DC Inverter R410A
Ducted Central Split Systems
Air Conditioners & Heat Pump

Service Manual 2014

DYC Series DC Inverter Ducted Central Split Systems. Cool Only / Heat Pump

Air Handling Units	:	DC024GMFI18HT2, DC036GMFI18HT2 DC048GMFI18HT2, DC060GMFI18HT2
Cool Only Outdoor Units	:	AD024GMFI18MR2, AD024GMFI18MR2 AD048GMFI18MR2, AD060GMFI18MR2
Heat Pump Outdoor Units	:	YD024GMFI18MR2, YD024GMFI18MR2 YD048GMFI18MR2, YD060GMFI18MR2
Electric Heater Kits	:	EHK-05B, EHK-08B, EHK-10B

CONTENTS

1. Precaution ..... - 2 -
1.1 Safety Precaution ..... - 2 -
1.2 Warning & Caution ..... - 2 -
2. Function ..... - 4 -
2.1 Model Names Of Indoor/Outdoor Units ..... - 4 -
2.2 Specifications ..... - 5 -
3. Dimension ..... - 10 -
3.1 Indoor Units ..... - 10 -
3.2 Outdoor Units ..... - 11 -
4. Refrigerant Cycle Diagram ..... - 12 -
5. Wiring Diagram ..... - 13 -
5.1 Indoor Units ..... - 13 -
5.2 Outdoor Units ..... - 18 -
6. Installation Details ..... - 20 -
6.1 Outdoor Unit Installation ..... - 20 -
6.2 Indoor Unit Installation ..... - 33 -
6.3 Maintenance And Replacement Of Outdoor Unit Electronic Control Box ..... - 47 -
7. Operation Characteristics ..... - 49 -
8. Electronic Function ..... - 50 -
8.1 Abbreviation ..... - 50 -
8.2 Main Control Logic ..... - 50 -
8.3 Main Control Board Ports Instructions ..... - 54 -
8.4 Outdoor Unit Status Display ..... - 58 -
9. Troubleshooting ..... - 59 -
9.1 Outdoor Unit Error Display ..... - 59 -
9.2 Diagnosis And Solution ..... - 60 -

1. Precaution

1.1 Safety Precaution

This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

This is an attention alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention to the signal words DANGER, WARNING, or CAUTION.
DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.
WARNING indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.
CAUTION indicates a potentially hazardous situation, which, if not avoided may result in minor or moderate injury. It is also used to alert against unsafe practices and hazards involving only property damage.

1.2 Warning & Caution

➢ Outdoor Installation

- Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer or service agency.

- This product must be installed in strict compliance with the installation instructions and any applicable local, state, and national codes including, but not limited to building, electrical, and mechanical codes.
- Fire or electrical hazard

Failure to follow the safety warnings exactly could result in serious injury, death or property damage.

A fire or electrical hazard may result causing property damage, personal injury or loss of life.

- If using existing refrigerant lines make certain that all joints are brazed, not soldered.
- Do not touch the top of compressor, it may cause minor to severe burning.

➢ Indoor Installation

- Disconnect all power to unit before installing or servicing. More than one disconnect switch may be required to de-energize the equipment. Hazardous voltage can cause server personal injury or death.
- If removal of the blower assembly is required, all disconnect switches supplying power to the equipment must be de-energized and locked (if not in sight of unit) so the field power wires can be safely removed from the blower assembly. Failure to do so can cause electrical shock resulting in personal injuring or death.
- Because of possible damage to equipment or personal injury, installation, service, and maintenance should be performed by a trained, qualified service personnel. Consumer service is recommended only for filter cleaning / replacement. Never operate the unit with the acess panels removed.
- These instructions are intended as an aid to qualified, licensed service personnel for proper installation, adjustment and operation of this unit. Read these instructions thoroughly before attempting installation or operation. failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, property damage, personal injury or death.
- The unit must be permanently grounded. Failure to do so can result in electrical shock causing personal injury or death.

2. Function

2.1 Model Names of Indoor/Outdoor Units

18SEER DC inverter	24K	DC024GMFI18HT2	AD024GMFI18MR2
		DC024GMFI18HT2	YD024GMFI18MR2
	36K	DC036GMFI18HT2	AD036GMFI18MR2
		DC036GMFI18HT2	YD036GMFI18MR2
	48K	DC048GMFI18HT2	AD048GMFI18MR2
		DC048GMFI18HT2	YD048GMFI18MR2
	60K	DC060GMFI18HT2	AD060GMFI18MR2
		DC060GMFI18HT2	YD060GMFI18MR2

2.2 Specifications

18 SEER Outdoor Unit						
Model			24AC	24HP	36AC	36HP
Power supply	V-Ph-Hz		208/230V-1Ph-60Hz			
Cooling	Capacity	Btu/h	24000	24000	35200	34600
	EER	Btu/h.W	12.5	11.6	12.2	11.6
	SEER	Btu/h.W	18	17.5	18	17.5
Heating	Capacity	Btu/h	/	23800	/	33600
	HSPF	Btu/h.W	/	9.5	/	9.5
Compressor	Type		DC inverter rotary	DC inverter rotary	DC inverter rotary	DC inverter rotary
	Capacity	Btu	24327	24327	24327	24327
	Input	W	2200	2200	2200	2200
	Brand		Mitsubishi	Mitsubishi	Mitsubishi	Mitsubishi
Fan motor	Type		AC	AC	AC	AC
	Capacitor	uF	6	6	6	6
Outdoor coil	Number of rows		1	1	2	2
	Tube outside dia	mm	7	7	7	7
	Tube outside type		innergroove tube			
	Fin spacing	mm	1.3	1.3	1.5	1.5
	Tube pitch(a)x row pitch(b)	mm	21 x 19.4	21 x 19.4	21 x 17	21 x 17
Outdoor unit	Dimension (W*H*D)	mm	740×633×740			
	Dimension (W*H*D)	inch	29-1/8×24-15/16×29-1/8			
	Packing (W*H*D)	mm	768×667×768			
	Packing (W*H*D)	inch	30-1/5x26-1/4x30-1/5			
	Gross weight	Kg / lbs	65/143	69/152	71/157	75/165
	Net weight	Kg / lbs	61/134	65/143	67/148	71/157
Reversing valve	Model		/	STF-02BN1(UL)	/	STF-02BN1(UL)
Refrigerant piping	Liquid side/ Gas side	inch	3/8 / 3/4	3/8 / 3/4	3/8 / 3/4	3/8 / 3/4
Controller			Wire Control			
Operation temp		℃/F	10℃-30℃			
Ambient temp		℃/F	-5℃-43℃			

