remote controller simultaneously and hold for 2 seconds.

*The above steps are the same as when making group settings (A).

- Changing to the linked operation unit address display state: The display shown in Figure 4 will appear when the button on the remote control is pressed.
- Displaying the address of the Lossnay unit and linked indoor unit: In this situation, the indoor unit number will be the lowest address of the group. The Lossnay unit will not operate if this setting is incorrect.

* If the temperature adjustment buttons are pressed, the address may be changed to the indoor unit that are to be linked.

* If the time setting buttons are pressed, the address of the linked units may be changed to the address where it is desired to enter the Lossnay .

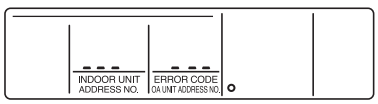
- Linking the Lossnay and the indoor unit: The display shown in Figure 5 will appear when the TEST RUN button is pressed. The indoor unit whose address is displayed and the Lossnay unit with a linked address will operate in a linked manner.

* If it is desired to display the address of the Lossnay in the indoor unit address, display the indoor unit address in the linked unit address, and the above content will also be recorded.

* Apart from the indoor unit with the lowest address in the group, display and enter the addresses of the other indoor unit that are to be linked with the Lossnay unit.

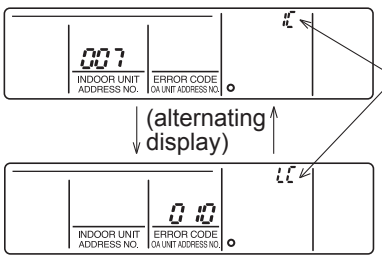
- Returning to the normal mode after completing entry: Press the FILTER and buttons on the remote controller simultaneously and hold for 2 seconds to return to the normal mode.

Figure 4. (B) Making paired settings



The addresses of indoor unit and linked units are displayed simultaneously.

Figure 5. Completing normal entry



These alternating IC or LC displays will appear when entry is completed normally.

A flashing “88” will appear if there is a problem with the entry (indicating that the unit does not exist).

(2) Address check: Refer to section (1) regarding address entry.

a) In making group settings:

- Turn off the remote controller: Press the remote controller's ON/OFF button to stop operation (the indicator light will go off).
- Locate the indoor unit address display mode: Press the FILTER and buttons on the remote controller simultaneously and hold for 2 seconds.
- Display indoor unit address: The entered indoor units address and type will be displayed each time the button is pressed.
  * When 1 entry is made, only 1 address will be displayed no matter how many times the button is pressed.
- Returning to the normal mode after completing check: Simultaneously press the FILTER and buttons on the remote controller and hold for 2 seconds to return to the normal mode.

b) In making paired settings:

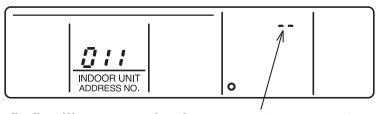
- Turn off the remote controller: Press the remote controller's ON/OFF button to stop operation (the indicator light will go off).
- Put in indoor unit address display mode: Press the FILTER and buttons on the remote controller simultaneously and hold for 2 seconds.
- Changing to the linked operation unit address display state: Press the button on the remote control.
- Displaying the address of the indoor unit to be checked: Change the address to that of the indoor unit to be checked by pressing the temperature adjustment buttons ▲ ▼.
- Displaying the address of the linked Lossnay unit: Press the button to display the addresses of the linked Lossnay and indoor unit in alternation.
- Displaying the addresses of other entered units: The addresses of the other entered units will be displayed in alternating fashion after resting the button again.
- Returning to the normal mode after completing the check: Simultaneously press the FILTER and buttons on the remote controller and hold for 2 seconds to return to the normal mode.

(3) Clearing an address: Refer to section (1) regarding the address entry and section (2) regarding checking addresses.

a) In making group settings:

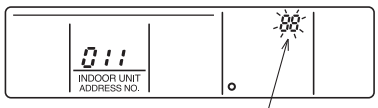
- Turn off the remote controller: The procedure is same as **a)** in (2) Address check.
- Put in the indoor unit address display mode: The procedure is same as **a)** in (2) Address check.
- Displaying the indoor unit address to be cleared: The procedure is same as **a)** in (2) Address check.
- Clearing indoor unit address : Pressing the CLOCK ON OFF button on the remote controller twice will clear the address entry of the displayed indoor unit, resulting in the display shown in Figure 6.
  The display shown in Figure 7 will appear if an abnormality occurs and the entry is not cleared. Please repeat the clearing procedure.
- Returning to the normal mode after clearing an address: The procedure is same as **a)** in (2) Address check.

Figure 6. Display after address has been cleared normally



"--" will appear in the room temperature display location.

Figure 7. Display when an abnormality has occurred during clearing

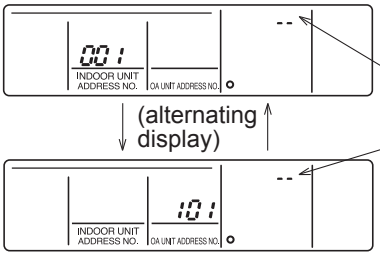


"88" will appear in the room temperature display location.

b) In making paired settings:

- Turn off the remote controller: The procedure is same as **b)** in (2) Address check.
- Put into the indoor unit address display mode: The procedure is same as **b)** in (2) Address check.
- Put into the linked unit address display mode: The procedure is same as **b)** in (2) Address check.
- Display the address of the Lossnay unit or the indoor unit to be cleared.
- Deleting the address of a linked indoor unit: Pressing the CLOCK ON OFF button on the remote controller twice will clear the address entry of the displayed indoor unit, resulting in the display shown in Figure 8.
- Returning to the normal mode after clearing an address: The procedure is same as **b)** in (2) Address check.

Figure 8. Display after address has been cleared normally



"--" will appear in the unit type display location when an address has been cleared normally.

"88" will appear in the unit type display location when an abnormality has occurred during clearing.

8-1-3. Countermeasures for Error During Test Run

• If a problem occurs during test run, a code number will appear in the temperature display area on the remote controller (or LED on the outdoor unit), and the air conditioning system will automatically cease operating.

Determine the nature of the abnormality and apply corrective measures.

Note that this document describes flow charts for solving trouble/error(s) which is detected in outdoor unit only.

Check code	Trouble	Detected Unit			Remarks
		Indoor	Outdoor	Remote Controller	
0403	Serial communication error		○		Outdoor unit Multi controller board ~ Power board communiation trouble
1102	Compressor temperature		○		Check delay code 1202
1300	Low pressure		○		
1302	High pressure		○		Check delay code 1402
1500	Superheat due to low discharge temperature		○		Check delay code 1600
1501	Insufficient refrigerant trouble		○		Check delay code 1601
	Blocked valve in cooling mode		○		Check delay code 1501
1508	4-way valve trouble in heating mode		○		Check delay code 1608
2500	Water leakage	○			
2502	Drain pump trouble	○	○		
2503	Drain sensor trouble (THd)	○			
4100	Compressor current interruption(locked compressor)		○		Check delay code 4350
4210	Compressor over current interruption		○		
4220	Voltage shortage/overvoltage/PAM error/T-open phase/power syncronization signal error		○		Check delay code 4320
4230	Heatsink temperature		○		Check delay code 4330
4250	Power module		○		Check delay code 4350
4400	Rotational frequency of outdoor fan motor		○		Check delay code 4500
5101	Air inlet sensor trouble (TH21) or	○			
	Compressor temperature thermistor (TH4) open/short		○		Check delay code 1202
5102	Liquid pipe temp.sensor trouble (TH22) or	○			
	Low pressure saturated temp.thermistor (TH6) open/short		○		Check delay code 1211
5103	Gas pipe temperature sensor trouble (TH23)	○			
5105	Piping temperature thermistor (TH3) open/short		○		Check delay code 1205
5106	Piping temperature thermistor (TH7) open/short		○		Check delay code 1221
5109	HIC piping temperature thermistor (TH2) open/short		○		Check delay code 1222
5110	Heatsink temperature sensor thermistor (TH8) open/short		○		Check delay code 1214
5201	High pressure sensor (63HS)		○		Check delay code 1402
5202	Low pressure sensor (63LS)		○		Check delay code 1400
5300	Primary current		○		Check delay code 4310
5701	Contact failure of drain flowt switch	○			
6600	Duplex address error	○	○	○	Only M-NET Remote controller is detected.
6602	Transmission processor hardware error	○	○	○	Only M-NET Remote controller is detected.
6603	Transmission bus BUSY error	○	○	○	Only M-NET Remote controller is detected.
6606	Signal comminication error with transmission processor	○	○	○	Only M-NET Remote controller is detected.
6607	No ACK error	○		○	Only M-NET Remote controller is detected. *
6608	No responce frame error	○		○	Only M-NET Remote controller is detected. *
6831	MA communication receive signal error (no receive signal)	○		○	Only MA Remote controller is detected.
6832	MA commnication send signal error (starting bit derection error)	○		○	Only MA Remote controller is detected.
6833	MA commnication send error (H/W error)	○		○	Only MA Remote controller is detected.
6834	MA commnication receive error (Synchronous recovery error)	○		○	Only MA Remote controller is detected.
7100	Total capacity error		○		
7101	Capacity code error	○	○		
7102	Connecting excessive number of units		○		
7105	Address setting error		○		
7111	Remote controller sensor trouble			○	

Note:

When the outdoor unit detects No ACK error/No response error, an object indoor unit is treated as a stop, and not assumed to be abnormal.

Self-diagnosis function

The indoor and outdoor units can be diagnosed automatically using the self-diagnosis switch (SW1) and LED1, LED2 (LED indication) found on the multi-controller of the outdoor unit.

LED indication : Set all contacts of SW1 to OFF.

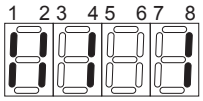
During normal operation

The LED indicates the drive state of the controller in the outdoor unit.

Bit	1	2	3	4	5	6	7	8
Indication	Compressor operated	52C	21S4	SV1	(SV2)	—	—	Always lit

[Example]

When the compressor and SV1 are turned during cooling operation.



Check code

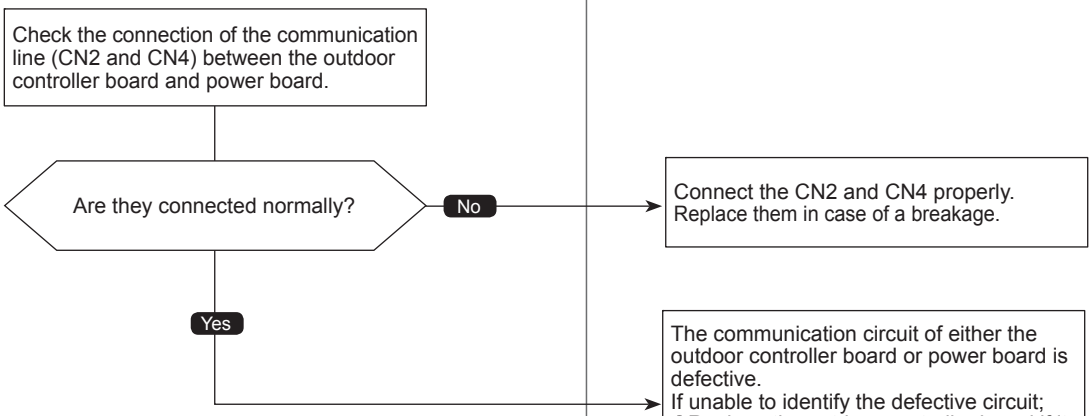
0403

Serial commucication error

Abnormal points and detection methods	Causes and check points
Abnormal if serial communication between the outdoor controller board and outdoor power board is defective.	①Wire breakage or contact failure of connector CN2 or CN4 ②Malfunction of power board communication circuit on outdoor controller board ③Malfunction of communication circuit on outdoor power board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
	

Check code

1102

Compressor temperature trouble

Abnormal points and detection methods	Causes and check points
(1) Abnormal if TH4 falls into following temperature conditions; ●exceeds 110℃ [230 °F]continuously for 5 minutes ●exceeds 125℃ [257 °F] (2) Abnormal if a pressure detected by the high-pressure sensor and converted to saturation temperature exceeds 40℃ [104 °F]during defrosting, and TH4 exceeds 110℃ [230 °F]. TH4: Compressor temperature thermistor LEV: Linear expansion valve	①Malfunction of stop valve ②Over-heated compressor operation caused by shortage of refrigerant ③Defective thermistor ④Defective outdoor controller board ⑤LEV performance failure ⑥Defective indoor controller board ⑦Clogged refrigerant system caused by foreign object ⑧Refrigerant shortage while in heating operation (Refrigerant liquid accumulation in compressor while indoor unit is OFF/thermostatic control OFF.)

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
Is 5101 displayed when restart? Yes (5101)	Refer to the diagnosis of check code 5101.
No (1102)	
Is the outdoor stop valve fully open? No	Open the stop valve fully.
Yes	
Is there a refrigerant leak? Yes	Repair the refrigerant leakage.
No (no leak)	
Check the connection for thermistor wiring and indoor controller board connector	
Is there any abnormality on connectors/wires such as a disconnection, half-disconnection or breakage? Yes	Connect the connector properly (Repair or replace it in case of a breakage).
No	
Continue to the next page	

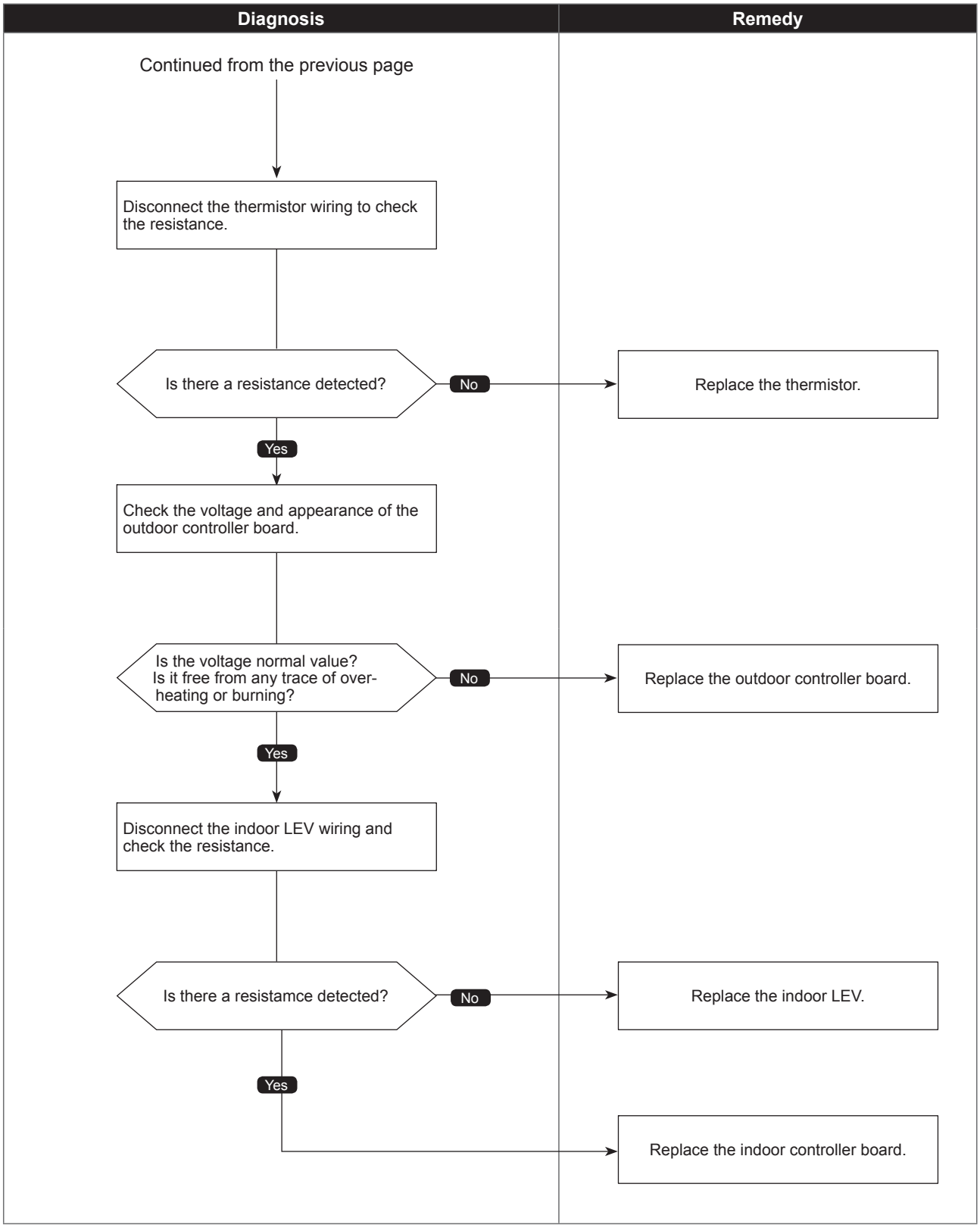
Check code

1102

Compressor temperature trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

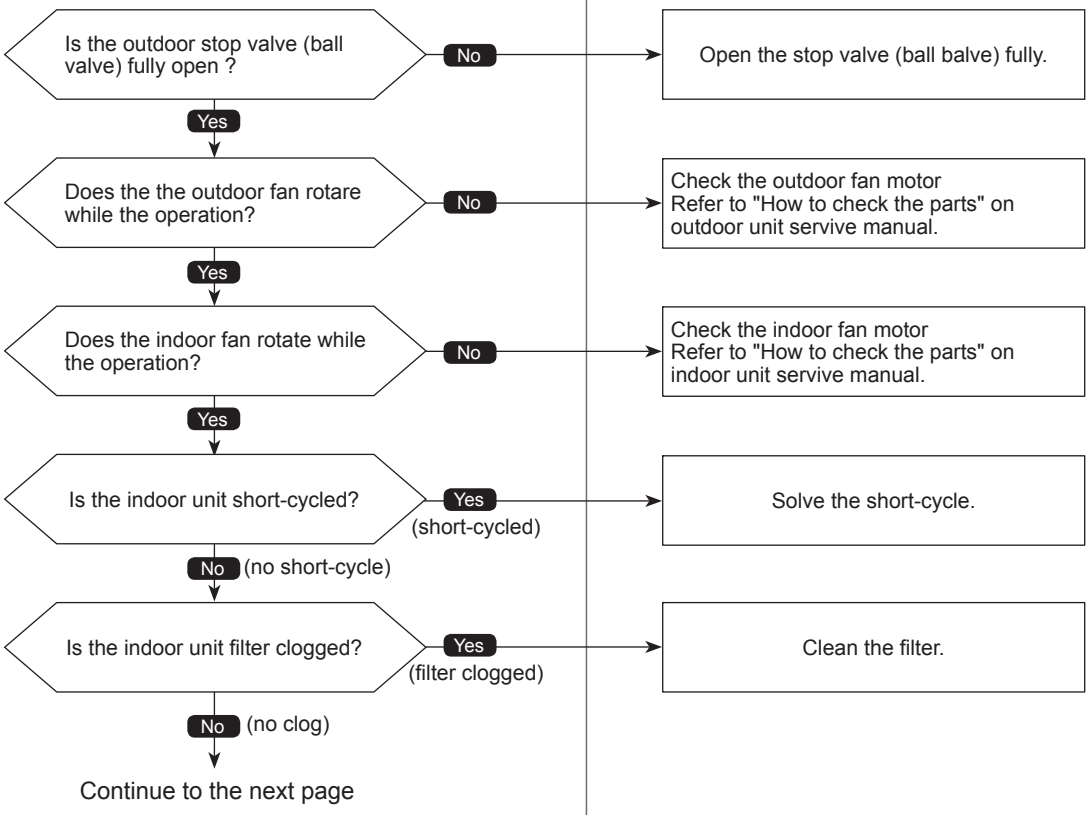
1300

Low pressure trouble

Abnormal points and detection methods	Causes and check points
<63L equipped model (63LS non-equipped)> (1) Low pressure (63L is in operation) Abnormal if 63L operates (under-0.03MPa) during compressor operation. <63LS equipped model (63L non-equipped)> (2) Low pressure (63LS is in operation) Abnormal if 63LS operates (under-0.03MPa) during compressor operation. 63L : Low pressure switch 63LS : Low pressure sensor LEV : Linear expansion valve SV1 : Solenoid valve TH7 : Outdoor temperature thermistor	① Defective operation of stop valve (not fully open) ② Clogged or broken pipe. ③ Malfunction or locked outdoor fan motor ④ Short-cycle of outdoor unit ⑤ Dirt of outdoor heat exchanger ⑥ Remote controller transmitting error caused by noise interference ⑦ Contact failure of outdoor controller board connector ⑧ Defective outdoor controller board ⑨ Short-cycle of indoor unit ⑩ Decreased airflow, clogged filter, or dirt on indoor unit. ⑪ Malfunction or locked indoor fan motor. ⑫ Decreased airflow caused by defective inspection of outdoor temperature thermistor (It detects lower temperature than actual temperature.) ⑬ Indoor LEV performance failure ⑭ Malfunction of fan driving circuit ⑮ SV1 performance failure ⑯ Defective low-pressure sensor ⑰ Malfunction of low-pressure sensor input circuit on outdoor conrtoller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
	

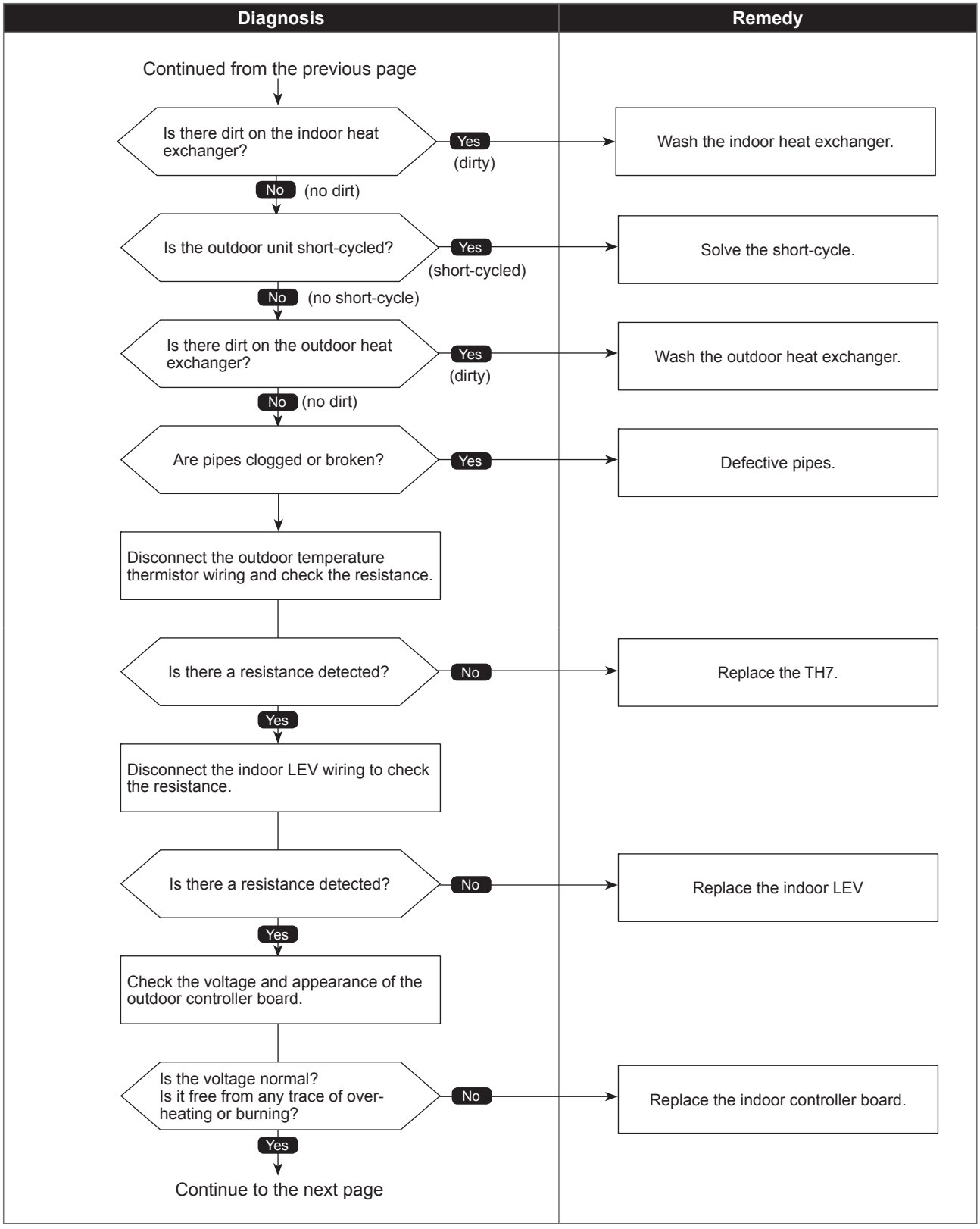
Check code

1300

Low pressure trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



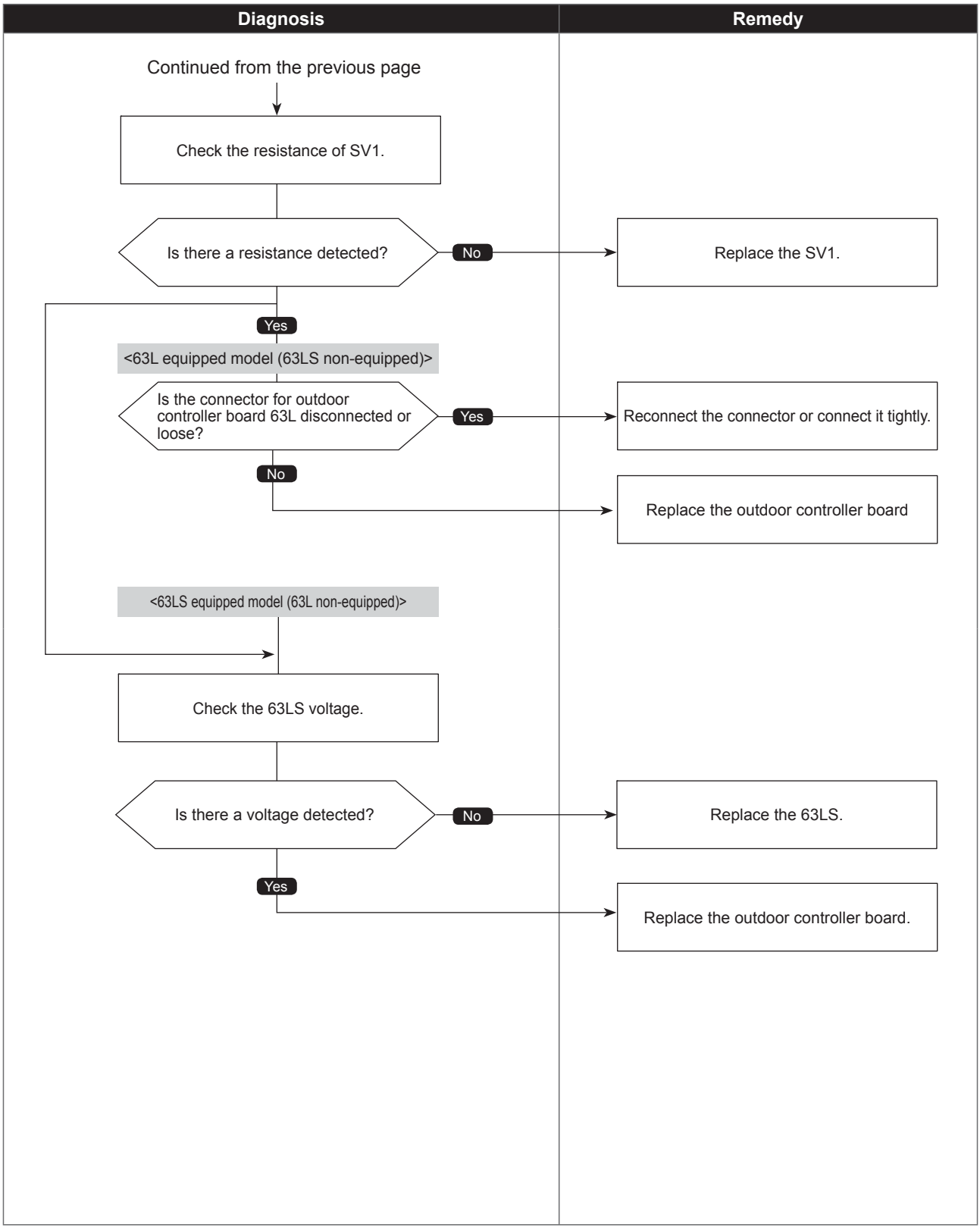
Check code

1300

Low pressure trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

1302

High pressure trouble

Abnormal points and detection methods	Causes and check points
<63H equipped model (63HS non-equipped)> (1) High pressure abnormality (63H operation) Abnormal if 63H operates(*) during compressor operation. (* 4.15MPa) <63HS equipped model (63H non-equipped)> (2) High pressure abnormality (63HS detected) Abnormal if a pressure detected by 63HS exceeds 4.15MPa during compressor operation. 63H : Higi-pressure switch 63HS: Higi-pressure sensor LEV : Linear expansion valve SV1 : Solenoid valve TH7 : Outdoor temperature thermistor	① Defective operation of stop valve (not fully open) ② Clogged or broken pipe. ③ Malfunction or locked outdoor fan motor ④ Short-cycle of outdoor unit ⑤ Dirt of outdoor heat exchanger ⑥ Remote controller transmitting error caused by noise interference ⑦ Contact failure of the outdoor controller board connector ⑧ Defective outdoor controller board ⑨ Short-cycle of indoor unit ⑩ Decreased airflow, clogged filter, or dirt on indoor unit. ⑪ Malfunction or locked indoor fan motor. ⑫ Decreased airflow caused by defective inspection of outdoor temperature thermistor (It detects lower temperature than actual temperature.) ⑬ Indoor LEV performance failure ⑭ Malfunction of fan driving circuit ⑮ SV1 performance failure ⑯ Defective high-pressure sensor ⑰ Defective high-pressure sensor input circuit on outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
Is 5201 displayed when restart? — Yes (5201)	Refer to the diagnosis of check code 5201.
No (1302)	
Is the outdoor stop valve (ball valve) fully open ? — No	Open the stop valve (ball balve) fully.
Yes	
Does the outdoor fan rotate while the operation? — No	Check the outdoor fan motor Refer to "How to check the parts" on the outdoor unit servive manual.
Yes	
Does the indoor fan rotate while the operation? — No	Check the indoor fan motor Refer to "How to check the parts" on the indoor unit servive manual.
Yes	
Is the indoor unit short-cycled? — Yes (short-cycled)	Solve the short-cycle.
No (no short-cycle)	
Continue to the next page	

