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Safety Precautions

Cautions and Warnings

Read these precautions carefully before repair.

This manual classifies the precautions into ⚠Warning and ⚠Caution. Warning is very important as failure to observe it may lead to deaths or serious injuries. ⚠Caution is also important as in some cases failure to observe it may also lead to grave accidents. Hence, be sure to follow the safety precautions below.

- ❖ After completing repair, test the unit to ensure it runs properly. In addition, give the user adequate instructions concerning the precautions when using this unit.

Warnings During Repair

- ◆ Before dismantling the unit for repair, be sure to remove the power plug, as operating a device that is powered on may result in electric shock. If repair must be carried out with power on, do not touch any active part.

- ◆ Keep away from the refrigerant gas that leaks during repair, because exposure to this gas may result in frostbite.

- ◆ When dismantling compressor intake or discharge pipes at welding part, first empty refrigerant gas in a well-ventilated place, as the trapped refrigerant gas or refrigerator oil may flow out and cause injuries.

- ◆ If any refrigerant gas leaks during repair, ventilate the place immediately. Refrigerant gas may produce a toxic gas if it comes in contact with fire.

- ◆ Boost capacitor is a component that provides high voltage electricity for ODU electrical parts. Make sure it is fully discharged before repair; otherwise, it may cause electric shock.

- ◆ Do not attempt to turn on or off the unit by inserting or removing the power plug, as this may result in electric shock or fire.

Precautions During Repair

- Do not attempt to touch electrical parts with wet hands, as it may cause electric shock.
- Do not clean the air conditioner by spraying water on it, as it may cause electric shock.
- To prevent an electric shock, make sure that the unit is grounded when repair is carried out in a damp place.
- Cut off the power supply and remove the power plug before cleaning.
- The fan running at high speed may hurt people.
- When relocating the unit, do not tilt it; otherwise, the water inside the unit may splash on floor and furniture.

- Before repair, check to make sure that the refrigeration and circulation system is fully cooled. Otherwise, it may result in burns.
- Make sure to use the gas welding machine in a well-ventilated place, as use of it in a sealed room may cause hypoxia.

Warnings after Repair

- ◆ Use components listed in the Maintenance Parts List and appropriate tools of the corresponding model. Do not attempt to modify the unit, as improper use of components or tools may cause electric shock, overheating or fire.
- ◆ When installing the unit in a new place, make sure that the place of installation is strong enough to support the unit's weight. If the place cannot provide enough support or the installation is not secure enough, the unit may fall and cause injuries.
- ◆ Make sure to use a standard mounting rack to install the unit. Improper use of mounting rack or operations may result in unit dropping and personal injuries.
- ◆ Fasten the unit securely to the mounting rack that is fixed on the sash frame. Improper installations may cause unit falling and personal injuries.
- ◆ When wiring, make sure to use a dedicated power supply and observe the relevant technical standards, internal wiring rules and installation manual on electrical equipment.
- ◆ Insufficient power capacity and improper electrical wiring may cause electric shock or fire.
- ◆ Be sure to use dedicated cables to connect IDU and ODU. Fasten and arrange the wires in a way that the wires at the joint are not too tight. Improper wiring may result in overheating or fire.
- ◆ When connecting IDU and ODU, make sure that the terminal cover doesn't fall off because cables extend out of the cover. If the covers are improperly fixed, the terminal connection part may cause electric shock, overheating or fire.
- ◆ Do not damage or change power cords, as damaged or changed power cords may result in electric shock or fire.
- ◆ Do not put heavy objects on power cords. Heating or stretching power cords will cause damages to power cords.
- ◆ Use designated refrigerants (R-410A) in the refrigerating system. Do not let air or other gases in refrigerating system, as it may generate high pressure and hence damage the unit.
- ◆ If refrigerant gas leaks, make sure to find the leaking points and repair them before refrigerant can be added. If leaking points cannot be determined, stop repair work immediately and perform evacuation. Close service valves to prevent refrigerant gas from entering the room. Refrigerant gas is nontoxic in itself. However, when it comes in contact with fire, or fans, other heaters, furnaces, it may generate toxic gases.

- ◆ Make sure to dispose of the old batteries after removing them from the remote controller. Keep these batteries away from children.

Precautions after Repair

- Residual current device may be provided depending on circumstances to prevent electric shock.
- Do not install the unit where flammable gases are present, as it may cause fire.
- Install sealing parts and pads to mounting rack correctly, as improper installations may let water in room and wet furniture and floor.

Check after Repair

- ◆ Check to make sure that power plug is clean and fastened securely, and then insert the power plug into power socket. If power plug is dirty or loosened, electric shock or fire may occur.
- ◆ If cables and wires are scratched or damaged, make sure to replace them with new ones, as broken cables or wires may cause electric shock, overheating or fire.
- ◆ Do not use cables in tandem or stretched cables. Use a separate socket. Otherwise, it may cause electric shock, overheating or fire.
- ◆ Check whether all parts are fastened reliably, wires connected correctly and welding part or crimping part connected securely. Improper installation or wiring may result in electric shock, overheating or fire.
- ◆ Replace the corroded mounting stand or rack with a new one, as the old ones may fall off and cause personal injuries.
- ◆ Check grounding. If the unit is grounded improperly, repair it immediately, as improper grounding may cause electric shock.
- ◆ After repair, measure insulation resistance to make sure that the value is at least 1 M Ω , as improper insulation may cause electric shock.
- ◆ After repair, check IDU drainage status, as improper drainage may allow water enter the room and wet the floor or furniture in it.

Preface

Thank you for purchasing TICA products.

This is the Maintenance Manual for TICA cooling and heating type air conditioners (TIMS).

TICA offers a broad spectrum of models to meet different air conditioning needs in buildings and offices. We believe that there is a model for everyone.

This Maintenance Manual contains information on repairing R-410A cooling and heating type air conditioner (TIMS).

December 2016

TICA Technology Center

Chapter I Overview

1. Models

1. Models and Codes of VRF ODUs

Product series	Product model	Batch No.	Remarks
Individual VRF ODU TIMS**AS	TIMS080AS	P70432000000	8-16HP Single compressor Full inverter 18-32HP Dual compressor Full inverter
	TIMS100AS	P70433000000	
	TIMS120AS	P70389000000	
	TIMS140AS	P70350000000	
	TIMS160AS	P70351000000	
	TIMS180AS	P70379000000	
	TIMS200AS	P70272000000	
	TIMS220AS	P70380000000	
	TIMS240AS	P70381000000	
	TIMS260AS	P70440000000	
	TIMS280AS	P70536000000	
	TIMS300AS	P70537000000	
TIMS320AS	P70538000000		
Full inverter VRF ODU TIMS**AX	TIMS080AX	P70526000000	Full inverter 3 modules in parallel allowable
	TIMS100AX	P70527000000	
	TIMS120AX	P70528000000	
	TIMS140AX	P70515000000	
	TIMS160AX	P70444000000	
	TIMS180AX	P70524000000	
	TIMS200AX	P70525000000	
	TIMS220AX	P70505000000	
Strong-heat individual VRF ODU TIMS**AST	TIMS080AST	P70849000000	8-18HP Single compressor Full inverter EVI
	TIMS100AST	P70850000000	
	TIMS120AST	P70851000000	
	TIMS140AST	P70852000000	
	TIMS160AST	P70853000000	
	TIMS180AST	P70854000000	

2. Models and Codes of VRF IDUs

Product series	Product model	Batch No.	Remarks
All-way embedded IDU	TMCF028AB	P70245000000	
	TMCF036AB	P70246000000	
	TMCF045AB	P70363000000	
	TMCF050AB	P70547000000	
	TMCF056AB	P70247000000	
	TMCF063AB	P70548000000	
	TMCF071AB	P70377000000	
	TMCF080AB	P70248000000	
	TMCF090AB	P70361000000	
	TMCF100AB	P70249000000	
	TMCF112AB	P70362000000	
	TMCF125AB	P70250000000	
	TMCF140AB	P70360000000	
	TMCF160AB	P70549000000	
Two-way embedded IDU	TMCD028A	P70131000000	
	TMCD036A	P70132000000	
	TMCD045A	P70133000000	
	TMCD056A	P70134000000	
	TMCD071A	P70135000000	
	TMCD080A	P70136000000	
	TMCD090A	P70137000000	
	TMCD100A	P70138000000	
	TMCD112A	P70139000000	
	TMCD125A	P70140000000	
	TMCD140A	P70141000000	
One-way embedded IDU	TMCS028A	P70142000000	
	TMCS036A	P70143000000	
	TMCS045A	P70144000000	
	TMCS056A	P70145000000	
	TMCS071A	P70146000000	
Ultra-thin silent duct type IDU	TMDN022AC	P70517000000	
	TMDN025AC	P70518000000	
	TMDN028AC	P70481000000	
	TMDN032AC	P70519000000	
	TMDN036AC	P70445000000	
	TMDN040AC	P70520000000	
	TMDN045AC	P70521000000	
	TMDN050AC	P70466000000	
	TMDN056AC	P70522000000	
	TMDN063AC	P70523000000	

Product series	Product model	Batch No.	Remarks
	TMDN071AC	P70478000000	
	TMDN022AC-NS	P70770000000	
	TMDN025AC-NS	P70771000000	
	TMDN028AC-NS	P70772000000	
	TMDN032AC-NS	P70773000000	
	TMDN036AC-NS	P70774000000	
	TMDN040AC-NS	P70775000000	
	TMDN045AC-NS	P70776000000	
	TMDN050AC-NS	P70777000000	
	TMDN056AC-NS	P70778000000	
	TMDN063AC-NS	P70779000000	
	TMDN071AC-NS	P70780000000	
Standard duct type IDU	TMDN022AB	P70276000000	
	TMDN025AB	P70277000000	
	TMDN028AB	P70278000000	
	TMDN032AB	P70279000000	
	TMDN036AB	P70280000000	
	TMDN040AB	P70281000000	
	TMDN045AB	P70282000000	
	TMDN050AB	P70283000000	
	TMDN056AB	P70284000000	
	TMDN063AB	P70285000000	
	TMDN071AB	P70286000000	
	TMDN080AB	P70287000000	
	TMDN090AB	P70288000000	
	TMDN100AB	P70289000000	
	TMDN112AB	P70290000000	
	TMDN125AB	P70343000000	
	TMDN140AB	P70342000000	
	TMDN160AB	P70800000000	
	TMDN080AB-NS	P70764000000	
	TMDN090AB-NS	P70765000000	
TMDN100AB-NS	P70766000000		
TMDN112AB-NS	P70767000000		
TMDN125AB-NS	P70768000000		
TMDN140AB-NS	P70769000000		
High static pressure duct type IDU	TMDH100A	P70170000000	
	TMDH112A	P70171000000	
	TMDH125A	P70172000000	
	TMDH140A	P70173000000	

High-capacity duct type IDU	TMDH195AI	P70669000000	
	TMDH255AI	P70670000000	
	TMDH410AI	P70685000000	
	TMDH520AI	P70846000000	
	TMDH620AI	P70847000000	
	TMDH790AI	P70848000000	
Ceiling exposed/floor type IDU	TMVX028A	P70162000000	
	TMVX036A	P70163000000	
	TMVX056A	P70164000000	
	TMVX071A	P70165000000	
	TMVX090A	P70166000000	
	TMVX112A	P70167000000	
	TMVX125A	P70168000000	
Wall mounted IDU	TMVX140A	P70169000000	
	TMVW028A	P70158000000	
	TMVW036A	P70159000000	
	TMVW040A	P70550000000	
	TMVW056A	P70160000000	
	TMVW063A	P70551000000	
Full-fresh air handling unit	TMVW071A	P70161000000	
	TMDF175A-022	P70174000000	
	TMDF210A-020	P70175000000	
	TMDF250A-015	P70176000000	
	TMDF250A-020	P70177000000	
	TMDF250A-030	P70178000000	
	TMDF300A-020	P70179000000	
	TMDF400A-020	P70180000000	
	TMDF400A-030	P70181000000	
	TMDF500A-020	P70182000000	
	TMDF500A-030	P70183000000	
TMDF600A-020	P70184000000		
TMDF600A-030	P70185000000		
Series E ultra-thin duct type IDU	TMDS022AE	P70492000000	
	TMDS025AE	P70493000000	
	TMDS028AE	P70494000000	
	TMDS032AE	P70495000000	
	TMDS036AE	P70496000000	
	TMDS040AE	P70497000000	
	TMDS046AE	P70498000000	
	TMDS050AE	P70499000000	
	TMDS056AE	P70500000000	
TMDS063AE	P70501000000		

	TMDS071AE	P70502000000	
Series D DC ultra-thin duct type IDU	TMDS022AD	P70579000000	
	TMDS025AD	P70580000000	
	TMDS028AD	P70581000000	
	TMDS032AD	P70582000000	
	TMDS036AD	P70583000000	
	TMDS040AD	P70584000000	
	TMDS046AD	P70585000000	
	TMDS050AD	P70586000000	
	TMDS056AD	P70587000000	
	TMDS063AD	P70588000000	
Series E four-way embedded IDU	TMCF036AE	P70594000000	
	TMCF040AE	P70595000000	
	TMCF046AE	P70596000000	
	TMCF050AE	P70597000000	
	TMCF056AE	P70598000000	
Mini quiet series ventilators	TRD015ACA	V4A14D000000	
	TRD020ACA	V4A14F000000	
	TRD030ACA	V4A14H000000	
	TRD040ACA	V4A14K000000	
	TRD060ACA	V4A14M000000	
	TRD080ACA	V4A14P000000	
	TRD015ACC	V4A14E000000	
	TRD020ACC	V4A14G000000	
	TRD030ACC	V4A14J000000	
	TRD040ACC	V4A14L000000	
	TRD060ACC	V4A14N000000	
	TRD080ACC	V4A14Q000000	
Medium high-end series fresh air ventilators	TRD100ACB	V4A0XF000000	
	TRD150ACB	V4A0ZZ000000	
	TRD200ACB	V4A0YM000000	
	TRD250ACB	V4A0YL000000	
	TRD300ACB	V4A0ZE000000	
	TRD400ACB	V4A10G000000	
	TRD500ACB	V4A10H000000	
	TRD600ACB	V4A10J000000	

Notes: The foregoing models are expected to go on the market in 2016. However, they are subject to change over time; please refer to listing or change notice for specific models and their functions.

2. Nomenclature

2.1 ODUs

TIMS **080** **A** **A**
1~4 5~7 8 9

Digits 1-4: TICA inverter VRF air conditioning unit (ODU)

Digits 5-7: Specifications

For example: 080 = 8HP

Digit 8: Design S/N

A

The 9: Structure

S: Individual

X: Full inverter

ST: Strong-heat individual

2.2 IDUs

TM **C** **S** **028** **A** **A**
1~2 3 4 5~7 8 9

Digits 1-2: TICA inverter VRF air conditioning unit (IDU)

Digit 3: IDU type

C: Embedded type D: Duct type V: Exposed type

Digit 4: Classification of types

S: Ceiling embedded (C type) S: Ultra-thin duct type (D type)

D: Two-way embedded (C type) N: Standard duct type (D type)

F: Four-way embedded (C type) H: High static pressure duct type (D type)

W: Wall-mounted (V type) F: All fresh air duct type (D type)

X: Ceiling exposed/floor type (V type)

Digits 5-7: Specifications

028: 2.8 kW

175: 1750CMH (only applied to TMDF)

Digit 8: Design S/N

A

Digit 9: Product code Standard configuration May be omitted

2.3 Branch pipes

TVB **16** **A** **2**
1-3 4-5 6 7

Digits 1-3

TICA flow control box

Digits 4-5

Specifications

16 applied to 2.2kW~3.6kW

18 applied to 4.0kW~5.6kW

20 applied to 6.3kW~9.0kW

25 applied to 10.0kW~14.0kW

Digit 6

Design S/N

A

Digit 7

Pipe diameter

2=1/4"

3=3/8"

2.4 AHU kits

TBP 4022T A

1-3 4-8 9

Digits 1-3

TICA branch pipes

Digits 4-8

Specifications

4022T

R410a: IDU total capacity < 22.5 kW

4033T

R410a: 22.5 kW ≤ IDU total capacity < 35.0 kW

4072T

R410a: 35.0 kW ≤ IDU total capacity < 71.0 kW

4073T

R410a: IDU total capacity > 71.0 kW

4073P

Used together with 4073T

4090T

R410a: Dual module connection pipe

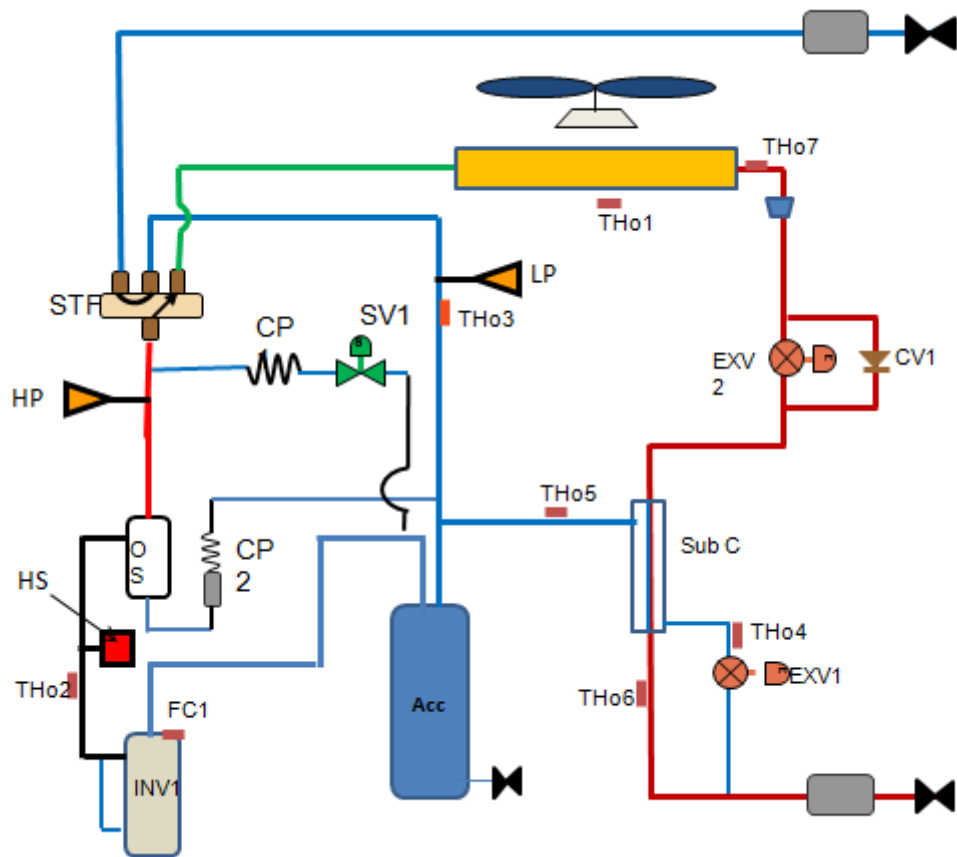
4135T

R410a: Triple module connection pipe

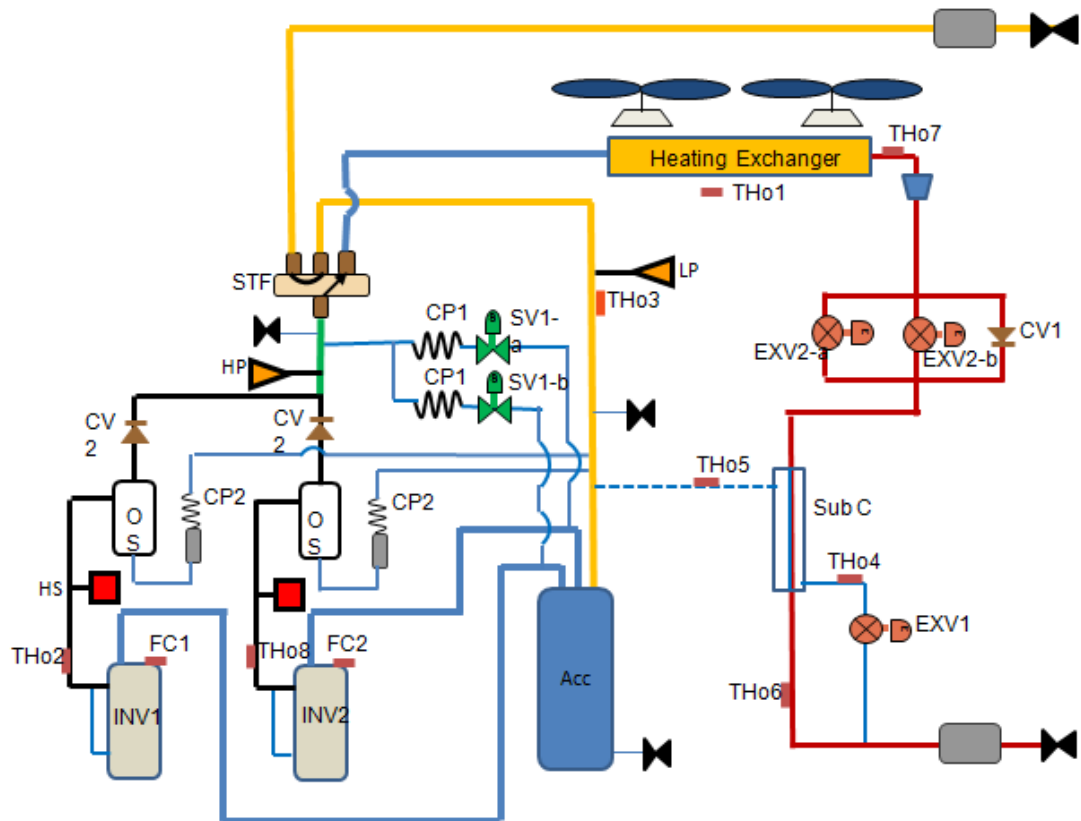
Digit 9

Design S/N

1.3 TIMS080/100/120/140/160AX



1.4 TIMS180/200/220AX



1.7 Key ODU Components

① Compressor



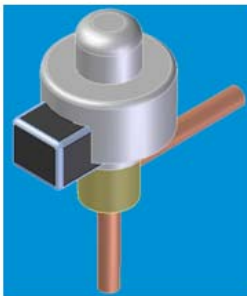
The **inverter** compressor adopts the low-temperature and strong heating scroll compressor that is equipped with the advanced permanent magnet synchronous motor. Speed: 20-100RPS; generally, compressor coil has a resistance value of 2~4 Ω and insulation resistance $\geq 1 M\Omega$.

Features of scroll compressor:

1. Highest efficiency
2. Small rotation torque changes, stable performance with less vibration and low noises
3. Least components used, simple structure, compact, low weight and high reliability
4. High requirements for machining precision and high costs

Model	Compressor	Item No.
TIMS080-100AS/X	E655DHD-65D2YG	B7020226
TIMS120AS/X	E705DHD-72D2YG	B7020796
TIMS140-160AS/X	E856DHD-80D2YG	B7020743
TITIMS180-240AS TIMS180-220AX	E655DHD-65D2YG*2	B7020226
TIMS260AS	E705DHD-72D2YG*2	B7020796
TIMS280-320AS	E856DHD-80D2YG*2	B7020743
TIMS080-120AST	DS4GK5052FVS	B7020977
TIMS140-180AST	AMB78FZDMT	B7021045

② Electronic expansion valve

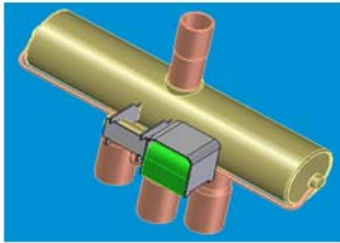


Driven by the stepper motor, the electronic expansion valve is used to keep and control the pressure difference required by the refrigerating system, and precisely adjust the volume of refrigerant that enters the evaporator.

The electronic expansion valve has 5 lead-out wires at its connecting terminal, which are respectively **A+ orange**, **A- red**, **B+ yellow**, **B- black** and **COM gray**. Resistance between any two phases of A+, A-, B+ and B- is about 94~100 Ω , and resistance between any phase and public end is about 47~50 Ω , and drive voltage is usually at DC12V.

Model	Electronic expansion valve				Item No.
	EXV1	EXV2	EXV3	EXV4	
TIMS080-100AS/X	UKV18D202	UKV30D209	/		UKV18D202 B4040079
TIMS120AS/X		UKV32D210	/		
TIMS140-160AS/X		UKV-40D305	/		
TIMS180-240AS TIMS180-220AX		UKV-40D305	UKV-40D305	/	UKV-30D209 B4040083
TIMS260AS		UKV-40D305	UKV-40D305	/	UKV-32D210 B4040147
TIMS280-320AS		UKV-40D305	UKV-40D305	/	UKV-40D305 B4040107
TIMS080-120AST		DPF(TS1) 1.65C-03	UKV30D209	/	/
TIMS140-180AST	UKV-40D305		/	/	B4040283

③ 4-way valve



The 4-way valve is used to switch the system between cooling and heating mode, and implement **oil return and defrosting** during heating.

Generally its control coil is disconnected from power during cooling and connected to power during heating. Switching is implemented when pressure difference meets specified conditions. Coil resistance is usually within 1000~1800 Ω.

Model	4-way valve	Item No.
TIMS080-100AA	STF-H0712	B4050052
TIMS120-180AA	STF-2011G	B4050061
TIMS080-120AS/X	STF-H0712	B4050052
TIMS140-260AS TIMS140-220AX	STF-2011G	B4050061
TIMS280-320AS	STF-2501G	B4050013

④ Air/liquid separator



The air/liquid separator removes liquid from low pressure steam from the evaporator, to ensure that air sucked into the compressor is saturated or superheated and to prevent liquid slugging.

Model	Air/liquid separator capacity L	Item No.
TIMS080-160AS	24	B7010147
TIMS180-260AS		B7010148
TIMS080-160AX		B7010145
TIMS180-220AX		B7010166
TIMS080-180AST		B7010147
TIMS280-320AS	30	B7010152

⑤ Oil separator



Oil separator separates oil and gas, and timely brings back the proper amount of lubricating oil to the compressor to ensure safe operation and efficient heat transfer. Installed on the air discharge pipe, the oil separator has air inlet and outlet at the middle and upper places and oil outlet at the bottom.

Model	Oil separator capacity L	Item No.
TIMS080-160AS	1.5	B7010167
TIMS180-260AS		
TIMS080-160AX		
TIMS180-220AX		
TIMS280-320AS		
TIMS080-180AS T		

⑥ Pressure sensor

The pressure sensor converts the system pressure value into voltage signal, and then sends the signal to main board, thereby ensuring system operation and pressure protection. Falling into two categories (low pressure and high pressure), the pressure sensor has 3 lead-out wires.

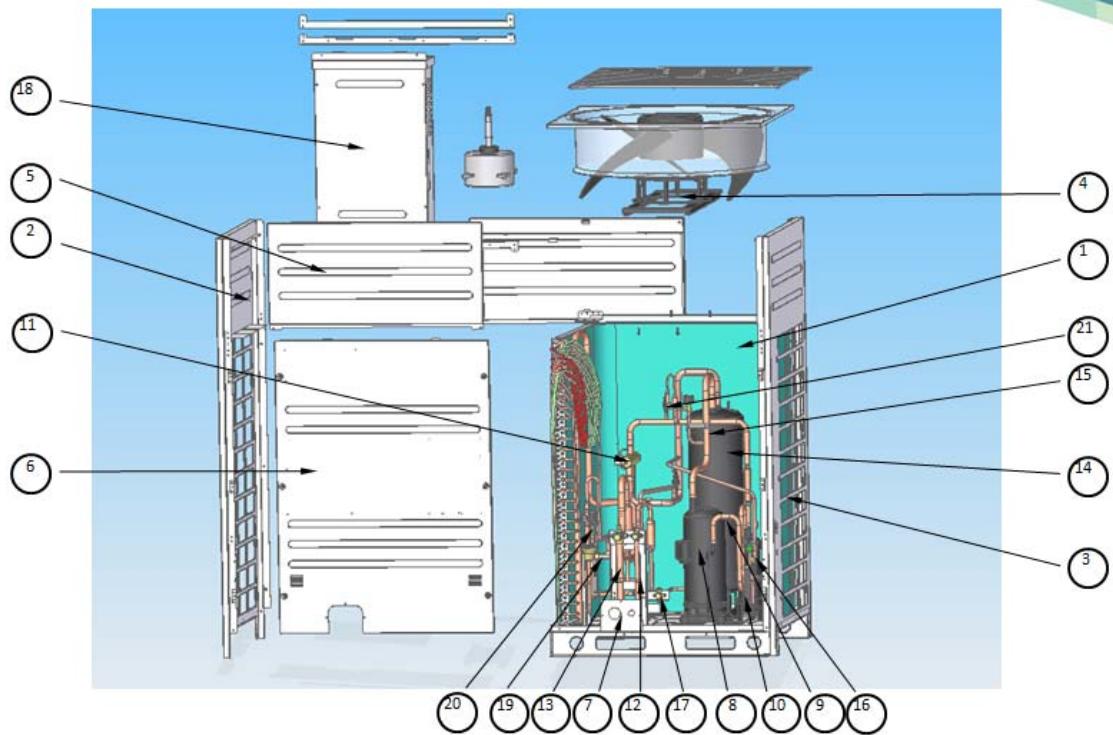
- High pressure sensor (red) $V_{out}=0.87*P_g+0.5$
- Low pressure sensor (blue) $V_{out}=2*P_g+0.5$
- $P_g=Mpa$ (gage pressure)



Model	High/low pressure sensor	Item No.
TIMS080-160AS TIMS180-260AS TIMS080-160AX TIMS180-220AX TIMS280-320AS TIMS080-180AST	2HMP6-1 (red)/2HMP6-2 (black)	B5180406/B5180361

2. Exploded view/3D diagram

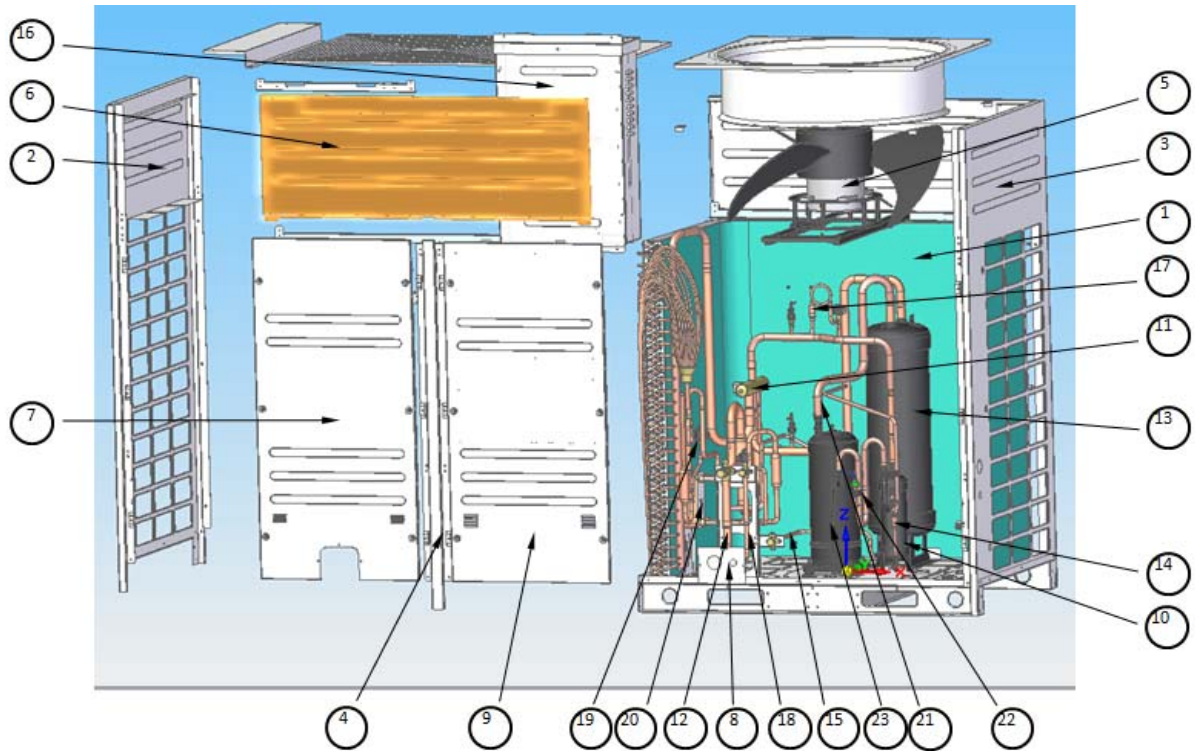
2.1 TIMS080/100/120AS/AX



S/N	Item No.	Item name	Qty	Classification
1	P70010300045	Condenser assembly	1	Assembly
	P70014300036	Liquid distribution pipe assembly	1	Assembly
	P70010300044	Gas collector assembly	1	Assembly
2	P70010000029	Left panel	1	Plate
3	P70010000030	Right panel	1	Plate
	P70010300047	Motor bracket fixing plate assembly	2	Assembly
4	P70010300068	Condenser fan assembly	1	Assembly
	B6030004	Motor bracket	1	Component
	B601002H	Axial-flow fan blades	1	Component
	B5040007	DC motor		Component
	P70010000014	Electric control box fixing plate	2	Plate
5	P70010000048	Upper front panel and upper rear panel	2	Plate
	P70010000036	Top panel	1	Component
6	P70010000013	Lower front panel	1	Plate
	B6130011	Wind screen	1	Wind screen
	B6130006	Wind screen	1	Wind screen
	P70010000046	Plate heat exchanger fixing plate	1	Plate
8	B7020226	Scroll compressor	1	Compressor and its fittings

10	B7010057	Oil separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
11	P70010300012	4-way valve assembly	1	Assembly
	B4050061	4-way valve	1	Component
12	P70010300061	Liquid valve assembly	1	Assembly
	B4010160	Liquid valve	1	Component
13	P70010300057	Air valve assembly	1	Assembly
	B4010157	Air valve	1	Component
14	B7010145	Air/liquid separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
16	P70010300062	Oil-return pipe assembly	1	Assembly
18	D50191000000	Electric control box assembly (to be purchased in Sanhua in a uniform way)	1	Air-cooled cold/hot air unit
19	P70010300060	Subcooler assembly	1	Assembly
	J30136000000	Subcooler	1	Component
	B4040079	Electronic expansion valve for subcooling	1	Component
20	P70010300059	Electronic expansion valve assembly for heating	1	Assembly
	B4040083	Electronic expansion valve for heating	1	Component
21	P70010300070	Bypass valve assembly	1	Assembly

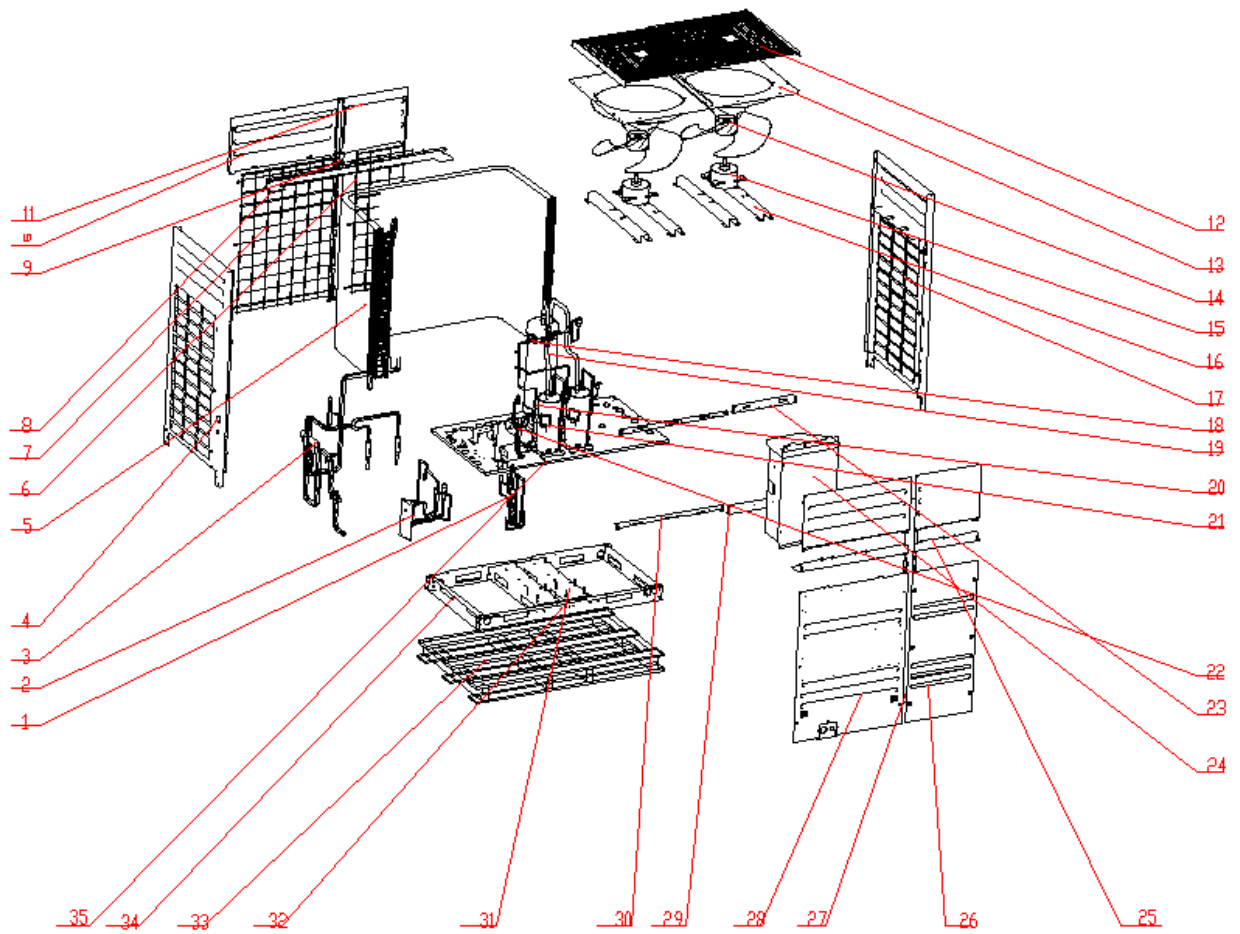
2.2 TIMS140/160AS/AX



S/N	Item No.	Item name	Qty	Classification
1	P70014300037	Condenser assembly	1	Assembly
	P70014300036	Liquid distribution pipe assembly	1	Assembly
	P70014300035	Gas collector assembly	1	Assembly
2	P70010300031	Left panel assembly	1	Assembly
3	P70010300032	Right panel assembly	1	Assembly
	P70014300042	Motor bracket fixing plate assembly	2	Assembly
4	P70014000011	Front central pillar	1	Plate
5	P70010300068	Condenser fan assembly	1	Assembly
	B6030004	Motor bracket	1	Component
	B601002H	Axial-flow fan blades	1	Component
	B5040007	DC motor		Component
	P70014000010	Electric control box fixing plate	2	Plate
6	P70014000008	Upper front panel and upper rear panel	2	Plate
	P70010000036	Top panel	1	Component
	P70014000009	Top panel fixing plate	2	Plate
7	P70014000018	Lower left front panel	1	Plate

	B6130011	Wind screen	1	Wind screen
	B6130012	Wind screen	2	Wind screen
	P70014000017	Rear central pillar	1	Plate
	P70010000044	Pipe fixing plate	2	Plate
	P70010000047	Plate heat exchanger fixing plate	1	Plate
9	P70014000019	Lower right front panel	1	Plate
10	B7010057	Oil separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
11	P70350300008	4-way valve assembly	1	Assembly
	B4050061	4-way valve	1	Component
12	P70014300049	Air valve assembly	1	Assembly
	B4010157	Air valve	1	Component
13	B7010147	Air/liquid separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
14	P70012300028	Oil-return pipe assembly	1	Assembly
16	D50180000000	Electric control box assembly	1	Air-cooled cold/hot air unit
17	P70350300004	Bypass valve assembly	1	Assembly
18	P70014300048	Liquid valve assembly	1	Assembly
	B4010160	Liquid valve	1	Component
19	P70014300047	Electronic expansion valve assembly for heating	1	Assembly
	B4040107	Electronic expansion valve for heating	1	Component
20	P70014300051	Subcooler assembly	1	Assembly
	J30136000000	Subcooler	1	Component
	B4040079	Electronic expansion valve for subcooling	1	Component
23	B7020743	Scroll compressor	1	Compressor and its fittings

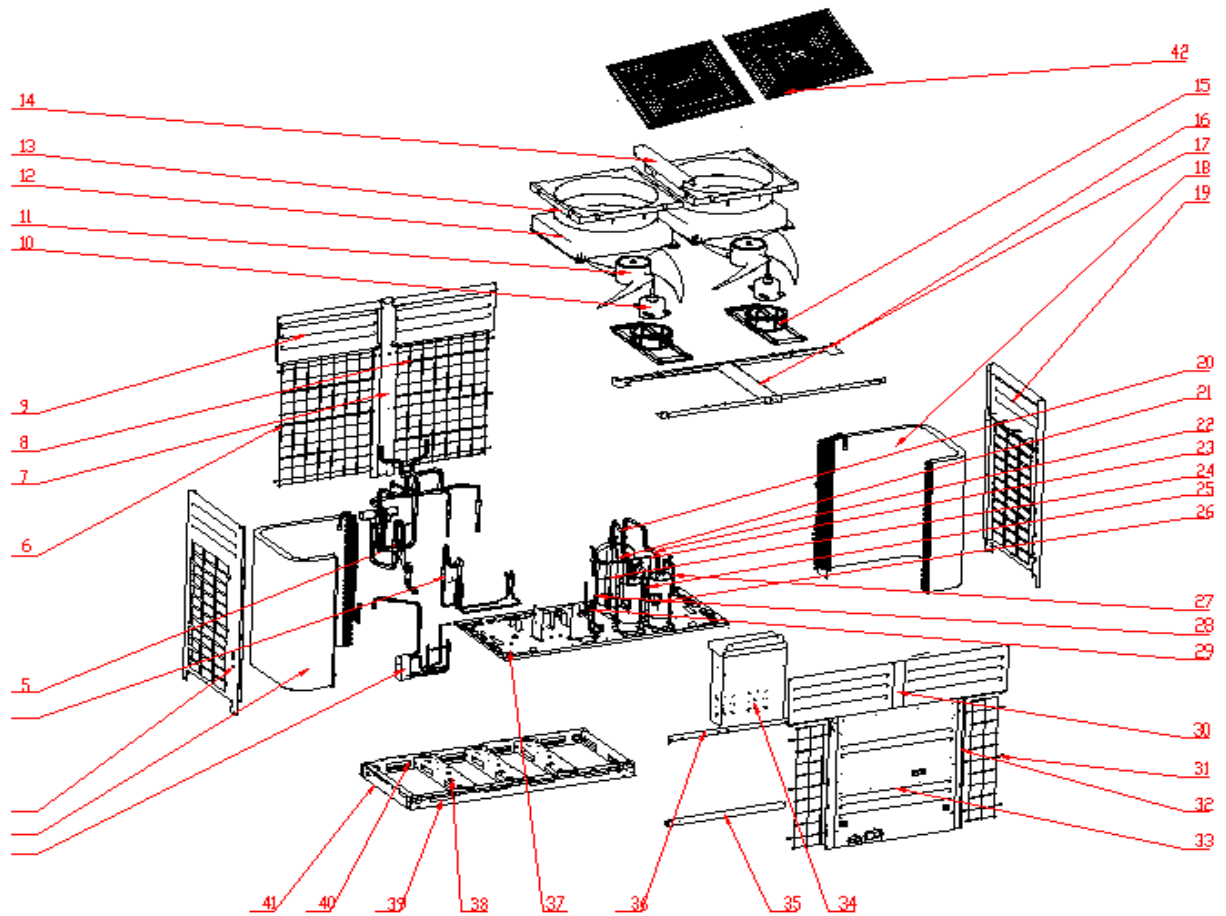
2.3 TIMS180/200/220AX/ TIMS180/200/220/240/260AS



S/N	Item No.	Item name	Qty	Classification
5	P70385300002	Condenser assembly	1	Assembly
	P70440300004/ P70440300003	Upper/lower liquid distribution pipe assembly	1	Assembly
	P70272300038	Gas collector assembly	1	Assembly
4	P70010000048	Left panel assembly	1	Assembly
17	P70010000030	Right panel assembly	1	Assembly
30	P70010000014	Electric control box fixing plate	2	Assembly
29	P70272000036	Electric control box fixing plate (lower one)	1	Assembly
28	P70010000013	Lower front panel	1	Component
27	P70272300052	Front pillar assembly	1	Assembly
26	P70272000011	Right front panel	1	Component
25	P70272300056	Motor installing crossbeam assembly	1	Assembly

24	D50193000000	Electric control box assembly (to be purchased in Sanhua in a uniform way)	1	Assembly
23	P70272000035	Electric control box fixing plate (upper one)	1	Component
22	P70525300004	Liquid valve assembly	1	Assembly
	B4010159	Liquid valve	1	Component
21	B7020796	Scroll compressor	1	Component
20	B7010167	Oil separator	1	Component
19	B7010166	Air/liquid separator	1	Component
18	P70525300002	Bypass valve assembly	1	Assembly
16	P70272300050	Motor installing longitudinal beam assembly	4	Assembly
15	B5040011	DC brushless motor	2	Component
14	B6010037	Axial-flow fan blades	2	Component
11	P70272000014	Rear panel	2	Component
10	P70010000048	Upper front panel and upper rear panel	2	Component
4	P70010000029	Left panel	1	Component
3	P70525300001	4-way valve assembly	1	Assembly
	B4050061	4-way valve	1	Component
2	P70440300006	Subcooler assembly	1	Assembly
	J30137000000	Subcooler	1	Component
	B4040079	Electronic expansion valve for subcooling	1	Component
1	P70385300001	Electronic expansion valve assembly for heating	1	Assembly
	B4040107	Electronic expansion valve for heating	2	Component

2.4 TIMS280/300/320AS

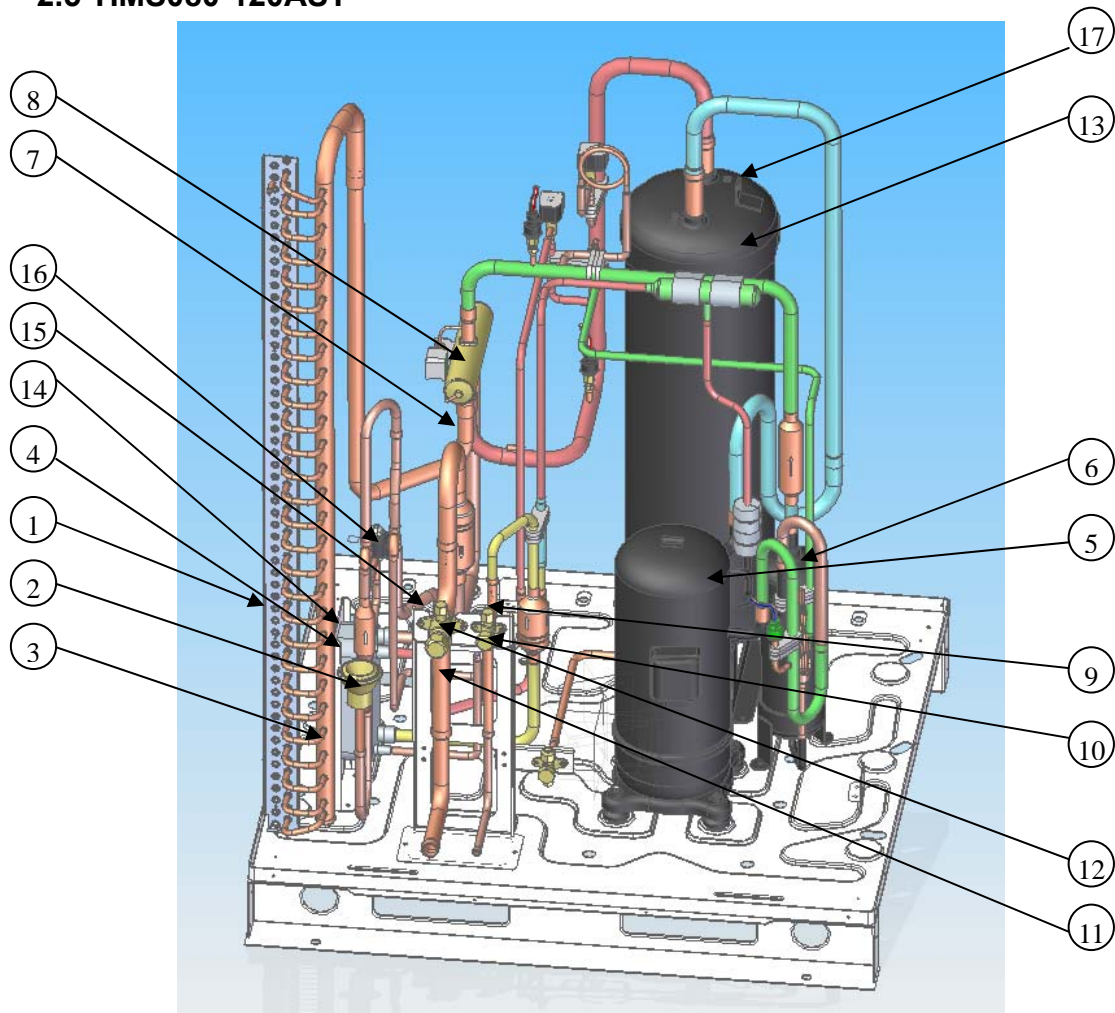


S/N	Item No.	Item name	Qty	Classification
8	B7010057	Oil separator	2	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
9	B7020743	Scroll compressor	2	Compressor and its fittings
10	B7010149	Air/liquid separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
14	P70387300003	4-way valve part	1	Assembly
	B4050013	4-way valve	1	Component
15	P70387300019	Oil-return pipe assembly A	1	Assembly
16	P70387300020	Oil-return pipe assembly B	1	Assembly

17	P70387300004	Subcooler assembly	1	Assembly
	J30138000000	Subcooler	1	Component
	B4040079	Electronic expansion valve for subcooling	1	Component
18	P70387300005	Electronic expansion valve assembly for heating	1	Assembly
	B4040107	Electronic expansion valve for heating	2	Component
19	P70387300022	Liquid valve assembly	1	Assembly
	B4010158	Liquid valve	1	Component
24	P70010000030	Right panel	1	Plate
25	P70010000029	Left panel	1	Plate
26	P70378300005	Rear pillar assembly	1	Assembly
27	P70378300006	Motor installing crossbeam assembly	2	Assembly
28	P70010000048	Upper front panel and upper rear panel	4	Plate
29	P70010300068	Condenser fan assembly	2	Assembly
	P70046300001	Upper guide ring	2	Component
	P70046300002	Lower guide ring	2	Component
	B5040007	DC brushless motor	2	Component
30	P70010000036	Top panel	2	Component
31	P70387000004	Top panel fixing plate	1	Plate
33	D50194000000	Electric control box assembly (to be purchased in Sanhua in a uniform way)	1	Air-cooled cold/hot air unit
42	P70387000027	Front panel	1	Plate
	P70387300031	Upper left liquid distribution pipe assembly	1	Assembly
	P70387300030	Lower left liquid distribution pipe assembly	1	Assembly

	P70387300026	Upper right liquid distribution pipe assembly	1	Assembly
	P70387300027	Lower right liquid distribution pipe assembly	1	Assembly
	P70387300010	Left gas collector assembly	1	Assembly
	P70387300012	Right gas collector assembly	1	Assembly

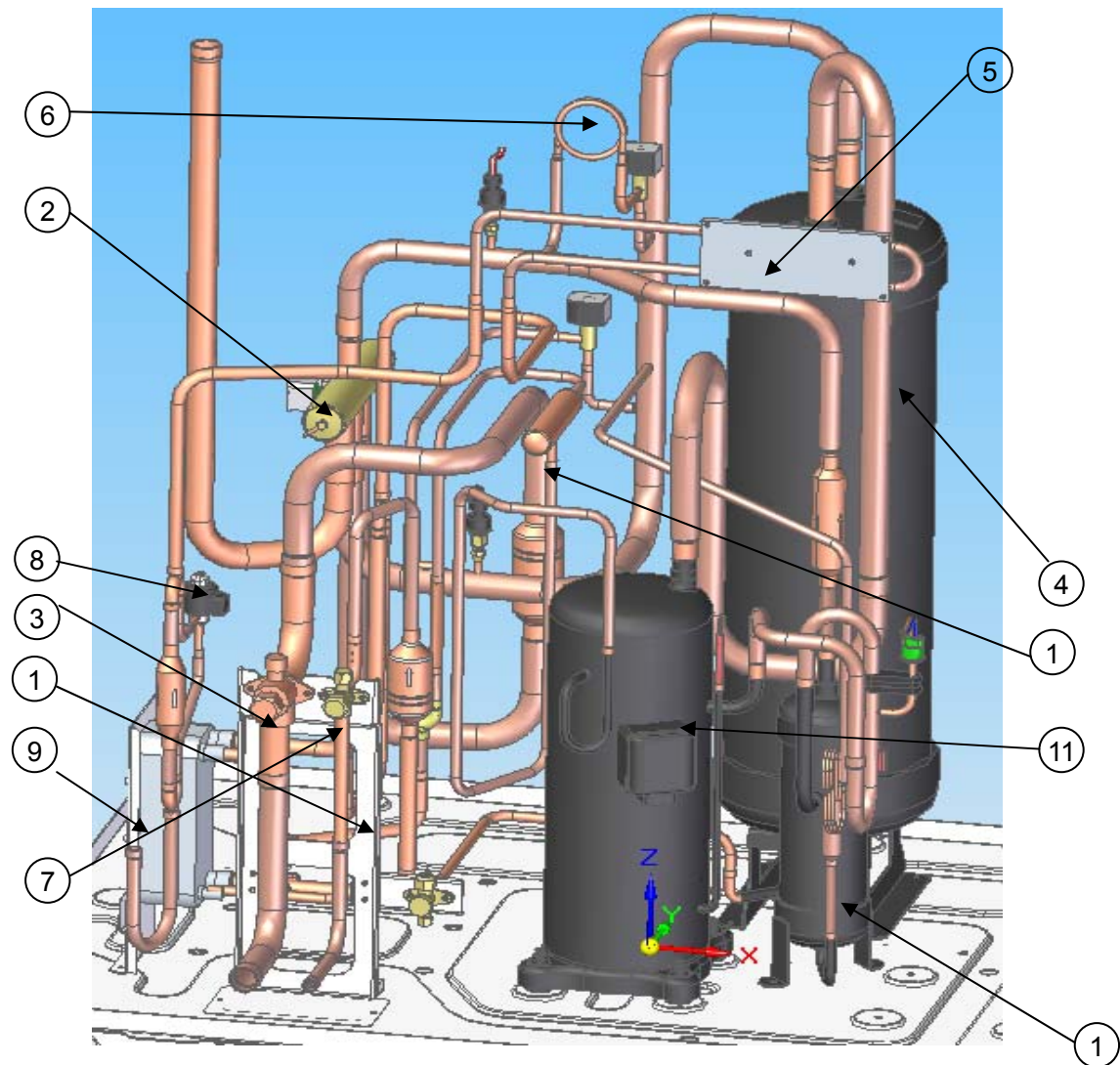
2.5 TIMS080-120AST



S/N	Item No.	Item name	Qty	Classification
1	P70010300045	Condenser assembly	1	Assembly
2	P70014300036	Liquid distribution pipe assembly	1	Assembly

