



APC SERIES

TECHNICAL MANUAL

R410a Rooftop Packaged Unit



APC-series

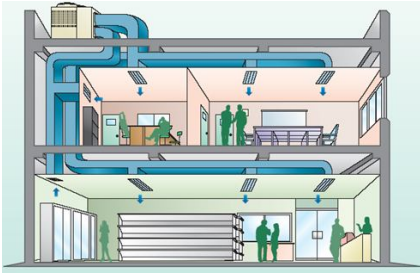
R410A

High External Static, 100% Fresh Air

Extra Long Life

High Efficiency

T1 Condition



Typical installation

When installing or carrying out operations on the unit, closely follow the recommendations and procedures given in this manual, observe warnings on the machine and take all precautionary measures as required by the situation. Failure to comply with the procedures recommended by this manual or unauthorized modification to the unit will automatically render the guarantee null and void.

KYBOM reserves the right to alter the features of their products without notice in the interests of continuous improvement.

UNIT DESCRIPTION AND TECHNICAL DATA

Rooftop Packaged Units are single packaged units which are factory assembled, tested and shipped completely with compressor, evaporator and condenser coils, fans and controls. These packages are designed for outdoor installation, and they may be used for cooling only or cooling and heat pump.

The units are ideal for residential, commercial and industrial applications and are available in nominal cooling capacity from 10 kW to 190 kW. Quality design and construction make air-cooled rooftop package units with hermetic scroll compressors the preferred applications and easy installation and maintenance. Operation range of outdoor temperature is from -10°C to 45°C.

Rooftop packaged systems are unobtrusive, quiet, and designed to provide year round comfort – warming in winter and cooling in summer. this wide product range offers a unit of performance capacity to suit small to large packaged air conditioner applications, e.g. offices, shops, motels, fast food outlets, restaurants, petrol stations, open plan office and work spaces, supermarkets, shopping malls and auditoriums.

Units are suited to high static pressure applications where large volume spaces are to be air conditioned. Long pipe and duct runs are possible enabling greater installation flexibility.

This range of units has been developed to meet the needs of typical applications. Should you have special requirements, such as higher air flows or greater sensible duty units contact your nearest representatives. engineers have extensive experience in designing air conditioning equipment for specific applications.

FEATURES

Efficient. These reverse cycle (heat pump) air conditioners provide one of the most efficient forms of heating you can invest in. For every 1 kW of power consumed, up to 2.8 kW of heat is generated. For every 1 kW of power consumed, up to 3.1 kW of heat is generated. Each outdoor unit incorporates high efficiency scroll compressors. Heat exchange coils use high efficient tube for better heat transfer.

Performance. These systems have been designed and tested to perform in ambient conditions as low as -10°C and as high as 45°C. For the models from APH 10 to APH 190 belt drive fan motors are used to match the supply air requirements. The smaller units(models from APH 10 to APH 20) have 3 speed direct drive fans for adjusting air flows.

Durable. Our packaged systems are built tough to withstand all weathers. Their durable construction ensures a long life and excellent return on your investment. The outdoor air coils' aluminum fins are epoxy coated for extra protection in corrosive environments, e.g. salt laden sea air. Cabinets are constructed from high grade steel - polyester powder coated for all weather protection. External fasteners are stainless steel or galvanized type. Corrosion resistant drain trays are also included.

Insulation. Indoor air sections are generously insulated to reduce condensation and contain noise.

More Safe. The refrigeration system includes a number of protection facilities, including: HP and LP switches, phase sequence relay, circuit breaker control etc.

Economy. Some models feature the flexibility and economy of 2~4 stages operation. Compressors are progressively switched on only as they are needed. This has the added advantage of lowering start-up current.

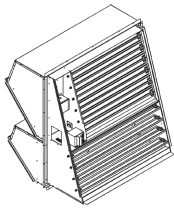
Economizer Option. If the outdoor air heat content or temperature is below that of the return air, a fresh air damper opens and the return air damper closes to provide the first stage of cooling. Operating costs are reduced as the compressor(s) will only operate to provide more cooling if it is required.

Fresh Air Introduction. An optional fresh air damper is available for most models. For applications using high proportions of fresh air (50%+) a hot gas bypass and HP fan speed controller are recommended and are available as options.

Peace of mind. The manufacturer operates a quality management system that conforms to international standard like CE, ISO14001, ISO9001:2000. these products have been chosen, against worldwide competition, for use in some of the most exclusive projects — chosen because of their proven efficiency, durability, performance, reliability and value.

Easy service. Quick release fasteners are provided on electrical and compressor panel.

Quiet design. Apartments are provided on electrical and compressor section, low noise.



**WITH ECONOMIZER
IS OPTIONAL**



WITH CE CERTIFICATE

Components or Assembly Descriptions

A) Quiet operation. The packaged Rooftop series are basic constructed and engineered with noise reduction as a first consideration, low noise mounted fans are used, 15mm wave type acoustic Insulation for compressor section and compressors are mounted on vibration isolators.

B) Low Cost Installation. Units are factory assembled and pre-charged, with a single point electrical connection. On arrival to the job site they are ready to be lifted to their operating position through the lifting supports available on the units.

C) Capacities to Fit. There is a large production line of packaged units, with capacities ranging from 10.9 to 188.5kW for 50 Hz refrigeration tons at nominal conditions.

D) Casing. Heavy grade steel casing with polyester epoxy powder electrostatic oven-baked paint of coating finish, designed for outdoor installation with 10mm insulation for evaporator section only. All units are provided with an 8mm thickness aluminum frame filter that slides out for easy cleaning or replacement.

E) Compressor. The compressor used is hermetic refrigerant gas cooled, with internal thermal protection in each phase, scroll type. The terminal boxes are rain tight, starting is direct-on-line. With high efficiency, low sound, so as to match all other CARDIFF products' reliability and efficiency.

F) Evaporator and Condenser Coils. The evaporator and condenser coils are designed to deliver their respective duties at optimum performance at all design conditions. Coils are manufactured from seamless copper tubes mechanically expanded into aluminum fins. All coils are tested at 30kg/cm² (450 Psi) air pressure, under water to avoid leakage. They also undergo dry chemical cleaning after manufacturing for optimum system cleanness.

G) Direct Driven Condenser Axial Fans. All condenser fans are of the axial type, which are directly mounted on the motor shaft. All fans are selected for optimum efficiency and for maximum sound power reduction. Fan blades are made for maximum corrosion resistance, and are statically and dynamically balanced before Installation. CARDIFF tries its bests to ensure the low noise operation with high efficiency. All condenser fans are equipped with wire guards.

H) Condenser Fan Motor. All fans motors are of totally enclosed air-cooled, internal thermal current overload protected, with class "IP56" electrical insulation.