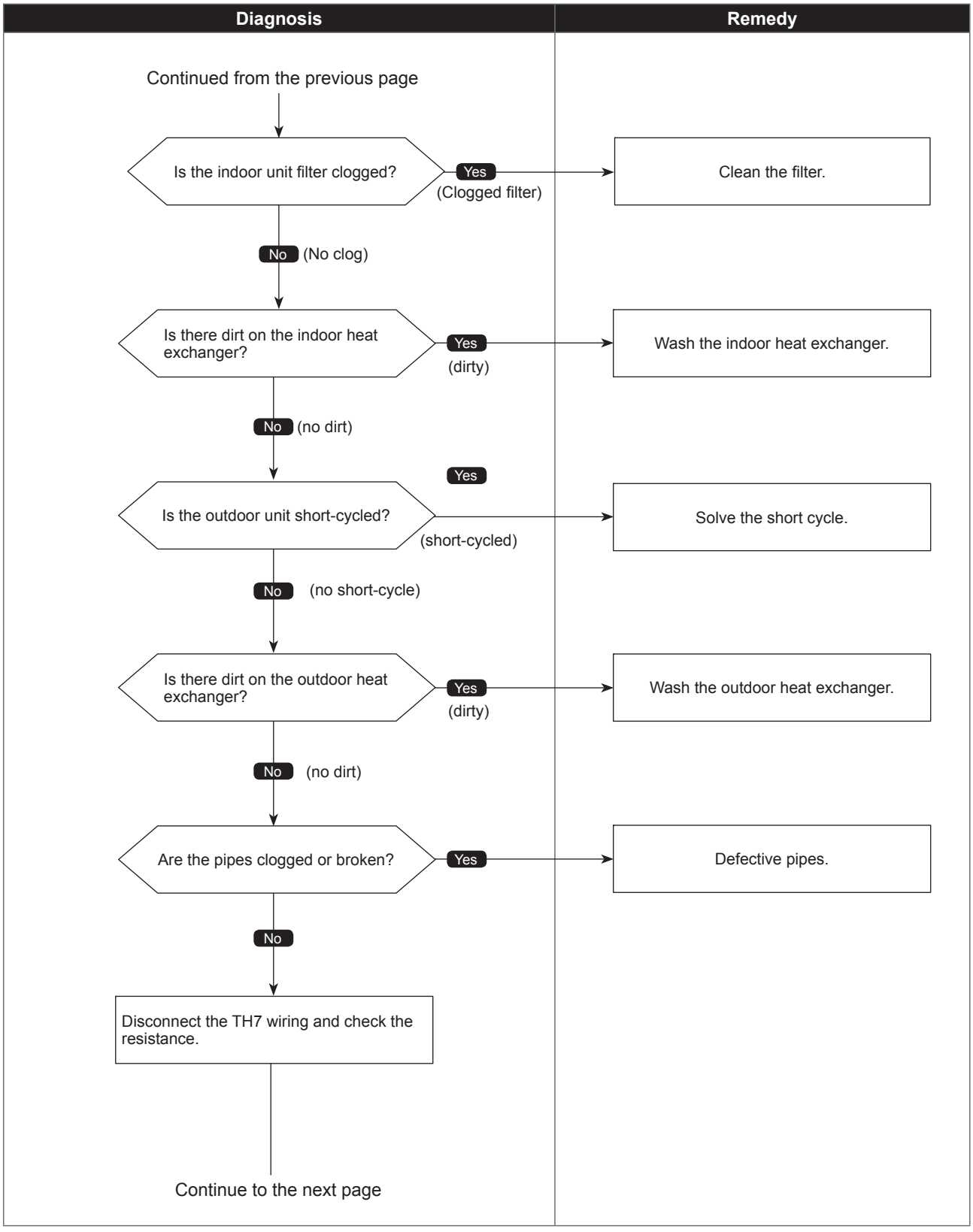
Check code

1302

High pressure trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



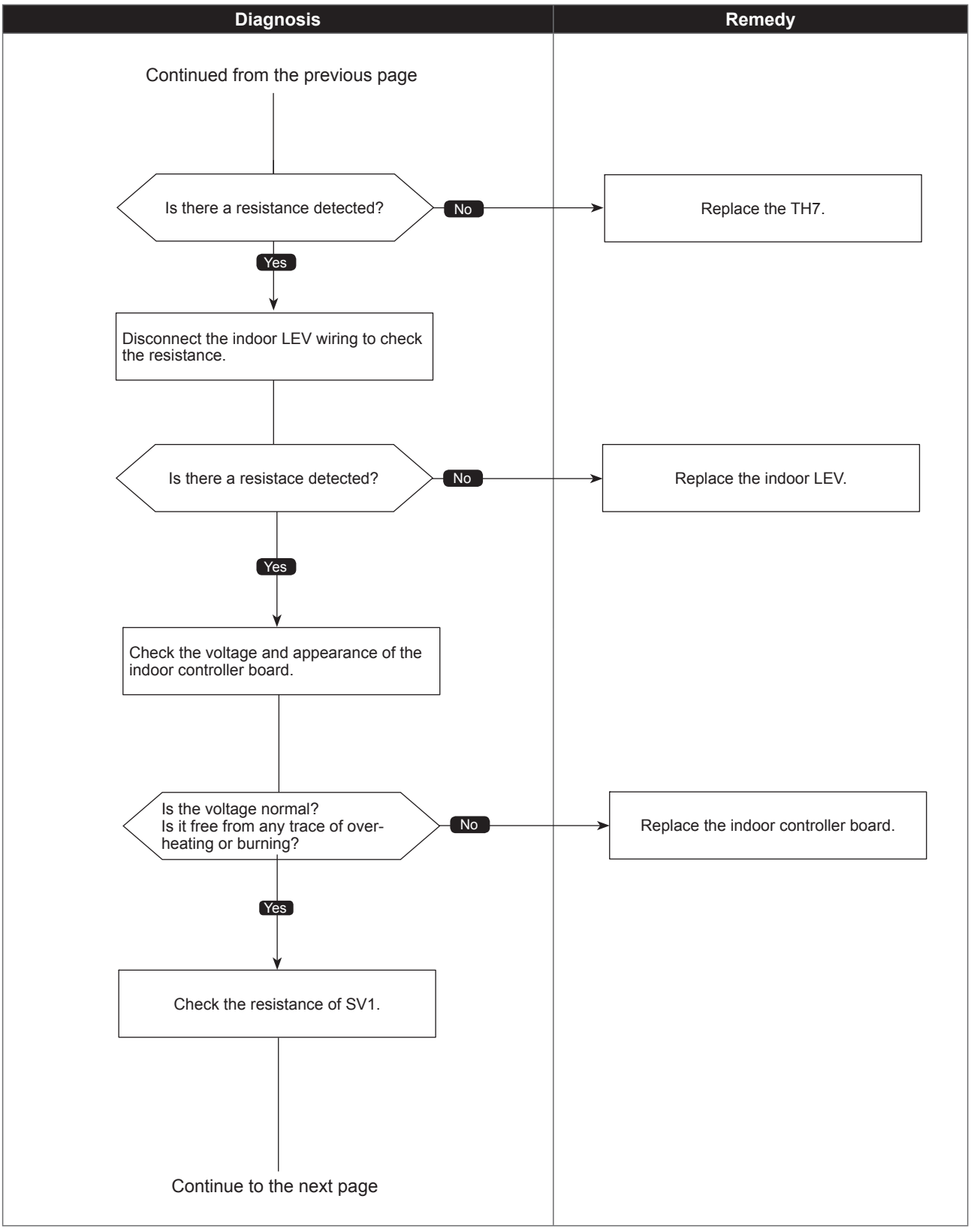
Check code

1302

High pressure trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



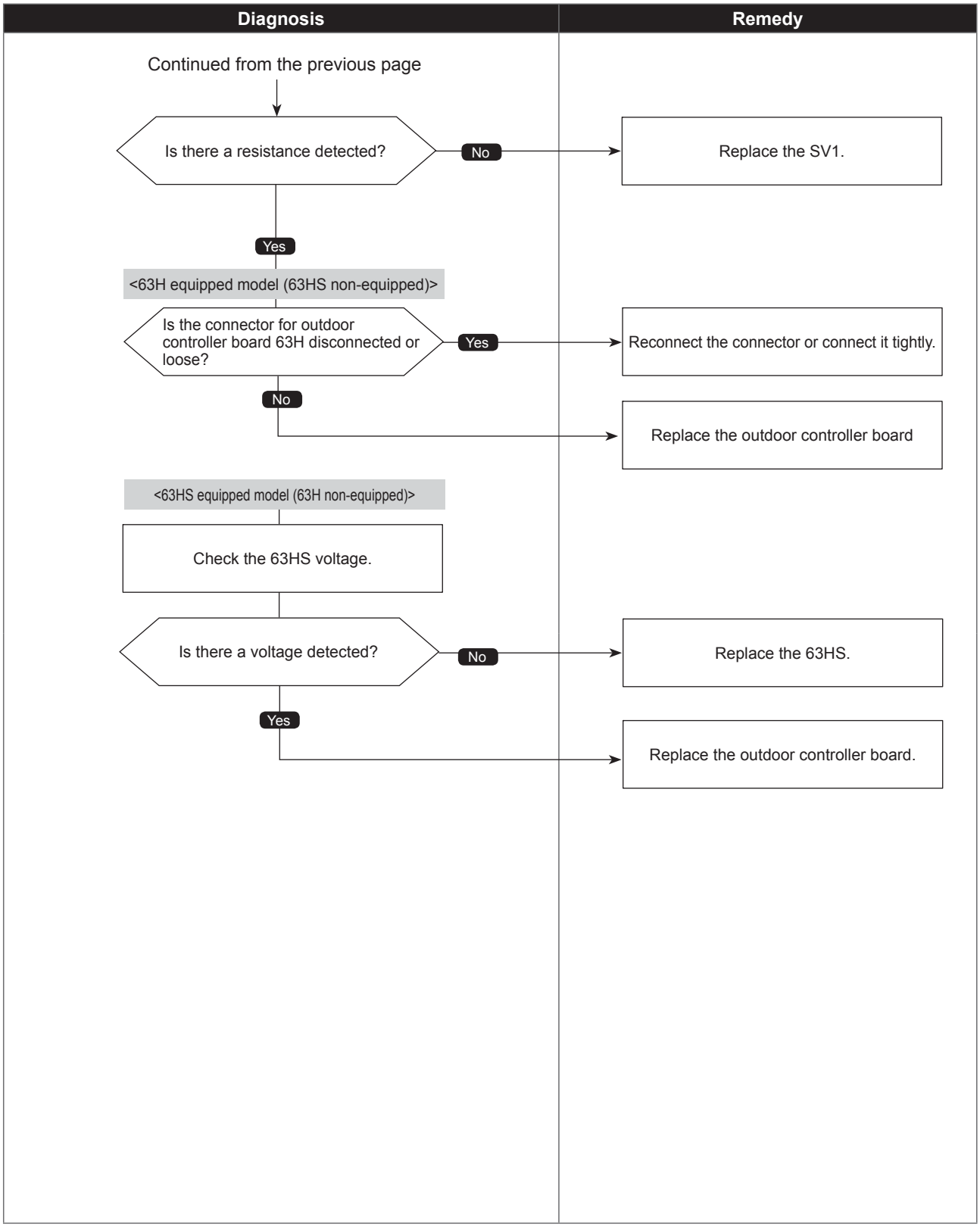
Check code

1302

High pressure trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

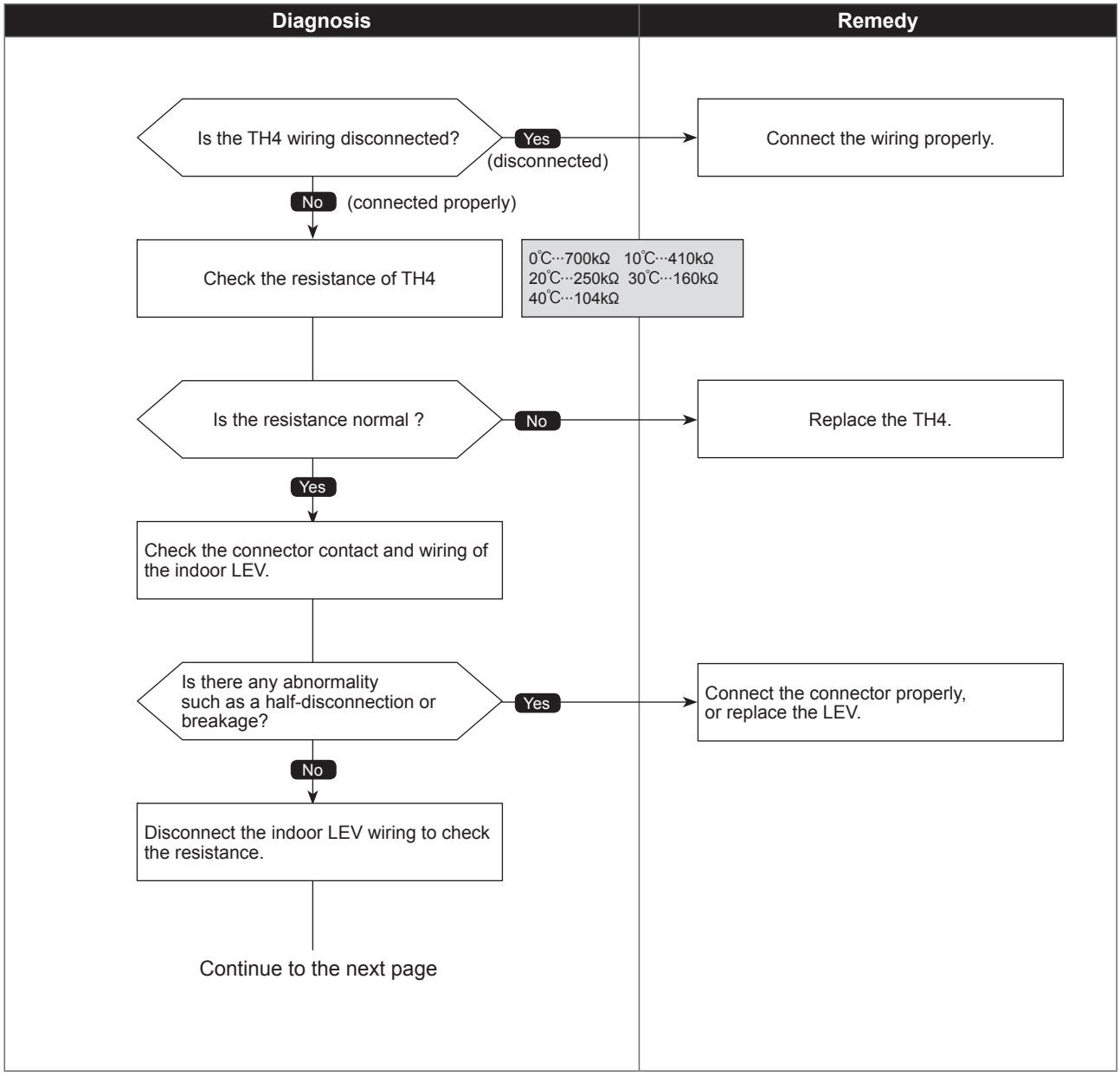
1500

Superheat due to low discharge temperature trouble

Abnormal points and detection methods	Causes and check points
Abnormal if the discharge superheat is continuously detected less than or equal to −15℃ [5 °F]* for 5 minutes even though the indoor LEV has minimum open pulse after the compressor starts operating for 10 minutes. LEV : Linear expansion valve TH4 : Compressor temperature thermistor 63HS : High-pressure sensor *At this temperature, conditions for the abnormality detection will not be satisfied if no abnormality is detected on either TH4 or 63HS.	① Disconnection or loose connection of TH4 ② Defective holder of TH4 ③ Disconnection of LEV coil ④ Disconnection of LEV connector ⑤ LEV performance failure

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



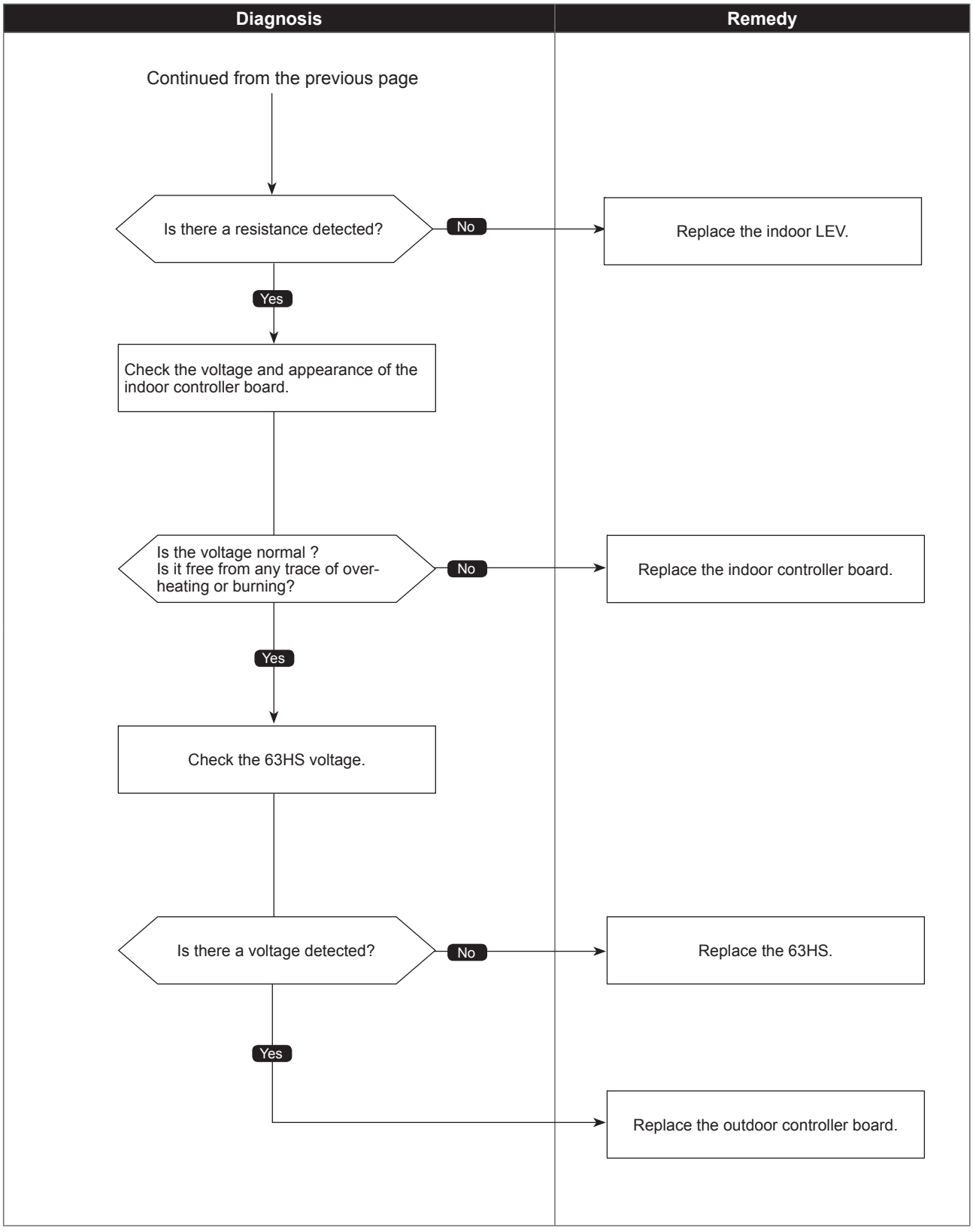
Check code

1500

Superheat due to low discharge temperature trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

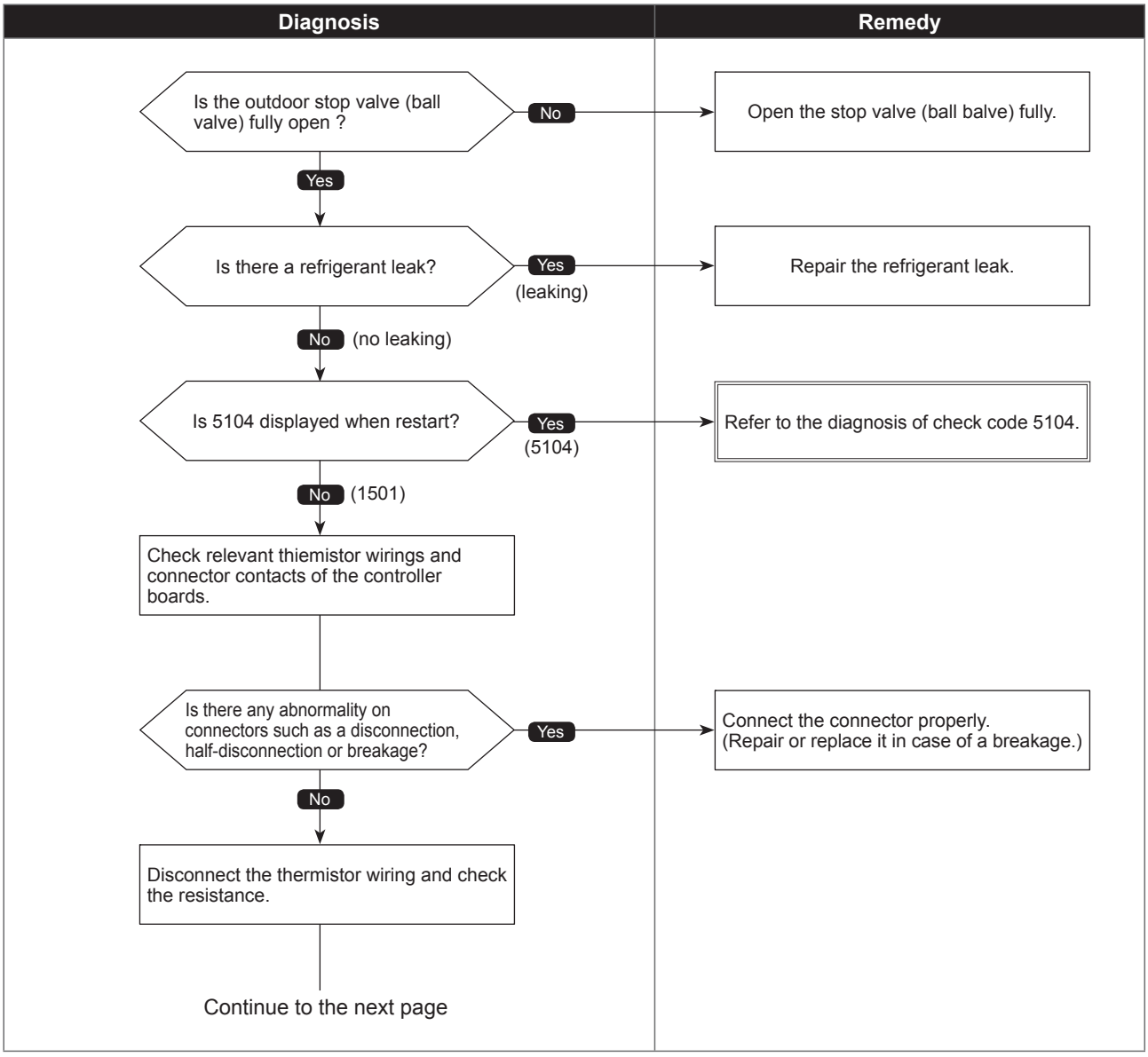
1501

Refrigerant shortage trouble

Abnormal points and detection methods	Causes and check points
(1) Abnormal when all of the following conditions are satisfied: 1. The compressor is operating in HEAT mode 2.Discharge super heat is 80℃ [176 °F] or more. 3.Difference between TH7 and the TH3 applies to the formula of (TH7-TH3 <5℃) 4.The 63HS detects below 2.04MPa. (2) Abnormal when all of the following conditions are satisfied: 1.The compressor is in operation 2.When cooling, discharge superheat is 80℃ [176 °F] or more When heating, discharge superheat is 90℃ [194 °F] or more. The High-pressure sensor detects below 2.32 MPa	①Defective operation of stop valve (not fully open) ②Defective thermistor ③Defective outdoor contoroller board ④Indoor LEV performance failure ⑤Gas leakage or shortage ⑥Defective 63HS TH3 : Piping temperature thermistor TH7 : Outdoor temperature thermistor LEV : Linear expansion valve 63HS: High-pressure sensor

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



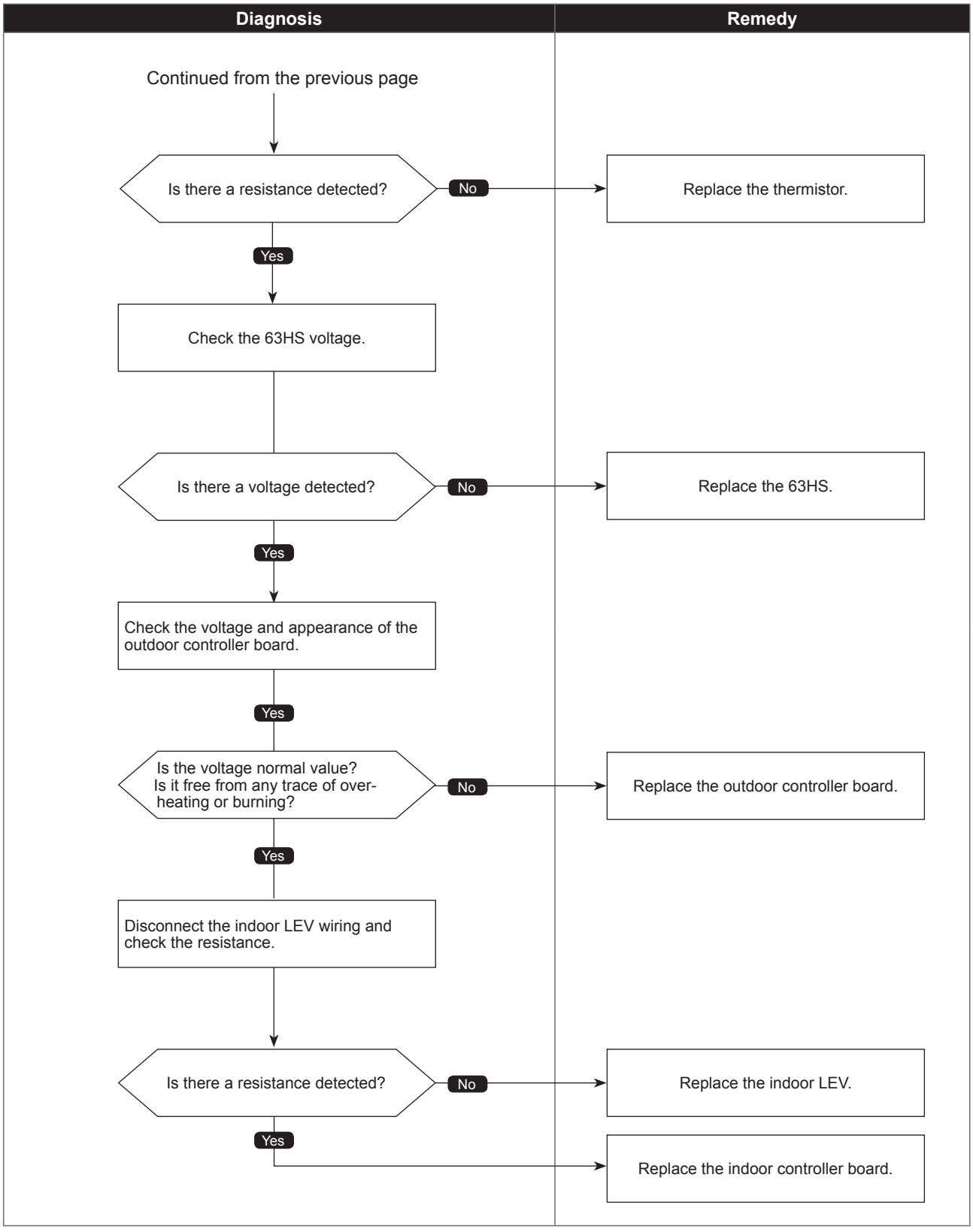
Check code

1501

Refrigerant shortage trouble

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

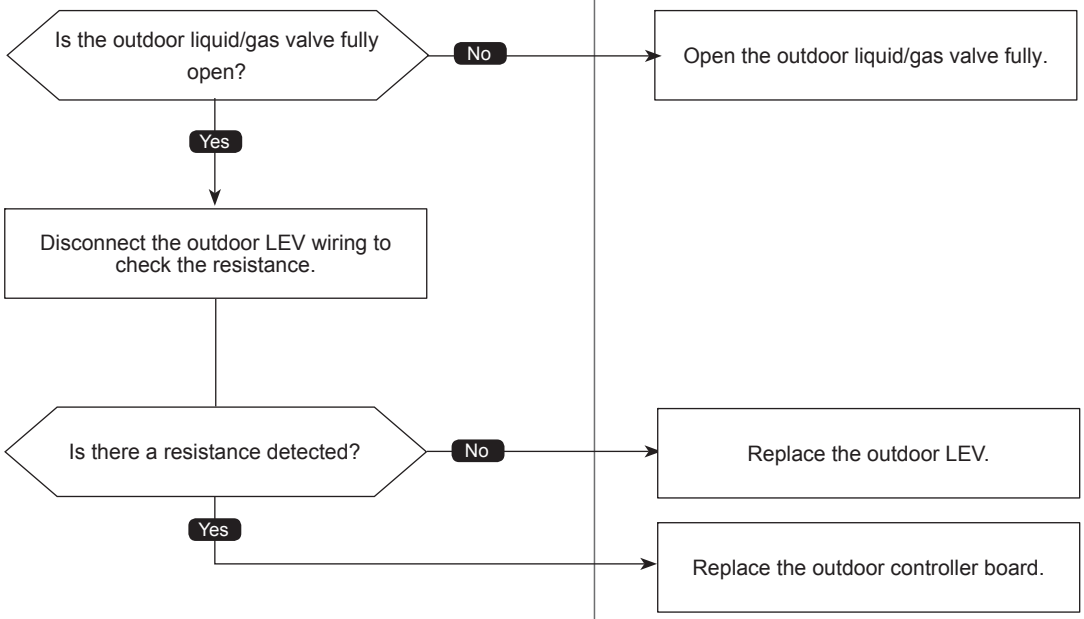
1501

Blocked valve in cooling mode

Abnormal points and detection methods	Causes and check points
Abnormal if stop valve is blocked during cooling operation. Abnormal when both of the follwing temperature condition is satisfied for 20 minutes or more during coling condition. 1. TH22j − TH21j ≧ −2 °C [28.4 °F] 2. TH23j − TH21j ≧ −2 °C[28.4 °F] Note: For indoor unit, the abnormality is detected if an operating unit satisfies the condition.	① Outdoor liquid/gas valve is blocked. ② Mulfunction of outdoor LEV (LEV1)(blockage) TH21: Indoor intake temperature thermistor TH22: Indoor liquid pipe tmperature thermistor TH23: Indoor gas pipe tmperature thermistor LEV: Linear expansion valve

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
	

Check code

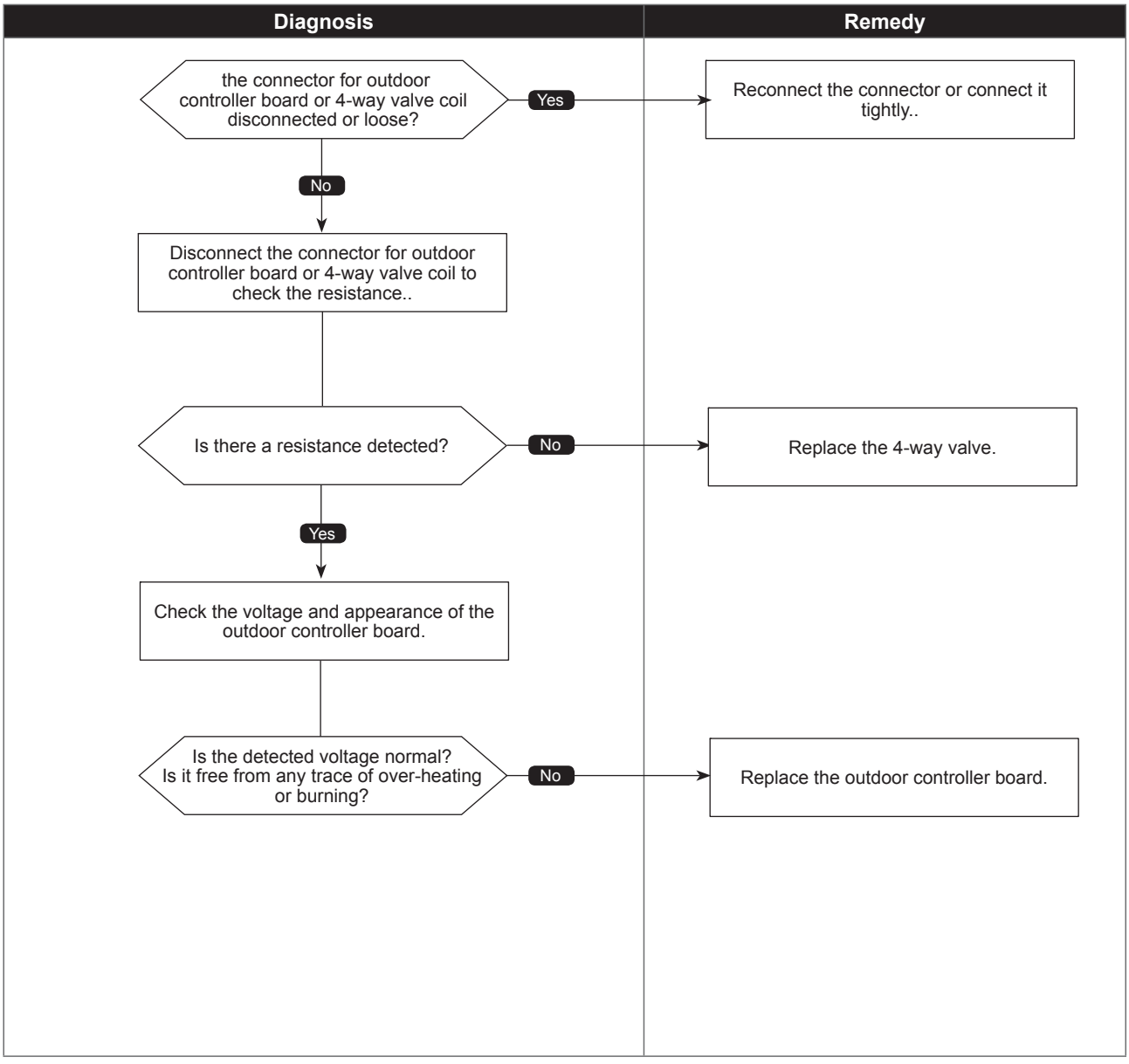
1508

4-way valve trouble in heating mode

Abnormal points and detection methods	Causes and check points
Abnormal if 4-way valve does not operate during heating operation. Abnormal when any of the following temperature condition is satisfied for 3 min. or more during heating operation 1. TH22j − TH21j ≧ −10 °C [14 °F] 2. TH23j − TH21j ≧ −10 °C [14 °F] 3. TH22j ≦ 3 ℃ [37 °F] 4. TH23j ≦ 3 ℃ [37 °F] Note: For indoor unit, the abnormality is detected if an operating unit satisfies the condition.	①4-way valve failue ②Disconnection or failure of 4-way valve coil ③Clogged drain pipe ④Disconnection or loose connection of connectors ⑤Malfunction of input circuit on outdoor controller board ⑥Defective outdoor power board TH21: Indoor intake temperature thermistor TH22: Indoor liquid pipe tmperature thermistor TH23: Indoor gas pipe tmperature thermistor

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

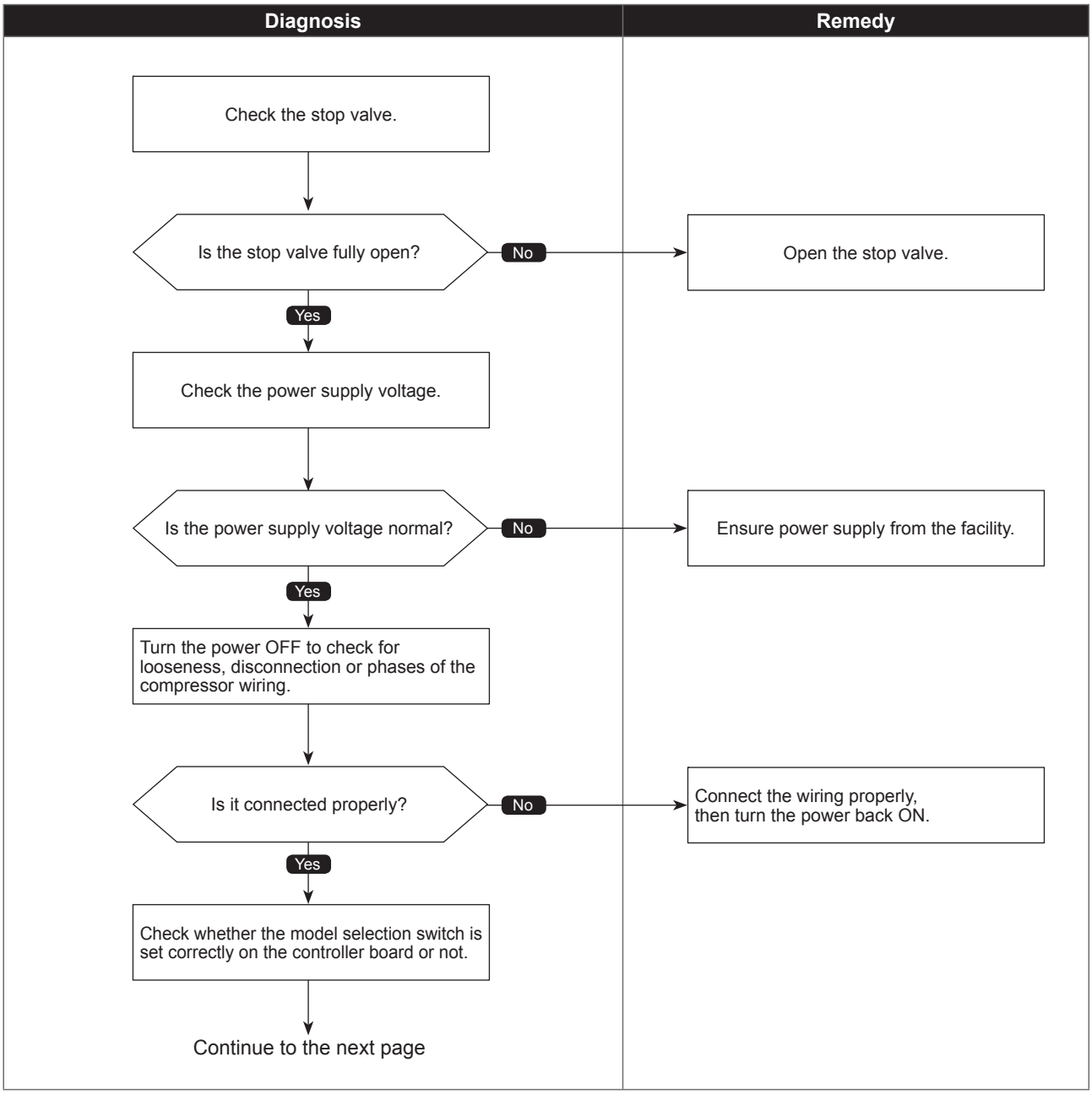
4100

Compressor current interruption (Locked compressor)

Abnormal points and detection methods	Causes and check points
Abnormal if overcurrent of DC bus or compressor is detected 30 seconds after the compressor starts operating.	①Closed stop valve ②Decrease of power supply voltage ③Looseness, disconnection or converse of compressor wiring connection ④Model selection error upon replacement of indoor controller board ⑤Defective compressor ⑥Defective outdoor power board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