3	P70010300044	Gas collector assembly	1	Assembly
4	P70010000046	Plate heat exchanger fixing plate	1	Plate
5	B7020226	Scroll compressor	1	Compressor and its fittings
6	B7010057	Oil separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
7	P70010300012	4-way valve assembly	1	Assembly
8	B4050061	4-way valve	1	Component
9	P70010300061	Liquid valve assembly	1	Assembly
10	B4010160	Liquid valve	1	Component
11	P70010300057	Air valve assembly	1	Assembly
12	B4010157	Air valve	1	Component
13	B7010145	Air/liquid separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
14	J30136000000	Subcooler	1	Component
15	B4040283	Electronic expansion valve for subcooling	1	Component
16	B4040083	Electronic expansion valve for heating	1	Component
17	P70010300070	Bypass valve assembly	1	Assembly

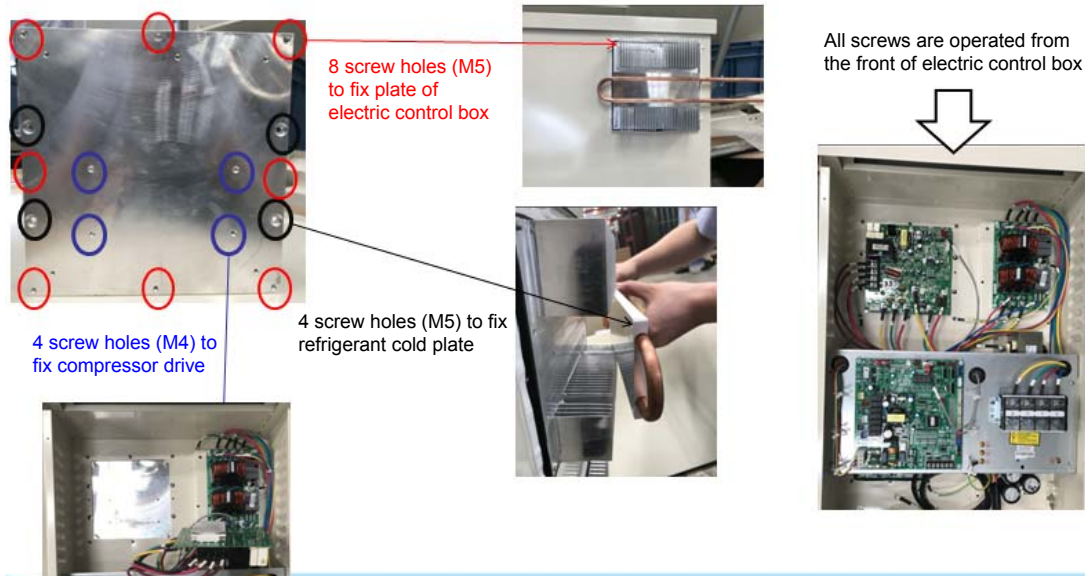
2.5 TIMS140-180AST



S/N	Item No.	Item name	Qty	Classification
1	B7010057	Oil separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
2	B4050061	4-way valve	1	Component
3	B4010156	Air valve	1	Component
4	B7010147	Air/liquid separator	1	Non-compressor containers (liquid accumulator, air/liquid separator and oil separator)
5	B5300179	Refrigerant cold plate	1	Fittings
6	P70350300004	Bypass valve assembly	1	Assembly
7	B4010160	Liquid valve	1	Component
8	B4040107	Electronic	1	Component

		expansion valve for heating		
9	J30136000000	Subcooler	1	Component
10	B4040079	Electronic expansion valve for subcooling	1	Component
11	B7021045	Scroll compressor	1	Compressor and its fittings
12	P70851200001	Copper silencer	1	Fittings

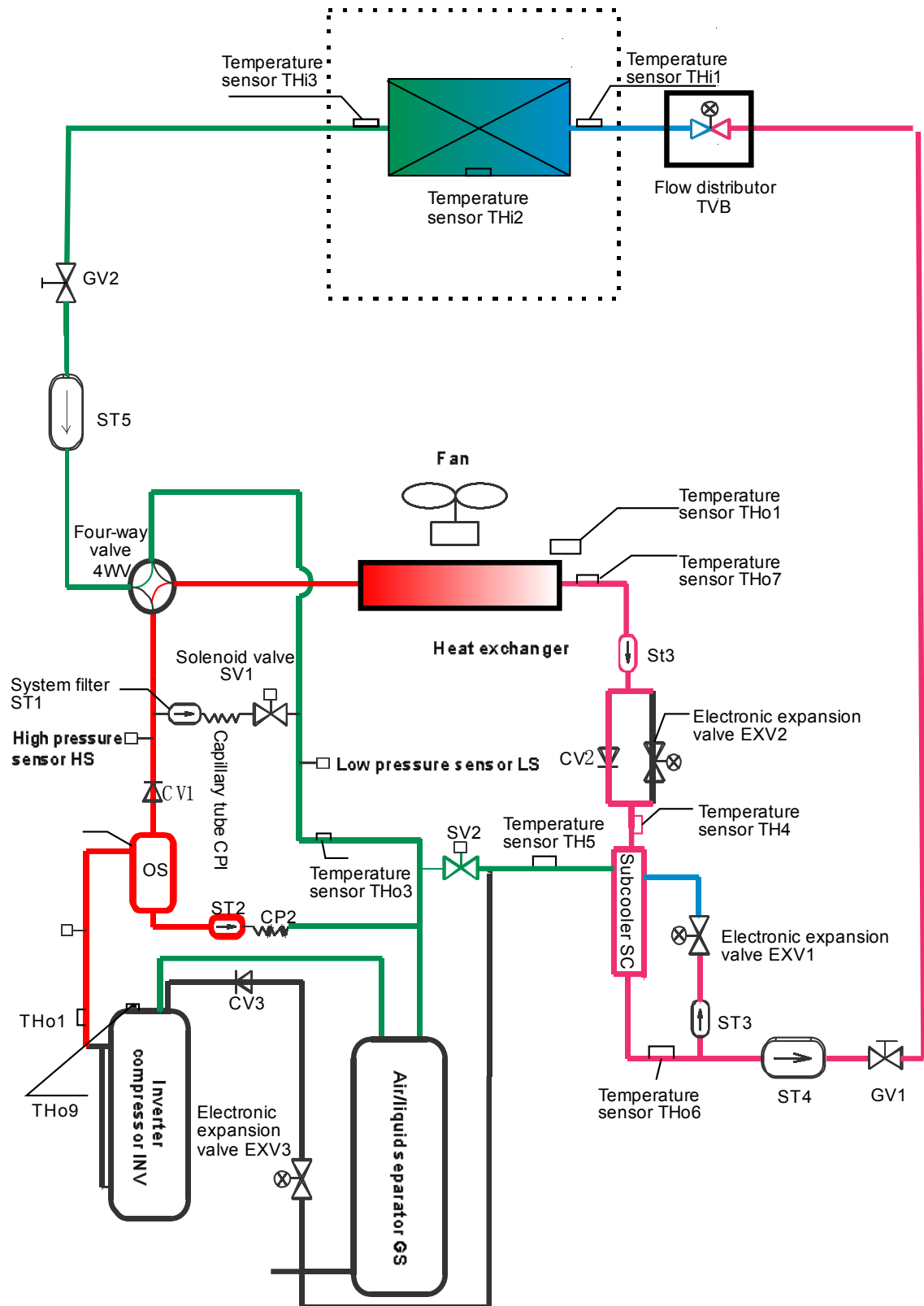
TIMS140-180AST compressor combines refrigerant-cooled and air-cooled methods, with Installation and Operation Diagram listed as follows:



3. Refrigerant Flow Direction in Different Operating Modes

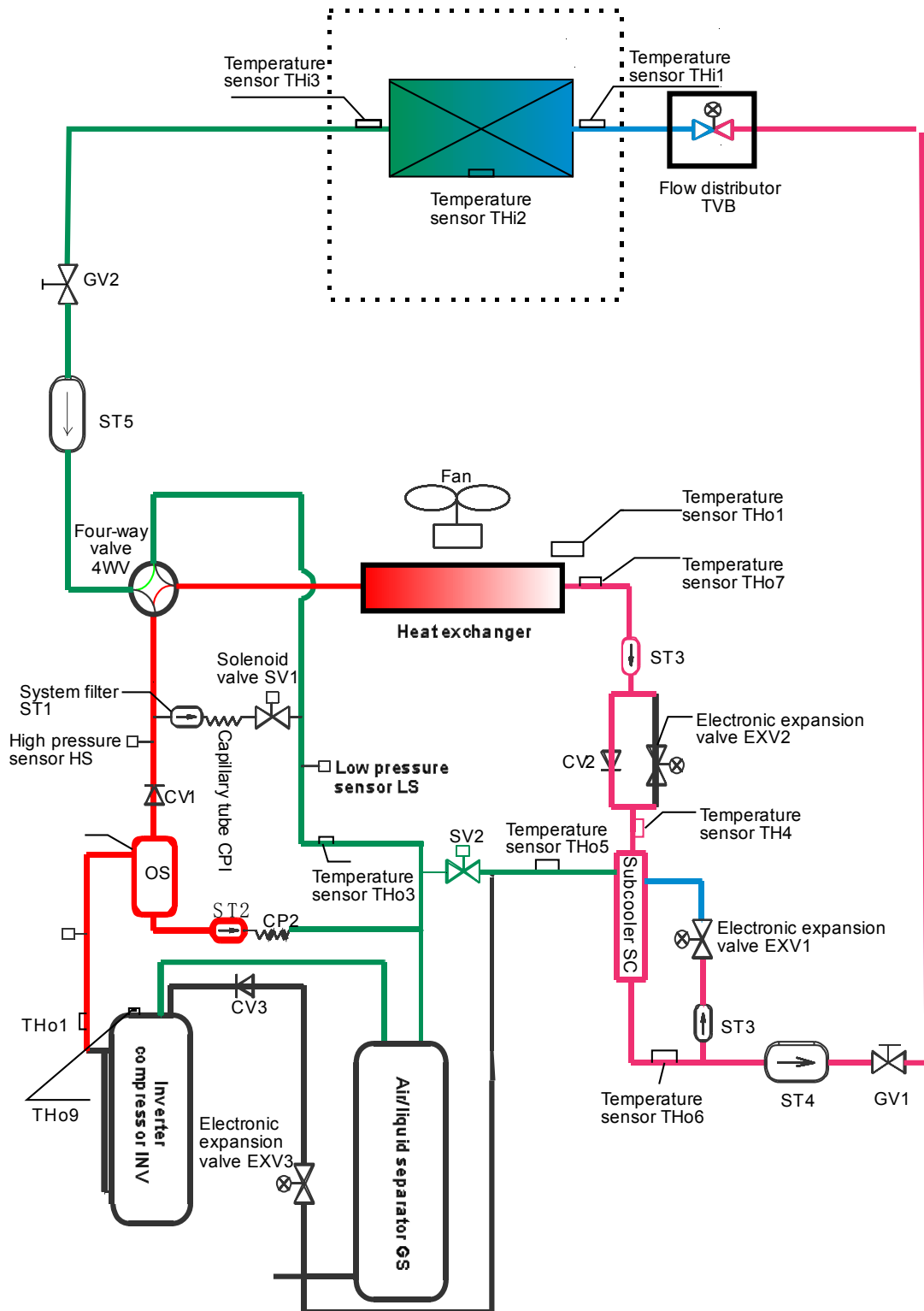
3.1 Refrigerant flow direction in cooling mode

INDOOR



3.3 Refrigerant flow direction when oil-return and defrosting

INDOOR



Chapter 4 Basic Control

1. Basic Control

1.1 Operating range for different models

Model	Operating mode of ODU		
	Cooling	Heating	Fixed speed compressor
	INV(RPS)	INV(RPS)	STD
TIMS080AA	20-72	20-76	/
TIMS100AA	20-80	20-84	/
TIMS120AA	20-92	20-96	/
TIMS140AA	20-88	20-88	off
	20-60	20-64	on
TIMS160AA	20-88	20-88	off
	20-76	20-80	On
TIMS180AA	20-88	20-88	off
	20-96	20-98	On

Operating capacity	Operating mode (individual)	
	Cooling	Heating
TIMS080AS	20~96	20~98
TIMS100AS	20~96	20~98
TIMS120AS	20~96	20~98
TIMS140AS	20~96	20~98
TIMS160AS	20~96	20~98
TIMS180AS	20~92	20~96
TIMS200AS	20~92	20~96
TIMS220AS	20~92	20~96
TIMS240AS	20~92	20~96

TIMS260AS	20~92	20~96
TIMS280AS	20~96	20~98
TIMS300AS	20~96	20~98
TIMS320AS	20~96	20~98

Operating capacity	Operating mode (modular)	
	Cooling	Heating
TIMS080AX	20~96	20~98
TIMS100AX	20~96	20~98
TIMS120AX	20~96	20~98
TIMS140AX	20~96	20~98
TIMS160AX	20~96	20~98
TIMS180AX	20~92	20~96
TIMS200AX	20~92	20~96
TIMS220AX	20~92	20~96

1.2 Trial operation function

For TIMS**AS/AX models, after initial power-on of the unit (or reboot after power-off), the unit implements trial operation within the following frequency range:

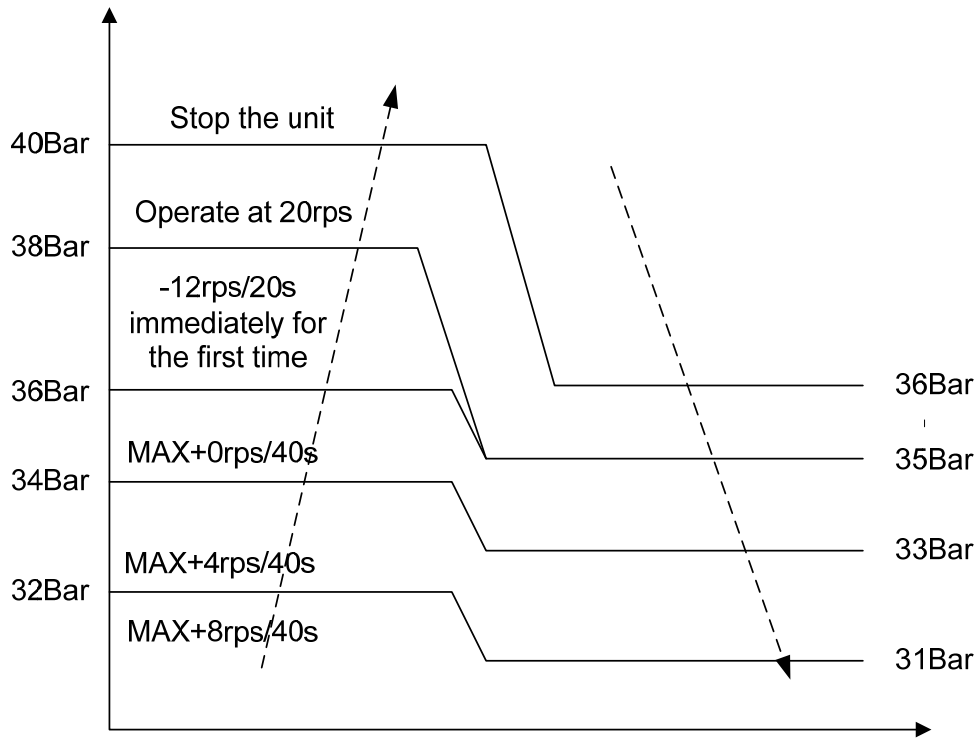
Frequency 64rps 40min, frequency 76rps 30min (excluding oil return and defrosting mode);

When the unit's operating frequency is greater than or equal to 80rps, keep the unit running for 10 minutes at 80rps and increase to the speed as instructed.

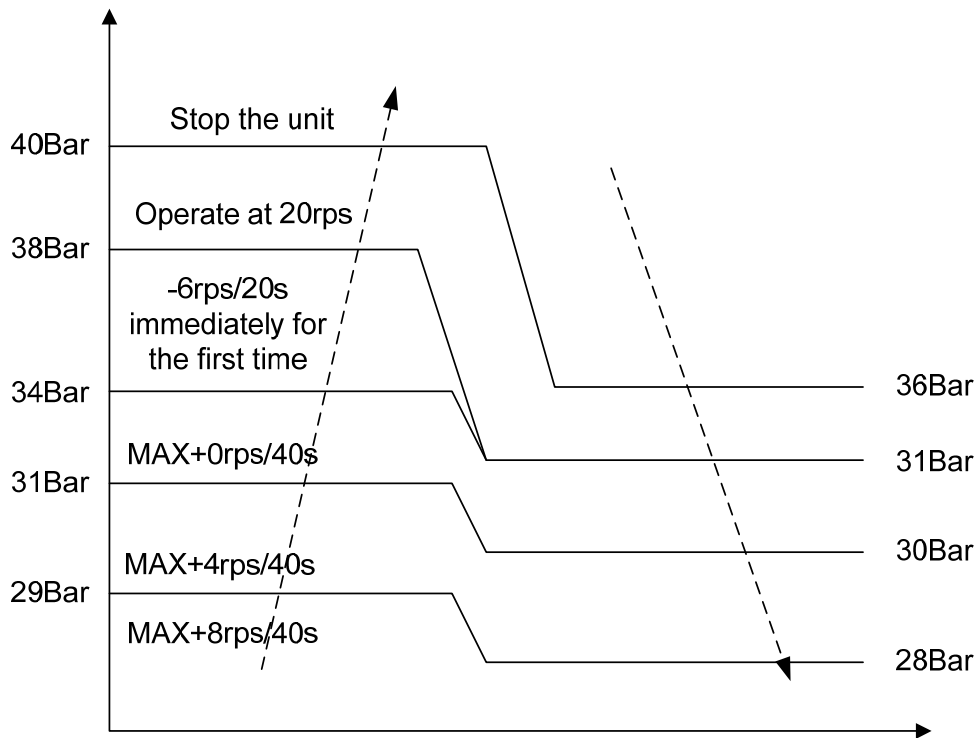
2. Protection Control

2.1 High pressure protection control

Cooling mode:

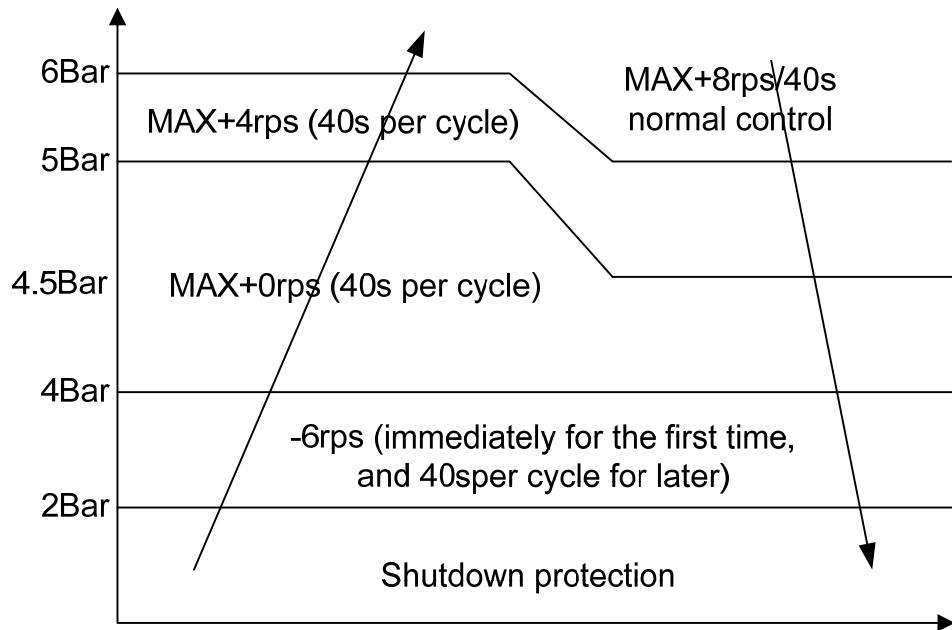


Heating mode:

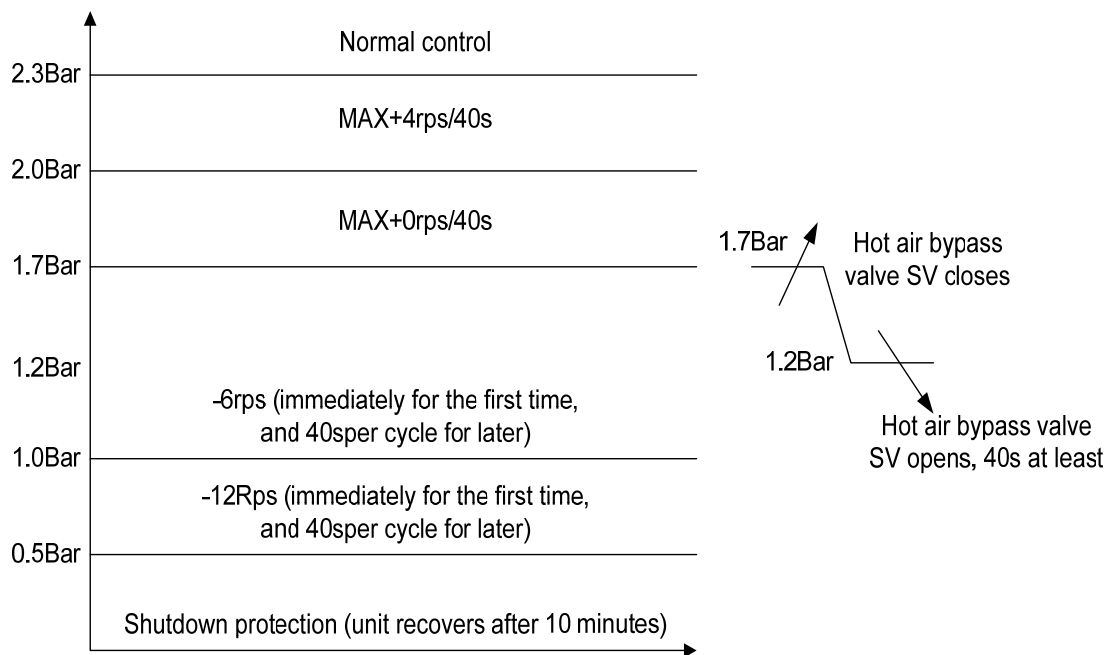


3.2 Low pressure protection control

Cooling mode:

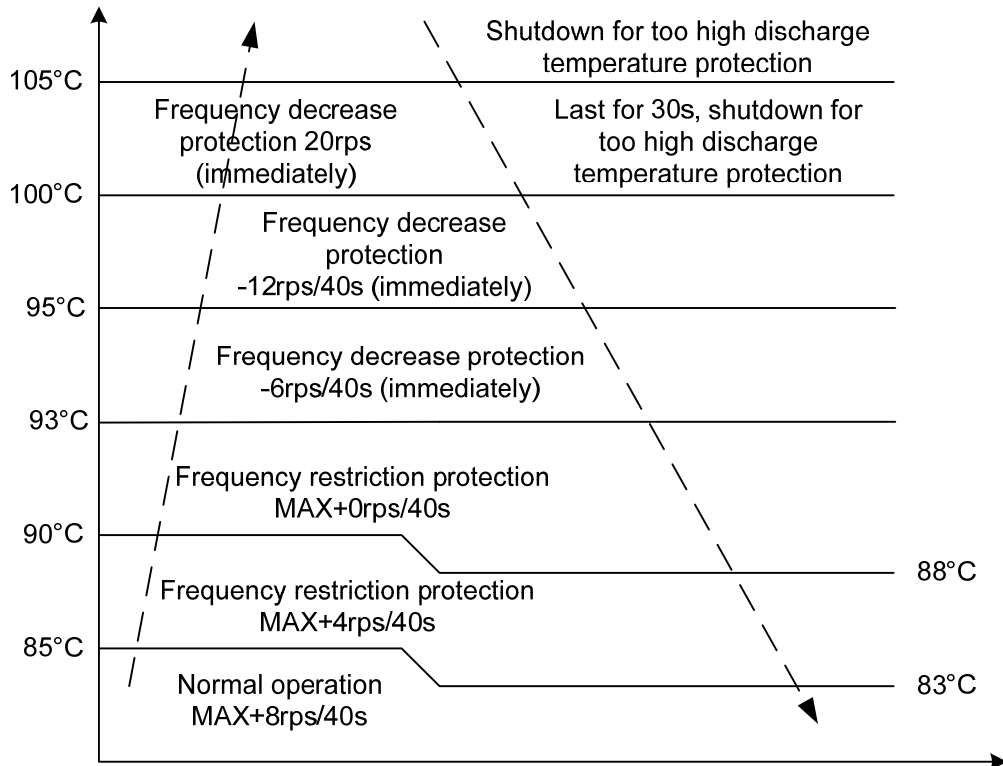


Heating mode:

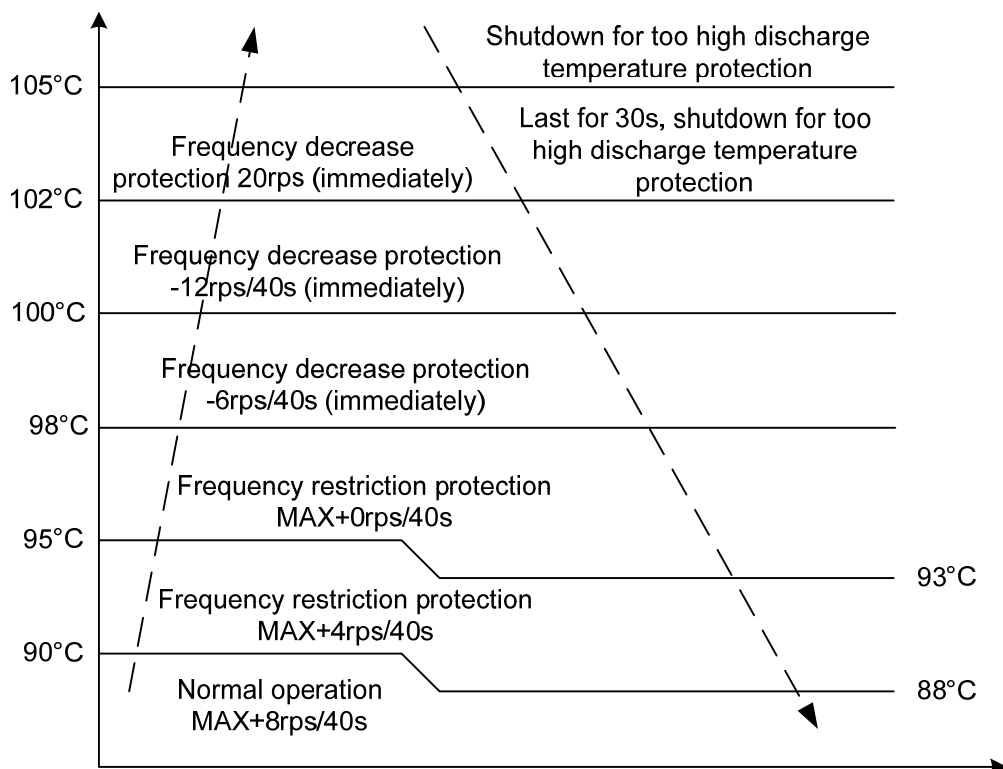


3.3 Discharge temperature protection control

When $THo1 < 40^{\circ}C$



THo1 ≥ 40°C



Remarks:

- a The compressor discharge temperature protection is triggered when the temperature sensor reads too high of a value. If THmax (THo2, THo8) < 85°C, the unit is recovered

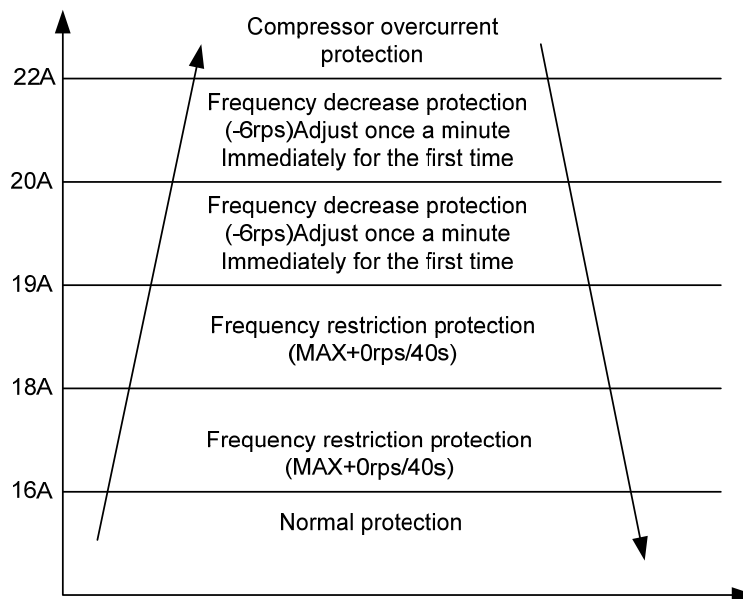
automatically after 10 minutes; if the failure occurs 3 times in 2 hours, it indicates that the INV compressor is faulty. The unit needs to be turned on and reset after temporary power disconnection;

b When failure occurs to two INV compressors at the same time, the unit will automatically turn off to prevent damages. After the power is resumed, reset the unit.

3.4 Current protection of inverter compressor

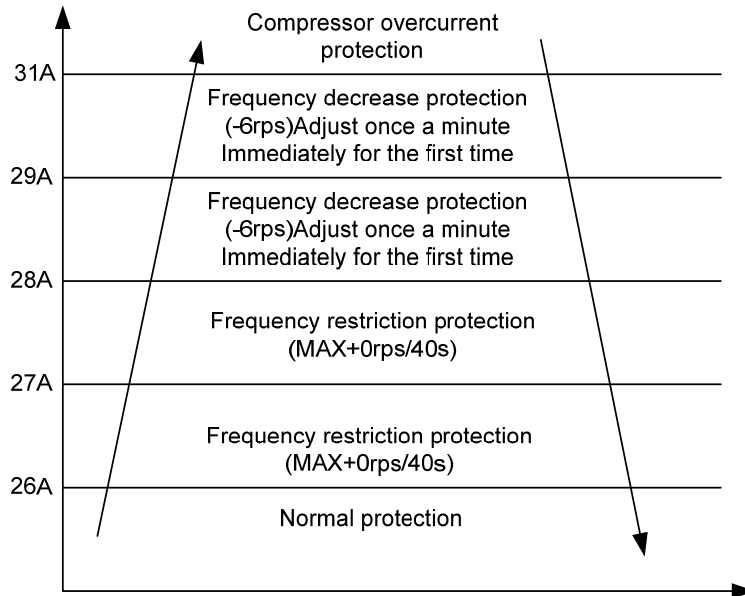
The unit's compressor drive module detects the compressor operating current and hence to provide feedback. See details below

E655DHD:

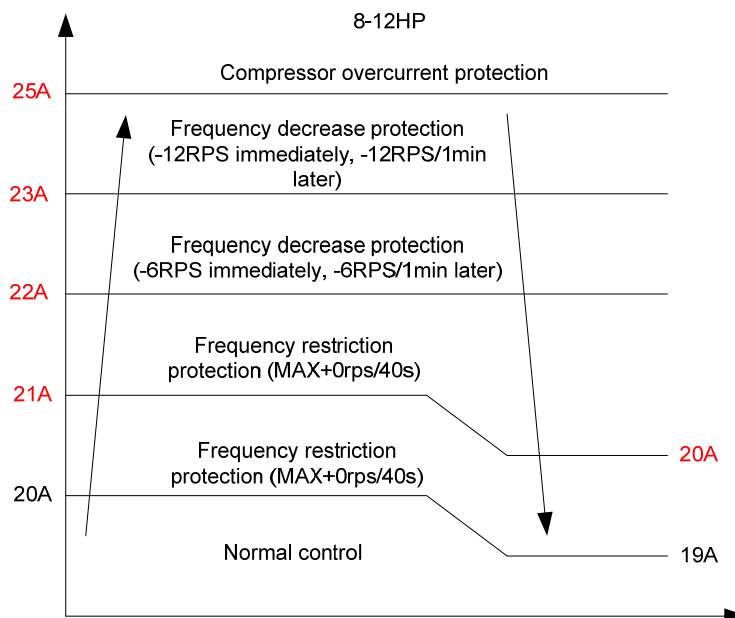


When $I(INV) \geq 22A$ for 4s, the corresponding INV compressor sends compressor current overload protection alarms (remove error data after 5 minutes) and the unit recovers after 10 minutes; if compressor error is reported 3 times in 2 hours, the compressor cannot turn on. The unit needs to be restarted after temporary power disconnection. If all the compressors of the unit send alarms, the unit will automatically turn off to prevent damages.

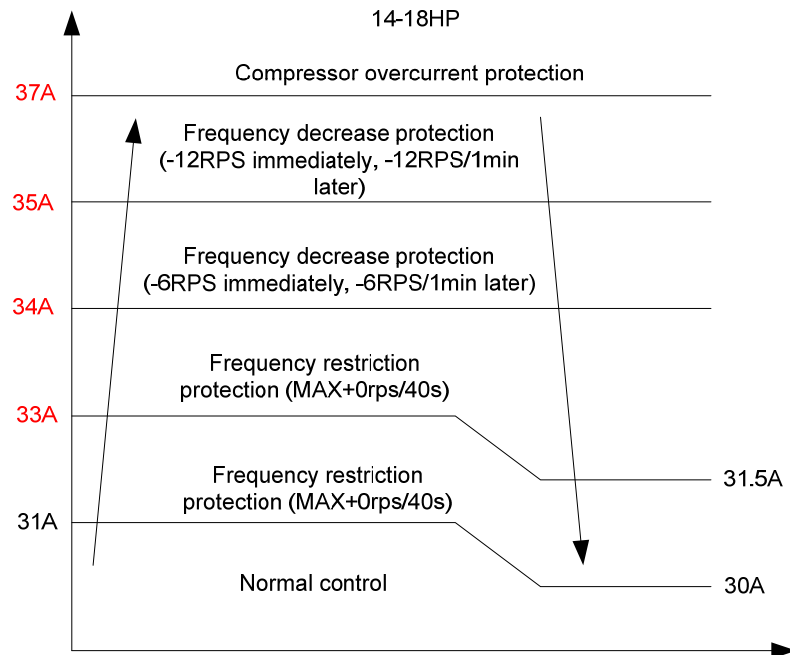
E856DHD:



When $I(INV) \geq 31A$ for 4s, the corresponding INV compressor sends compressor current overload protection alarms (remove error data after 5 minutes) and the unit recovers after 10 minutes; if compressor error is reported 3 times in 2 hours, the compressor cannot turn on. The unit needs to be restarted after temporary power disconnection. If all the compressors of the unit send alarms, the unit will automatically turn off to prevent damages. DS-GB052FAVA: TIMS080-120AST



When $I(INV) \geq 25A$ for 4s, the corresponding INV compressor sends compressor current overload protection alarms (remove error data after 5 minutes) and the unit recovers after 10 minutes; if compressor error is reported 3 times in 2 hours, the compressor cannot turn on. The unit needs to be restarted after temporary power disconnection. If all the compressors of the unit send alarms, the unit will automatically turn off to prevent damages.



When $(INV) \geq 37A$ for 4s, the corresponding INV compressor sends compressor current overload protection alarms (remove error data after 5 minutes) and the unit recovers after 10 minutes; if compressor error is reported 3 times in 2 hours, the compressor cannot turn on. The unit needs to be restarted after temporary power disconnection. If all the compressors of the unit send alarms, the unit will automatically turn off to prevent damages.

3.5 High temperature protection of compressor drive module

When module temperature $< 82^{\circ}C$, the unit runs normally;

When $82^{\circ}C \leq$ module temperature $< 84^{\circ}C$, frequency increase is not allowed;

When $84^{\circ}C \leq$ module temperature $< 88^{\circ}C$, compressor frequency is -6rps (regulated once every 1 minute and regulated immediately for the first time);

When module temperature $\geq 88^{\circ}C$ for 1 minute, compressor will turn off to prevent damages (recover if $< 80^{\circ}C$ for 10 minutes);

When module temperature $> 90^{\circ}C$ (compressor drive protection), the compressor recovers after 10 minutes.

3.6 Anti-freezing protection of IDU coils

Anti-freezing protection for IDU coils is available in cooling and dehumidification mode.

When IDU mid-coil temperature $THi2 \leq -1^{\circ}C$ for 10 minutes or when $THi2 \leq -5^{\circ}C$ for 3 minutes, anti-freezing protection function is triggered: with no energy needs for IDU, the fan implements automatic control. When $THi2 \geq 7^{\circ}C$ for 2 minutes, the unit recovers to

normal operational state.

3.7 4-way valve fault protection

Judgment based on the entire process when the unit runs in heating mode (after 4-way valve is connected to power);

When $THo2_{average}$ (IDU in operation) $\leq -10^{\circ}\text{C}$ for 3 minutes or $THo2_{average}$ (IDU in operation) $\leq 5^{\circ}\text{C}$ for 10 minutes, the unit will automatically turn off and send alarms of abnormal 4-way valve; the unit will restart after 3 minutes. If error is reported 3 times in 2 hours, the unit automatically turns off to prevent damages.

Whole-process protection available for any unit in defrosting mode or oil return process during heating mode.

Heating mode:

When pressure difference within a module < 5 Bar for 10 minutes (timing starts after switched to 4-way valve), insufficient pressure difference alarm will be triggered:

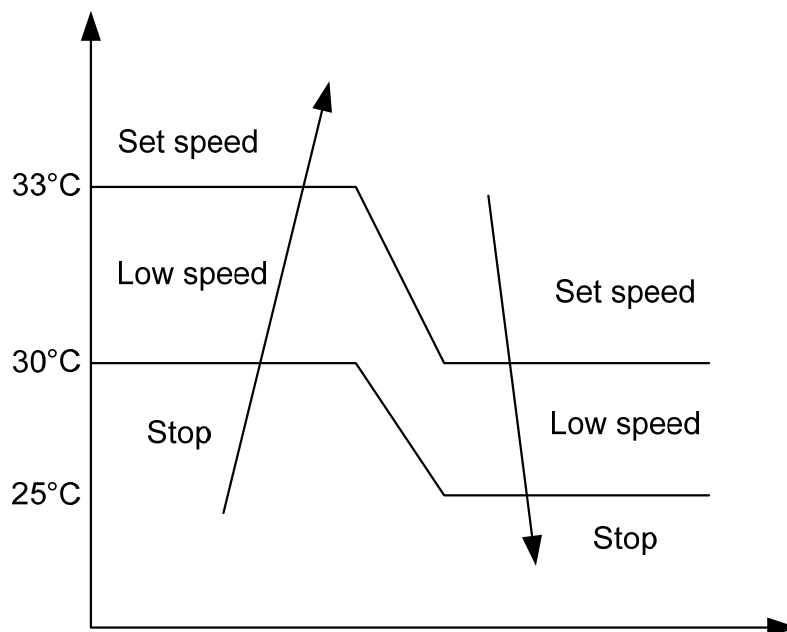
When pressure difference > 5 Bar or error lasts for 5 minutes, fault is cleared; if error lasts for 10 minutes, the system enters standby mode.

Cooling mode:

When pressure difference within a module < 5 Bar for 10 minutes (timing starts after the platform operates), insufficient pressure difference alarm will be triggered:

When pressure difference > 5 Bar or error lasts for 5 minutes, fault is cleared; after 10 minutes, the system recovers to normal operation.

3.8 Anti-cold-air control



4. IDU Control

TICA offers a wide range of options for IDU installation solutions, ranging from wall-mounted, ceiling-embedded, duct type, ceiling exposed/floor type, ultra-thin duct type, to single- and two-sided cassette air conditioner types.

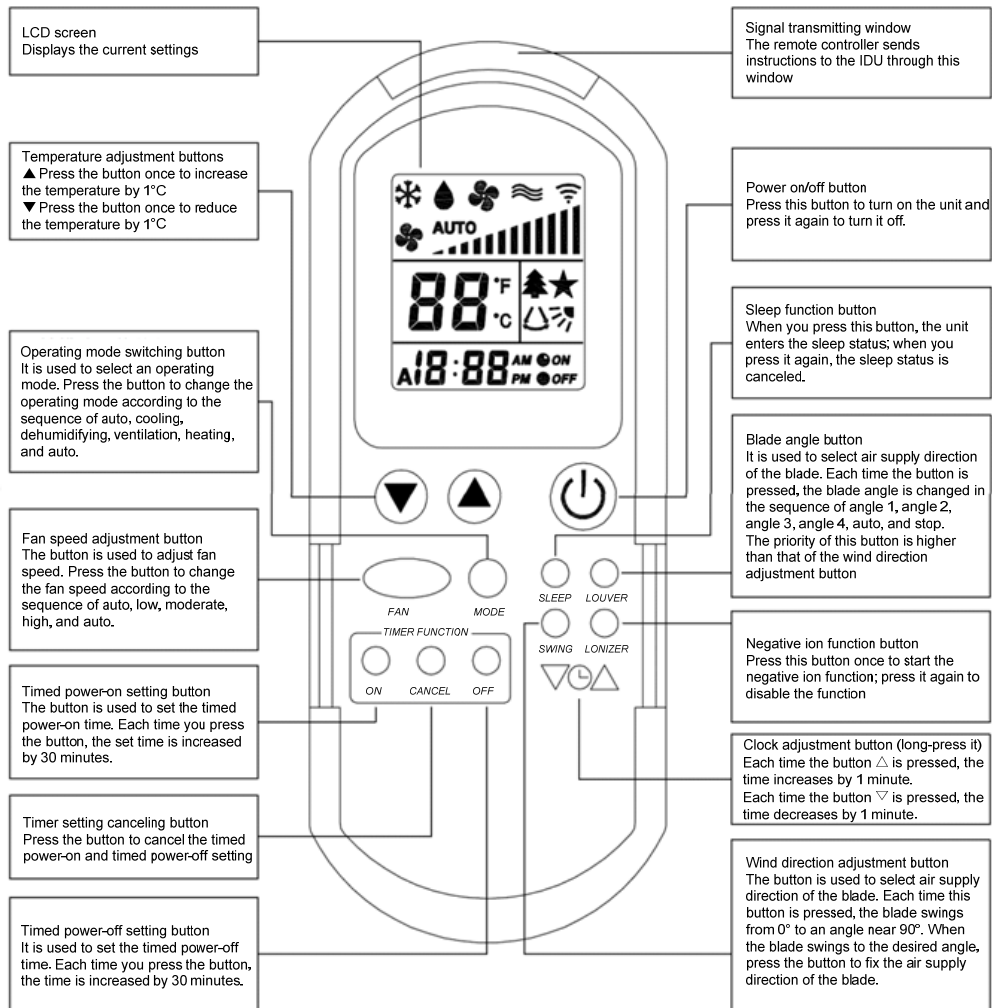
All these units use the advanced intelligent control system. Please refer to the following table for configurations of IDU controllers:

IDU type	Wall-mounted	Ceiling Embedded	Standard duct type	High static pressure Duct type	Ceiling exposed/ Floor type	Ultra-thin duct type	Fresh air handling unit
LCD remote controller	▲	▲	△	△	▲	△	△
Emergency controller	▲	▲	△	△	▲	△	△
Wired controller	No	△	▲	▲	△	▲	▲
Card-type remote controller	No	△	△	△	△	△	△

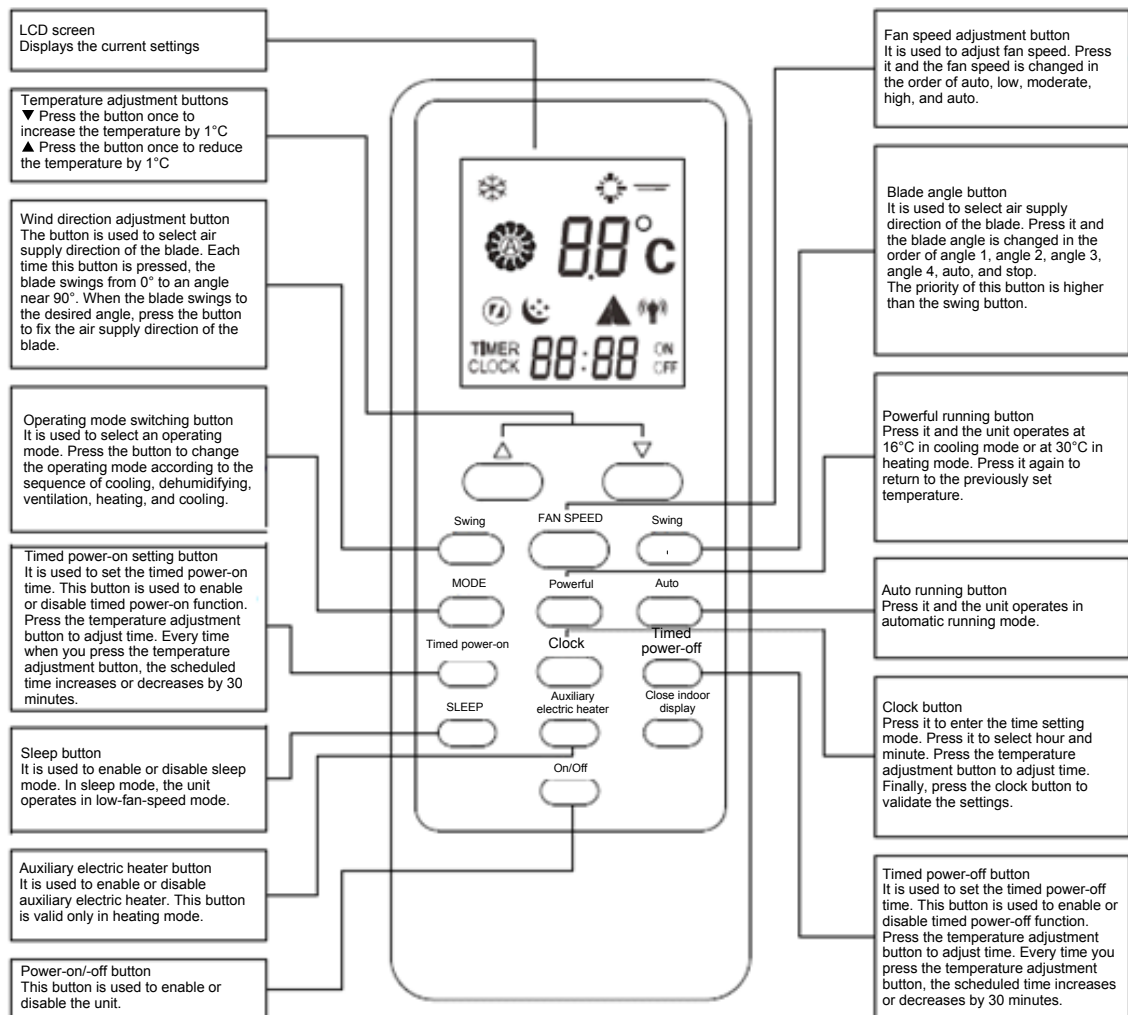
Notes: ▲ Standard △ Optional

4.1 Remote controller instructions

Functions



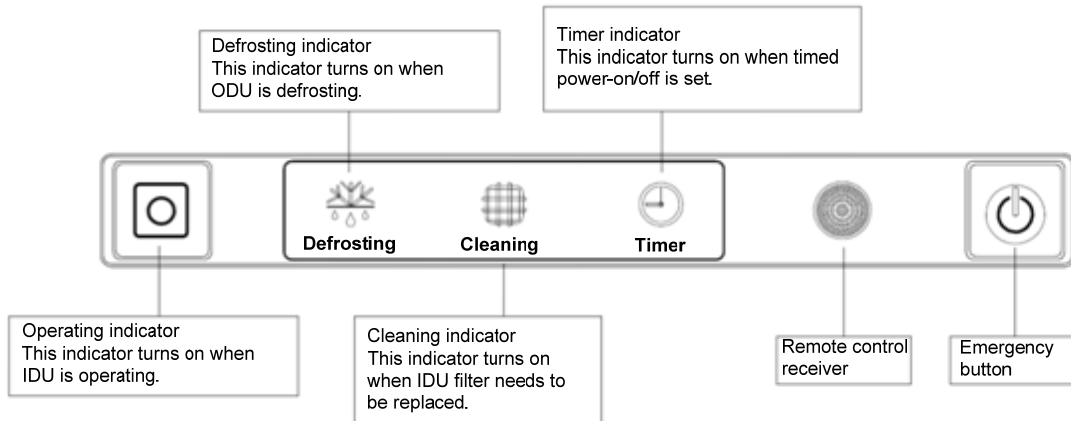
Remote controller (new version)



- In a fluorescent lamp room where voltage stabilizer or chopping oscillator (electronic ballast) are used, sometimes IDU cannot receive signals sent by the remote controller. In this circumstance, put the remote controller close to the signal receiving part.
- When the battery power is sufficient, the range of control is about 6 meters.
- Use remote controller with care. Damages may be caused if dropping it on the ground or into water.
- After the IDU is powered off and powered on again, the originally set timed-on/off will be canceled.

Notes: Instructions on emergency control functions:

Caution: This function is optional for a duct unit.



Use emergency switches to control the unit when remote controller runs out of power, fails to work or is missing.

Each time emergency switch is pressed, air conditioner operates in the sequence as follows:

Cooling-only: cooling→stop→cooling, and another cycle

Cooling/heating type: cooling (heating)→stop→cooling (heating), and another cycle

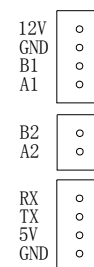
Operating mode	Set temperature	FAN SPEED
Cooling	24°C	High
Heating	24°C	High

Notes: When the ambient temperature is greater than 24°C, cooling/heating type unit operates in cooling mode; and when the ambient temperature lower than 24°C, the unit in heating mode.

4.2 Wired controller instructions

Universal IDU wired controller 1

1. Appearance



As shown in the above figure, the TICS wired controller has the following interfaces:

Power interface (VCC GND): 12V_GND/5V_GND;

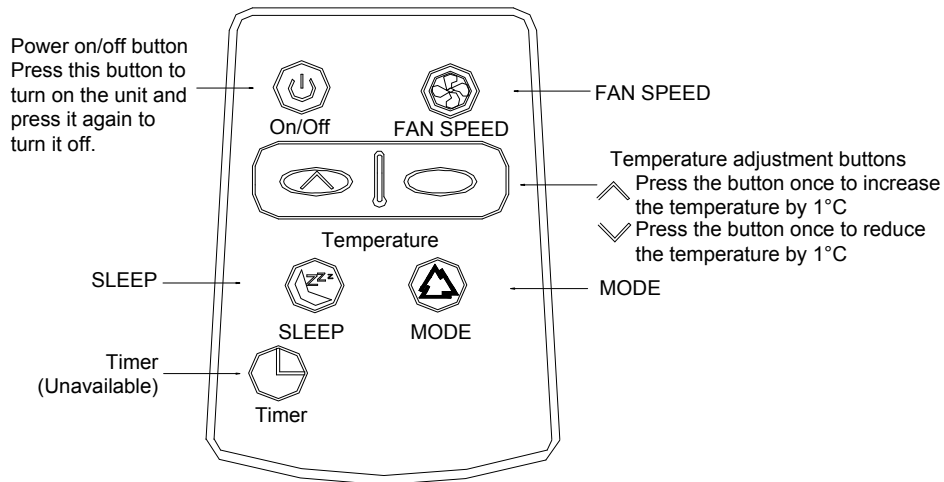
System communication interface (RX, TX): connected to the IDU;

Other communication interfaces (reserved): A1/B1, A2/B2;

When using a wired controller, a card-type remote controller is optional.

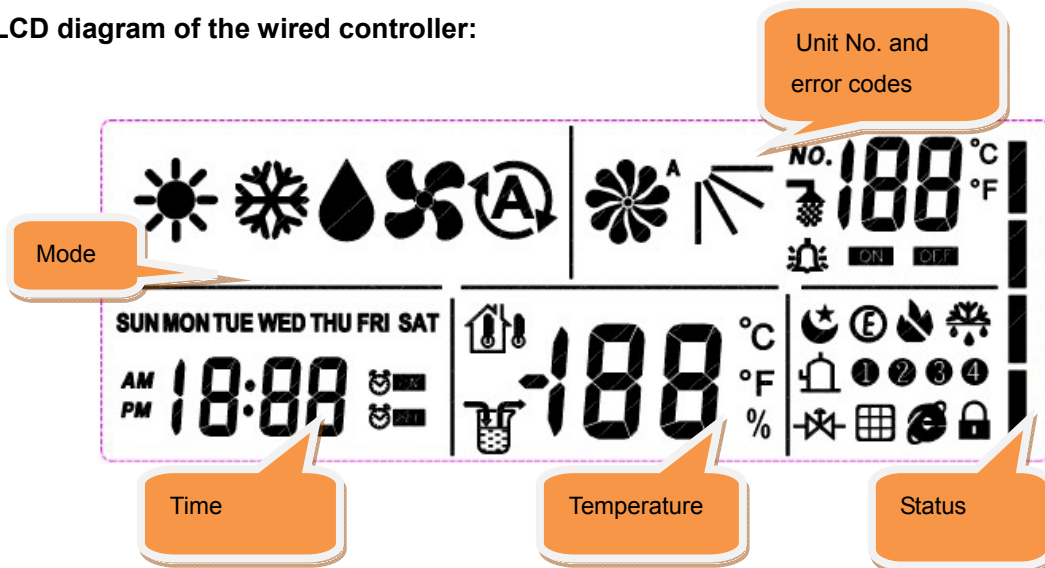
Functions of card-type remote controller

Point the card-type remote controller at wired controller LCD before required buttons are pressed.