I) Belt Drive Evaporator Fan. Fans are of the centrifugal type that is designed for maximum efficiency for uniform air distribution. V—belt driven with variable pitch pulley as optional. All fans are statically and dynamically balanced to ensure quiet operation and smooth performance.

J) Evaporator Fan Motors. Motors are of the totally enclosed induction type, with fan motor assembly placed on a floating

base with a flexible connection at the fan/casing interface. All fan motors of direct-driven are of the 3-speed type, highly efficient induction type motors, totally enclosed air-cooled, squirrel-cage type, internal thermal current protected and with class "B" insulation. Fan motors with V-belt-driven type are of 1 speed type.

K) Filters

All Models are provided with 8mm thickness aluminum frame filter (as standard features). Other filters are available upon request.

L) Drain Pan

All units are provided with a drain pan having drain connection from one side. The drain pan is painted galvanized steel type and insulated on the underside to prevent condensation.

M) Insulation

All units are internally lined with 10mm thermal insulation for coil and fan section (evaporator side only).

N) Easy Installation

The package rooftop has a compact design. It is supplied as a complete package ready for operation, with no extra controls or other items to be installed. The units have a single power point entry with simple connections. All units are designed to ensure maximum compliance with international standards.

Quick start-up is assured once installation is completed, as each rooftop unit is manufactured in an ISO9001:2000 listed facility to guarantee quality. All units are tested at the factory to provide reliable start up.

Standard Features

Easily accessible system components.

Ample space for easy access to power and control panels.

Heavy duty mounting chassis for the whole unit with lifting holes.

Anti-vibration mounting compressor.

Weather-proof, polyester epoxy powder electrostatic paint oven-baked finish for sheet metal and base frame.

All units are shipped out from factory tested and protecting devices seated against client requirement.

8mm nylon filter as standard for Returning air inlet.

Single skin evaporator side with 10mm thermal insulation.

Condenser coil with treated blue fins.

Quick release fasteners to be provided on electrical and compressor apartment cabinet.

Electrical features:

1. Control and power panels include the direct-on-line starting contactors for the compressors and condenser fan motor.

2. Internal thermal motor protector for condenser and evaporator fan motor.

3. Compressor internal thermal protection.

4. Anti-recycling protection (time delay) for compressors through microprocessor.

5. Crank case heater for each compressor.

6. Control circuit breaker.

7. Microprocessor controller with the following main functions.

A, Compressor lead-lag operation to ensure longer life for the compressors and equal running hours between compressors.

B, External remote ON/OFF button for remote operation of the unit using external ON/OFF switch or connection to building management system.

C, Volt-free terminals available for general alarm indication signal to remote monitoring station.

8. Dual power supply input.

9. High and low pressure safety switches (capsule type, factory Pre-set) from all models.

10. Remote control panel with the same functions as the on-board panel. It can be used with a shielded cable at a distance

of 20m.

Refrigeration features:

- 1.High efficient Hermetic scroll compressor.
- 2.Filter drier (for mod. 63 and above only).
- 3.Charging points pin valve.
- 4.Thermal expansion valve (for mod. 72 and above only).
- 5.Fully charged unit with refrigerant.
- 6.Oil equalizing lines installed between parallel installed compressors

Optional Features

A) Construction options:

1. Metal mesh on condenser section.
2. Optional supply/return air configurations, optional bottom supply and return type.
3. Evaporator with treated anti-corrosion protection for coils (blue fins)for copper/aluminum coils only.
4. "25mm (1")" or "50mm(2")" thick flat filter.
5. Economizer option with fresh, return and exhaust air dampers with cowl.

If this option is installed in the unit the unit has the ability to work with free cooling or free heating mode allowing it to exploit the external environmental condition as much as possible, since it avoids turning on the heaters and the compressors. This function can be achieved by controlling the opening/closing of the external air damper. With reference to the difference between the outdoor air temperature(std)/enthalpy and the indoor air temperature(std)/enthalpy.

6. High Static condenser fan option will also required a sealed + drain condensing section.
7. Upgraded Evaporator Fan Motor Drives.

B) Electrical options:

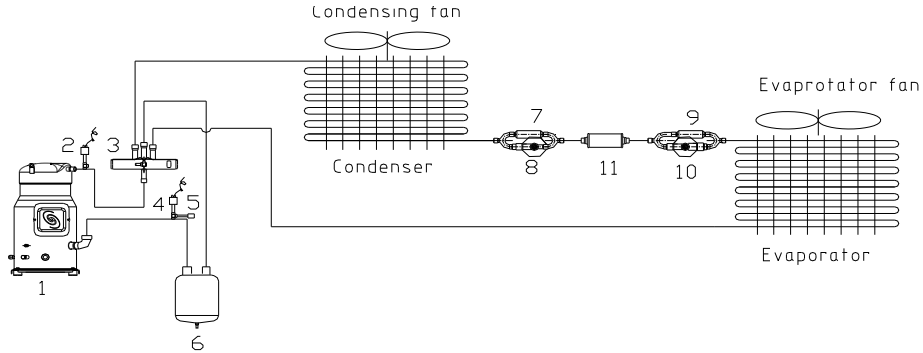
1. Power circuit breaker for each motor.
2. Main power molded case circuit breaker for the whole unit (can also be available with an external handle as an option).
3. Low ambient control:
The refrigeration systems in all unit are inherently designed to operate efficiently, without extra controls or modifications. To permit the unit to operate in low ambient condition a head pressure control can be Installed either by:
 - ON/OFF condenser fans sequencing (for models with 2 condenser fans).
 - 3 speed of the condenser fan motor.
4. Earth leakage relay for each compressor.
5. Earth leakage relay for the whole unit.
6. External overload relay for each motor.
7. Power factor correction capacitor.
8. Automatic or manual provision for pump down operation of each compressor stop.
9. Building automation system interface. Interfacing with other building management systems can be Achieved by an optional card which can communicate with other devices using the serial communication port.
10. Voltage monitor controller (phase sequence relay) for monitoring the main incoming power supply for the unit which provides protection from single-phasing, under-voltage, phase-voltage imbalance and phase-non-sequence

Refrigeration options:

1. Heat pump packaged unit with 4-way reversing valve, suction accumulator is a standard feature in heat pump option.
2. Pressure gauges for each refrigeration circuit (high/low pressure gauges).
3. Hot gas bypass (where low-local situation occurs and where it is necessary avoid low suction pressure and "compressor cycling")

4. Extra refrigerant accessories such as suction accumulators (for cooling units only), refrigerant liquid receivers, oil separators etc..
5. Solenoid valve for heat pump mode.
6. High and low pressure controller for models

Refrigerant Piping Diagram (Sample only)