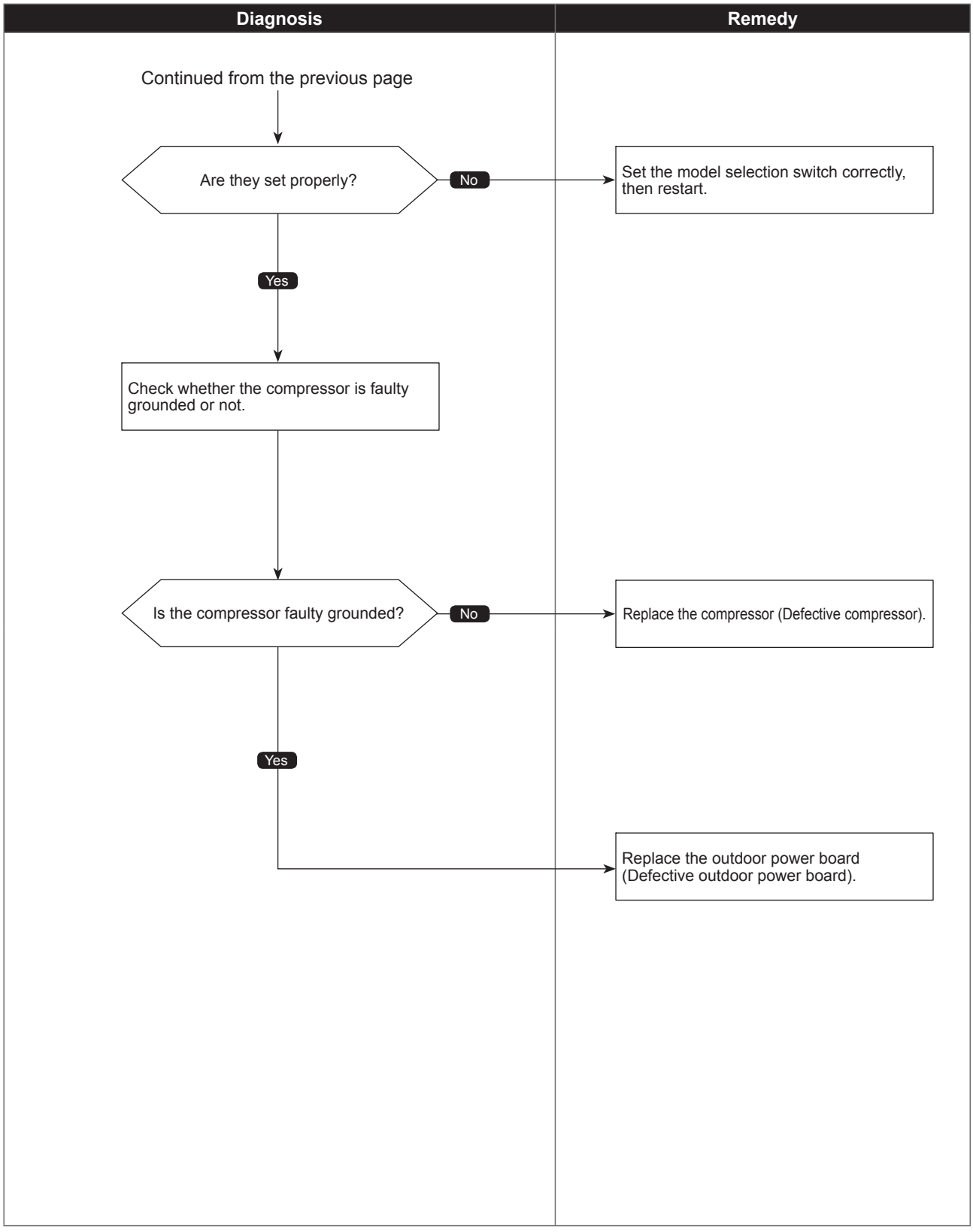
Check code

4100

Compressor current interruption (Locked compressor)

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

4210

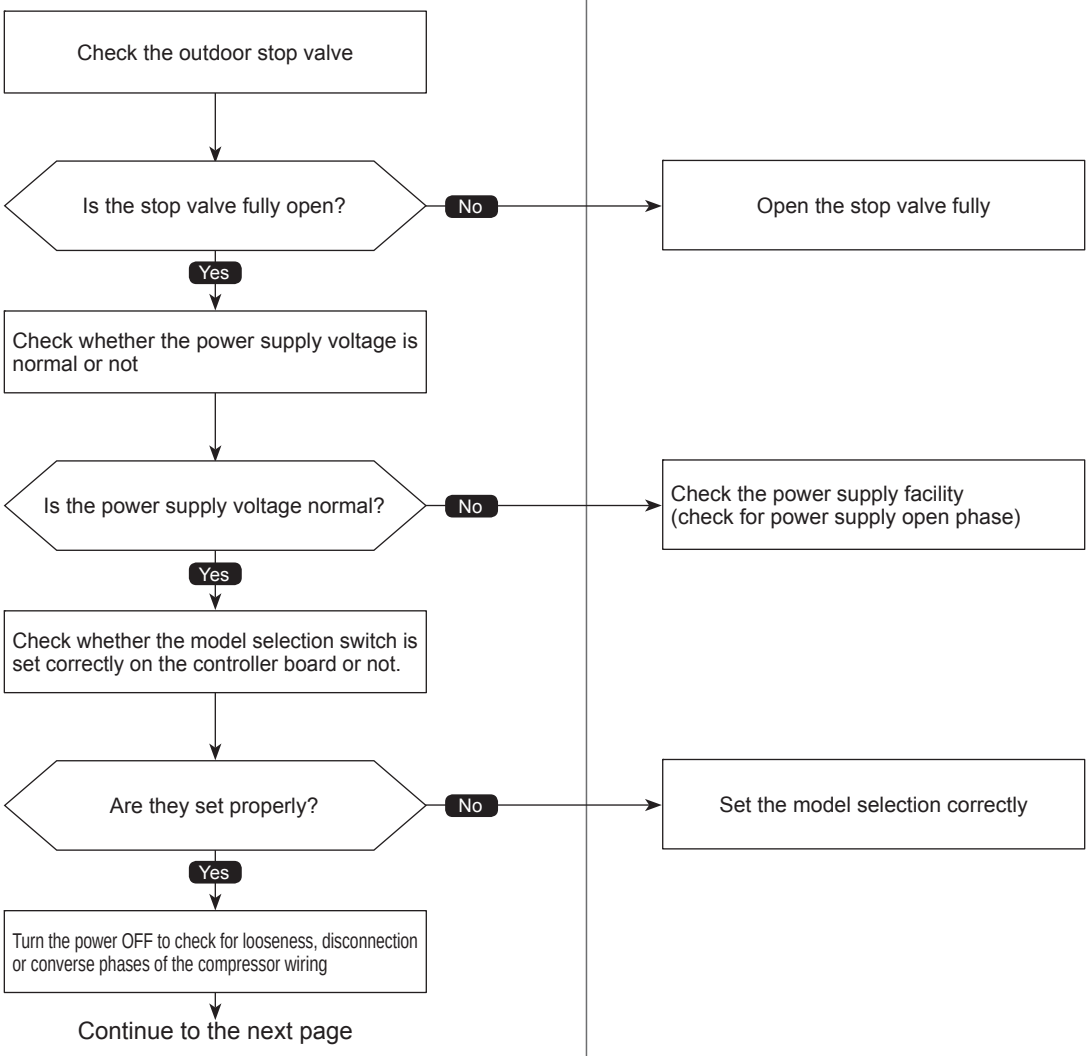
Compressor overcurrent interruption

Abnormal points and detection methods	Causes and check points
Abnormal if overcurrent of DC or the compressor is detected within 30 seconds after the compressor starts operating.	①Closed outdoor stop valve ②Decrease of power supply voltage ③Looseness, disconnection or reverse phase of compressor wiring connection ④Malfunction of indoor/outdoor fan ⑤Short-cycle of indoor/outdoor unit ⑥Model selection error upon replacement of outdoor controller board ⑦Malfunction of input circuit on outdoor controller board ⑧Defective compressor ⑨Defective outdoor power board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy



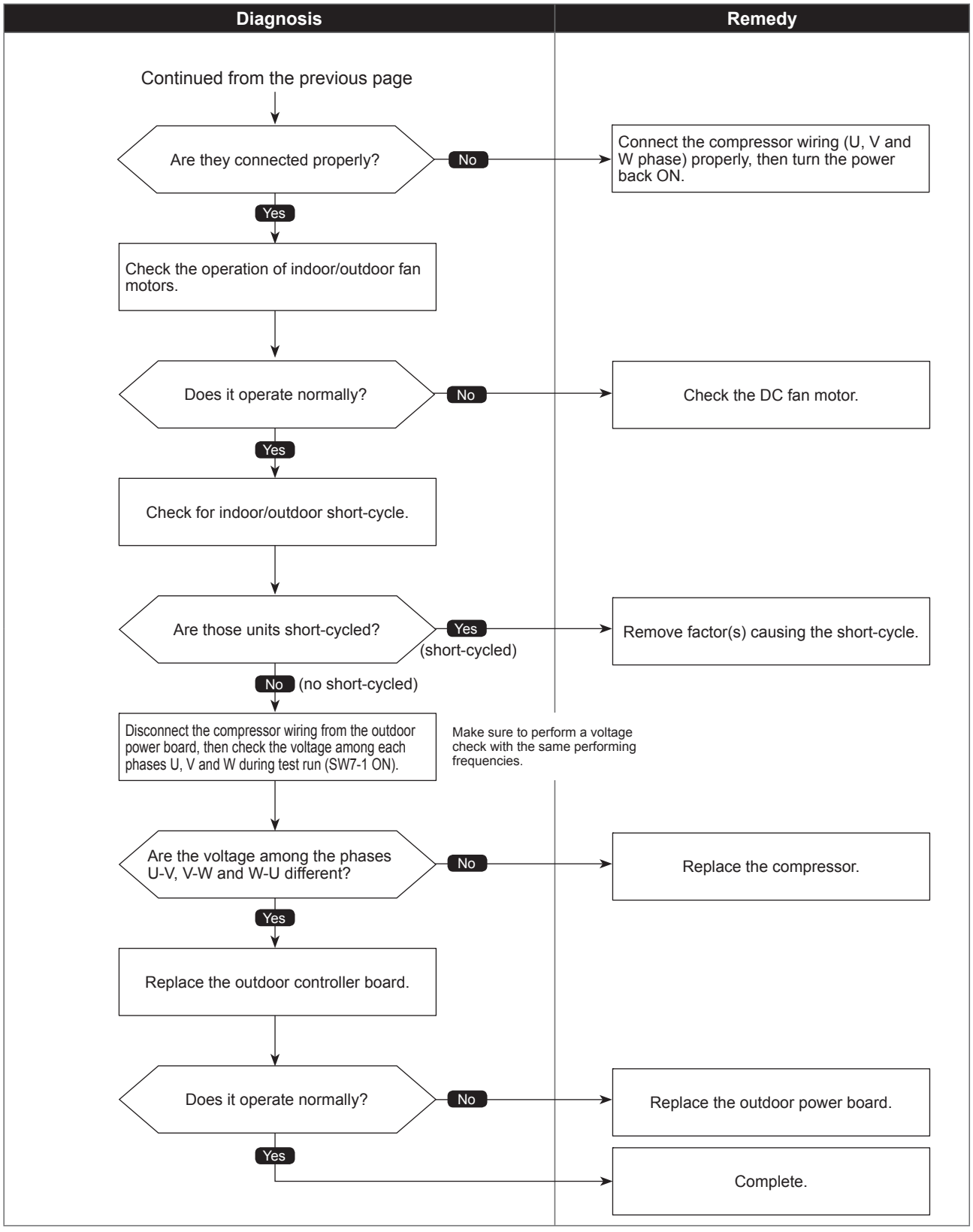
Check code

4210

Compressor overcurrent interruption

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

4220

Voltage shortage/Overvoltage/PAM error/T open-phase/ Power synchronization signal error

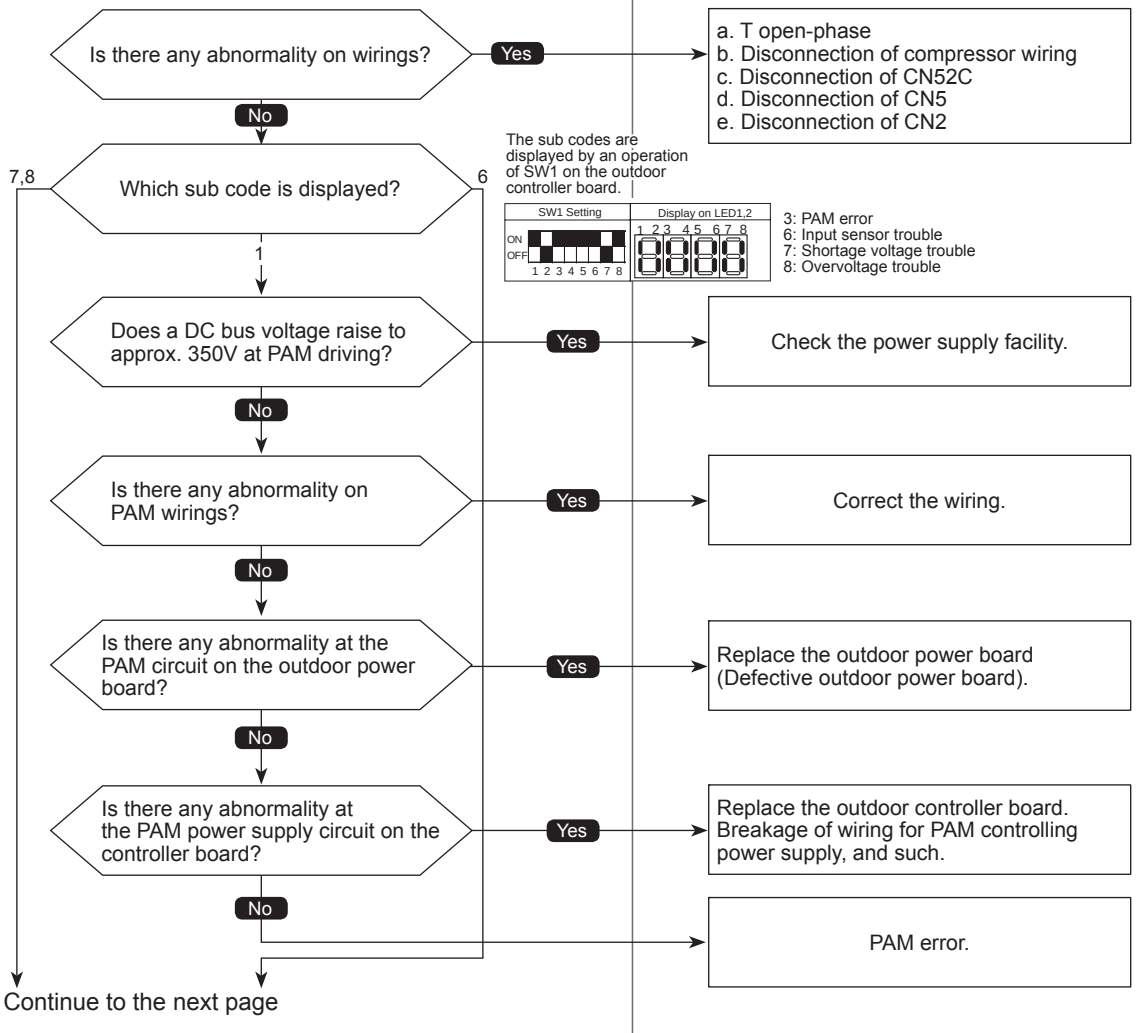
Abnormal points and detection methods	Causes and check points
Abnormal if any of following symptoms are detected; ●Decrease of DC bus voltage to 200V ●Increase of DC bus voltage to 400V ●Decrease of primary current (The detection is active only when the operational frequency is 40Hz or more, or the compressor current is 5A or more.)	①Decrease/increase of power supply voltage, or T open-phase ②Disconnection of compressor wiring ③Malfunction of 52C ④Disconnection or contact failure of CN52C ⑤Defective outdoor power board ⑥Malfunction of 52C driving circuit on outdoor controller board ⑦Disconnection of CN5 ⑧Disconnection of CN2 ⑨Malfunction of primary current detecting circuit on outdoor power board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis



Check code

4220

Voltage shortage/Overvoltage/PAM error/T open-phase/ Power synchronization signal error

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis	Remedy

Continued from the previous page

Is CN5 connected properly without any contact failure?

No → Correct the CN5 wiring.

Yes

Is there any breakage of CT1 on the noise filter board?

Yes → Malfunction of noise filter CT1.

No → Replace the outdoor power board (Defective outdoor power board).

Check the bus voltage read by the microprocessor with an operation of SW1 on the outdoor controller board.

The bus voltage can be displayed by an operation of SW1 on the outdoor controller board.

SW1 Setting	Display on LED1,2	Unit
ON / OFF 1 2 3 4 5 6 7 8	0～999.9	V

Is the power supply normal?

No → Decrease of power supply voltage. T open-phase.

Yes

Check the bus voltage at the both ends of R80 on the outdoor power board using a tester.

Is the bus voltage normal?

No → Replace the outdoor power board (Defective outdoor power board).

Yes

The difference on the voltage between the one read by the microprocessor and the one at the both ends of R80 is large.

Yes → Replace the outdoor power board (A HIC trouble is suspected).

No → Check the power supply facility (Check if a receiving electricity is lowered).

Check code

4230

Heatsink temperature trouble

Abnormal points and detection methods	Causes and check points
Abnormal if TH8 detects a temperature outside the specified range during compressor operation. TH8: Heatsink temperature thermistor	①Blocked outdoor fan ②Malfunction of outdoor fan motor ③Blocked airflow path ④Rise of ambient temperature ⑤Characteristic defect of thermistor ⑥Malfunction of input circuit on outdoor power board ⑦Malfunction of outdoor fan driving circuit

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
Is 5110 displayed when restart? Yes	Refer to the diagnosis of check code 5110.
No → Does the fan rotate during compressor operation? No	Refer to the diagnosis of check code 4400.
Yes → Is there any obstacle which blocks an airflow around the heatsink? Yes (air path blocked)	Improve the airflow path.
No (no obstacle) → Check the wiring and connector connection TH8.	
→ Is there any abnormality such as a disconnection, looseness or breakage? Yes	Connect the wiring/connector properly. Replace it in case of a breakage.
No → Check the resistance of TH8.	TH8 temp. - resistance characteristic 0℃···180kΩ 25℃···50kΩ 50℃···17kΩ 70℃···8kΩ 90℃···4kΩ
→ Is the resistance normal ? No	Replace the thermistor (Defective thermistor).
Yes	Replace the outdoor power board (Defective outdoor power board).

Check code

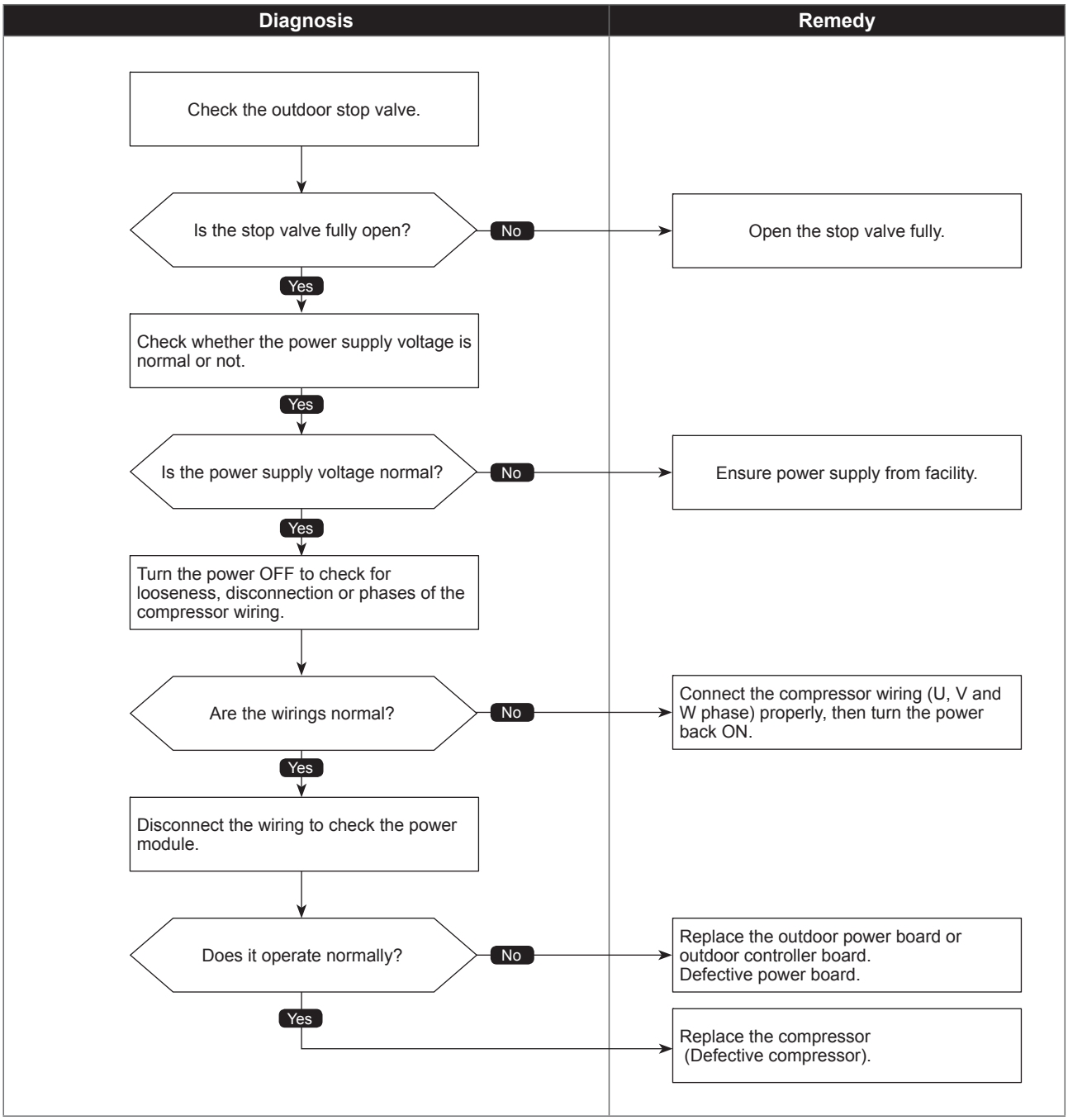
4250

Power module trouble

Abnormal points and detection methods	Causes and check points
Abnormal if overcurrent of DC bus or compressor is detected 30seconds after the compressor starts operating. To determine the source of abnormality, either the compressor or the power module, drive the power module forcedly.	①Closed outdoor stop valve ②Decrease of power supply voltage ③Disconnection, looseness or conversed connection of compressor wiring ④Defective compressor ⑤Defective outdoor power board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

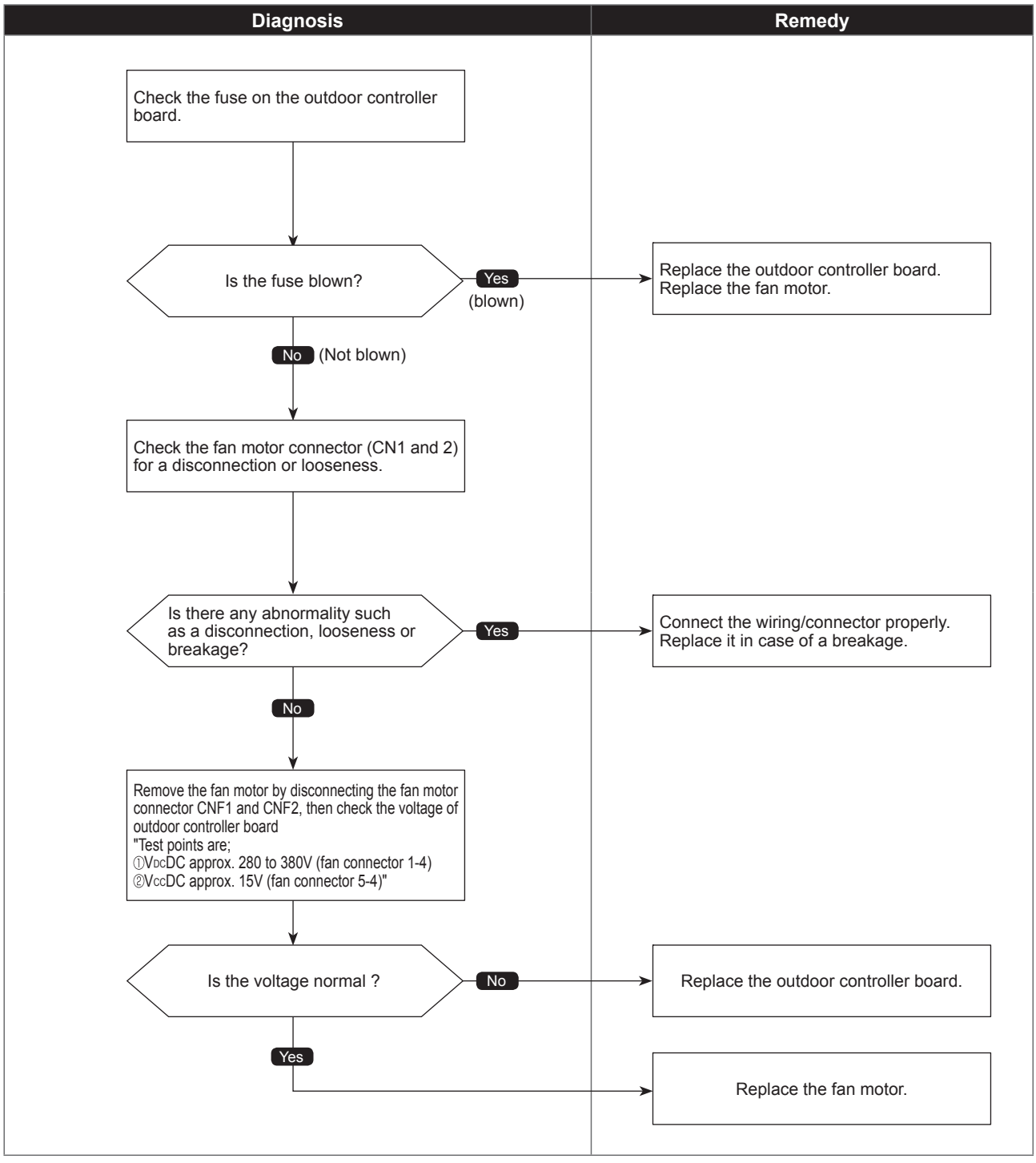
4400

Rotational frequency of outdoor fan motor trouble

Abnormal points and detection methods	Causes and check points
Abnormal if no rotational frequency is detected, or detected a value outside the specified range during fan motor operation.	①Malfunction of fan motor ②Disconnection of CNF connector ③Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

5101

Compressor temperature thermistor (TH4) open/short

Abnormal points and detection methods	Causes and check points
Abnormal if TH4 detects to be open/short. (The open/short detection is disabled for 10 minutes after compressor starts, during defrosting operation, or for 10 minutes after returning from the defrosting operation.) Open: 3℃ [37.4°F] or less Short: 217℃ [422.6°F] or more TH4: Compressor temperature thermistor	① Disconnection or contact failure of connectors ② Characteristic defect of thermistor ③ Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis

Check the wiring and connector connection of TH4

Is there any abnormality such as a disconnection, looseness or breakage?

Yes → Connect the wiring/connector properly. Replace the connector in case of a breakage.

No

Disconnect the connector to check the resistance of TH4 using a tester

Is the detected resistance normal?

No → Replace the thermistor.

Yes

Check a temperature of TH4.

The detected temperature of TH4 can be displayed by an operation of SW1 on the outdoor controller board.

SW1 Setting	Display on LED1,2	Unit
ON / OFF 1 2 3 4 5 6 7 8	-99.9 ～ 999.9	°F

Is the detected temperature normal?

No → Replace the controller board (Malfunction of thermistor circuit).

Yes → No abnormality (A connector contact failure is suspected)

Check code

5102

Low-pressure saturated temperature thermistor (TH6) open/short

Abnormal points and detection methods	Causes and check points
Abnormal if TH6 detects to be open/short. (The open/short detection is disabled during 10 sec. to 10 min. after compressor starts, during defrosting operation, or for 10 min. after returning from the defrosting operation.) Open: -40℃ [-40°F] or less Short: 90℃ [194°F] or more TH6: Low-pressure saturated temperature thermistor	① Disconnection or contact failure of connectors ② Characteristic defect of thermistor ③ Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis

Check the wiring and connector connection of TH6.

Is there any abnormality such as a disconnection, looseness or breakage?

Yes → Connect the wiring/connector properly. Replace it in case of a breakage.

No

Disconnect the connector to check the resistance of TH6 using a tester.

Is the detected resistance normal?

No → Replace the thermistor.

Yes

Check a temperature of TH6.

The detected temperature of TH6 can be displayed by an operation of SW1 on the outdoor controller board

SW1 Setting	Display on LED1,2	Unit
ON / OFF 1 2 3 4 5 6 7 8	-99.9 ～ 999.9	°F

Is the detected temperature normal?

No → Replace the controller board (Malfunction of thermistor circuit).

Yes → No abnormality (A connector contact failure is suspected).

Check code

5105

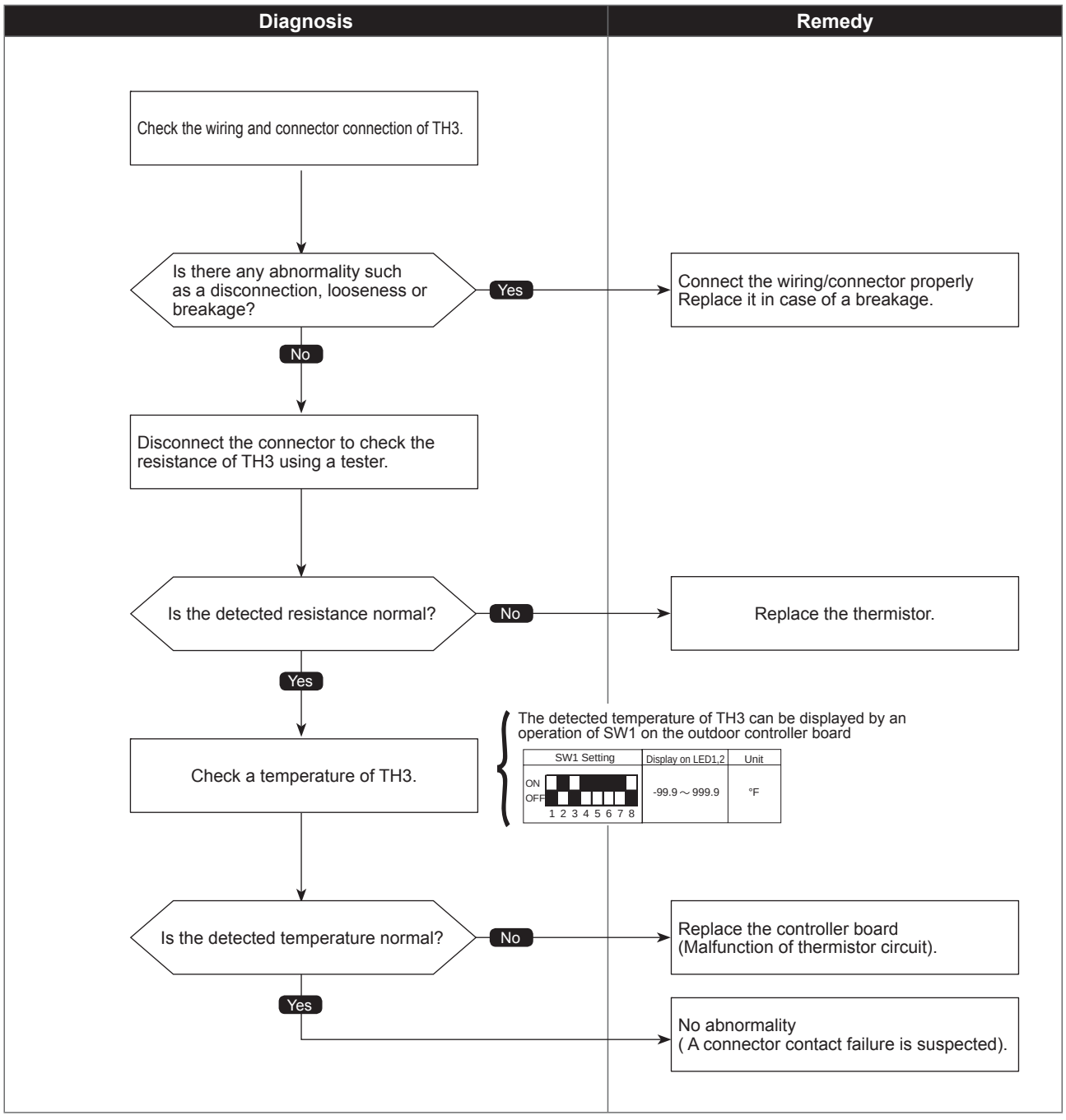
Piping temperature thermistor (TH3) open/short

Abnormal points and detection methods	Causes and check points
Abnormal if TH3 detects to be open/short. (The open/short detection is disabled during 10 sec. to 10 min. after compressor starts, during defrosting operation, or for 10 min. after returning from the defrosting operation.) Open: -40℃ [-40°F] or less Short: 90℃ [194°F] or more TH3: Piping temperature thermistor	① Disconnection or contact failure of connectors ② Characteristic defect of thermistor ③ Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.



Check code

5106

Outdoor temperature thermistor (TH7) open/short

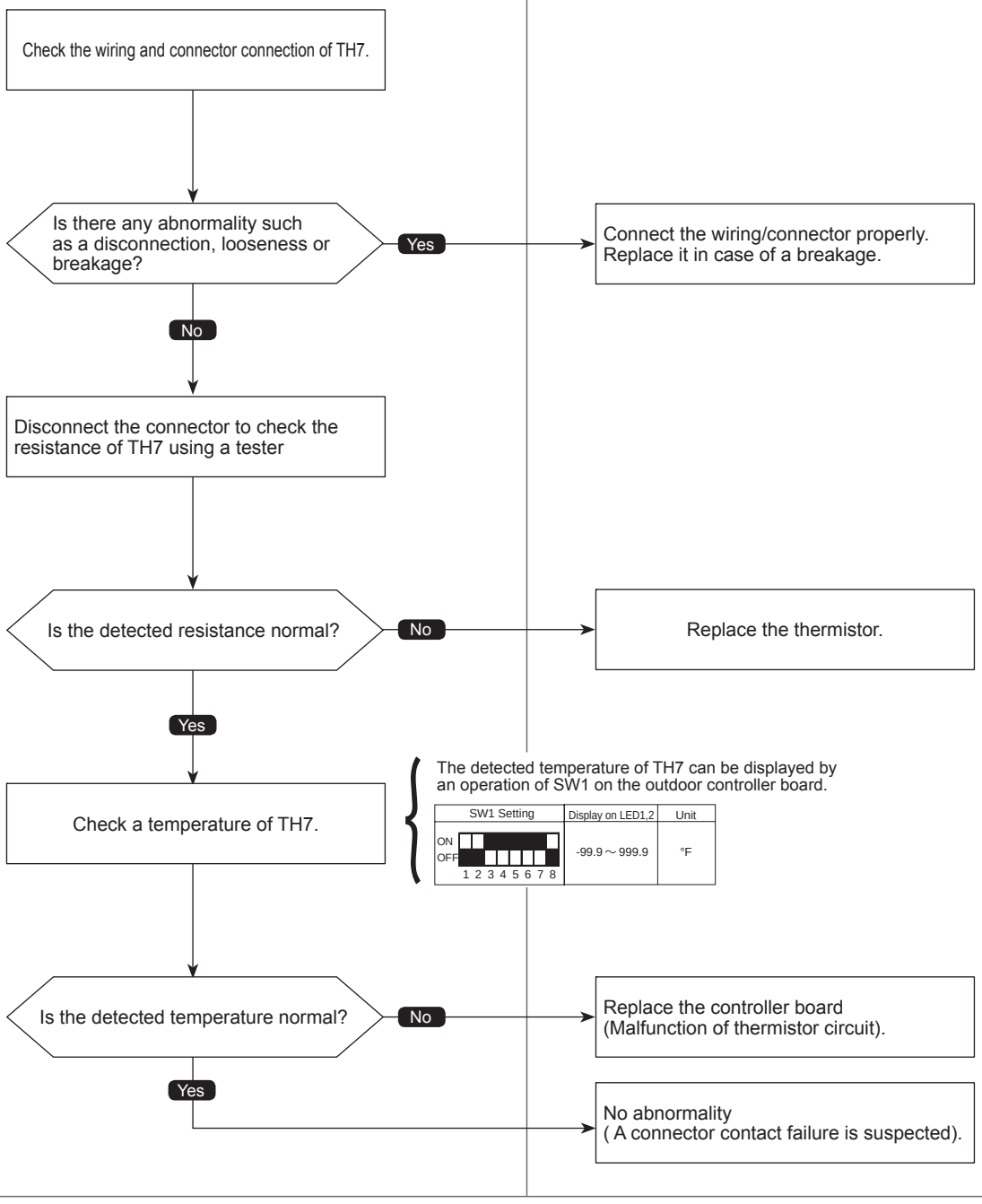
Abnormal points and detection methods	Causes and check points
Abnormal if TH7 detects to be open/short Open: -40℃ [-40°F] or less Short: 90℃ [194°F] or more TH7: Outdoor temperature thermistor	① Disconnection or contact failure of connectors ② Characteristic defect of thermistor ③ Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis	Remedy



Check code

5109

HIC piping temperature thermistor (TH2) open/short

Abnormal points and detection methods	Causes and check points
Abnormal if TH2 detects to be open/short. Open: -40℃ [-40°F] or less Short: 90℃ [194°F] or more TH2: HIC piping temperature thermistor	① Disconnection or contact failure of connectors ② Characteristic defect of thermistor ③ Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis	Remedy

Check the wiring and connector connection of TH2.