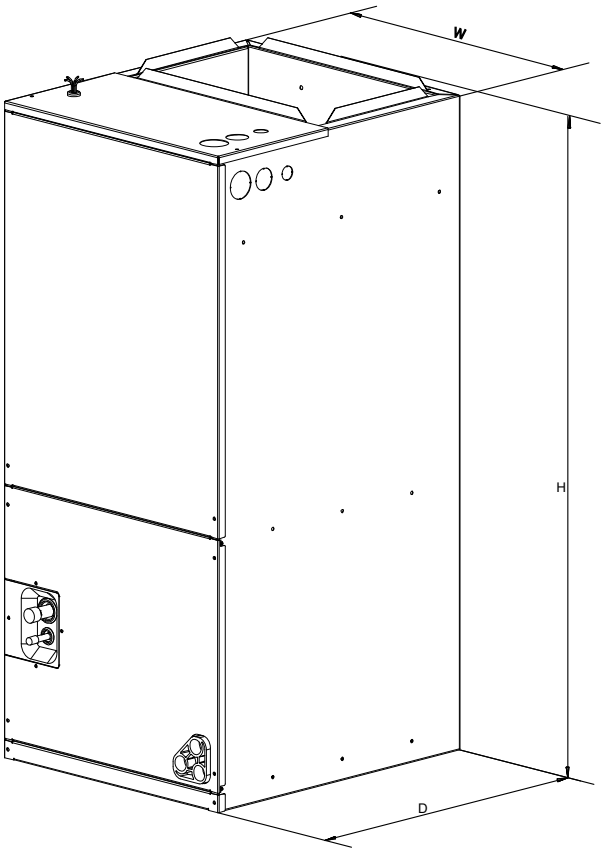
18SEER outdoor unit						
Model			48AC	48HP	60AC	60HP
Power supply	V-Ph-Hz		208/230V-1Ph-60Hz			
Cooling	Capacity	Btu/h	46500	46000	55000	55000
	EER	Btu/h.W	11.7	11.5	11.7	11.1
	SEER	Btu/h.W	18	17	18	17
Heating	Capacity	Btu/h	/	46000	/	55000
	HSPF	Btu/h.W	/	9	/	9
Compressor	Type		DC inverter rotary	DC inverter rotary	DC inverter rotary	DC inverter rotary
	Capacity	Btu	44356	44356	44356	44356
	Input	W	3505	3505	3505	3505
	Brand		GMCC	GMCC	GMCC	GMCC
Fan motor	Type		DC	DC	DC	DC
	Capacitor	uF	/	/	/	/
Outdoor coil	Number of rows		2	2	2.6	2.6
	Number of U tube		38	38	51	51
	Tube outside dia	mm	7	7	7	7
	Tube outside type		innergroove tube	innergroove tube	innergroove tube	innergroove tube
	Fin spacing	mm	1.3	1.3	1.3	1.3
	Tube pitch(a)x row pitch(b)	mm	13.37/21	13.37/21	13.37/21	13.37/21
Outdoor unit	Dimension (W*H*D)	inch	29-1/8×33-3/16×29-1/8			
	Packing (W*H*D)	inch	30-1/5x34-1/2x30-1/5			
Reversing valve	Model		/	STF-03A	/	STF-03A
Charged refrigerant type	Type		R410a	R410a	R410a	R410a
	g		4500g	4700g	4900g	5100g

Indoor unit				
Model			024	036
Power supply		V-Ph-Hz	208/230V-1Ph-60Hz	
MCA		A	2.4	3.4
Fan motor	Model	-	WZDK250-312G-1	WZDK370-312G-1
	Type	-	DC MOTOR	DC MOTOR
	Brand	-	genteq	genteq
	Insulation class	-	B	B
	Safe class	-	IP20	IP20
	Input	W	117(45Pa,3)	146(60Pa,3)
	Rated current	A	0.8(45Pa,3)	1.04(60Pa,3)
	Capacitor	uF	/	/
	Rated HP	-	1/3	1/2
	Rated RPM	r/min	1050	1050
Fan	material	-	Metal	Metal
	Type	-	centrifugal fan	centrifugal fan
	Diameter	mm	270	279
	Height	mm	207	271
Coil	Number of rows	-	4*2	4*2
	Tube pitch*row pitch	mm	21*13.37	21*13.37
	Fin spacing	mm	1.5	1.5
	Fin type	-	hydrophilic aluminium	
	Tube size and type	mm	Φ7	Φ7
			inergroove tube	inergroove tube
	Coil (L×H)	mm	445*420	510*546
	Number of circuits	-	8	12
Standard ESP		Pa	25	45
Air flow (Hi)		CFM	892	1320
Sound level (sound pressure level)		dB(A)	51 (64)	54 (67)
Unit dimension (W×H×D)		mm	500*1180*550	560*1385*610
Unit dimension (W×H×D)		inch	19-5/8"*46-1/2"*21-5/8"	22”*54-1/2”*24”
Packing dimension (W×H×D)		mm	644*1205*567	704*1410*627
Packing dimension (W×H×D)		inch	22-3/5"*47-4/5"*22-7/10"	25”*55-4/5”*27-7/10”
Net/Gross weight		Kg	54/60	74/82
Refrigerant piping size (Liquid/ Gas)		inch	3/8 / 3/4	3/8 / 3/4
		mm	9.53/19.1	9.53/19.1
Connection wiring	Power wiring	mm^2	3×2.1mm2（14AWG）	3×2.1mm2（14AWG）
	Signal wiring	mm^2	4×0.8mm2（18 AWG）	4×0.8mm2（18 AWG）
Controller		-	Wire Control	Wire Control
Operation temp.		℃	17～30	17～30
Ambient temp.		℃	18~43	18~43
Shipping per STD40HQ		Pieces	154	104

			Indoor unit	
Model			048	060
Power supply		V-Ph-Hz	208/230V-1Ph-60Hz	
MCA		AMPS	7.5	7.5
Motor	Model		WZDK560-312G	WZDK560-312G
	Type		DC	DC
	Capacitor	uF	/	/
	Rated HP		3/4	3/4
Indoor fan	Material		Metal	Metal
	Type		centrifugal fan	centrifugal fan
	Diameter		274mm	274mm
	Height		274mm	274mm
indoor coil	Number of rows		4*2	5*2
	Tube outside dia	mm	7	7
	Tube outside type		innergroove tube	innergroove tube
	Fin spacing	mm	1.5	1.5
	Tube pitch(a)x row pitch(b)	mm	21*13.37	21*13.37
Indoor limit value of static pressure and air flow		Pa/CFM	0.20 IN.W.C/1600	0.20 IN.W.C/1600
Indoor sound level (sound pressure level)		dB(A)	58	58
Indoor unit	Dimension (W*H*D)	inch	22”x54-1/2”x24”	22”x54-1/2”x24”
	Packing (W*H*D)	inch	25”x55-4/5”x27-7/10”	25”x55-4/5”x27-7/10”
	Net/Gross weight	lbs	162/180	170/188
Throttle type			TXV/5TON	TXV/5TON
Refrigerant connection valve size	Liquid side/ Gas side	inch	3/8---3/4	3/8---3/4

3. Dimension

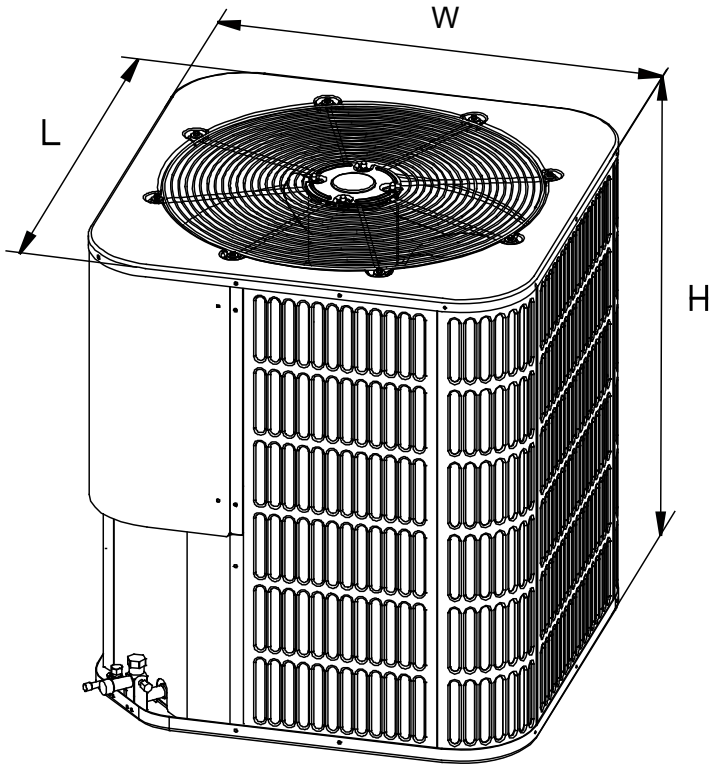
3.1 Indoor Units



DIMENSIONAL DATA

MODEL SIZE	Dimensions inch			
	UNIT HEIGHT "H" IN.	UNIT WIDTH "W" IN.	UNIT LENGTH "D" IN.	LIQUID LINE / VAPOR LINE
24	46-1/2"	19-5/8"	21-5/8"	3/8"/3/4"
36	54-1/2"	22”	24"	3/8"/3/4"
48	54-1/2"	22"	24"	3/8"/7/8"
60	54-1/2"	22"	24"	3/8"/7/8"