1	COMPRESSOR	7	SINGLE WAY VALVE
2	HIGH PRESSURE SWITCH	8	EXPANSION VALVE (or CAPILLARY)
3	REVERSING VALVE (HEATING MODEL ONLY)	9	SINGLE WAY VALVE
4	LOW PRESSURE SWITCH	10	EXPANSION VALVE or CAPILLARY
5	PIN VALVE	11	FILTER
6	OIL SEPARATOR	<i>Refrigerant Piping Diagram (Sample only)</i>	

NOMENCLATURE

A P C 56 D 3
 ① ② ③ ④ ⑤ ⑥

- ① A: Air Cooled Chiller
- ② P : Package type
- ③ R: Cooling only

④56:Cooling Capacity
 unit:KW

⑤D:R410a

⑥3 : 380V/50Hz/3 Phase

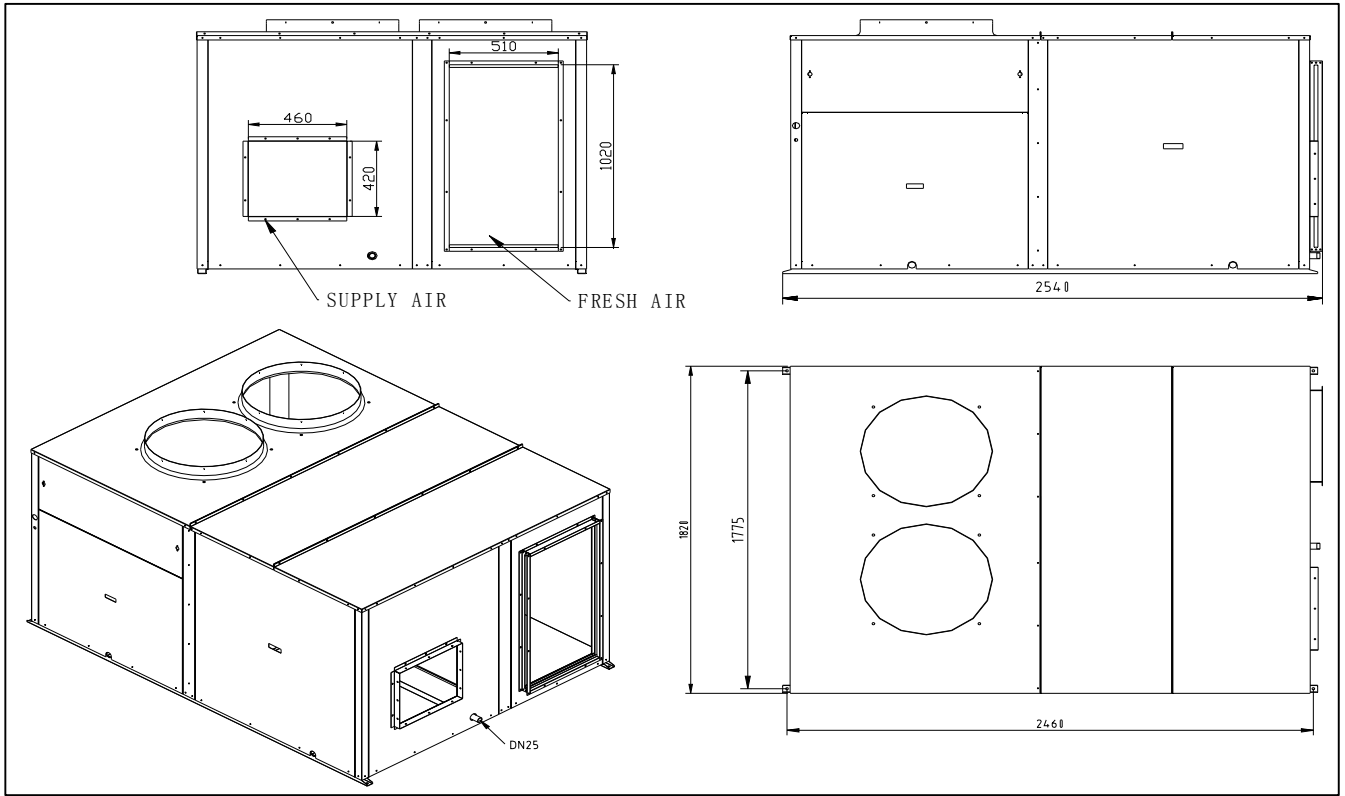
MODEL	Unit	APC-56D3D
Cooling		
Nominal cooling capacity	kW	56
Nominal power input	KW	20.9
Heating		
Nominal heating capacity	kW	----
Nominal power input	KW	----
Compressor		
Type	/	Scroll
Brand	/	Sanyo
Model/Quantity	/	----
Quantity/system	n	2
Cooling power input	kW	5.2+9.9
Fan		
Type	/	Axial
Air flow Rate	m3/h	22000
Rated Power × Quantity	n×kW	2×0.55
Fan speed	RPM	1000
Filter		G4
Evaporator		
Type	/	Cooper- Aluminum fins
Air flow Rate	m3/h	10200
External static pressure	Pa	300
Refrigerant		
Type	/	R410a
Electric		
Power supply	V/Ph/Hz	380/3/50
Max. running current	A	---
Max. starting current	A	---
Dimension		
Length	mm	2530
Width	mm	1820
Height	mm	1420
Operating weight	KGS	860
Sound pressure level	dB(A)	≤ 70

* Performance values refer to the following conditions:

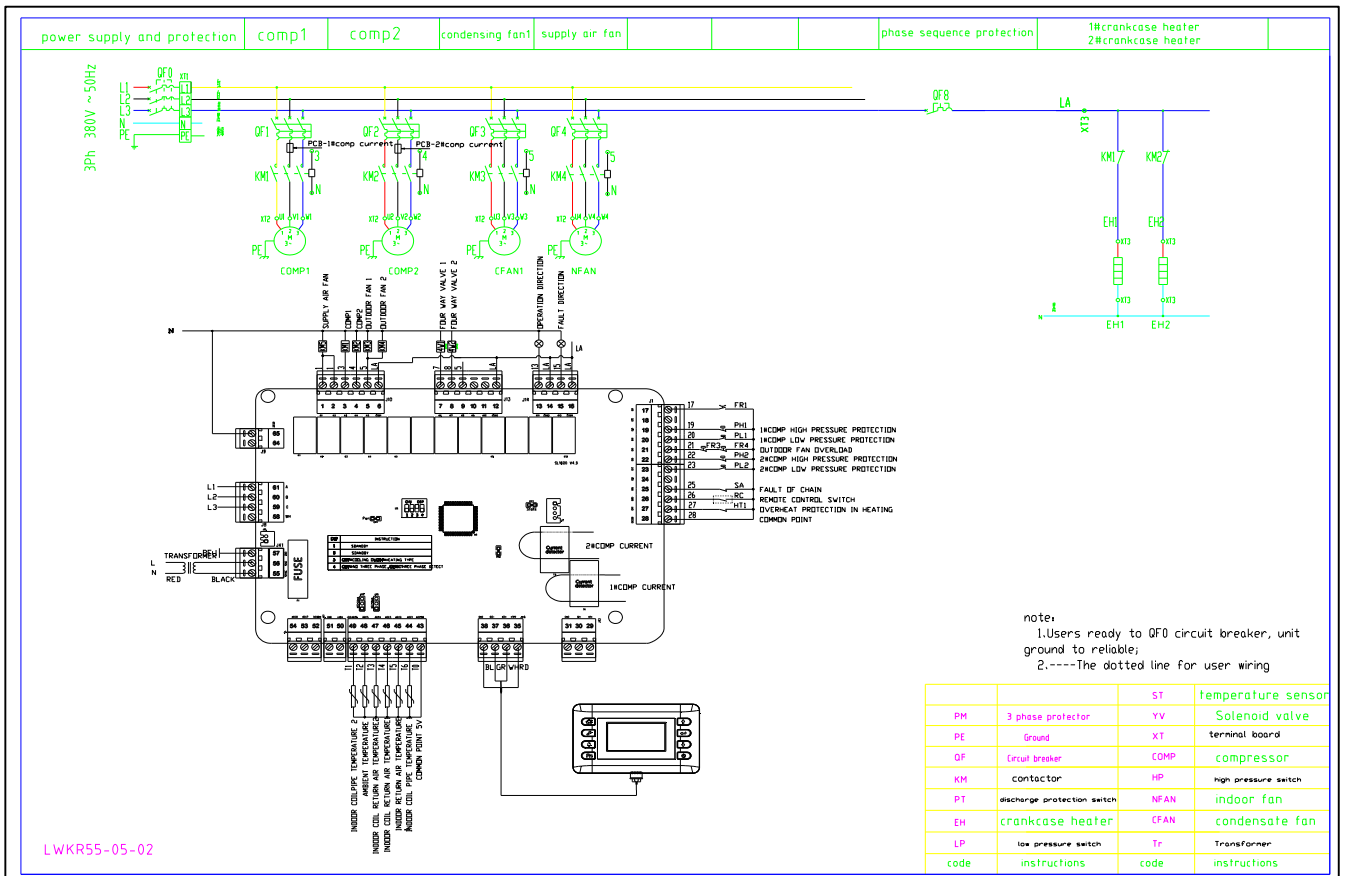
Norminal condition: indoor temperature (cooling): 27°CDB/19°CWB, Outdoor temperature(cooling): 35°CDB/24°CWB,
Heating: room air temperature 20.0°C DB, ambient air temperature 7°C DB / 6°C WB

** Noise level measured by adopting average value in the noise lab with background noise of 25 dB(A), at a distance of 1.5m high fan speed.

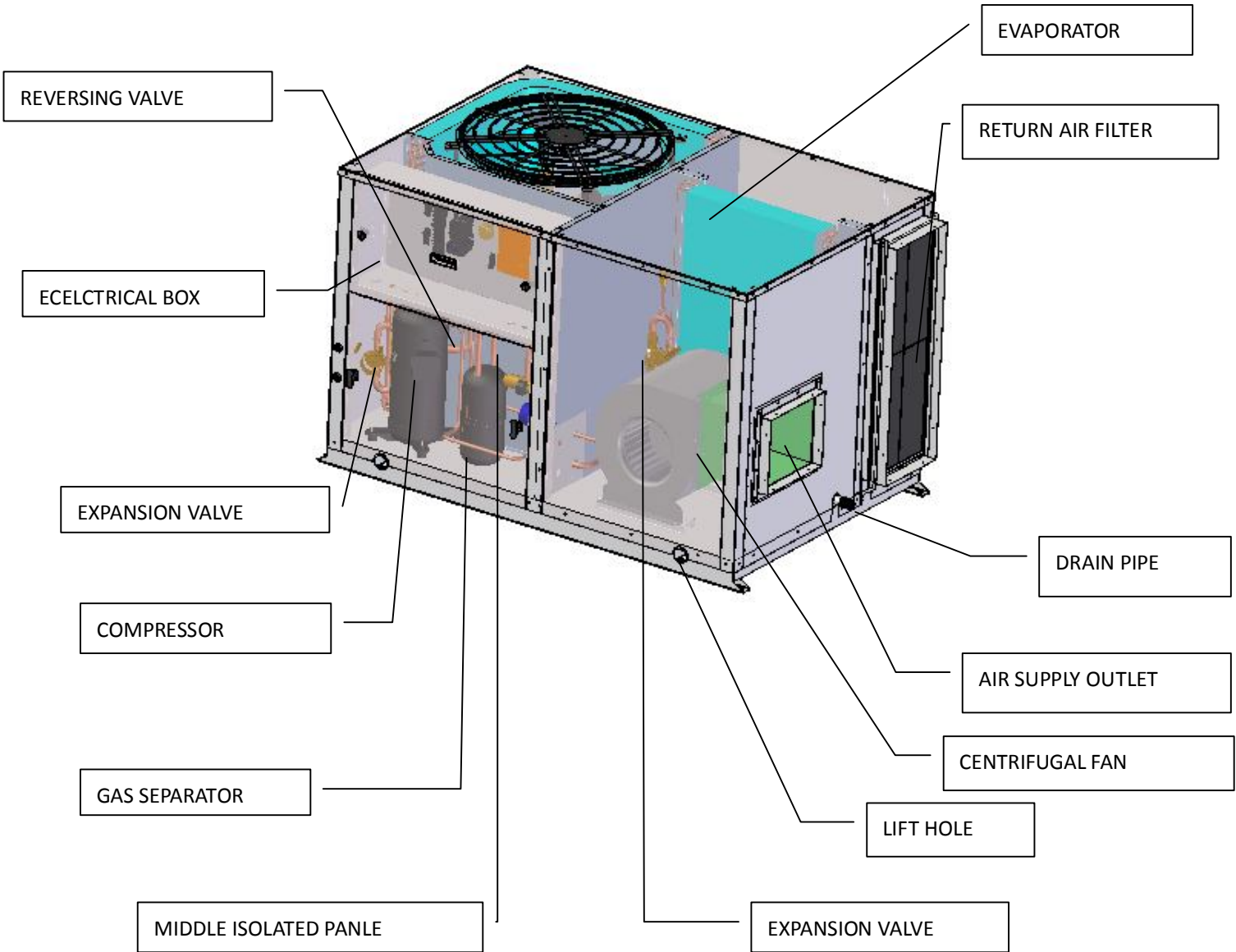
Dimension drawing



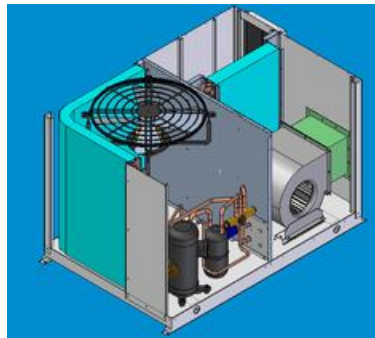
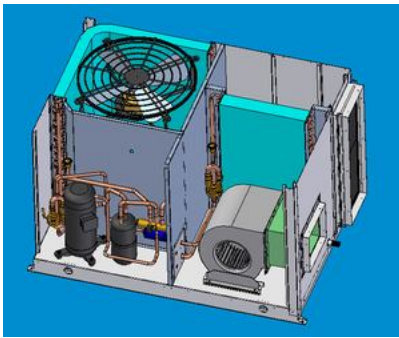
Wiring Diagram