Is there any abnormality such as a disconnection, looseness or breakage?

Yes → Connect the wiring/connector properly. Replace it in case of a breakage.

No

Disconnect the connector to check the resistance of TH2 using a tester.

Is the detected resistance normal?

No → Replace the thermistor.

Yes

Check a temperature of TH2.

The detected temperature of TH2 can be displayed by an operation of SW1 on the outdoor controller board.

SW1 Setting	Display on LED1,2	Unit
ON / OFF 1 2 3 4 5 6 7 8	-99.9 ～ 999.9	℃

*F=(9/5)×°C+32

Is the detected temperature normal?

No → Replace the controller board (Malfunction of thermistor circuit).

Yes → No abnormality (A connector contact failure is suspected).

Check code

5110

Heatsink temperature thermistor(TH8) open/short

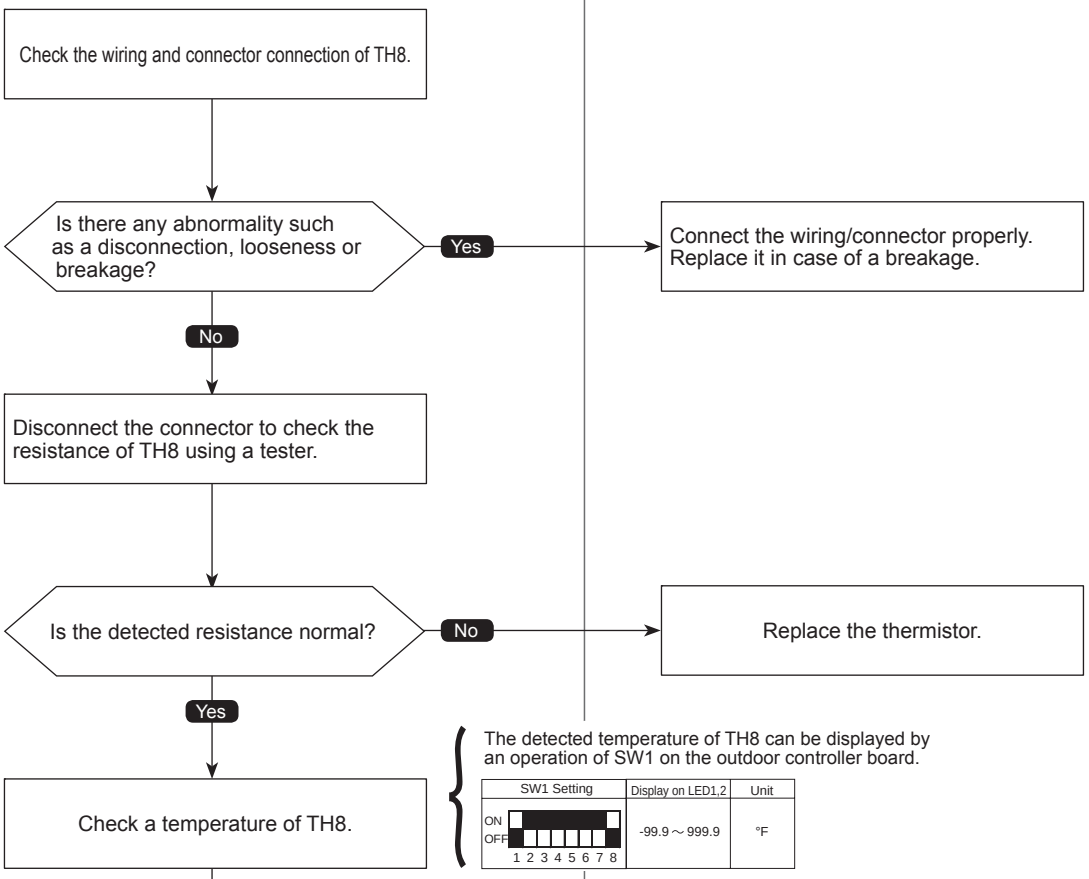
Abnormal points and detection methods	Causes and check points
Abnormal if TH8 detects to be open/short. ①P36/48 model Open: -102℃ [215.6°F] or less Short: 34.8℃ [-30.6°F] or more ②P60 model Open: 170.3℃ [338.5°F] or less Short: 35.1℃ [-31.8°F] or more TH8: Heatsink temperature thermistor	①Disconnection or contact failure of connectors ②Characteristic defect of thermistor ③Defective outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis	Remedy



Check code

5201

High-pressure sensor (63HS) trouble

Abnormal points and detection methods	Causes and check points
① When the detected pressure in the high-pressure sensor is 1kgf/㎠ or less during operation, the compressor stops operation and enters into an anti-restart mode for 3 minutes. ② When the detected pressure is 1kgf/㎠ immediately before restarting, the compressor falls into an abnormal stop with a check code <5201>. ③ For 3 minutes after compressor restarting, during defrosting operation, and for 3 minutes after returning from defrosting operation, above mentioned symptoms are not determined as abnormal.	① Defective high-pressure sensor ② Decrease of internal pressure caused by gas leakage ③ Disconnection or contact failure of connector ④ Malfunction of input circuit on outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis	Remedy

63HS: High-pressure sensor

Check the wiring and connector connection.

Is there any abnormality such as a disconnection, looseness or breakage?

Yes → Connect the wiring/connector properly. Replace it in case of a breakage.

No

Check an internal pressure of the refrigerant circuit.

Is the detected internal pressure normal?

No → Check the refrigerant circuit, and refill refrigerant after repairing the leakage.

Yes

Check the detected pressure in 63HS, then compare it with the internal pressure.

The detected pressure in 63HS can be displayed by an operation of SW1 on the outdoor controller board.

SW1 Setting	Display on LED1,2	Unit
ON / OFF 1 2 3 4 5 6 7 8	0.0 ~ 711.0	PSIG

Is the detected pressure normal?

No → Replace the 63HS.

Replace the outdoor controller board.

Check code

5202

Low-pressure sensor (63LS) trouble

Abnormal points and detection methods	Causes and check points
① When the detected pressure in the low-pressure sensor is -2.3kgf/cm² or less, or 23.1kgf/cm² or more during operation, the compressor stops operation with a check code <5202>. ② For 3 minutes after compressor restarting, during defrosting operation, and for 3 minutes after returning from defrosting operation, above mentioned symptoms are not determined as abnormal.	① Defective low-pressure sensor ② Decrease of internal pressure caused by gas leakage ③ Disconnection or contact failure of connector ④ Malfunction of input circuit on outdoor controller board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

The black square (■) indicates a switch position.

Diagnosis	Remedy
Check the wiring and connector connection.	63LS: Low-pressure sensor
Is there any abnormality such as a disconnection, looseness or breakage? — Yes	Connect the wiring/connector properly. Replace it in case of a breakage.
No	
Check an internal pressure of the refrigerant circuit.	
Is the detected internal pressure normal? — No	Check the refrigerant circuit, and refill refrigerant after repairing the leakage.
Yes	
Check the detected pressure in 63LS, then compare it with the internal pressure.	The detected pressure in 63LS can be displayed by an operation of SW1 on the outdoor controller board.
Is the detected pressure normal? — No	Replace the 63LS.
	Replace the outdoor controller board.

SW1 Setting	Display on LED1,2	Unit
ON / OFF 1 2 3 4 5 6 7 8	-99.9 ～ 999.9	kgf/cm²

*1kgf/cm² =14.22PSIG

Check code

5300

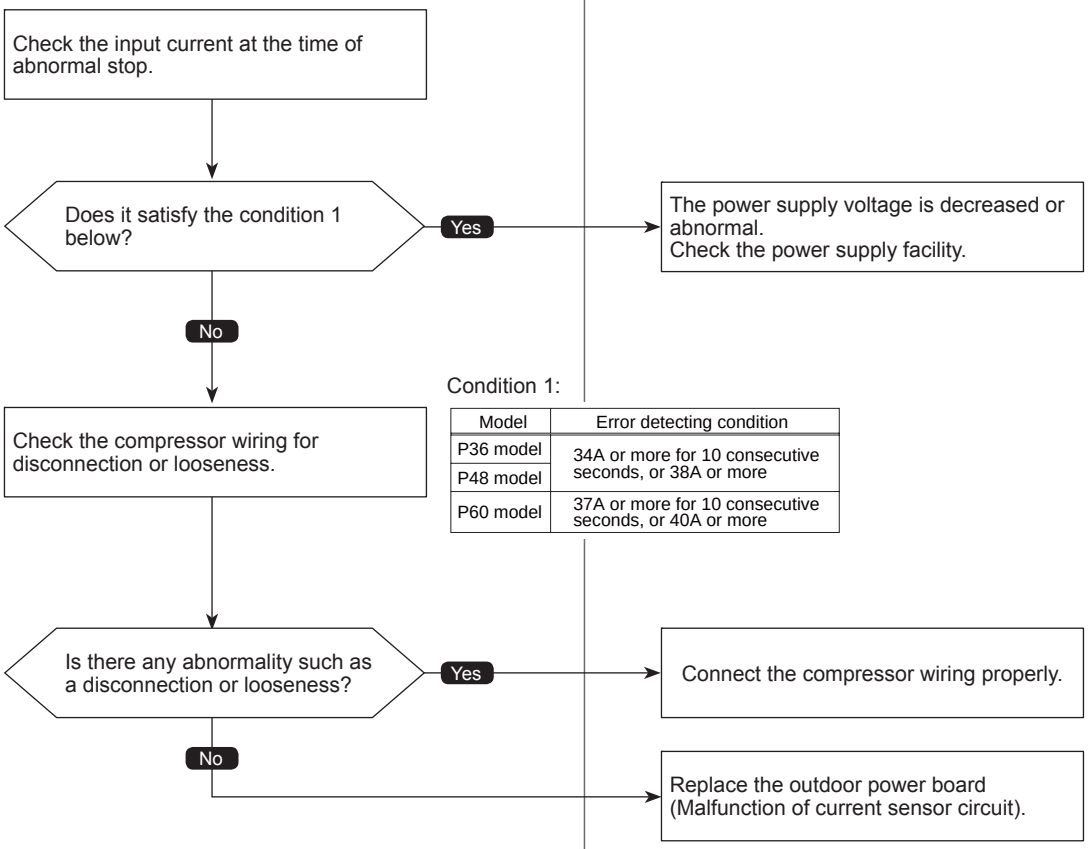
Primary current error

Abnormal points and detection methods	Causes and check points
Abnormal if the detected current sensor input value (primary current) during compressor operation is outside the specified range.	① Decrease/ trouble of power supply voltage ② Disconnection of compressor wiring ③ Input sensor trouble on outdoor power board

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis



Condition 1:

Model	Error detecting condition
P36 model	34A or more for 10 consecutive seconds, or 38A or more
P48 model	
P60 model	37A or more for 10 consecutive seconds, or 40A or more

Remedy

Check code

6600

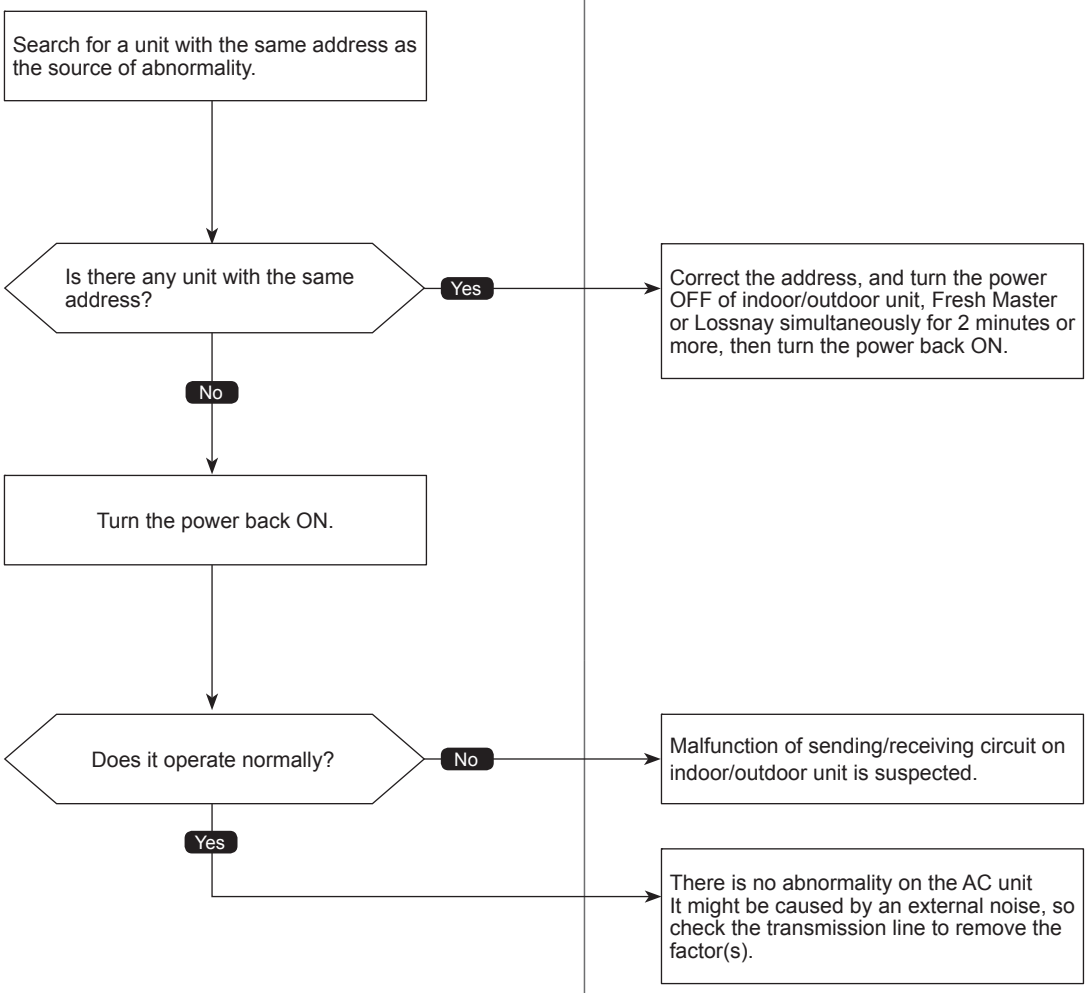
Duplex address error

Abnormal points and detection methods	Causes and check points
Abnormal if 2 or more units with the same address are exsisting.	① There are 2 units or more with the same address in their controller among outdoor unit, indoor unit, Fresh Master, Lossnay or remote controller ② Noise interference on indoor/outdoor connectors

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis



Remedy

Correct the address, and turn the power OFF of indoor/outdoor unit, Fresh Master or Lossnay simultaneously for 2 minutes or more, then turn the power back ON.

Malfunction of sending/receiving circuit on indoor/outdoor unit is suspected.

There is no abnormality on the AC unit
It might be caused by an external noise, so check the transmission line to remove the factor(s).

Check code

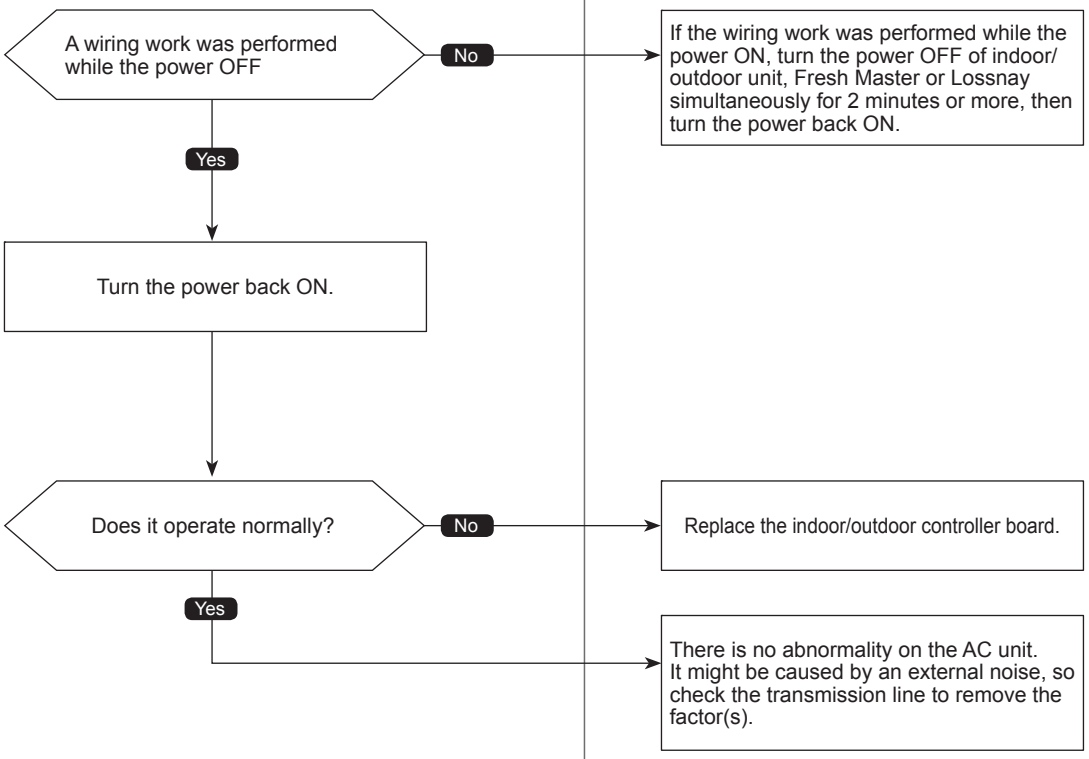
6602

Transmission processor H/W error

Abnormal points and detection methods	Causes and check points
Abnormal if the transmission line shows "1" although the transmission processor transmitted "0".	① A transmitting data collision occurred because of a wiring work or polarity change has performed while the power is ON on either of the indoor/outdoor unit, Fresh Master or Lossnay ② Malfunction of transmitting circuit on transmission processor ③ Noise interference on indoor/outdoor connectors

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
	

Check code

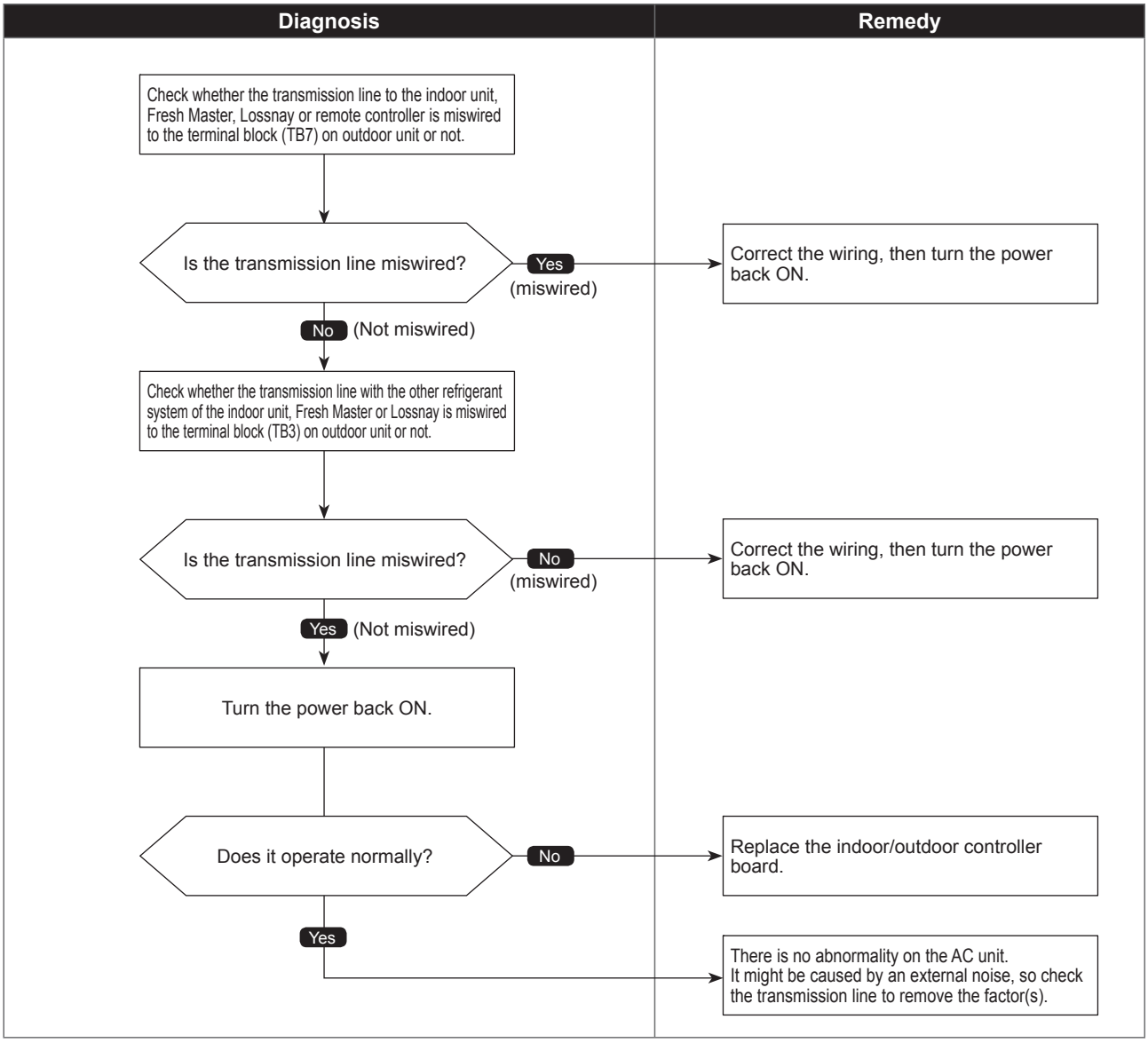
6603

Transmission bus BUSY error

Abnormal points and detection methods	Causes and check points
①Over error by collision Abnormal if no-transmission status caused by a transmitting data collision is consecutive for 8 to 10minutes. ②Abnormal if a status, that data is not allowed on the transmission line because of noise and such, is consecutive for 8 to 10 minutes	①The transmission processor is unable to transmit due to a short-cycle voltage such as noise is mixed on the transmission line. ②The transmission processor is unable to transmit due to an increase of transmission data amount caused by a miswiring of the terminal block (transmission line) (TB3) and the terminal block (centralized control line) (TB7) on the outdoor unit. ③The share on transmission line becomes high due to a mixed transmission caused by a malfunction of repeater on the outdoor unit, which is a function to connect/disconnect transmission from/to control system and centralized control system.

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

6606

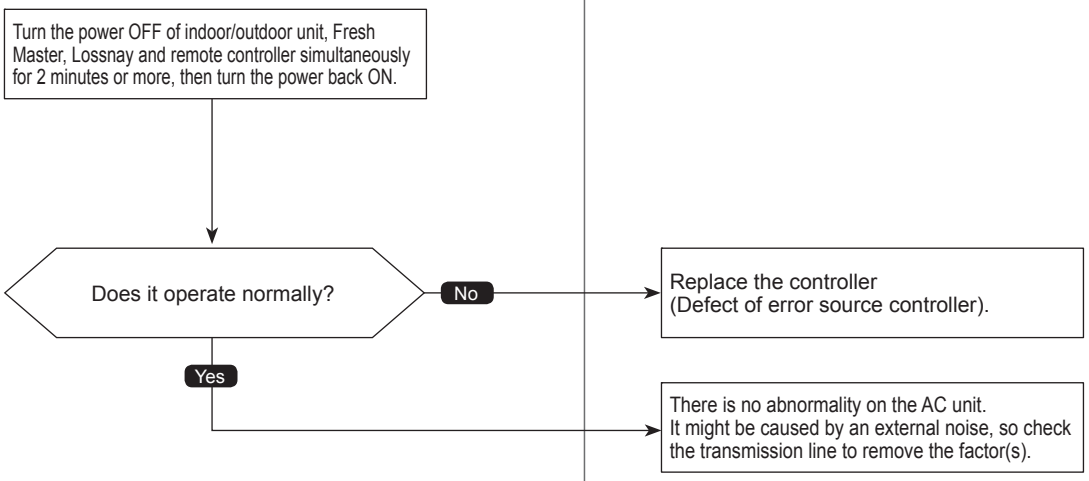
Signal communication error with transmission processor

Abnormal points and detection methods	Causes and check points
① Abnormal if the data of unit/transmission processor were not normally transmitted. ② Abnormal if the address transmission from the unit processor was not normally transmitted.	① Accidental disturbance such as noise or lightning surge ② Hardware malfunction of transmission processor

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy



Check code

6607

No ACK error

Abnormal points and detection methods	Causes and check points
① Represents a common error detection An abnormality detected by the sending side controller when receiving no ACK from the receiving side, though signal was once sent.The sending side searches the error in 30 seconds interval for 6 times continuously.	① The previous address unit does not exist since the address switch was changed while in electric continuity status. ② Decline of transmission voltage/signal caused by tolerance over on transmission line ·At the furthest end: 200m ·On remote controller line: (12m) ③ Decline of transmission voltage/ signal due to unmatched transmission line types ·Types for shield line: CVVS, CPEVS ·Line diameter: 1.25 ㎟ or more ④ Decline of transmission voltage/ signal due to excessive number of connected units ⑤ Malfunction due to accidental disturbance such as noise or lightning surge ⑥ Defect of error source controller
② The cause of displayed address and attribute is on the outdoor unit side An abnormality detected by the indoor unit if receiving no ACK when transmitting signal from the indoor unit to the outdoor unit.	① Contact failure of indoor/outdoor unit transmission line. ② Disconnection of transmission connector (CN2M) on indoor unit. ③ Malfunction of sending/receiving circuit on indoor/ outdoor unit.
③ The cause of displayed address and attribute is on the indoor unit side An abnormality detected by the remote controller if receiving no ACK when sending data from the remote controller to the indoor unit.	① While operating with multi refrigerant system indoor units, an abnormality is detected when the indoor unit transmit signal to the remote controller during the other refrigerant-system outdoor unit is turned OFF, or within 2 minutes after it turned back ON. ② Contact failure of indoor unit or remote controller transmission line ③ Disconnection of transmission connector (CN2M) on indoor unit ④ Malfunction of sending/receiving circuit on indoor unit or remote controller
④ The cause of the displayed address and attribute is on the remote controller side An abnormality detected by the indoor unit if receiving no ACK when transmitting signal from the indoor unit to the remote controller.	① While operating with multi refrigerant system indoor units, an abnormality is detected when the indoor unit transmit signal to the remote controller during the other refrigerant-system outdoor unit is turned OFF, or within 2 minutes after it turned back ON. ② Contact failure of indoor unit or remote controller transmission line ③ Disconnection of transmission connector (CN2M) on indoor unit ④ Malfunction of sending/receiving circuit on indoor unit or remote controller

Check code

6607

No ACK error

Abnormal points and detection methods	Causes and check points
⑤ The cause of displayed address and attribute is on the Fresh Master side An abnormality detected by the indoor unit if receiving no ACK when transmitting signal from the indoor unit to the Fresh Master.	① While the indoor unit is operating with multi refrigerant system Fresh Master, an abnormality is detected when the indoor unit transmits signal to the remote controller while the outdoor unit with the same refrigerant system as the Fresh Master is turned OFF, or within 2 minutes after it turned back ON. ② Contact failure of indoor unit or Fresh Master transmission line ③ Disconnection of transmission connector (CN2M) on indoor unit or Fresh Master ④ Malfunction of sending/receiving circuit on indoor unit or Fresh Master
⑥ The cause of displayed address and attribute is on Lossnay side An abnormality detected by the indoor unit if receiving no ACK when the indoor unit transmit signal to the Lossnay.	① An abnormality is detected when the indoor unit transmits signal to Lossnay while the Lossnay is turned OFF. ② While the indoor unit is operating with the other refrigerant Lossnay, an abnormality is detected when the indoor unit transmits signal to the Lossnay while the outdoor unit with the same refrigerant system as the Lossnay is turned OFF, or within 2 minutes after it turned back ON. ③ Contact failure of indoor unit or Lossnay transmission line ④ Disconnection of transmission connector (CN2M) on indoor unit ⑤ Malfunction of sending/receiving circuit on indoor unit or Lossnay
⑦The controller of displayed address and attribute is not recognized	① The previous address unit does not exist since the address switch was changed while in electric continuity status. ② An abnormality detected at transmitting from the indoor unit since the Fresh Master/Lossnay address are changed after synchronized setting of Fresh Master/Lossnay by the remote controller.