2. Functions: applied to TICA VRF IDUs, functions as a remote controller

LCD diagram of the wired controller:







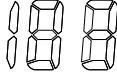
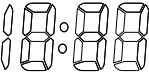
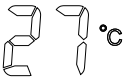

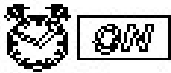




1. Button functions:

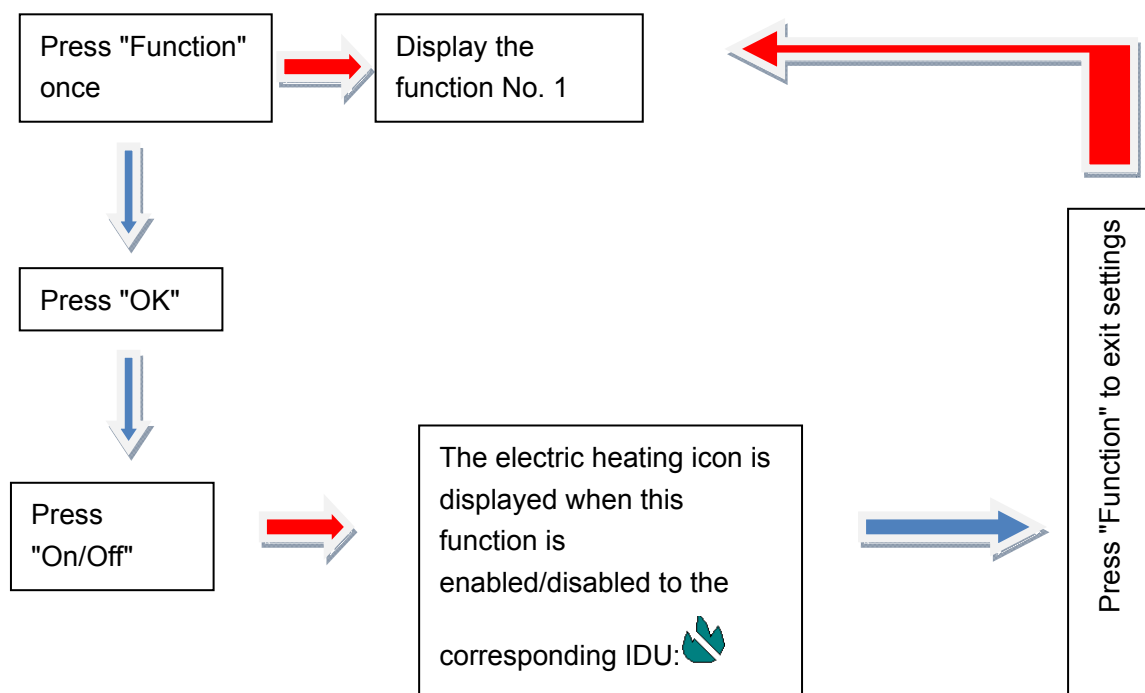


2. Displayed functions of LCD screen icons:

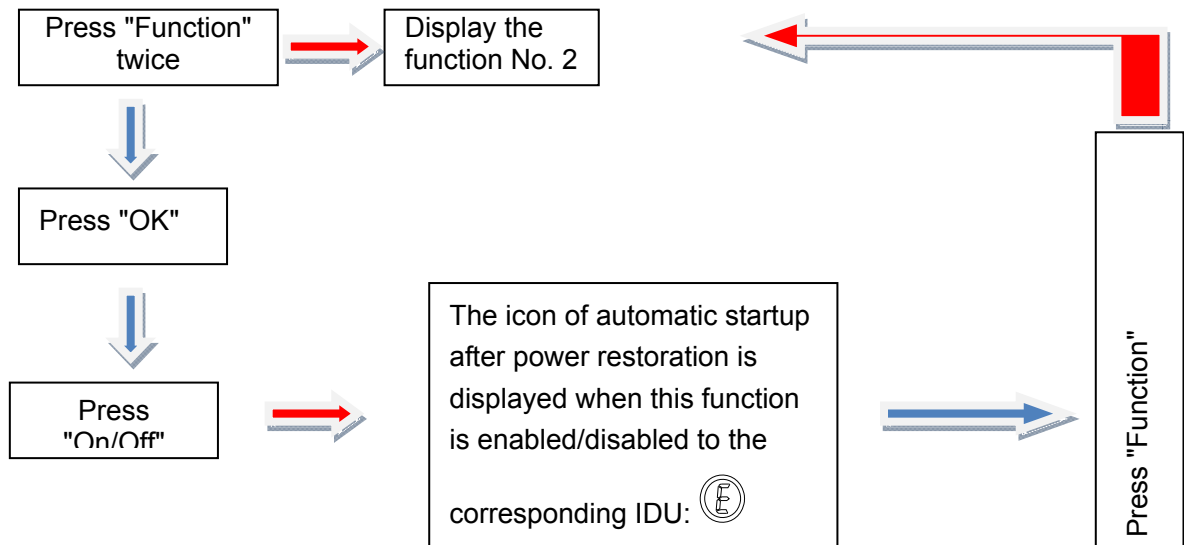
No.	Icon	Function	No.	Icon	Function
1		Power-on	2		Power-off
3		Cooling	4		Dry
5		Fan	6		Heating
7		Auto	8		Defrosting
9		SLEEP	10		Swing
11		Low speed	12		Medium speed
13		High speed	14		Auto wind

15		Electric heating	16		Locking
17		Outdoor ambient temperature icon	18		Indoor ambient temperature/temperature setting icon
19		Fault	20		Compressor on
21		Fault code	22		Clock
23		Indoor ambient temperature/temperature setting	24		Communication faults
25		Timed power-on	26		Timed power-off
27		Automatic startup icon after power restoration			

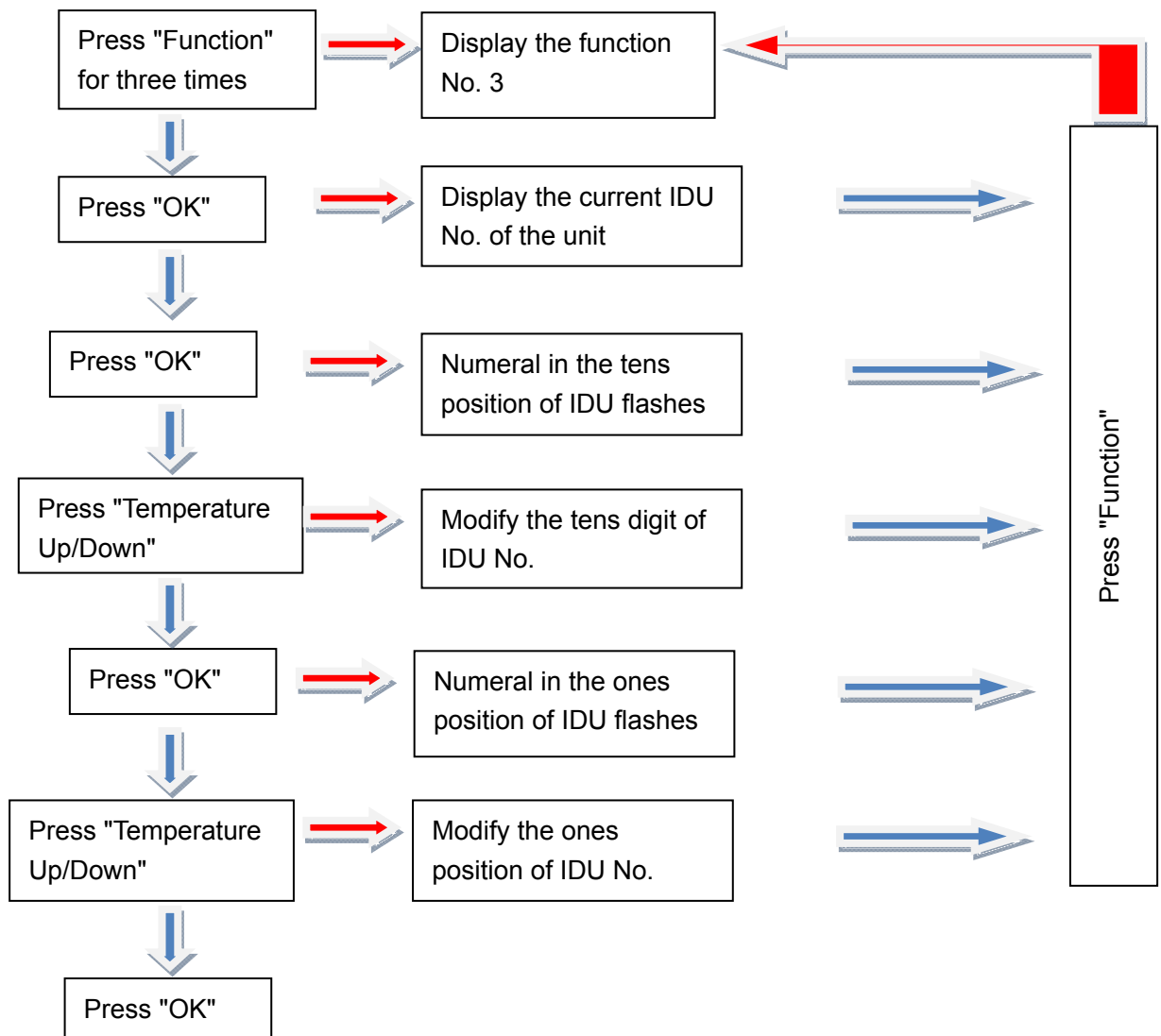
3. Auxiliary electric heater settings:



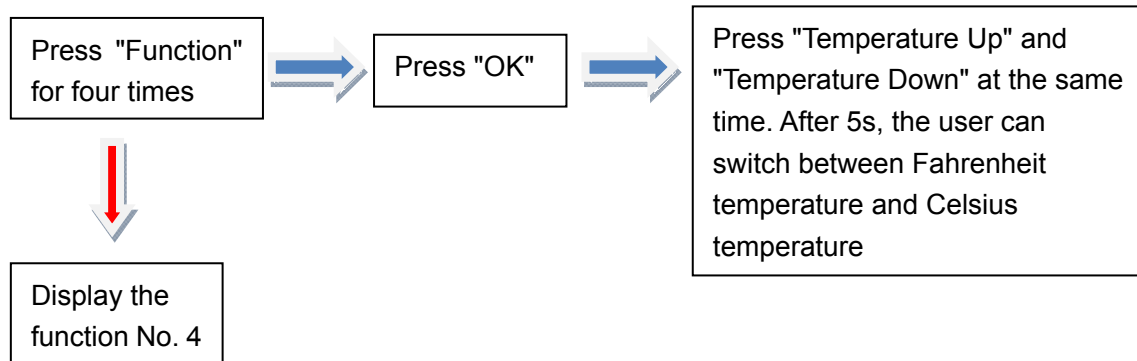
4. Setting automatic startup after power restoration:



5. IDU address query and setting:



6. Switching between Fahrenheit temperature and Celsius temperature:



Note: After all the above functions are set, press "Function" to quit the setting interface, or exit the setting interface automatically when the backlight is off.

7. Mode settings:

Press "Mode" to switch between the heating, cooling, dehumidifying, and air supply modes.

8. Swing settings:

Press "Swing" to switch the wind swing between stop, angle 1, angle 2, angle 3, angle 4, and auto swing.

9. Power-on/off settings:

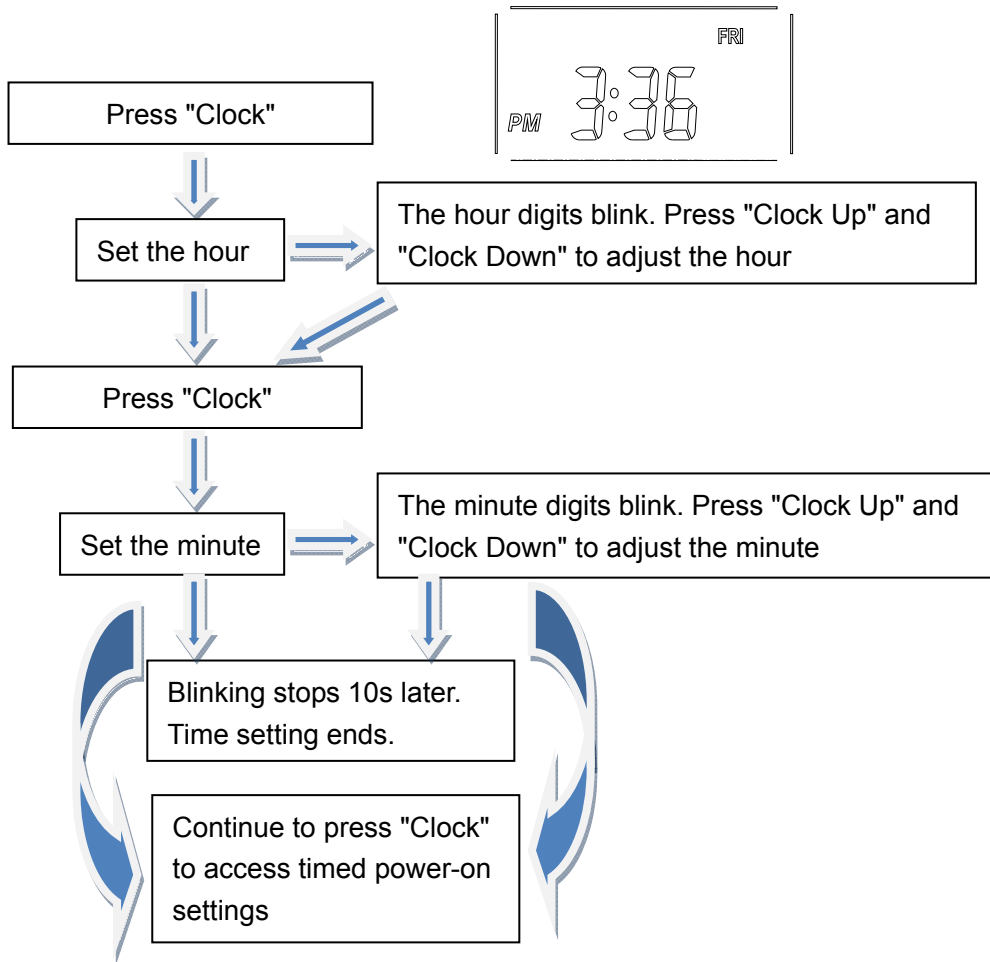
Press "On/Off" to switch between the power-on and power-off status.

10. Button lock settings:

Press "Temperature Up" and "Temperature Down" at the same time and after 5s the buttons are locked; after the LCD light is off, press "Temperature Up" and "Temperature Down" at the same time and after 5s the buttons are unlocked;

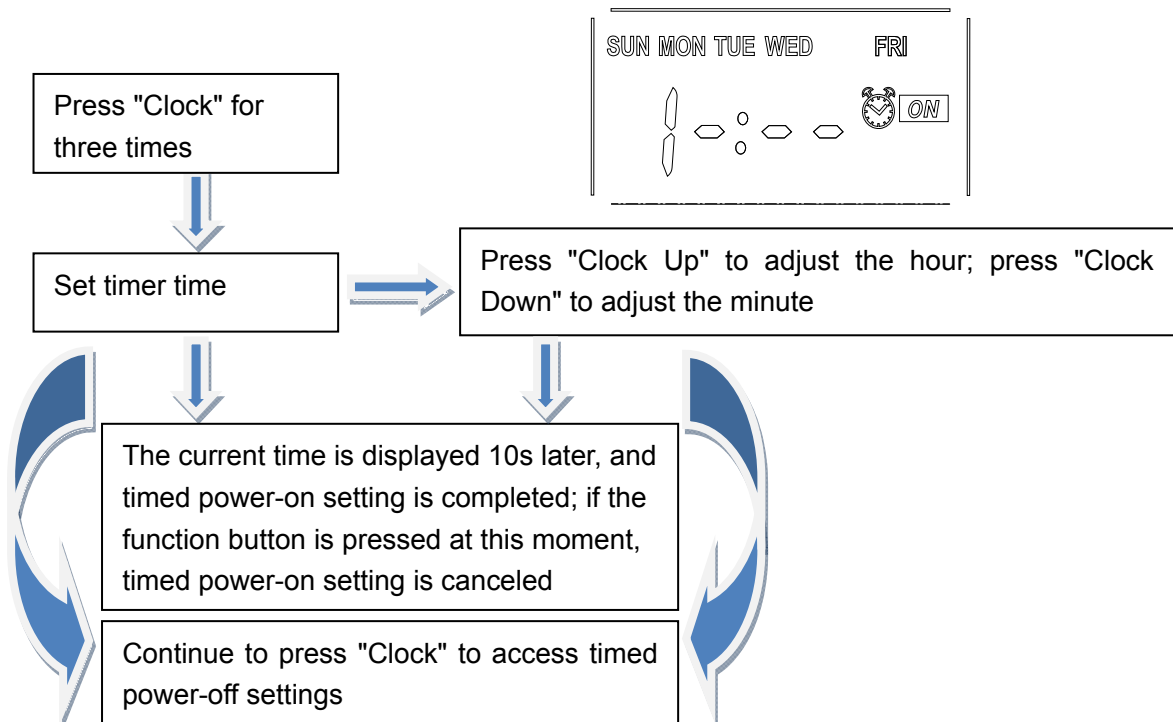
11. Clock settings/timer settings:

(1) Clock settings:

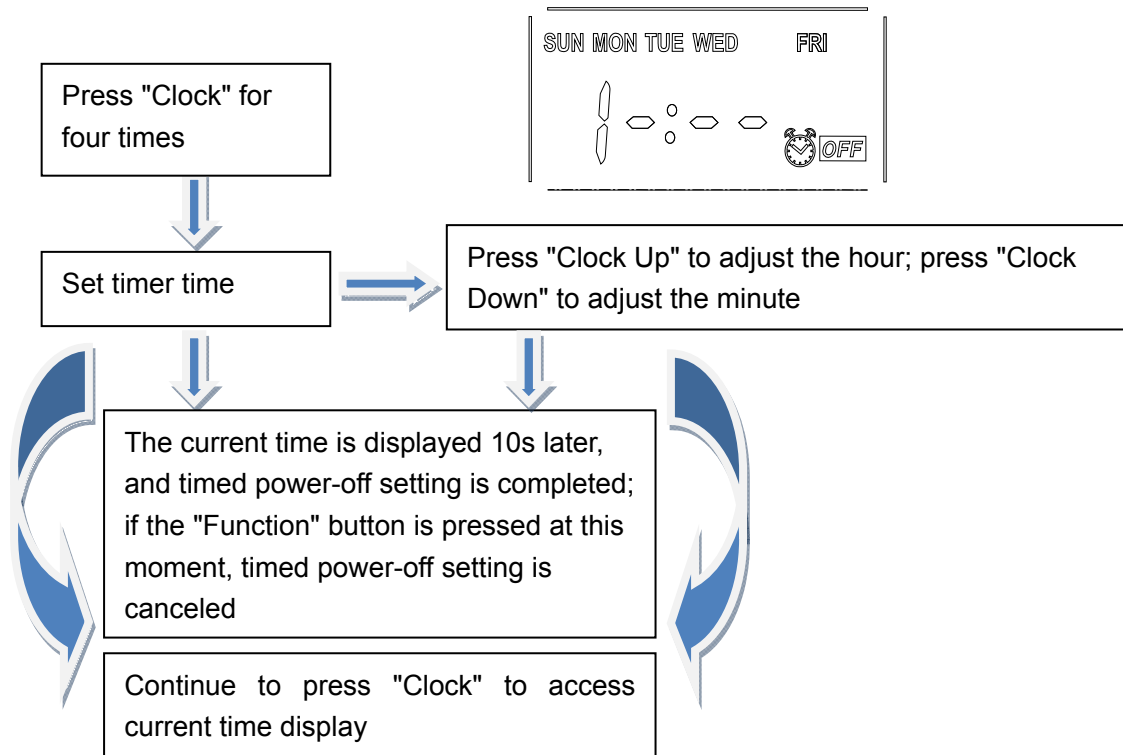


Note: When the clock is displayed normally or time is set, press "Week" to adjust day of the week.

(2) Timed power-on settings:



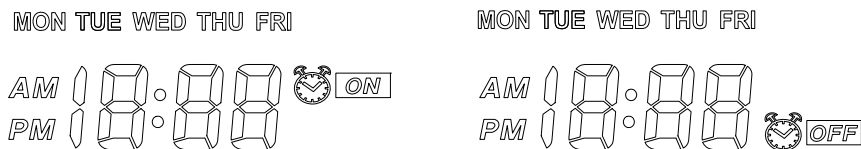
(3) Timed power-off settings:



(4) Week settings in timed power-on/off:

During setting of timed power-on/off, press "Week" till the desired day of the week blinks, and then press "OK" to select timed power-on/off on this date, or press "Function" to cancel timed power-on/off on this date. For example:

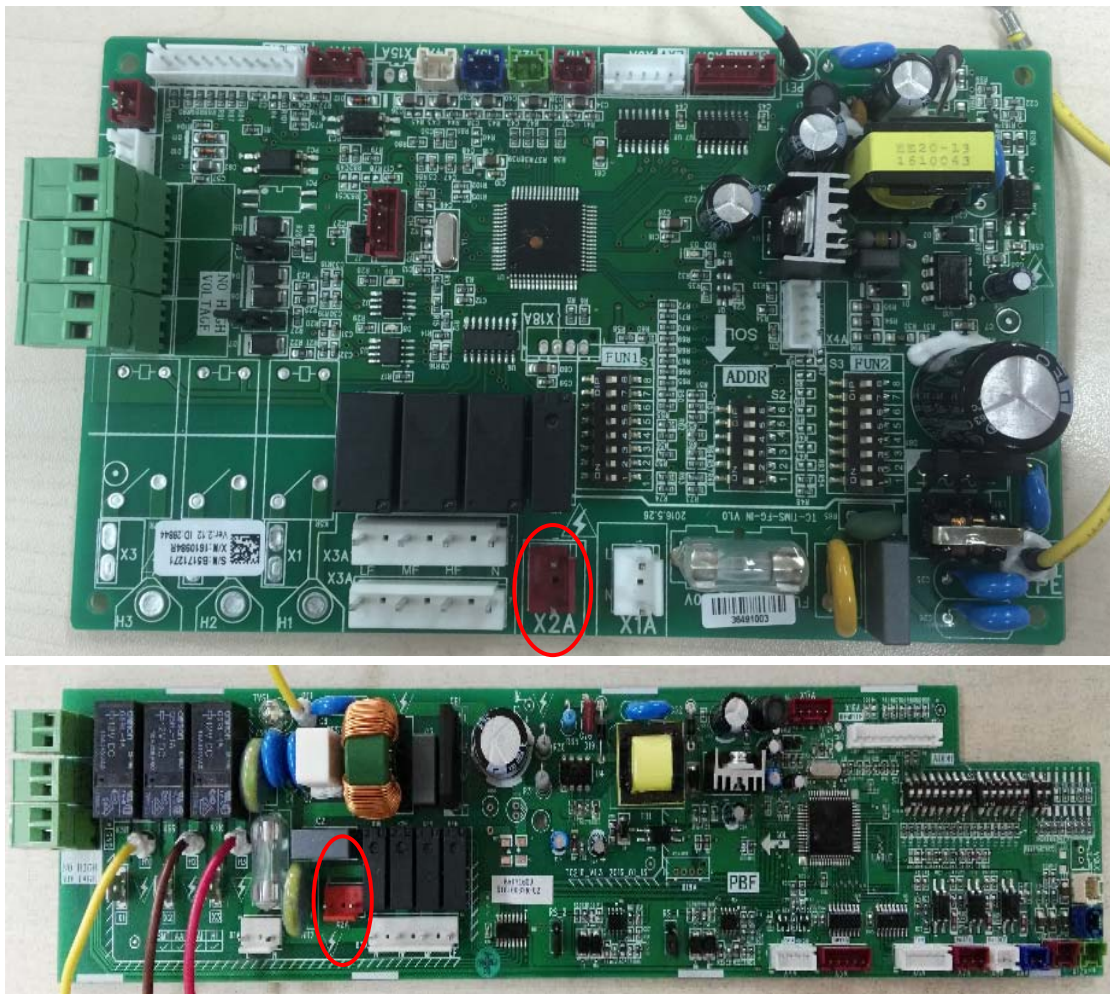
(Timed power-on/off is valid from Monday to Friday)



Timed power-on time and icon Timed power-off time and icon

Note: Timer setting is valid only when both the time and day of the week are set.

4.2 Drain pump control

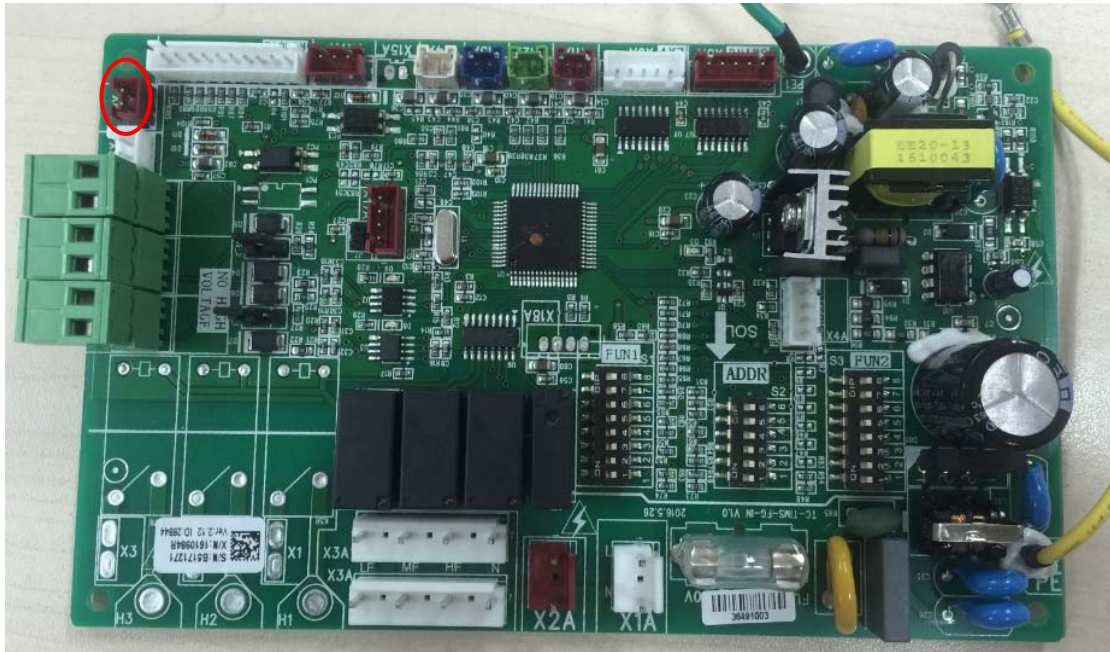


The red part X2A in the above figure indicates water pump port of IDU.

Water pump control: water pump operates all the time in cooling mode. In other modes, water pump operates after water level switch is opened.

4.3 Connecting the power supply by plugging a card

When bit 1 of DIP switch S3 is at the ON position, the unit is able to work with a plug-in card. In this circumstance, IDU controller X8A is closed, IDU works properly. If X8A is disconnected, IDU stops.



- The input signal must be passive rather than active. Otherwise, the main board may get burnt. The switching line shall be less than 2 meters and away from power interference.

4.4 Remote on/off functions

When bit 1 of DIP switch S3 is at the OFF position, remote on/off functions are enabled. When X8A open/close status changes, IDU status changes. That is, if IDU is on, when X8A open/close status changes, the IDU turns off. If IDU is off, when X8A open/close status changes, the IDU turns on automatically.

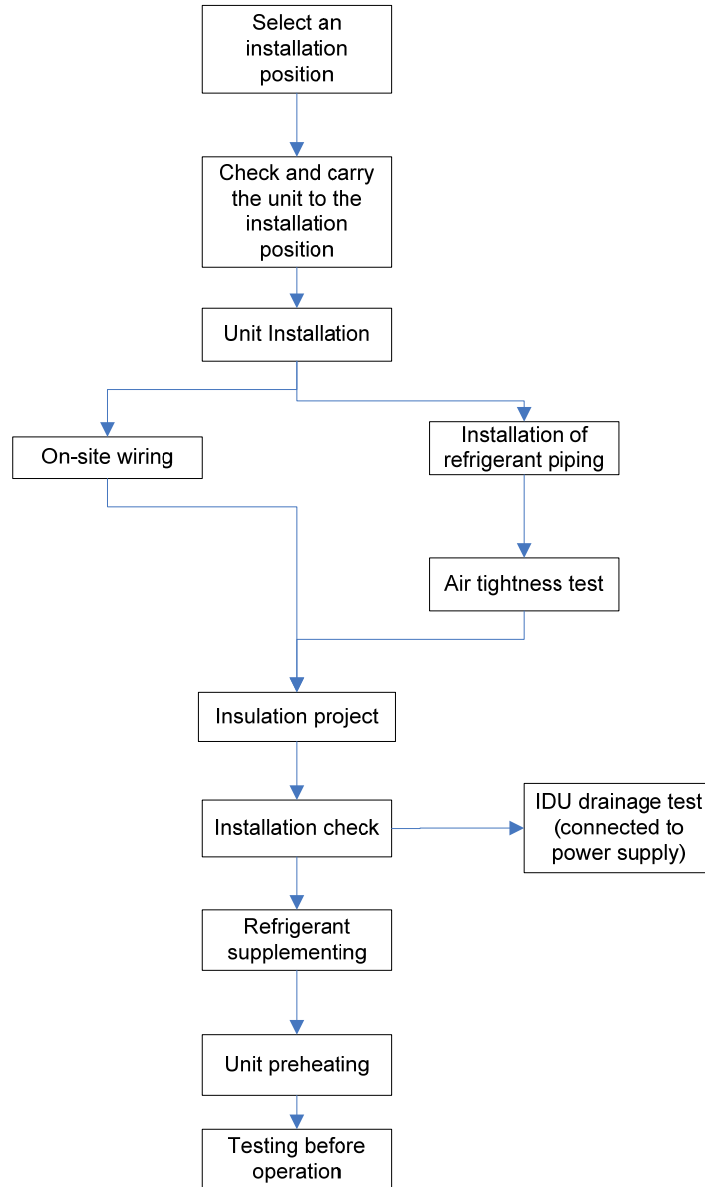
Notes: refer to Section 4.3 for interface drawing.

The input signal must be passive rather than active. Otherwise, the main board may get burnt. The switching line shall be less than 2 meters and away from power interference.

Chapter V Testing and Trial Operation

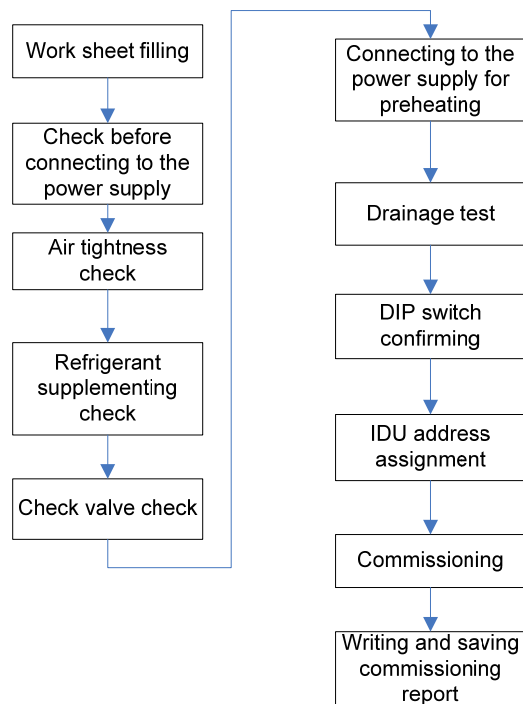
1. Testing before Operation

1.1 Installation process

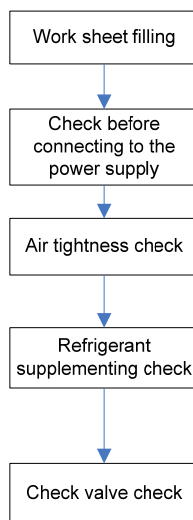


1.2 Testing procedures

After installation, test the unit according to the procedures below:



1.2.1 Check before connecting to the power supply



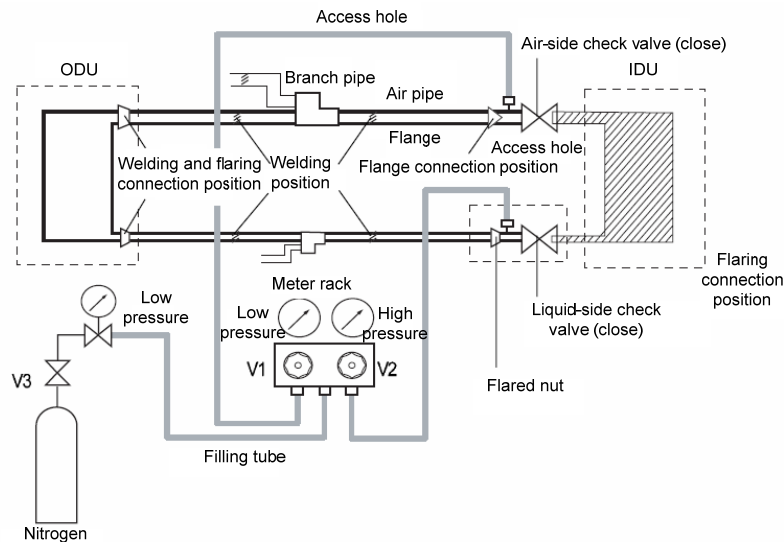
1.2.1.1 Electrical check

1. Whether carry out wiring work in accordance with regulations
2. Whether wire diameter complies with standard
3. Whether screws are reliably tightened
4. Whether the unit is grounded properly
5. Whether or not use a 500V megohm meter to measure main circuits' insulation resistance

1.2.1.2 Air tightness test

1. Use nitrogen in air tightness test instead of oxygen, flammable and toxic gas.
2. Use a pressure gauge dedicated for R410A with a range above than 45 kgf/cm².

3. Connect high pressure pipe and low pressure pipe and increase pressure for them at the same time. Do not increase ODU pressure by connecting to the ball valve.
4. The pressure increased in the third phase must not exceed 40 kgf/cm² and the time for holding the fixed pressure shall not exceed 24 hours.
5. After passing the air tightness test, the unit is required to lower the levels of pressure to 0.2~0.3 Mpa and be stored at a fixed pressure.

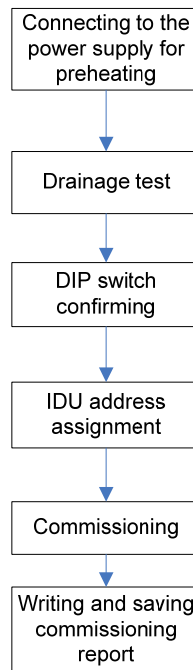


1.2.1.3 Refrigerant supplementing table

Liquid pipe diameter (mm)	6.35	9.52	12.7	15.88	19.05
Supplemented refrigerant quantity (g/m)	45	70	120	180	260

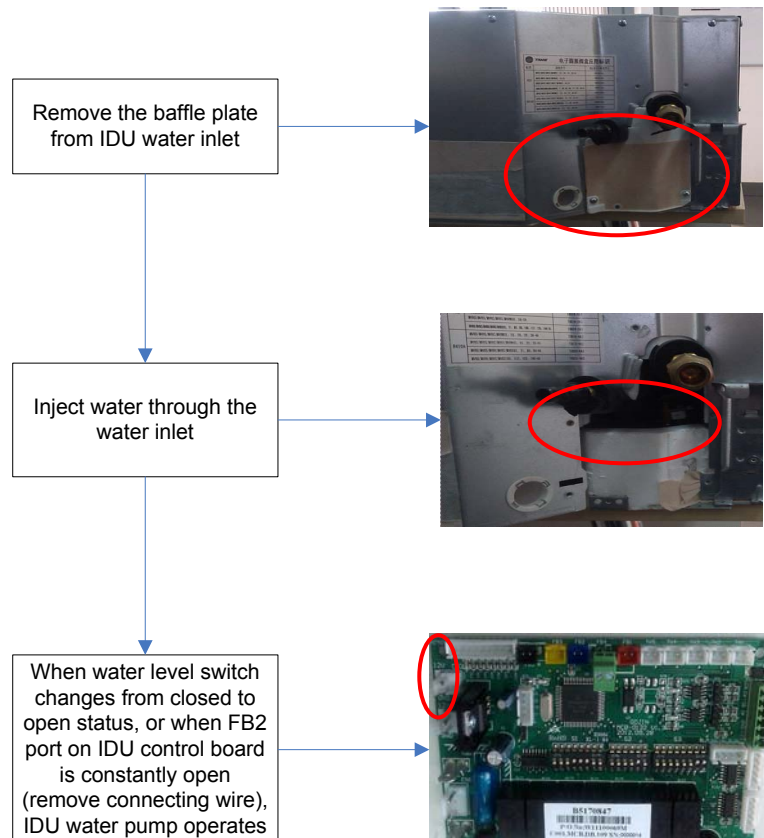
1. Supplemented refrigerant quantity=(L1*0.045+L2*0.07+L3*0.12+L4*0.18+L5*0.26)kg
2. Verify that high/low pressure check valves of ODU are closed.
3. Use an electronic scale to measure the amount of refrigerant to be supplemented. Never attempt to supplement refrigerant based on experience.
4. **R410A refrigerant must be supplemented in liquid form. If using R410A charge tank without siphon, make sure that the tank is put upside down before charging.**

1.2.2 Connecting to the power supply for preheating

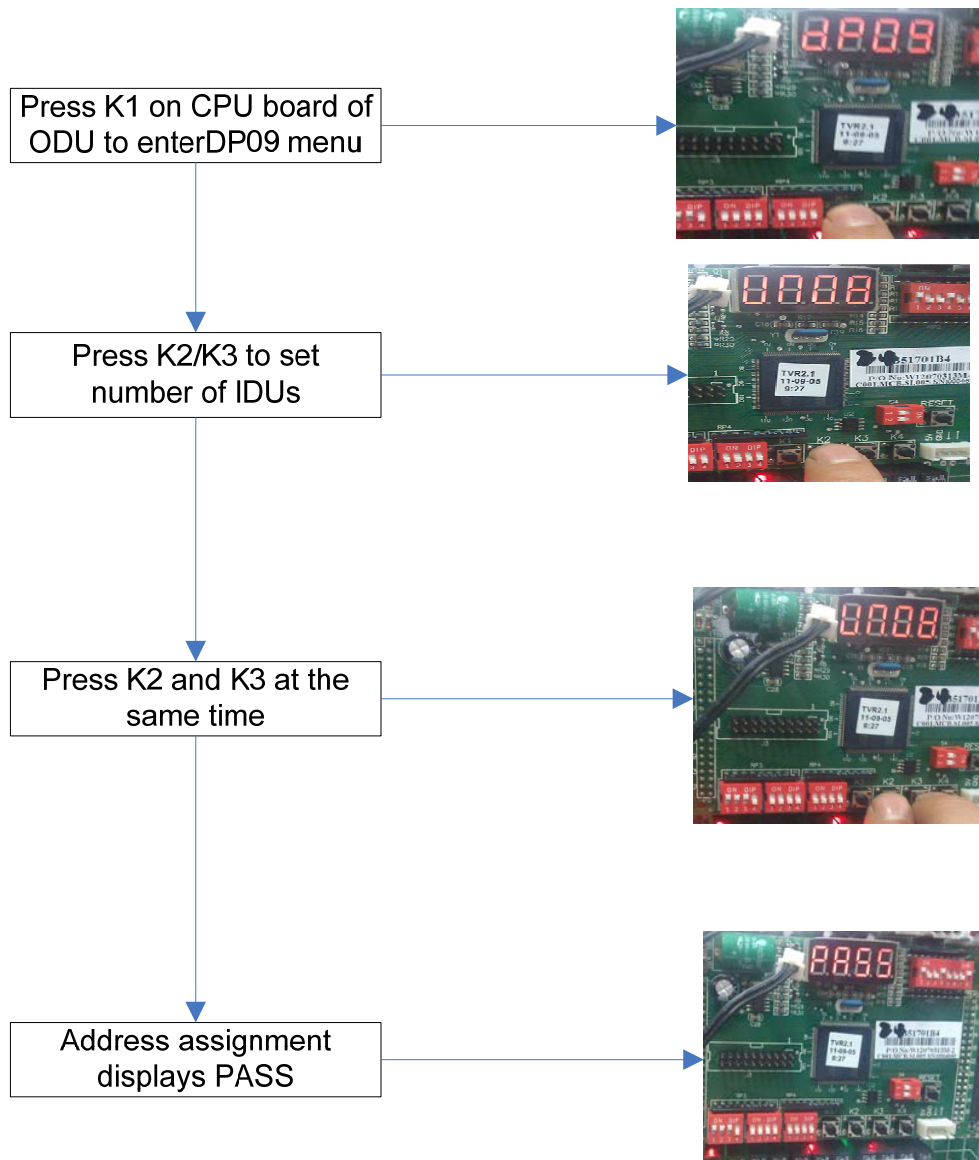


Make sure that the unit is connected to the power supply at least 8 hours before operation, so as to protect compressor (crankcase heating belt) and to confirm power phase sequence, magnitude of voltage and three-phase equilibrium.

1.2.2.1 IDU drainage test



1.2.2.2 Confirm DIP switch for ODU (refer to DIP switch table or circuit diagram inside ODU electric control box).IDU addresses are assigned manually as follows:



2. Testing Software

2.1 Use of testing software

2.1.1 Installation of software

Monitoring software contains the following three files and one registration file of communication control. Before use, note to install Monitor software\Usb to 485 driver\98ME_20011_2kXP_20024\Y-105 Driver and unzip and run project1.exe.

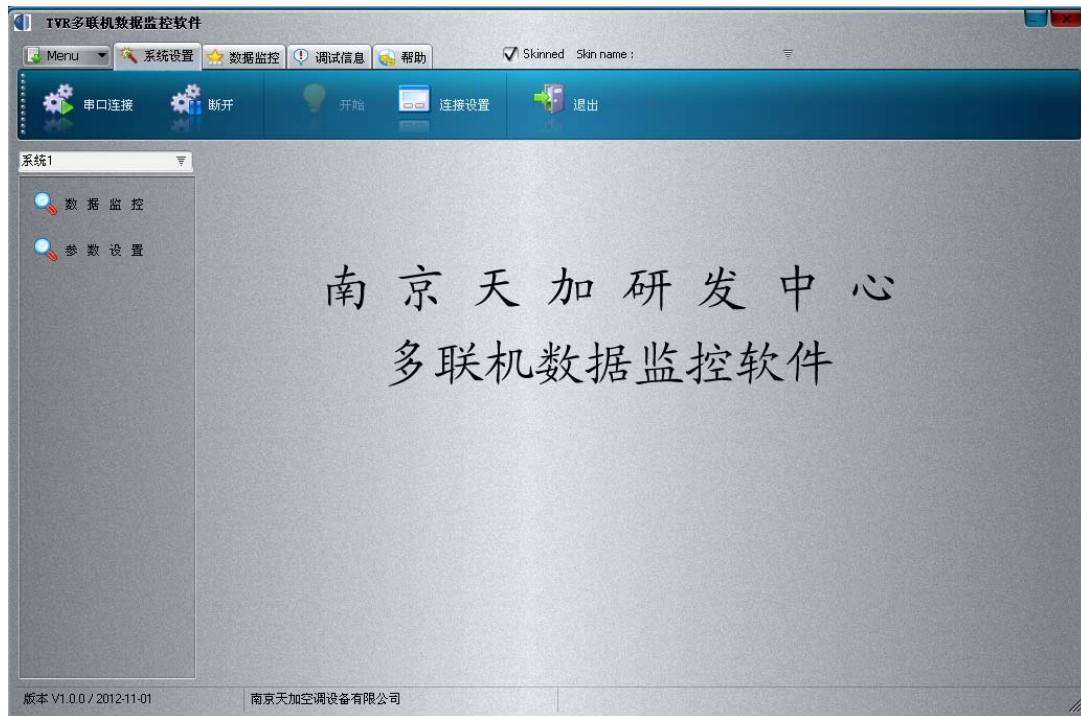


2.1.2 Installation of software:

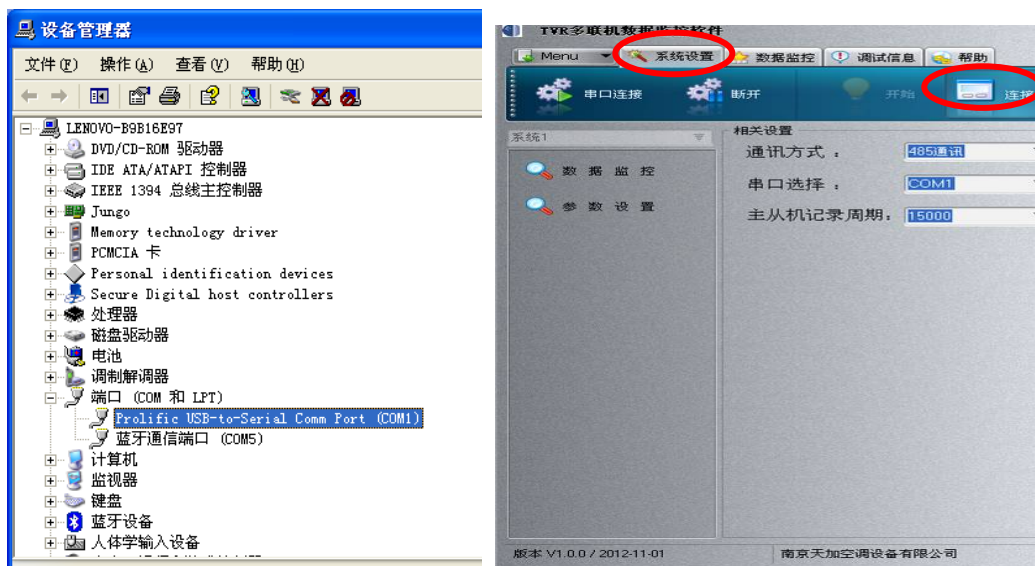
Before use, make all preparations: connect converter to PC through USB interface and terminal A and B of converter to NET interface of ODU. Make sure that A is connected to A and B to B.



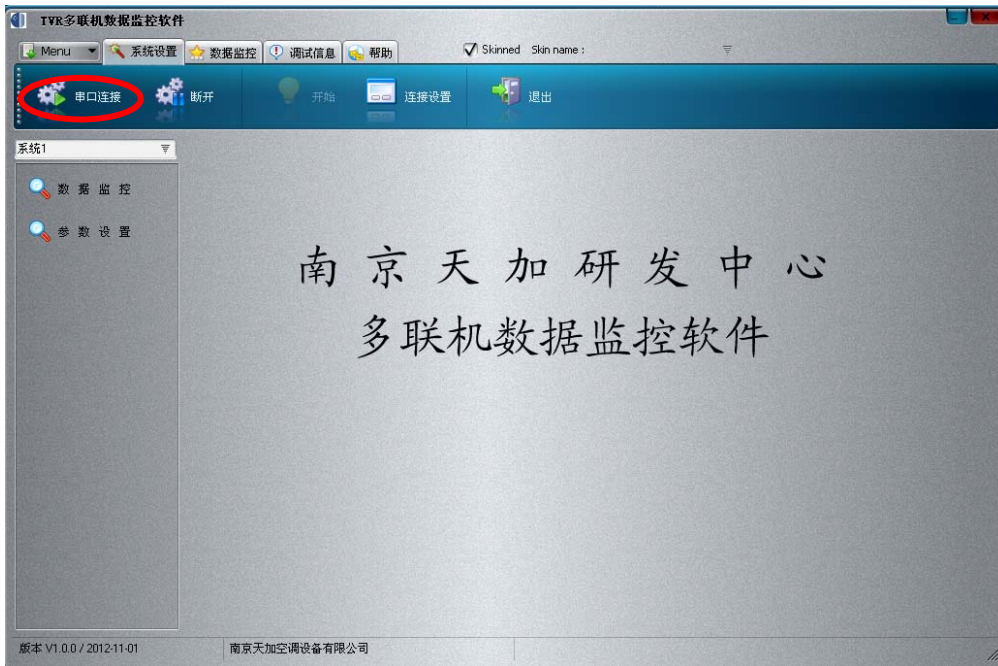
Double click the software and the following screen appears:



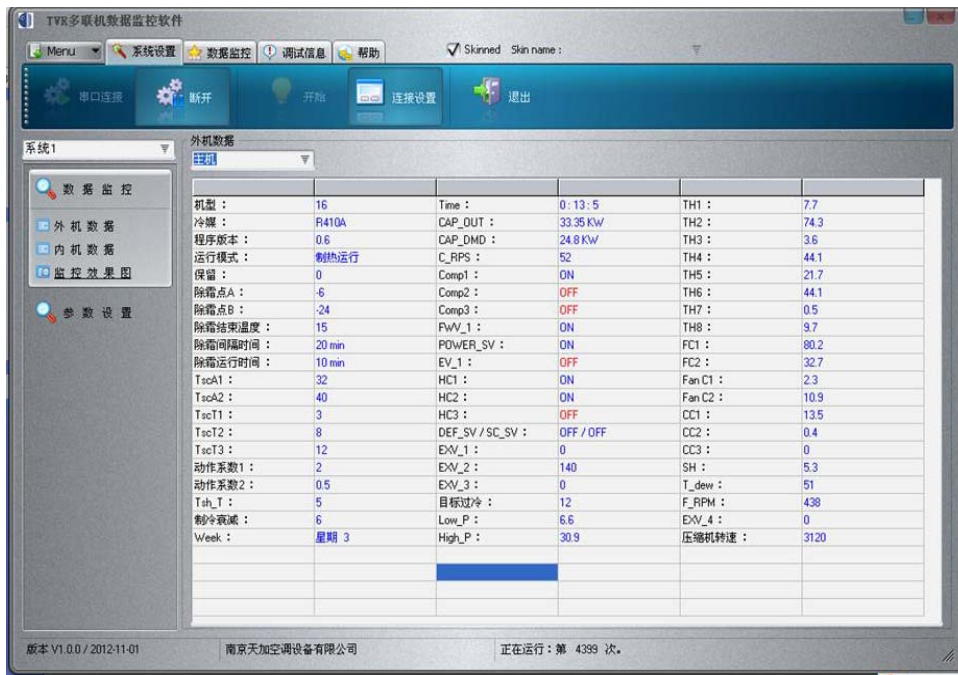
For initial use, set up COM port (for specific ports, refer to Device Manager under Computer Properties). Set software port as follows: **System Settings** → **Connection** → **Serial Port Selection** → **Confirming Port**



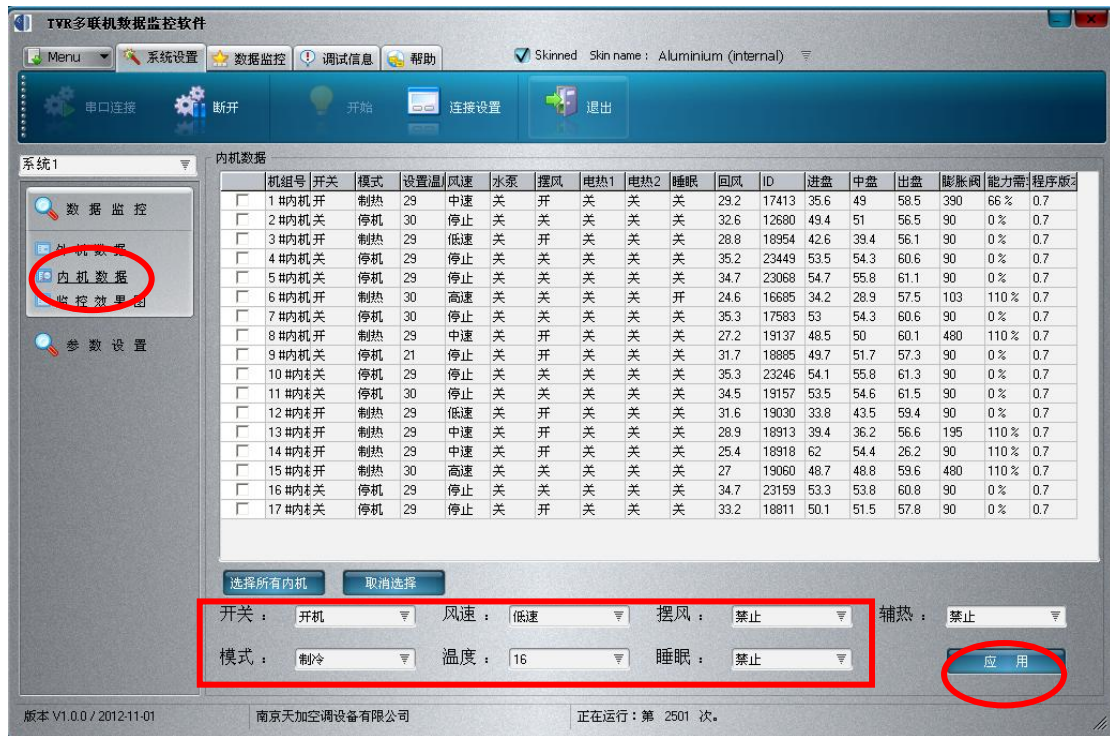
Then, click **Serial Port Connection**



Then, the following screen appears

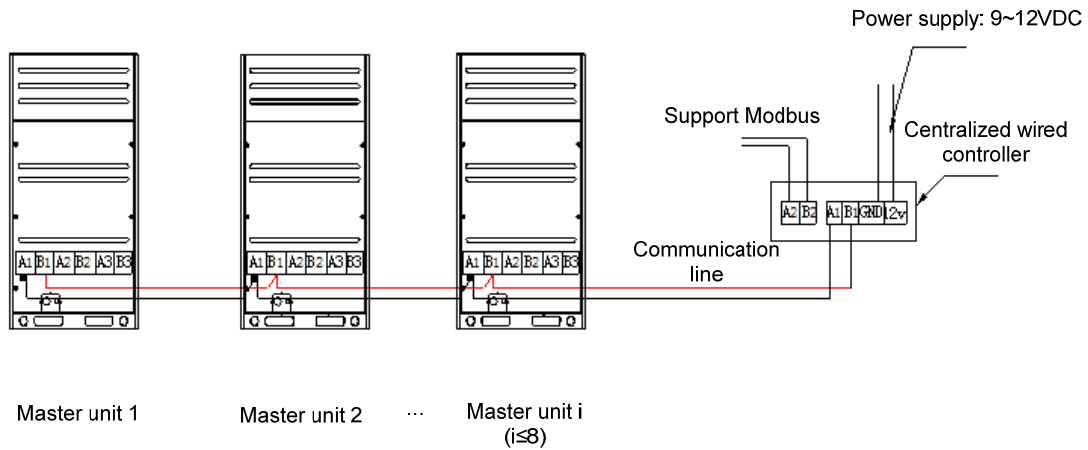


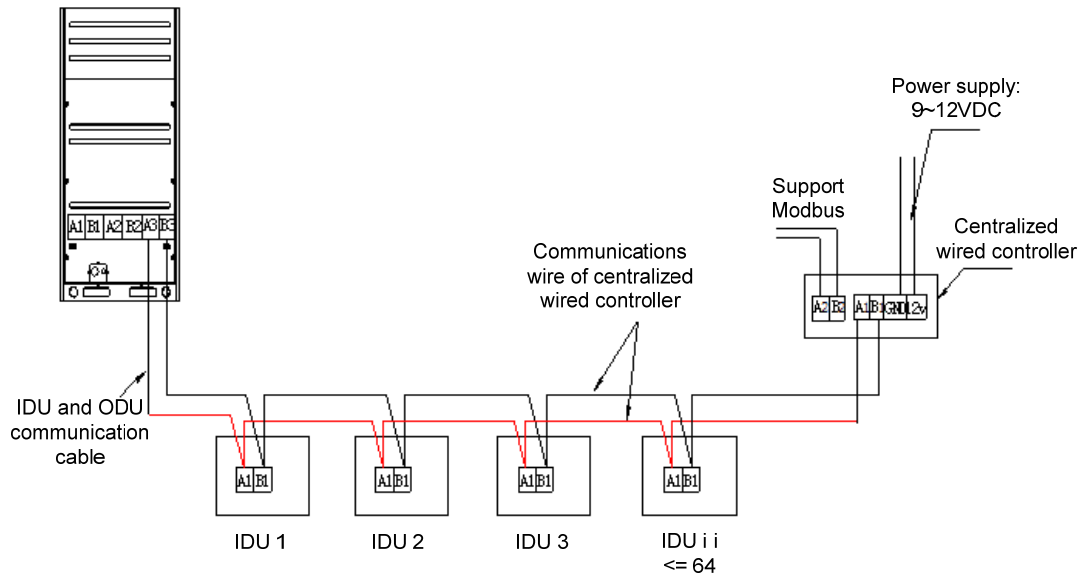
Click **IDU Data** → set IDU operating data → click **Confirm**



3. Centralized Control

3.1 Methods of installing TIMS centralized wired controller





Notes:

- 1) In the first method: if ODU is a modular unit, communication cable of centralized wired controller must be connected to the master unit. In addition, PC monitoring software is unavailable.
- 2) Fix the centralized wired controller to the wall the same as fixing a wired controller.
- 3) Use centralized wired controller with care. Damages may be caused if dropping it on the ground or into water.
- 4) In the first installation method, each master unit address is unique and continual and starts from 01: master unit 1: AR01 master unit 2: AR02 master unit 3: AR03.....
- 5) Address settings: SP03 monitors equipment address setting in a uniform way; SP04 monitors communication baud rate setting in a uniform way.