EXPLODED COMPONENTS VIEW (Sample only)



Inner Structure



INSTALLATION AND MAINTENANCE

UNPACKING

Retain packing materials until the unit is operated and found to be in good condition. If the unit shows external or internal damage, or does not operate properly, contact the transportation company and file a damage claim.

AFTER-SALES SUPPORT

This is committed to customer service both during and after the sale. If you have questions concerning the operation of your unit or the information of this booklet, contact our Sales Department. If your units fail to operate properly, or if you have questions concerning spare parts or Service Contact, contact our Sales Department.

SECTION I: SAFETY

These instructions are primarily intended to assist qualified individuals experienced in the proper installation of heating and/or air conditioning appliances. Some local codes require licensed installation/service personnel for this type equipment. All installations must be in accordance with these instructions and with all applicable national and local codes and standards. We recommend that you read this instruction manual carefully before use to gain full advantage of the functions of the unit and to avoid malfunction due to mishandling.

Read these instructions thoroughly before starting the installation. Follow all precautions and warnings contained within these instructions and on the unit.

1. SAFETY CONSIDERATIONS

The unit is designed to provide safe and reliable service when operating within design specifications. To avoid injury to personnel and damage to equipment or property when operating the equipment, the following safe practices should be observed as a minimum.

A, Check the unit weight to be sure the lifting equipment is adequate.

B, Disconnect power to the unit before working on it.

C, Do not remove access panels or doors until fans have completely stopped.

D, Do not enter an enclosed fan cabinet or into the unit while the fan is running.

E, Protect materials when welding or flame cutting. Use suitable cloth to contain sparks. Have a fire extinguisher at hand and ready for immediate use.

2. WARNING and CAUTION

The precautions described below are WARNING and CAUTION. These are very important precautions concerning safety. Be sure to observe all of them without fail.



WARNING

The matters with possibilities leading to serious consequences such as death or serious injury due to erroneous handling.



CAUTION

These are the matters with possibilities leading to injury or material damage due to erroneous handling including probabilities leading to serious consequences in some cases.

Installation and servicing of air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service air conditioning equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply.

3. ADDITIONAL WARNINGS

In addition to the specific warnings listed on the previous page the following general warnings apply to your unit:

Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.

Transport the unit with care. Sudden jolts or drops can damage the refrigeration lines.

- 1.Observe all warning labels.
- 2.Never remove warning labels.
- 3.Never operate damaged or leaking equipment.
- 4.Always turn off the unit and disconnect the power cord from the power source before performing any service or maintenance procedures, or before moving the unit.
- 5.Never operate equipment with damaged power cords.
- 6.Refer service and repairs to a qualified technician.
- 7.Do not overcharge with refrigerant.

SECTION II INSTALLATION

1) INSTALLATION REQUIREMENTS

EQUIPMENT APPLICATION

Before beginning the installation, verify that the unit model is correct for the job. The unit model number is printed on the data label.

Charge Adjustment

As stated previously, the system is pre-charged. If further charge is required to be added, this can be done by CAREFULLY drawing LIQUID refrigerant only through the compressor suction pipe valve.

ELECTRICAL

All electrical work must be carried out by a qualified and licensed electrician. The installation must comply with the current relevant standards wiring rules and local authority requirements. Wire sizing is the responsibility of the installer, as it depends on the conditions and regulations applicable to each installation site. Refer to the electrical drawing and specification of the unit for the electrical data. The electrical installation requirements are generally as follows: The air-conditioning unit shall be supplied directly from a distribution board through a mains lockable isolating switch.

Pre punched holes have been provided in the unit casing for the isolating switch. Do not drill into the cabinet as pipes may be located behind.

REQUIREMENTS AND CODES

The unit should be installed in accordance with all national and local codes and regulations which govern the installation of this type of equipment. In lieu of local codes, the equipment should be installed in accordance with National Electric Code, and in accordance with the recommendations made by the National Board of Fire Underwriters.

UNIT LOCATION

The electric unit is designed only for outdoor installations. Choosing the location of the unit should be based on minimizing the length of the supply ducts. Consideration should also be given to availability, service access, noise, and shade. The unit installation shall avoid areas where condensate drainage may cause problems.


CLEARANCES

The units require certain clearances for proper operation and service. Installer must make provisions for adequate ventilation air, normally 2000mm's spaces all around the units. It's required to place a anti wind/rain hood 2000mm above the unit.



DO NOT PERMIT OVERHANGING STRUCTURES OR SHRUBS
TO OBSTRUCT CONDENSER AIR DISCHARGE OUTLET, AIR
INLET OR VENT OUTLETS.

A suitable air filter must be installed in the unit. This unit is supplied with air filters. Air filter(s) must be installed ahead of the evaporator coil of this unit.

 CAUTION
NEVER OPERATE UNIT WITHOUT A FILTER. A FAILURE TO FOLLOW THIS WARNING COULD RESULT IN A PERSONAL INJURY OR DEATH.

UNIT INSTALLATION

GROUND LEVEL

If installing the unit at ground level, provide a concrete mounting pad separate from the building foundation. The pad must be level to ensure proper condensate disposal and strong enough to support the unit's weight.

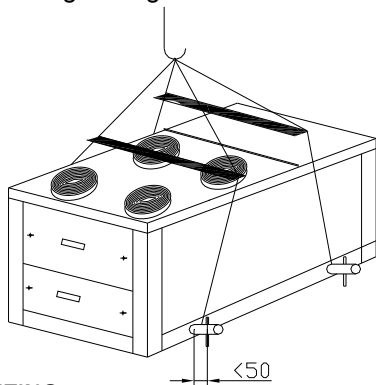
UNCONDITIONED SPACES

All ductwork passing through unconditioned spaces must be properly insulated to minimize duct losses and prevent condensation. Refer to local codes for any insulation material requirements.