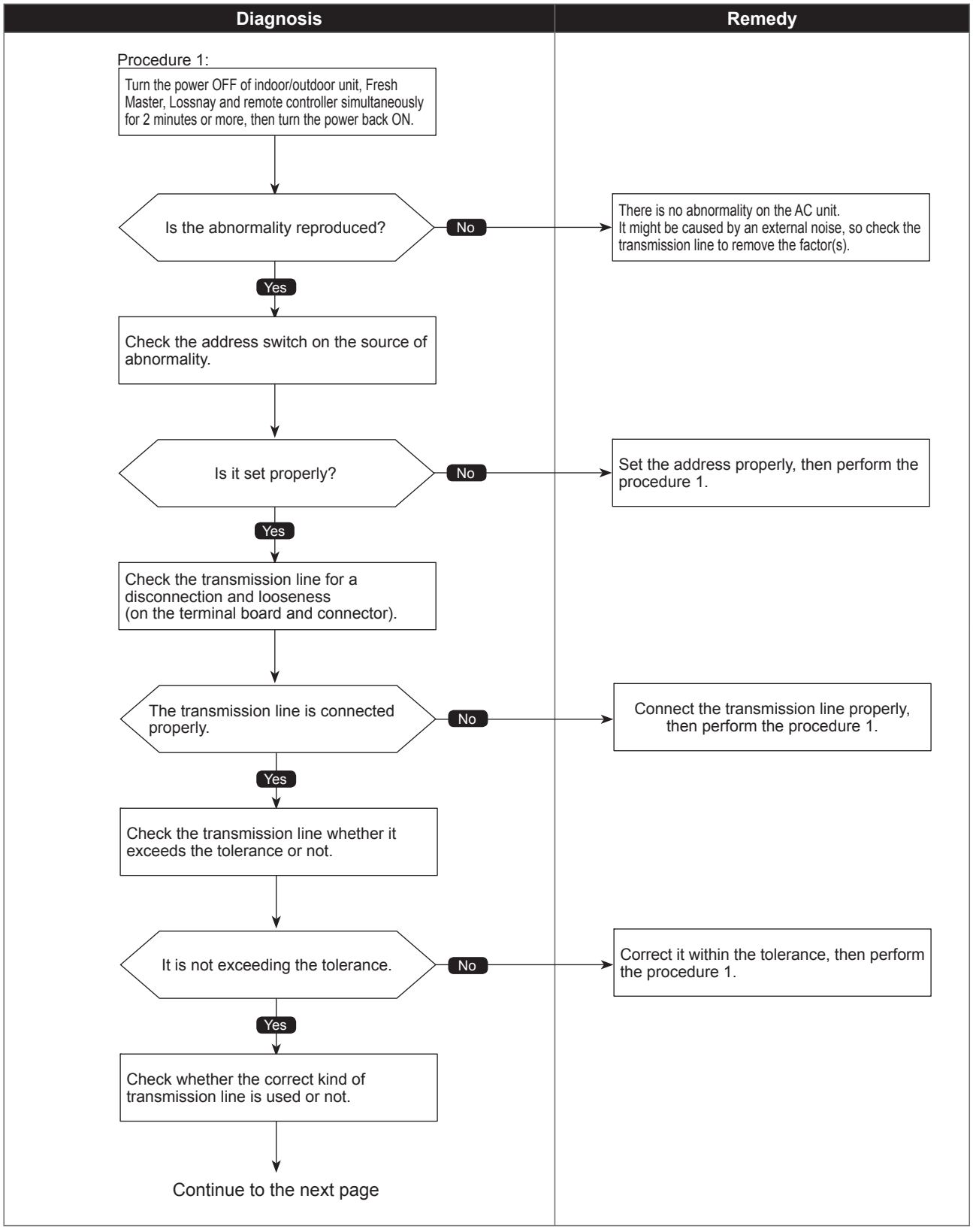
Check code

6607

No ACK error

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



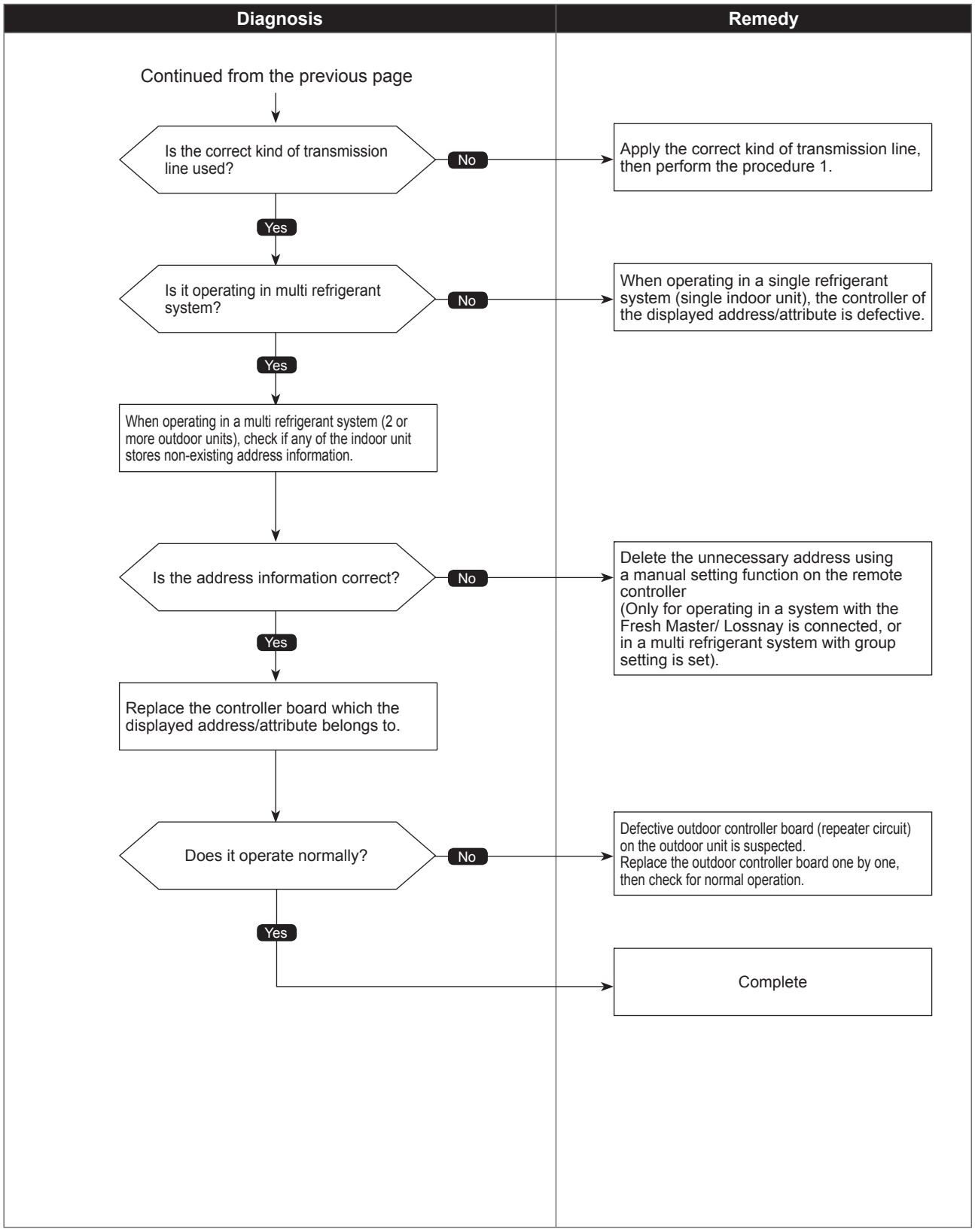
Check code

6607

No ACK error

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

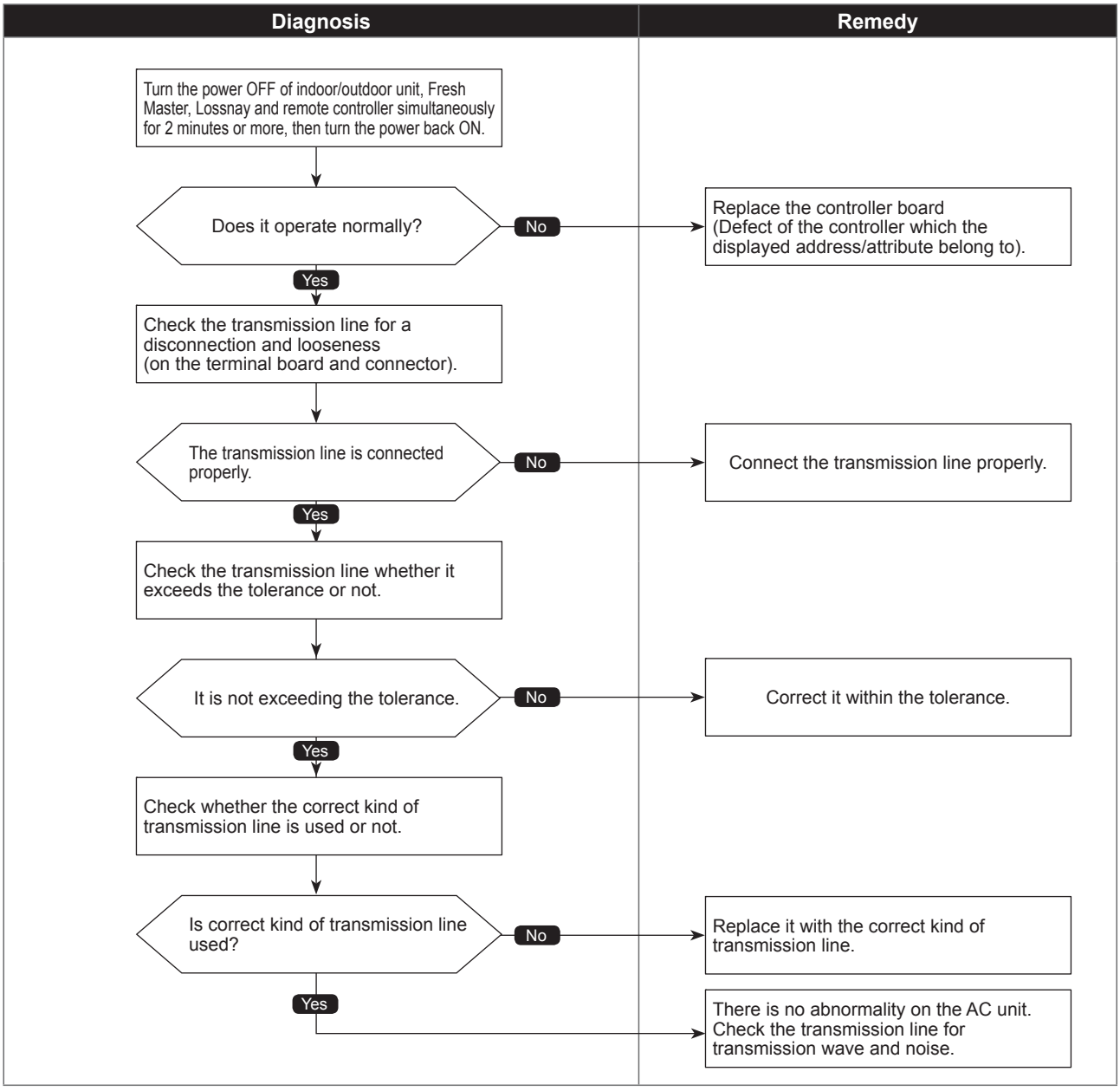
6608

No response frame error

Abnormal points and detection methods	Causes and check points
Abnormal if receiving no response command while already received ACK. The sending side searches the error in 30 seconds interval for 6 times continuously.	①Continuous failure of transmission due to noise etc ②Decline of transmission voltage/signal caused by tolerance over on transmission line ·At the furthest end: 200m ·On remote controller line: (12m) ③Decline of transmission voltage/ signal due to unmatched transmission line types ·Types for shield line: CVVS, CPEVS ·Line diameter: 1.25 ㎟ or more ④Accidental malfunction of error source controller

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

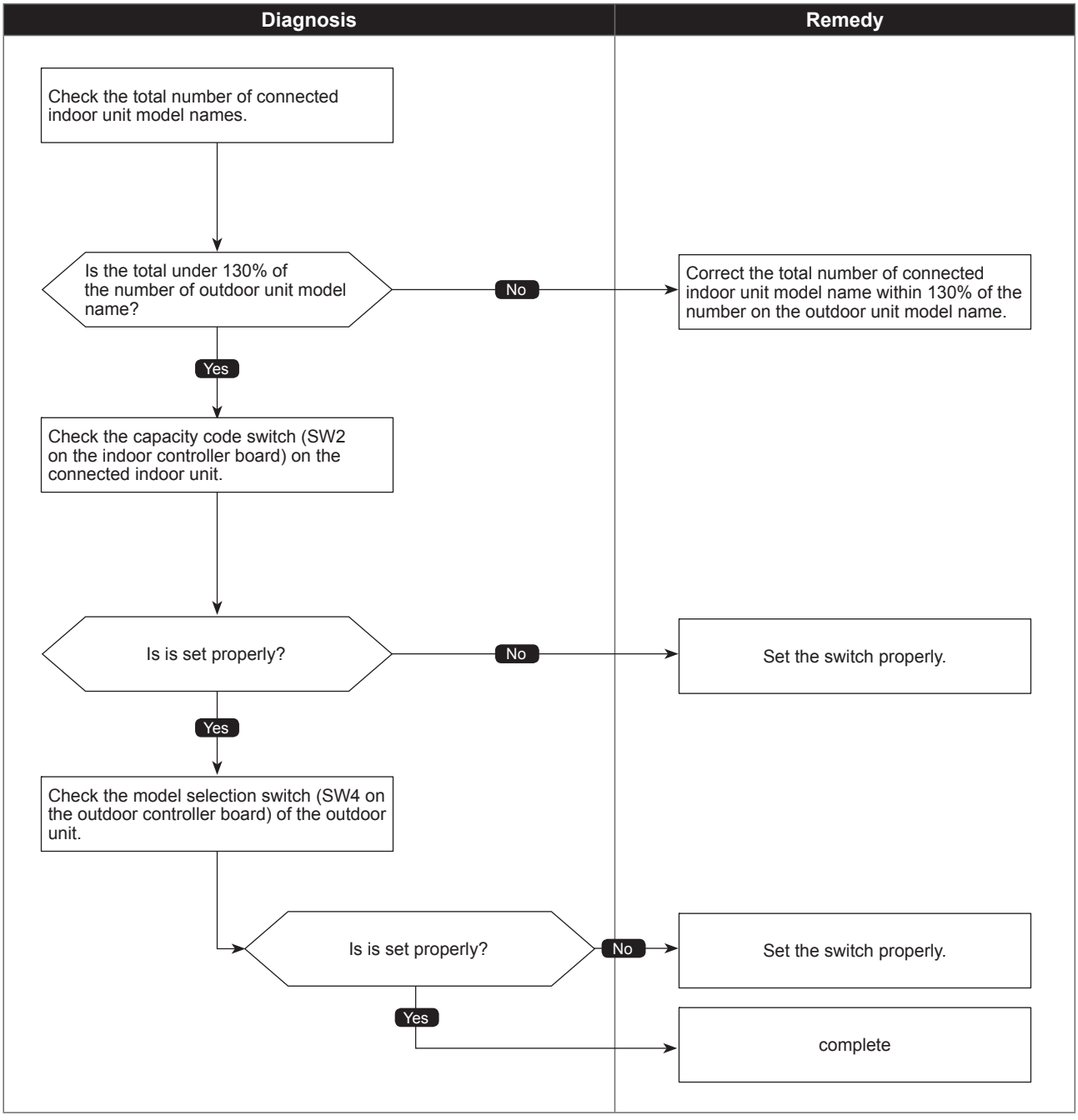
7100

Total capacity error

Abnormal points and detection methods	Causes and check points
When the total of the number on connected indoor unit model names exceeds the specified capacity level (130% of the number on the outdoor unit model name), a check code <7100> is displayed.	① The total of number on connected indoor unit model names exceeds the specified capacity level ·P36 model:~code26 ·P48 model:~code34 ·P60 model:~code56 ② The model name code of the outdoor unit is registered wrongly.

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

7101

Capacity code error

Abnormal points and detection methods	Causes and check points
When a connected indoor unit is incompatible, a check code <7101> is displayed.	The model name of connected indoor unit (model code) is read as incompatible. The connectable indoor units are: ·P36/P48 model: P6 to P54 model (code3 to 28) ·P60 model: P15 to P140 model (code 4 to 28)

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

Diagnosis	Remedy
Check the model selection switch (SW4 on the indoor controller board) of the connected indoor unit. Is it set properly? No Yes	Set the switch properly. The model code of the connected indoor unit can be displayed by an operation of SW1 on the outdoor unit.

Check code

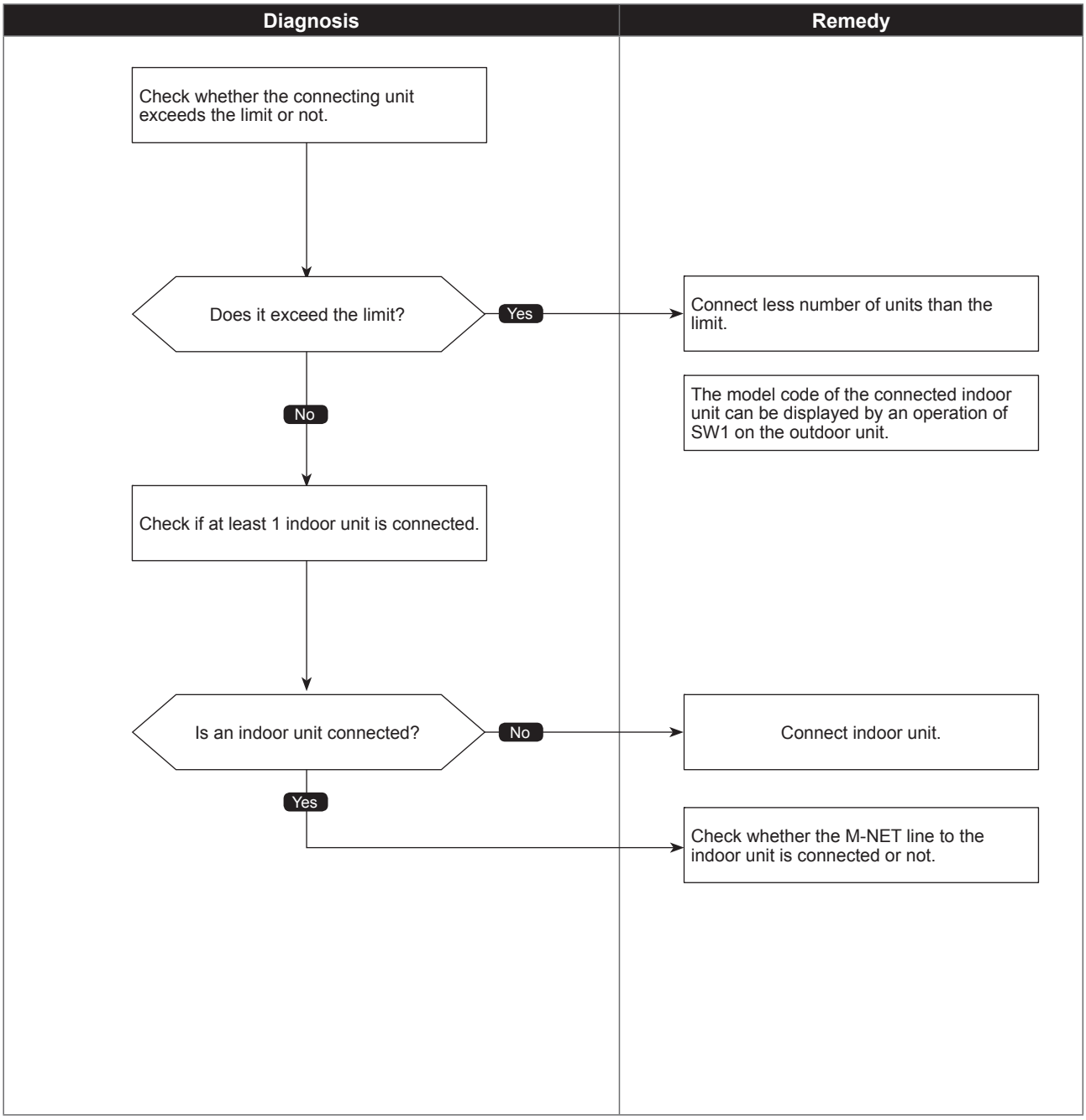
7102

Connecting excessive number of units

Abnormal points and detection methods	Causes and check points
When the connected AC unit exceeds the limit, a check code <7102> is displayed.	Connecting more AC units than the limit Abnormal if connecting status does not comply with the following limit; ①Connectable up to 12 indoor units ②Connect at least 1 indoor unit (Abnormal if connected none) ③Connectable only 1 ventilation unit

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.



Check code

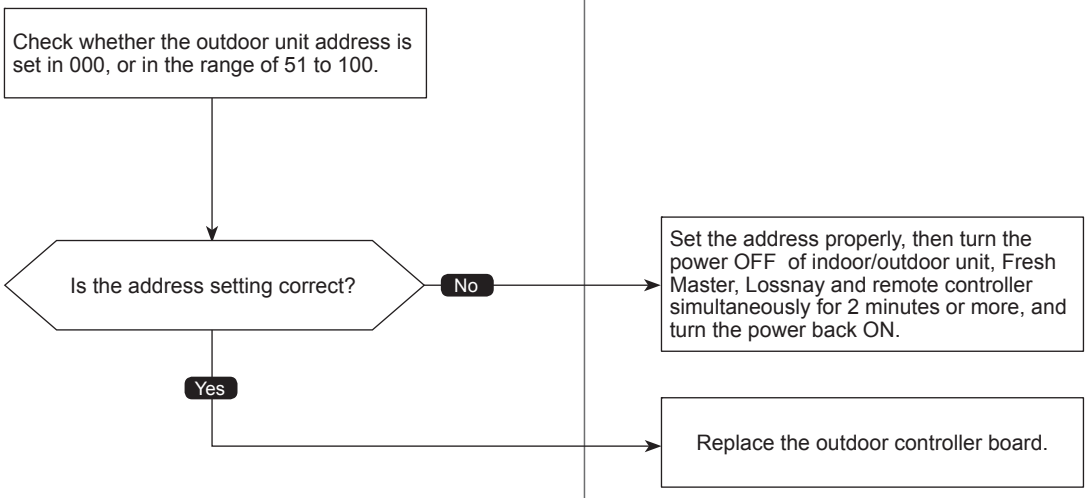
7105

Address setting error

Abnormal points and detection methods	Causes and check points
The address setting of outdoor unit is wrong.	Wrongly set address of indoor unit The outdoor unit is not set in 000, or in the range of 51 to 100.

●Diagnosis of defectives

Make sure to turn the power OFF before connecting/disconnecting any connectors, or replacing boards.

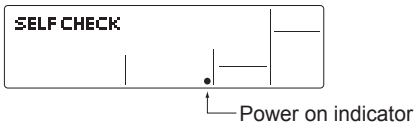
Diagnosis	Remedy
	

8-2. REMOTE CONTROLLER DIAGNOSIS

· MA remote controller is equipped with the diagnosis function

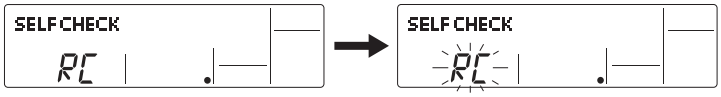
If the air conditioner cannot be operated from the remote controller, diagnose the remote controller as explained below.

① First, check that the power-on indicator is lit.
If the correct voltage (DC12 V) is not supplied to the remote controller, the indicator will not light.
If this occurs, check the remote controller's wiring and the indoor unit.



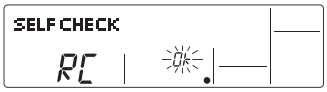
② Switch to the remote controller self-diagnosis mode.
Press the (CHECK) button for 5 seconds or more. The display content will change as shown below.

Press the (FILTER) button to start self-diagnosis.



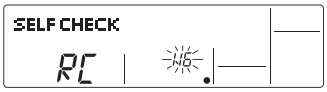
③ Remote controller self-diagnosis result

[When the remote controller is functioning correctly]



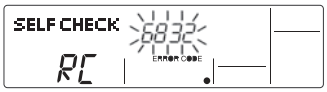
Check for other possible causes, as there is no problem with the remote controller.

[When the remote controller malfunctions]
(Error display 1) "NG" flashes. → The remote controller's transmitting-receiving circuit is defective.



The remote controller must be replaced with a new one.

[Where the remote controller is not defective, but cannot be operated.]
(Error display 2) [E3], [6833] or [6832] flashes. → Transmission is not possible.



There might be noise or interference on the transmission path, or the indoor unit or other remote controllers are defective. Check the transmission path and other controllers.

(Error display 3) "ERC" and the number of data errors are displayed.
→ Data error has occurred.

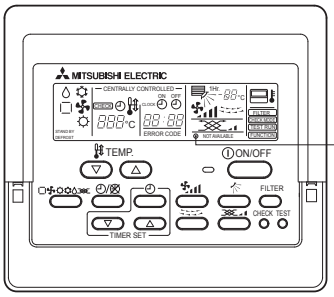
The number of data errors is the difference between the number of bits sent from the remote controller and the number actually transmitted through the transmission path. If such a problem is occurring, the transmitted data is affected by noise, etc. Check the transmission path.

☞ When the number of data errors is "02":
Transmission data from remote controller
Transmission data on transmission path

④ To cancel remote controller diagnosis

Press the (CHECK) button for 5 seconds or more. Remote controller diagnosis will be cancelled, "PLEASE WAIT" and operation lamp will flash. After approximately 30 seconds, the state in effect before the diagnosis will be restored.

8-3. REMOTE CONTROLLER TROUBLE



"◉" Indicator: appears when current is carried.

(M-NET Remote controller)

(1) For M-NET remote controller systems

Symptom or inspection code	Cause	Inspection method and solution
Though the content of operation is displayed on the remote controller, some indoor units do not operate.	• The power supply of the indoor unit is not on. • The address of the indoor units in same group or the remote controller is not set correctly. • The group setting between outdoor units is not registered to the remote controller. • The fuse on the indoor unit controller board is blown.	• Check the part where the abnormality occurs. ① The entire system ② In the entire refrigerant system ③ In same group only ④ 1 indoor unit only <In case of the entire system or in the entire refrigerant system> • Check the self-diagnosis LED of the outdoor unit. • Check the items shown in the left that are related to the outdoor unit. <In case of in same group only or 1 indoor unit only> • Check the items shown in the left that are related to the indoor unit.
Though the indoor unit operates, the display of the remote controller goes out soon.	• The power supply of the indoor unit is not on. • The fuse on the indoor unit controller board is blown.	
(◉) is not displayed on the remote controller. (M-NET remote controller is not fed.)	• The power supply of the outdoor unit is not on. • The connector of transmission outdoor power board is not connected. • The number of connected indoor unit in the refrigeration system is over the limit or the number of connected remote controller is over the limit. • M-NET remote controller is connected to MA remote controller cable. • The transmission line of the indoor/outdoor unit is shorted or down. • M-NET remote controller cable is shorted or down. • Transmission outdoor power board failure.	
"HO" keeps being displayed or it is displayed periodically. ("HO" is usually displayed about 3 minutes after the power supply of the outdoor unit is on.)	• The power supply for the feeding expansion unit for the transmission line is not on. • The address of the outdoor unit remains "00". • The address of the indoor unit or the remote controller is not set correctly. • MA remote controller is connected to the transmission line of the indoor/outdoor unit.	
The remote controller does not operate though (◉) is displayed.	• The transmission line of the indoor/outdoor unit is connected to TB15. • The transmission line of the indoor/outdoor unit is shorted, down or badly contacted.	

(2) For MA remote controller systems

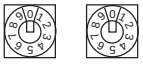
Symptom or inspection code	Cause	Inspection method and solution
Though the content of operation is displayed on the remote controller, some indoor units do not operate.	• The power supply of the indoor unit is not on. • Wiring between indoor units in same group is not finished. • The indoor unit and Slim model are connected to same group. • The fuse on the indoor unit controller board is blown.	• Check the part where the abnormality occurs. ① The entire system ② In the entire refrigerant system ③ In same group only ④ 1 indoor unit only <In case of the entire system or in the entire refrigerant system> • Check the self-diagnosis LED of the outdoor unit. • Check the items shown in the left that are related to the outdoor unit. <In case of in same group only or 1 indoor unit only> • Check the items shown in the left that are related to the indoor unit.
Though the indoor unit operates, the display of the remote controller goes out soon.	• The power supply of the indoor unit (Master) is not on. • In case of connecting the system controller, the setting of the system controller does not correspond to that of MA remote controller. • The fuse on the indoor unit (Master) controller board is blown.	
(◉) is not displayed on the remote controller. (MA remote controller is not fed.)	The remote controller is not fed until the power supply of both indoor unit and outdoor unit is on and the start-up of both units is finished normally. • The power supply of the indoor unit is not on. • The power supply of the outdoor unit is not on. • The number of connected remote controller is over the limit (Maximum: 2 units) or the number of connected indoor unit that is over the limit (Maximum: 16 units). • The address of the indoor unit is "00" and the address for the outdoor unit is the one other than "00". • The transmission line of the indoor/outdoor unit is connected to TB15. • MA remote controller is connected to the transmission line of the indoor/outdoor unit . • The remote controller cable is shorted or down. • The power supply cable or the transmission line is shorted or down. • The fuse on the indoor unit controller board is blown.	
"PLEASE WAIT" keeps being displayed or it is displayed periodically. ("PLEASE WAIT" is usually displayed about 3 minutes after the power supply of the outdoor unit is on.)	• The power supply of the outdoor unit is not on. • The power supply of the feeding expansion unit for the transmission line is not on. • The setting of MA remote controller is not main remote controller, but sub-remote controller. • MA remote controller is connected to the transmission line of the indoor/outdoor unit.	
The remote controller does not operate though (◉) is displayed.	• The power supply of the indoor unit (Master) is not on. • The transmission line of the indoor/outdoor unit is connected to TB15. • The transmission line of the indoor/outdoor unit is shorted, down or badly contacted. •The fuse on the indoor unit controller board is blown.	

8-4. THE FOLLOWING SYMPTOM DO NOT REPRESENT TROUBLE (EMERGENCY)

Symptom	Display of remote controller	CAUSE
Even the cooling (heating) operation selection button is pressed, the indoor unit cannot be operated.	"Cooling (Heating)" blinks	The indoor unit can not cool (Heat) if other indoor units are heating (Cooling).
The auto vane runs freely.	Normal display	Because of the control operation of auto vane, it may change over to horizontal blow automatically from the downward blow in cooling in cause the downward blow operation has been continued for 1 hour. At defrosting in heating, hot adjusting and thermostat OFF, it automatically changes over to horizontal blow.
Fan setting changes during heating.	Normal display	Ultra-low speed operation is commenced at thermostat OFF. Light air automatically change over to set value by time or piping temperature at thermostat ON.
Fan stops during heating operation.	"Defrost ☼"	The fan is to stop during defrosting.
Fan does not stop while operation has been stopped.	Light out	Fan is to run for 1 minute after stopping to exhaust residual heat (only in heating).
No setting of fan while start SW has been turned on.	STAND BY ☼	Ultra-low speed operation for 5 minutes after SW ON or until piping temperature becomes 35C. There low speed operate for 2 minutes, and then set notch is commenced. (Hot adjust control)
Indoor unit remote controller shows “HO” or “PLEASE WAIT ” indicator for about two minutes when turning ON power supply.	“HO” blinks “PLEASE WAIT” blinks	System is being driven. Operate remote controller again after “HO” or “PLEASE WAIT” disappears.
Drain pump does not stop while unit has been stopped.	Light out	After a stop of cooling operation, unit continues to operate drain pump for 3 minutes and then stops it.
Drain pump continues to operate while unit has been stopped.	—	Unit continues to operate drain pump if drainage is generated, even during a stop.
The compressor that is running soon after powered on is slow to speed up.	—	The rate of speed-up is kept at 2 Hz/min. during 4 hours after powered on. This can prevent a compressor failure that occurs when a non-energized compressor speeds up rapidly with refrigerant collected in the compressor.

8-5. INTERNAL SWITCH FUNCTION TABLE
PUMY-P60NKMU
PUMY-P60NKMU-BS

The black square (■) indicates a switch position.

	Switch	Step	Function	Operation in each switch setting			Remarks
				ON	OFF	When to set	
Outdoor unit	SWU1 1s digit SWU2 10ths digit	Rotary switch				Before turning the power on	<Initial settings> 
	SW1 Digital display switch	1~8				Can be set either during operation or not.	<Initial settings> 
	SW2 Function switch	1	Selects operating system startup	With centralized controller	Without centralized controller	Before turning the power on	<Initial settings> 
		2	Connection information clear switch	Clear	Do not clear		
		3	Abnormal data clear switch input	Clear abnormal data	Normal	OFF to ON any time after the power is turned on.	
		4	Pump down	Run adjustment mode	Normal	During compressor running	
		5	Auto change over from remote controller	Enable	Disable	Before turning the power on	
		6	Silent mode/Demand control selsction (see 8.6)	Demand control	Silent mode	Can be set when off or during operation	
	SW3 Test run	1	ON/OFF from outdoor unit	ON	OFF	Always	<Initial settings> 
		2	Mode setting	Heating	Cooling		
	SW4 Model select	1~6	MODEL SELECT 1: ON 0: OFF MODELS / SW4 (1 2 3 4 5 6) / SW8 (1 2) PUMY-P60: 0 1 1 0 0 0 / 0 0			Before the power is turned on.	<Initial settings> Set for each capacity.
	SW5 Function switch	1	—	—	—	—	<Initial settings> 
		2	Change the indoor-linear expansion valve opening at start	Enable	Normal	Can be set when off or during operation	
		3	—	—	—	—	
		4	Auxiliary heat will follow the string***	ON	OFF	Always	
		5	Change the indoor-linear expansion valve opening at defrost	Enable	Normal	Can be set when off or during operation	
		6	Switching the target sub cool	Enable	Normal		
		7	During the outdoor unit is in HEAT operation, slightly opens the linear expansion valve on the indoor unit which is in FAN, STOP, COOL or thermo-OFF.*	Active	Inactive		
		8	During the outdoor unit is in HEAT operation, fully opens the linear expansion valve on the indoor unit which is in FAN, COOL, STOP, or thermo-OFF.**	Active	Inactive		

* SW5-7 Opens the indoor-linear expanion valve as a countermeasure against the indoor unit in FAN, COOL, STOP, or thermo-OFF operation with refrigerant-shortage status due to an accumulation of liquid refrigerant in the indoor unit.

** SW5-8 Countermeasure against room temperature rise for indoor unit in FAN, COOL, and thermo-OFF (heating) mode.

***When SW5-4 is set to ON, auxiliary heater and outdoor unit will follow the string set at the outdoor unit. (Refer to page 6 for more information). When SW5-4 set to OFF auxiliary heater will work based on the differential between the set point and room temperature at the indoor units.

The black square (■) indicates a switch position.

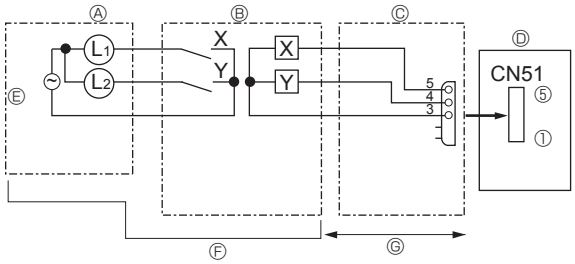
	Switch	Step	Function	Operation in each switch setting			Remarks
				ON	OFF	When to Set	
Outdoor unit	SW6 Function switch	1	—	—	—	—	<Initial settings> ON OFF 1 2 3 4 5 6 7 8
		2	Switch of current limitation reading in a different way	Enable	Normal	Before turning the power on.	
		3	—	—	—	—	
		4	Change of defrosting control	Enable (For high humidity)	Normal	Can be set when off or during operation	
		5	Ignore refrigerant filling abnormality	Enable	Normal		
		6	Switching the target discharge pressure (Pdm)	Enable	Normal		
		7	Switching (1) the target evaporation temperature (ETm)	Enable	Normal		
		8	Switching (2) the target evaporation temperature (ETm)	Enable	Normal		
	SW7 Function switch	1	Ignore current sensor abnormality	Enable	Normal	After turning the power on.	<Initial settings> ON OFF 1 2 3 4 5 6
		2	Setting to energize the freeze stat heater (optional part)	During heating operation only *	Include when the heating operation is OFF. **	—	
		3	High heating performance mode	Enable	Normal		
		4	—	—	—		
		5	Simultaneous heating and cooling with external heater	Enable	Normal		
		6	Forced defrost	Forced defrost	Normal	During compressor running in heating mode.	
	SW8 Model select	1	—	—	—	—	<Initial settings> ON OFF 1 2
		2	—	—	—	—	

* During heating operation and the ambient temperature is 4°C (39°F) or below, the freeze prevention heater is energized.

** During heating mode is OFF (include thermo-OFF in cooling mode), and the ambient temperature is 4°C (39°F) or below, the freeze prevention heater is energized.

8-6. OUTDOOR UNIT INPUT/OUTPUT CONNECTOR

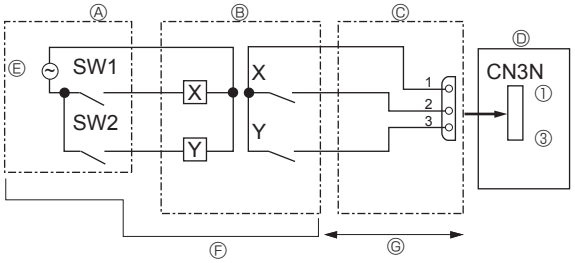
● **State (CN51)**



Ⓐ Distant control board
Ⓑ Relay circuit
Ⓒ External output adapter (PAC-SA88HA-E)
Ⓓ Outdoor unit control board
Ⓔ Lamp power supply
Ⓕ Procure locally
Ⓖ Max. 10m

L_1: Error display lamp
L_2: Compressor operation lamp
X, Y: Relay (Coil standard of 0.9W or less for DC 12V)
X, Y: Relay (DC1mA)

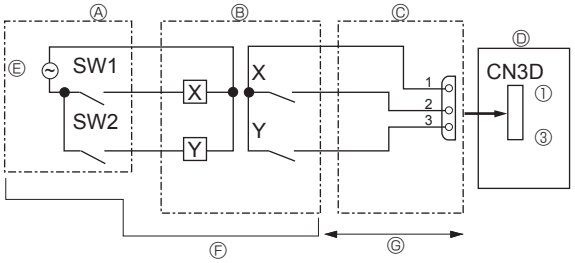
● **Auto change over (CN3N)**



Ⓐ Remote control panel
Ⓑ Relay circuit
Ⓒ External input adapter (PAC-SC36NA)
Ⓓ Outdoor unit control board
Ⓔ Relay power supply
Ⓕ Procure locally
Ⓖ Max. 10m

	ON	OFF
SW1	Heating	Cooling
SW2	Validity of SW1	Invalidity of SW1

● **Silent Mode / Demand Control (CN3D)**

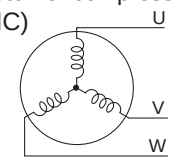


Ⓐ Remote control panel
Ⓑ Relay circuit
Ⓒ External input adapter (PAC-SC36NA)
Ⓓ Outdoor unit control board
Ⓔ Relay power supply
Ⓕ Procure locally
Ⓖ Max. 10m

The silent mode and the demand control are selected by switching the Dip switch 2-6 on outdoor controller board.
It is possible to set it to the following power consumption (compared with ratings) by setting SW1, 2.