3.2 Outdoor Units

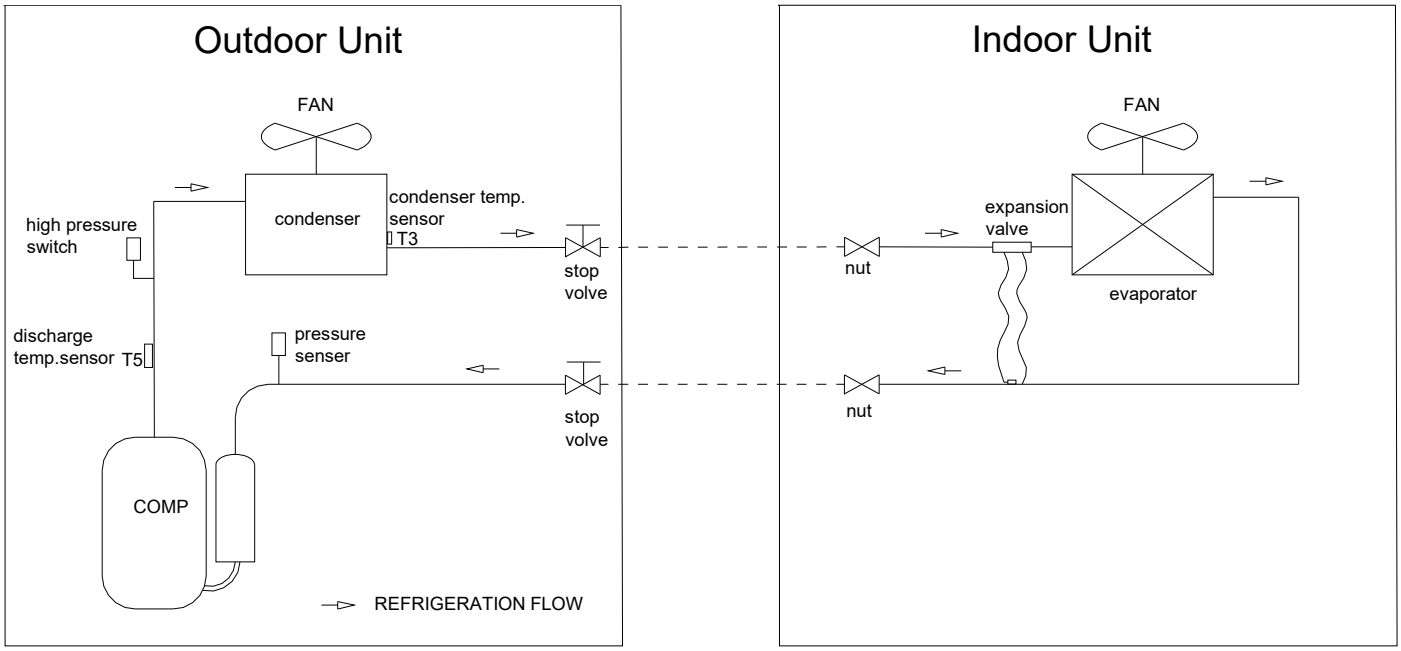


DIMENSIONAL DATA

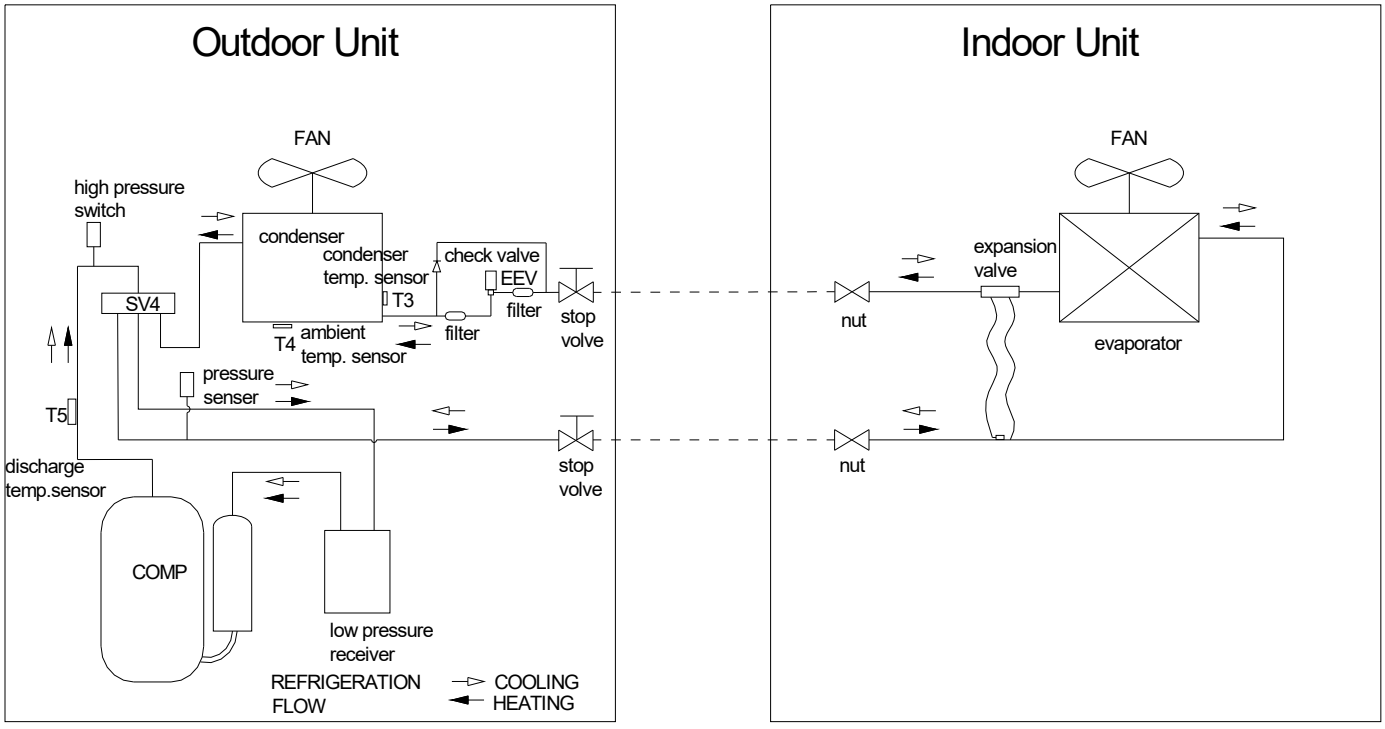
Mode size		Dimensions			Refrigerant connection Service Valve Size	
AC	HP	“H” in.	“W” in.	“L” in.	Liquid in.	Suction in.
24/36	24/36	24-15/16	29-1/8	29-1/8	3/8	3/4
48/60	48/60	33-3/16	29-1/8	29-1/8	3/8	7/8

4. Refrigerant Cycle Diagram

For cooling only models:



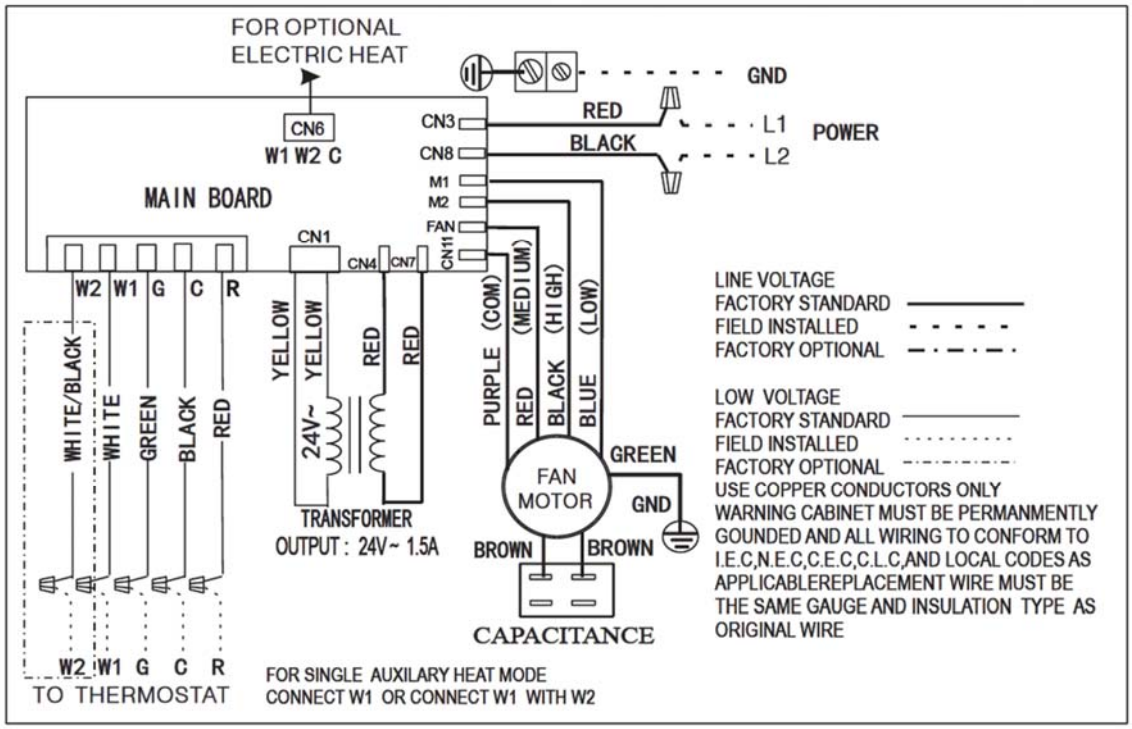
For heat pump models:



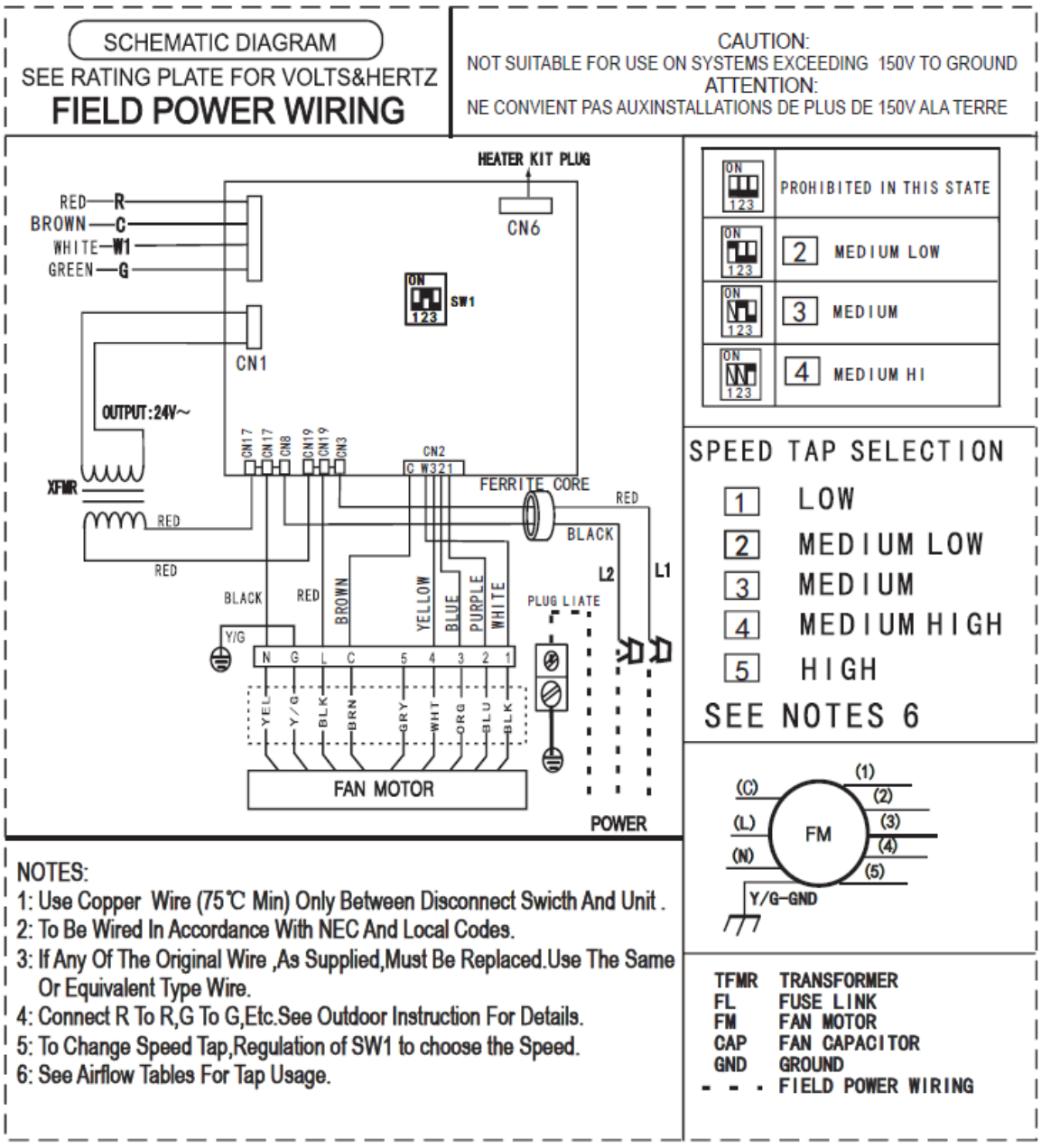
5. Wiring Diagram

5.1 Indoor Units

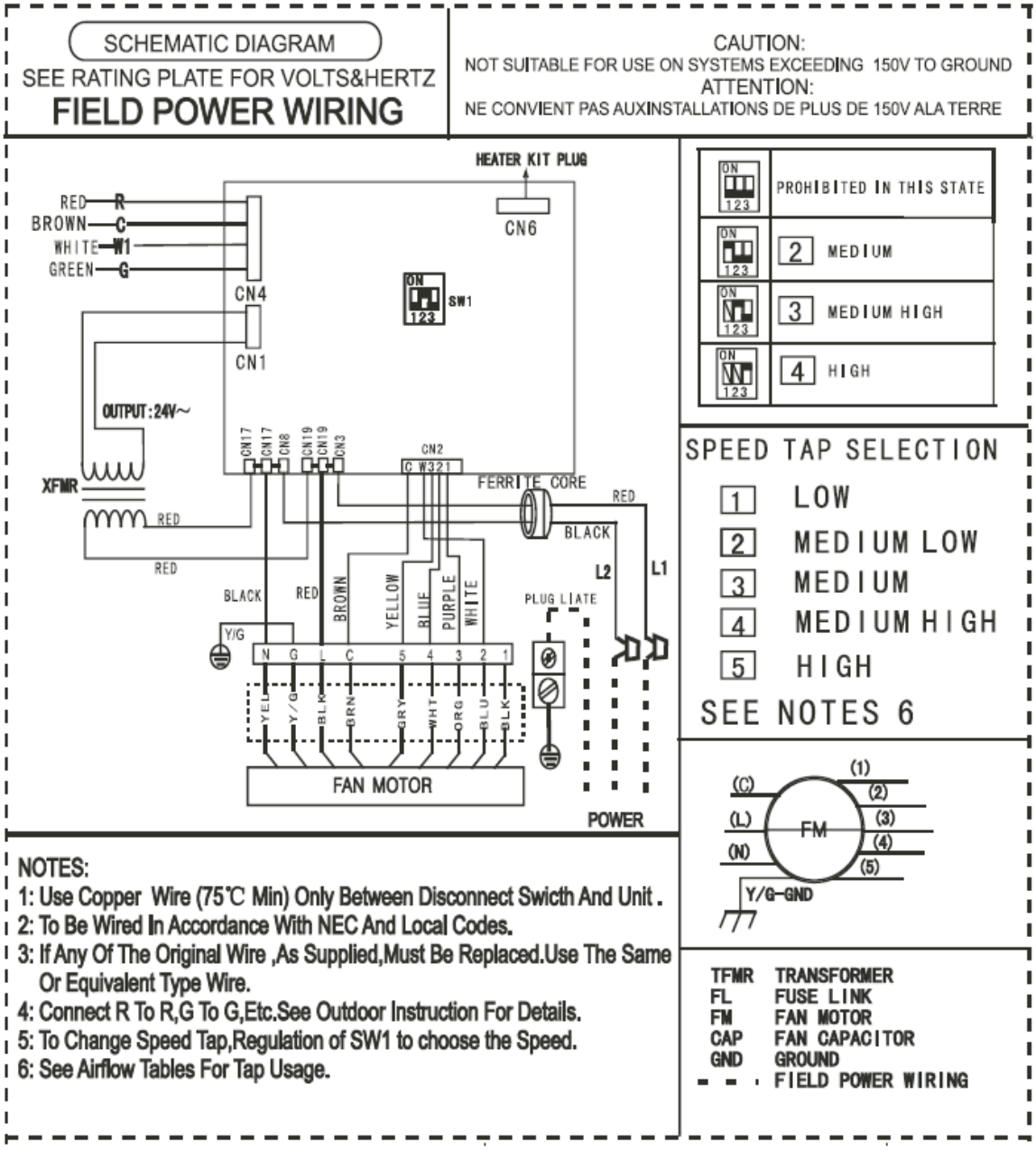
Indoor unit wiring diagram for PSC motor A/C systems and H/P systems.