3.2 DIP switch description of TIMS centralized wired controller



S1 DIP switch:

No. 5 digit: communication mode setting, ON by default; refer to Table 1 for its definition:

Table 1:

DIP switch 5	Function	Definition
1	Communication mode, corresponding to methods of installing centralized wired controller in Page 2	Installation method 1
0		Installation method 2

When DIP switch 5 is 1, the four digits indicate system quantity; when DIP switch 5 is 0, the four digits have no meaning. See Table 2 for definition:

Table 2:

DIP switch 1	DIP switch 2	DIP switch 3	DIP switch 4	Function	System quantity
0	0	0	0	When DIP switch 5 is 1, the four digits indicate system quantity; when DIP switch 5 is at other positions, the four digits have no meaning.	1
0	0	0	1		2
0	0	1	0		3
0	0	1	1		4
0	1	0	0		5
0	1	0	1		6
0	1	1	0		7
0	1	1	1		8

Notes: Equipment address DIP switch must start from 000 and in a continual manner.

No. 6 digit: model selection. OFF: TIMS-AA, ON: TIMS-AS;

No. 8 digit: 485 communication and TTL communication settings. OFF: TTL communication; ON: 485 communication; (485 communication mode is applied to TIMS centralized wired controller);

S2 DIP switch:

No. 6 digit: communication baud rate settings, see Table 3:

Table 3:

DIP switch 6	Function	Baud rate
0	Baud rate settings	19200
1		9600

Digits 1~5: When Modbus is activated, these five digits define Modbus addresses. For details, refer to Table 4:

Table 4:

DIP switch 1	DIP switch 2	DIP switch 3	DIP switch 4	DIP switch 5	Modbus address
0	0	0	0	0	1
0	0	0	0	1	2
...
1	1	1	1	1	32

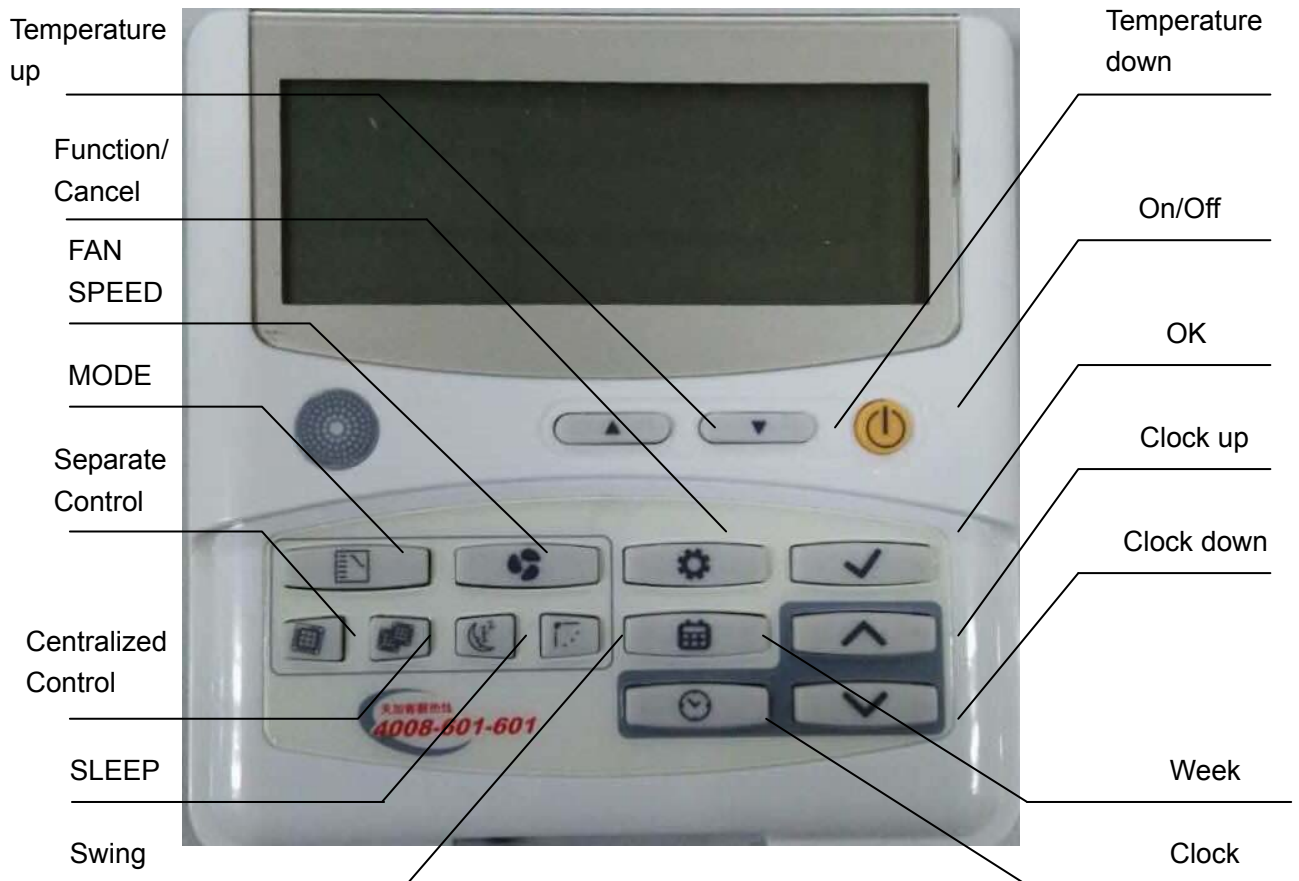
Notes: 1. Each time DIP switch is changed, it is necessary to reset the centralized controller.

No. 7 digit: Short circuit DIP switch for the matched resistor of A1/B1 communication interface; ON: connects to the matched resistor; OFF: not connects to the matched resistor;

No. 8 digit: Short circuit DIP switch for the matched resistor of A2/B2 communication interface; ON: connects to the matched resistor; OFF: not connects to the matched resistor;

3.3 Functions and instructions of TIMS centralized wired controller

1. Button functions:















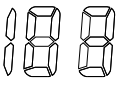
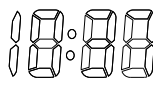
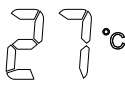







“Separate Control”: to control a specified IDU within the system;

“Centralized Control”: to control all IDUs within the system;

2. Displayed functions of LCD screen icons:

No.	Icon	Function	No.	Icon	Function
1		Power-on	2		Power-off
3		Cooling	4		Dry
5		Fan	6		Heating

7		Auto	8		Defrosting
9		SLEEP	10		Swing
11		Low speed	12		Medium speed
13		High speed	14		Auto wind
15		Electric heating	16		Locking
17		Outdoor ambient temperature icon	18		Indoor ambient temperature/temperature setting icon
19		Fault	20		Compressor on
21		Fault code	22		Clock
23		Indoor ambient temperature/temperature setting	24		Communication faults
25		Timed power-on	26		Timed power-off
27		Automatic startup icon after power restoration			Air return temperature mark

3. IDU Numbering

For IDUs under centralized wired control, numbering starts from 1 and ends at 64.

If more than one ODU system exists, numbering starts from No. 1 IDU of No. 1 System and so on.

For example:

IDU of No. 1 System	1_1	1_2	1_3	1_4	1_5	1_6	1_7	1_8	1_9
IDU numbering on the wired controller	1	2	3	4	5	6	7	8	9
IDU of No. 2 System	2_1	2_2	2_3	2_4	2_5	2_6	2_7		
IDU numbering on the wired controller	10	11	12	13	14	15	16		
IDU of No. 3 System	3_1	3_2	3_3	3_4	3_5	3_6	3_7	3_8	
IDU numbering on the wired controller	17	18	19	20	21	22	23	24	
IDU of No. 4 System	4_1	4_2	4_3	4_4	4_5	4_6			
IDU numbering on the wired controller	25	26	27	28	29	30			

4. Operation on a Single Unit for IDUs under Centralized Control

For example: To turn on No. 3 IDU and set temperature to 30°C, enable high fan speed, swing and sleep functions, do as follows:

- (1) Press "Separate Control" to display product number "NO--" at "Product No. Display Area";
- (2) Press "Clock Up/Down" and the tens position of IDU No. flashes. Then, modify the tens position of IDU No.;
- (3) Press "Separate Control" to display the tens position of IDU No. at "Product No. Display Area"; the ones position flashes;
- (4) Press "Clock Up/Down" to modify the ones position of IDU No.;
- (5) Press "Separate Control" to determine IDU No.; then "Product No. Display Area" displays desired IDU No., while the other display areas display the desired IDU status;
- (6) Press "On/Off" to set IDU on/off status;
- (7) Press "Temperature Up/Down" to set temperature;
- (8) Press "Mode" to set IDU mode (Auto mode is unavailable);
- (9) Press "Fan" to regulate fan speed; (note: set fan speed when the unit is on)
- (10) Press "Swing";
- (11) Press "Sleep";
- (12) Settings completed;

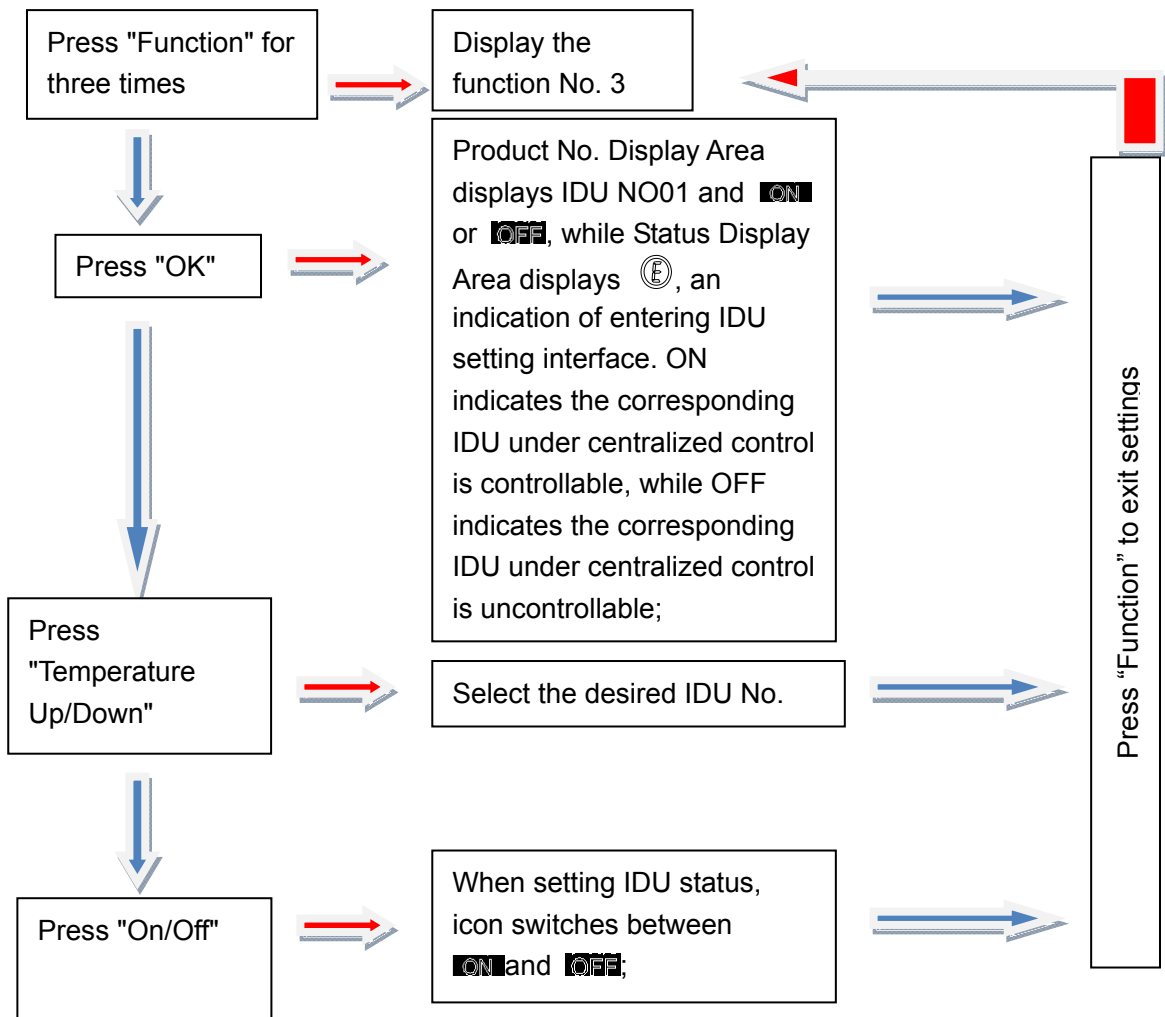
5. Centralized Operation for IDUs under Centralized Control:

For example: To turn on all the IDUs, and set temperature to 30°C, enable high fan speed, swing, auxiliary electric heater and sleep functions, do as follows:

- (1) Press "Centralized Control";

- (2) Press "On/Off" to set IDU status;
- (3) Press "Mode" to set operating mode (Auto mode is unavailable);
- (4) Press "Temperature Up/Down" to set temperature;
- (5) Press "Fan" to regulate fan speed; (note: set fan speed when the unit is on)
- (6) Press "Swing";
- (7) Press "Sleep";
- (8) Settings completed;

6. IDU Functions Settings:

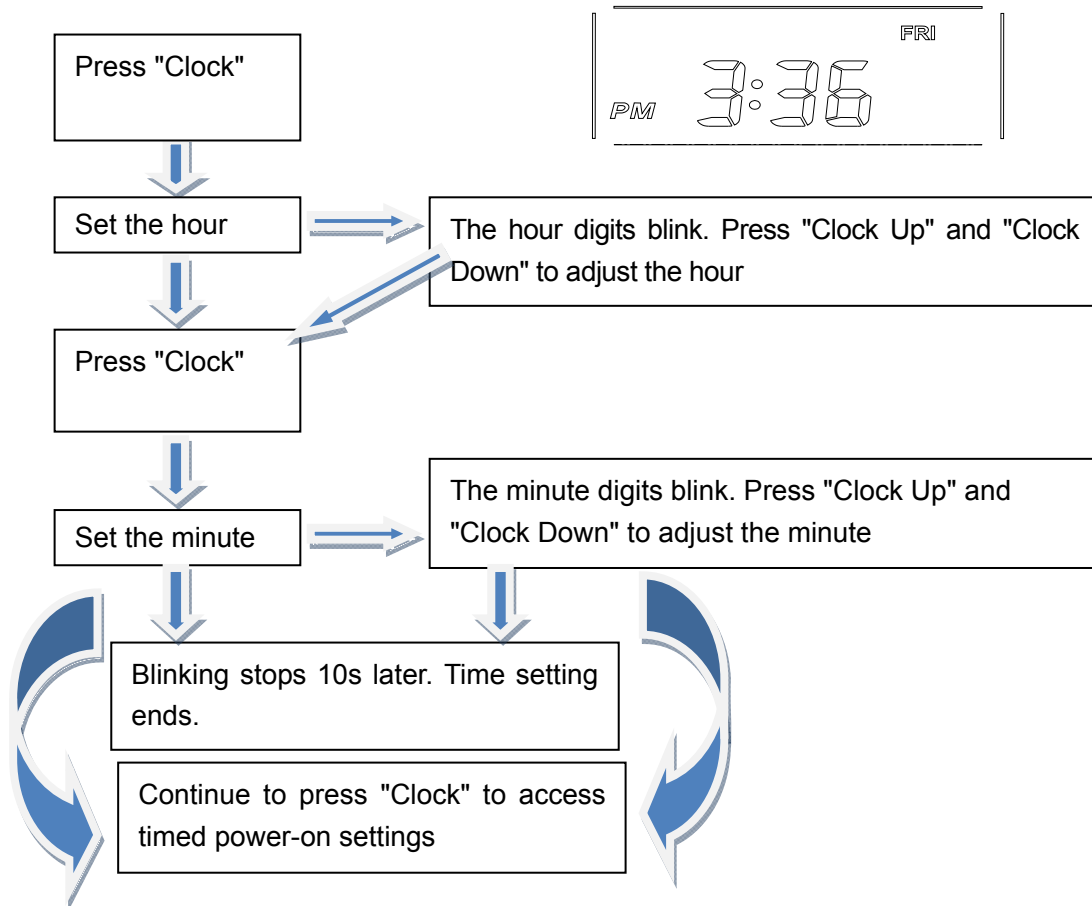


7. Switching between Fahrenheit temperature and Celsius temperature:

Press "Temperature Up/Down" at the same time, and one beep is heard after 5s, which indicates setting successfully completed;

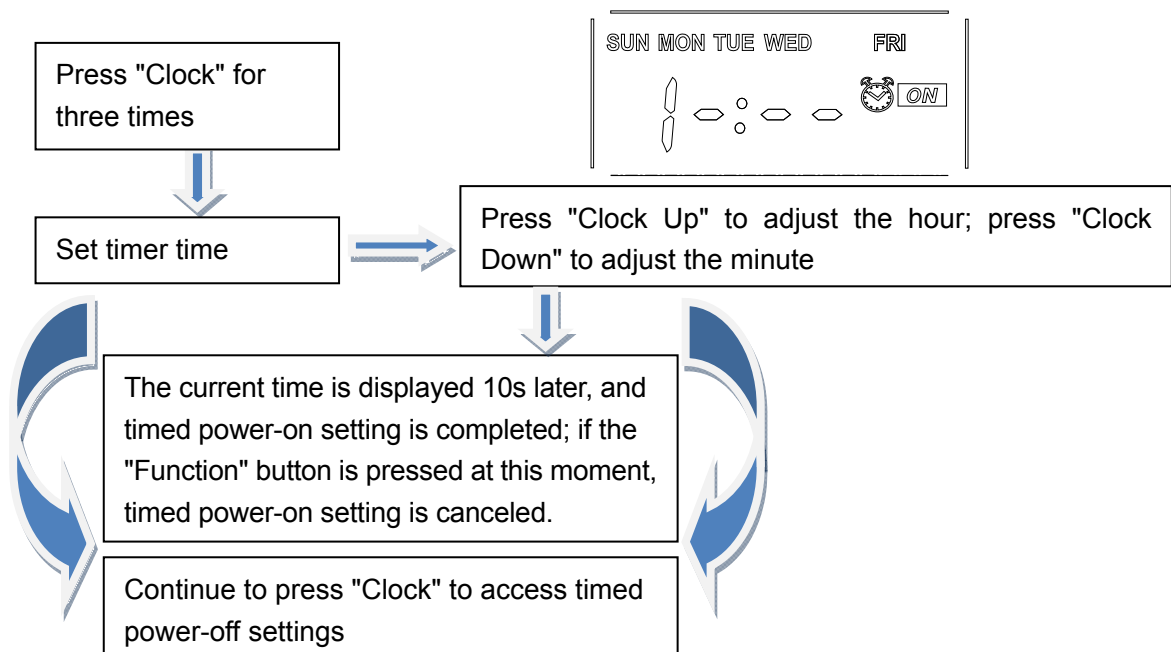
8. Clock settings/timer settings:

- (1) Clock settings:

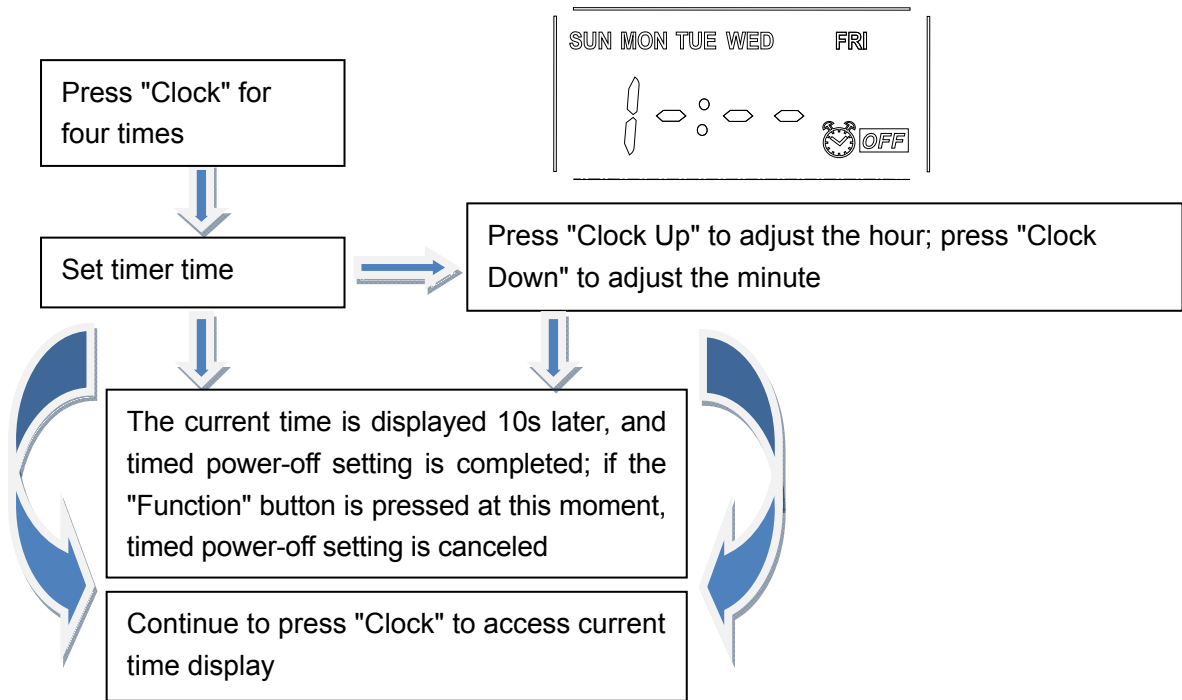


Note: When the clock is displayed normally or time is set, press "Week" to adjust day of the week.

(2) Timed power-on settings:



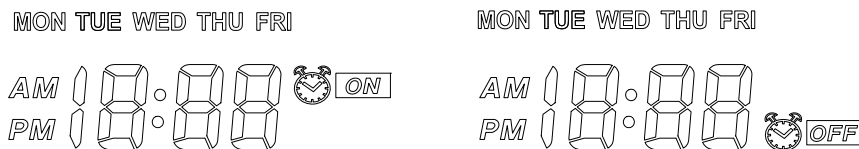
(3) Timed power-off settings:



(4) Week settings in timed power-on/off:

During setting of timed power-on/off, press "Week" till the desired day of the week blinks, and then press "OK" to select timed power-on/off on this date, or press "Function" to cancel timed power-on/off on this date. For example:

(Timed power-on/off is valid from Monday to Friday)



Timed power-on time and icon Timed power-off time and icon

Note 1: Timer setting is valid only when both the time and day of the week are set.

Note 2: All the above functions will exit the setting interface automatically when the backlight is off.

4. Household-based Charging

4.1 Overview

1. Definition

TICA VRF remote-control household-based charging system (also referred to as VRF charging control system) is a new way to monitor air conditioning units and to charge fees which are targeted solutions for central air conditioning of commercial buildings and

residences. This system offers solutions for places where multiple property owners use different IDUs but share a public ODU, and hence clarifies ODU electricity distribution among multiple property owners. In the meantime, the system provides solutions for remote and uniform control of VRF air conditioner, hence making management and maintenance on VRF air conditioning units more convenient.

Household-based charging technology is widely applied to places where central heating and central air conditioning is required. It is available in the following three types: based on time, based on both time and energy, and based on energy. Using a highly accurate energy based method, TICA's household-based charging is a way that could distribute electricity depending on users' actual consumption of cooling/heating amount in the room. According to this method, fees are charged depending on the room area or rated cooling capacity of IDU, which is more reasonable and justified. In addition, this system could prompt users to be more energy conscious.

2. Application scope

This charging system is only applied to TICA VRF units under remote control. It is a dedicated system and hence not applicable to other manufacturers' equipment.

3. Requirements in use of software

The computer where this software runs must meet the following requirements:

- (1) Hardware: at least 2GB memory and 2.0GHz CPU
- (2) Operating system: Windows XP (SP3), Windows Vista, Windows 7
- (3) Resolution: at least 1024×768
- (4) Interfaces: at least 1 RS232 interface
- (5) UPS system: make sure that the computer can still work for 1 hour after a power outage.

4. Charging principle

The electricity consumed by TICA VRF units fall into the following four categories:

- 1: Electricity consumed by IDU-- including energy consumed by electric heater and fan
- 2: Electricity consumed by ODU during operation--power consumption to be distributed according to IDU load ratio
- 3: Electricity consumed by ODU during standby mode--power consumption to be distributed according to IDU capacity
- 4: Air conditioner in public area--power consumption to be distributed according to IDU capacity

1 and 2 fall within the scope of basic power consumption while 3 and 4 within the scope of power consumption equally shared by all.

4.2 Software installation

The household-based charging software uses MySQL as its database and Crystal Reports

to generate reports. Before running this software, install MySQL Database Software and Crystal Reports Operating Environment.

1. Database software installation

Before using this charging software, install MySQL database.



Figure 1 MySQL Installer

2. Installation of Crystal Reports Operating Environment

This set of software is able to help users generate reports. Before running Crystal Reports, install Crystal Reports Operating Environment first. Install CRRuntime_32bit_13_0.msi or CRRuntime_64bit_13_0.msi on 32 bit or 64 bit operating system.



Figure 2 Crystal Reports Operating Environment

3. Installation

As a piece of green software, it does not require installation for use. Unpack the software to a folder, which contains a folder and some files as shown below. Note to delete no files in this folder.

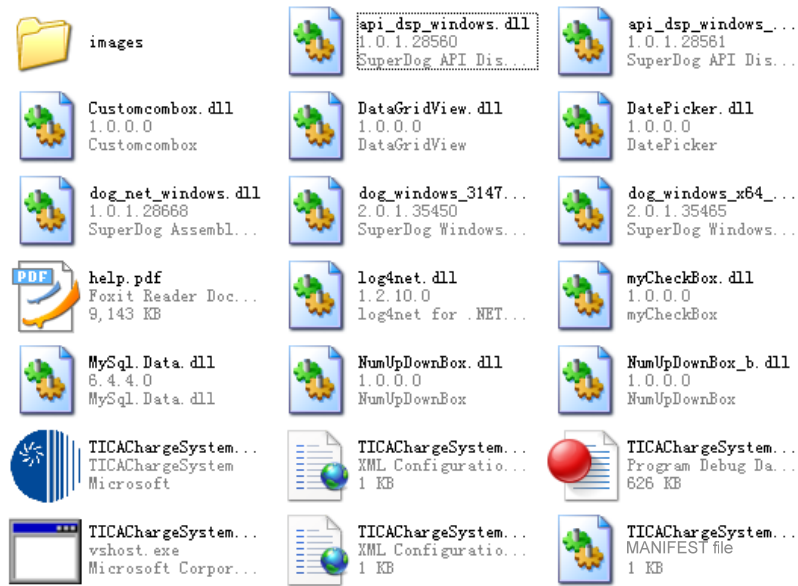


Figure 3 Charging Software Installation Package

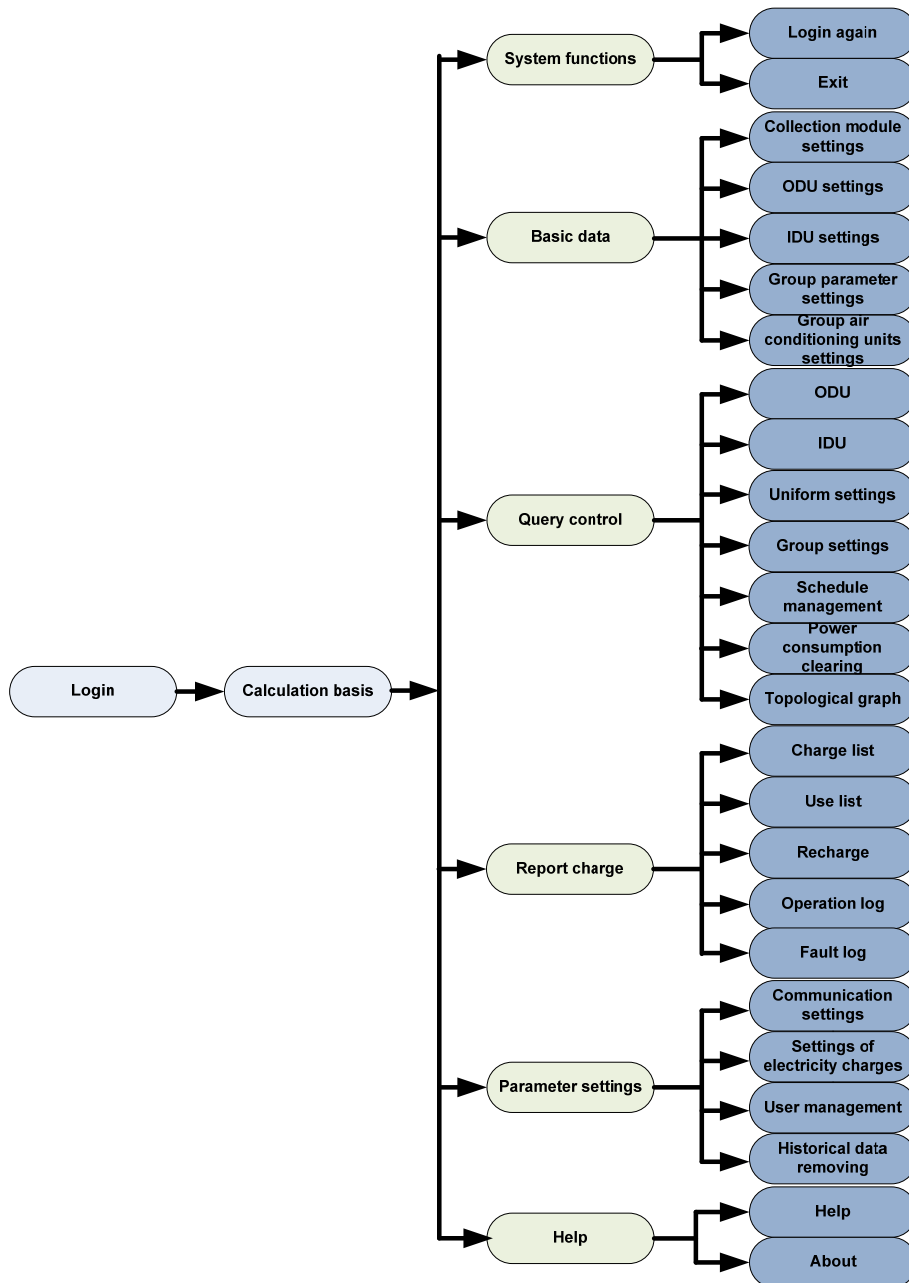
Click **TICAChargeSystem.exe** to start installation.



4.3 Use of software

1. Functions and structures

The system consists of front end, back end and database. The front end is a layer where users could operate the software and make data queries. The back end could update the system automatically and constantly, and in this way could provide the latest IDU and ODU information of central air conditioning units and send control and query signals to users in a timely manner. Database is used to store IDU and ODU information and to distribute electricity among various IDUs through some internal mechanisms. Refer to the following tree diagram:



Software structure and function diagram

2. Login and exit

(1) Login

Click **TICACHargeSystem.exe** to log in. See the figure below:



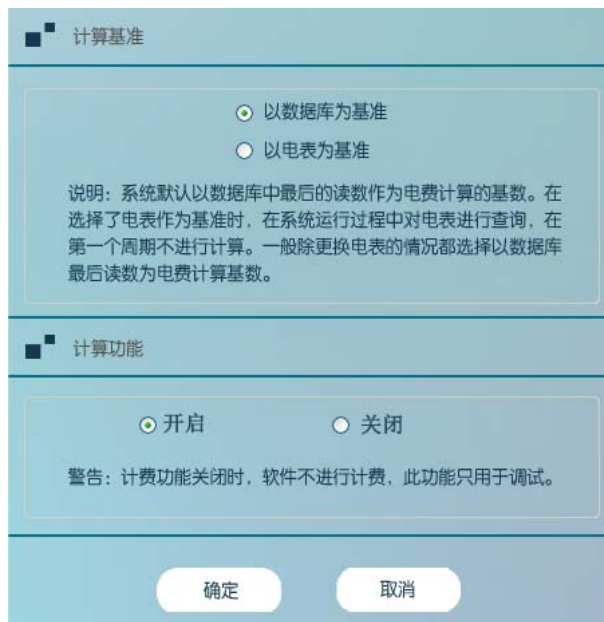
Functions: To check whether login ID is correct. Users could log in to the system by entering the correct ID and password.

Interface: This interface provides five operable areas for users: **Enter ID**, **Enter Password**, **Remember Password**, **OK**, and **Cancel**.

Operation: Click **Cancel** to exit; Click **OK** to check whether entered ID and password are correct. If yes, go to the “Calculation Basis” interface.

(2) Calculation Basis

Enter Calculation Basis after login.



Functions: Choose Calculation Basis and Calculation Function.

The last reading in the database is the basis for charging. Generally the query made on the electricity meter is not taken into account during the first cycle. Except that electricity meter needs to be replaced, generally the last reading in the database is the basis for

calculating fees charged.

Calculation Function is used to enable and disable charging function. When charging function is disabled, the software stops charging. This only occurs when equipment needs to be tested by the admin.

Interface: There are three areas on this interface, respectively Calculation Basis area, Calculation Function area, and operational area. At Calculation Basis area, users could choose “Database-based” or “Electricity Meter Based”; at Calculation Function area, users could enable or disable this function; and at operational area, users could click **OK** or **Cancel** to confirm their choices.

Operation: Click **Cancel** to exit; Click **OK** to enter Main Interface depending on users’ choice of Calculation Basis and Calculation Function.

(3) Main interface



Functions: Main interface of this charging software.

Interface: Users will be redirected to the main interface after selecting a calculation basis. There are four areas on the main interface. A indicates menu bar, B indicates shortcuts, C is functional area, and D is status bar. Menu provides access to all functions. Status bar is used to display time and communication status in real time. Functional area is where users can operate and control the air conditioner on the main interface. Shortcuts are provided for ease of switching among different interfaces of functional area.

Operation: Click menu bar in A/B area to access corresponding functions.

(4) Exit

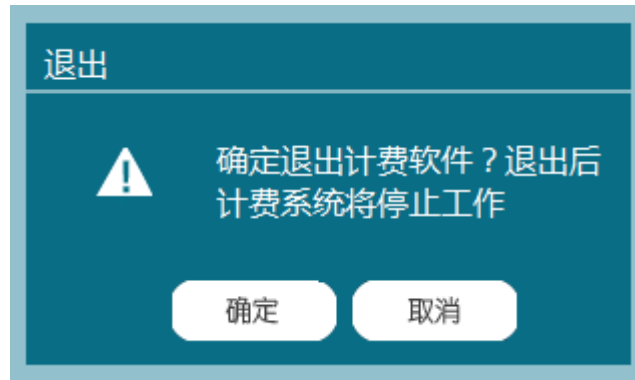


Figure1Exit

Functions: Exit the software.

Interface: Two buttons available on this interface, respectively OK and Cancel.

Operation: Click **System Functions** at menu bar and then click **Exit**. Click **Cancel** to return to main interface and **OK** to exit this software.

(5) Login again



Functions: It enables users to switch between different accounts without having to exit the software. Authorization varies depending on accounts. Therefore, switching between accounts may affect access to some functions. For authorization, please refer to description on User Management page.

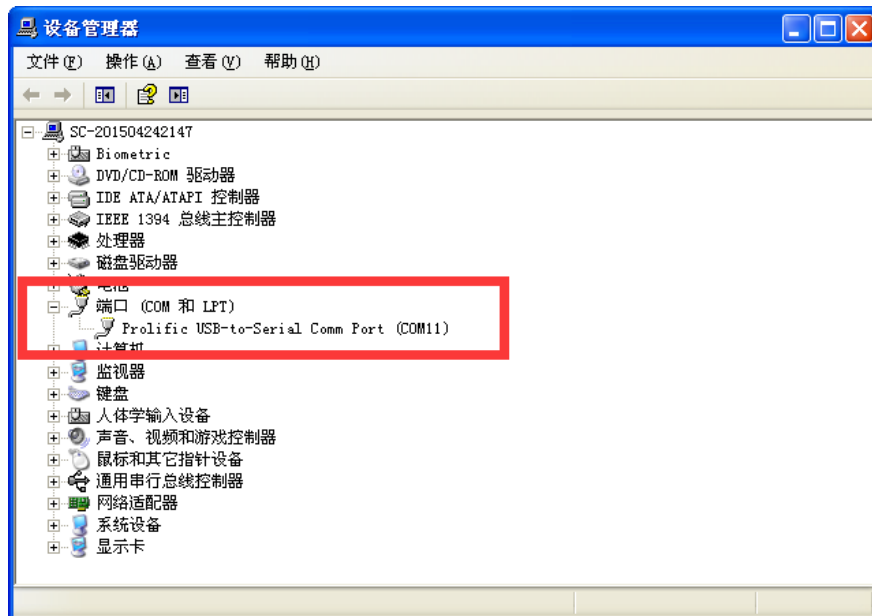
Interface: The same as login interface.

Operation: Click **System Functions** at menu bar and then click **Login Again**. Click **Cancel** to return to main interface and **OK** to verify user's account. After verification completed, user logs in to another account and returns to main interface.

4.4 Parameter settings

(1) Communication settings

This set of software connects and exchanges data through computer serial ports and collection modules. Therefore, serial port numbers shall be properly set. User can check serial port numbers in Device Manager, and set them through Parameters Settings→Communication Settings.



Functions: at Communication Settings interface user is able to set communication port of this software. Configure ports properly to allow communication between software and collection modules.

Interface: This interface displays the current port configured; the drop-down menu of ports lists all the ports available for use; click **OK** to confirm your settings.

Operation: Go to Communication Settings interface under Parameters Settings, and select a proper port for software communication from the port drop-down menu; then Click **OK**, and an alert dialog **Change Port** pops out. Click **Cancel** to return to Communication Settings interface, or **OK** to change port and then return to Communication Settings interface.



(2) Settings of electricity charges



Functions: Set electricity charges from Parameters Settings. Electricity prices can be either uniform or classified according to peak demand periods and off-peak demand periods.

Electricity price has four attributes, respectively type (including uniform price, and price for peak hours and off-peak hours), unit price, starting time and closing time.

Interface: presentation area on the left and setting area on the right. The presentation area on the left displays the current electricity price. On the right user can select Type, Unit Price, Starting Time and Closing Time, and change electricity price by clicking **Update**, **Delete** or **Add**.

Operation:

From the drop-down menu, user can select electricity price type, unit price, starting time and closing time. User can also add an electricity price item (Only one uniform price exists in the system, and the price intervals can not be overlapped). Once the electricity price item is added, it will be shown on the left.

Select one electricity price item on the left, and click **Delete** to delete it.

Or change electricity price type, unit price, starting time and closing time and click **Update**.

4.5 Query control

Through Query Control menu, user can carry out operations below: ODU Query, IDU Query and Control, Uniform Settings, Group Settings, Schedule Management, Topological Graph Check, and Power Consumption Clearing.

(1) ODU



Functions: User can move to ODU Query interface through ODU under Query Control or shortcut button ODU. This interface displays ODU status, electricity meter status and error information.

Interface: Four areas in total. The left area contains a system list, where red dot indicates on line and gray dot indicates off line. The upper right area contains electricity meter information, including off line/on line indication (gray line below electricity meter indicates off line), electricity meter name (also collection module name), multiple and reading of electricity meter. The middle area on the right displays operating status of ODU. The lower right area contains a fault list.

Operation:

In the system list on the left, select a collection module, and the right area will display the electricity meter status, ODU status and fault list of the corresponding system.

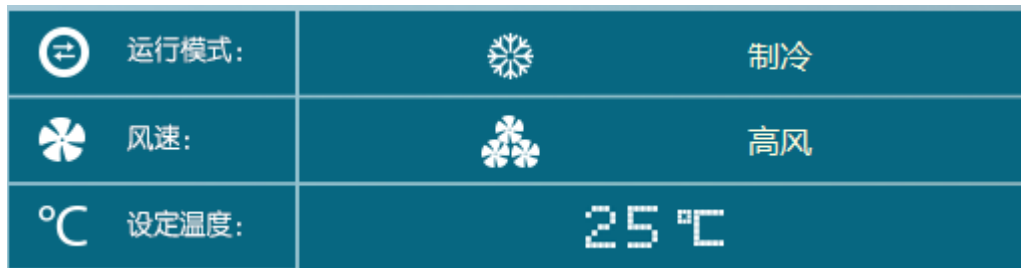
(2) IDU



Functions: User can move to IDU interface through IDU under Query Control or shortcut button IDU. This interface displays IDU status and sends IDU control commands.

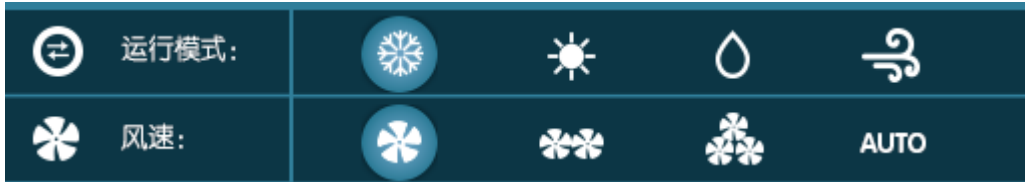
Interface: Four areas in total. The upper left area contains a system list, where red dot indicates on line and gray dot indicates off line. The lower left area contains a list of IDUs, where red dot indicates on line and gray dot indicates off line.

The upper right area displays IDU status, including operating mode, fan speed, set temperature, swing/sleep/electric heater status and shield status. See the figure below:





The lower right area is reserved for IDU settings. User can select operating mode, fan speed, temperature, swing/sleep/electric heater status, shield status and ON/OFF status. For operating mode and fan speed, refer to the figure below. Operating modes are Cooling, Heating, Dehumidification and Air Supply respectively from left to right; and fan speed modes are Low, Medium, High and Auto respectively from left to right.



Change temperature values by clicking arrows on the two sides.



User needs to select the IDUs requiring control under List of IDUs. More than one IDU can be selected.



Select a single IDU



Select all IDUs

Select Shield when necessary, as shown below.



Operation:

Select the list from upper left area and IDU from lower left area, and then the upper right area will display the status of selected IDUs.

Select the IDU from lower left area and choose from lower right area the operating mode, fan speed, set temperature, swing/sleep/electric heater status, shield status and ON/OFF status. Click **Settings** to send commands and to set IDUs.

(3) Uniform Settings



Figure 2Uniform Settings

Functions: User can move to Uniform Settings interface through Uniform Settings under Query Control or shortcut button Uniform Settings. IDUs of the entire system can be accessed from this interface.

Interface: Three areas in total. The left area contains a system list, where red dot indicates on line and gray dot indicates off line. The upper right area is where user can set and send commands. The lower right area displays the status of commands.

Operation:

From upper right area user can select operating mode, fan speed, temperature,

swing/sleep/electric heater status, shield status and ON/OFF status. Click **Settings** to send IDU setting commands.

The status presentation area will display the command delivery status.

(4) Group Settings



Functions: User can move to Group Settings interface through Group Settings under Query Control or shortcut button Group Settings. Set all the IDUs within the group in a uniform way from this interface.

Interface: Three areas in total. The left area contains a list of IDUs within a group, where red dot indicates on line and gray dot indicates off line. Group number can be selected. The upper right area is where user can set and send commands. The lower right area displays the status of commands.

Operation:

Select group number on the left to display all the IDUs within this group. By default, all the

IDUs are marked by , indicating all the IDUs under uniform control. Once the mark is removed from one single IDU, this IDU will be immune from group commands.

From upper right area user can select operating mode, fan speed, temperature, swing/sleep/electric heater status, shield status and ON/OFF status. Click **Settings** to send IDU setting commands.

The status presentation area will display the command delivery status.

(5) Schedule Management



Functions: User can move to Schedule Management interface through Schedule Management under Query Control or shortcut button Schedule Management. From this interface, user can gain access to all IDUs and implement time management.

Set a single date or weekday from Schedule Management. User can select a single IDU, a certain group or all air conditioning units.

Interface: From top to bottom this interface displays List Area, Time Selection Area, Operation Selection Area, Equipment Selection Area, Remarks Area and Buttons Area.

List Area displays all schedule management rules that are previously set. Time Area is where user can set a single date, a weekday or the specific time. Operation Selection Area is where user implements schedule management, including setting operating mode, fan speed, temperature, and ON/OFF status.

Equipment Selection Area is where user can select and move some equipment under schedule management. User can select a single piece of equipment, a group or all equipment.



Selection of a single piece of equipment



Selection of a group



Selection of all

Remarks Area is where users provide comments on customized rules.

Operation:

Respectively set Time, Operation and Equipment, click **Add** to add a new schedule management rule into the list.

Click a schedule management rule in the list and then click **Delete** to delete it.

(6) Topological graph



Functions: User can move to Topological Graph interface through Topological Graph under Query Control or shortcut button Topological Graph. Through Topological Graph user can have a quick view of constituent parts of a VRF system and of electricity meter, ODUs and IDUs under each system.

Interface: Three areas in total. The left area contains a system list, where red dot indicates on line and gray dot indicates off line. The upper right area contains electricity meter and ODU information (gray line below electricity meter indicates off line).



Off line indicator

The lower right area displays IDU information as below.

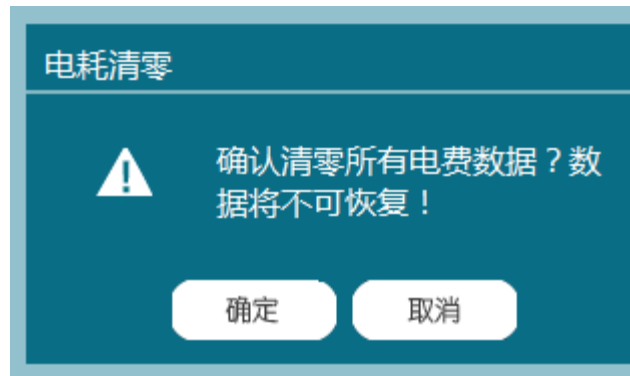


Operation:

Click a certain system from the system list, and the right area will display the information of that system, including electricity meters, ODUs and IDUs.

(7) Power Consumption Clearing

Click **Power Consumption Clearing** under Query Control menu to remove the entire electricity bill data.



Functions: User can enter Power Consumption Clearing interface under Query Control menu. This interface is used to remove all the data on electricity charges for system maintenance purposes.

Interface: Two buttons are available on this interface, respectively Cancel and OK.

Operation: Enter Power Consumption Clearing interface, and click **OK** to remove the entire data; or click **Cancel** to return to main interface.

Chapter VI Troubleshooting

1. Fault Code List

1.1 Description on ODU nixie tubes and fault codes

Legends

0	1	2	3	4	5	6	7	8	9
A	B	C	D	E	F	G	H	I	J
L	N	O	P	R	S	T	U	Y	
Address	COOL			COOL STOP		COOL START		DEFROST	
DEFROST STOP	DEFROST START			Disable		Dry		Enable	
ERROR	FAIL			FAN		HEAT		HEAT STOP	
HEAT START	House power			No error		OFF		ON	
OPEN all exv	parameter			PASS		PROTECT		R22	
R410A	REST			Software version		STOP		Slave	
Set parameter	TEST			Unit number					

After controller is reset, the following contents are shown

		Legend 1	Legend 2	Notes
1	Refrigerant type	R22	R410	R22/R410A
2	Program Version	SF26		The last two numerals indicate program version
3	ODU address	AF03		The last two numerals indicate ODU address
4	Set capacity	HP16		The last two numerals indicate system capacity
5	Number of IDUs	UN30		The last two numerals indicate number of IDUs
6	Number of slave units	SLO1		The last two numerals indicate number of slave units
7	Cooling-only heat pump	C	H	C: Cooling-only; H: Heat pump

Menu structure

K1: used to select menu, applied to DP01~DP09

DP01	Display current clock
DP02	Display the operating mode
DP03	Display real time parameters
DP04	Display set parameters
DP05	Current fault code
DP06	Memorized fault code
DP07	Enter password
DP08	Reserved
DP09	Number of IDUs set

K2/K3:

Display mode	K2 function	K3 function
DP01: Display current clock	Adjust ODU time (hour)	Adjust time (minute)
DP02: Display the operating mode	Null	Null
DP03: Display real time parameters	Page up to display PAXx parameters	Page down to display PAXx parameters
DP04: Display set parameters	Page up to display SAXx parameters or adjust corresponding parameters	Page down to display SAXx parameters or adjust corresponding parameters
DP05: Current fault code	Page up to display fault code	Page down to display fault code
DP06: Memorized fault code	Page up to display memorized fault code	Page down to display memorized fault code

DP07: Enter password	Enter password	Enter password
DP08: Reserved	Reserved	Reserved
DP07: Number of IDUs set	Increase number of IDUs	Reduce number of IDUs

Press K2/K3 simultaneously for IDU address login during initial communication commissioning stage of IDU and ODU. Pass indicates commissioning succeeded and Fail indicates commissioning failed.

K4: Used to enter parameters or confirm password.

Display rules: PA indicates parameter. The last two numerals of system parameters indicate S/N from 00 to 23. Temperature is indicated by °C, pressure by bar, current by A, EXV opening by step, shown as follows

PA00	TH1	PA08	TH9	PA 16	Target superheat
PA01	TH2	PA09	TH10	PA 17	Target over-cooling degree of HIC loop
PA02	TH3	PA 10	CS1	PA 18	PWM
PA03	TH4	PA 11	CS2	PA 19	Total power output
PA04	TH5	PA 12	CS3	PA20	Total power demand
PA05	TH6	PA 13	LP	PA21	EXV1 opening
PA06	TH7	PA 14	HP	PA22	EXV2 opening
PA07	TH8	PA 15	Actual superheat degree Tsca	PA23	EXV3 opening

1.2 Fault code list of ODUs

1. TMS**AA fault code list

Code	Content	Handling by the Machine
E000	Disconnection of inverter high pressure switch	ODU stops
E001	Fan overload/ Fan drive fault	ODU stops
E002	Disconnection of fixed speed high pressure switch	Fixed speed compressor stops

E003	Fixed speed current too high	Fixed speed compressor stops
E004	Compressor drive communication fault	ODU stops
E005	Fan drive communication fault	ODU stops
E006	Compressor drive overheat fault	ODU stops
E007	Compressor drive fault	ODU stops
E008	TH1 fault	If main unit fails, test from 1 and 2 successively; if all units fail, start unit protection procedure; one hour after recovery (through sensor detection), units resume operation
E009	TH2 fault	ODU stops
E010	TH3 fault	Protection runs
E011	TH4 fault	Protection runs
E012	TH5 fault	Protection runs
E013	TH6 fault	Protection runs
E014	TH7 fault	Protection runs
E015	TH8 fault	Fixed speed compressor stops
E016	TH9 fault (FC1)	ODU stops
E017	TH10 fault (FC2)	Fixed speed compressor stops
E018	Compressor 1 overload	Compressor stops
E019	Compressor 2 overload	Compressor stops
E020	Unmatched capacity between IDU and ODU (Abnormal capacity distribution)	ODU stops
E021	Low pressure sensor fault	ODU stops
E022	High pressure sensor fault	ODU stops
E023	TH9 fault	Protection runs
E024	Contactors 1 adhesion	Reserved
E025	Contactors 2 adhesion	Fixed speed compressor stops
E026	Low voltage is too high	ODU stops
E027	Communication fault of slave unit 1#	Slave unit stops
E028	Communication fault	Slave unit stops

	of slave unit 2#	
E029	Communication fault of slave unit 3#	Slave unit stops
E030	RTC fault	Related to clock control, including timer, silent mode at night, and IDU clock
E031	Storing device fault	Refer to default parameters
E032	Insufficient pressure difference	ODU stops
E033	Discharge superheat degree is too high or too low	ODU stops
E034	High voltage is too low	ODU stops
E035	Low voltage is too low	ODU stops
E036	Discharge temperature too high	ODU stops
E037	Ambient temperature exceeding limit	ODU stops, and resumes operation when temperature returns to normal
E038	No communication	ODU stops
E039	System failure	ODU stops. If low/high voltage overload occurs 3 times in an hour, reboot ODU

TIMS**AS fault code list

Fault code	Content	Remarks
E000	Inverter high pressure fault	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E001	Fan 1 drive fault	
E002	INV1 compressor overload	
E003	Discharge temperature of INV1 compressor	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E004	Inverter 1 drive communication fault	
E005	Fan 1 drive communication fault	
E006	Inverter 1 drive overheat fault	
E007	Inverter 1 drive fault	
E008	THo1 sensor fault	
E009	THo2 sensor fault	
E010	THo3 sensor fault	
E011	THo4 sensor fault	
E012	THo5 sensor fault	
E013	THo6 sensor fault	
E014	THo7 sensor fault	
E015	THo8 sensor fault	

E016	Inverter 1 compressor-top temperature sensor fault	
E017	Inverter 2 compressor-top temperature sensor fault	
E018	Master/slave unit 1 communication fault	
E019	Master/slave unit 2 communication fault	
E020	Unmatched capacity between IDU and ODU	
E021	Low pressure sensor fault	
E022	High pressure sensor fault	
E023	Phase sequence fault	ODU stops
E024	INV2 high pressure switch fault	
E025	FAN2 drive fault	
E026	INV2 compressor overload	
E027	Discharge temperature of INV2 compressor is too high	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E028	Inverter 2 drive communication fault	
E029	Fan 2 drive communication fault	
E030	Inverter 2 drive overheat fault	
E031	INV2 drive fault	
E032	Insufficient pressure difference/four-way valve fault	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E033	INV1 discharge superheat degree is too high or too low	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E034	High voltage is too low	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E035	Low voltage is too low/high	
E036	INV2 discharge superheat degree is too high or too low	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E037	Ambient temperature too high/low	
E038	No communication	
E039	System failure	
ECXX	IDU communication fault	EC00 indicates IDU 0#, and EC01 indicates IDU 1#, and so on.