	Outdoor controller board DIP SW2-6	SW1	SW2	Function
Silent mode	OFF	ON	—	Silent mode operation
Demand control	ON	OFF	OFF	100% (Normal)
		ON	OFF	75%
		ON	ON	50%
		OFF	ON	0% (Stop)

8-7. HOW TO CHECK THE PARTS
PUMY-P60NKMU
PUMY-P60NKMU-BS

<table>
<tr><th>Parts name</th><th>Check points</th></tr>
<tr><td>Thermistor (TH2)
<HIC piping temp.>
Thermistor (TH3)
<Piping temp.>
Thermistor (TH4)
<Compressor>
Thermistor (TH6)
<Low pressure saturated temperature>
Thermistor (TH7)
<Outdoor temp.></td><td>Disconnect the connector then measure the resistance with a tester.
(At the ambient temperature 10℃~30℃)
<table>
<tr><th></th><th>Normal</th><th>Abnormal</th></tr>
<tr><td>TH4</td><td>160kΩ~410kΩ</td><td rowspan="2">Open or short</td></tr>
<tr><td>TH2
TH3
TH6
TH7</td><td>4.3kΩ~9.6kΩ</td></tr>
</table></td></tr>
<tr><td>Fan motor (MF1, MF2)</td><td>Refer to next page.</td></tr>
<tr><td>Solenoid valve coil
<Four-way valve>
(21S4)</td><td>Measure the resistance between the terminals with a tester.
(At the ambient temperature 20℃)
<table>
<tr><th>Normal</th><th>Abnormal</th></tr>
<tr><td>1580 ± 110Ω</td><td>Open or short</td></tr>
</table></td></tr>
<tr><td>Motor for compressor
(MC)
 
</td><td>Measure the resistance between the terminals with a tester.
(Winding temperature 20℃)
<table>
<tr><th>Normal</th><th>Abnormal</th></tr>
<tr><td>0.37Ω</td><td>Open or short</td></tr>
</table></td></tr>
<tr><td>Solenoid valve coil
<Bypass valve>
(SV1)</td><td>Measure the resistance between the terminals with a tester.
(At the ambient temperature 20℃)
<table>
<tr><th>Normal</th><th>Abnormal</th></tr>
<tr><td>1197 ± 10Ω</td><td>Open or short</td></tr>
</table></td></tr>
</table>

Check method of fan motor (fan motor/outdoor controller board)

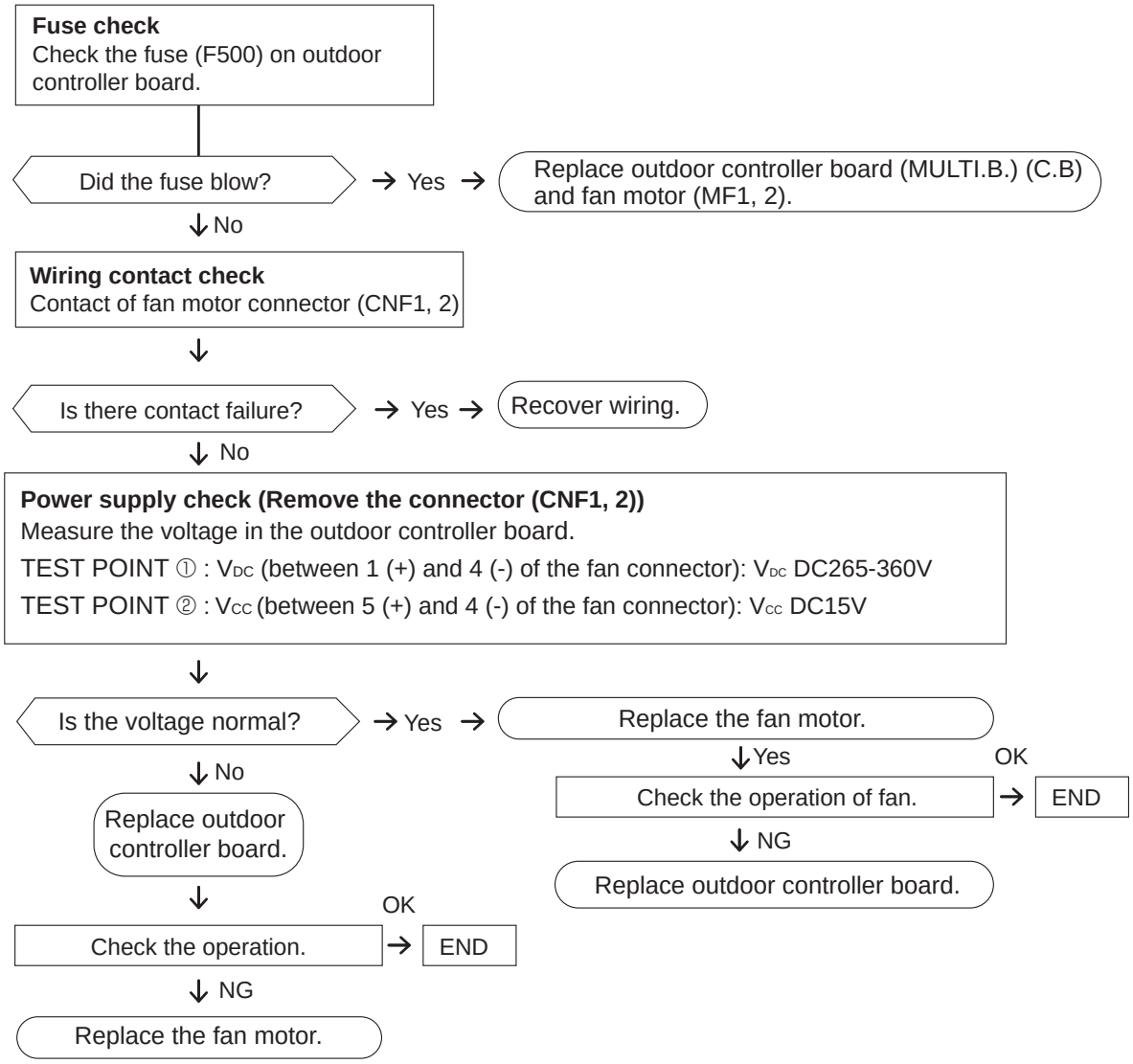
① Notes

· High voltage is applied to the connecter (CNF1, 2) for the fan motor. Pay attention to the service.

· Do not pull out the connector (CNF1, 2) for the motor with the power supply on.
(It causes trouble of the outdoor controller board and fan motor.)

② Self check

Symptom : The outdoor fan does not rotate.



8-8. HOW TO CHECK THE COMPONENTS

<Thermistor feature chart>

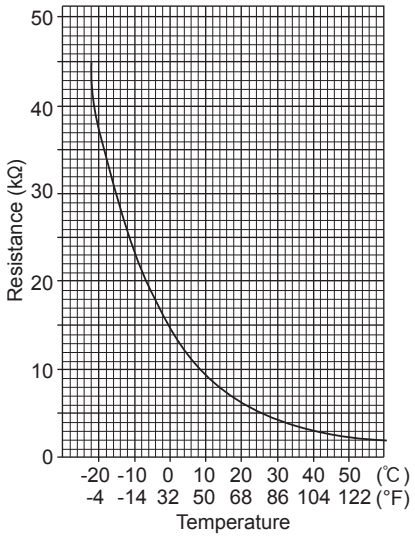
Low temperature thermistors

- Thermistor <HIC pipe> (TH2)
- Thermistor <Outdoor pipe> (TH3)
- Thermistor <Low pressure saturated temperature> (TH6)
- Thermistor <Outdoor> (TH7)

Thermistor R0 = 15kΩ ± 3%
B constant = 3480 ± 2%

$R_t = 15\exp\{3480(\frac{1}{273+t} - \frac{1}{273})\}$ t : °C = (°F-32)/1.8

0°C [32°F]	15kΩ	30°C [86°F]	4.3kΩ
10°C [50°F]	9.6kΩ	40°C [104°F]	3.0kΩ
20°C [68°F]	6.3kΩ		
25°C [77°F]	5.2kΩ		



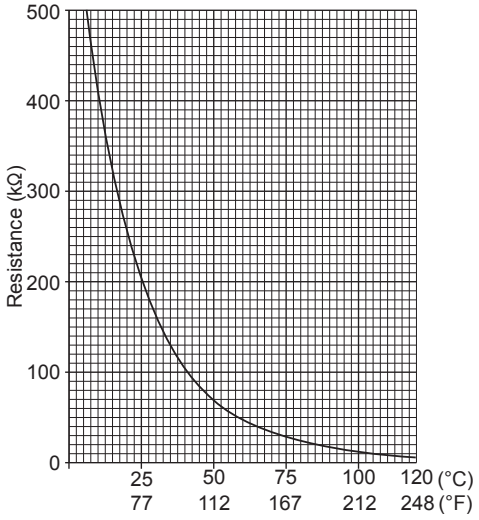
High temperature thermistor

- Thermistor <Compressor> (TH4)

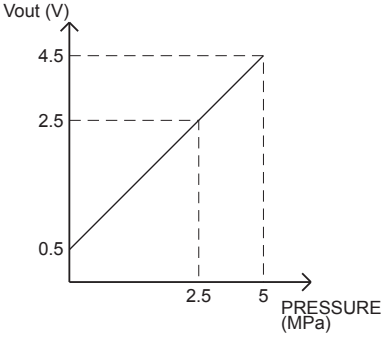
Thermistor R120 = 7.465kΩ ± 2%
B constant = 4057 ± 2%

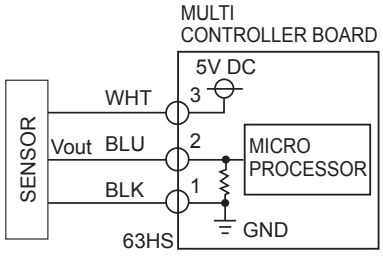
$R_t = 7.465\exp\{4057(\frac{1}{273+t} - \frac{1}{393})\}$ t : °C = (°F-32)/1.8

20°C [68°F]	250kΩ	70°C [158°F]	34kΩ
30°C [86°F]	160kΩ	80°C [176°F]	24kΩ
40°C [104°F]	104kΩ	90°C [194°F]	17.5kΩ
50°C [122°F]	70kΩ	100°C [212°F]	13.0kΩ
60°C [140°F]	48kΩ	110°C [230°F]	9.8kΩ



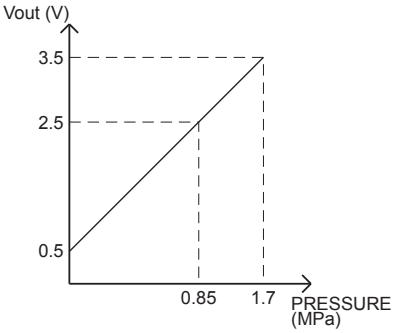
<HIGH PRESSURE SENSOR>

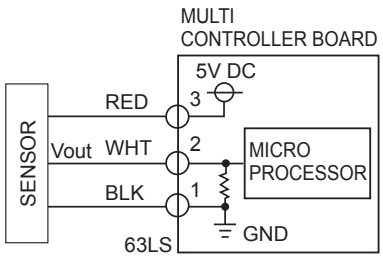




③-① : 5V (DC)
②-① : Output Vout (DC)

<LOW PRESSURE SENSOR>

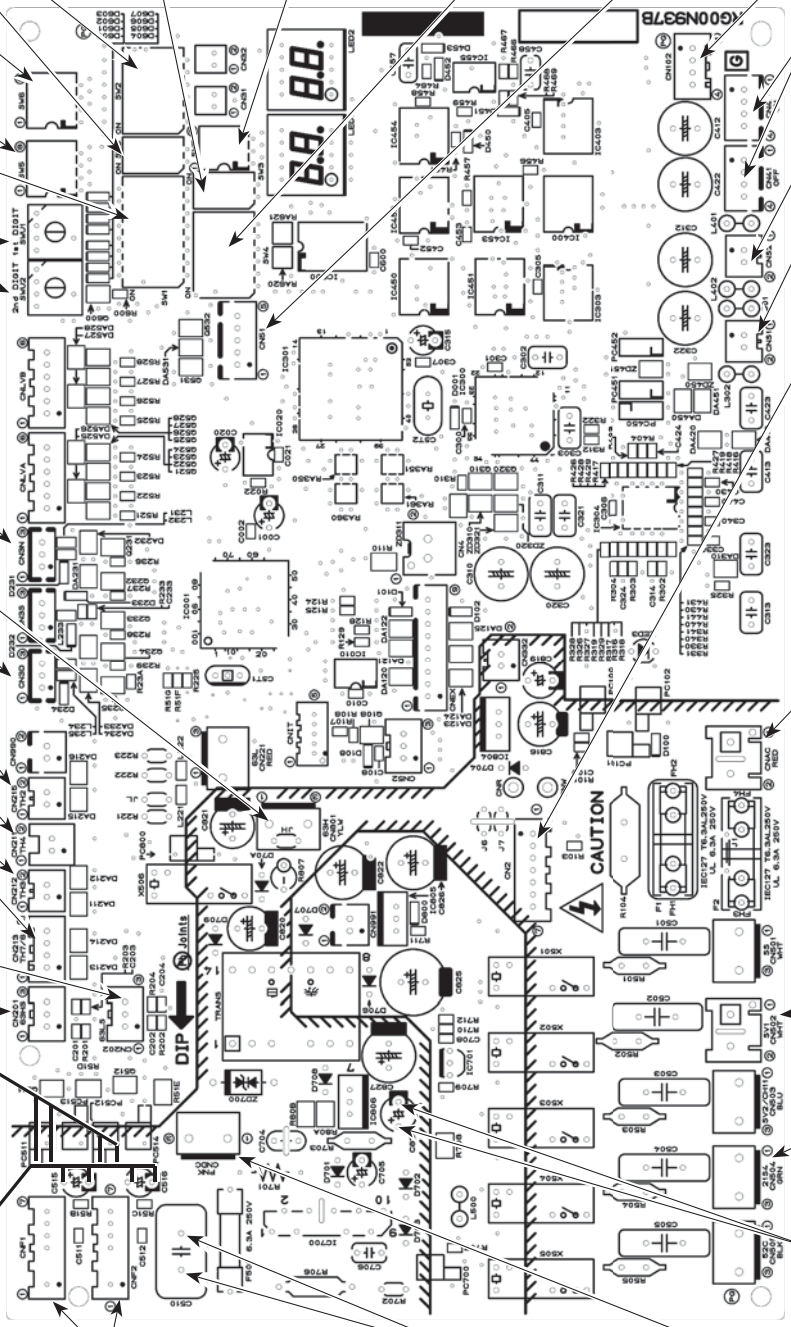




③-① : 5V (DC)
②-① : Output Vout (DC)

8-9. TEST POINT DIAGRAM
Outdoor controller board
PUMY-P60NKMU
PUMY-P60NKMU-BS

<CAUTION> TEST POINT ① is high voltage.



SW8
Model select

SW2
Pump down

SW3
Test run

SW7
Forced defrost

SW4
Model select

CN51
External signal output

CN102
Connect to the M-P.B (Transmission power board)

SW6
Function switch

CN40,CN41
Centralized control power supply/ For storing jumper connector selection

SW5
Function switch

CNS2
Transmission wire of centralized control

SW1
Display selection (Self diagnosis)

CNS1
Indoor/ outdoor unit connecting wire

SWU2, SWU1
Address setting

CN2
Connect to the outdoor power circuit board
①-⑤:
Power circuit board → Transmitting signal to the multi controller board (0-5V DC)
②-⑤: Zero cross signal (0-5V DC)
③-④: Not used
⑥-⑤: 16V DC
⑦-⑤: 16V DC

CN3N
Auto change over

63H
High pressure switch

CN3D
Input of demand control

TH2 Thermistor
<HIC pipe>

TH4 Thermistor
<Compressor>

TH3 Thermistor
<Outdoor pipe>

TH7/TH6 Thermistor
<Outdoor/Saturation temperature of suction pressure>

63LS
Low pressure sensor

63HS
High pressure sensor

CNAC
Power supply for multi controller board 208/230VAC

SV1
Bypass valve

V_{FG} (TEST POINT④)
(Voltage between left pins of PC511 and PC512, pin1 and pin2) :
(Same as CNF1,2 ⑦(+)–④(-))

21S4
Four-way valve

V_{CC} (TEST POINT②)
(Voltage between pins of C82A) : DC15V
(Same as CNF1,2 ⑤(+)–④(-))

V_{SP}
(Voltage between pins of C515 and C516) :
DC0V (when stopped)
DC1–6.5V (when operated)
(Same as CNF1,2 ⑥(+)–④(-))

CNF1, 2
Connect to fan motors
①–④ : DC310V
⑤–④ : DC15V
⑥–④ : DC0–6.5V
⑦–④ : DC15V (when stopped)
DC0–15V pulse (when operated)

V_{DC} (TEST POINT①)
(Voltage between pins of C510) : DC310V
(Same as CNF1,2 ①(+)–④(-))

CNDC
DC280-380V (①(+)–③(-))

Outdoor power board
PUMY-P60NKMU
PUMY-P60NKMU-BS

Brief check of POWER MODULE
* Usually, each point is in a state of being short-circuited if they are broken.
Measure the resistance in the following points (connectors, etc.).
If they are short-circuited, it means that they are broken.
1. Check of POWER MODULE
①.Check of DIODE circuit
L1-P1, L2-P1, L3-P1, L1-N1, L2-N1, L3-N1
②.Check of IGBT circuit
P2-U, P2-V, P2-W, N2-U, N2-V, N2-W
Note:The marks, L1, L2, L3, N1, N2, P1, P2, U, V and W shown in the diagram are not actually printed on the board.

CN4
Connect to the outdoor controller circuit board (CN4)

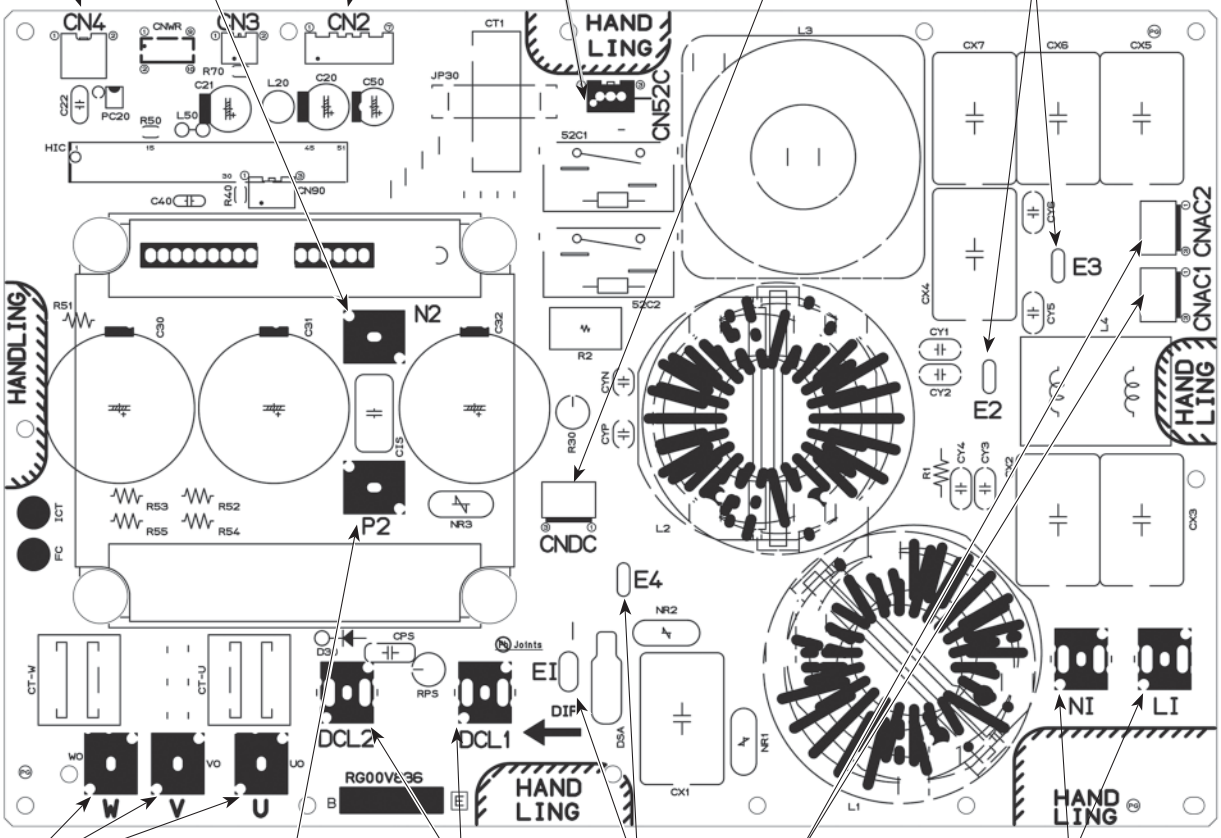
CN2
Connect to the outdoor controller circuit board (CN2)
1-5: Transmitting signal to outdoor controller circuit board (0-5 V DC)
2-5: Zero cross signal (0-5 V DC)
3-4: 18 V DC
6-5: 16 V DC
7-5: 16 V DC

N2
Connect to the smoothing capacitor CB ⊖

CN52C
52C driving signal
Connect to the outdoor controller circuit board (CN52)

CNDC
280-380 V DC (①+, ③-)
Connect to the outdoor controller circuit board (CNDC)

E2, E3
Connect to the earth



U/V/W
Connect to the compressor (MC) Voltage among phases: 10 V-180 V AC

P2
Connect to the smoothing capacitor CB ⊕

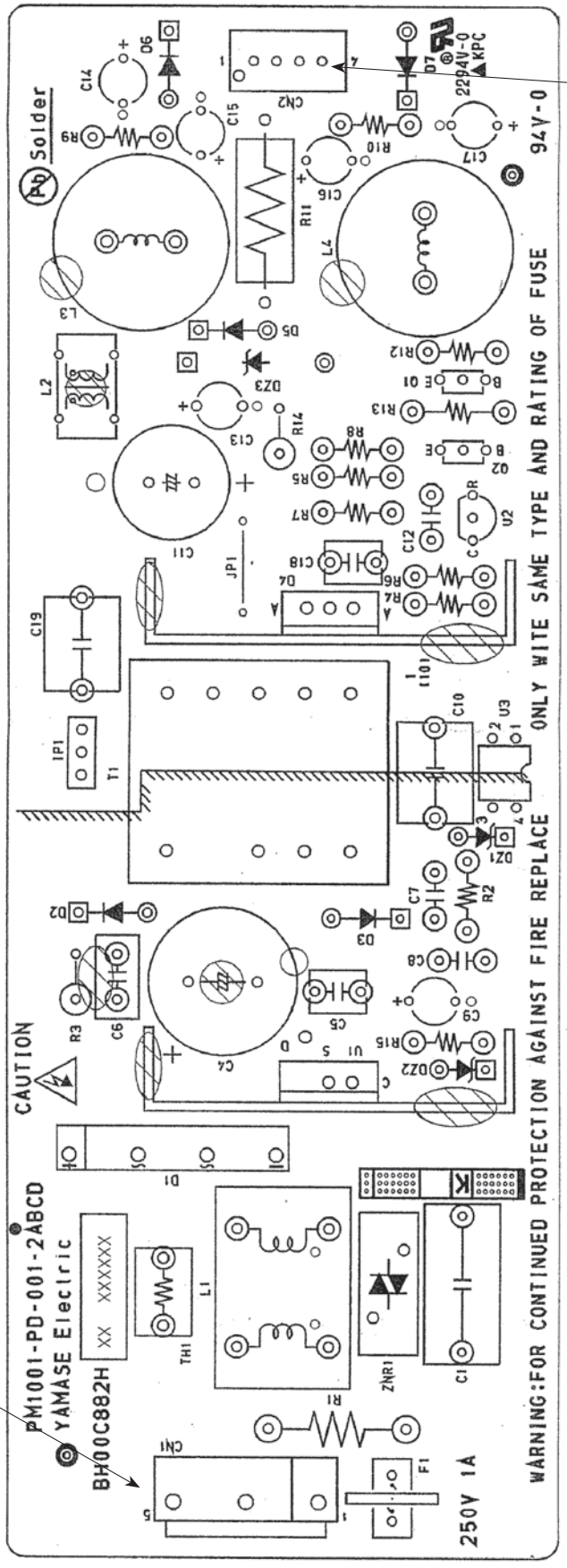
DCL1, DCL2
Connect to DCL

EI, E4
Connect to the earth

CNAC1, CNAC2
203/230 V AC
Connect to the outdoor controller circuit board (CNAC)

NI, LI
Voltage of 208/230 V AC is input (Connect to the terminal block (TB1))

Transmission power board
PUMY-P60NKMU
PUMY-P60NKMU-BS



No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1	2	3	4	5	6	7	8	Notes
0	00000000	Relay output display	Compressor operation	52C	21S4	SV1	(SV2)			Lighting always	ON: light on OFF: light off
		Check display	0000 – 9999 (Alternating display of addresses and error code)								When abnormality occurs, check display.
1	10000000	Indoor unit check status	No.1 unit check	No.2 unit check	No.3 unit check	No.4 unit check	No.5 unit check	No.6 unit check	No.7 unit check	No.8 unit check	Check: light on Normal: light off
2	01000000	Protection input	High-pressure abnormality	SHd(low discharge temperature) abnormality	Compressor temperature abnormality	TH4 abnormality	TH3 abnormality	Outdoor fan rotantial frequency abnormality	TH7 abnormality	TH8 abnormality	Display input microprocessor protection (abnormality)
3	11000000	Protection input	Heatsink overheating	Over current interception	Voltage abnormality	Insufficient refrigerant amount abnormality	Current sensor abnormality		63HS abnormality	start over current interception abnormality	
4	00100000	Protection input	Abnormality in the number of indoor units	Address double setting abnormality	Indoor unit capacity error	Over capacity	Indoor unit address error	Outdoor unit address error	Current sensor open/short	serial communication abnormality	
5	10100000	Abnormality delay display 1	High-pressure abnormality delay	SHd(low discharge temperature) abnormality delay	Compressor temperature abnormality delay	TH4 abnormality delay	TH3 abnormality delay	Outdoor fan rotantial frequency abnormality delay	TH7 abnormality delay	TH8 abnormality delay	Display all abnormalities remaining in abnormality delay
6	01100000	Abnormality delay display 2	Heatsink overheating delay	Over current interception delay	Voltage abnormality delay	Insufficient refrigerant amount abnormality delay	Current sensor abnormality delay		63HS abnormality delay	start over current interception abnormality delay	
7	11100000	Abnormality delay display 3	63LS abnormality delay	HIC(TH2) abnormality delay	4-way valve disconnection abnormality delay	Stop valve blockage abnormality delay	Power module abnormality delay	TH6 abnormality delay	Current sensor open/short delay		
8	00010000	Abnormality delay history 1	High-pressure abnormality delay	SHd(low discharge temperature) abnormality delay	Compressor temperature abnormality delay	TH4 abnormality delay	TH3 abnormality delay	Outdoor fan rotantial frequency abnormality delay	TH7 abnormality delay	TH8 abnormality delay	Display all abnormalities remaining in abnormality delay history
9	10010000	Abnormality delay history 2	Heatsink overheating delay	Over current interception delay	Voltage abnormality delay	Insufficient refrigerant amount abnormality delay	Current sensor abnormality delay		63HS abnormality delay	start over current interception abnormality delay	
10	01010000	Abnormality delay history 3	63LS abnormality delay	HIC(TH2) abnormality delay	4-way valve disconnection abnormality delay	Stop valve blockage abnormality delay	Power module abnormally delay	TH6 abnormality delay	Current sensor open/short delay		
11	11010000	Abnormality code history 1 (the latest)	Alternating display of addresses 0000-9999 and abnormality code (including abnormality delay code)								•Display abnormalities up to present (including abnormality terminals) •History record in 1 is the latest; records become older in sequence; history record in 10 is the oldest.
12	00110000	Abnormality code history 2									
13	10110000	Abnormality code history 3									
14	01110000	Abnormality code history 4									
15	11110000	Abnormality code history 5									
16	00001000	Abnormality code history 6									
17	10001000	Abnormality code history 7									
18	01001000	Abnormality code history 8									
19	11001000	Abnormality code history 9									
20	00101000	Abnormality code history 10 (the oldest)									
21	10101000	Cumulative time	0~9999(unit: 1-hour)								Display of cumulative compressor operating time
22	01101000	Cumulative time	0~9999(unit: 10-hour)								
23	11101000	Outdoor unit operation display	Excitation Current	Restart after 3 minutes	Compressor operation	Abnormality(detection)					
24	00011000	Indoor unit operation mode	No.1 unit mode	No.2 unit mode	No.3 unit mode	No.4 unit mode	No.5 unit mode	No.6 unit mode	No.7 unit mode	No.8 unit mode	Cooling : light on Heating: light flashing Stop fan: light off
25	10011000	Indoor unit operation display	No.1 unit operation	No.2 unit operation	No.3 unit operation	No.4 unit operation	No.5 unit operation	No.6 unit operation	No.7 unit operation	No.8 unit operation	Thermo ON : light on Thermo OFF : light off
26	01011000	Capacity code (No. 1 indoor unit)	0~255								•Display of indoor unit capacity code •The No. 1 unit will start from the address with the lowest number
27	11011000	Capacity code (No. 2 indoor unit)									
28	00111000	Capacity code (No. 3 indoor unit)									
29	10111000	Capacity code (No. 4 indoor unit)									
30	01111000	Capacity code (No. 5 indoor unit)									

Delay code	Abnormality delay	Delay code	Abnormality delay
1202	Compressor temperature abnormality	1402	High-pressure abnormality
	Compressor temperature sensor (TH4) abnormality		Pressure sensor (63HS) abnormality
1205	Outdoor pipe temperature sensor (TH3) abnormality	1600	Over charge refrigerant abnormality
1211	Saturation temperature of suction pressure sensor (TH6) abnormality	1601	Insufficient refrigerant abnormality
1214	Heatsink thermistor (TH8) abnormality	4320	Frequency converter insufficient wiring voltage abnormality
1221	Outside air temperature sensor (TH7) abnormality	4330	Heatsink temperature abnormality
1222	TH2(HIC) open/short abnormality delay	4350	Power module abnormality
1400	63LS abnormality delay		

SW:setting
0.....OFF
1.....ON

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1	2	3	4	5	6	7	8	Notes
31	11111000	IC1 operation mode	OFF	Fan	Cooling thermo ON	Cooling thermo OFF	Heating thermo ON	Heating thermo OFF			Display of indoor unit operating mode
32	00000100	IC2 operation mode									
33	10000100	IC3 operation mode									
34	01000100	IC4 operation mode									
35	11000100	IC5 operation mode									
36	00100100	OC operation mode	ON/OFF	Heating/Cooling	Abnormal/Normal	DEFROST/NO	Refrigerant pull back/no	Excitation current/no	3-min.delay/no		Light on/light off
37	10100100	External connection status	P97:Autochange over permission CN3N1-3 input	P96:Autochange over fixed mode CN3N1-2 input		P94:Demand CN3D1-3 input	P93:Silent CN3D1-2 input				Input: light off No input: light on
38	01100100	Communication demand capacity	0 – 255								Display of communication demand capacity
39	11100100	Number of compressor ON/OFF	0000 – 9999 (×10)								
40	00010100	Compressor operating current	0 – 999.9 (A)								
41	10010100	Input current of outdoor unit	0 – 999.9 (A)								
42	01010100	Thermo ON operating time	0000 – 9999 (×10)								
43	11010100	Total capacity of thermo on	0 – 255								
44	00110100	Number of indoor units	0 – 255								
45	10110100	DC bus voltage	0 – 999.9 (V)								
46	01110100	State of LEV control	Td over heat prevention	SHd declease prevention	Min.Sj correction depends on Td	LEV opening correction depends on Pd	LEV opening correction depends on Td	Correction of high compression ratio prevention			
47	11110100	State of compressor frequency control 1	Discharge pressure control	Compressor temperature control	Max. Hz control	Discharge temp.(heating) Backup	Pd abnormality control (heating)	Pd Back up (heating)		Freeze prevention control	
48	00001100	State of compressor frequency control 2	Heatsink over heat pre-vention control	Secondary current control	Input current control		Frequency restrain of receipt voltage change				
49	10001100	Protection input	63LS abnormality	HIC(TH2) abnormality			4-way valve disconnection abnormality	Stop valve blockage abnormality	TH6 abnormality	Power module abnormality	
50	01001100	The second current value when microprocessor of POWER BOARD abnormality is detected	0 – 999.9 [Arms]								
51	11001100	The radiator panel temperature when microprocessor of POWER BOARD abnormality is detected	-99.9 – 999.9 (Short/Open:-99.9 or 999.9)								

State of compressor frequency(Hz) control (Words)	Content
Discharge pressure control	Hz control by pressure limitation
Compressor temperature control	Hz control by compressor temperature limitation
Max.Hz control	Max.Hz limitation when power supply on
SV control	Hz control by bypass valve
Abnormal rise of Pd control	Control that restrains abnormal rise of discharge pressure
Heatsink over heat prevention control	Heatsink over heat prevention control
Secondary current control	Secondary current control
Input current control	Input current control
Hz correction of receipt voltage decrease prevention	Max.Hz correction control due to voltage decrease
Hz restrain of receipt voltage change	Max.Hz correction control due to receipt voltage change

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1	2	3	4	5	6	7	8	Notes
52	00101100	Outdoor LEV-A opening pulse	0 - 2000								
53	10101100	Outdoor LEV-A opening pulse when abnormaliy delay is detected									
54	01101100	Outdoor LEV-A opening pulse when abnormaliy is detected									
55	11101100	Outdoor LEV-B opening pulse									
56	00011100	Outdoor LEV-B opening pulse when abnormaliy delay is detected									
57	10011100	Outdoor LEV-B opening pulse when abnormaliy is detected									
58	01011100	63LS value	−99.9 - 999.9								
59	11011100	63LS value when abnormaliy delay is detected									
60	00111100	63LS value when abnormaliy is detected									
61	10111100	HIC(TH2) value									
62	01111100	HIC(TH2) value when abnormaliy delay is detected									
63	11111100	HIC(TH2) value when abnormaliy is detected									
64	00000010	Operational frequency	0 – 255 (plus decimal places)								Display of actual operating frequency
65	10000010	Target frequency	0 – 255 (plus decimal places)								Display of target frequency
66	01000010	Outdoor fan control step number	0 – 15								Display of number of outdoor
69	10100010	IC1 LEV Opening pulse	0 – 2000								fan control steps (target) Display of opening pulse of indoor LEV
70	01100010	IC2 LEV Opening pulse									
71	11100010	IC3 LEV Opening pulse									
72	00010010	IC4 LEV Opening pulse									
73	10010010	IC5 LEV Opening pulse									
74	01010010	High-pressure sensor (Pd) kgf/cm^2	-99.9 – 999.9								Display of outdoor subcool (SC) data and detection data from high-pressure sensor and each thermistor
75	11010010	TH4 (Td) °C									
76	00110010	TH6 (ET) °C									
77	10110010	TH7 (Outdoor-temp.) °C									
78	01110010	TH3 (Outdoor pipe) °C									
80	00001010	TH8 (Power module) °C									
81	10001010	IC1 TH23 (Gas) °C	-99.9 – 999.9 (When the indoor unit is not connected, it is displayed as"0".)								
82	01001010	IC2 TH23 (Gas) °C									
83	11001010	IC3 TH23 (Gas) °C									
84	00101010	IC4 TH23 (Gas) °C									
85	10101010	IC5 TH23 (Gas) °C									

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1 2 3 4 5 6 7 8	Notes
86	01101010	IC1 TH22 (Liquid) °C	-99.9 – 999.9 (When the indoor unit is not connected, it is displayed as “0”.)	Display of outdoor subcool (SC) data and detection data from high-pressure sensor and each thermistor
87	11101010	IC2 TH22 (Liquid) °C		
88	00011010	IC3 TH22 (Liquid) °C		
89	10011010	IC4 TH22 (Liquid) °C		
90	01011010	IC5 TH22 (Liquid) °C		
91	11011010	IC1 TH21 (Intake) °C		
92	00111010	IC2 TH21 (Intake) °C		
93	10111010	IC3 TH21 (Intake) °C		
94	01111010	IC4 TH21 (Intake) °C		
95	11111010	IC5 TH21 (Intake) °C		
96	00000110	Outdoor SC (cooling) °C	-99.9 – 999.9	
97	10000110	Target subcool °C	0.0 – 20.0	Display of target subcool data
98	01000110	IC1 SC/SH °C	-99.9 – 999.9 during heating: subcool (SC)/during cooling: superheat (SH)	Display of indoor SC/SH data
99	11000110	IC2 SC/SH °C		
100	00100110	IC3 SC/SH °C		
101	10100110	IC4 SC/SH °C		
102	01100110	IC5 SC/SH °C		
103	11100110	Discharge superheat (SHd) °C	-99.9 – 999.9	Display of target subcool step data
105	10010110	Target Pd display (heating) kgf/cm²	Pdm (0.0 – 30.0)	Display of all control target data
106	01010110	Target ET display (cooling) °C	ETm (-2.0 – 23.0)	
107	11010110	Target outdoor SC (cooling) °C	SCm (0.0 – 20.0)	
108	00110110	Target indoor SC/SH (IC1) °C	SCm/SHm (0.0 – 20.0)	
109	10110110	Target indoor SC/SH (IC2) °C		
110	01110110	Target indoor SC/SH (IC3) °C		
111	11110110	Target indoor SC/SH (IC4) °C		
112	00001110	Target indoor SC/SH (IC5) °C		