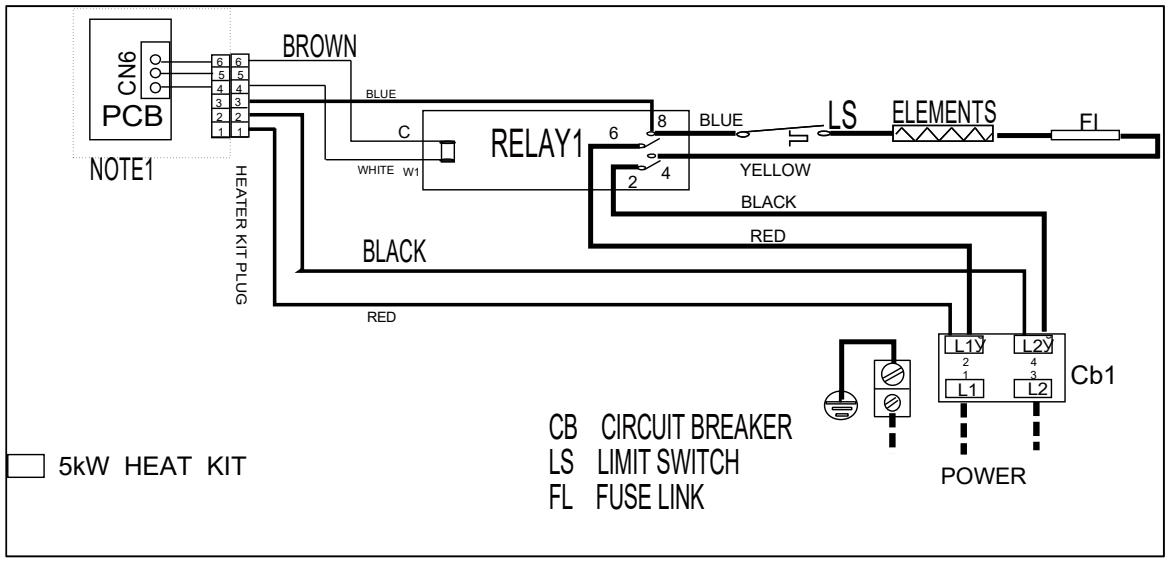
Indoor unit wiring diagram for ECM motor A/C systems and H/P systems (24K/36K/48K).

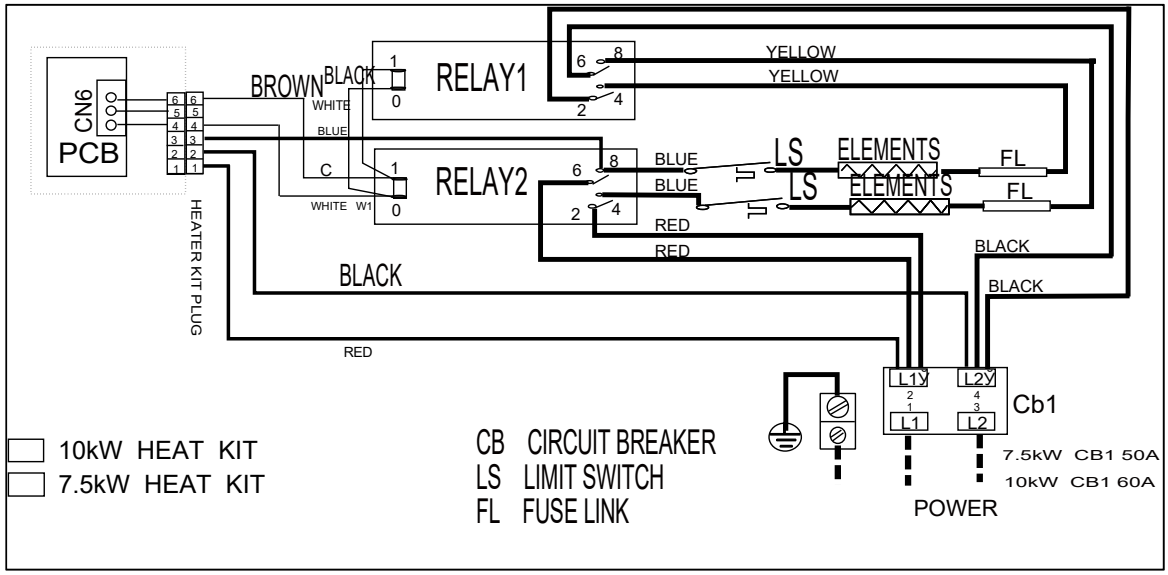


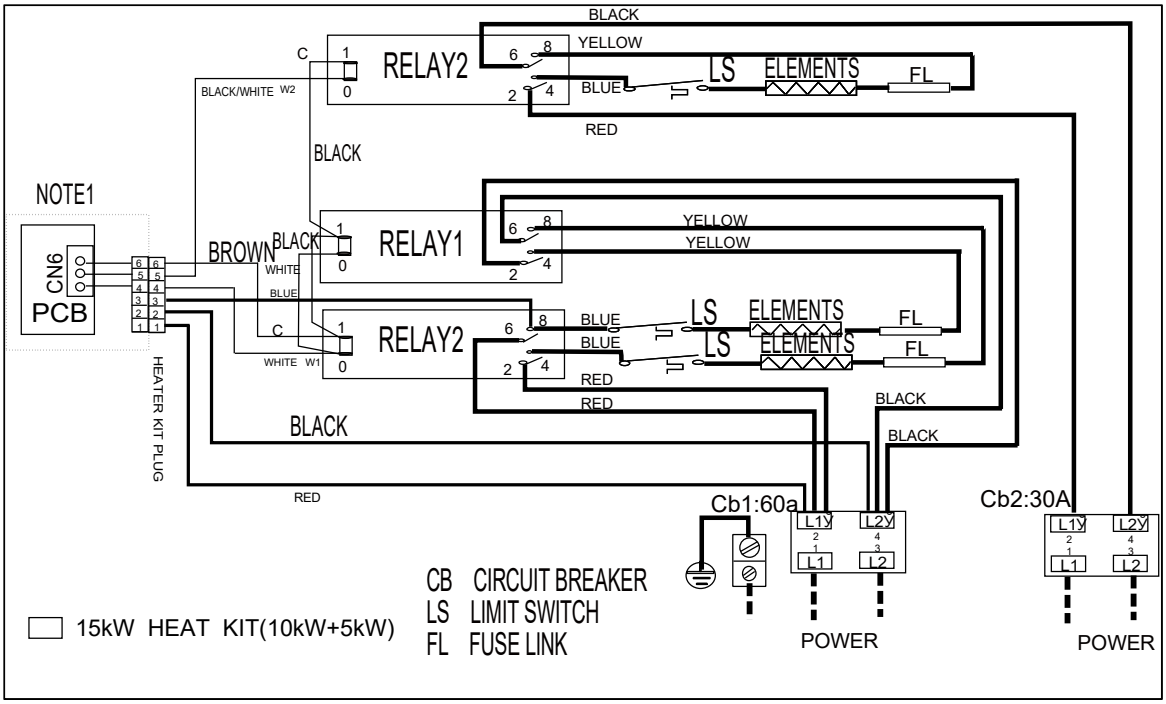
Indoor unit wiring diagram for ECM motor A/C systems and H/P systems (60K).