TIMSAX fault code list**

Fault code	Content	Remarks
E000	Disconnection of INV1 high pressure switch	High pressure switch fault or high pressure \geq 40 Bar; if occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E001	Fan 1 drive fault	
E002	INV1 compressor overload	
E003	Discharge temperature of INV1 compressor	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E004	Inverter 1 drive communication fault	
E005	Fan 1 drive communication fault	
E006	Inverter 1 drive overheat fault	
E007	Inverter 1 drive fault	
E008	THo1 sensor fault	
E009	THo2 sensor fault	
E010	THo3 sensor fault	
E011	THo4 sensor fault	
E012	THo5 sensor fault	
E013	THo6 sensor fault	
E014	THo7 sensor fault	
E015	THo8 sensor fault	
E016	Inverter 1 compressor-top temperature sensor fault	
E017	Inverter 2 compressor-top temperature sensor fault	
E018	Master/slave unit 1 communication fault	
E019	Master/slave unit 2 communication fault	
E020	Unmatched capacity between IDU and ODU	
E021	Low pressure sensor fault	
E022	High pressure sensor fault	
E023	Phase sequence (default phase) fault	ODU stops
E024	INV2 high pressure switch fault	High pressure switch fault or high pressure \geq 40 Bar; if occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.

E025	FAN2 drive fault	
E026	INV2 compressor overload	
E027	Discharge temperature of INV2 compressor is too high	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E028	Inverter 2 drive communication fault	
E029	Fan 2 drive communication fault	
E030	Inverter 2 drive overheat fault	
E031	INV2 drive fault	
E032	Insufficient pressure difference/four-way valve fault	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E033	INV1 discharge superheat degree is too high or too low	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E034	High voltage is too low	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E035	Low voltage is too low/high	
E036	INV2 discharge superheat degree is too high or too low	If occurring 3 times in 2 hours, the unit turns off to prevent damages. Power on the unit again.
E037	Ambient temperature too high/low	
E038	No communication	
E039	System failure	
ECXX	IDU communication fault	EC00 indicates IDU 0#, and EC01 indicates IDU 1#, and so on.

1.3 Fault code list of remote control receiver

Flashing times of receiver indicator	Fault description
1	Room temperature thermistor fault
2	Entering coil temperature sensor fault
3	Mid-coil temperature sensor fault
4	Leaving coil temperature sensor fault
5	Communication failure of IDU and ODU
6	Operating mode conflict
7	Water level switch alarm

1.4 Fault codes of wired controller

ODU Fault		IDU Fault	
Fault code	Fault	Fault code	Fault
10	Compressor fan drive fault	00	Communication failure of IDU and ODU
11	Sensor failure	01-04	Indoor sensor failure
12	Communication fault between main unit and secondary unit	06	Operating mode conflict
13	Compressor overload or contactor adhesion	07	Water level fault
14	System operating fault E.g. Abnormal high/low pressure; Abnormal superheat degree	Notes: Fault code 2* shown on the wired controller indicates that a fault occurs to secondary unit #1 of the modular unit. Fault code 3* shown on the wired controller indicates that a fault occurs to secondary unit #2 of the modular unit. For example, 33 indicates that adhesion occurs to compressor contactor of secondary unit #2.	
15	General fault: phase sequence fault, clock fault, and unmatched capacity between IDU and ODU		
16	System failure		

1.5 Fault codes of centralized controller

① Applicable to TIMS-AA

Fault code	Content	Fault code	Content
0	Inverter high pressure fault	20	Abnormal capacity distribution between IDU and ODU
1	Fan drive fault	21	Low pressure sensor fault
2	Fixed speed high pressure fault	22	High pressure sensor fault
3	Fixed speed thermal relay fault	23	TH9 sensor fault
4	Inverter drive communication fault	24	Reserved
5	Fan drive communication fault	25	Adhesion occurs to fixed speed compressor contactor
6	Inverter drive overheat fault	26	Low voltage is too high
7	Inverter drive fault	27	Communication fault of slave unit 1#
8	TH1 sensor fault	28	Communication fault of slave unit 2#

9	TH2 sensor fault	29	Communication fault of slave unit 3#
10	TH3 sensor fault	30	Real-time clock fault
11	TH4 sensor fault	31	Storing device fault
12	TH5 sensor fault	32	Insufficient pressure difference
13	TH6 sensor fault	33	Discharge superheat degree is too high or too low
14	TH7 sensor fault	34	High voltage is too low
15	TH8 sensor fault	35	Low voltage is too low
16	Inverter compressor-top temperature sensor fault	36	Discharge or compressor-top temperature too high
17	Fixed speed compressor-top temperature sensor fault	37	Ambient temperature too low/high
18	Inverter compressor overload	38	No communication between IDU and ODU
19	Fixed speed compressor overload	39	System failure
40~104 indicates communication failure between IDU and ODU, for example, 40 indicates communication failure between IDU 1# and ODU, 41 indicates communication failure between IDU 2# and ODU, and so on.			

② Applicable to TIMS-AS/AX

Fault code	Content	Fault code	Content
0	INV1 high pressure switch fault	20	Unmatched capacity between IDU and ODU
1	FAN1 drive fault	21	Low pressure sensor fault
2	INV1 compressor overload	22	High pressure sensor fault
3	Discharge temperature of INV1 compressor	23	TH9 sensor fault
4	INV1 drive communication fault	24	INV2 high pressure switch fault
5	FAN1 drive communication fault	25	FAN2 drive fault
6	INV1 drive overheat fault	26	INV2 compressor overload
7	INV1 drive fault	27	Discharge temperature of INV2 compressor is too high
8	THo1 sensor fault	28	INV2 drive communication fault
9	THo2 sensor fault	29	FAN2 drive communication fault
10	THo3 sensor fault	30	INV2 drive overheat fault
11	THo4 sensor fault	31	INV2 drive fault
12	THo5 sensor fault	32	Insufficient pressure

			difference/four-way valve fault
13	THo6 sensor fault	33	INV1 discharge superheat degree is too high or too low
14	THo7 sensor fault	34	High voltage is too low
15	THo8 sensor fault	35	Low voltage is too low/high
16	FC1 sensor fault	36	INV2 discharge superheat degree is too high or too low
17	FC2 sensor fault	37	Ambient temperature too high/low
18	Master/slave unit 1 communication fault	38	No communication
19	Master/slave unit 1 communication fault	39	System failure
40~104 indicates communication failure between IDU and ODU, for example, 40 indicates communication failure between IDU 1# and ODU, 41 indicates communication failure between IDU 2# and ODU, and so on.			

2. Common fault handling and analysis

2.1 Compressor drive overheat

Code displayed: ODU main board displays E006/E030 (applicable to AA/AS/AX models).

Fault detection method: use a thermistor to measure the temperature of fins on inverter drive board for compressor.

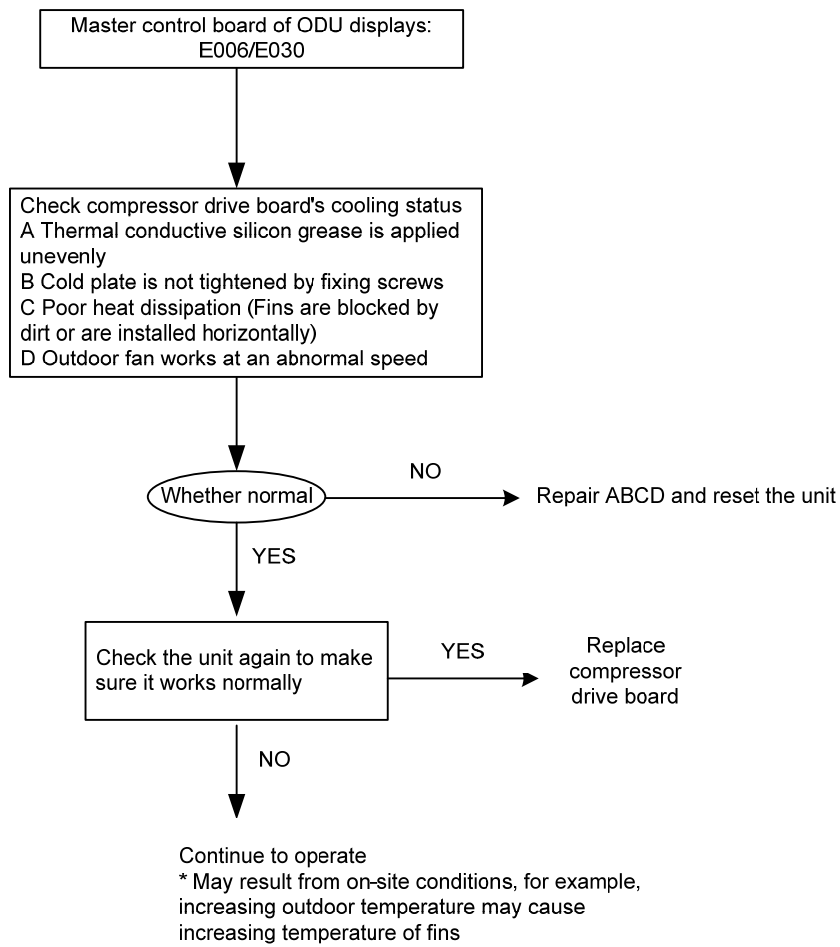
Fault identification conditions: when the thermistor detects a temperature beyond set range.

P Thermistor on circuit board

Possible causes:

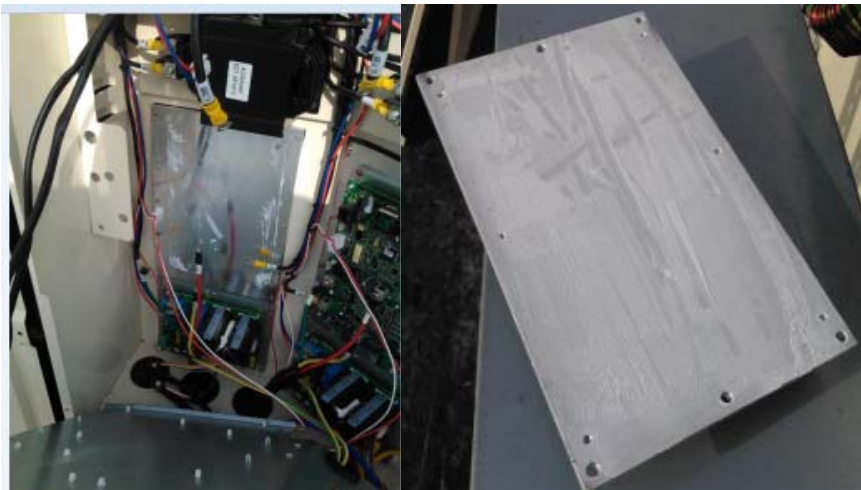
- ① thermal conductive silicon grease is applied unevenly
- ② Cold plate is not tightened by fixing screws
- ③ Inverter drive board fault
- ④ Too high outdoor temperature results in poor heat exchanging
- ⑤ Outdoor fan is not working or working at an abnormal speed

Troubleshooting:



Remarks:

Figure 1



Thermal conductive silicon grease is applied unevenly

Figure 2



Fins are installed horizontally, thus resulting in poor heat exchanging effects

2.2 Insufficient pressure difference/four-way valve fault

Code displayed: ODU main board displays E032 (applicable to AA/AS/AX models).

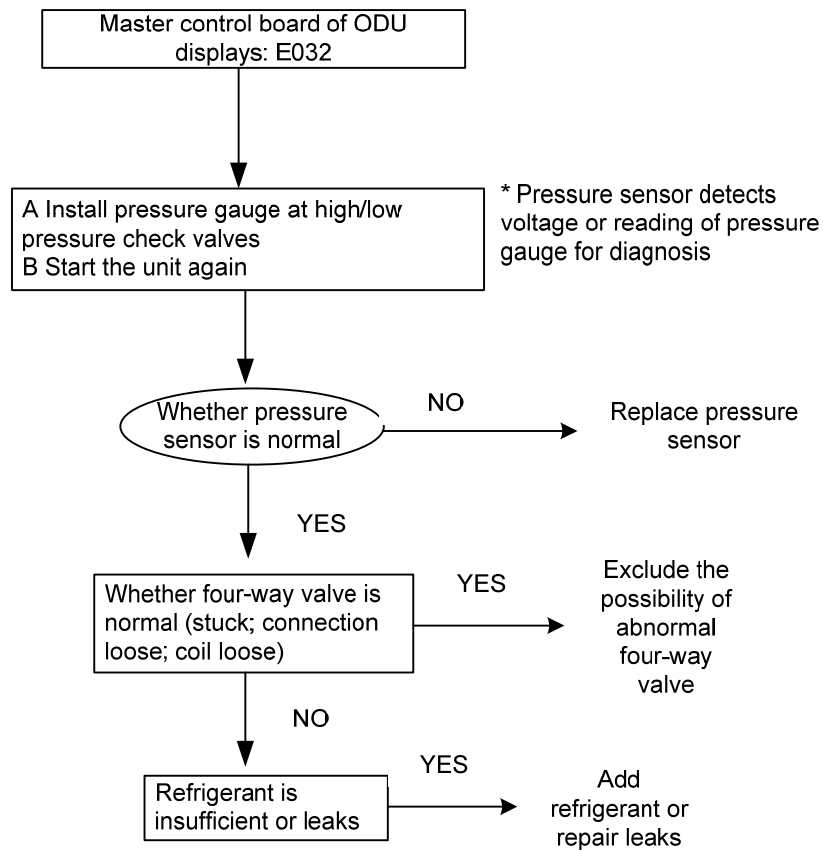
Fault detection method: In heat mode, different modules vary significantly in high pressure, or high/low pressure difference is abnormal within a single module;
In cooling mode, high/low pressure difference is abnormal within a single module.

Fault identification conditions: High/low pressure difference < 5 Bar during operation.

Possible causes:

- ① Insufficient refrigerant
- ② High/low pressure sensor abnormal
- ③ Four-way valve is stuck or gets loose

Troubleshooting:



2.3 High pressure switch fault

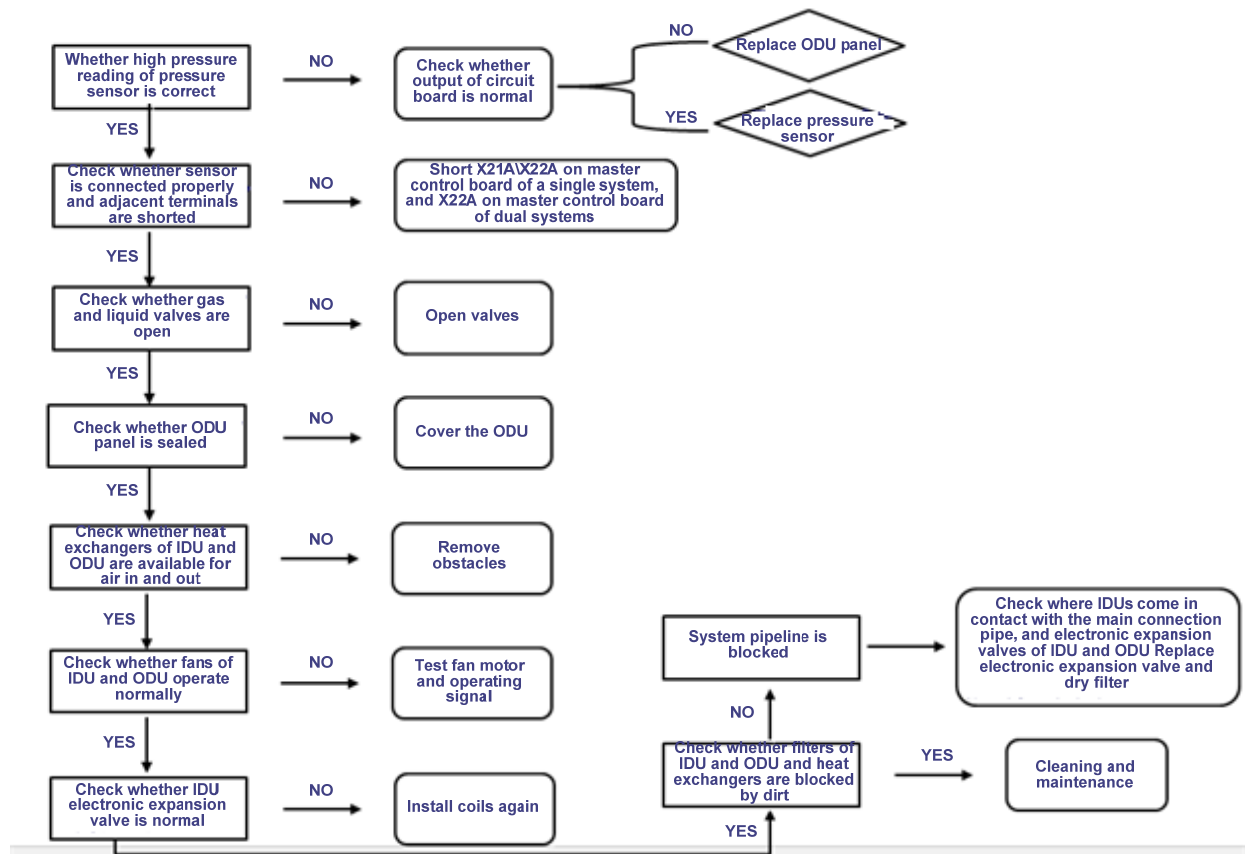
Code displayed: ODU main board displays E000 (applicable to AA/AS/AX models) or E024 (applicable to AS/AX models).

Fault detection method: Detect high pressure switch status through protection device circuit.

Fault identification conditions: Open circuit for protection device.

Possible causes:

- ① High pressure switch operates
- ② High pressure switch fault
- ③ Wrong wiring



Troubleshooting:

2.4 High pressure sensor fault

Code displayed: ODU main board displays E022 (applicable to AA/AS/AX models).

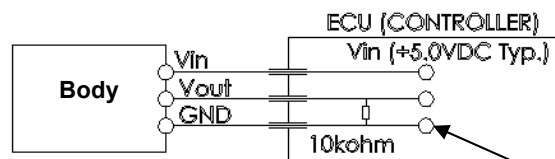
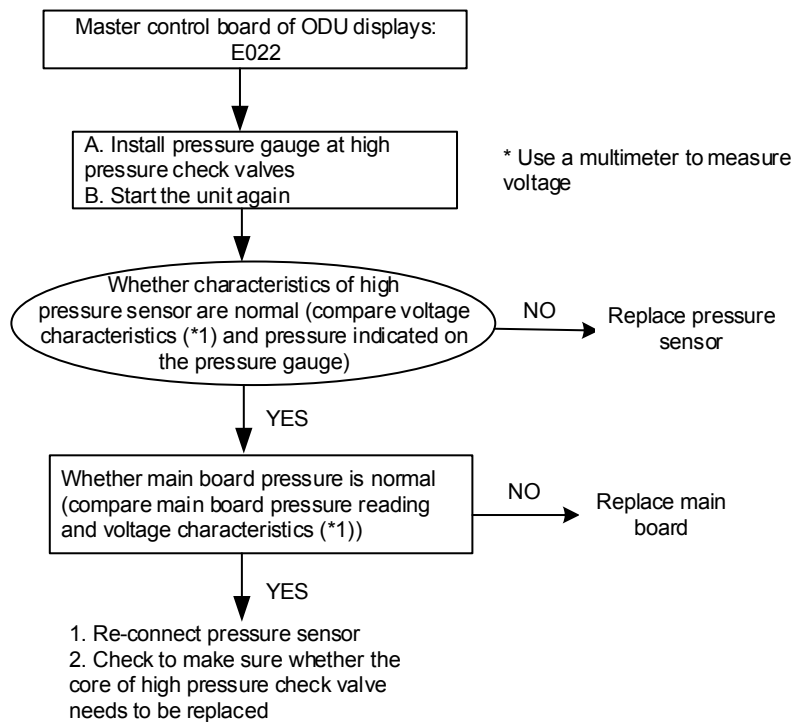
Fault detection method: Localize the fault according to the pressure measured by high pressure sensor.

Fault identification conditions: Short or open circuit.

Possible causes:

- ① High pressure sensor fault
- ② Opposite connection with low pressure sensor
- ③ Fault of master control board of ODU
- ④ Fault in connection with high pressure sensor

Troubleshooting:



Electrical wiring drawing

Measure the in-between pressure (DC)

2.5 Low pressure sensor fault

Code displayed: ODU main board displays E021 (applicable to AA/AS/AX).

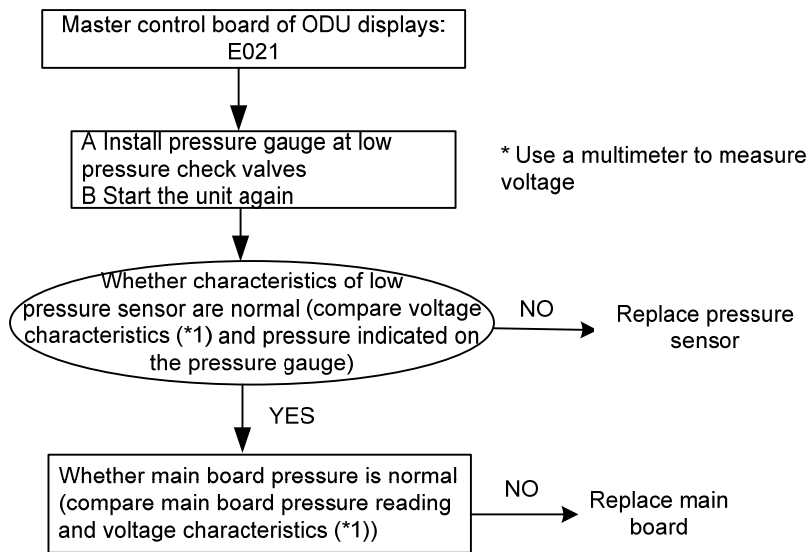
Fault detection method: Localize the fault according to the pressure measured by low pressure sensor.

Fault identification conditions: Short or open circuit.

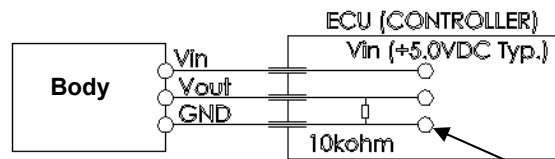
Possible causes:

- ① Low pressure sensor fault
- ② Opposite connection with high pressure sensor
- ③ Fault of master control board of ODU
- ④ Fault in connection with low pressure sensor

Troubleshooting:



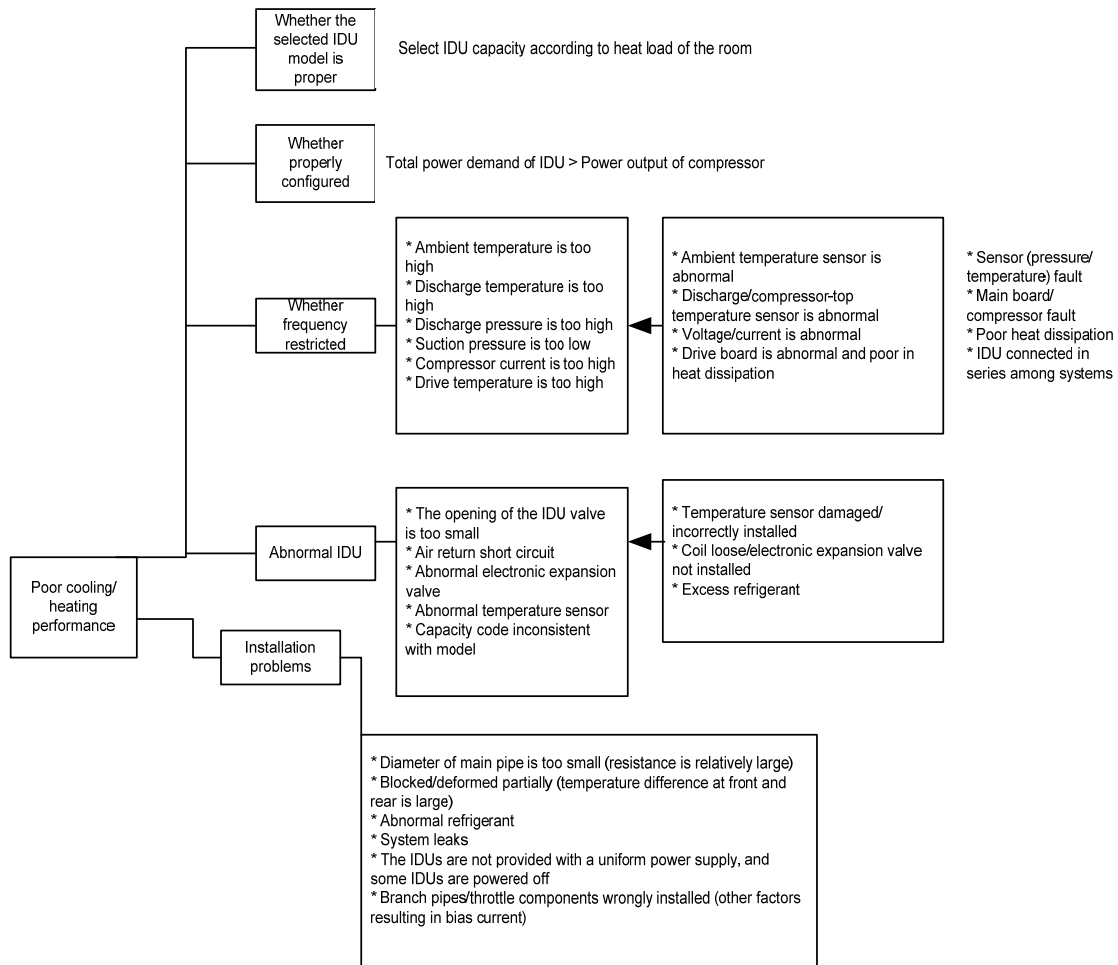
*1 voltage characteristics are as follows:
 $V_{out} = 2 * P_g \text{ (absolute pressure, Mpa)} + 0.5$



Electrical wiring drawing

Measure the in-between pressure (DC)

2.6 Poor cooling/heating effects



Notes:

If piping, level difference or number of IDUs do not fall within the specified range:

- ① Occurrence of poor cooling/heating is very likely especially for the few IDUs at the end.
- ② Indoor-side load is too high in cooling mode, thus causing high evaporation temperature, high suction temperature, compressor over-heating and a reduce life span.
- ③ For an excessive number of IDUs, under which circumstance IDUs are featured by small capacity and small-diameter liquid pipes, the system resistance will be increased accordingly, together with high pressure and current. In this way, the system fails to work properly.
- ④ Long piping, significant level difference and excessive number of IDUs may cause more refrigerant oil deposits in pipes and in IDUs and accordingly less refrigerant oil in compressor, thereby resulting in abnormal operation or a reduced life span for compressor.

2.7 High discharge/compressor-top temperature protection

Code displayed: ODU main board displays E003/E027 (applicable to AS/AX models) or E036 (applicable to AA models).

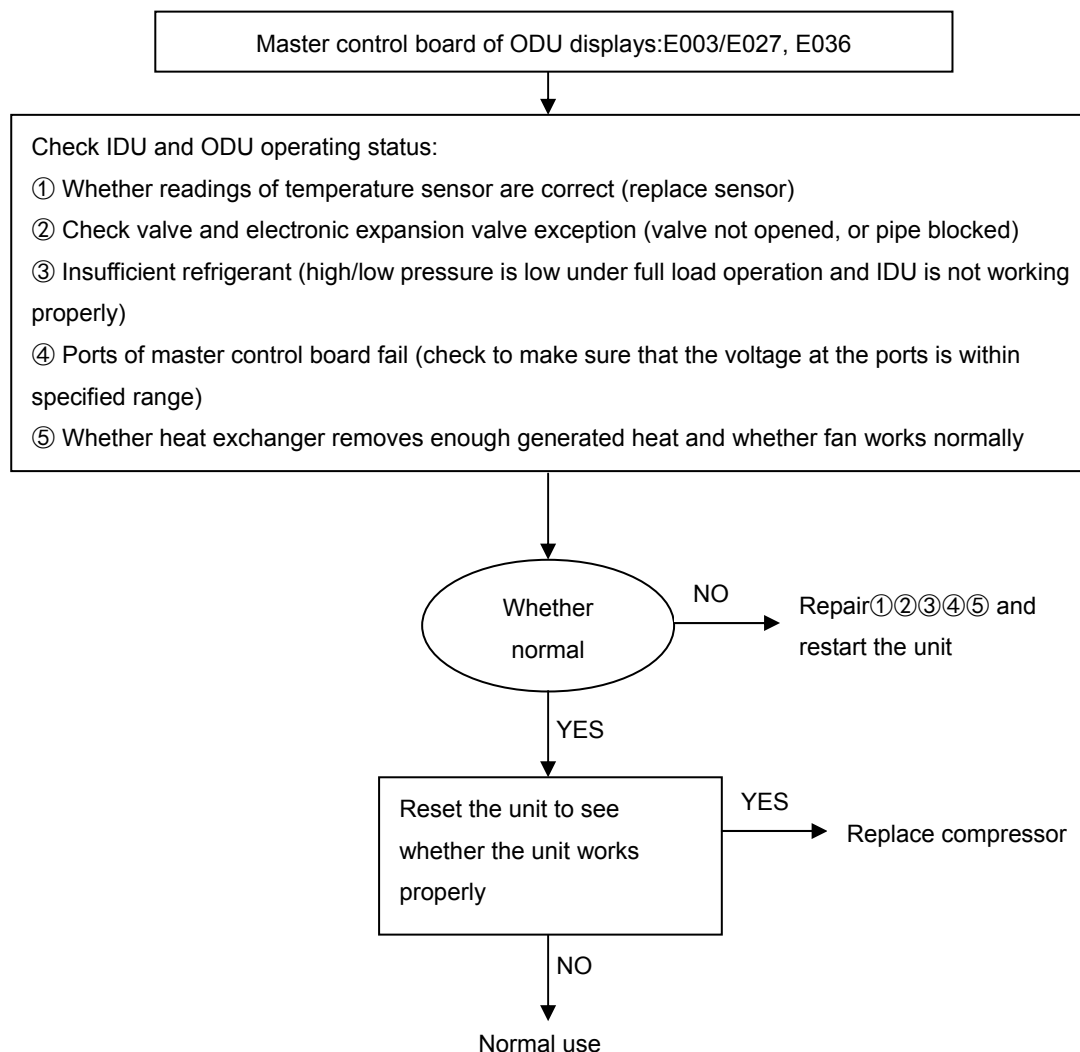
Fault detection method: Measure compressor discharge temperature and compressor-top temperature through temperature sensor.

Fault identification conditions: when detecting the following temperatures beyond set range.

- ① Temperature of discharge pipe of compressor
- ② Temperature at the top of compressor

Possible causes:

- ① Temperature sensor fails
- ② Check valve and electronic expansion valve abnormal
- ③ Insufficient refrigerant
- ④ Ports of master control board fail
- ⑤ Compressor exception
- ⑥ Abnormal fan



Troubleshooting:

Methods of judging whether ports of master control board are normal: connect a 50k resistor to the corresponding port to see on the monitor software whether the discharge temperature or compressor-top temperature is 25°C. If yes, master control board is normal; if no, replace master control board.

2.8 Communication failure of IDU and ODU

Code displayed: ODU main board displays E038 (applicable to AA/AS/AX models).

Fault detection method: Check fault codes displayed on master control board of ODU.

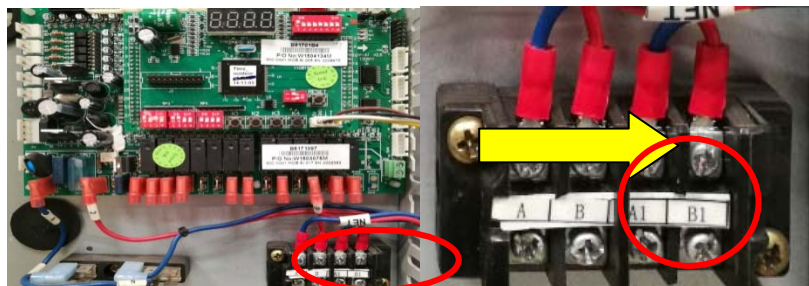
Fault identification conditions: Master control board of ODU displays fault code E038.

Possible causes: ① IDU and ODU are not connected to power supply

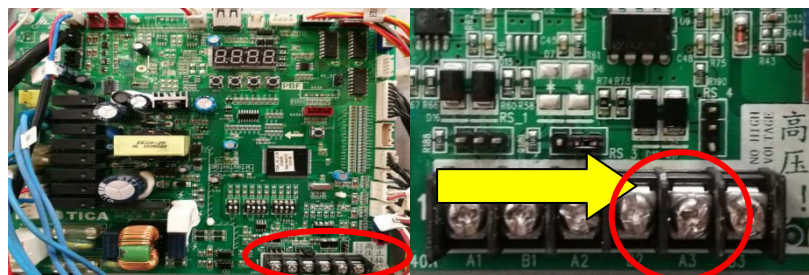
② Number of IDUs is incorrectly set

③ AB lines are wrongly connected (Correct port: see figure below)

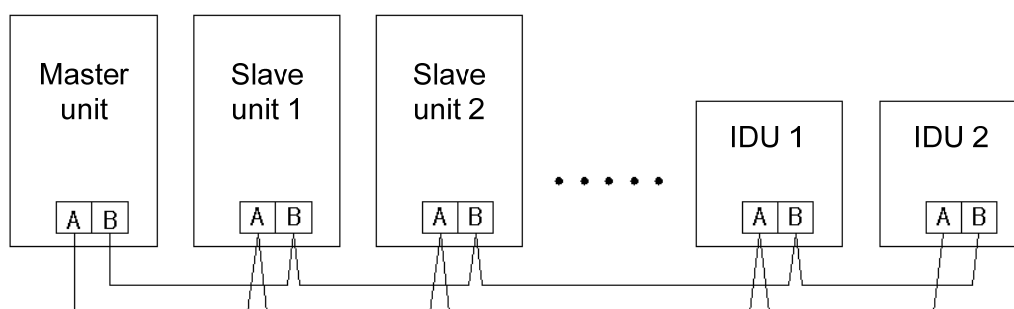
AA old master control board A1/B1 port:



AS/AX new master control board A3/B3 port:

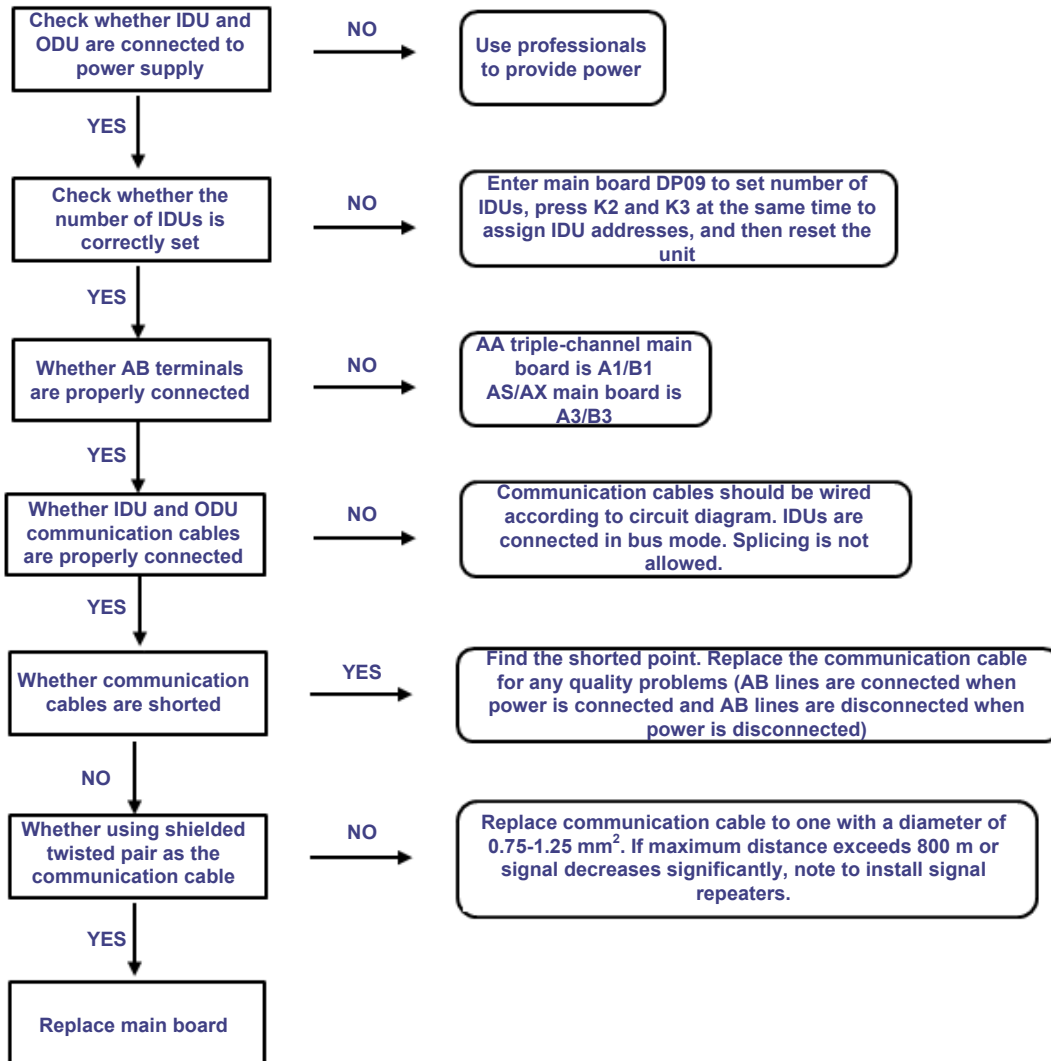


④ Master/slave units and indoor/outdoor units are connected hand in hand (see figure below)



- ⑤ Short communication line
- ⑥ Whether using shielded twisted pair as the communication cable

Troubleshooting:



2.9 Master/slave unit communication fault

Code displayed: ODU main board displays E018/E019 (applicable to AA/AX modular units).

Fault detection method: Check fault codes displayed on master control board of ODU.

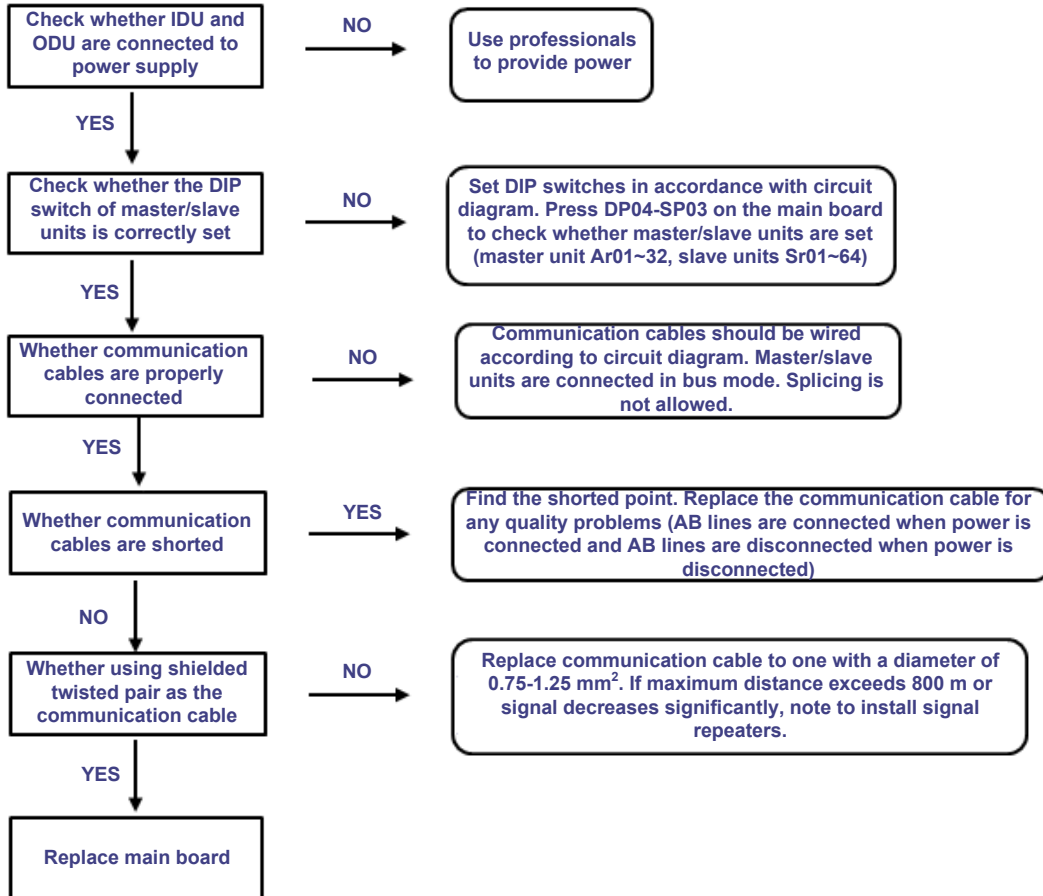
Fault identification conditions: Master control board of ODU displays fault code E018/E019.

Possible causes:

- ① Slave units are not connected to power supply or main board is not provided with power supply

- ② Wrong DIP switch for master/slave unit
- ③ Wrong wiring for master/slave unit
- ④ Short communication cable
- ⑤ Whether using shielded twisted pair as the communication cable

Troubleshooting:



2.10 Compressor overload

Code displayed: ODU main board displays E002/E026 (applicable to AA/AS/AX models).

Fault detection method: Localize the fault by software or nixie tube.

Fault identification conditions: Whether momentary excess current exists

Normal protective current values:

Compressor model	Current overload parameters X(A)
E655DHD-65D2YG (KE655DHD-65D2YG)	22
E705DHD-72D2YG	23
E856DHD-80D2YG	31

Drive board P fault causes a false alarm

Power filter board damage

Possible causes: ① Drive module does not dissipate heat well

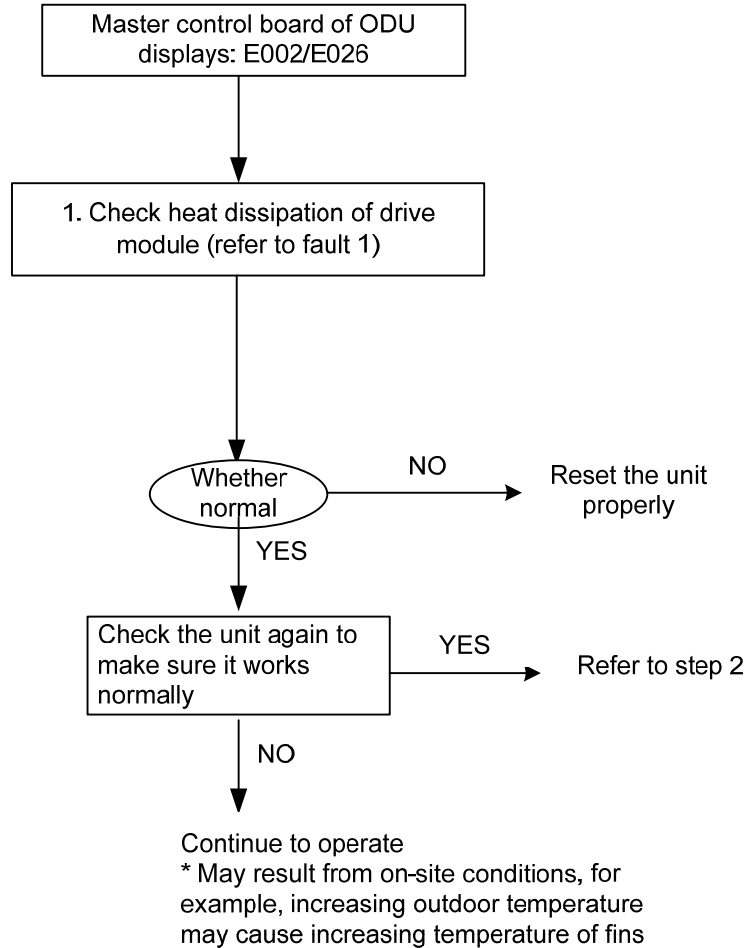
② Inverter drive board fault E007/EO31

③ Loose connection of compressor

④ Compressor worn or damaged

Troubleshooting:

① Drive module does not dissipate heat well



② Inverter drive board fault

Hitachi drive testing methods: (for internal fault codes, refer to Appendix VII)

Hitachi drive fault diagnosis (E007/E031)

Fault code	Notes
00	Not operating
01	Over-current protection for constant speed operation
02	Over-current protection for frequency reducing
03	Over-current protection for frequency increasing
04	Over-current protection when power off
05	Overload protection
07	Over voltage protection
08	EEPROM module fault
09	Low voltage protection
10	CT fault
11	CPU fault
14	Grounding failure protection
15	Over voltage input protection
20	Power supply module temperature fault (fan stops)
21	Power supply module temperature fault
25	Main circuit fault
30	Operating fault
35	Thermistor fault
41	Communication fault (RS485)

1. Connect to monitor software

2. Observe the following error codes of C1/C2 marked by circles

3. Make diagnosis based on error codes of FAN and left diagram

Name	Master unit	Slave unit 1
◆ C1 speed:		
◆ C2 speed:		
◆ C1 temperature:		
◆ C1 error code:		
◆ C2 temperature:		
◆ C2 error code:		
◆ FAN1 current:		
◆ FAN1 error code:		
◆ FAN2 current:		
◆ FAN2 error code:		
◆ FAN1 set speed:		
◆ FAN2 set speed:		
◆ HC1:		
◆ HC2:		
◆ Total running duration of C1:		
◆ Total running duration of C2:		

Hitachi compressor drive overload troubleshooting (Voltage of bus line)



① Measure voltage of bus line and connect a multimeter to the line with positive electrode to P and negative electrode to N

② When power supply is connected, voltage between P and N should be 540V (±20V)

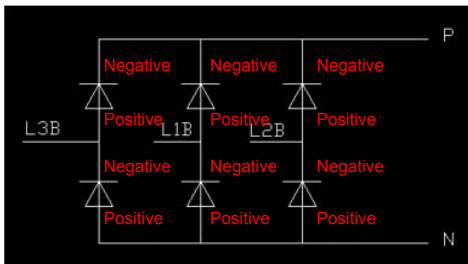
③ If voltage of bus line is too high or too low, check rectifying circuit of an upper level

Hitachi compressor drive overload troubleshooting (Rectifying circuit)



① Observe whether bridge rectifier looks dim or black. If yes, it can be initially considered bridge rectifier is burnt

② P\N\L1B\L2B\L3B characters cover their corresponding welding points



③ If visual observation fails, use a multimeter (diode gear) to test it after power off Use a multimeter according to the left diagram



① For upper bridge rectifier, if diode is not burnt, the multimeter displays 0.5V pressure drop, and diode between L3B and P (refer to the left diagram) phases is intact



② For upper bridge rectifier, if diode is burnt, the multimeter displays no pressure drop, and diode between L1B and P (refer to the left diagram) phases is burnt

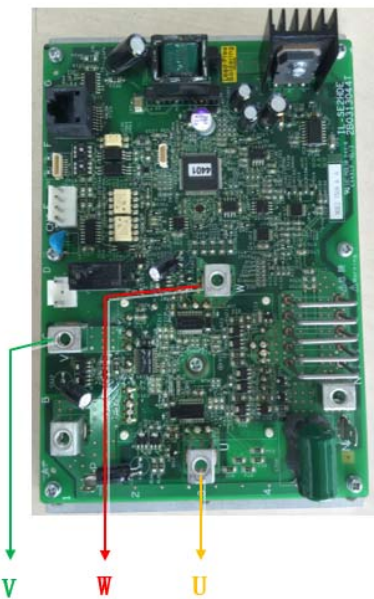


① For lower bridge rectifier, if diode is not burnt, the multimeter displays 0.5V pressure drop, and diode between L3B and N (refer to the left diagram) phases is intact



② For lower bridge rectifier, if diode is burnt, the multimeter displays no pressure drop, and diode between L2B and N (refer to the left diagram) phases is burnt

Hitachi compressor drive overload troubleshooting (Three phase unbalance)



① Remove compressor lines at the compressor junction box side and leave the drive side unchanged

② Turn on the unit and make the drive operate with no load, and use a multimeter to measure voltage between U/V/W phases

③ Generally, voltage between U/V, V/W and U/W should be 380V

④ If voltage between any of the two phases is beyond $380 \pm 40V$, it can be considered three phase unbalance exists

Sanhua compressor drive testing methods: (for internal fault codes, refer to Appendix VIII)

Sanhua compressor drive fault diagnosis (E007/E031)

No.	Description of faults	D1 Red RE	D2 Green GR	D3 Yellow YEL	Cause	Fault code
1	Compressor over-current	⊙	⊙	⊙	Compressor instantaneous current exceeds protection values	101
2	IPM module abnormal	○	⊙	●	Module hardware protection	105
3	IPM module temperature sensor fault	○	●	⊙	Abnormal output of IPM module sensing circuit	102
4	IPM module temperature too high	○	⊙	⊙	Protection of too high IPM module temperature	116
5	PFC abnormal	●	○	⊙		111
6	PFC module temperature sensor abnormal	⊙	○	●		104
7	PFC module temperature too high	○	○	⊙		123
8	Input power abnormal fault	⊙	●	○	Great power voltage fluctuations	110
9	AC current protection (input side)	●	○	○	Protection of too large input current	112
10	Fluctuating outdoor temperature	○	○	○		108
11	Voltage of DC bus line is too high	⊙	○	○	Voltage of bus line exceeds protection values	106
12	Voltage of DC bus line is too low	●	○	○	Voltage of bus line falls below protection values	107
13	Communication faults	⊙	⊙	●	Communication between drive and master control board	109
14	Out of step	○	○	○	Compressor falls out of step	113
15	Circuit fault by current detection	○	○	●	Abnormal operational amplifier output voltage	114
16	Compressor start failure	○	○	○	Compressor start failure	119
17	Fault of ambient temperature sensors on drive board	○	●	○	Short circuit of ambient temperature sensors on drive board	121
18	Compressor phase loss	○	⊙	○	One or two phases of compressor (U/V/W) are missed	122

Note: In trouble free status, the green indicator flashes once everytime it receives signal

○	On
⊙	Flashing
●	Off

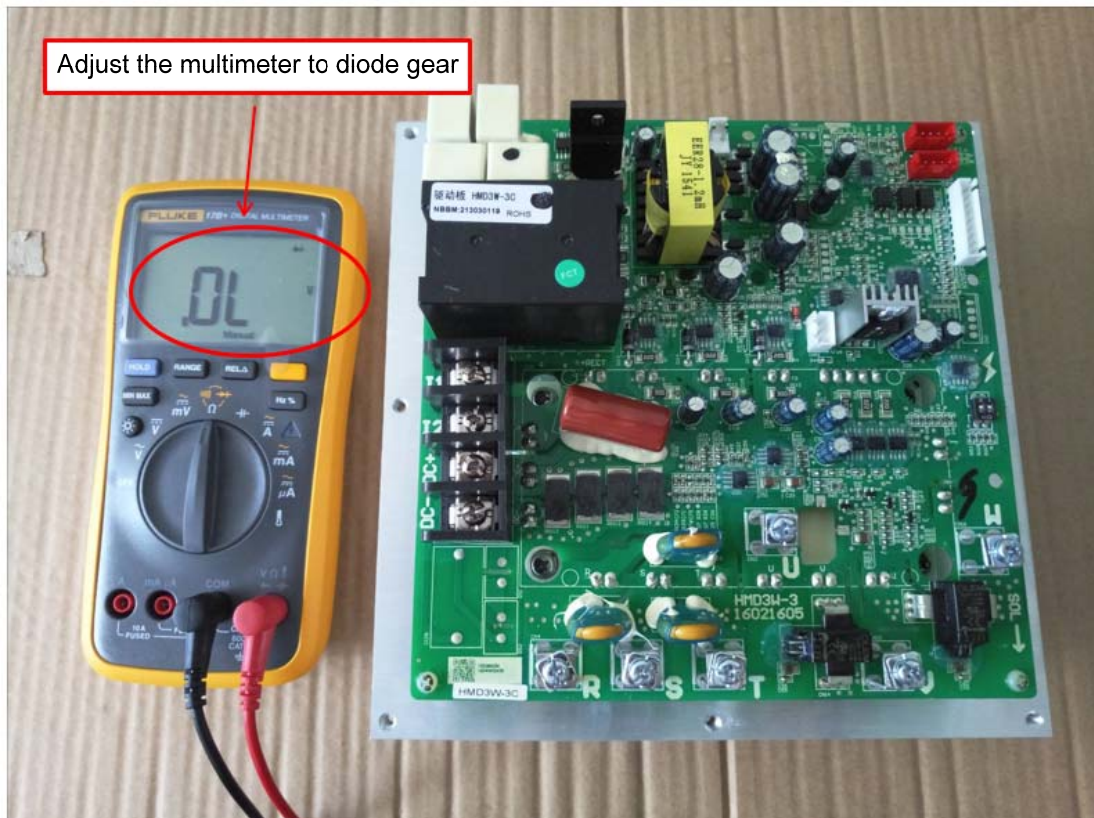
1. Connect to monitor software

2. Observe the following error codes of C1/C2 marked by circles

3. Make diagnosis based on error codes of C1/C2 and left diagram

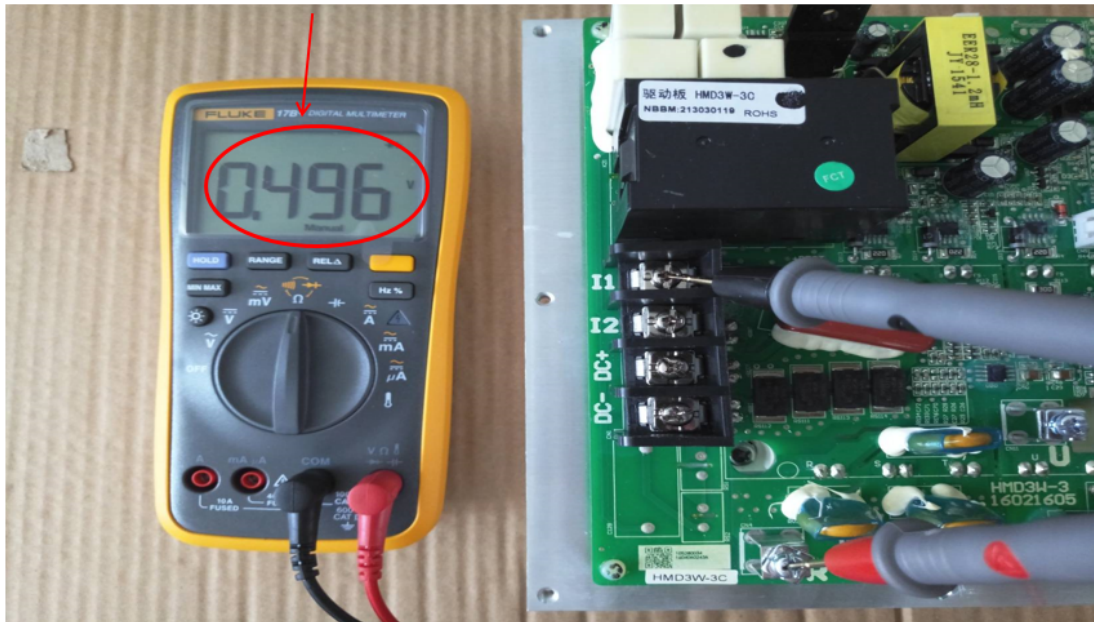
Name	Master unit	Slave unit 1
◆ C1 speed:		
◆ C2 speed:		
◆ C1 temperature:		
◆ C1 error code:		
◆ C2 temperature:		
◆ C2 error code:		
◆ FAN1 current:		
◆ FAN1 error code:		
◆ FAN2 current:		
◆ FAN2 error code:		
◆ FAN1 set speed:		
◆ FAN2 set speed:		
◆ HC1:		
◆ HC2:		
◆ Total running duration of C1:		
◆ Total running duration of C2:		