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1 2 3 4 5 6 7 8	Notes
113	10001110	Target indoor SC/SH (IC6) °C	SCm/SHm (0.0 – 20.0)	Display of all control target data
114	01001110	Target indoor SC/SH (IC7) °C		
115	11001110	Target indoor SC/SH (IC8) °C		
116	00101110	Target indoor SC/SH (IC9) °C		
117	10101110	Target indoor SC/SH (IC10) °C		
118	01101110	Target indoor SC/SH (IC11) °C		
119	11101110	Target indoor SC/SH (IC12) °C		
121	10011110	TH4 (Td) °F	-99.9 – 999.9 [°F]	Display of detection data from high-pressure sensor and each thermistor
122	01011110	TH3 (Outdoor pipe) °F		
123	11011110	TH6 (ET) °F		
124	00111110	TH7 (Outdoor temp.) °F		
125	10111110	Hight pressure sensor (Pd) PSIG	0.0 – 711.0 [PSIG]	
126	01111110	TH8 (Power module) °F	-99.9 ~ 999.9 [°F]	
128	00000001	IC1 LEV opening pulse abnormality delay	0 – 2000	Display of opening pulse of indoor LEV at time of abnormailty delay
129	10000001	IC2 LEV opening pulse abnormality delay		
130	01000001	IC3 LEV opening pulse abnormality delay		
131	11000001	IC4 LEV opening pulse abnormality delay		
132	00100001	IC5 LEV opening pulse abnormality delay		
133	10100001	IC6 LEV opening pulse abnormality delay		
134	01100001	IC7 LEV opening pulse abnormality delay		
135	11100001	IC8 LEV opening pulse abnormality delay		
136	00010001	IC9 LEV opening pulse abnormality delay		
137	10010001	IC10 LEV opening pulse abnormality delay		
138	01010001	IC11 LEV opening pulse abnormality delay		
139	11010001	IC12 LEV opening pulse abnormality delay		
140	00110001	Actual frequency of abnormality delay	0 – FF (16 progressive)	Display of actual frquency at time of abnormality delay
141	10110001	Fan step number at time of abnormailty delay	0 – 15	Display of fan step number at time of abnormailty delay

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1 2 3 4 5 6 7 8	Notes
142	01110001	High-pressure sensor data at time of abnormality delay kgf/cm²	-99.9 – 999.9	Display of data from high-pressure sensor, all thermistors, and SC/SH at time of abnormality delay
143	11110001	OC SC (cooling) at time of abnormality delay °C		
145	10001001	TH4 sensor data at time of abnormality delay °C		
146	01001001	TH6 sensor data at time of abnormality delay °C		
147	11001001	TH3 sensor data at time of abnormality delay °C		
148	00101001	TH8 sensor data at time of abnormality delay °C		
149	10101001	IC1 SC/SH at time of abnormality delay °C		
150	01101001	IC2 SC/SH at time of abnormality delay °C		
151	11101001	IC3 SC/SH at time of abnormality delay °C		
152	00011001	IC4 SC/SH at time of abnormality delay °C		
153	10011001	IC5 SC/SH at time of abnormality delay °C		
154	01011001	IC6 SC/SH at time of abnormality delay °C		
155	11011001	IC7 SC/SH at time of abnormality delay °C		
156	00111001	IC8 SC/SH at time of abnormality delay °C		
157	10111001	IC9 SC/SH at time of abnormality delay °C		
158	01111001	IC10 SC/SH at time of abnormality delay °C		
159	11111001	IC11 SC/SH at time of abnormality delay °C		
160	00000101	IC12 SC/SH at time of abnormality delay °C		
170	01010101	ROM version monitor		Display of version data of ROM
171	11010101	ROM type		Display of ROM type
172	00110101	Check sum mode		Display of check sum code of ROM
173	10110101	IC1 LEV opening pulse at time of abnormality delay	0 – 2000	Display of opening pulse of indoor LEV at time of abnormality
174	01110101	IC2 LEV opening pulse at time of abnormality delay		
175	11110101	IC3 LEV opening pulse at time of abnormality delay		
176	00001101	IC4 LEV opening pulse at time of abnormality delay		
177	10001101	IC5 LEV opening pulse at time of abnormality delay		
178	01001101	IC6 LEV opening pulse at time of abnormality delay		
179	11001101	IC7 LEV opening pulse at time of abnormality delay		
180	00101101	IC8 LEV opening pulse at time of abnormality delay		
181	10101101	IC9 LEV opening pulse at time of abnormality delay		
182	01101101	IC10 LEV opening pulse at time of abnormality delay		
183	11101101	IC11 LEV opening pulse at time of abnormality delay		
184	00011101	IC12 LEV opening pulse at time of abnormality delay		

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1	2	3	4	5	6	7	8	Notes
185	10011101	Actual frequency of abnormality	0 – FF (16progressive)								Display of actual frequency at time of abnormality
186	01011101	Fan step number at time of abnormality	0 – 15								Display of fan step number at time of abnormality
187	11011101	High-pressure sensor data at time of abnormality	-99.9 – 999.9								Display of data from high-pressure sensor at time of abnormality
188	00111101	OC SC (cooling) at time of abnormality	-99.9 – 999.9								Display of SC data at time of abnormality
189	10111101	4420 Error history	——	——	ACTM error	——	——	CT sensor disconn-ection	Under voltage	Over Voltage	
190	01111101	TH4 sensor data at time of abnormality	-99.9 – 999.9								Display of data from high-pressure sensor, all thermistors, and SC/SH at time of abnormality
191	11111101	TH6 sensor data at time of abnormality									
192	00000011	TH3 sensor data at time of abnormality									
193	10000011	TH8 sensor data at time of abnormality									
194	01000011	IC1 SC/SH at time of abnormality									
195	11000011	IC2 SC/SH at time of abnormality									
196	00100011	IC3 SC/SH at time of abnormality									
197	10100011	IC4 SC/SH at time of abnormality									
198	01100011	IC5 SC/SH at time of abnormality									
199	11100011	IC6 SC/SH at time of abnormality									
200	00010011	IC7 SC/SH at time of abnormality									
201	10010011	IC8 SC/SH at time of abnormality									
202	01010011	IC9 SC/SH at time of abnormality									
203	11010011	IC10 SC/SH at time of abnormality									
204	00110011	IC11 SC/SH at time of abnormality									
205	10110011	IC12 SC/SH at time of abnormality									
211	11001011	IC6 Capacity code	0 – 255								Display of indoor unit capacity code
212	00101011	IC7 Capacity code									
213	10101011	IC8 Capacity code									
214	01101011	IC9 Capacity code									
215	11101011	IC10 Capacity code									
216	00011011	IC11 Capacity code									
217	10011011	IC12 Capacity code									

No.	SW1 setting 12345678	Display mode	Display on the LED1, 2 (display data) 1 2 3 4 5 6 7 8	Notes
218	01011011	IC6 SC/SH	-99.9 – 999.9	Display of indoor SC/SH data
219	11011011	IC7 SC/SH		
220	00111011	IC8 SC/SH		
221	10111011	IC9 SC/SH		
222	01111011	IC10 SC/SH		
223	11111011	IC11 SC/SH		
224	00000111	IC12 SC/SH		
225	10000111	IC6 LEV opening pulse	0 – 2000	Display of opening pulse of indoor LEV
226	01000111	IC7 LEV opening pulse		
227	11000111	IC8 LEV opening pulse		
228	00100111	IC9 LEV opening pulse		
229	10100111	IC10 LEV opening pulse		
230	01100111	IC11 LEV opening pulse		
231	11100111	IC12 LEV opening pulse		
232	00010111	IC6 TH23 (Gas) °C	-99.9 – 999.9	Display if detection data from each indoor thermistor
233	10010111	IC7 TH23 (Gas) °C		
234	01010111	IC8 TH23 (Gas) °C		
235	11010111	IC9 TH23 (Gas) °C		
236	00110111	IC10 TH23 (Gas) °C		
237	10110111	IC11 TH23 (Gas) °C		
238	01110111	IC12 TH23 (Gas) °C		
239	11110111	IC6 TH22 (Liquid) °C		
240	00001111	IC7 TH22 (Liquid) °C		
241	10001111	IC8 TH22 (Liquid) °C		
242	01001111	IC9 TH22 (Liquid) °C		
243	11001111	IC10 TH22 (Liquid) °C		
244	00101111	IC11 TH22 (Liquid) °C		
245	10101111	IC12 TH22 (Liquid) °C		
246	01101111	IC6 TH21 (Intake) °C		
247	11101111	IC7 TH21 (Intake) °C		
248	00011111	IC8 TH21 (Intake) °C		
249	10011111	IC9 TH21 (Intake) °C		
250	01011111	IC10 TH21 (Intake) °C		
251	11011111	IC11 TH21 (Intake) °C		
252	00111111	IC12 TH21 (Intake) °C		

9 ELECTRICAL WIRING

This chapter provides an introduction to electrical wiring for the CITY MULTI-S series, together with notes concerning power wiring, wiring for control (transmission wires and remote controller wires), and the frequency converter.

9-1. OVERVIEW OF POWER WIRING

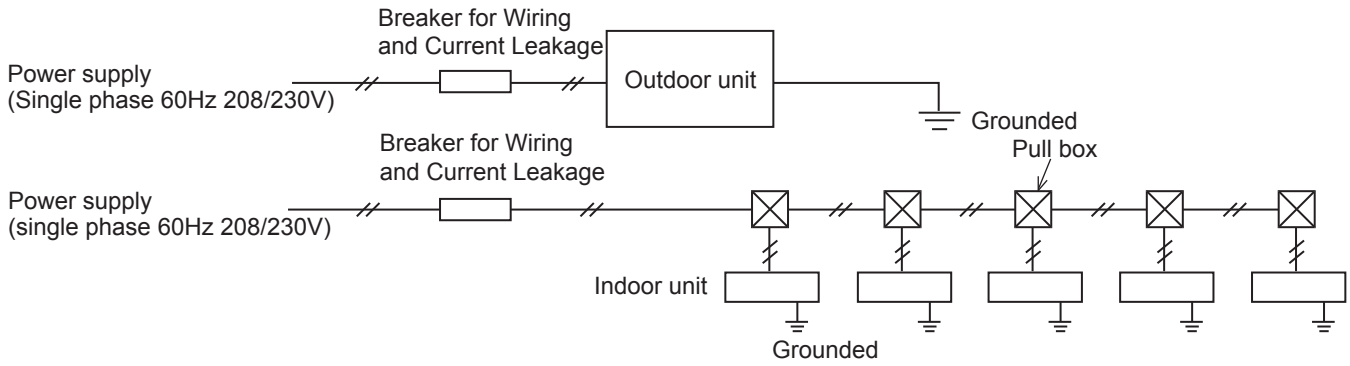
(1) Use a separate power supply for the outdoor unit and indoor unit.
(2) Bear in mind ambient conditions (ambient temperature, direct sunlight, rain water,etc.) when proceeding with the wiring and connections.
(3) The wire size is the minimum value for metal conduit wiring. The power cord size should be 1 rank thicker consideration of voltage drops. Make sure the power-supply voltage does not drop more than 10 %.
(4) Specific wiring requirements should adhere to the wiring regulations of the region.
(5) Power supply cords of parts of appliances for outdoor use shall not be lighter than polychloroprene sheathed flexible cord. For example, use wiring such as YZW.
(6) Install an earth longer than other cables.
(7) Use copper supply wires. Use electric wires over the rating voltage 300V.

⚠ Warning:
- Be sure to use specified wires to connect so that no external force is imparted to terminal connections. If connections are not fixed firmly, it may cause heating or fire.
- Be sure to use the appropriate type of overcurrent protection switch. Note that generated overcurrent may include some amount of direct current.

⚠ Caution:
- Some installation site may require attachment of an earth leakage breaker. If no earth leakage breaker is installed, it may cause an electric shock.
- Do not use anything other than breaker and fuse with correct capacity. Using fuse and wire or copper wire with too large capacity may cause a malfunction of unit or fire.

9-2. WIRE DIAMETER AND MAIN POWER SWITCH CAPACITY

9-2-1. Wiring diagram for main power supply



9-2-2. Power supply wire diameter and capacity

Model		Power Supply	Minimum Wire Thickness (mm^2[AWG])		Breaker for Wiring*	Breaker for Current Leakage	Minimum circuit ampacity	Maximum rating of over current protector device
			Main Cable**	Ground				
Outdoor Unit	P60	~/N (single), 60Hz 208/230V	5.3 [AWG10]	5.3 [AWG10]	40 A	30 A 30 mA 0.1 sec. or less	35 A	40 A
Indoor Unit		~/N (single), 60Hz 208/230V	Refer to installation manual of indoor unit.					

*A breaker with at least 3.0 mm contact separation in each poles shall be provided. Use earth leakage breaker (NV).
**Use copper supply wires. Use the electric wires over the rating voltage 300V.

9-3. DESIGN FOR CONTROL WIRING

Please note that the types and numbers of control wires needed by the CITY MULTI-S series will depend on the remote controllers and whether they are linked with the system.

9-3-1. Selection number of control wires

		M-NET remote controller
Use		Remote controller used in system control operations. • Group operation involving different refrigerant systems. • Linked operation with upper control system.
Remote controller → indoor unit		2 wires (non-polar)
Transmission wires	Wires connecting → indoor units	
	Wires connecting → indoor units with outdoor unit	
	Wires connecting → outdoor units	

9-3-2. Control signal wires

● Transmission wires

• Types of transmission cables : Shielding wire CVVS or CPEVS.

• Cable diameter : More than 1.25 ㎟ [AWG 16]

• Maximum wiring length : Within 200 m [656 ft]

9-3-3. M-NET Remote controller wiring

Kind of remote control cable	Shielding wire MVVS
Cable diameter	0.5 to 1.25 ㎟ [AWG 20 to AWG 16]
Remarks	When 10 m is exceeded, use cable with the same specifications as 10-3-2. Transmission line wiring

9-3-4. MA Remote control cables

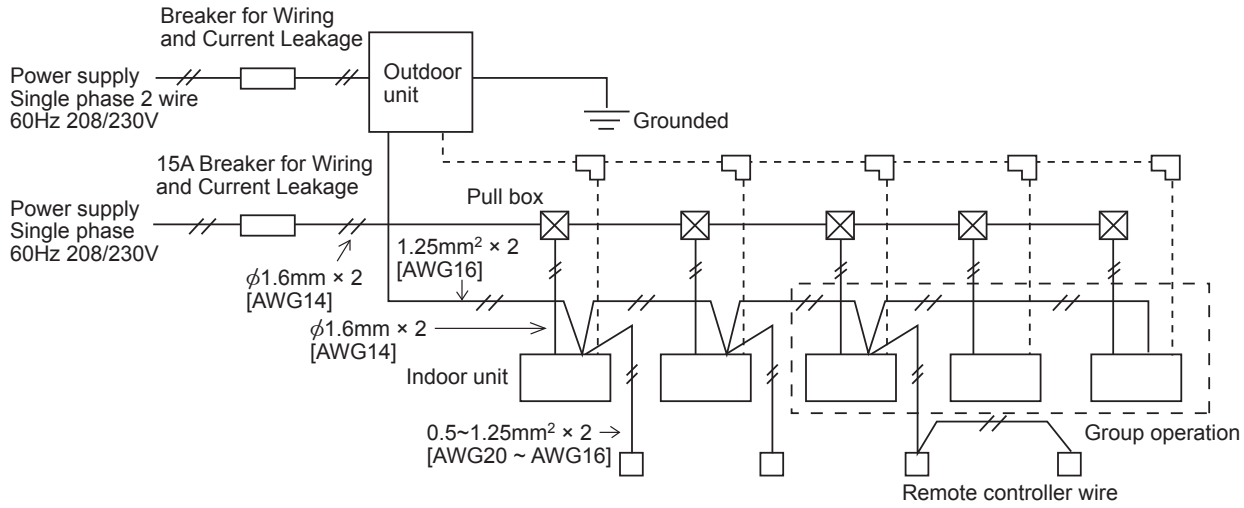
Kind of remote control cable	2-core cable (unshielded)
Cable diameter	0.3 to 1.25 ㎟ [AWG 22 to AWG 16]

9-4. SYSTEM SWITCH SETTING

In order to identify the destinations of signals to the outdoor units, indoor units, and remote controller of the MULTI-S series, each microprocessor must be assigned an identification number (address). The addresses of outdoor units, indoor units, and remote controller must be set using their settings switches. Please consult the installation manual that comes with each unit for detailed information on setting procedures.

9-5. EXAMPLE EXTERNAL WIRING DIAGRAM FOR A BASIC SYSTEM

9-5-1. Example using a M-NET remote controller



9-6. METHOD FOR OBTAINING ELECTRICAL CHARACTERISTICS WHEN A CAPACITY AGREEMENT IS TO BE SIGNED WITH AN ELECTRIC POWER COMPANY

The electrical characteristics of connected indoor unit system for air conditioning systems, including the MULTI-S series, will depend on the arrangement of the indoor and outdoor units.
First read the data on the selected indoor and outdoor units and then use the following formulas to calculate the electrical characteristics before applying for a capacity agreement with the local electric power company.

9-6-1. Obtaining the electrical characteristics of a CITY MULTI-S series system

(1) Procedure for obtaining total power consumption

	Page numbers in this technical manual	Power consumption
Total power consumption of each indoor unit	See the technical manual of each indoor unit	①
*1 power consumption of outdoor unit	Standard capacity table— Refer to 5-2.	②
Total power consumption of system	See the technical manual of each indoor unit	①+② <kW>

*1 Please note that the power consumption of the outdoor unit will vary depending on the total capacity of the selected indoor units.

(2) Method of obtaining total current

	Page numbers in this technical manual	Subtotal
Total current through each indoor unit	See the technical manual of each indoor unit	①
*2 current through outdoor unit	Standard capacity table— Refer to 5-2.	②
Total current through system	See the technical manual of each indoor unit	①+② <A>

*2 Please note that the current through the outdoor unit will vary depending on the total capacity of the selected indoor units.

(3) Method of obtaining system power factor

Use the following formula and the total power and current obtained in parts ① and ② in the above table to calculate the system power factor.

$$\text{System power factor} = \frac{\text{(Total system power consumption)}}{\text{(Total system current x voltage)}} \times 100\%$$

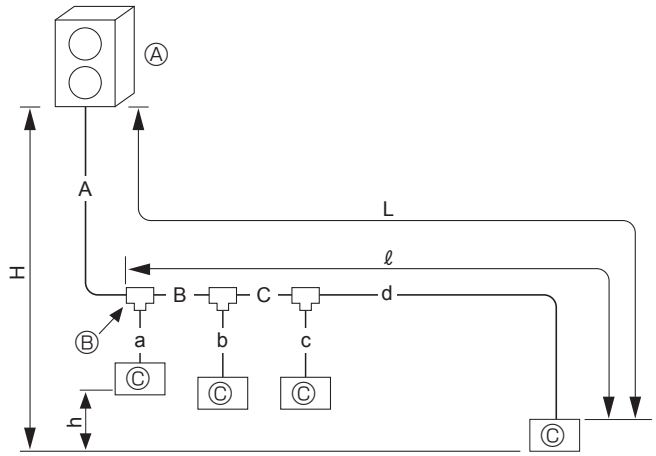
9-6-2. Applying to an electric power company for power and total current

Calculations should be performed separately for heating and cooling employing the same methods; use the largest resulting value in your application to the electric power company.

10 REFRIGERANT PIPING TASKS

10-1. REFRIGERANT PIPING SYSTEM

Line-Branch Method
Connection Examples
(Connecting to 4 Indoor Units)



Ⓐ Outdoor Unit
Ⓑ First Branch
Ⓒ Indoor unit

Permissible Length	Total Piping Length	A+B+C+a+b+c+d≦ 150m [492ft]
	Farthest Piping Length (L)	A+B+C+d ≦ 80m [262ft]
	Farthest Piping Length After First Branch (ℓ)	B+C+d ≦ 30m [100ft]
Permissible High/ Low Difference	High/Low Difference in Indoor/Outdoor Section (H)	50 meters [164ft] or less (If the outdoor unit is lower, 40 meters [131ft] or less)
	High/Low Difference in Indoor/Indoor Section (h)	15 meters [49ft] or less
■ **Selecting the Refrigerant Branch Kit**		Use an optional branch piping kit (CMY-Y62-G-E).

■ **Select Each Section of Refrigerant Piping**

(1) Section From Oudoor Unit to First Branch (A)
(2) Sections From Branch to Indoor Unit (a,b,c,d)
(3) Section From Branch to Branch (B,C)

Select the size from the right table.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to First Branch (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm [inch])	
PUMY-P60	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ19.05 [3/4]

(2) Refrigerant Piping Diameter In Section From Branch to Indoor Unit (Indoor Unit Piping Diameter)

Model number	Piping Diameter (mm [inch])	
18 or lower	Liquid Line	ϕ6.35 [1/4]
	Gas Line	ϕ12.7 [1/2]
24 to 54	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ15.88 [5/8]
72	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ19.05 [3/4]

(3) Refrigerant Piping Diameter In Section From Branch to Branch

Liquid Line (mm [inch])	Gas Line (mm [inch])
ϕ9.52 [3/8]	ϕ19.05 [3/4]

■ **Additional refrigerant charge**

Refrigerant for the extended piping is not included in the outdoor unit when the unit is shipped from the factory.
Therefore, charge each refrigerant piping system with additional refrigerant at the installation site. In addition, in order to carry out service, enter the size and length of each liquid pipe and additional refrigerant charge amounts in the spaces provided on the “Refrigerant amount” plate on the outdoor unit.

■ **Calculation of additional refrigerant charge**

- Calculate the additional charge using the liquid pipe size and length of the extended piping.
- Calculate the additional refrigerant charge using the procedure shown to the right, and charge with the additional refrigerant.
- For amounts less than 0.1 kg, round up the calculated additional refrigerant charge. (For example, if the calculated charge is 32.92 kg, round up the charge to 33.0 kg.)

<Additional Charge>

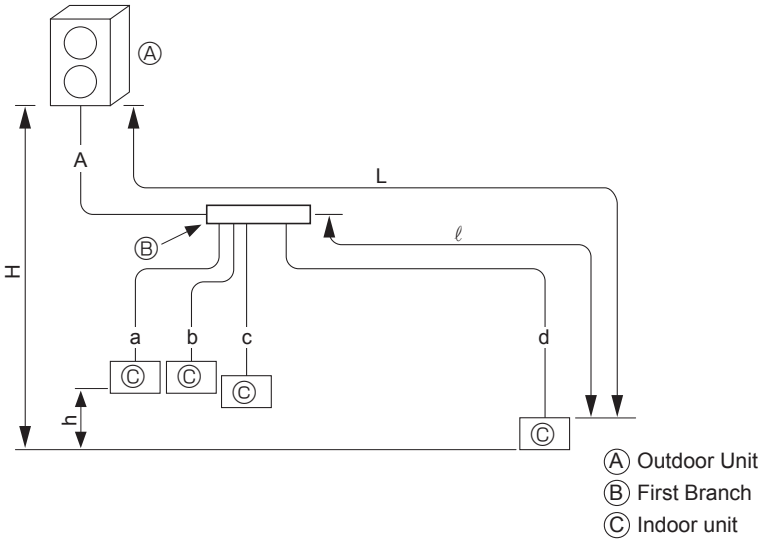
Additional refrigerant charge	=	Liquid pipe size Total length of ϕ9.52 × 0.07 kg [3/8" × 0.047 lbs]	+	Liquid pipe size Total length of ϕ6.35 × 0.027 kg [1/4" × 0.018 lbs]	+	Total capacity of connected indoor units	Amount for the indoor units
(kg) [lbs]		(m) × 0.07 (kg/m), [ft] × 0.047 [lbs/ft]		(m) × 0.027 (kg/m), [ft] × 0.018 [lbs/ft]		~P42 P43 ~ P60 P61~	2.0kg [4.4lbs] 2.5kg [5.5lbs] 3.0kg [6.6lbs]

<Calculation example>
Outdoor model : P60
Indoor

1 : P24	A : ϕ9.52 [3/8"] 10 m [33 ft]	a : ϕ9.52 [3/8"]	15m [49 ft]	At the conditions below:
2 : P15	B : ϕ9.52 [3/8"] 10 m [33 ft]	b : ϕ6.35 [1/4"]	10m [33 ft]	
3 : P08	C : ϕ9.52 [3/8"] 10 m [33 ft]	c : ϕ6.35 [1/4"]	10m [33 ft]	
4 : P06		d : ϕ6.35 [1/4"]	20m [66 ft]	

The total length of each liquid line is as follows;
ϕ9.52 [3/8"] : A + B + C + a = 10 m + 10 m + 10 m + 15 m = 45 m [33 ft + 33 ft + 33 ft + 49 ft = 148 ft]
ϕ6.35 [1/4"] : b + c + d = 10 m +10 m + 20 m = 40 m [33 ft + 33 ft + 66 ft = 132 ft]
The total capacity of connected indoor units is as follows:
24 + 15 + 08 + 06 = 53
Therefore, the additional refrigerant
charge is as follows = 45 m × 0.07 kg + 40 m × 0.027 kg + 2.5 kg = 6.8 kg (rounded up)
= [147 ft × 0.047 lbs + 132 ft × 0.018 lbs + 5.5 lbs = 14.8 lbs]

Header-Branch Method
Connection Examples
(Connecting to 4 Indoor Units)



Permissible Length	Total Piping Length	A+a+b+c+d ≦ 150m [492 ft]
	Farthest Piping Length (L)	A+d ≦ 80m [262 ft]
	Farthest Piping Length After First Branch (ℓ)	d is 30 meters[100 ft] or less
Permissible High/ Low Difference	High/Low Difference in Indoor/Outdoor Section (H)	50 meters [164 ft] or less (If the outdoor unit is lower, 40 meters [131 ft] or less)
	High/Low Difference in Indoor/Indoor Section (h)	15 meters [49 ft] or less

■ **Selecting the Refrigerant Branch Kit**

Please select branching kit, which is sold separately, from the table below.
(The kit comprises sets for use with liquid pipes and for use with gas pipes.)

Branch header (4 branches)	Branch header (8 branches)
CMY-Y64-G-E	CMY-Y68-G-E

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to First Branch (A)
(2) Sections From Branch to Indoor Unit (a,b,c,d)

Select the size from the right table.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to First Branch (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm [inch])	
PUMY-P60	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ19.05 [3/4]

(2) Refrigerant Piping Diameter In Section From Branch to Indoor Unit (Indoor Unit Piping Diameter)

Model number	Piping Diameter (mm [inch])	
18 or lower	Liquid Line	ϕ6.35 [1/4]
	Gas Line	ϕ12.7 [1/2]
24 to 54	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ15.88 [5/8]
72	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ19.05 [3/4]

■ **Additional refrigerant charge**

Refrigerant for the extended piping is not included in the outdoor unit when the unit is shipped from the factory.
Therefore, charge each refrigerant piping system with additional refrigerant at the installation site. In addition, in order to carry out service, enter the size and length of each liquid pipe and additional refrigerant charge amounts in the spaces provided on the "Refrigerant amount" plate on the outdoor unit.

■ **Calculation of additional refrigerant charge**

- Calculate the additional charge using the liquid pipe size and length of the extended piping.
- Calculate the additional refrigerant charge using the procedure shown to the right, and charge with the additional refrigerant.
- For amounts less than 0.1 kg, round up the calculated additional refrigerant charge. (For example, if the calculated charge is 32.92 kg, round up the charge to 33.0 kg.)

<Additional Charge>

Additional refrigerant charge	=	Liquid pipe size Total length of ϕ9.52 × 0.07 kg [3/8" × 0.047 lbs]	+	Liquid pipe size Total length of ϕ6.35 × 0.027 kg [1/4" × 0.018 lbs]	+	Total capacity of connected indoor units	Amount for the indoor units
(kg) [lbs]		(m) × 0.07 (kg/m), [ft] × 0.047 [lbs/ft]		(m) × 0.027 (kg/m), [ft] × 0.018 [lbs/ft]		~P42 P43 ~ P60 P61~	2.0kg [4.4lbs] 2.5kg [5.5lbs] 3.0kg [6.6lbs]

<Calculation example>
Outdoor model : P60
Indoor

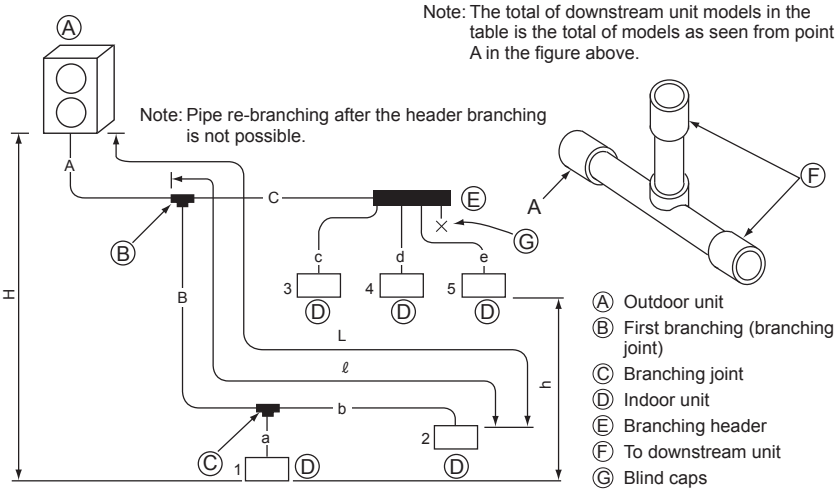
1 : P24	A : ϕ9.52 [3/8"] 30 m [98ft]	a : ϕ9.52 [3/8"]	15m [49ft]	At the conditions below:
2 : P15		b : ϕ6.35 [1/4"]	10m [33 ft]	
3 : P08		c : ϕ6.35 [1/4"]	10m [33 ft]	
4 : P06		d : ϕ6.35 [1/4"]	20m [66 ft]	

The total length of each liquid line is as follows;
ϕ9.52 : A + a = 30 m + 15 m = 45 m [98 ft + 49 ft = 147 ft]
ϕ6.35 : b + c + d = 10 m + 10 m + 20 m = 40 m [33 ft + 33 ft + 66 ft = 132 ft]
The total capacity of connected indoor units is as follows:
24 + 15 + 08 + 06 = 53
Therefore, the additional refrigerant
charge is as follows = 45 m × 0.07 kg + 40 m × 0.027 kg + 2.5 kg = 6.8 kg (rounded up)
= [147 ft × 0.047 lbs + 132 ft × 0.018 lbs + 5.5 lbs = 14.8 lbs]

Method of Combined Branching of Lines and Headers
Connection Examples
(Connecting to 5 Indoor Units)

Note: The total of downstream unit models in the table is the total of models as seen from point A in the figure above.

Note: Pipe re-branching after the header branching is not possible.



Permissible Length	Total Piping Length	A+B+C+a+b+c+d+e is 150 meters [492 ft] or less
	Farthest Piping Length (L)	A+B+b is 80 meters [262 ft] or less
	Farthest Piping Length After First Branch (ℓ)	B+b is 30 meters [100 ft] or less
Permissible High/Low Difference	High/Low Difference in Indoor/Outdoor Section (H)	50 meters [164 ft] or less (If the outdoor unit is lower, 40 meters [131 ft] or less)
	High/Low Difference in Indoor/Indoor Section (h)	15 meters [49 ft] or less

■ **Selecting the Refrigerant Branch Kit**

Please select branching kit, which is sold separately, from the table below.
(The kit comprises sets for use with liquid pipes and for use with gas pipes.)

Branch Joint	Branch Header (4 branches)	Branch Header (8 branches)
CMY-Y62-G-E	CMY-Y64-G-E	CMY-Y68-G-E

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to First Branch (A)
(2) Sections From Branch to Indoor Unit (a,b,c,d,e)
(3) Section From Branch to Branch (B,C)

Select the size from the right table.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to First Branch (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm [inch])	
PUMY-P60	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ19.05 [3/4]

(2) Refrigerant Piping Diameter In Section From Branch to Indoor Unit (Indoor Unit Piping Diameter)

Model number	Piping Diameter (mm [inch])	
18 or lower	Liquid Line	ϕ6.35 [1/4]
	Gas Line	ϕ12.7 [1/2]
24 to 54	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ15.88 [5/8]
72	Liquid Line	ϕ9.52 [3/8]
	Gas Line	ϕ19.05 [3/4]

(3) Refrigerant Piping Diameter In Section From Branch to Branch

Liquid Line (mm [inch])	Gas Line (mm [inch])
ϕ9.52 [3/8]	ϕ19.05 [3/4]

■ **Additional refrigerant charge**

Refrigerant for the extended piping is not included in the outdoor unit when the unit is shipped from the factory.
Therefore, charge each refrigerant piping system with additional refrigerant at the installation site. In addition, in order to carry out service, enter the size and length of each liquid pipe and additional refrigerant charge amounts in the spaces provided on the "Refrigerant amount" plate on the outdoor unit.

■ **Calculation of additional refrigerant charge**

- Calculate the additional charge using the liquid pipe size and length of the extended piping.
- Calculate the additional refrigerant charge using the procedure shown to the right, and charge with the additional refrigerant.
- For amounts less than 0.1 kg, round up the calculated additional refrigerant charge. (For example, if the calculated charge is 32.92 kg, round up the charge to 33.0 kg.)

<Additional Charge>

Additional refrigerant charge	=	Liquid pipe size Total length of ϕ9.52 × 0.07 kg [3/8" × 0.047 lbs]	+	Liquid pipe size Total length of ϕ6.35 × 0.027 kg [1/4" × 0.018 lbs]	+	Total capacity of connected indoor units	Amount for the indoor units
(kg) [lbs]		(m) × 0.07 (kg/m), [ft] × 0.047 [lbs/ft]		(m) × 0.027 (kg/m), [ft] × 0.018 [lbs/ft]		~P42	2.0kg [4.4lbs]
						P43 ~ P60	2.5kg [5.5lbs]
						P61~	3.0kg [6.6lbs]

<Calculation example>
Outdoor model : P60
Indoor

1 : P24	A : ϕ9.52 [3/8"] 10 m [33 ft]	a : ϕ9.52 [3/8"]	15m [49 ft]	At the conditions below:
2 : P15	B : ϕ9.52 [3/8"] 10 m [33 ft]	b : ϕ6.35 [1/4"]	10m [33 ft]	
3 : P08	C : ϕ9.52 [3/8"] 10 m [33 ft]	c : ϕ6.35 [1/4"]	10m [33 ft]	
4 : P06		d : ϕ6.35 [1/4"]	10m [33 ft]	
5 : P06		e : ϕ6.35 [1/4"]	10m [33 ft]	

The total length of each liquid line is as follows;
ϕ9.52 : A + B + C + a = 10 m + 10 m + 10 m + 15 m = 45 m [33 ft + 33 ft + 33 ft + 49 ft = 148 ft]
ϕ6.35 : b + c + d + e = 10 m + 10 m + 10 m + 10 m = 40 m [33 ft + 33 ft + 33 ft + 33 ft = 132 ft]

The total capacity of connected indoor units is as follows:
24 + 15 + 08 + 06 + 06 = 59

Therefore, the additional refrigerant charge is as follows = 45 m × 0.07 kg + 40 m × 0.027 kg + 2.5 kg = 6.8 kg (rounded up)
= [147 ft × 0.047 lbs + 132 ft × 0.018 lbs + 5.5 lbs = 14.8 lbs]

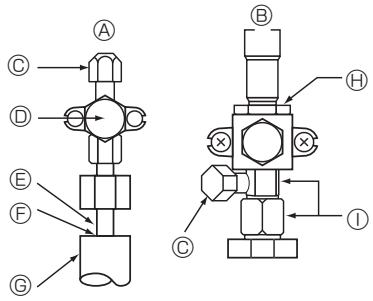
10-2. REFRIGERANT PIPE AIRTIGHT TESTING METHOD

(1) Connect the testing tools.
- Make sure the stop valves Ⓐ Ⓑ are closed and do not open them.
- Add pressure to the refrigerant lines through the service port Ⓒ of the liquid stop valve Ⓐ and the stop valve Ⓑ.