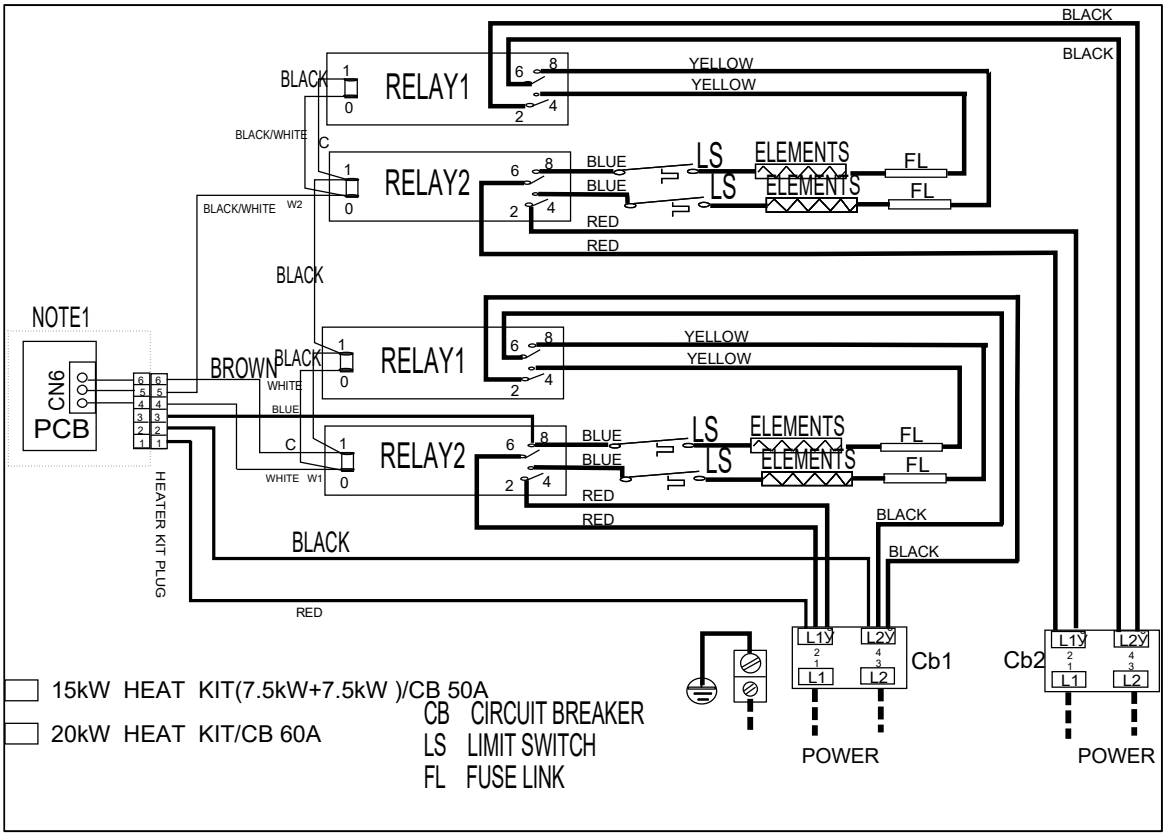


Indoor unit wiring diagram for electric heat.



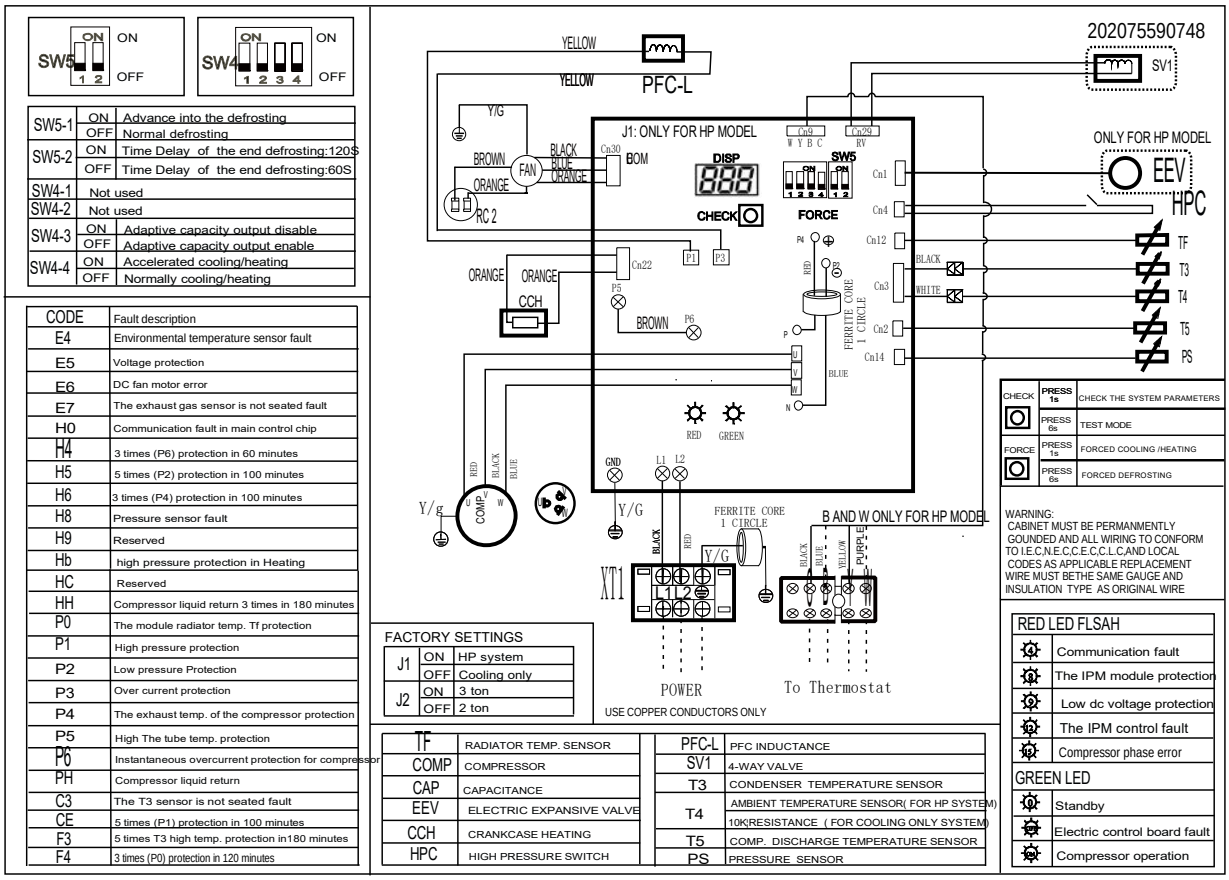



BLACK
YELLOW
BLUE
RED
RELAY2
RELAY1
LS
ELEMENTS
FL
BLACK/WHITE W2
BLACK
NOTE1
CN6
PCB
BROWN
WHITE
BLUE
WHITE W1
HEATER KIT PLUG
Cb1:60a
Cb2:30A
L1Y
L2Y
L1
L2
POWER
CB CIRCUIT BREAKER
LS LIMIT SWITCH
FL FUSE LINK
15kW HEAT KIT(10kW+5kW)


BLACK
YELLOW
BLUE
RED
RELAY1
RELAY2
LS
ELEMENTS
FL
BLACK/WHITE W2
NOTE1
CN6
PCB
BROWN
WHITE
WHITE W1
HEATER KIT PLUG
Cb1
Cb2
L1Y
L2Y
L1
L2
POWER
CB CIRCUIT BREAKER
LS LIMIT SWITCH
FL FUSE LINK
15kW HEAT KIT(7.5kW+7.5kW)/CB 50A
20kW HEAT KIT/CB 60A