Sanhua compressor drive testing methods (Step 1)



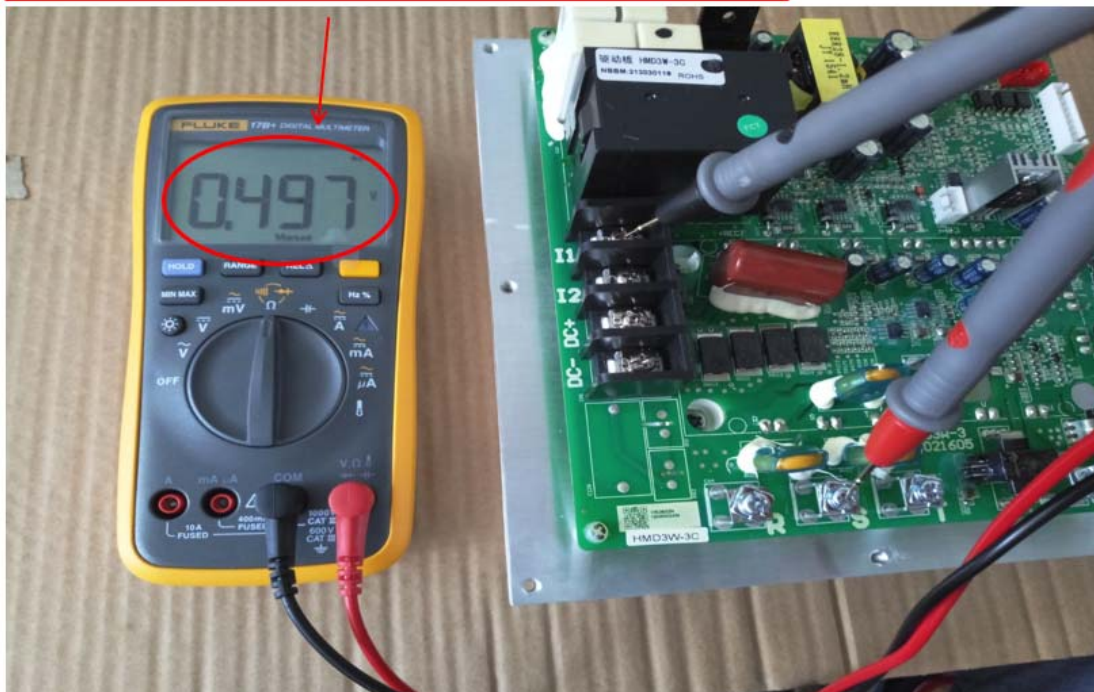
Sanhua compressor drive testing methods (Step 2)

Adjust the multimeter to diode gear, and black probe to measure I1 and red probe to measure R, with reading value as below (10% error is allowable)



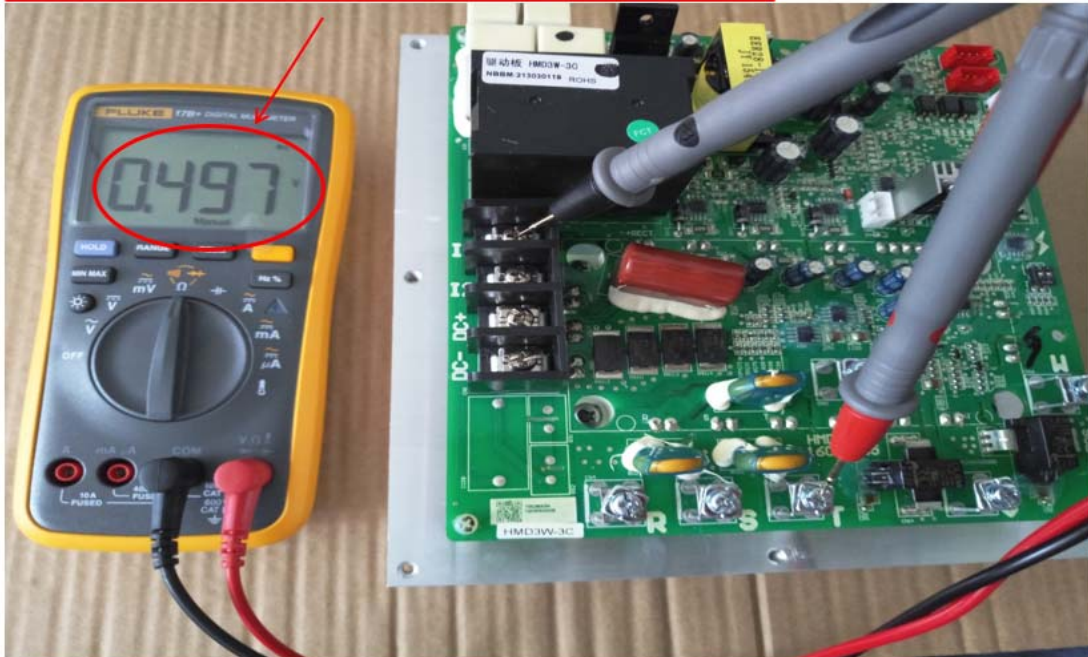
Sanhua compressor drive testing methods (Step 3)

Adjust the multimeter to diode gear, and black probe to measure I1 and red probe to measure S, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 4)

Adjust the multimeter to diode gear, and black probe to measure I1 and red probe to measure T, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 5)

Adjust the multimeter to diode gear, and red probe to measure DC- and black probe to measure R, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 6)

Adjust the multimeter to diode gear, and red probe to measure DC- and black probe to measure S, with reading value as below (10% error is allowable)



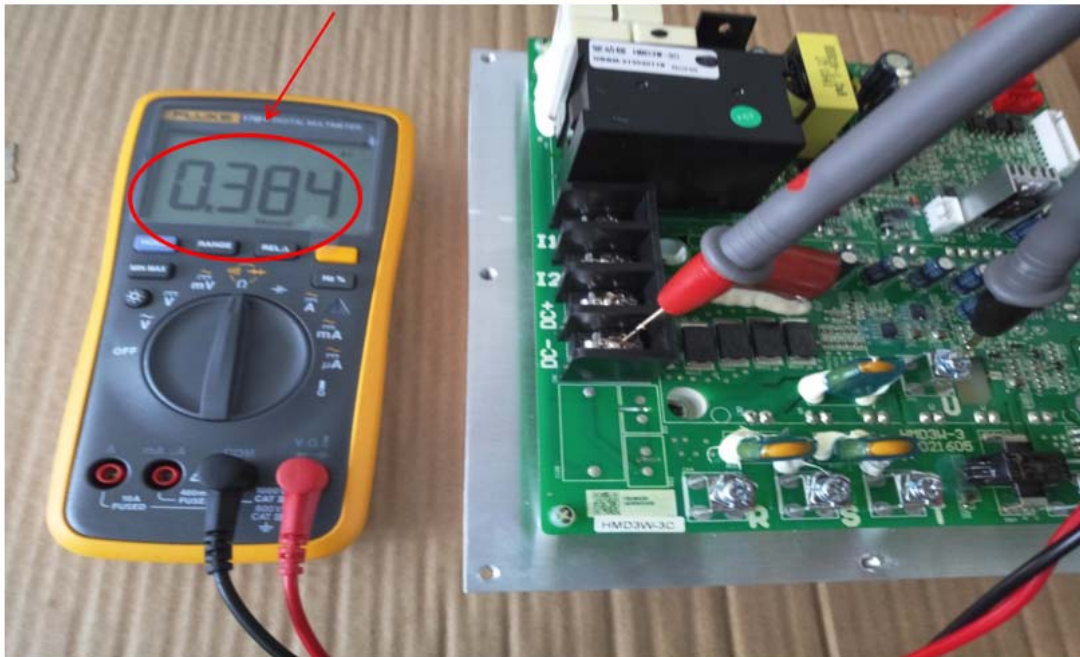
Sanhua compressor drive testing methods (Step 7)

Adjust the multimeter to diode gear, and red probe to measure DC- and black probe to measure T, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 8)

Adjust the multimeter to diode gear, and red probe to measure DC- and black probe to measure U, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 9)

Adjust the multimeter to diode gear, and red probe to measure DC- and black probe to measure V, with reading value as below (10% error is allowable)



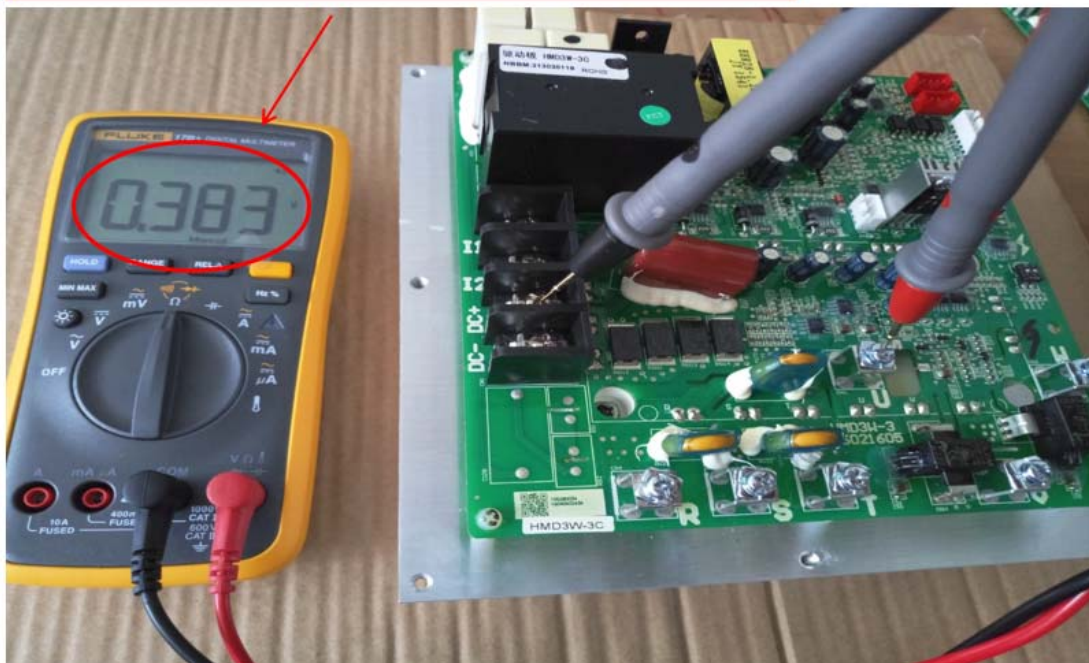
Sanhua compressor drive testing methods (Step 10)

Adjust the multimeter to diode gear, and red probe to measure DC- and black probe to measure W, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 11)

Adjust the multimeter to diode gear, and black probe to measure DC+ and red probe to measure W, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 12)

Adjust the multimeter to diode gear, and black probe to measure DC+ and red probe to measure W, with reading value as below (10% error is allowable)



Sanhua compressor drive testing methods (Step 13)

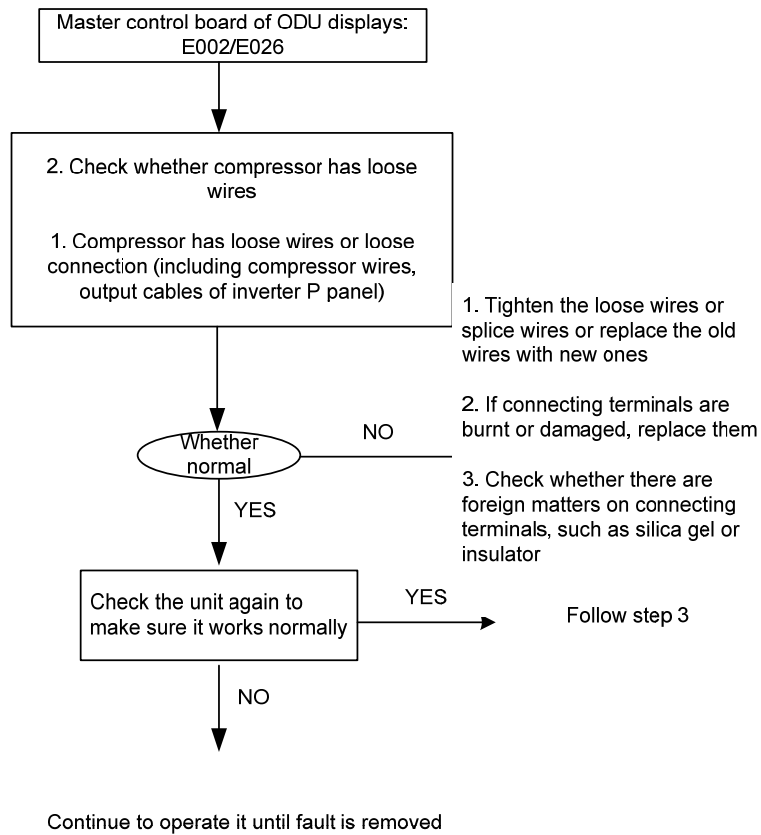
Adjust the multimeter to diode gear, and black probe to measure DC+ and red probe to measure W, with reading value as below (10% error is allowable)



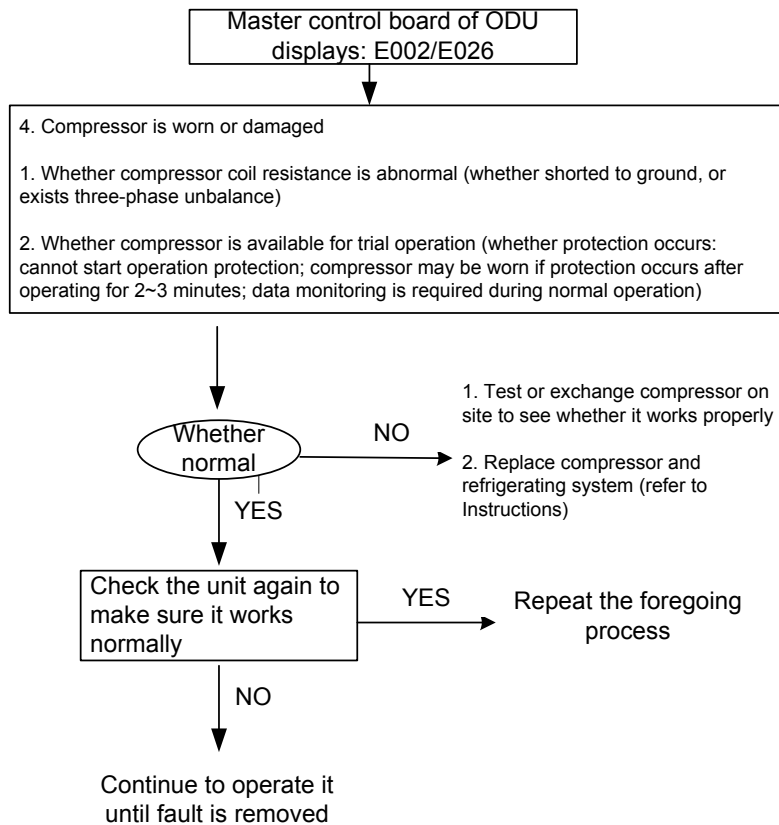
① Loose connection of compressor:

Normally, on a 3 phase compressor the resistance among phases should be less than 1Ω . If resistance reaches $K\Omega$ or $M\Omega$, it indicates that the winding is damaged; the resistance

between compressor and ground should be infinite. If resistance to ground is small or none, it indicates that the compressor is damaged.



② Compressor is worn or damaged



2.11 Discharge superheat degree is too high or too low

Code displayed: ODU main board displays E033/E036 (applicable to AA/AS/AX models).

Fault detection method: Localize the fault by software or nixie tube.

Fault identification conditions: Refrigerant amount is inappropriate and unit protection starts frequently

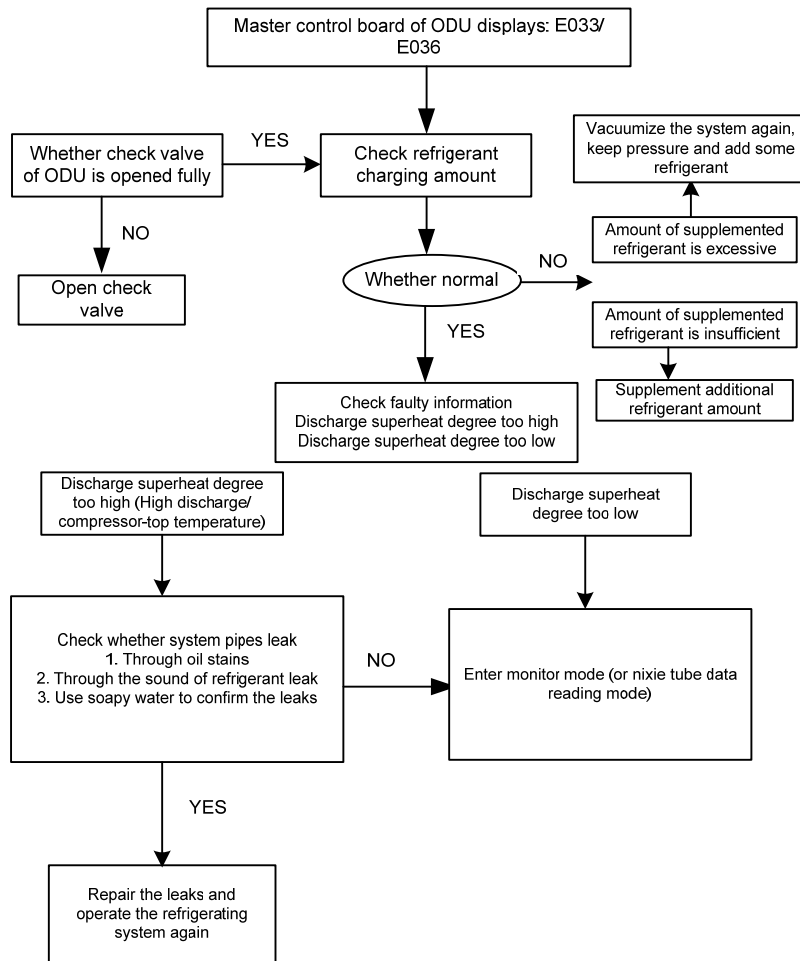
Discharge superheat protection:

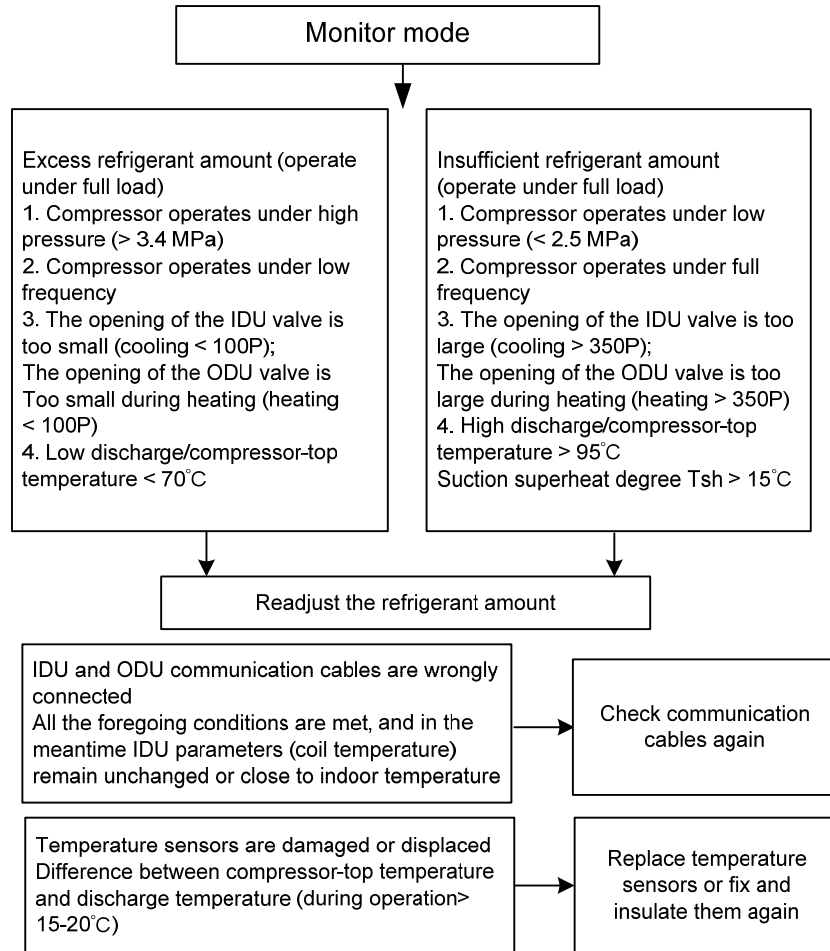
Protection class	Protection parameters
Protection of too low discharge superheat degree	$\leq 10^{\circ}\text{C}$ Protection lasts for 30 minutes; $\leq 5^{\circ}\text{C}$ Protection lasts for 5 minutes;
Discharge superheat degree too high	Cooling: $\geq 45^{\circ}\text{C}$ and compressor-top temperature (or discharge temperature) $> 93^{\circ}\text{C}$, protection lasts for 30 minutes Heating: if $\geq 50^{\circ}\text{C}$, protection lasts for 30 minutes
Protection of too high compressor-top temperature/discharge temperature	If compressor-top temperature/discharge temperature $\geq 105^{\circ}\text{C}$, protection starts

Possible causes:

- ① Excess refrigerant amount
- ② Insufficient refrigerant amount
- ③ Refrigerant leaks
- ④ Whether temperature sensors are damaged or displaced
- ⑤ Whether check valve is opened fully
- ⑥ Wrong connection of IDU and ODU wires (when multiple systems exist)

Troubleshooting:





2.12 High voltage is too low

Code displayed: ODU main board displays E034 (applicable to AA/AS/AX models).

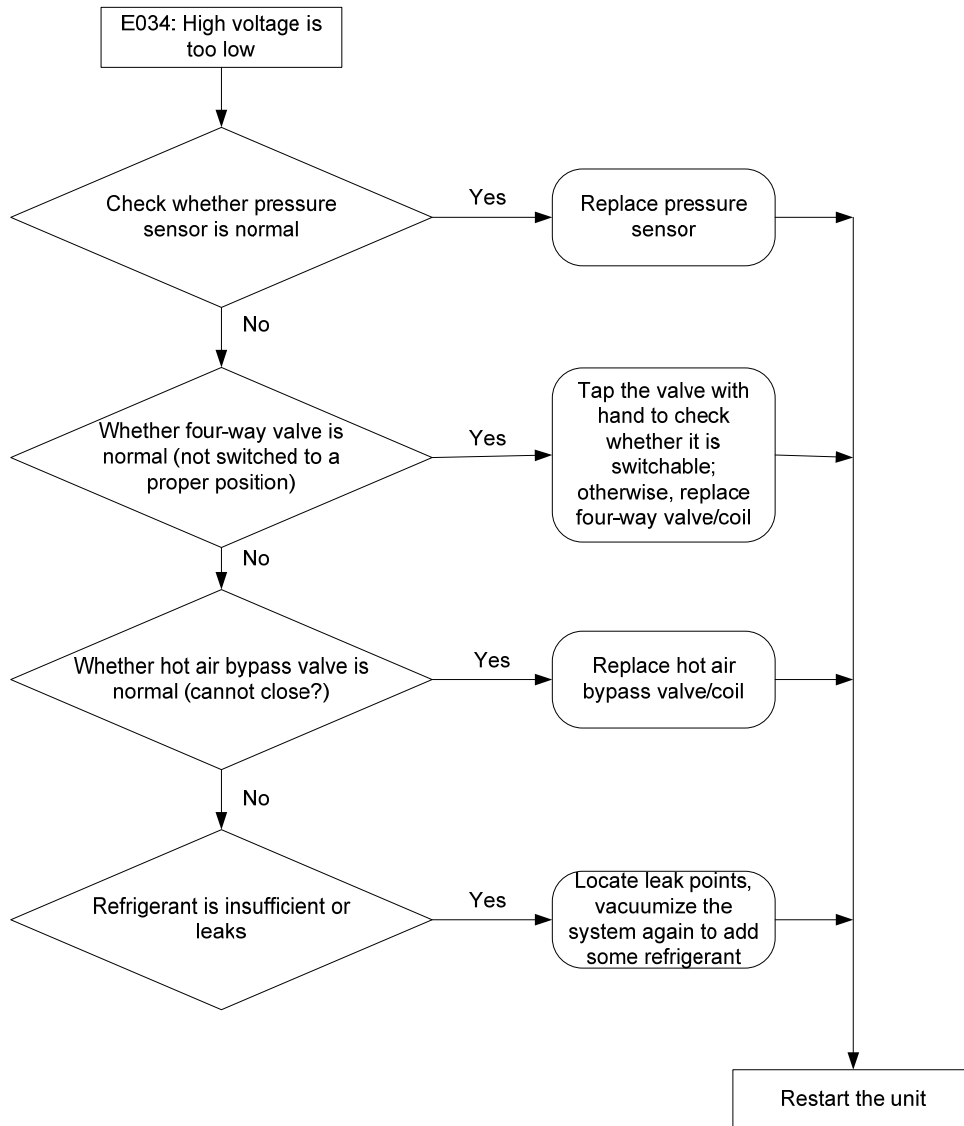
Fault detection method: Pressure value read by high pressure sensor

Fault identification conditions: ODU main board sends a false alarm and the unit fails to work properly

Possible causes:

- ① Refrigerant is insufficient or refrigerant leaks
- ② Abnormal four-way valve
- ③ Abnormal hot air bypass valve

Troubleshooting:



2.13 Low voltage is too low/high

Code displayed: ODU main board displays E035 (applicable to AA/AS/AX models).

Fault detection method: Pressure value read by low pressure sensor

Fault identification conditions: ODU main board sends a false alarm and the unit fails to work properly

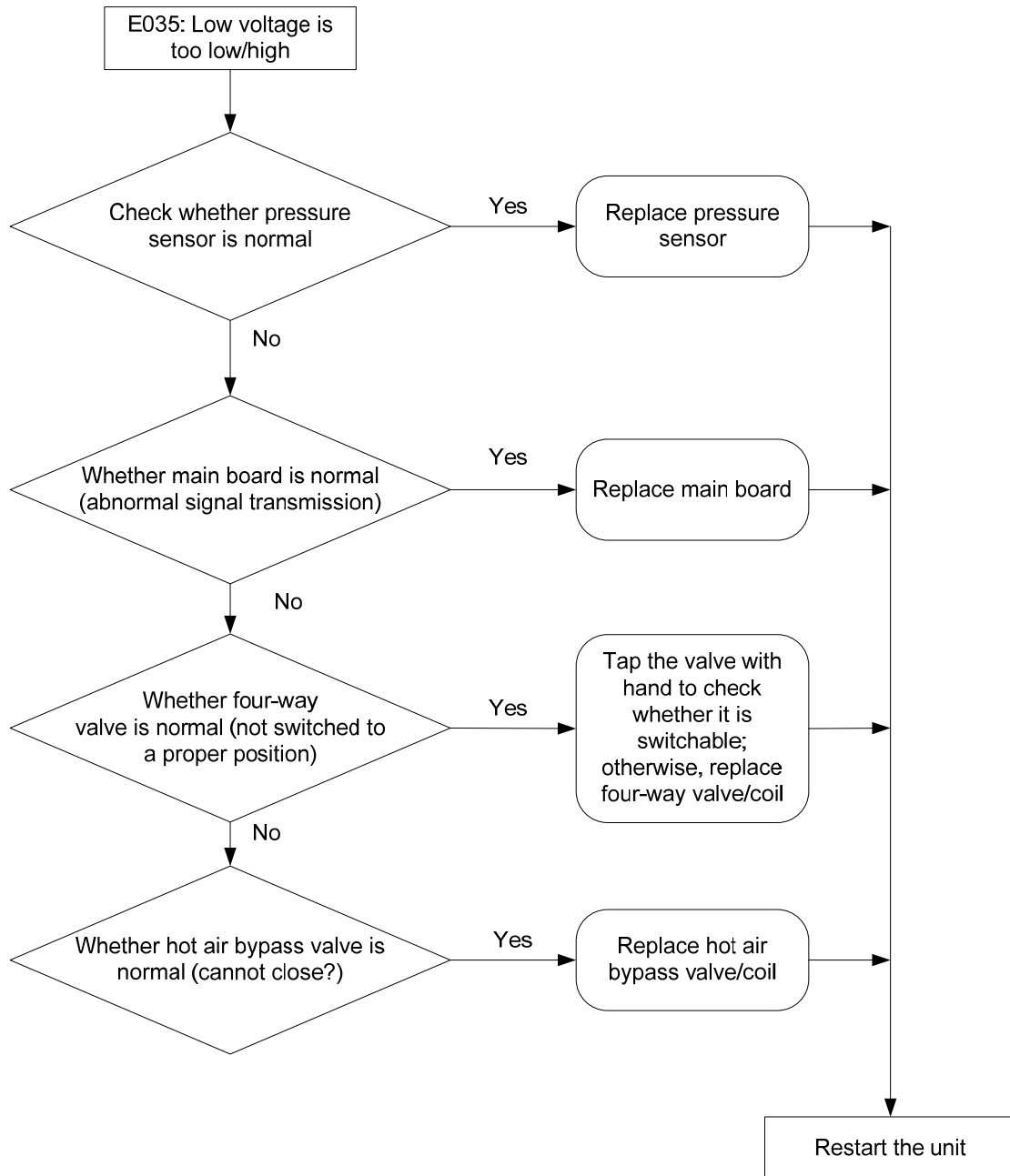
Possible causes:

1. Low voltage is too high:
 - ① Abnormal pressure sensor
 - ② Abnormal main board
 - ③ Abnormal four-way valve
 - ④ Abnormal hot air bypass valve
2. Low voltage is too low:
 - ① Refrigerant is insufficient or refrigerant leaks

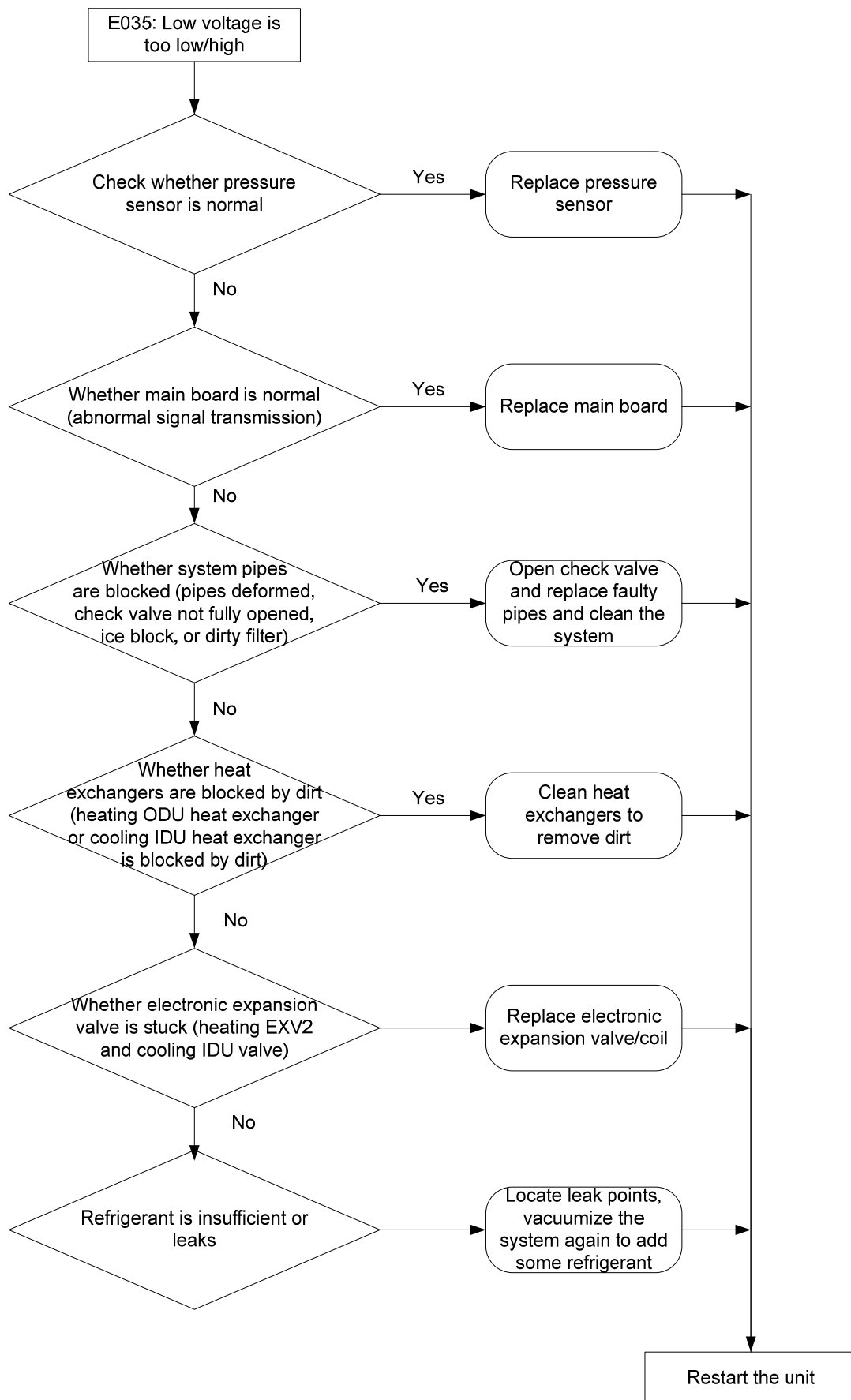
- ② Abnormal pressure sensor
- ③ Abnormal main board
- ④ System pipes are blocked (pipes deformed, check valve not fully opened, ice block, or dirty filter)
- ⑤ Heat exchanger is blocked by dirt
- ⑥ Abnormal electronic expansion valve

Troubleshooting:

1. Low voltage is too high



2. Low voltage is too low



2.14 Ambient temperature too high/low

Code displayed: ODU main board displays E037 (applicable to AA/AS/AX models).

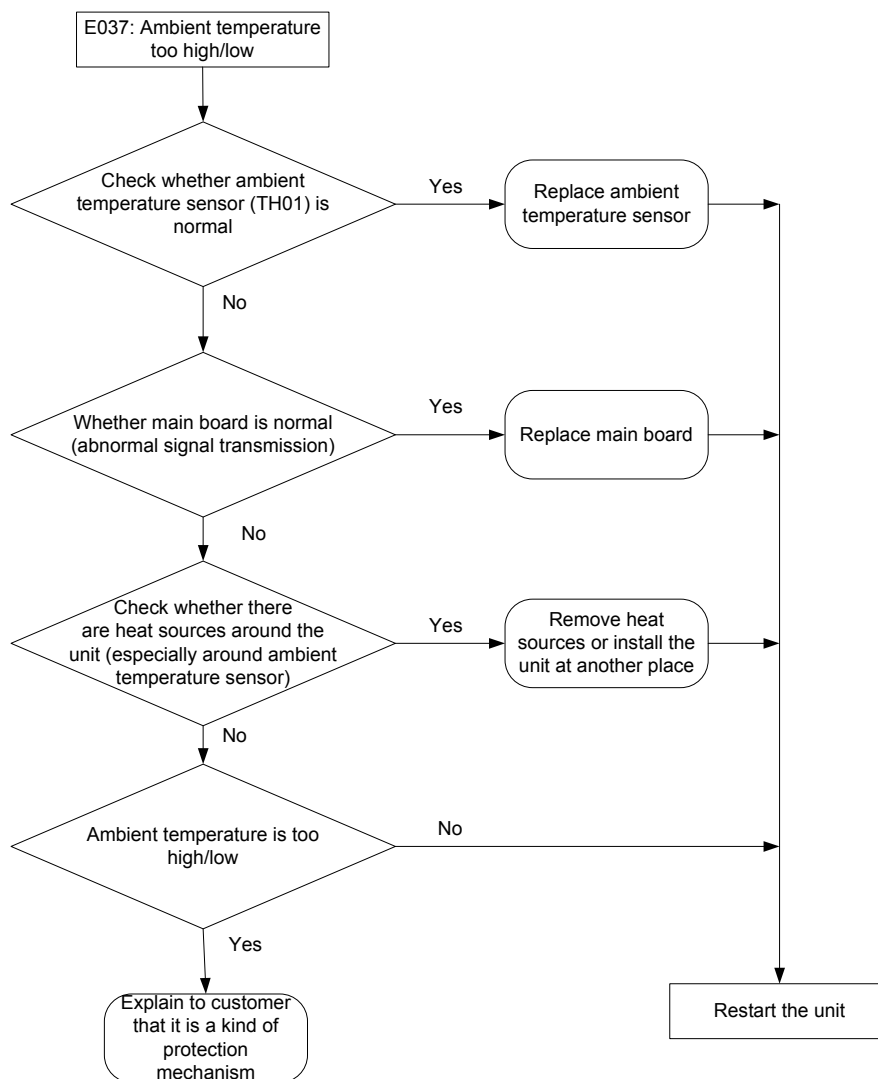
Fault detection method: Ambient temperature too high/low

Fault identification conditions: ODU starts fault protection and fails to work properly

Possible causes:

- ① Abnormal temperature sensor
- ② Abnormal main board
- ③ External heat sources around ambient temperature sensor
- ④ Actual ambient temperature too high/low

Troubleshooting:



2.15 System failure

Code displayed: ODU main board displays E039 (applicable to AA/AS/AX models).

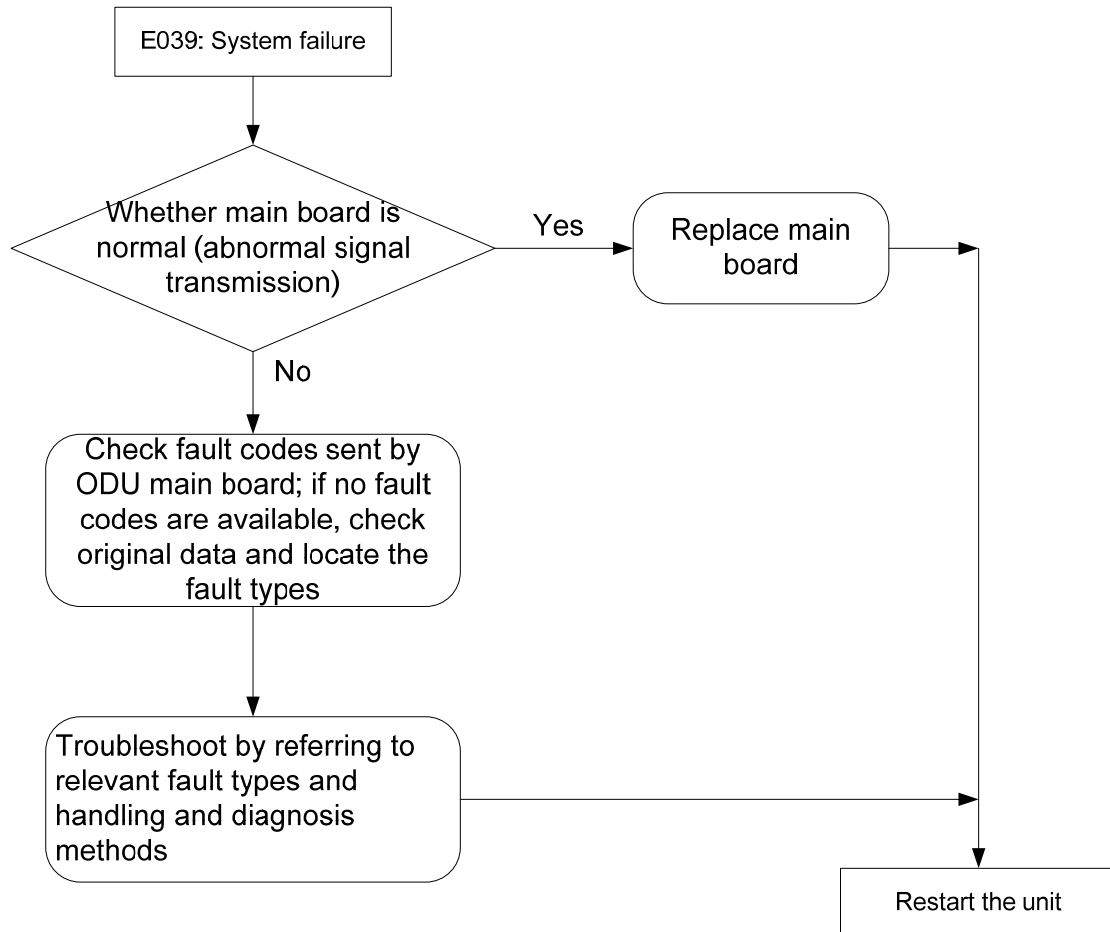
Fault detection method: ODU nixie tubes display corresponding fault codes

Fault identification conditions: the unit starts fault protection and fails to turn on properly. The unit must be restarted after power off.

Possible causes:

- ① Abnormal main board
- ② Refer to relevant handling methods

Troubleshooting:



2.16 Phase sequence (default phase) fault

Code displayed: ODU main board displays E023 (applicable to AA/AS/AX models).

Fault detection method: Check whether the unit's input power cord is not connected or wrongly connected.

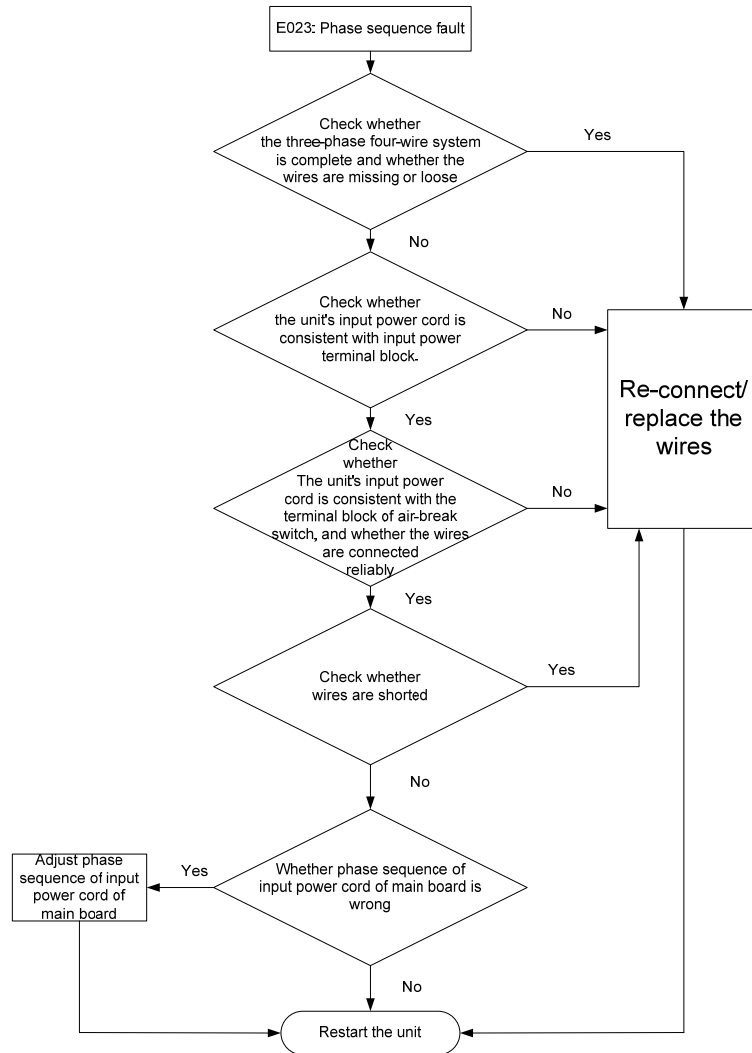
Fault identification conditions: ODU main board sends a false alarm and the unit fails to work properly

Possible causes:

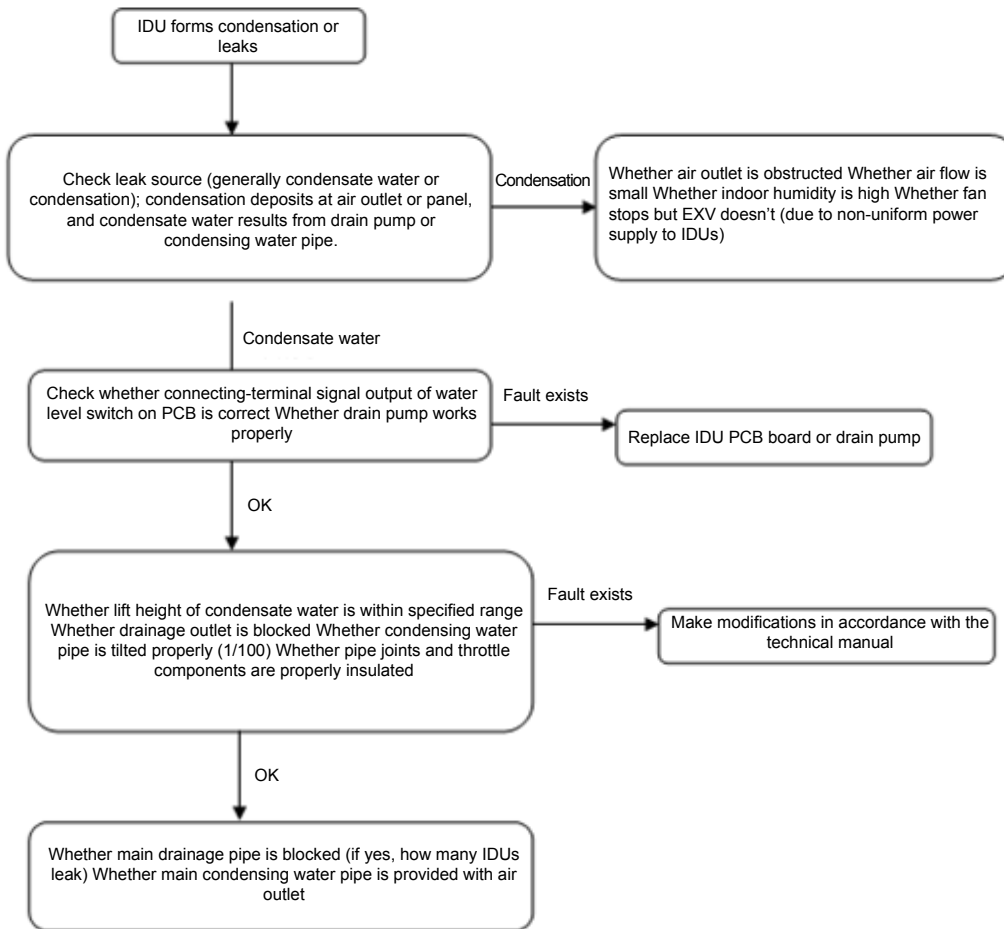
- ① The unit's input power cord is not connected
- ② The unit's input power cord sequence is not consistent with the connecting terminal sequence

- ③ The unit's input power cord sequence is not consistent with the connecting terminal sequence of air-break switch
- ④ The unit's input power cord is not connected reliably
- ⑤ The unit's input power cord is abnormal (disconnected or shorted)
- ⑥ Wrong phase sequence of input power cord of main board

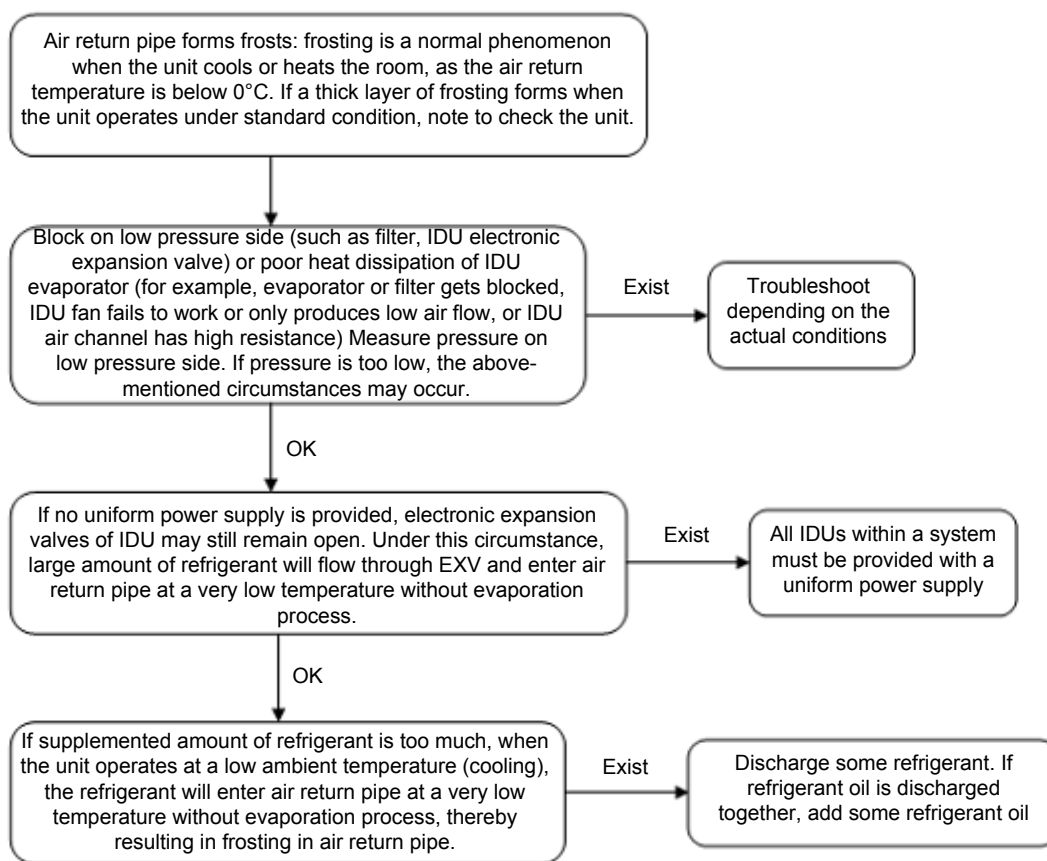
Troubleshooting:



2.17 IDU forms condensation or leaks



2.18 Air return pipe forms frosts



Notes:

If the IDUs are not provided with a uniform power supply: when some IDUs are suddenly power off, their electronic expansion valves may still remain open to let plenty of refrigerant pass:

- ① but because fan does not operate, the refrigerant cannot evaporate; as a result, the evaporator and the pipes are at a very low temperature and hence could easily generate condensation or ices when coming in contact with indoor hot air.
- ② the refrigerant will return to compressor in a liquid form without evaporation process, and may result in liquid hammer and cause harm to compressor.
- ③ the amount of refrigerant that passes through other normally functional IDUs is reduced, thereby dampening cooling effects.

2.19 Sensor fault

1. THo1 sensor fault

Code displayed: ODU main board displays E008 (applicable to AA/AS/AX models).

Fault detection method: Measure resistance value of ambient temperature probe (At 25°C, resistance value is 20K. The higher the temperature, the lower the resistance value)

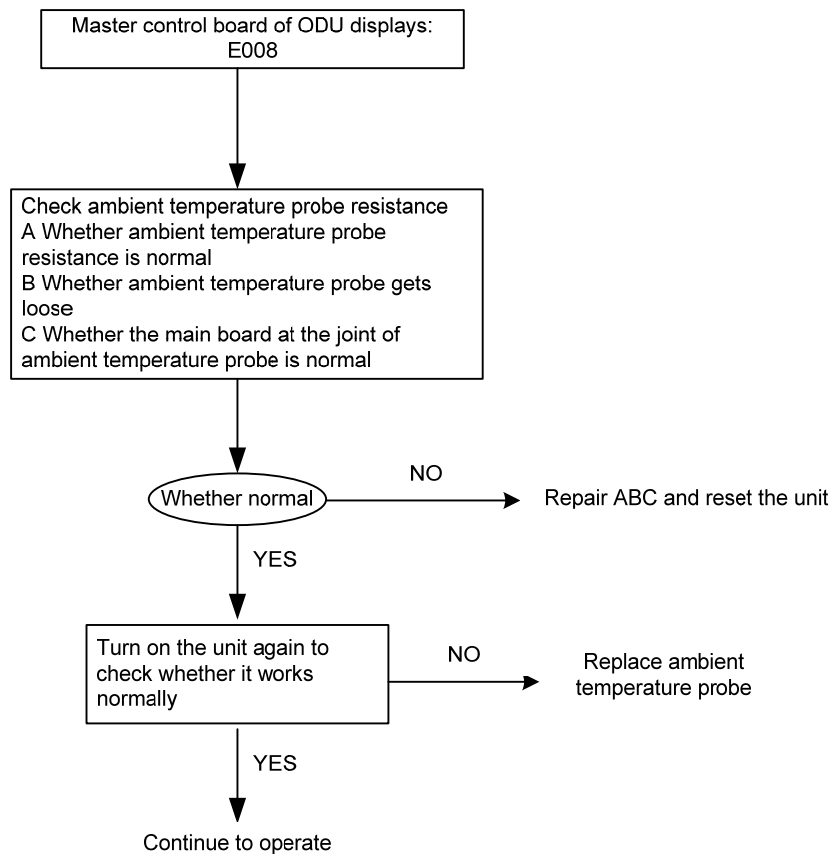
Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe may vary significantly under ambient temperature and actual ambient temperature (the actual reading should be -25°C~60°C)

Possible causes:

- ① TH1 ambient temperature probe is damaged
- ② Ambient temperature probe socket at main board gets loose
- ③ Ambient temperature detection port at the main board is damaged

Troubleshooting: Methods of judging whether ports of master control board are normal: connect a 20k resistor to the corresponding port to see on the monitor software whether the discharge temperature or compressor-top temperature is 25°C. If yes, master control board is normal; if no, replace master control board.