(2) Do not add pressure to the specified pressure all at once; add pressure little by little.
① Pressurize to 0.5 MPa (5 kgf/cm²G), wait 5 minutes, and make sure the pressure does not decrease.
② Pressurize to 1.5 MPa (15 kgf/cm²G), wait 5 minutes, and make sure the pressure does not decrease.
③ Pressurize to 4.15 MPa (41.5 kgf/cm²G) and measure the surrounding temperature and refrigerant pressure.

(3) If the specified pressure holds for about one day and does not decrease, the pipes have passed the test and there are no leaks.
- If the surrounding temperature changes by 1 °C, the pressure will change by about 0.01 MPa (0.1 kgf/cm²G). Make the necessary corrections.

(4) If the pressure decreases in steps (2) or (3), there is a gas leak. Look for the source of the gas leak.



Ⓐ Stop valve <Liquid side>
Ⓑ Stop valve <Gas side>
Ⓒ Service port
Ⓓ Open/Close section
Ⓔ Local pipe
Ⓕ Sealed, same way for gas side
Ⓖ Pipe cover
Ⓗ Do not use a wrench here.
Refrigerant leakage may result.
Ⓘ Use 2 wrenches here.

10-3. PRECAUTIONS AGAINST REFRIGERANT LEAKAGE

The installer and system specialist shall secure safety against leakage according to local regulations or standards. The following standards may be applicable if local regulations are not available.

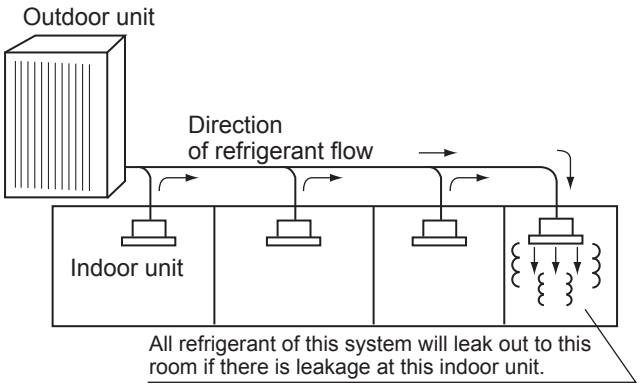
10-3-1. Introduction

R410A refrigerant of this air conditioner is non-toxic and non-flammable but leaking of large amount from an indoor unit into the room where the unit is installed may be deleterious. To prevent possible injury, the rooms should be large enough to keep the R410A concentration specified by KHK : (a high pressure gas safety association) installation guidelines S0010 as follows.

* Maximum concentration
Maximum refrigerant concentration of R410A of a room is 0.30 kg/m³ accordance with the installation guidelines. To facilitate calculation, the maximum concentration is expressed in units of kg/m³ (kg of R410A per m³)

Maximum concentration of R410A: 0.3kg/m³[0.019lbs/ft³]

(KHK installation guidelines S0010)



10-3-2. Confirming procedure of R410A concentration

Follow (1) to (3) to confirm the R410A concentration and take appropriate treatment, if necessary.

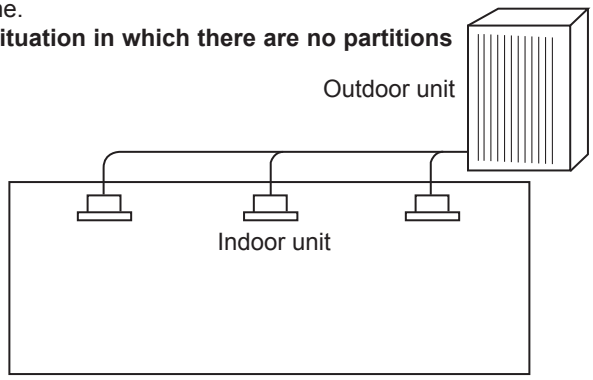
(1) Calculate total refrigerant amount by each refrigerant system.
Total refrigerant amount is precharged refrigerant amount at ex-factory plus additional charged amount at field installation.

Note:
When a single refrigeration system consists of several independent refrigeration circuit, figure out the total refrigerant amount by adding each independent refrigerant circuit.

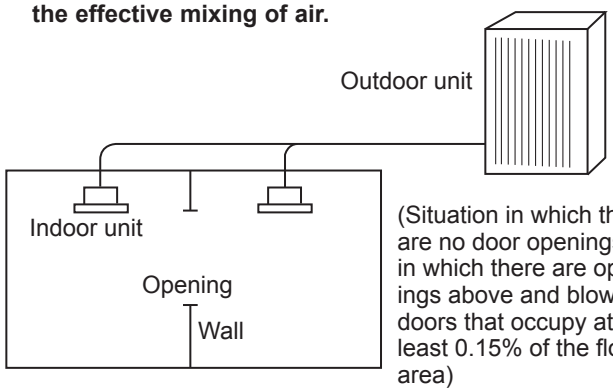
(2) Calculate room volumes (m³[ft³]) and find the room with the smallest volume

The part with ▭ represents the room with the smallest volume.

(a) Situation in which there are no partitions

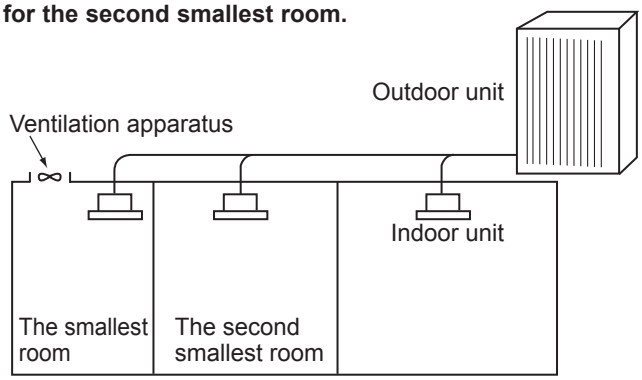


(b) There are partitions, but there are openings that allow the effective mixing of air.



(Situation in which there are no door openings or in which there are openings above and blow doors that occupy at least 0.15% of the floor area)

(c) If the smallest room has mechanical ventilation apparatus that is linked to a household gas detection and alarm device, the calculations should be performed for the second smallest room.



(3) Use the results of calculations (1) and (2) to calculate the refrigerant concentration:

$$\frac{\text{Total refrigerant in the refrigerating unit (kg[lbs])}}{\text{The smallest room in which an indoor unit has been installed (m³[ft³])}} \leqq \text{maximum concentration (kg/m³[lbs/ft³])}$$

Maximum concentration of R410A:0.3kg/m³[0.019lbs/ft³]

If the calculation results do not exceed the maximum concentration, perform the same calculations for the larger second and third room, etc., until it has been determined that nowhere will the maximum concentration be exceeded.

10-4. REFRIGERANT COLLECTING (PUMP DOWN)

Perform the following procedures to collect the refrigerant when moving the indoor unit or the outdoor unit.

① Turn off the circuit breaker.

② Connect the low pressure side of the gauge manifold to the service port of the gas side stop valve.

③ Close the liquid stop value.

④ Supply power (circuit breaker).

- Start-up of the indoor-outdoor communication takes about 3 minutes after the power (circuit breaker) is turned on. Start the pump-down operation 3 to 4 minutes after the power (circuit breaker) is turned ON.

⑤ Perform the test run for cooling operation (SW3-1: ON and SW3-2: OFF). The compressor (outdoor unit) and ventilators (indoor and outdoor units) start operating and test run for cooling operation begins. After the cooling operation has been carried out for approximately 5 minutes, set the outdoor service switch SW2-4 (pump down switch) from OFF to ON.

- Do not continue to operate for a long time with the switch SW2-4 set to ON. Make sure to switch it to OFF after pump down is completed.
- Only set the SW3-1 and SW3-2 to ON if the unit is stopped. However, even if the unit is stopped and the SW3-1 and SW3-2 are set to ON less than 3 minutes after the compressor stops, the refrigerant collecting operation cannot be performed. Wait until compressor has been stopped for 3 minutes and then set the SW3-1 and SW3-2 to ON again.

⑥ Fully close the gas stop valve when the pressure reading on the gauge drops 0.05 - 0.00 MPa (approx. 0.5 - 0.0 kgf/cm²).

⑦ Stop the air conditioner operation (SW3-1: OFF and SW3-2: OFF). Set the outdoor service switch SW2-4 from ON to OFF.

⑧ Turn off the power supply (circuit breaker).

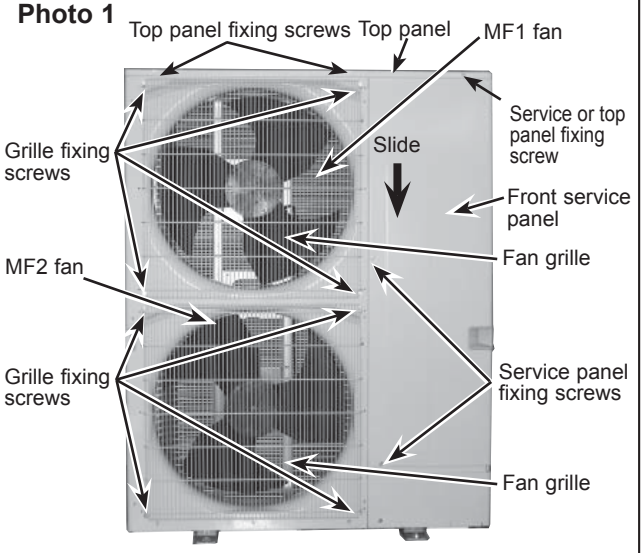
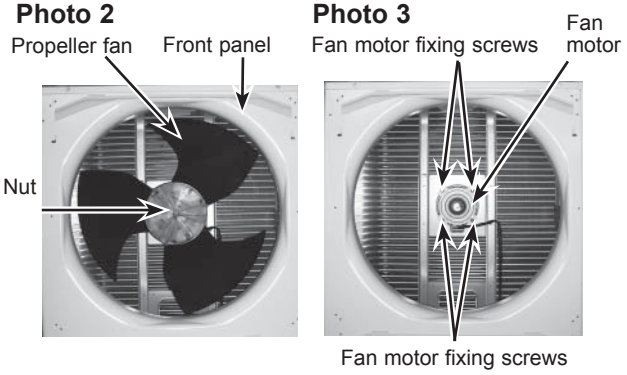
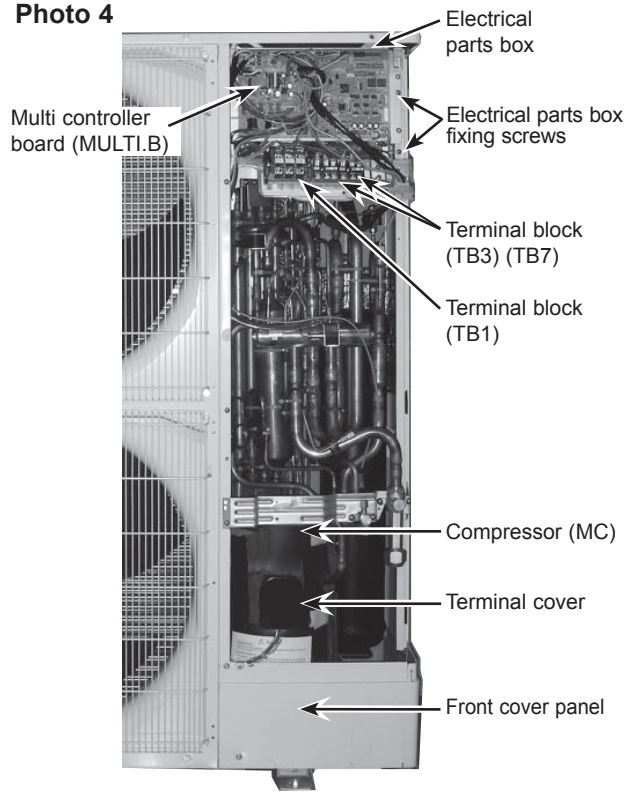
- If too much refrigerant has been added to the air conditioner system, the pressure may not drop to 0.5 kgf/cm². If this occurs, use a refrigerant collecting device to collect all of the refrigerant in the system, and then recharge the system with the correct amount of refrigerant after the indoor and outdoor units have been relocated.

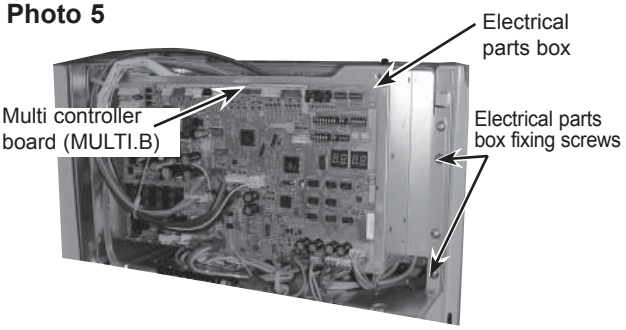
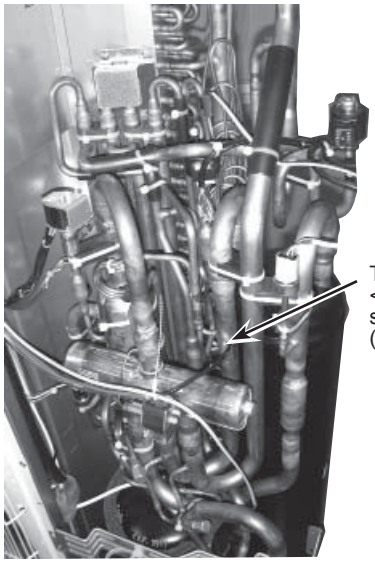
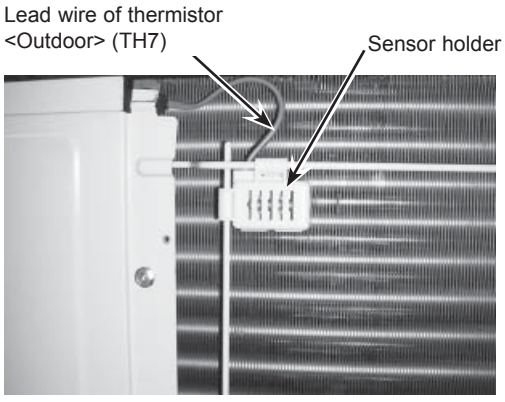
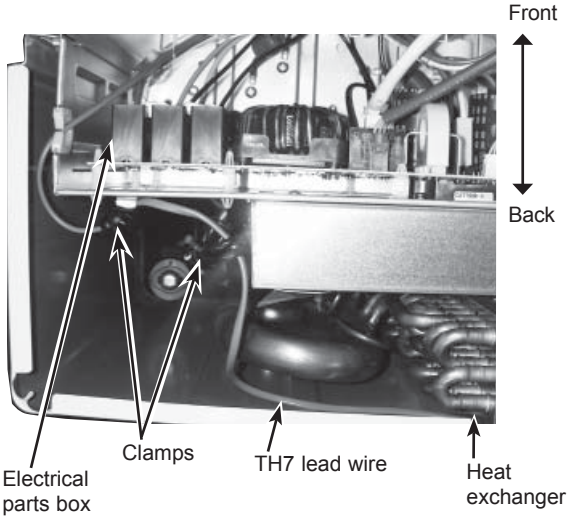
⚠Warning:

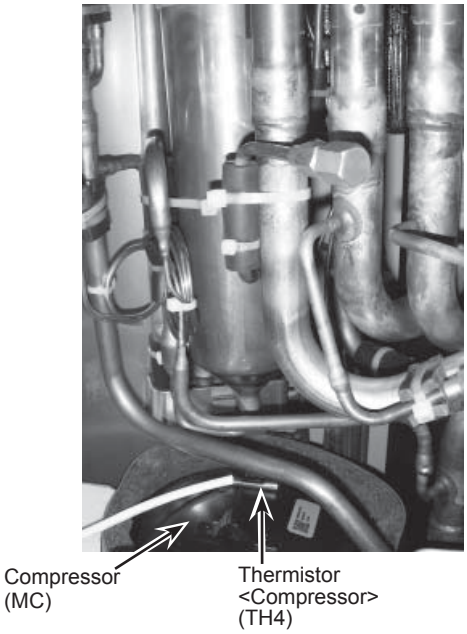
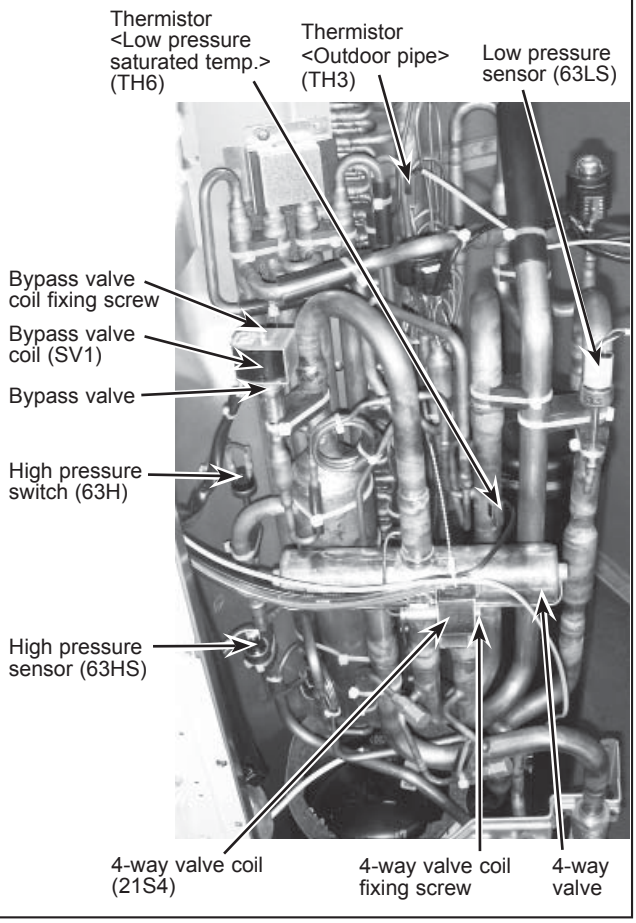
When pumping down the refrigerant, stop the compressor before disconnecting the refrigerant pipes.
The compressor may burst and cause injury if any foreign substance, such as air etc. enters the system.

11 DISASSEMBLY PROCEDURE

PUMY-P60NKMU PUMY-P60NKMU-BS

OPERATING PROCEDURE	PHOTOS & ILLUSTRATION
1. Removing the front service panel and top panel <Service panel> (1) Remove 3 front service panel fixing screws (5 × 12) (2) Slide the hook on the right downward to remove the service panel. <Top panel> (1) Remove the top panel fixing screws (3 for front, 3 for rear/5 × 12). (2) Lift the top panel to remove it. *The top panel and the service panel share one of the screws.	**Photo 1** 
2. Removing the fan motors MF1 (upper) and MF2 (lower) (1) Remove the service panel and the top panel. (See Photo 1.) (2) Remove 4 fan grille fixing screws (5 × 12) to remove MF1 (upper) or MF2 (lower) fan grille. (See Photo 1.) (3) Remove a nut (right handed screw of M6) to remove a propeller fan. (See Photo 2.) (4) Disconnect the relevant connector CNF1 (for MF1) or CNF2 (for MF2) from the control board in the electrical parts box. (5) Remove 4 fan motor fixing screws (5 × 20) and remove the fan motor together with the lead wire. (See Photo 3)	**Photo 2** **Photo 3** 
3. Removing the electrical parts box (1) Remove the service panel and top panel. (See Photo 1) (2) Disconnect the indoor unit connecting lead wires and the power supply wires from the terminal blocks TB3 and TB1 on the multi controller board. (4) Disconnect all the following connectors from the multi-controller board; fan motor, thermistor <Outdoor pipe>, thermistor (HIC pipe) thermistor <Compressor>, thermistor <Low pressure saturated temp>, thermistor <Outdoor>, high pressure switch, high pressure sensor, low pressure sensor, 4-way valve coil and bypass valve coil, and electronic expansion valve. <Diagram symbo indicating connector housings> • Fan motor (CNF1, CNF2) • Thermistor <HIC pipe> (TH2) • Thermistor <Outdoor pipe> (TH3) • Thermistor <Compressor> (TH4) • Thermistor <Low pressure saturated temp, Outdoor> (TH6/7) • High pressure switch (63H) • High pressure sensor (63HS) • Low pressure sensor (63LS) • Electronic Expansion Valve (CNLVA and CNLVB) • Solenoid valve coil <Four-way valve> (21S4) • Solenoid valve coil <Bypass valve> (SV1)	**Photo 4** 

OPERATING PROCEDURE	PHOTOS & ILLUSTRATION
(5) Remove the terminal cover and disconnect the compressor lead wire. (6) Remove the thermistor (TH7) from the sensor holder. (7) Remove electrical parts box fixing screws (4 × 10) and remove the electrical parts box by lifting it. The electrical parts box is fixed with 2 hooks on the left and 1 hook on the right. (See Photo 5)	**Photo 5** 
4. Removing the thermistors <Low pressure saturated temp.> (TH6) and <Outdoor> (TH7) **Remove** (1) Remove the top panel and the service panel. (See Photo 1) (2) Disconnect the connector that TH6 and TH7 share on the multi controller board in the electrical parts box. (3) Remove the thermistor <Low pressure saturated temp.> (TH6) from the sensor holder. (See Photo 6) (4) Unfasten clamps to remove the TH6 lead wire. (5) Remove the thermistor <Outdoor> (TH7) from the sensor holder. (See Photo 7) (6) Loosen clamps on top of the electrical parts box. (See Photo 8) **Note: TH6 and TH7 cannot be replaced individually as they share a connector. To replace TH6 or TH7, remove both of the thermistors.**	**Photo 6** 
Photo 7  **<Back view of outdoor unit >**	**Photo 8**  **<Top view of outdoor unit with top panel removed>**

OPERATING PROCEDURE	PHOTOS & ILLUSTRATION
5. Removing the thermistor <Outdoor pipe> (TH3) and thermistor <Compressor> (TH4) (1) Remove the service panel. (See Photo 1) (2) Disconnect the connectors TH3 (white) and TH4 (white) from the multi controller board in the electrical parts box. (See Photos 9, 10) (3) Pull out the thermistor <Outdoor pipe> (TH3) and thermistor <Compressor> (TH4) from the sensor holder.	**Photo 9** 
6. Removing the 4-way valve coil (21S4) (1) Remove the service panel and top panel. (See Photo 1) (2) Remove 4-way valve solenoid coil fixing screw (M4 × 6). (3) Remove the 4-way valve coil by sliding the coil to the front. (4) Disconnect the connector 21S4 (green) on the multi controller board in the electrical parts box.	**Photo 10** 
7. Removing the 4-way valve (1) Remove the service panel and top panel. (See Photo 1) (2) Remove the electrical parts box (See Photos 4, 5) (3) Remove 3 valve bed fixing screws (4 × 10) and 4 ball valve and stop valve fixing screws (5 × 16) and then remove the valve bed. (4) Remove 5 right side panel fixing screws (4: rear side, 1: right side 5 × 12) on the back of the unit and then remove the right side panel. (5) Remove the 4-way valve coil. (See Photo 10) (6) Recover refrigerant. (7) Remove the welded part of the 4-way valve. **Note 1: To recover refrigerants, do not release refrigerants into the atmosphere.** **Note 2: Remove the right side panel to remove the welded part easily.** **Note 3: When installing the 4-way valve, cover it with a wet cloth to prevent it overheating (120 °C [248 °F] or more), then braze the pipes so that the inside of pipes are not oxidized.**	

OPERATING PROCEDURE

8. Removing bypass valve coil (SV1) and bypass valve

(1) Remove the service panel and the top panel. (See Photo 1)
(2) Remove the electrical parts box (See Photos 4, 5)
(3) Remove 5 right side panel fixing screws (4: rear side, 1: right side 5 × 12) and then remove the right side panel.
(4) Remove the bypass valve coil fixing screw (M4 × 6).
(5) Remove the bypass valve coil by sliding the coil upward.
(6) Disconnect the connector SV1 (white) on the Multi controller circuit board in the electrical parts box.
(7) Recover refrigerant.
(8) Remove the welded part of bypass valve.

9. Removing the high pressure switch (63H)

(1) Remove the service panel and the top panel. (See Photo 1)
(2) Remove the electrical parts box. (See Photos 4, 5)
(3) Remove 5 right side panel fixing screws (4: rear side, 1: right side 5 × 12) and then remove the right side panel.
(4) Remove the lead wires of the high pressure switch.
(5) Recover refrigerant.
(6) Remove the welded parts of the high pressure switch.

10. Removing the high pressure sensor (63HS) and low pressure sensor (63LS)

(1) Remove the service panel and the top panel. (See Photo 1)
(2) Remove the electrical parts box. (See Photo 4)
(3) Remove 5 right side panel fixing screws (4: rear side, 1: right side 5 × 12) and then remove the right side panel.
(4) Remove the lead wire of high pressure sensor.
(5) Recover refrigerant.
(6) Remove the welded part of high pressure sensor and low pressure sensor.

11. Removing linear expansion valve (LEV-A, LEV-B)

(1) Remove the service panel and the top panel. (See Photo 1)
(2) Remove the electrical parts box. (See Photo 4)
(3) Remove 5 right side panel fixing screws (4: rear side, 1: right side 5 × 12) and then remove the right side panel.
(4) Remove the linear expansion valve coil. (See Photo 12)
(5) Recover refrigerant.
(6) Remove the welded part of linear expansion valve.

PHOTOS

Photo 11

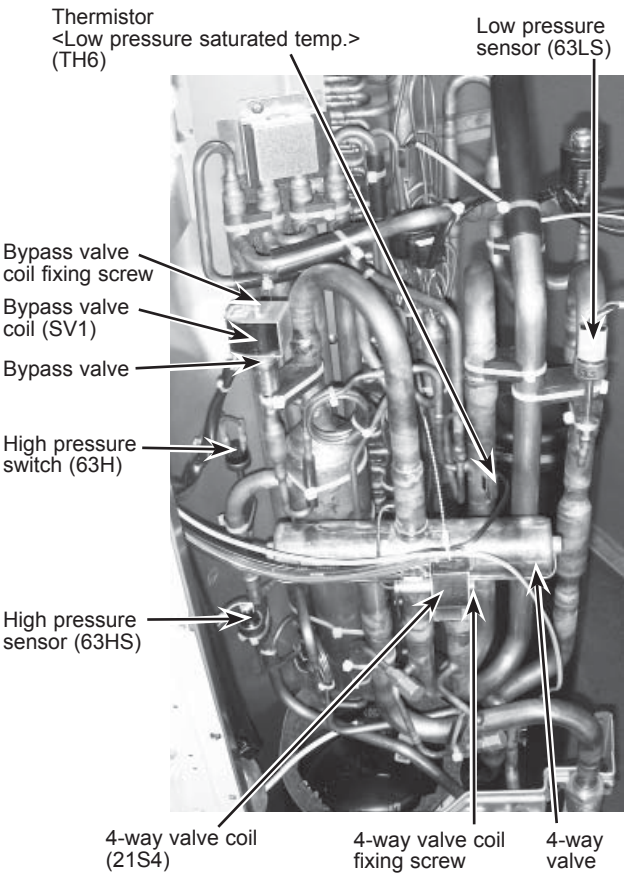
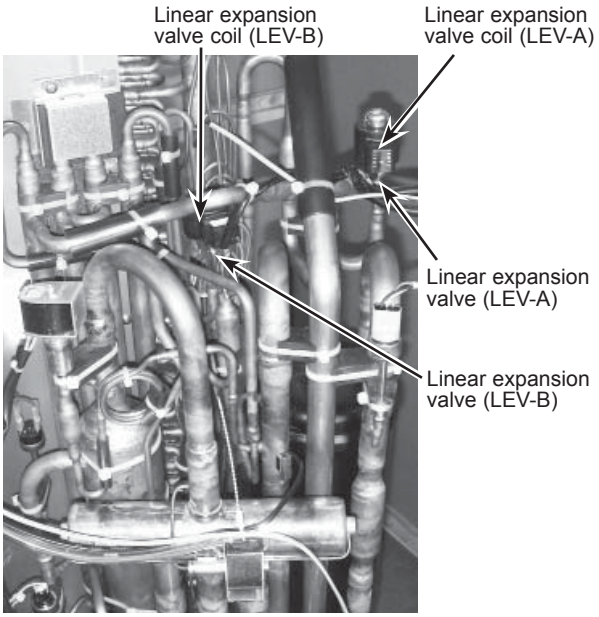


Photo 12



Notes:

1: To recover refrigerants, do not release refrigerants into the atmosphere.
2: Remove the right side panel to remove the welded part easily.
3: When installing the refrigerant system parts, cover them with a wet cloth to prevent them from heating (100°C or more: high pressure switch and high/low pressure sensor, 120°C or more: bypass valve coil, bypass valve and linear expansion valve), then braze the pipes so that the inside of pipes are not oxidized.

OPERATING PROCEDURE

12. Removing the compressor (MC)

(1) Remove the service panel and the top panel. (See Photo 1)
(2) Remove 2 front cover panel fixing screws (5 × 12) and remove the front cover panel. (See Photo 4)
(3) Remove 4 rear cover panel fixing screws (5 × 12) and remove the rear cover panel.
(4) Remove the electrical parts box. (See Photos 4, 5)
(5) Remove 3 valve bed fixing screws (4 × 10) and 4 ball valve and stop valve fixing screws (5 × 16) and then remove the valve bed.
(6) Remove 3 right side panel fixing screws (5 × 12) on the back of the unit and then remove the right side panel.
(7) Remove the front panel.
(8) Remove 3 separator fixing screws (4 × 10) and remove the separator.
(9) Recover refrigerant.
(10) Remove the 3 compressor fixing nuts using a spanner or a monkey wrench.
(11) Remove the welded parts of the inlet and outlet pipes from the compressor.

Note : To recover refrigerants, do not release refrigerants into the atmosphere.

13. Removing the accumulator

(1) Remove the service panel and the top panel. (See Photo 1)
(2) Remove 2 front cover panel fixing screws (5 × 12) and remove the front cover panel. (See Photo 13)
(3) Remove 4 rear cover panel fixing screws (5 × 12) and remove the rear cover panel. (See Photo 12)
(4) Remove the electrical parts box. (See Photos 4, 5)
(5) Remove 3 valve bed fixing screws (4 × 10) and 4 ball valve and stop valve fixing screws (5 × 16) and then remove the valve bed. (See Photo 13)
(6) Remove 3 right side panel fixing screws (5 × 12) on the back of the unit and then remove the right side panel.
(7) Recover refrigerant.
(8) Remove 2 welded pipes of accumulator inlet and outlet.
(9) Remove 2 receiver leg fixing screws (4 × 10). (See Photo 14)

Note : To recover refrigerants, do not release refrigerants into the atmosphere.

PHOTOS

Photo 13

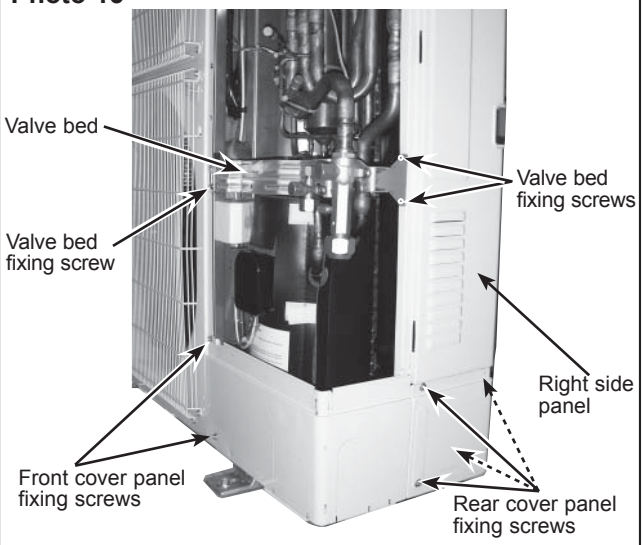


Photo 14

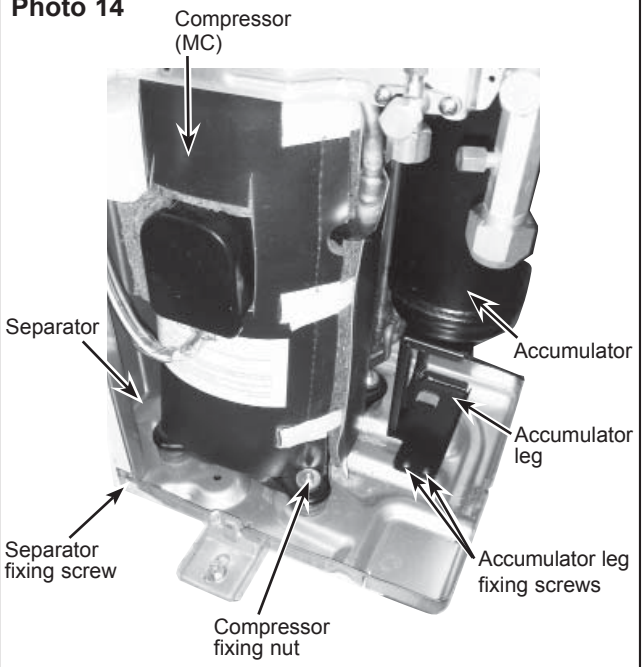
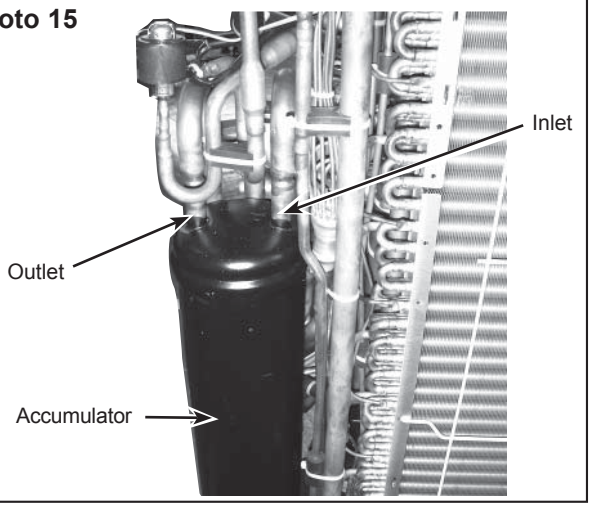


Photo 15



CITY MULTI™

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Distributed in Nov. 2013 No.OCH502 REVISED EDITION-C
Distributed in May 2013 No.OCH502 REVISED EDITION-B
Distributed in Dec. 2012 No.OCH502 REVISED EDITION-A
Distributed in Sep. 2012 No.OCH502
Made in Japan

New publication, effective Nov. 2013
Specifications are subject to change without notice.