5.2 Outdoor Units

Outdoor unit wiring diagram for 24/36K models:



SW5-1	ON	Advance into the defrosting
	OFF	Normal defrosting
SW5-2	ON	Time Delay of the end defrosting:120S
	OFF	Time Delay of the end defrosting:60S
SW4-1	Not used	
SW4-2	Not used	
SW4-3	ON	Adaptive capacity output disable
	OFF	Adaptive capacity output enable
SW4-4	ON	Accelerated cooling/heating
	OFF	Normally cooling/heating

CODE	Fault description
E4	Environmental temperature sensor fault
E5	Voltage protection
E6	DC fan motor error
E7	The exhaust gas sensor is not seated fault
H0	Communication fault in main control chip
H4	3 times (P6) protection in 60 minutes
H5	5 times (P2) protection in 100 minutes
H6	3 times (P4) protection in 100 minutes
H8	Pressure sensor fault
H9	Reserved
Hb	high pressure protection in Heating
HC	Reserved
HH	Compressor liquid return 3 times in 180 minutes
P0	The module radiator temp. Tf protection
P1	High pressure protection
P2	Low pressure Protection
P3	Over current protection
P4	The exhaust temp. of the compressor protection
P5	High The tube temp. protection
P6	Instantaneous overcurrent protection for compressor
PH	Compressor liquid return
C3	The T3 sensor is not seated fault
CE	5 times (P1) protection in 100 minutes
F3	5 times T3 high temp. protection in180 minutes
F4	3 times (P0) protection in 120 minutes

CHECK	PRESS 1s	CHECK THE SYSTEM PARAMETERS
	PRESS 6s	TEST MODE
FORCE	PRESS 1s	FORCED COOLING /HEATING
	PRESS 6s	FORCED DEFROSTING

FACTORY SETTINGS

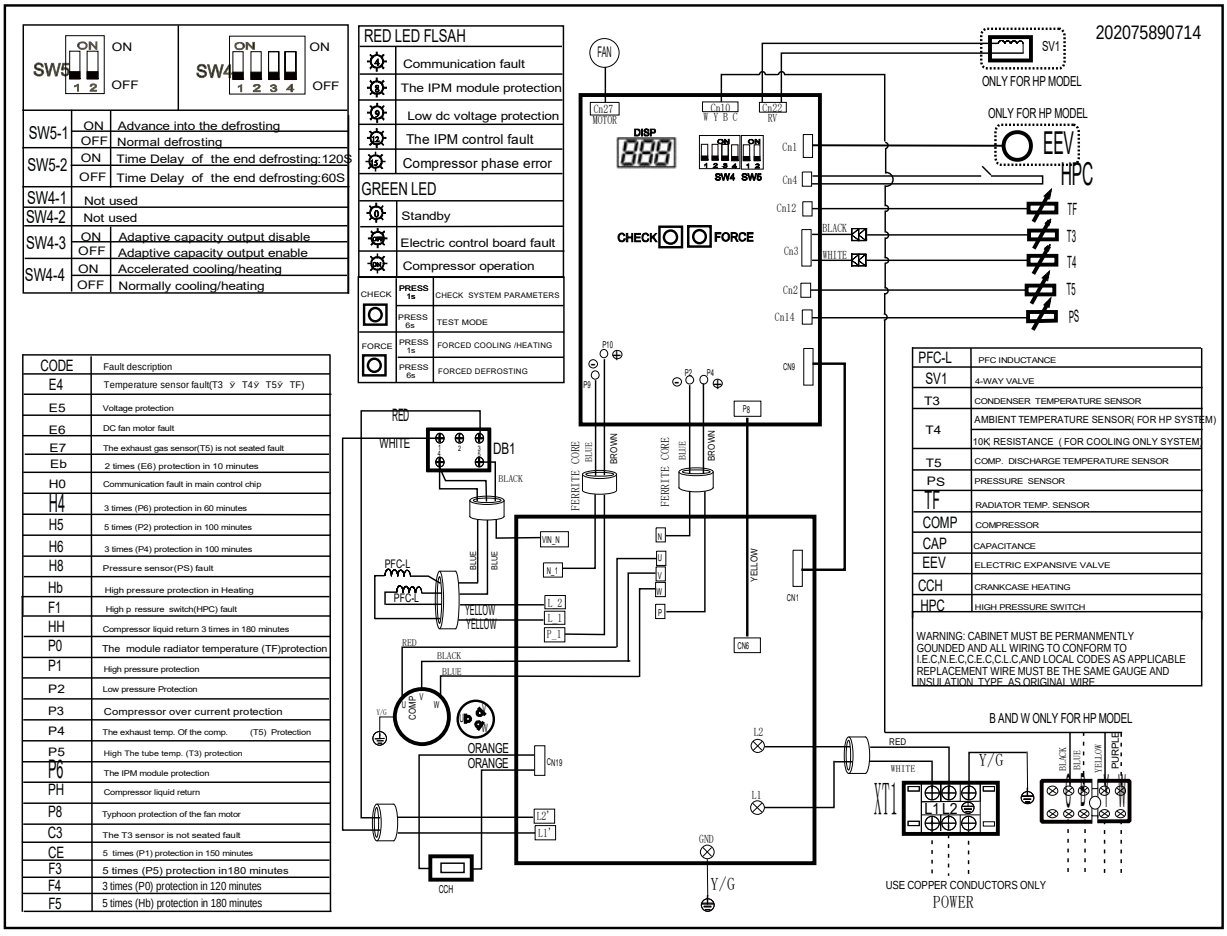
J1	ON	HP system
	OFF	Cooling only
J2	ON	3 ton
	OFF	2 ton

TF	RADIATOR TEMP. SENSOR
COMP	COMPRESSOR
CAP	CAPACITANCE
EEV	ELECTRIC EXPANSIVE VALVE
CCH	CRANKCASE HEATING
HPC	HIGH PRESSURE SWITCH

PFC-L	PFC INDUCTANCE
SV1	4-WAY VALVE
T3	CONDENSER TEMPERATURE SENSOR
T4	AMBIENT TEMPERATURE SENSOR(FOR HP SYSTEM) 10K(RESISTANCE (FOR COOLING ONLY SYSTEM)
T5	COMP. DISCHARGE TEMPERATURE SENSOR
PS	PRESSURE SENSOR

RED LED FLSAH	
	Communication fault
	The IPM module protection
	Low dc voltage protection
	The IPM control fault
	Compressor phase error
GREEN LED	
	Standby
	Electric control board fault
	Compressor operation

Outdoor unit wiring diagram for 48/60K models:



6. Installation Details

6.1 Outdoor Unit Installation

6.1.1 Location

Before starting the installation, select and check the suitability of the location for both the indoor and outdoor unit. Observe all limitations and clearance requirements. The outdoor unit must have sufficient clearance for air entrance to the condenser coil, for air discharge and for service access.

	NOTE
	For multiple unit installations, units must be spaced a minimum of 18 inches apart. (Coil face to coil face.)

If the unit is to be installed on a hot sun exposed roof or a black-topped ground area, the unit should be raised sufficiently above the roof or ground to avoid taking the accumulated layer of hot air into the outdoor unit.

Provide an adequate structural support.

6.1.2 Ground Installation

The unit may be installed at ground level on a solid base that will not shift or settle, causing strain on the refrigerant lines and possible leaks. Maintain the clearances and install the unit in a level position.

Normal operating sound levels may be objectionable if the unit is placed directly under windows of certain rooms (bedrooms, study, etc.). Top of unit discharge area must be unrestricted for at least 60 inches above the unit.

	WARNING
	The outdoor unit should not be installed in an area where mud or ice could cause personal injury or system damage.

Elevate the unit sufficiently to prevent any blockage of the air entrances by snow in areas where there will be snow accumulation. Check the local weather bureau for the expected snow accumulation in your area. Isolate the unit from rain gutters to avoid any possible wash out of the foundation.