2. THo2 sensor fault

Code displayed: ODU main board displays E009 (applicable to AA/AS/AX models).

Fault detection method: Measure resistance value of ambient temperature probe (At 25°C, resistance value is 50K. The higher the temperature, the lower the resistance value)

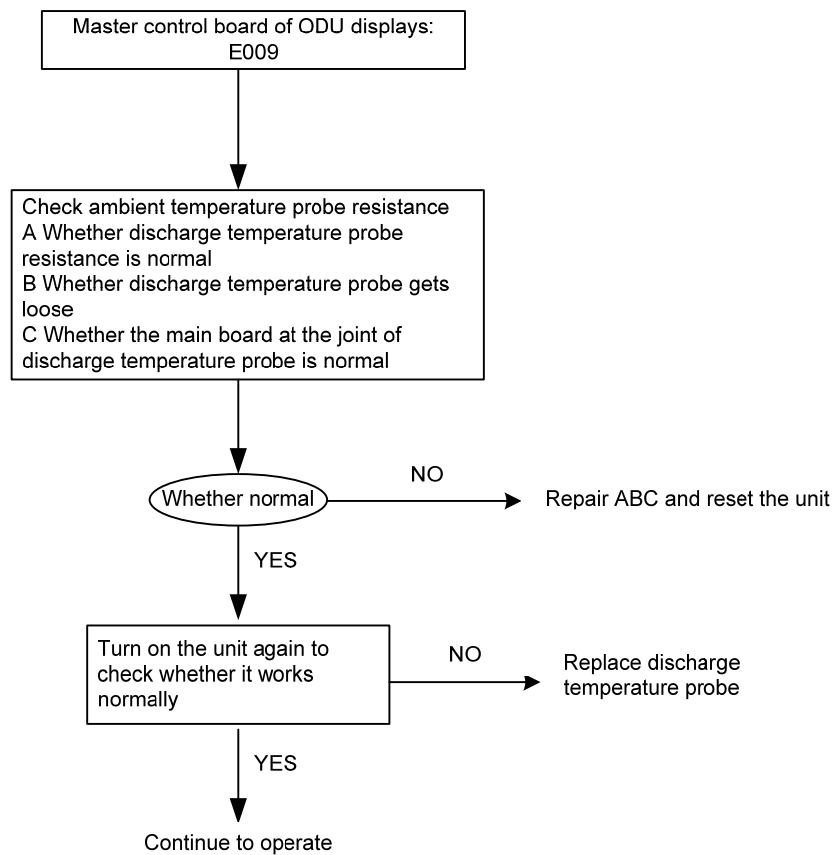
Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe in hot water may be greatly different from the actual reading of water temperature (the actual reading should be 0°C~100°C)

Possible causes:

- ① TH2 discharge temperature probe is damaged
- ② Discharge temperature probe socket at main board gets loose
- ③ Discharge temperature detection port at the main board is damaged

Troubleshooting: Methods of judging whether ports of master control board are normal: connect a 20k resistor to the corresponding port to see on the monitor software whether the discharge temperature or compressor-top temperature is 25°C. If yes, master control board is normal; if no, replace master control board.



3. THo3 sensor fault

Code displayed: ODU main board displays E010 (applicable to AA/AS/AX models).

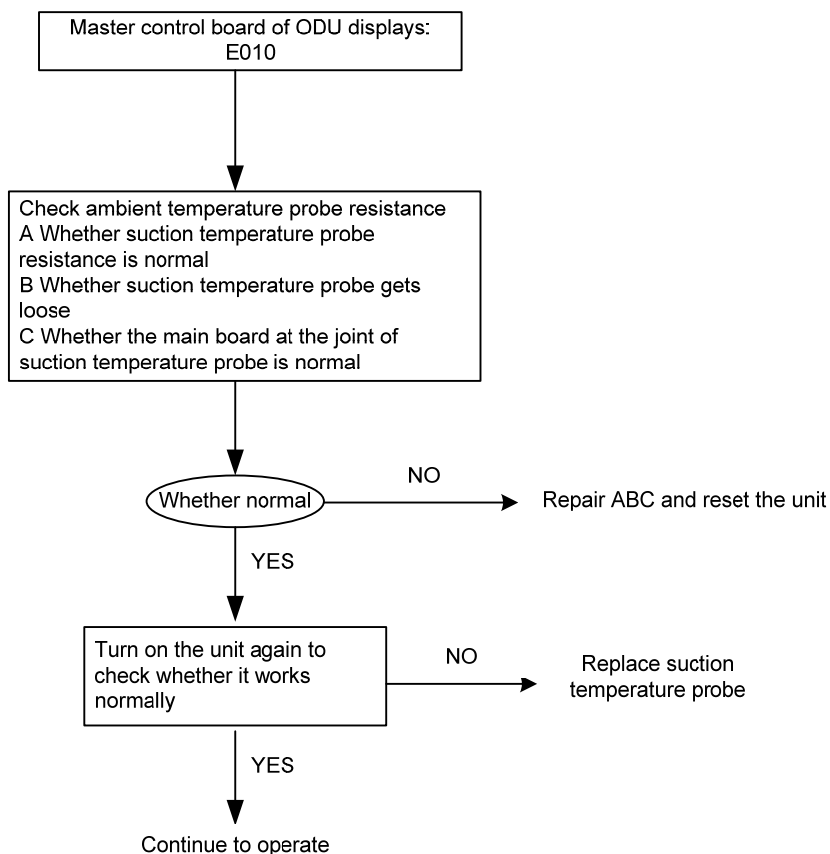
Fault detection method: Measure resistance value of ambient temperature probe (At 25°C, resistance value is 20K. The higher the temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe may vary significantly under ambient temperature and actual ambient temperature (the actual reading should be -25°C~60°C)

Possible causes:

- ① TH3 suction temperature probe is damaged
- ② Discharge temperature probe socket at main board gets loose
- ③ Discharge temperature detection port at the main board is damaged



4. THo4 sensor fault

Code displayed: ODU main board displays E011 (applicable to AA/AS/AX models).

Fault detection method: Measure resistance value of inlet temperature probe at

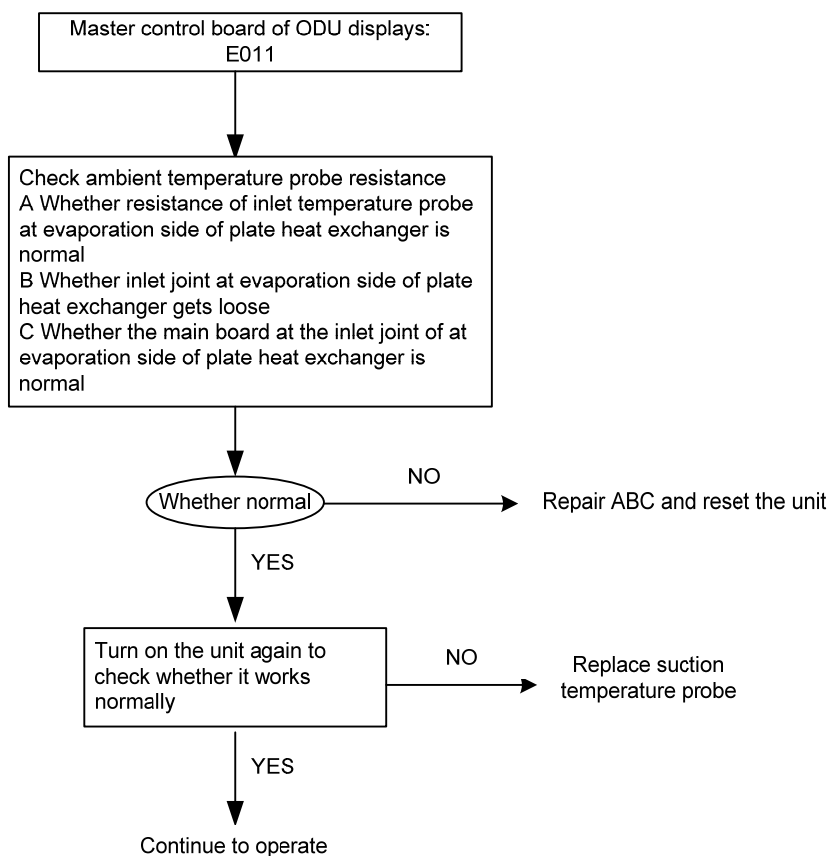
evaporation side of plate heat exchanger (At 25°C, resistance value is 20K. The higher the temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe may vary significantly under ambient temperature and actual ambient temperature (the actual reading should be -25°C~60°C)

Possible causes:

- ① TH4 temperature probe is damaged
- ② Inlet temperature probe socket at evaporation side of plate heat exchanger gets loose
- ③ Inlet temperature detection port at evaporation side of plate heat exchanger is damaged



5. THo5 sensor fault

Code displayed: ODU main board displays E012 (applicable to AA/AS/AX models).

Fault detection method: Measure resistance value of outlet water temperature probe at evaporation side of plate heat exchanger (At 25°C, resistance value is 20K. The higher the

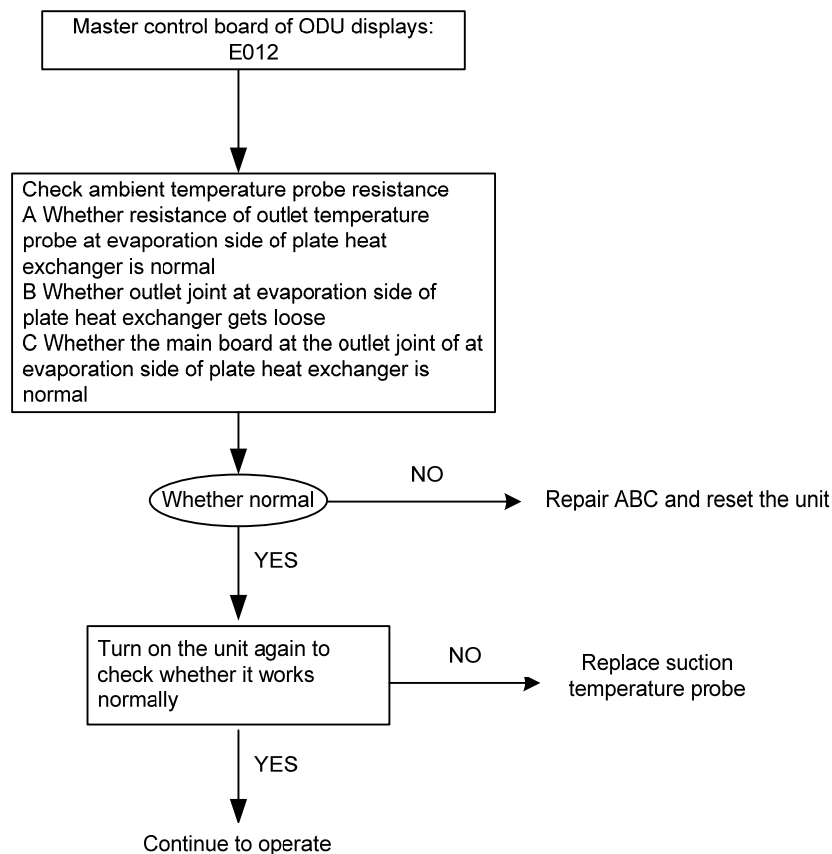
temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe may vary significantly under ambient temperature and actual ambient temperature (the actual reading should be -25°C~60°C)

Possible causes:

- ① TH5 temperature probe is damaged
- ② Outlet water temperature probe socket at evaporation side of plate heat exchanger gets loose
- ③ Outlet water temperature detection port at evaporation side of plate heat exchanger is damaged



6. THo6 sensor fault

Code displayed: ODU main board displays E013 (applicable to AA/AS/AX models).

Fault detection method: Measure resistance value of outlet water temperature probe at main side of plate heat exchanger (At 25°C, resistance value is 20K. The higher the

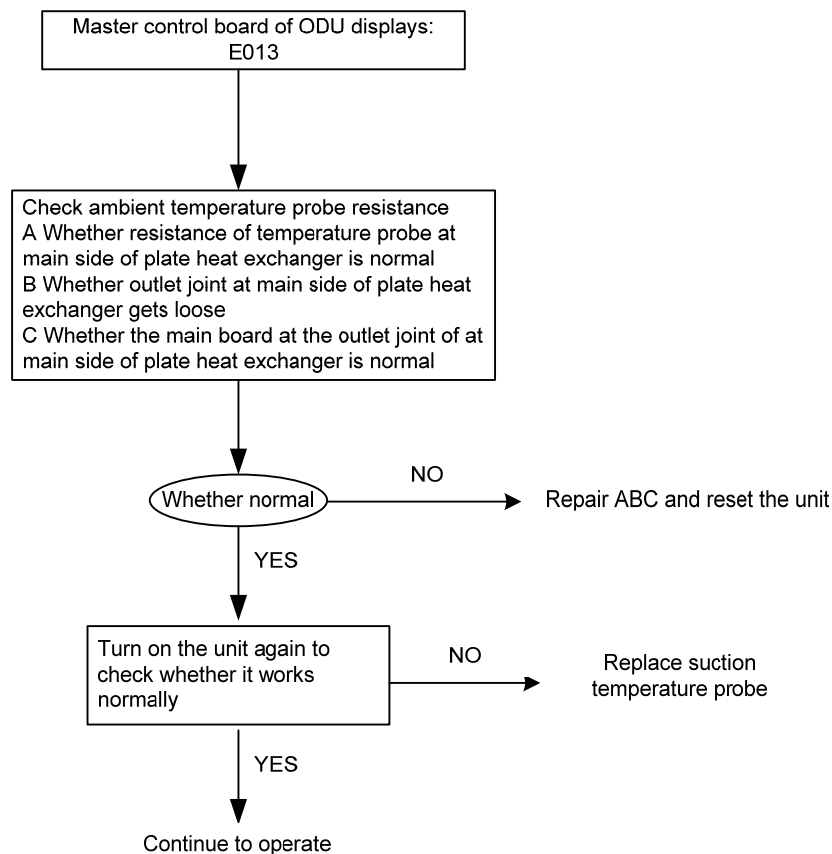
temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe may vary significantly under ambient temperature and actual ambient temperature (the actual reading should be -25°C~60°C)

Possible causes:

- ① TH6 temperature probe is damaged
- ② Outlet water temperature probe socket at main side of plate heat exchanger gets loose
- ③ Outlet water temperature detection port at main side of plate heat exchanger is damaged



7. THo7 sensor fault

Code displayed: ODU main board displays E014 (applicable to AA/AS/AX models).

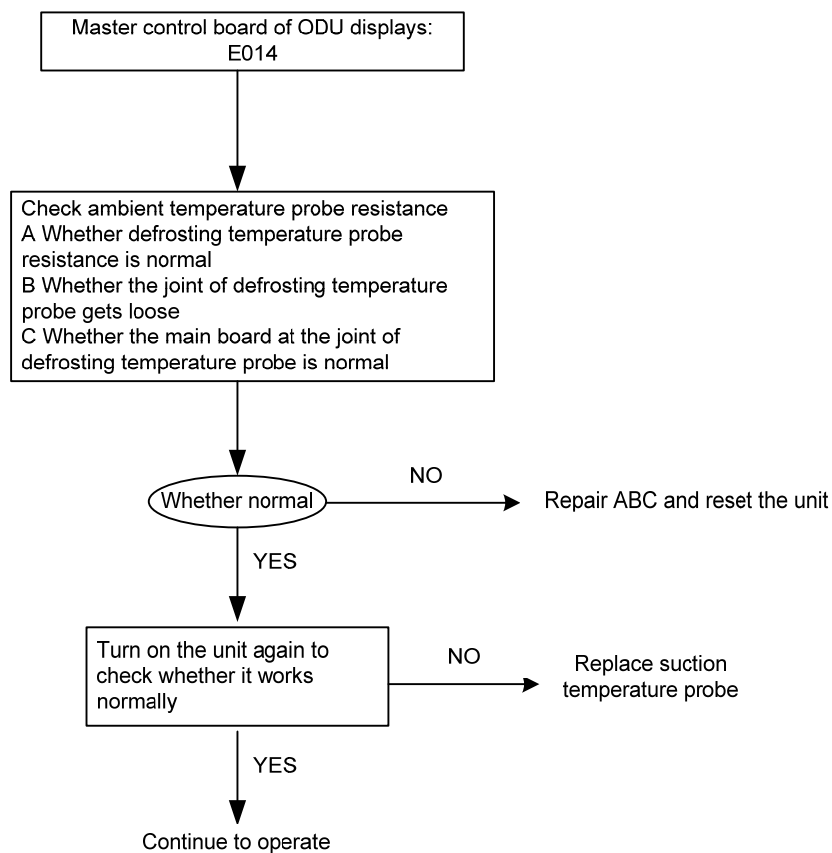
Fault detection method: Measure resistance value of defrosting temperature probe (At 25°C, resistance value is 20K. The higher the temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe may vary significantly under ambient temperature and actual ambient temperature (the actual reading should be -25°C~60°C)

Possible causes:

- ① TH7 temperature probe is damaged
- ② Defrosting temperature probe socket gets loose
- ③ Defrosting temperature detection port is damaged



8. THo8 sensor fault

Code displayed: ODU main board displays E015 (applicable to AA/AS/AX models).

Fault detection method: Measure resistance value of ambient temperature probe (At 25°C, resistance value is 50K. The higher the temperature, the lower the resistance value)

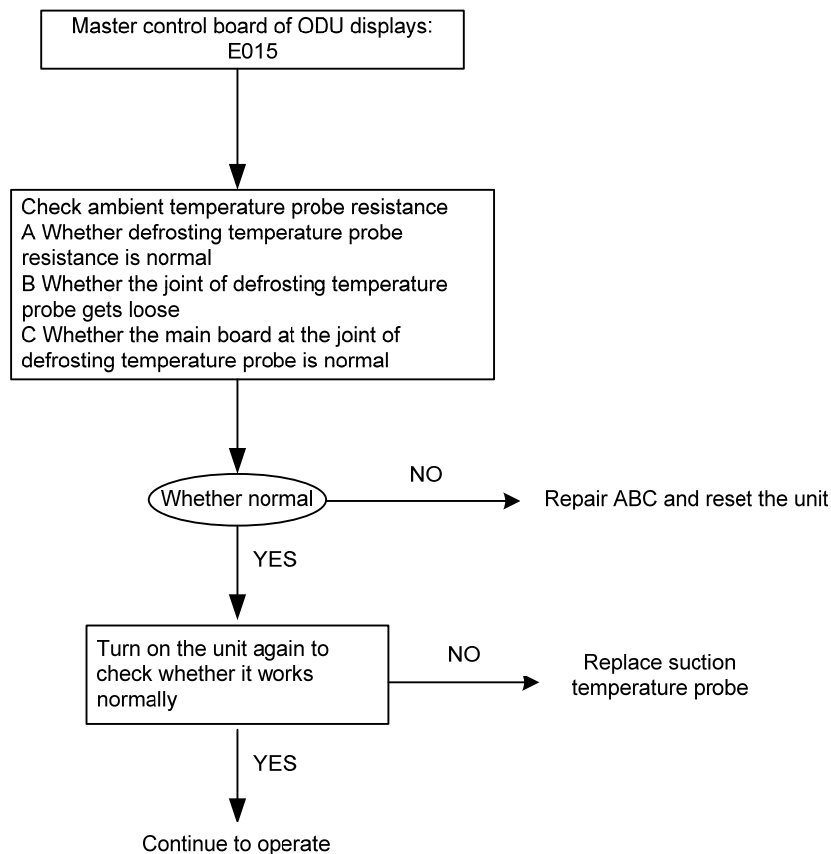
Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe in hot water may be greatly

different from the actual reading of water temperature (the actual reading should be 0°C~100°C)

Possible causes:

- ① TH8 temperature probe is damaged
- ② Discharge temperature probe socket at main board gets loose
- ③ Discharge temperature detection port at the main board is damaged



9. Inverter 1 compressor-top temperature sensor fault

Code displayed: ODU main board displays E016 (applicable to AA/AS/AX models).

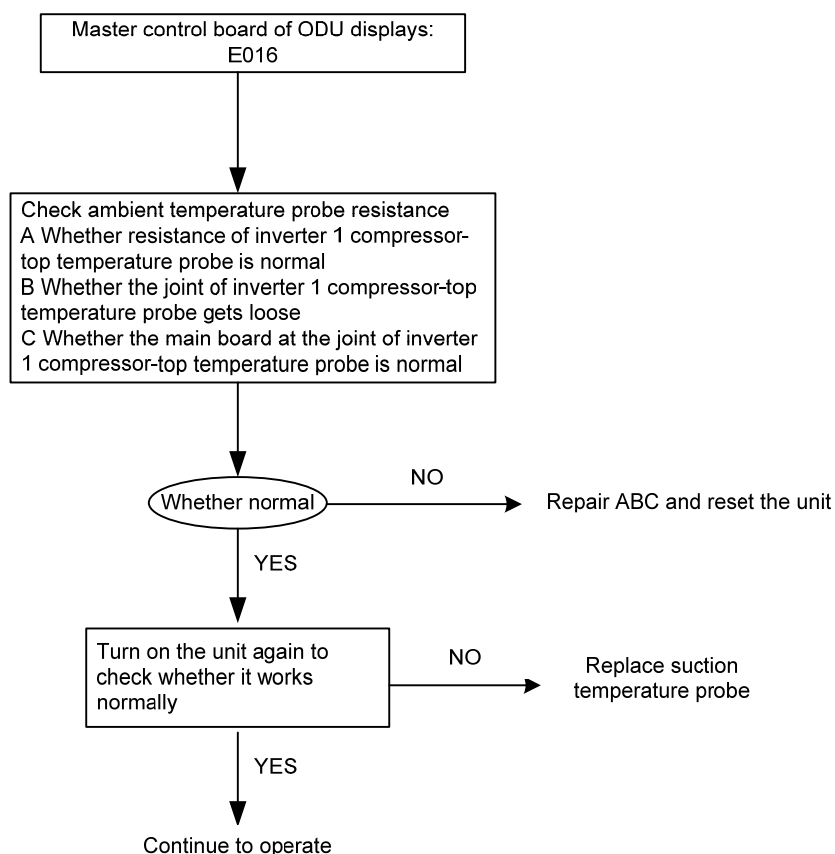
Fault detection method: Measure resistance value of ambient temperature probe (At 25°C, resistance value is 50K. The higher the temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe in hot water may be greatly different from the actual reading of water temperature (the actual reading should be 0°C~100°C)

Possible causes:

- ① Inverter 1 compressor-top temperature probe is damaged
- ② Inverter 1 compressor-top temperature probe socket at main board gets loose
- ③ Inverter 1 compressor-top temperature detection port at the main board is damaged



10. Inverter 2 compressor-top temperature sensor fault

Code displayed: ODU main board displays E017 (applicable to AA/AS/AX models).

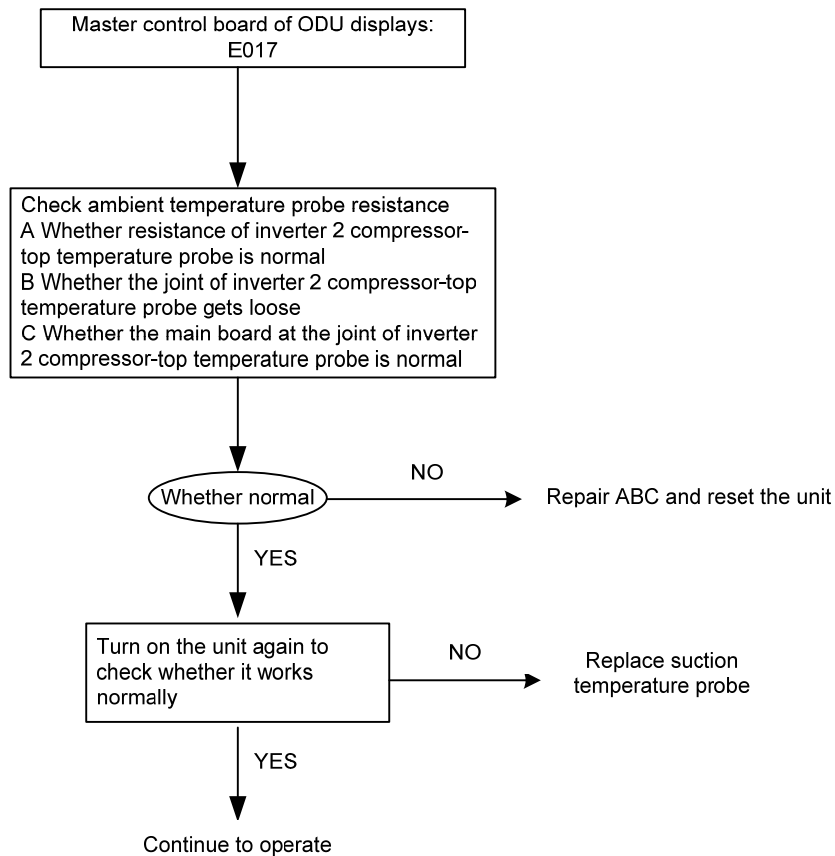
Fault detection method: Measure resistance value of ambient temperature probe (At 25°C, resistance value is 50K. The higher the temperature, the lower the resistance value)

Fault identification conditions: The resistance value measured under ambient temperature is abnormal

Take the probe out of the unit, as the reading of the probe in hot water may be greatly different from the actual reading of water temperature (the actual reading should be 0°C~100°C)

Possible causes:

- ① Inverter 2 compressor-top temperature probe fails
- ② Inverter 2 compressor-top temperature probe socket at main board gets loose
- ③ Inverter 2 compressor-top temperature detection port at the main board is damaged



2.20 Fan drive communication fault

Code displayed: ODU main board displays E005/E029 (applicable to AA/AS/AX models).

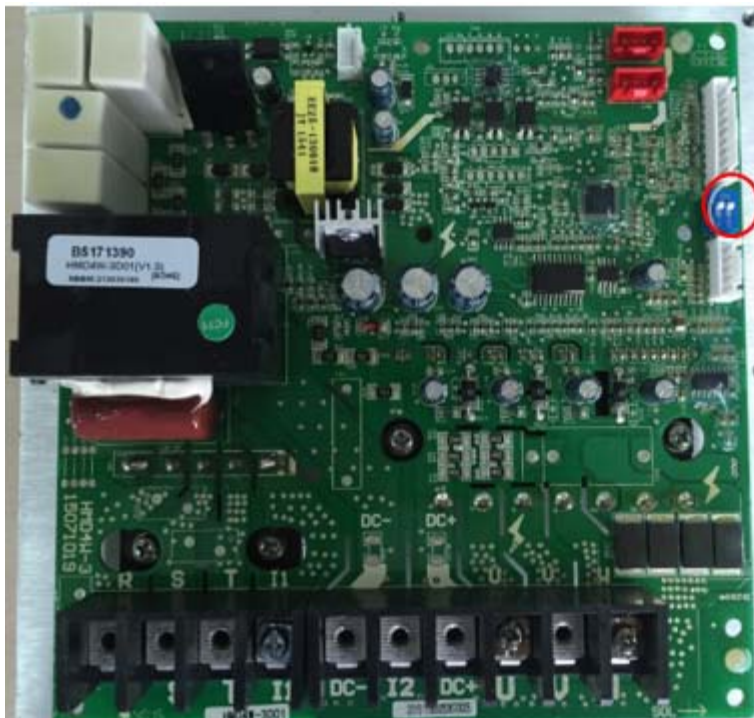
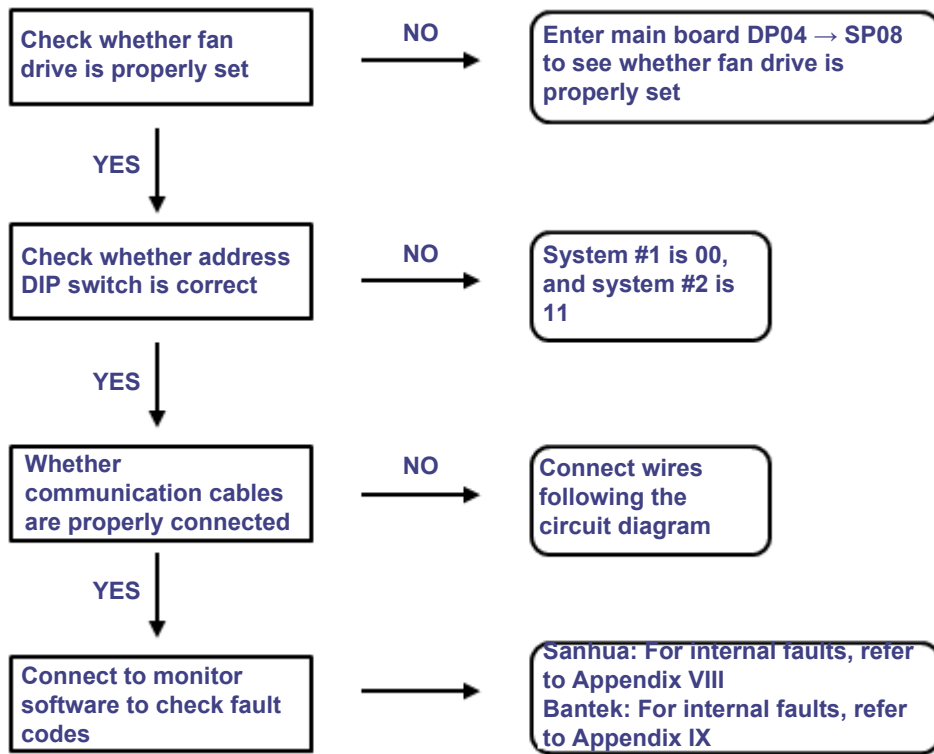
Fault detection method: Check fault codes displayed on master control board of ODU.

Fault identification conditions: Master control board of ODU displays fault code E005/E029.

Possible causes:

- ① Drive is incorrectly set
- ② Incorrect address DIP switch
- ③ Incorrect communication line connection

Troubleshooting:



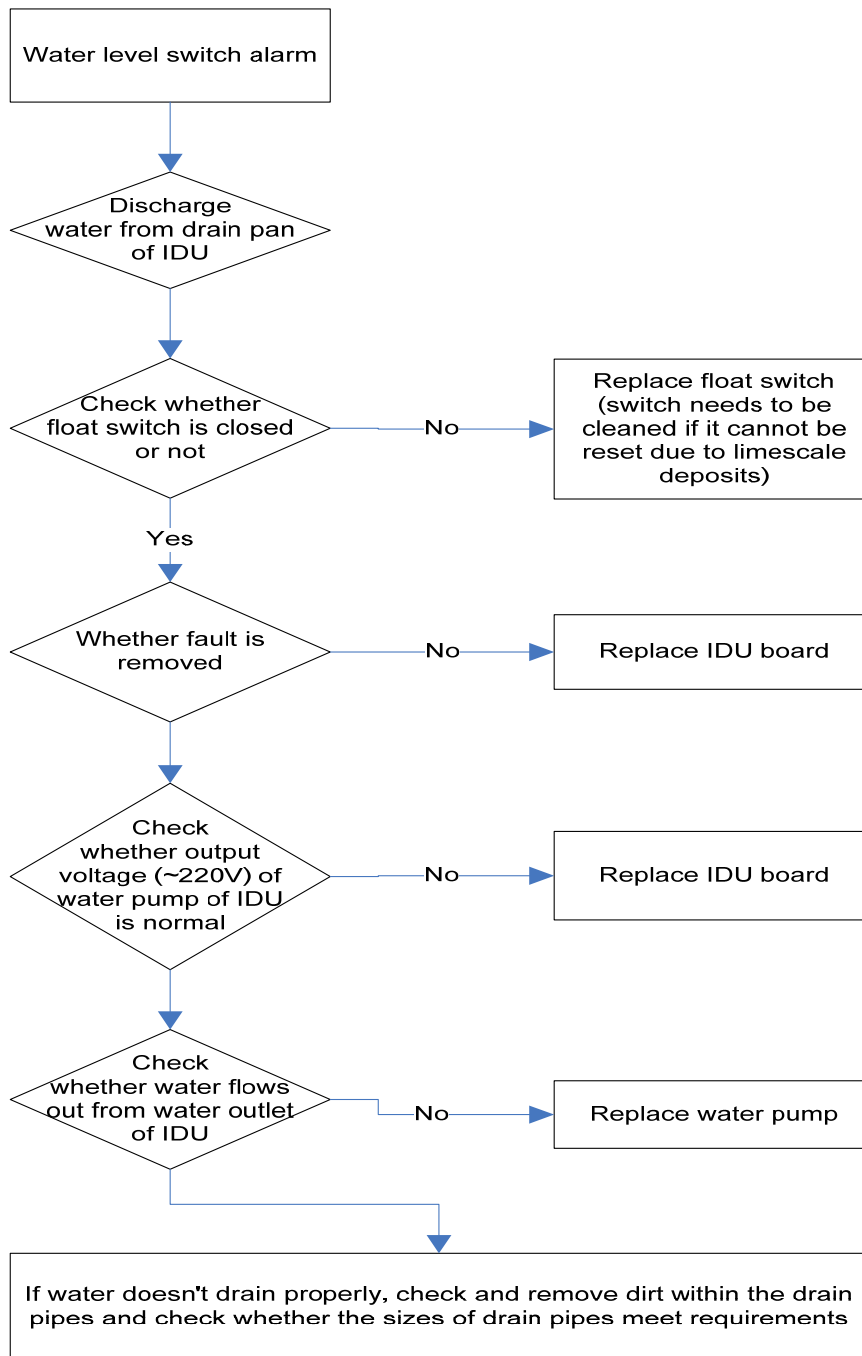
For 10P Sanhua drive address DIP switch, refer to the left diagram. ON is indicated by 1 and numerals by 0.



For 16P Sanhua drive address DIP switch, refer to the left diagram. ON is indicated by 1 and numerals by 0.

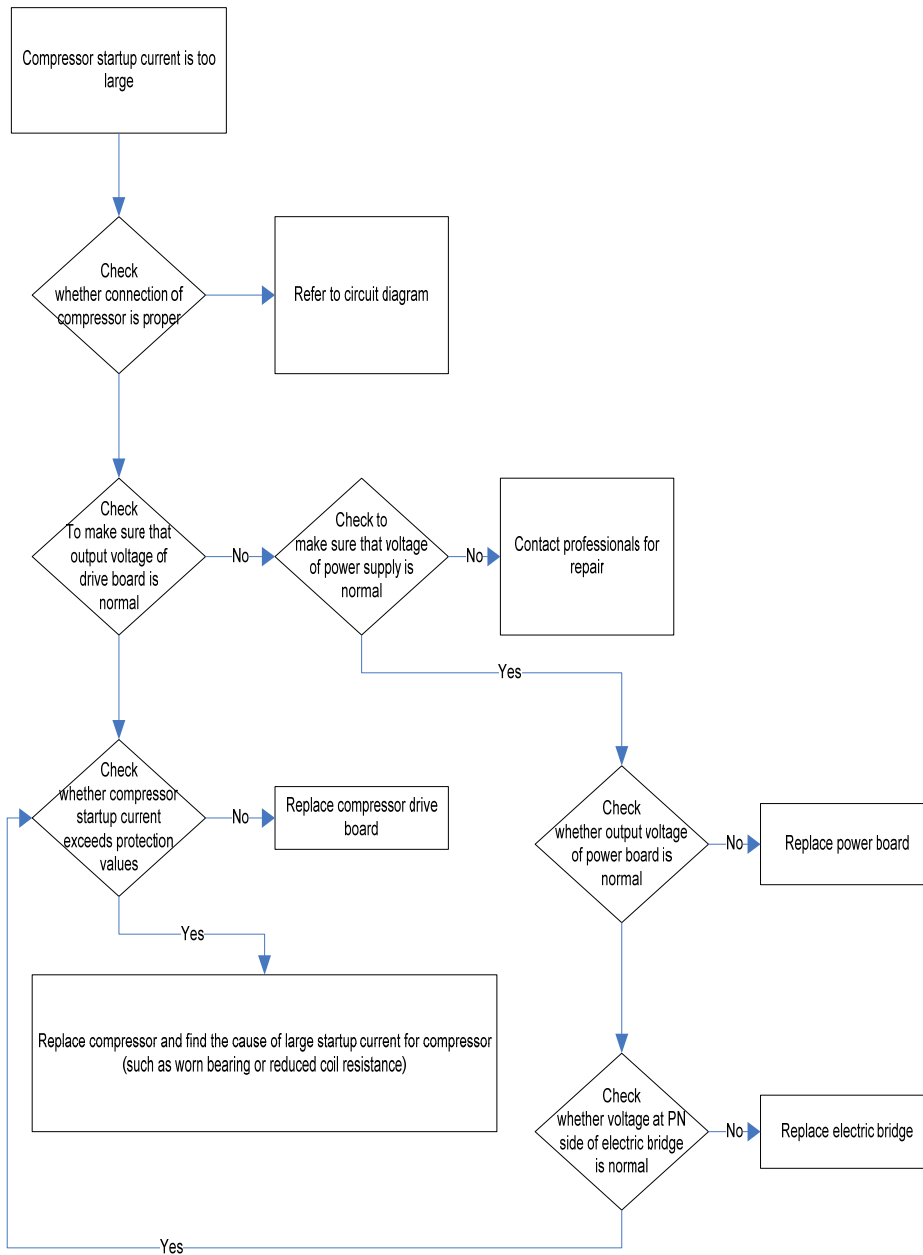
2.21 Water level switch alarm

Red indicator on fault-code remote control receiver flashes 7 times

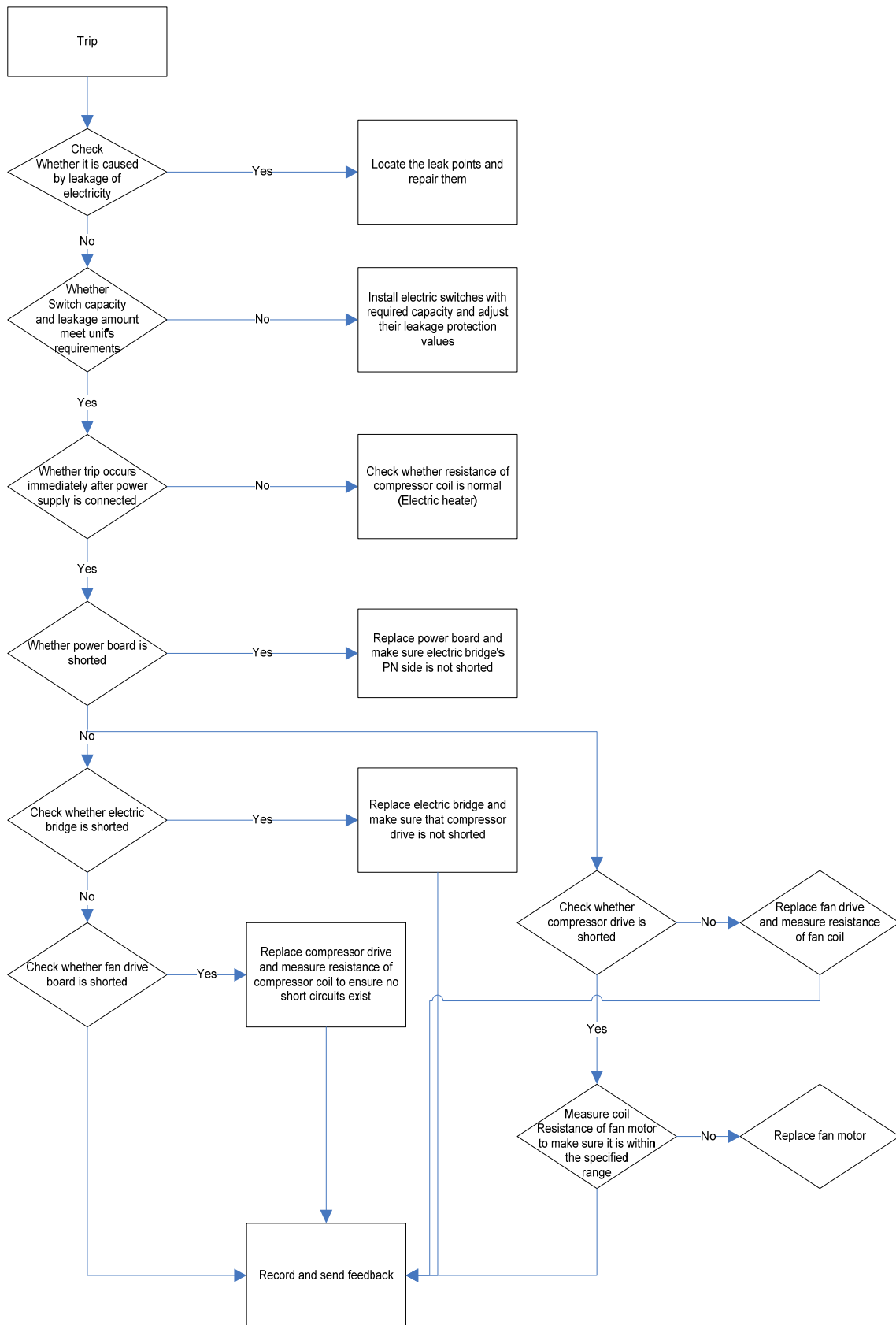


2.22 Compressor startup current is too large

Fault code E007 (E03.4)



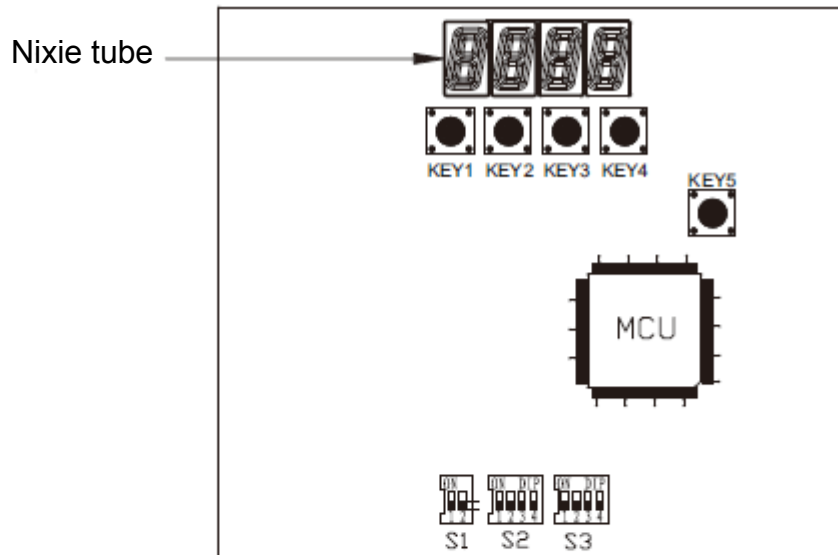
2.23 Trip



Chapter VII Electrical Conceptual Diagram and Description of DIP Switch

1. IDU and ODU DIP Switch Table

1.1 ODUDIP switch table



Code settings

Notes:



- a. "0" for the status above, and "1" when dialed to the "ON" position.
- b. Description on ODU address setting: based on the specific situation after installation is completed.
- c. The unit must be powered on again after the DIP switch is reset.
- d. ODU capacity code has been set properly before delivery. Please check whether the setting is right.

- S1: ODU capacity code (reserved)
- S2: System configuration DIP switch

No.	Function	Dialed to "0"	Dialed to "1"
S2-1	Main unit/ secondary unit	Slave unit	Master unit

Remarks: When there are not any modules in series, DIP switch must be "1".

S2-1	S2-2	S2-3	S2-4	Number of slave units	Addresses of slave units
0	0	0	/	/	1
0	0	1	/	/	2
0	1	0	/	/	3
1	0	0	/	0	/
1	0	1	/	1	/
1	1	0	/	2	/
1	1	0	/	3	/

- S3: DIP switch of ODU capacity

Model	S3			
	1	2	3	4
TIMS080AS	0	0	0	1
TIMS100AS	0	0	1	
TIMS120AS	0	0	1	1
TIMS140AS	0	1		
TIMS160AS	0	1		1
TIMS180AS	0	1	1	
TIMS200AS	0	1	1	1
TIMS220AS	1	0		
TIMS240AS	1	0		1
TIMS260AS	1	0	1	
TIMS280AS	1	0	1	1
TIMS300AS	1	1	0	
TIMS320AS	1	1	0	1

For example, if ODU capacity is 16HP, DIP switch of S3 is 0101, refer to the figure on the right for specific positions of DIP switch:



For other models, refer to the foregoing standard.

- Description of contents displayed on nixie tubes

Notes	0	1	2	3	4	5	6	7	8	9
Nixie tube display	0	1	2	3	4	5	6	7	8	9
Notes	A	B	C	D	E	F	G	H	I	J
Nixie tube display	A	B	C	D	E	F	G	H	I	J
Notes	L	N	O	P	R	S	T	U	Y	
Nixie tube display	L	N	O	P	R	S	T	U	Y	

When operation mode varies, nixie tube will display the new mode correspondingly; normally it will display this mode for five seconds before displaying real-time clock; in the case of malfunctions, it will display the current malfunction code.

1.2 Settings of ODU parameters

1. Contents to be set

SP03 Setting of addresses of devices for centralized monitoring;

SP04 Setting of centralized monitoring of baud rate;

SP05 TIMS_AS and TIMS_AX selection

SP06 Selection of fan operating mode;

SP07 Compressor drive (hardware) configuration;

SP08 Fan drive (hardware) configuration;

SP09 Compressor model configuration;

SP10 Fan model configuration;

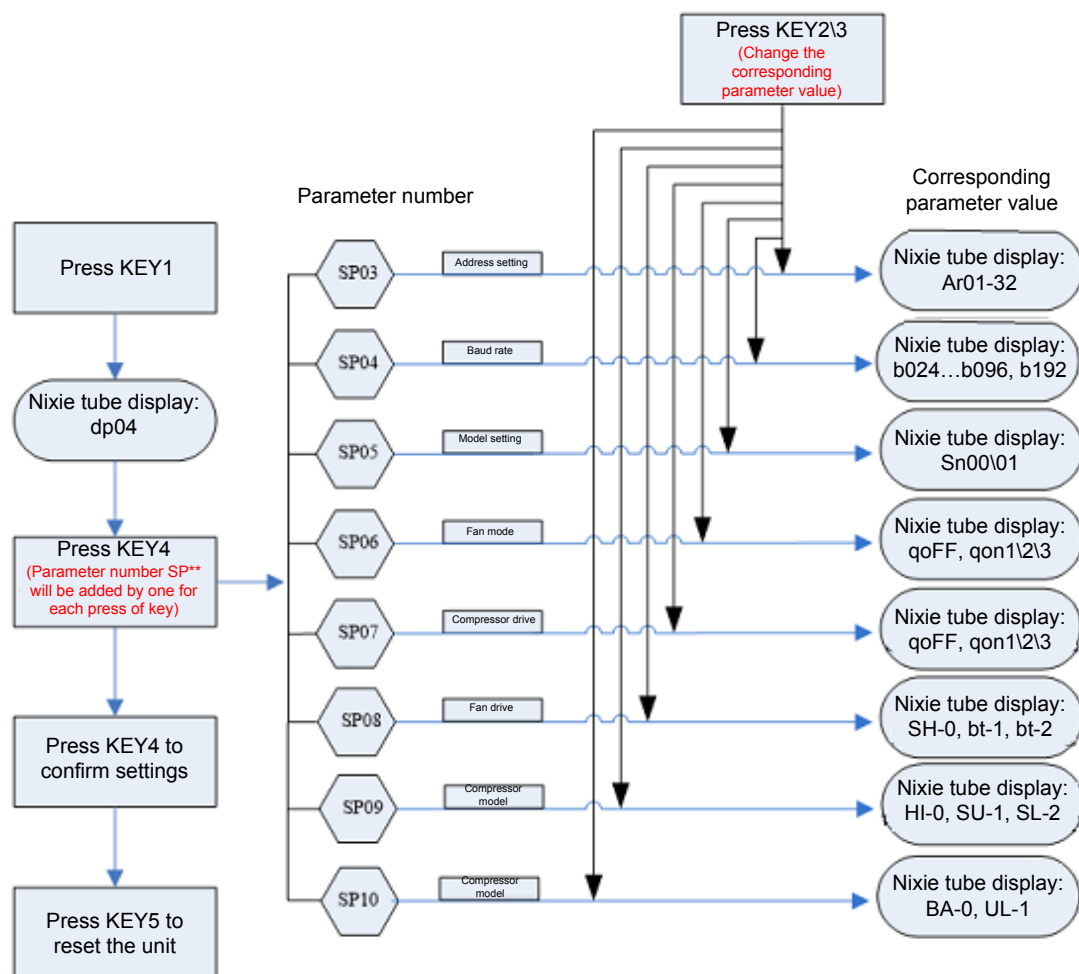
2. Buttons and corresponding labels

Shown icons:

1. dP04 Parameter setting function No.
2. SP** indicates parameter number, ** indicates specific parameter number (01, 02···07, 08)

3. Ar** indicates addresses of devices for centralized monitoring, ** indicates specific address (01, 02...07, 08)
4. b*** indicates centralized baud rate, *** indicates specific address (048, 096, 192)
5. Sn** Sn00: indicates TIMS_AS models; Sn01: indicates TIMS_AX models
6. qoFF close fan mode selection
7. qon1 quiet fan mode with temperature trend control
8. qon2 smart quiet mode
9. qon3 forced quiet mode

3. Description of specific operations



4. Trial operation command

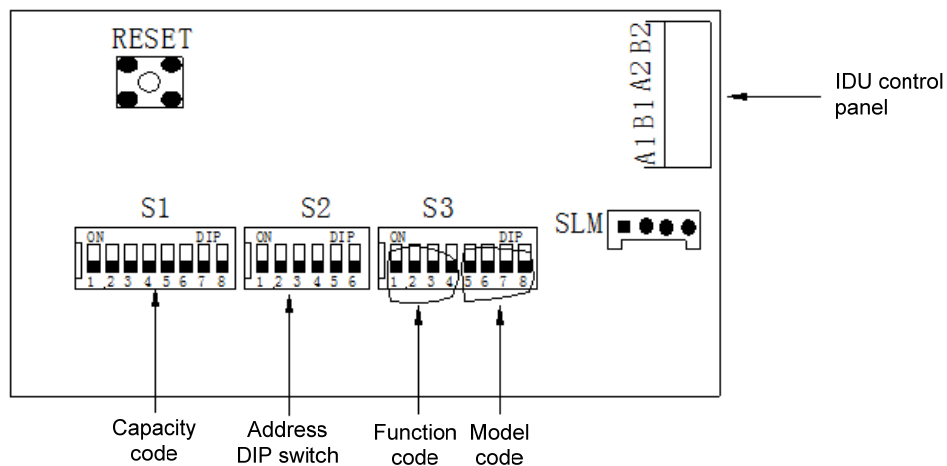
No.	Code	Function
1	0003	Start the cooling mode for test (start all IDUs, with cooling, high speed, 16°C and swing on)
2	0004	Cooling off
3	0009	Start the heating mode for test (start all IDUs, with heating, high speed, 30°C and swing on)

4	0010	Heating off
5	0374	Start electronic expansion valves of IDU and ODU

Press KEY1 to enter DP07 menu, press KEY2/KEY3 to select numerals and KEY4 to confirm your choice

1.3 IDU DIP switch table

A. IDU capacity code and model code are preset before delivery.



S1 DIP switch of unit capacity

(1) Applicable to IDUs except TMDF

Model	S1							
	1	2	3	4	5	6	7	8
TM**022	0	0	0	0	1	0	0	0
TM**025	0	0	0	0	1	0	0	1
TM**028	0	0	0	0	1	0	1	0
TM**032	0	0	0	0	1	1	0	0
TM**036	0	0	0	0	1	1	1	1
TM**040	0	0	0	1	0	0	0	0
TM**045	0	0	0	1	0	0	1	0
TM**050	0	0	0	1	0	0	1	1
TM**056	0	0	0	1	0	1	0	0
TM**063	0	0	0	1	1	0	0	1
TM**071	0	0	0	1	1	1	0	0
TM**080	0	0	0	1	1	1	1	0
TM**090	0	0	1	0	0	0	1	1
TM**100	0	0	1	0	1	0	0	0
TM**112	0	0	1	0	1	1	0	1

TM**125	0	0	1	1	0	0	1	0
TM**140	0	0	1	1	1	1	0	0
TM**160	1	0	1	0	0	0	0	0

For example: for model TMCF022, S1 code is 00010110 as below.