RIGGING AND HOISTING

This unit is not designed to be handled with a fork-truck. Exercise care when moving the unit. Rig the unit by attaching chain or cable slings to the holes provided in lifting lugs. Spreaders **MUST** be used across the top of the unit. Ensure the lifting equipment is adequate for the load. Keep the unit in an upright position at all times. The rigging must be located outside the unit's center of gravity. Lifting plates may be removed after installation.

Typical lifting arrangement:



<i>ALL ACCESS PANELS MUST BE SECURELY IN PLACE WHEN RIGGING AND HOISTING.</i>

MOUNTING

The unit should be fastened to a firm flat horizontal base plinth using the holes supplied in the mounting rails.

When the unit is being installed on a roof it is recommended that the unit is installed on a substantial structure with vibration isolating springs beneath the unit. These springs are not supplied with the unit. Three channels are provided under the base for spring mounts or bolting down.

Flexible duct connections are recommended between the supply and return ducts and the unit.

SECTION III OPERATION

1. Leave the on/off switch in the off position and close the mains isolating switch. A four hour delay period is required to allow the crankcase heaters to drive any liquid refrigerant out of the compressor oil.
2. Check that the shipping blocks beneath each compressor have been removed and that each compressor is secure on its mounts.
3. Check that all fan motors are free running.
4. Check that the thermostat is correctly wired to the unit and is set at the desired temperature.
5. Check that the air filters have been correctly installed if fitted.

6. Check air diffuser dampers are open if appropriate.

START UP PROCEDURE

Use the supplied Commissioning Sheet to help you complete the following procedure:

1. After the four hour delay period has expired, switch on the unit.

System 1's compressor will start straight away. System 2's compressor will start six minutes later due to the built in delay timer.

2. Check the supply voltage between each phase and neutral.

3. Compressors fitted are directional. Check for correct rotation. If rotation is incorrect the compressor will not pump, be noisy, and will draw minimal current. To correct motor rotation, change the phasing at the main power terminal.

4. Measure the current draw on each phase to the compressor motors and measure the current draw of each fan motor. Check all readings against the specified values in the wiring diagram.

5. Fit gauges and measure the suction and discharge pressures of both refrigeration circuits.

6. Check that the outdoor air fan motors are running smoothly.

7. Test the operation of the reversing valve by running the unit in both the heating and cooling mode.

8. Check the indoor unit's fan belt tension after 20 mins of operation and adjust if necessary (refer Commissioning Sheet).

9. Check the supply air flow at each outlet.

10. Check the tightness of all electrical connections and sign the check label.

11. Touch up any outdoor unit paintwork damage to prevent corrosion.

12. Running the unit in both the heating and cooling mode.

THE UNIT IS EQUIPPED WITH CRANKCASE HEATERS. ALLOW 24 HOURS PRIOR TO CONTINUING START UP PROCEDURES TO ALLOW FOR HEATING OF THE REFRIGERANT COMPRESSOR CRANKCASE. FAILURE TO COMPLY MAY RESULT IN DAMAGE AND COULD CAUSE PREMATURE OF THE SYSTEM. THIS WARNING SHOULD BE FOLLOWED AT INITIAL START UP AND ANY TIME THE POWER HAS BEEN REMOVED FOR 12 HOURS OR LONGER.

Operation instructions

SL1600-CF4-WZ Controller instruction

Controller Resource

Cooling/Heating Type

Digital output(12)	Digital input(11)	Analog input(6)
Blower low speed (250VAC/5A,30VDC/5A)	Blower fault	Supply air temperature (NTC)
Blower high speed (250VAC/5A,30VDC/5A)	Compressor one high pressure protection	Return air temperature (NTC)
Compressor one (250VAC/5A,30VDC/5A)	Compressor one low pressure protection	Evaporating temperature one(NTC)
Compressor two (250VAC/5A,30VDC/5A)	Compressor two high pressure protection	Evaporating temperature two (NTC)
Compressor three(250VAC/5A,30VDC/5A)	Compressor two low pressure protection	Evaporating temperature three (NTC)
Compressor four(250VAC/5A,30VDC/5A)	Compressor three high pressure protection	Evaporating temperature four (NTC)
Electrical heating one (250VAC/5A,30VDC/5A)	Compressor three low pressure protection	Heating valve proportion (with SL1600F)
Electrical heating two (250VAC/5A,30VDC/5A)	Compressor four high pressure protection	
Electrical heating three (250VAC/5A,30VDC/5A)	Compressor four low pressure protection	
Electrical heating four (250VAC/5A,30VDC/5A)	Remote control	
Air valve (250VAC/5A,30VDC/5A)	Heating protection	
Fault output (250VAC/5A,30VDC/5A)		

Heating Type







Digital output (12)	Digital input (11)	Analog input (7)
Aire blower low speed (250VAC/5A,30VDC/5A)	Blower overload	Supply air temperature (NTC)
Aire blower high speed (250VAC/5A,30VDC/5A)	Air pressure switch	Return air temperature (NTC)
Compressor one (250VAC/5A,30VDC/5A)	Compressor one high pressure protection	Fins temperature one (NTC)
Compressor two (250VAC/5A,30VDC/5A)	Compressor one low pressure protection	Fins temperature two (NTC)
Condenser fan one (250VAC/5A,30VDC/5A)	Condenser fan one overloas	Ambient temperature (NTC)
Four-way one(250VAC/5A,30VDC/5A)	Compressor two high pressure protection	Compressor one current (onboard)
Four-way two (250VAC/5A,30VDC/5A)	Compressor two low pressure protection	Compressor two current (onboard)
Condenser fan two (250VAC/5A,30VDC/5A)	Condenser fan two overloas	
Electrical heating one (250VAC/5A,30VDC/5A)	User fault chain	
Electrical heating two (250VAC/5A,30VDC/5A)	Remote control	
Air valve (250VAC/5A,30VDC/5A)	Heating protection	
Fault output (250VAC/5A,30VDC/5A)		

Operating instructions











Interface description

Viewing screen sign explanation

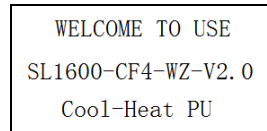
Sign	Definition	Sign	Definition
	Air supply		On/Off
	Cooling		Current time
	Heating		Fault alarm

Button description

Button	Meaning	Function description
	HOME	<ol style="list-style-type: none"> 1) On the interface of view or set, press this to return to the main interface; 2) When setting parameters, press this button to discard the data set; 3) Long press it to display the version information in the main interface; 4) Short press it to access the help page in the main interface;
	UP	<ol style="list-style-type: none"> 1) In the main screen, press it to enter the digital output and digital input query page; 2) If "↑" shown in any screen, press this button to enter the previous screen; 3) In the parameter setting mode, short press this button to set parameters increases, long press to set parameters increased rapidly;
	DOWN	<ol style="list-style-type: none"> 1) In the main screen, press it to enter the analog output and digital input query page; 2) If "↓" shown in any screen, press this button to enter the next screen; 3) In the parameter setting mode, short press this button to set parameters decrease, long press to set parameters decreased rapidly;
	ENT	<ol style="list-style-type: none"> 1) In the main page, excluded fault can be reset through pressing this button; 2) When setting parameters, press this button to confirm the setting parameters, and automatically skip to the next parameter setting; 3) In the main page, long press "ENT" and "SET" to enter the password page, enter the correct password to enter the factory settings page; 4) In the factory settings menu page, press it to enter the appropriate settings page;
	SET	<ol style="list-style-type: none"> 1) In the main page, short press to enter the user settings page; 2) In the parameter setting page, press it to enter the setting state (anti-white); If the current screen has no parameters can be set, no operation is performed. 3) In the main page, long press "ENT" and "SET" to enter the password page, enter the correct password to enter the factory settings page; 4) In the factory settings menu page,press it to enter the appropriate settings page;
	ALARM	<ol style="list-style-type: none"> 1) In the main page, short press it to enter the current fault page; 2) In the factory settings menu page,press it to enter the appropriate settings page;
	POWER	<ol style="list-style-type: none"> 1) In any page,press it to power off;
	MODE	<ol style="list-style-type: none"> 1) At stop state, press this button to switch the mode between "Auto" - "air" - "cooling" - "heating" on the main page;

Power on display






Welcome page will be displayed on the screen for 10 seconds. This welcome page displays unit information and current text screen version number. Press any button on the welcome page could exit the welcome page, and then enter the main page.







Main page display

After power on for 10 seconds, welcome page switches to the home page, as shown below:







Line 1: current running state —Air, —Cooling, —Heating, —Running, —Fault;

Line 2: current control temperature







Line 3: current time and set temperature. On this page, press “” “” to adjust the value, long press to adjust fast. Then press “” to confirm, if not “”, value is confirmed automatically by the system after 5 seconds.

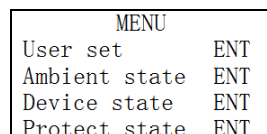
1. Mode switch must be operated on the stop state.
2. No “Auto” mode at heat pump unit.








Power on and power off

On main page, press “” to display running state. “” is shown on the upper right corner of the screen. If start air fan,  is displayed. Press “” again to power off and all icons disappear.

User parameter setting




On main page, press “” to main menu page. Press “” to choose user set page, continuously press “” to separately choose environmental status, device status, protection status pages. The bottom color of the chosen status is black. Press “” to enter the corresponding page. “” is one do-nothing operation. Press “” again to choose user setting pages. Main menu is as shown below:





Under the setting status,press“”to choose the parameter to modify. The bottom color of the chosen parameter is black.Press “”、“”to increase or decrease the value.Long press“”、“”could modify rapidly.After finishin, press“”.After all setting,press “”to return to the main page. Specific user setting is as shown below:

Name	Value	Unit	Default	Meaning
Temp.set	5~50	℃	25	Set the temperature
Fan speed	auto/low/high	--	auto	Set the fan speed
Auto.startup	disable/enable	--	disable	When auto startup is enabled, there is a random time 1~10 seconds when the system is powered on.
Contrast set	20~40	--	32	--
Spare/force defrost	Enable/disable	--	disable	Heat pump unit defrosts by force without time interval.
Time set	--	--	--	Set current time
Timer set	--	--	--	Timer switch
Language setting	--	--	Chinese	Choose system language

Input,output view

On “menu” page, press“”to main menu page. Press“”to choose user set page, continuously press“”to separately choose environmental status, device status, protection status pages, as below:

<p>MENU</p> <p>User set ENT</p> <p>Ambient state ENT</p> <p>Device state ENT</p> <p>Protect state ENT</p>	<p>Ambient state</p> <p>Supply temp 12.3℃</p> <p>Return temp 12.3℃</p> <p>Evap. temp1 12.3℃</p> <p>Evap. temp2 12.3℃</p>	<p>Evap. temp3 12.3℃</p> <p>Evap. temp4 12.3℃</p> <p>Reserve 12 A</p> <p>Reserve 12 A</p> <p>Heat valve 100%</p>	<p>Device state</p> <p>Blower Low <input type="radio"/></p> <p>Blower High <input type="radio"/></p> <p>Compr. 1 <input type="radio"/></p> <p>Compr. 2 <input type="radio"/></p>	<p>Compr. 3 <input type="radio"/></p> <p>Compr. 4 <input type="radio"/></p> <p>E-heater 1 <input type="radio"/></p> <p>E-heater 2 <input type="radio"/></p>
<p>E-heater 3 <input type="radio"/></p> <p>E-heater 4 <input type="radio"/></p> <p>Air valve <input type="radio"/></p> <p>Alarm <input type="radio"/></p>	<p>Protect state</p> <p>Blower Overload <input checked="" type="radio"/></p> <p>Compr. 1 PH <input checked="" type="radio"/></p> <p>Compr. 1 PL <input checked="" type="radio"/></p> <p>Compr. 2 PH <input checked="" type="radio"/></p>	<p>Compr. 2 PL <input checked="" type="radio"/></p> <p>Compr. 3 PH <input checked="" type="radio"/></p> <p>Compr. 3 PL <input checked="" type="radio"/></p> <p>Compr. 4 PH <input checked="" type="radio"/></p>	<p>Compr. 4 PL <input checked="" type="radio"/></p> <p>Heat protect <input checked="" type="radio"/></p>	

When view status,short press“”to return to previous menu;long press“”to main page.

Time set

On "user set"page, enter "time set"page. Current time is shown on first line. "↶" can move the cursor.Press"↶"、"↷"to adjust the value.

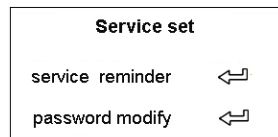
Timer set

On "user set"page, enter "timer set"function page.Press"↶"to enter "timer set"setting page. Press"↷"to choose the timer date and timer on/off. The bottom color of the chosen item is black, then press "↶"、"↷"to increase or decrease the value.Press "↷"to switch between date →timer on hour set →timer on minute set →timer off hour set →timer off minute set.When setting the start date,press "↷"to choose time set. Date flashes.Press "↶"to make the current date enable.The bottom color of the date is black. If cancel,press "↷"; press "↶"to confirm the modification."↶" back to previous menu.

If timer on/off is set to 00:00, it represents timer on/off is disabled.

Service reminder

In the main page, press"↶"+"↷"at the same time for 3 seconds to enter the menu choose page. Choose the maintenance setting and password page pops out. Enter"260000",if correct, page is as below:



On this page, select the "service reminder" to enter the "service reminder" settings page. Under the setting state, press "↷" to adjust the value of the cursor position; press "↶"、"↷"to adjust the position of the cursor. Press "↶"to confirm after settings.