S1

(2) Applicable to TMDF

IDU models	S1							
	1	2	3	4	5	6	7	8
TMDF175A-022	0	1	0	1	0	0	0	0
TMDF210A-020	0	1	1	0	0	1	0	0
TMDF250A-015	0	1	1	0	0	1	0	0
TMDF250A-020	0	1	1	0	0	1	0	0
TMDF250A-030	0	1	1	0	0	1	0	0
TMDF300A-020	0	1	1	0	0	1	0	0
TMDF400A-020	1	0	1	0	0	0	0	0
TMDF400A-030	1	0	1	0	0	0	0	0
TMDF500A-020	1	1	0	0	1	0	0	0
TMDF500A-030	1	1	0	0	1	0	0	0
TMDF600A-020	1	1	0	0	1	0	0	0
TMDF600A-030	1	1	0	0	1	0	0	0

● S2: address DIP switch

IDU address	1	2	3	4	5	6
1#	0	0	0	0	0	1
2#	0	0	0	0	1	0
3#	0	0	0	0	1	1
4#	0	0	0	1	0	0
5#	0	0	0	1	0	1
6#	0	0	0	1	1	0
7#	0	0	0	1	1	1
8#	0	0	1	0	0	0
9#	0	0	1	0	0	1
10#	0	0	1	0	1	0
11#	0	0	1	0	1	1
12#	0	0	1	1	0	0

13#	0	0	1	1	0	1
14#	0	0	1	1	1	0
15#	0	0	1	1	1	1
16#	0	1	0	0	0	0
17#	0	1	0	0	0	1
18#	0	1	0	0	1	0
19#	0	1	0	0	1	1
20#	0	1	0	1	0	0
21#	0	1	0	1	0	1
22#	0	1	0	1	1	0
23#	0	1	0	1	1	1
24#	0	1	1	0	0	0
25#	0	1	1	0	0	1
26#	0	1	1	0	1	0
...						
62#	1	1	1	1	1	0
63#	1	1	1	1	1	1

Manual assignment of addresses: use S2 DIP switch to set IDU address;

Automatic assignment of addresses: IDU addresses automatically assigned by ODU (but S2 DIP switches must be at 0 position)

S3: Model and function code

S/N		Function	0	1
S3	1	Remote switch/Card inserting at a hotel	Remote switch	Card inserting at a hotel
	2	Air return temperature selection	Use a control board Air return temperature	Use a wired controller Air return temperature (This function is unavailable if there is no wired controller)
	3	Electric heater 2	Electric heater 2 unavailable	Electric heater 2 available
	4	Electric heater 1	Electric heater 1 unavailable	Electric heater 1 available

Model	S3			
	5	6	7	8
TMDN	0	0	0	0
TMDS	0	0	0	1
TMDH	0	0	1	0
TMCF	0	0	1	1
TMVX	0	1	0	0
TMVW	0	1	0	1

TMDF	0	1	1	0
TMCS	0	1	1	1
TMCD	1	0	0	0

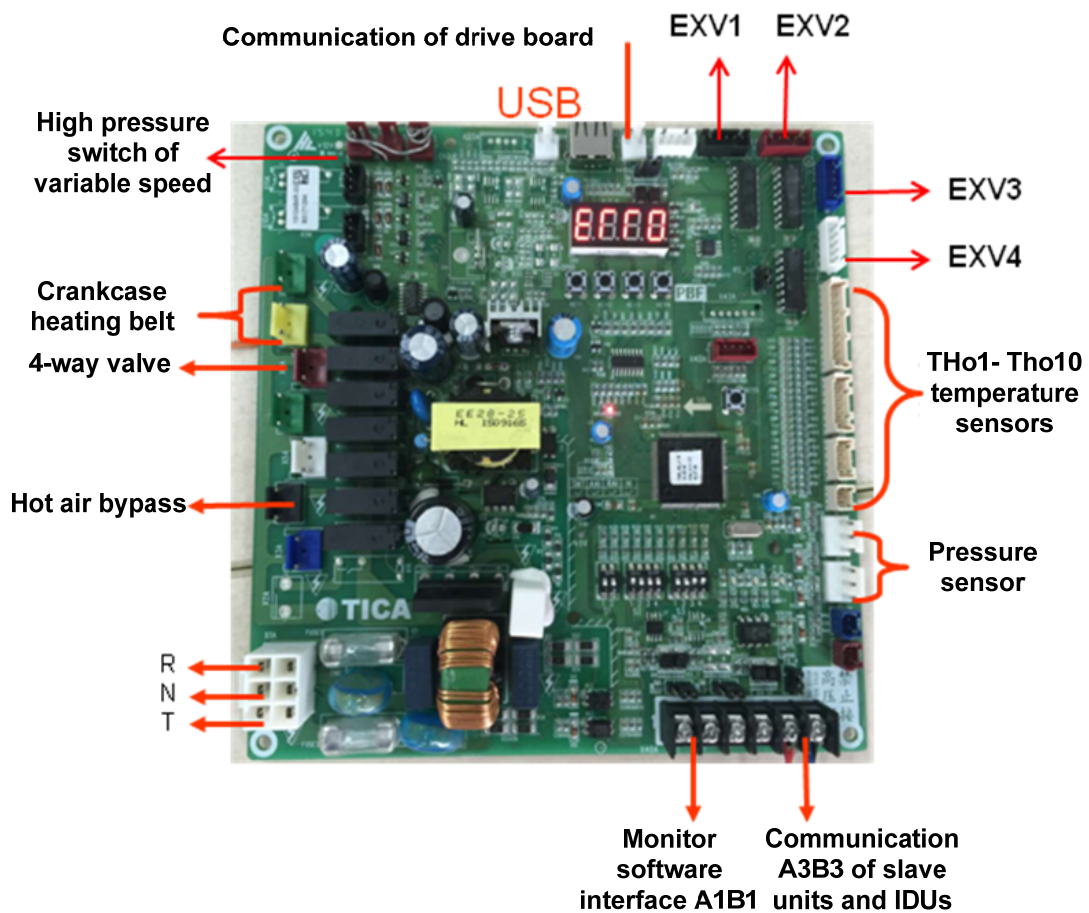
For example: for TMVX (with electric heater), S3 code is 00010100, as shown below:



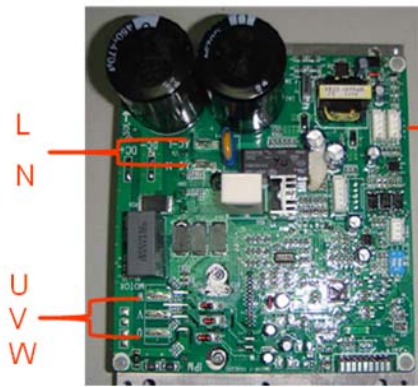
2. Electric control system

2.1 ODU

1. Master control board wiring is shown as below:



2. Fan drive board

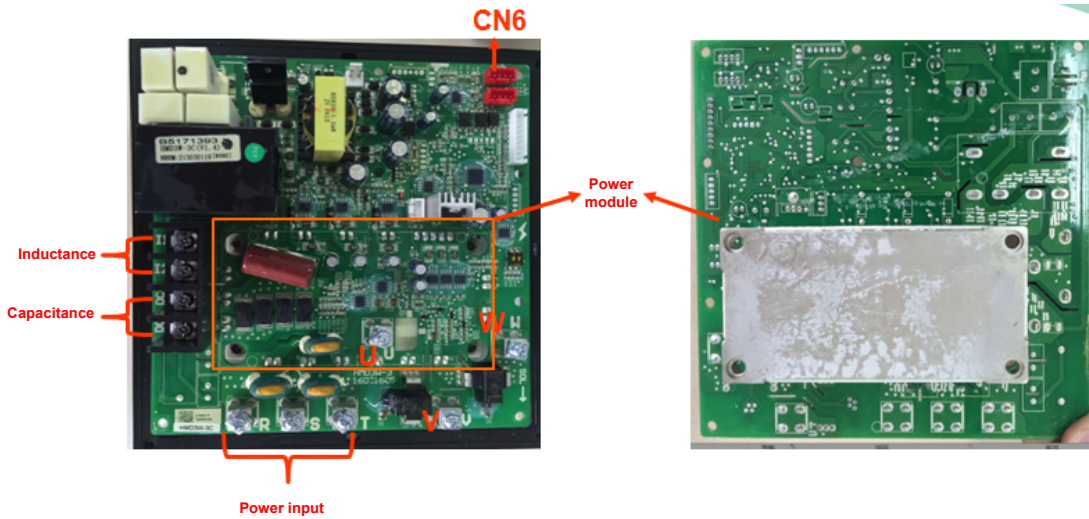


It is used to provide inverter power supply for fan.
 Fan runs at either 150-800RPM (8-18/28-32HP)
 or 150-1200 RPM (18-26HP).
 When drive board is disconnected from power supply, UV/UW/VW resistance is about 5.9 MΩ.

Communication port

Fan uses a RS485 interface and LN as incoming terminal of power supply.

3. Compressor drive board



It is used to provide inverter power supply for compressor. Compressor runs at 20-100RPS
 This drive module connects the rectifier and compressor drive board. When drive board is disconnected from power supply, UV/UW/VW resistance is about 3.5 MΩ.
 PN resistance is 0.2~0.6 MΩ.
 As an RS485 communication terminal, CN6 only uses 3-4 pin for communication, and connects to OUT interface at the bottom of main control board.

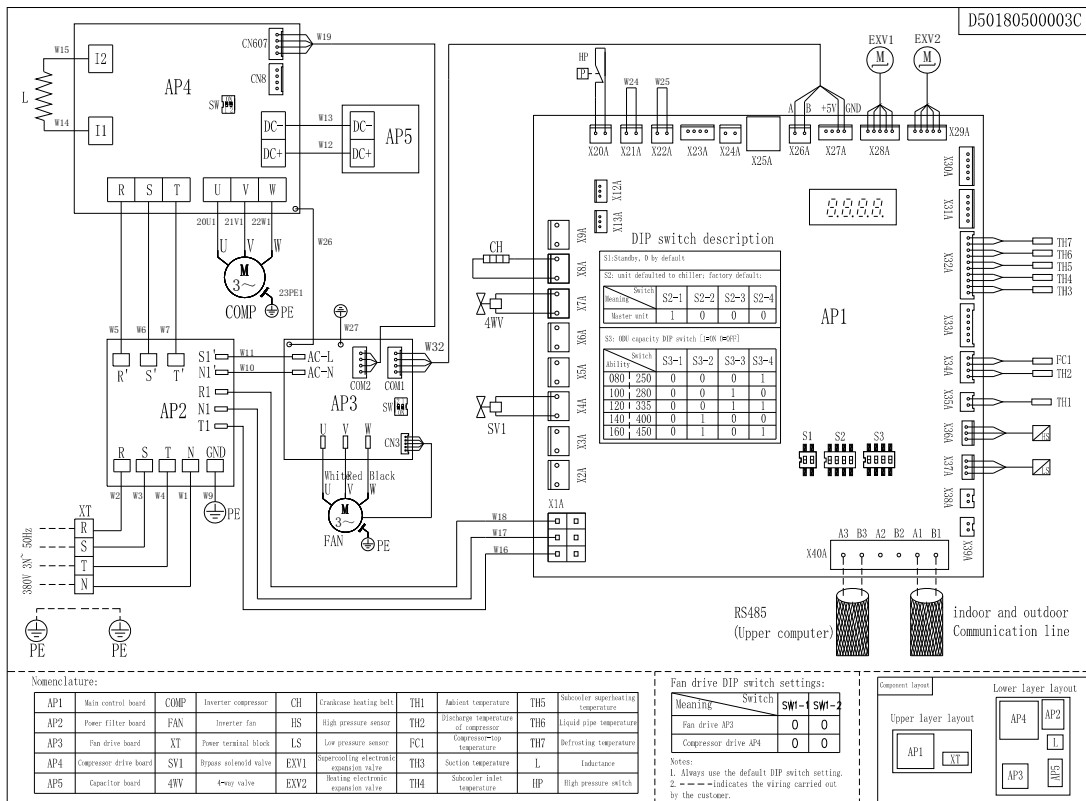
4. Filter board



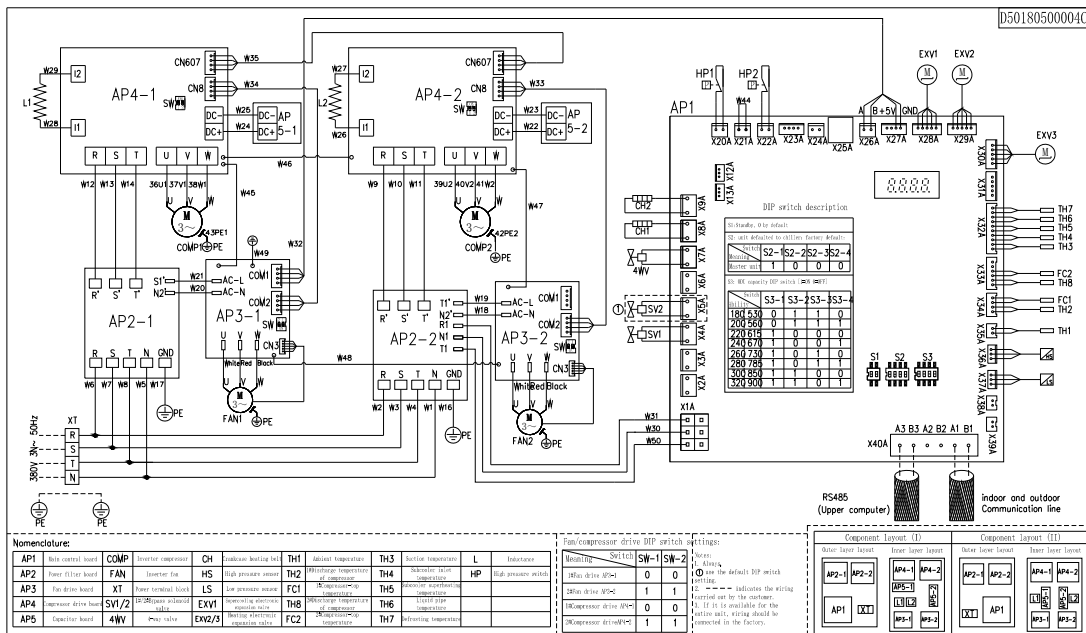
Filter board is used to filter noise wave and to prevent high-frequency interference of inverter machines on power grid.

When filter board is disconnected from power supply, resistance between power inlet and outlet phases is basically 0; resistance between phase and phase, between phase and zero, and between phase and ground, is above 10 MΩ. Due to capacitor charging, resistance may increase gradually upon measurement.

5. ODU wiring diagram



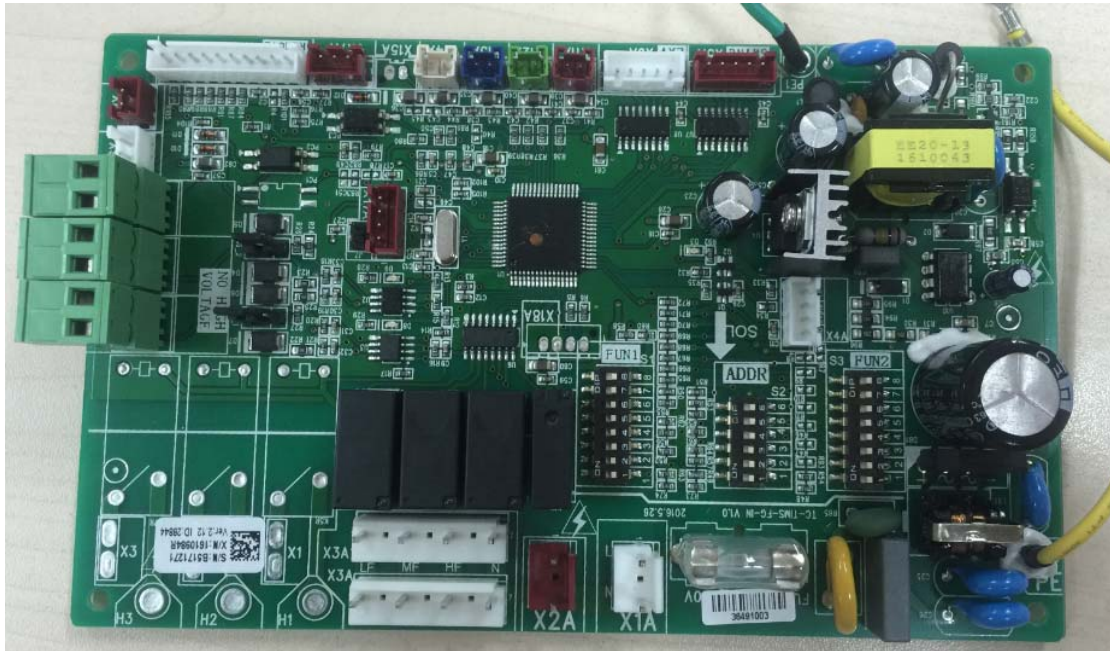
TIMS080~160AS/AX/AST D50180500003 Electrical principle diagram



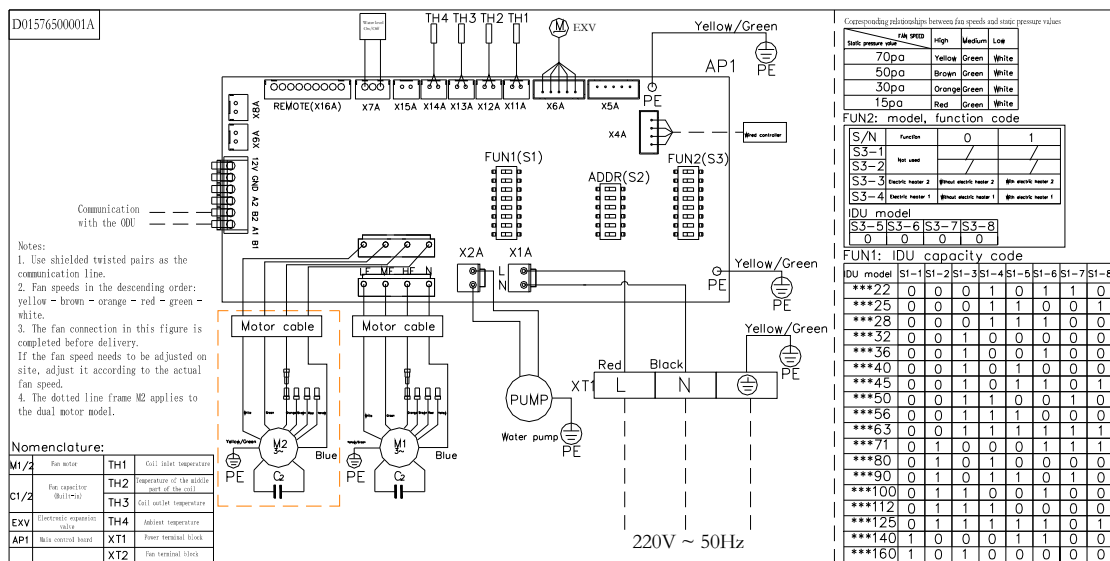
VRF unit TIMS180/200/220/240/260AS
 TIMS180/200/220AX
 TIMS280/300/320AS
 TIMS280/300/320AS (corrosion resistant)/AX
 D50180500004 control board
 Electrical principle diagram

2.2 IDU

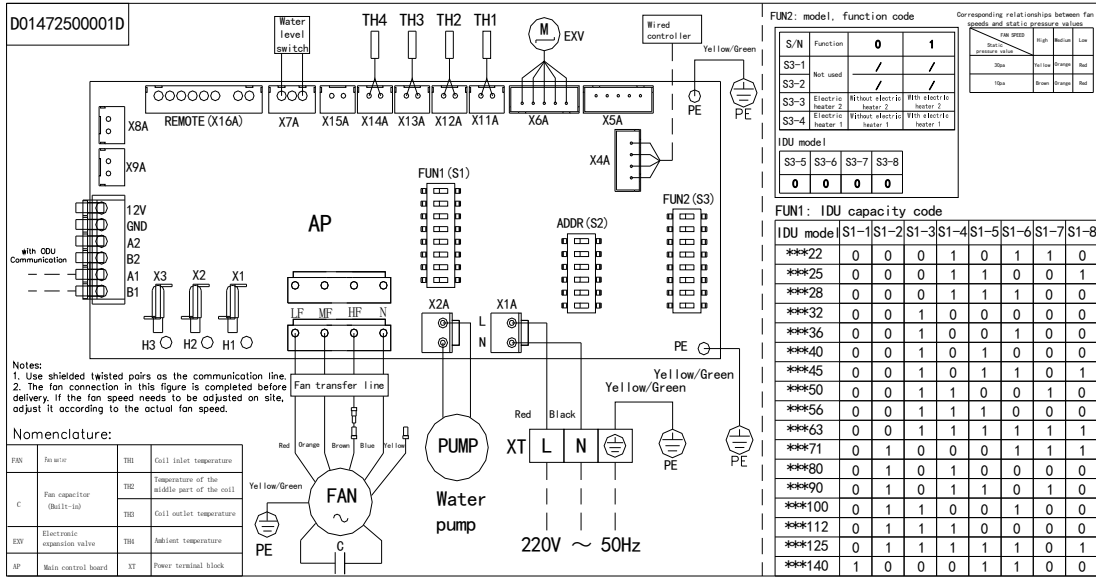
TMDN**AB/AC TMDH*A TMDF**A



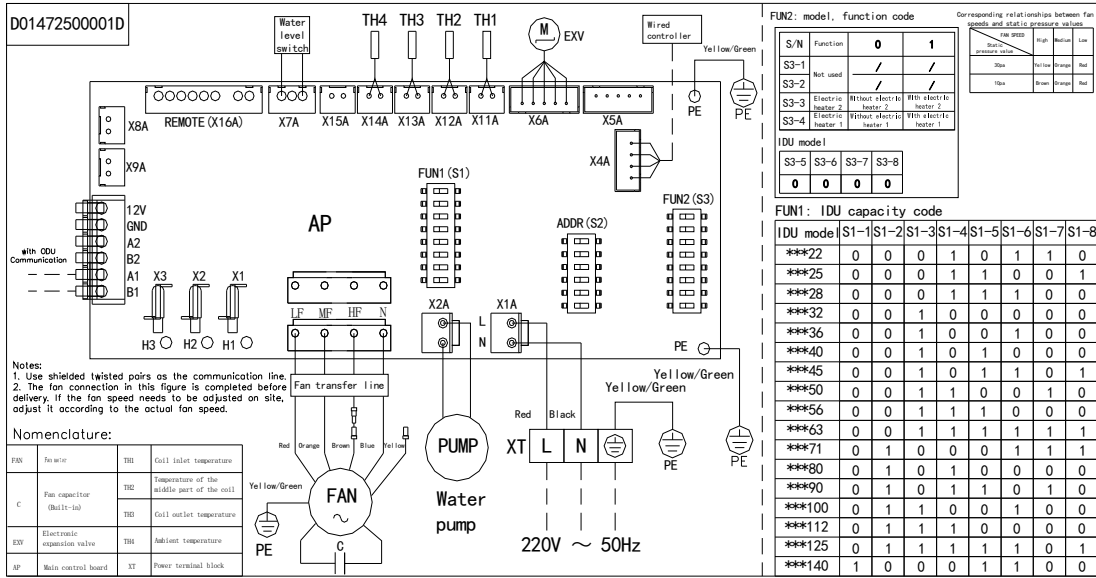
TMDN**AB



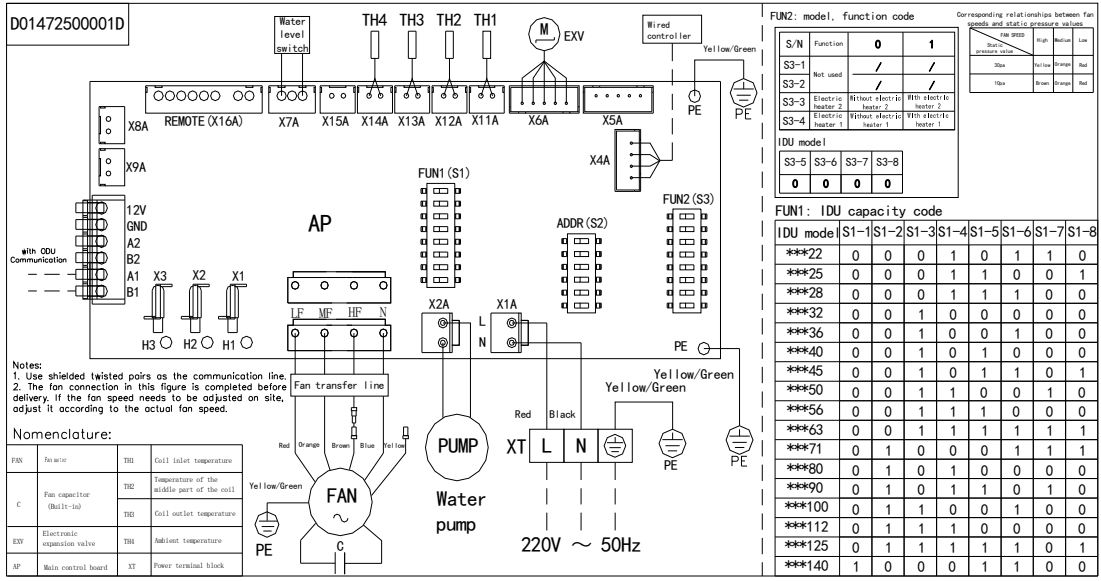
TMDN** AC



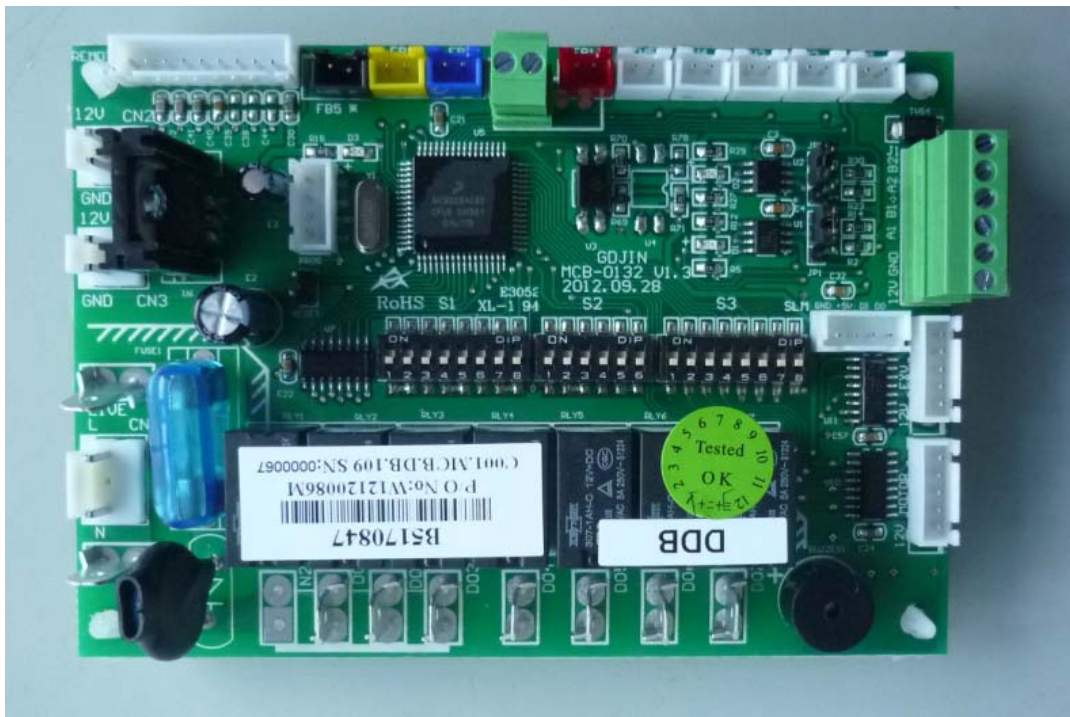
TMDH**A



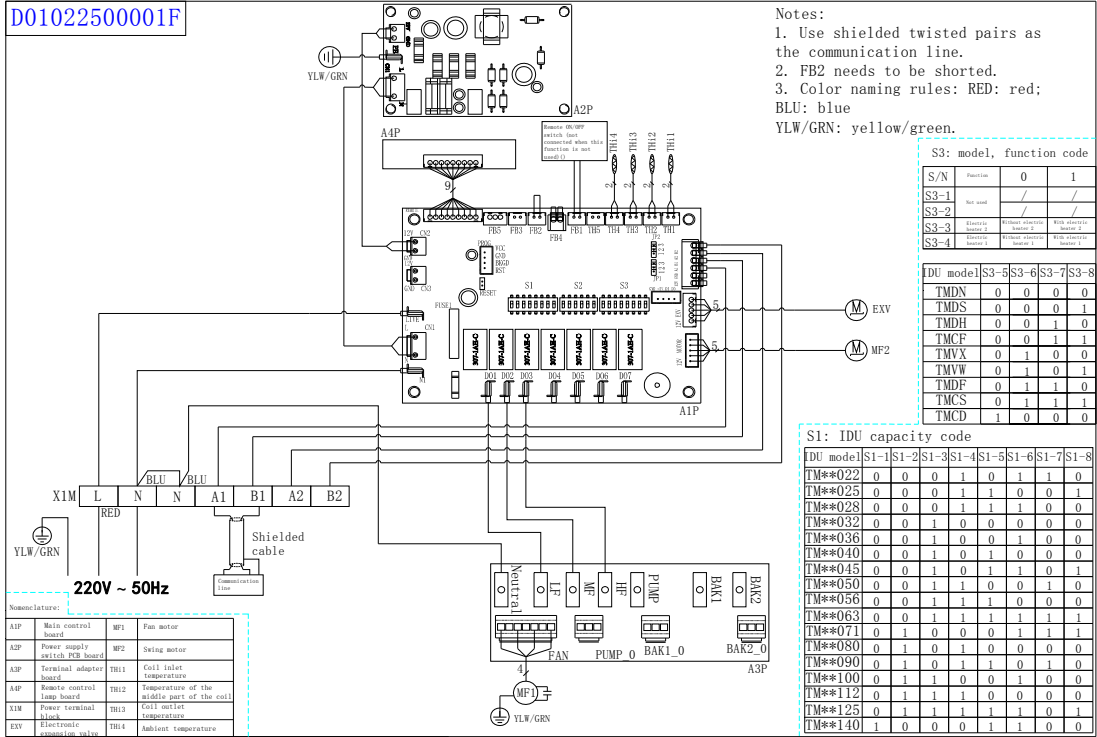
T MDF**A



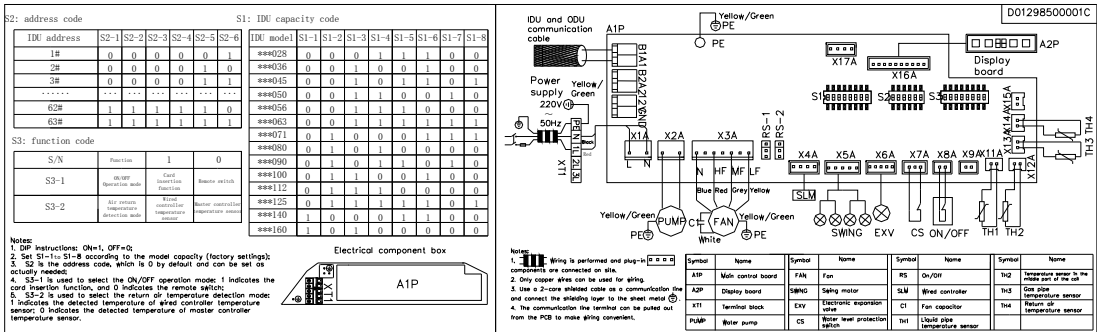
TMVX**A



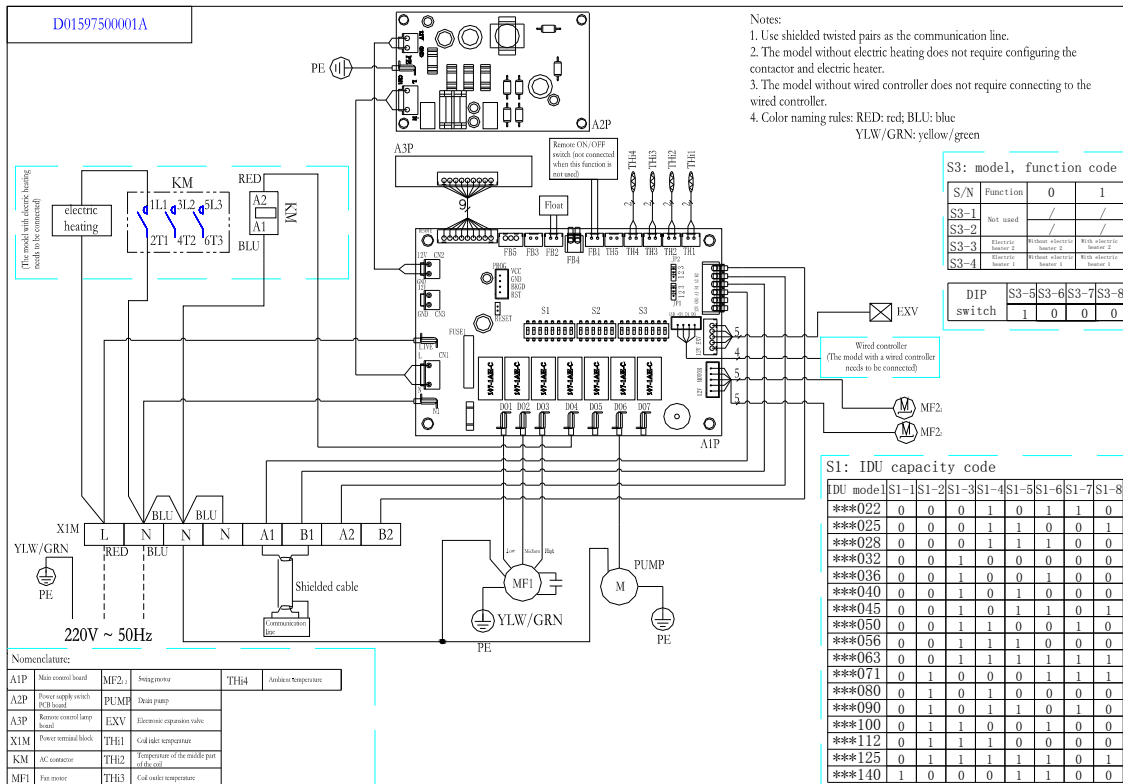
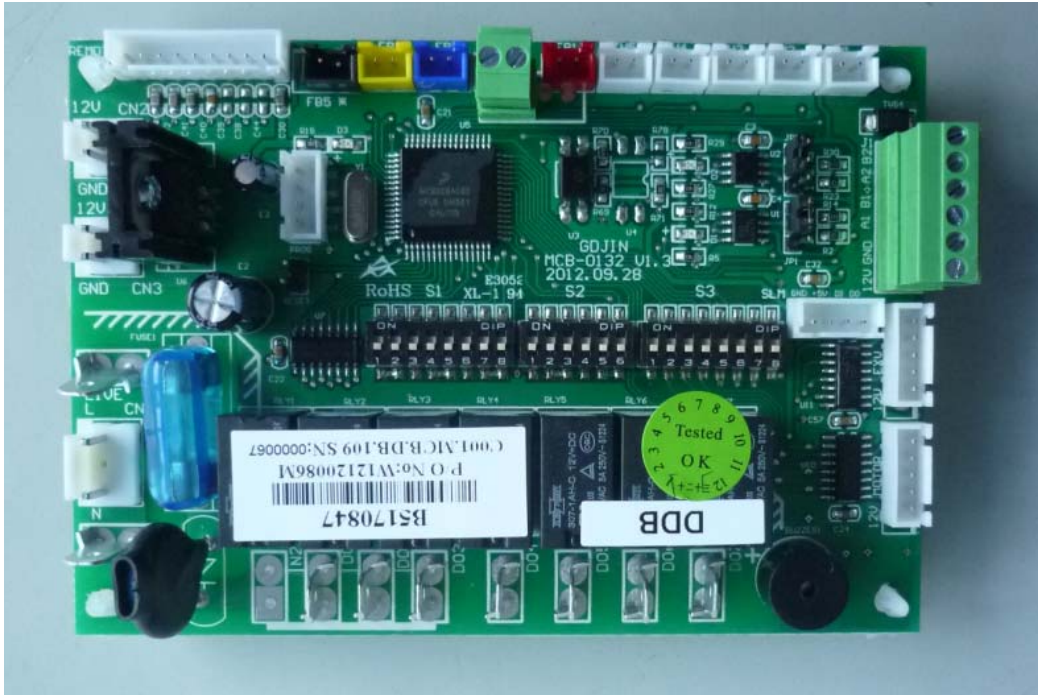
D0102250001F



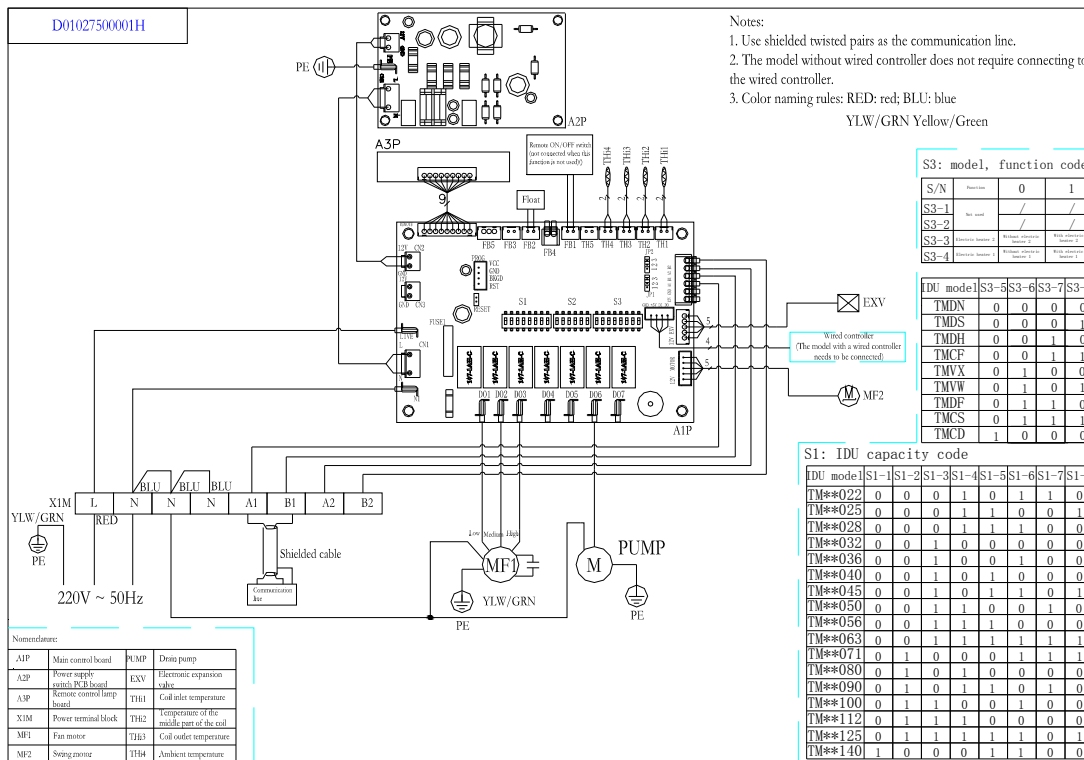
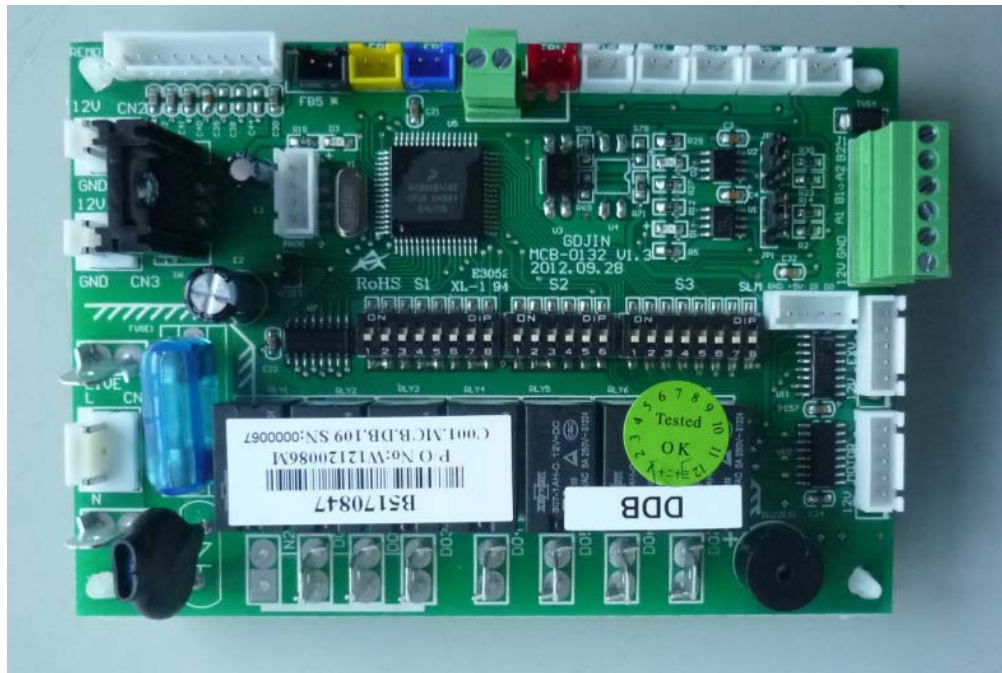
TMCF**AB



TMCD**A

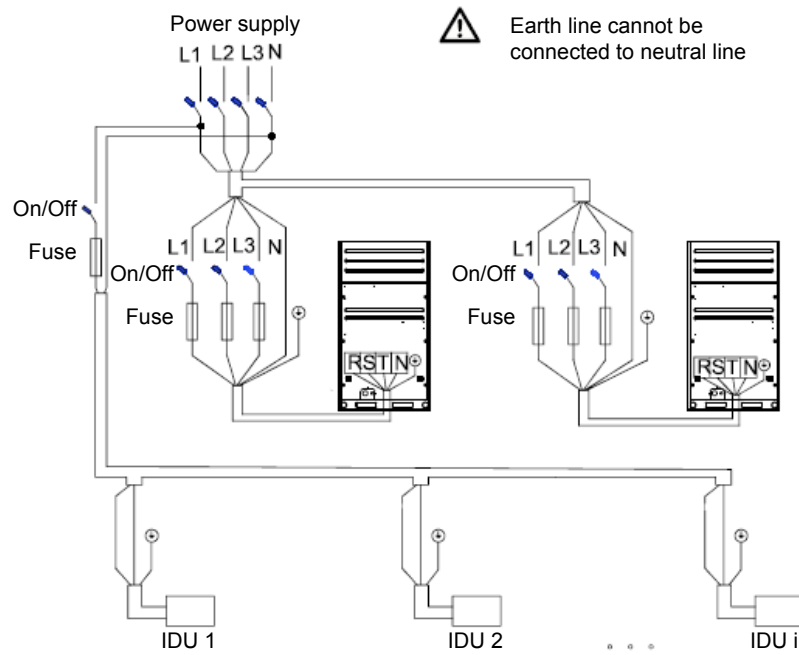


TMCS**A

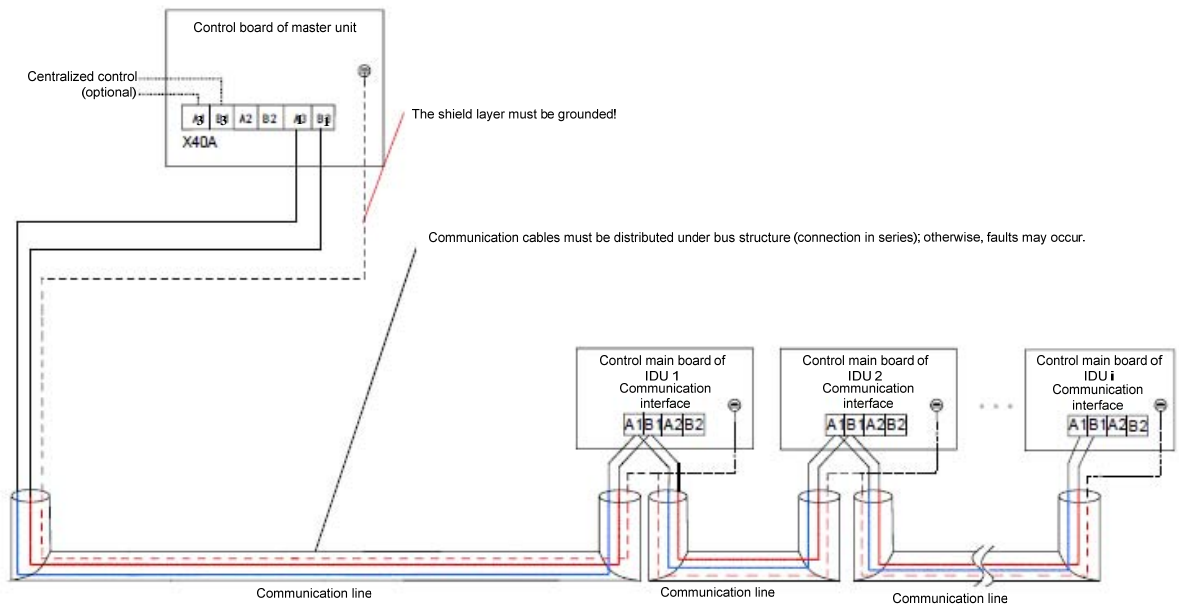


2.3 Wiring diagram of IDU and ODU

Electrical wiring



Communication wiring



Chapter VIII Appendixes

Appendix I Fault Code List of Hitachi Compressor Drive

Fault code	Content
00	Not operating
01	Over-current protection for constant speed operation
02	Over-current protection for frequency reducing
03	Over-current protection for frequency increasing
04	Over-current protection when power off
05	Overload protection
07	Over voltage protection
08	EEPROM module fault
09	Low voltage protection
10	CT fault
11	CPU fault
14	Grounding failure protection
15	Over voltage input protection
20	Power supply module temperature fault (fan stops)
21	Power supply module temperature fault
25	Main circuit fault
30	Operating fault
35	Thermistor fault
41	Communication fault (RS485)

Appendix II Fault Code List of Sanhua Compressor Drive and Indicator Flashing

Description of faults	D1 Red RE	D2 Green GR	D3 Yellow YEL	Cause	Monitor Code
Compressor over-current	⊙	⊙	⊙	Compressor instantaneous current exceeds protection values	101
IPM module abnormal	○	⊙	●	Module hardware protection	105
IPM module temperature sensor fault	○	●	⊙	Abnormal output of IPM module temperature sensing circuit	102
IPM module temperature too high	○	⊙	⊙	Protection of too high IPM module temperature	116
Input power fault	⊙	●	○	Great power voltage fluctuations	110
AC current protection	●	⊙	○	Protection of too large input	112

(input side)				current							
Great outdoor temperature fluctuations	◎	◎	○		108						
High voltage protection of DC bus line	◎	○	○	Voltage of bus line exceeds protection values	106						
Voltage of DC bus line is too low	●	○	○	Voltage of bus line falls below protection values	107						
Communication faults	◎	◎	●	Communication between drive and master control board	109						
Out of step	○	○	○	Compressor falls out of step	113						
Circuit fault by current detection	○	○	●	Abnormal operational amplifier output voltage	114						
Compressor start failure	○	○	◎	Compressor start failure	119						
Fault of ambient temperature sensors on drive board	○	●	○	Short circuit of ambient temperature sensors on drive board	121						
Compressor phase loss	○	◎	○	One or two phases of compressor (U/V/W) are missed	122						
<p>Note: In trouble free status, the green indicator flashes once everytime it receives signal</p> <table border="1"> <tr> <td>○</td> <td>On</td> </tr> <tr> <td>◎</td> <td>Flashing</td> </tr> <tr> <td>●</td> <td>Off</td> </tr> </table>						○	On	◎	Flashing	●	Off
○	On										
◎	Flashing										
●	Off										

Appendix III Fault Code List of Bantek Fan Drive

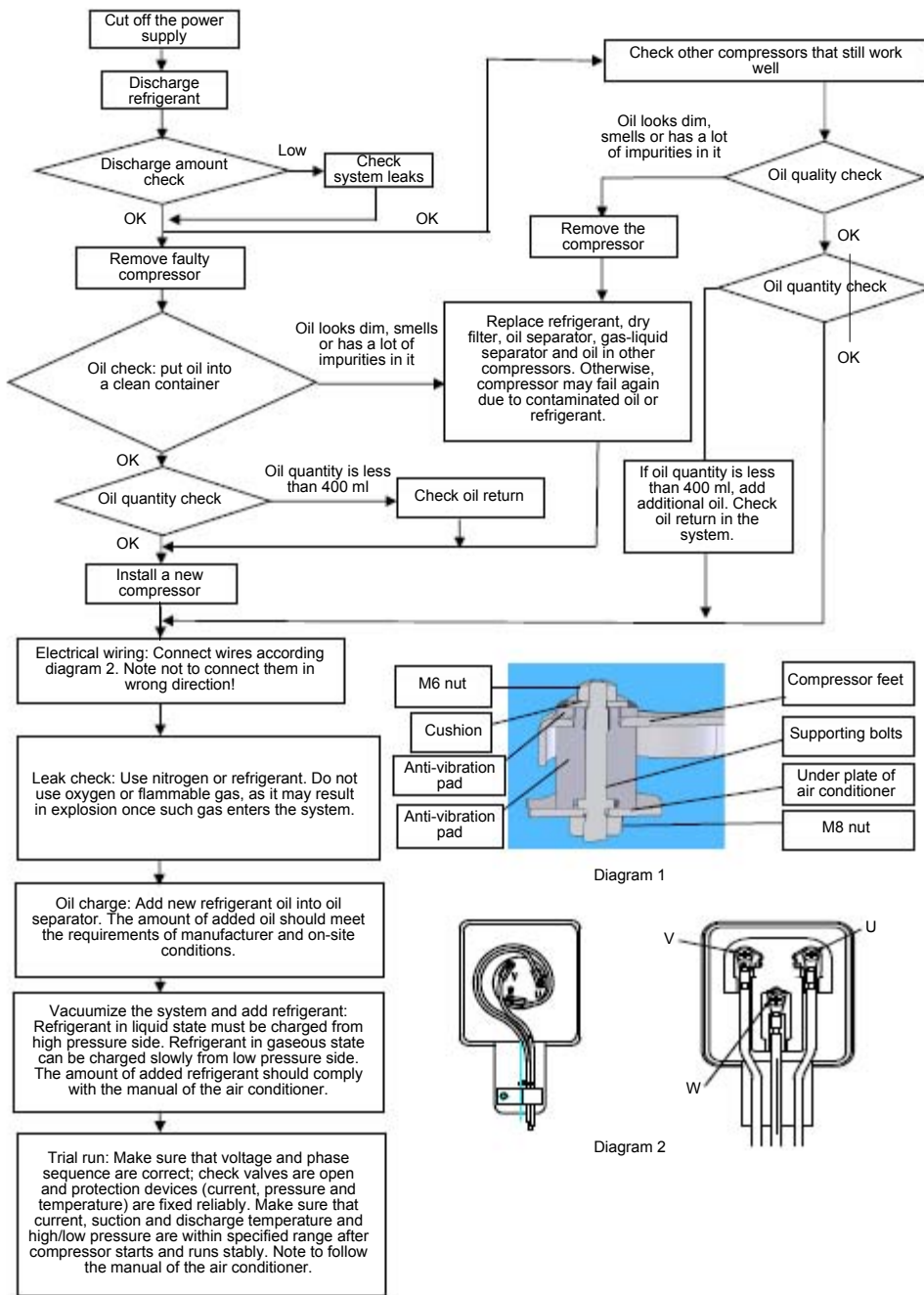
Type	Monitor code	LED flashing times	Description	Analysis of causes
Operating status	00H	Keep flashing	Module operates normally	
	01H	Keep flashing	Overvoltage stall	1. Voltage input is too high (> 271 V)
	02H	Keep flashing	Overcurrent stall	1. Fan is overloaded
	05H	Keep flashing	Frequency decrease due to overcurrent	1. Fan is overloaded
	07H	Keep flashing	Frequency decrease due to overheat	1. Module dissipates heat poorly; 2. Ambient temperature is too high;
Fault	1EH	1	Current fault	1. Module fault
	23H	2	Temperature sensor	1. Temperature sensor

			fault	fault
	28H	3	Communication faults	1. Report sending fault for upper computer
	49H	12	Wrong address signal	1. Hall sensor fault
	4AH	13	No address signal	1. Hall sensor fault
	52H	17	EEPROM fault	1. Module EEPROM fault
Protection	34H	7	Under-voltage protection	1. Voltage input is too low (< 154 V)
	35H	8	Over voltage protection	1. Voltage input is too high (> 283 V)
	39H	9	Overcurrent protection	1. Fan is overloaded;
				2. Fan starts spinning fast;
	3AH	10	Short circuit protection	1. Fan power cord is shorted;
				2. Fan is shorted;
	45H	11	Overheat protection	1. Module dissipates heat poorly;
				2. Ambient temperature is too high;
	2AH	5	Locked rotor protection for motor	1. Fan fault
	29H	4	Motor stall protection	1. Fan power cord UVW is reversely connected
2. Hall sensor fault				
2BH	6	Motor over-speed protection	1. Hall sensor fault	
4BH	14	Wrong operating direction protection	1. Fan power cord UVW is reversely connected	
			2. Hall sensor cable is reversely connected	

Appendix 4 Instructions on Compressor Replacement and Servicing

Topic: Instructions on replacement and maintenance of oil-supply compressors connected in parallel inside HCPG

Locate the fault of the compressor before it is replaced. Otherwise, the new compressor will fail due to the same causes. When the compressor needs to be replaced, follow the steps below:



Checklist of Compressor Replacement

Checklist of Compressor Replacement						
Project information	Project name				Place of use	
	ODU model					
	Qty					
	IDU model					
	Qty					
	Time	Time of		Time of		Running

		delivery		commissioning		duration		
System information	System	System diagram (when necessary)	Figures are attached (models and numbers of IDU and ODU, piping diameter and length, amount of refrigerant)					
		Piping length	m	Height difference	m (ODU is above or below IDU)	Capacity distribution		
		IDU checklist information	Checklist of wired controller is attached.					
	ODU	ODU	Machine model		Manufacturing number		Date of production	
		Compressor	Machine model		Product number		Date of production	
Maintenance information	Fault of this time		(1) Poor insulation (2) Poor startup		(3) Power supply protection device starts (fuse, FFB)			
		Fault (marked by ○)	(4) Poor compression (5) Poor capacity control		(6) Over-current (relay starts)			
			(7) Abnormal vibration (8) Abnormal noises		(9) Temperature protection starts			
			(10) Refrigerant leaks (11) Refrigerant oil leaks		(12) Others ()			
	Time	Time of occurrence		Time of repair		Time of return		
	Previous repairs	1st time						
		2nd time						
3rd time								
Compressor information	Power supply	L1-L2		L1-L3		L2-L3		
	Is fuse of power supply normal?							
	Does system refrigerant leak?							
	Does water in the system exceed limits? (Is time for vacuumizing the system enough?)							
	Is heat exchanger or filter blocked by dirt?							
	Never charge refrigerant from low pressure side, as it is the primary cause behind compressor faults.							
	Are oil heating belt and heating belt at the bottom of compressor still connected to power supply after compressor stops?							
	Are ODU installation position, piping length and height difference in line with installation requirements?							
	Are system pipes properly connected?							
	Is the opening degree of electronic expansion valves proper?							
	Is temperature sensor at the top of compressor properly installed?							
	Are distribution terminals of compressor (U, V, W) are connected reliably?							
	Is AC contactor of compressor working properly? Are contacts of AC contactor oxidized or burnt?							
	Does compressor refrigerant oil deteriorate? (turn black?)							
	Is the amount of oil in compressor normal?							
	Is oil-return pipe of compressor blocked? (If oil deteriorates or deposits at the bottom of oil separator, oil-return pipe may get blocked easily)							
	Confirm resistance of each phase to ground: U (MΩ), V (MΩ), W (MΩ)							
	Confirm resistance between phases: U-V (Ω), U-W (Ω), V-W (Ω)							
Confirm parameters after compressor is replaced (ODU checklist).								
Description of other faults:								

Appendix 5 Methods of Upgrading IDUs and ODUs

1. Steps of updating ODU program

Insert a USB drive into main board → Press K5 to reset → nixie tube displays countdown → Press and hold K3 → nixie tube stops countdown and starts flashing, and then release K3 to wait for program burning → when flashing stops, nixie tube starts countdown → burning completes

2. Steps of updating IDU program

Insert a USB drive into main board → Press K5 to reset → nixie tube displays countdown → Press and hold K1 → nixie tube displays 4 numerals (the first 2 numerals display the unit from which burning starts, and the last 2 numerals display the number of units being burnt. for example, if burning starts from the third IDU out of the 10 IDUs and 4 IDUs are burnt in total, the nixie tube displays 0304) → Press K2 or K3 to adjust the first 2 numerals → Press K4 to confirm → Press K2 or K3 to adjust the last 2 numerals → Press K4 to confirm → Burning starts