When every day passed, the service reminder time is automatically less one day.When the service reminder time becomes 000, the system automatically shuts down and prompts "service reminder time up".On this page, press "↶"to jump to the password entry page, enter the correct password and reset the service reminder time.Then,system will run normally.

If the time is set "999 days", it represents this function is disabled.

Remote control

Under default conditions, the control board D10 port (port 26) and the exhaust outlet DCOM (common port) form a loop, remote control is enabled. The system starts according to the control logic and the switch button is invalid; if the point is lost, the system enter the shutdown procedure, the switch button to return to normal;

Anti cold air function

When the inner coil temperature probe ≤ 25 °C, anti-cold air function starts.

- 1) If the electric heating is on, turn off it and then turn off the air fan after 40 seconds.
- 2) If electric heating is off, turn off the air fan delaying 15 seconds.

Anti cold air exits conditions:

When the inner temperature is higher than 25 °C, the fan restarts.

Air fan control

Air fan control: auto, low, high

auto: Selecting the auto mode, when the compressor or electric heating starts, fan will run at high speed. When all compressors and electric heating are stopped, the fan will delay 1 min to start low speed.

low: Low fan speed all the time

high: High fan speed all the time

Defrost control

System has compressor 1 and compressor 2 defrost probes, defrost parameters can be set through "setting";

Defrost enable conditions:

Defrosting probe temperature is lower than "defrost initiation temperature"/ the heating of the compressor running time is greater than "defrost interval time" / the difference between the ambient temperature and fin temperature is greater than the defrost temperature difference, system starts defrost and prompts "defrosting" status.

End defrost conditions:

If defrost probe temperature is higher than "End defrost temperature" or defrost operation time is greater than " defrost maximum time", system will end defrost and automatically saves the original working condition.

1. Do not allow more than two compressors simultaneously defrost;
2. If two compressors have reached the defrost condition, the first compressor defrosts first. If the first defrost compressor still meets the conditions under the setting condition, then the first compressor continues defrost during the next defrost cycle until the first compressor meets the defrost end condition.

Condenser fan control

Condenser fan and compressor linkage

When condenser fan temperature at cooling or heating is set “0”,that is, condenser fan and compressor linkage.After the compressor starts, the corresponding condenser fan delay 5 seconds to start; shut down the compressor, condenser fan is off after 5 seconds delay;

When condenser fan is controled based on temperature

When condenser fan temperature at cooling or heating is not set to “0” ,A compressor corresponds to a condenser fan: After the compressor starts 5S, fan will start if the fin temperature is greater than start temperature when cooling and stop if the fin temperature is less than -5 °C start temperature. When heating, fan will start if the fin temperature is less than start temperature and stop if the fin temperature is greater than 5 °C start temperature. When the compressor is off, the corresponding condenser fan is off.

A corresponding two compressor condenser fan: one condensing fan connected to the compressor output port, synchronized with the compressor, the other fan connected to the condensing fan output point. After the compressor starts 5S, fan will start if the fin temperature is greater than start temperature when cooling and stop if the fin temperature is less than -5 °C start temperature. When heating, fan will start if the fin temperature is less than start temperature and stop if the fin temperature is greater than 5 °C start temperature. When the compressor is off, the corresponding condenser fan is off.

Compressor balance control

The system automatically records and compares the running time of four compressors. System will sort according to the running time. The compressor with shortest total running time starts first. The compressor with longest total running time starts last in order to ensure the system compressor total running time difference narrowed as much as possible.

Two compressors balance on heat pump unit.

Communication Protocol

The controller uses RS485 communication, the protocol is Modbus RTU, parameters are as follows:

Communication: asynchronous half-duplex

Baud Rate: 9600

Data bits: 8

Stop bits: 1

Parity: None

Fault input and protection alarm

Fault list

According to system setting, ports normally closed: if the point forms a loop with DCOM (common port) ,it is normal; if disconnected,it is faulty.

Conversely, ports normally open: if the point disconnected with DCOM (common port) ,it is normal; if loop,it is faulty. Please set the unused port be normally open in case of alarm.

Fault	Triggering Condition	Delay Time	Duration	Corresponding Action	Reset Operation	Notes
Air fan	At any time	0s	2s	stop unit	Manual	Don't turn on the unit when fault already exists when power on.
high sure protect	At any time	0s	2s	Stop the comp.	Manual	Don't start comp when fault already exists when power on.
low pressure protect	Comp.start	*120s	2s	Stop the comp.	Manual	Delay detect after comp starts
user fault chain	At any time	0s	2s	stop unit	Manual	e.g. fire alarm
heating protect	Heating mode	0s	2s	Stop electric heating	Manual	
fan pressure switch	Fan start	30s	10s	stop unit	Manual	
condensing fan overload	At any time	0s	2s	stop the comp and condensing fan	Manual	
comp high current	Comp.start	2s	5s	Stop the comp.	Manual	
retrurn temp sensor fault	At any time	0s	5s	stop unit	Automatic	
air temp sensor fault	At any time	0s	5s	alarm	Automatic	Air sensor faults when air control, system will automatically change to return control after 10 min.
ambient temp sensor fault	At any time	0s	5s	alarm	Automatic	non - treatment
fin temp sensor fault	At any time	0s	5s	Stop the comp. alarm	Automatic	alarm only when evaporator temp sensor fault
air temp too high /too low	Air fan start	0s	2s	Stop the comp.	Automatic	No too high temp detection when cooling; No too low temp detection when heating
lack-phase/fault phase	Atany time	0s	0s	stop unit	Blackout	When the fourth DIP appropriated ON, power failure is detected; fourth DIP appropriated OFF, does not detect power failure; When set to detect when power failure is detected. If the fault is present, do not turn on unit.
Communication fault	At any time	0s	2s	alarm	Automatic	non - treatment

Fault view

Fault will pop out when occurs. Press “🔔” to enquiry the current fault not reset on main page.

06-25 16:53	06-25 16:53
1. comp. — high pressure	
06-25 16:53	06-25 16:53
2. cooling water pump overload	

History fault view

On fault history record enquiry page,press “←” to history fault record page,as below:

Line 1/3: fault occur month,date,hour,minute and fault recover month,date,hour,minute

Line 2/4: fault No. and name

250 records at most could be saved.If more than 250, the last record will be deleted.

Clear history fault records On fault history record page,press “🔧”, show as below:

On this page,press “←” to clear the records and history fault page will show “no record”

🔧 to clear records

Reset fault

- Press “←” to reset the fault when unit running;
- All faults could be reset when power off.

Please reset the fault after trouble shooting.