6.1.3 Roof Installation

When installing units on a roof, the structure must be capable of supporting the total weight of the unit, including a padded frame unit, rails, etc., which should be used to minimize the transmission of sound or vibration into the conditioned space.

6.1.4 Unit Placement

1. Provide a base in the pre-determined location.

2. Remove the shipping carton and inspect for possible damage.

3. Compressor tie-down nuts should remain tightened.

4. Position the unit on the base provided.

CAUTION

This system uses R410A refrigerant which operates at higher pressure than R-22. No other refrigerant may be used in this system. Gauge sets, hoses, refrigerant containers, and recovery system must be designed to handle R410A. If you are unsure, consult the equipment manufacturer.

The outdoor unit must be connected to the indoor coil using field supplied refrigerant grade copper tubing that is internally clean and dry. Units should be installed only with the tubing sizes for approved system combinations. The refrigerant charge shown in the nameplate is for standard size interconnecting liquid line lengths up to 15 feet.

NOTE

Using a larger than specified line size could result in oil return problems. Using a too small line will result in loss of capacity and other problems caused by insufficient refrigerant flow. Slope horizontal suction lines at least 1" every 20 feet toward the outdoor unit to facilitate proper oil return.

6.1.5 Unit Mounting

If elevating the heat pump, either on a flat roof or on a slab, observe the following guidelines.

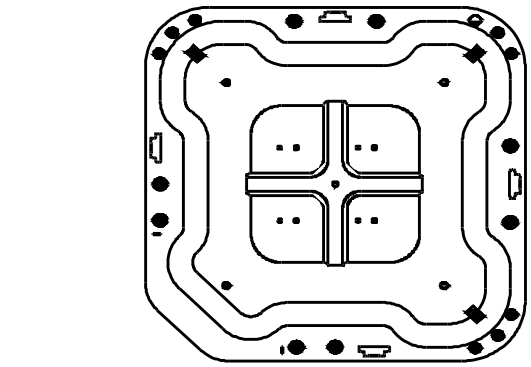
1. The base pan provided elevates the heat pump 2” above the base pad.

2 . If elevating a unit on a flat roof , use 4”× 4”(or equivalent) stringers positioned to distribute unit weight evenly and prevent noise and vibration (See Fig.1).

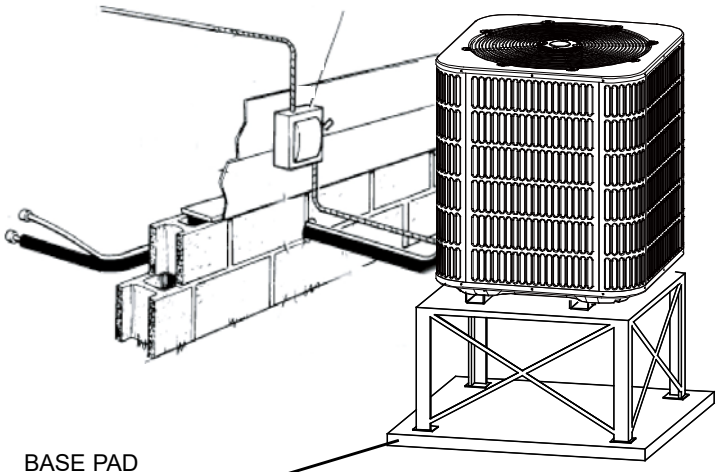
NOTE: Do not block drain openings shown in Fig.1.

3. If unit must be elevated because of anticipated snow fall, secure unit and elevating stand such that unit and/or stand will not tip over or fall off.

NOTE: To tie down unit, see 6.1.6.



BASE PAN (BOTTOM VIEW) DO NOT OBSTRUCT DRAIN HOLES (SHADED)



BASE PAD (CONCRETE OR OTHER SUITABLE MATERIAL)

ELEVATION ABOVE ANTICIPATED SNOW IS NECESSARY

Fig.1 RECOMMENDED ELEVATED INSTALLATION

6.1.6 Factory-Preferred Tie-Down Method

Step 1: Prior to installing clear pad of debris.

Important

Then cement pad must meet local codes and must be the proper thickness to accommodate fasteners.

Step 2: Center and level unit onto pad.

Step 3: Using field supplied L-shaped bracket to locate holes on concrete and drill pilot holes which is at least 1/4” deeper than fastener being used.

Important

Self drilling screws to base pan should not exceed 3/8” long to avoid damaging coil.

Step 4: Using conventional practices to install brackets, tighten concrete fasteners and self-tapping screws (See Fig.2).

Note: 1. One bracket for each side. For extra stability, 2 brackets for each side.

2. Do not over-tighten the concrete fastener to avoid weakening the concrete.

Important Note:

These instructions are intended to provide a method to tie-down system to cement slab as a securing procedure for high wind areas. It is recommended to check Local Codes for tie-down methods and protocols.

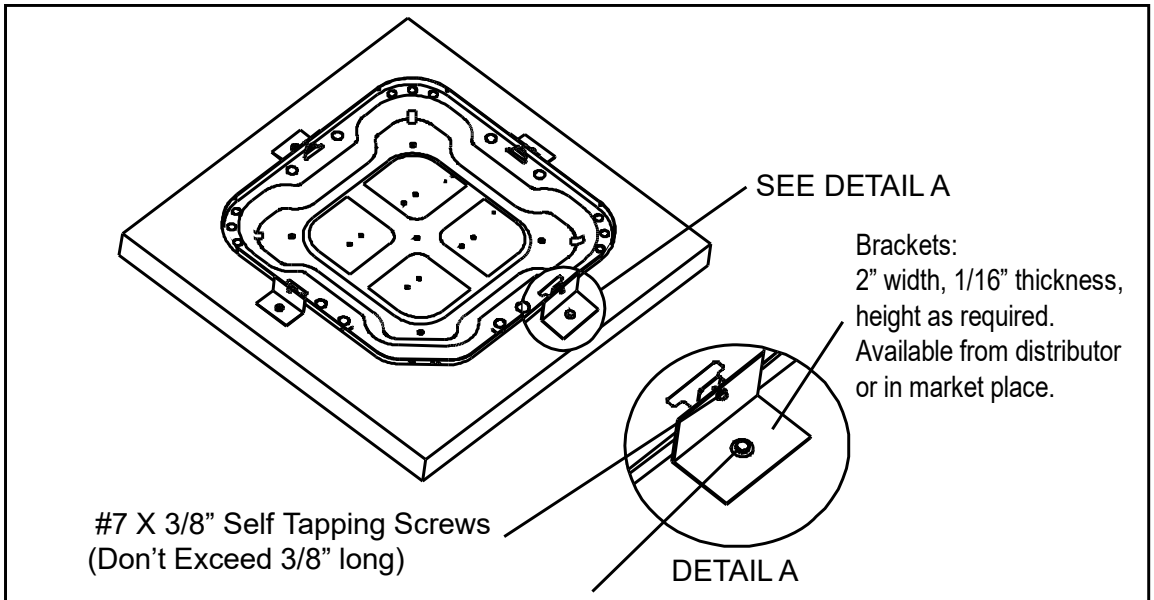


Fig.2 PREFERRED TIE-DOWN METHOD

6.1.7 Precautions During Line Installation

1. Install the lines with as few bends as possible. Care must be taken not to damage the couplings or kink the tubing. Use clean hard drawn copper tubing where no appreciable amount of bending around obstruction is necessary, if soft copper must be used, care must be taken to avoid sharp bends which may cause a restriction.

2. The lines should be installed so that they will not obstruct service access to the coil, air handling system or filter.

3. Care must also be taken to isolate the refrigerant lines to minimize noise transmission from the equipment to the structure.

4. The suction line must be insulated. Tape and suspend the refrigerant lines as shown. DO NOT allow tube metal-to-metal contact. See Fig.3.

5. Use PVC piping as a conduit for all underground installations as shown in Fig.4. Buried lines should be kept as short as possible to minimize the build up of liquid refrigerant in the suction line during long periods of shutdown.

6. Pack a sealing material such as perma gum around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.

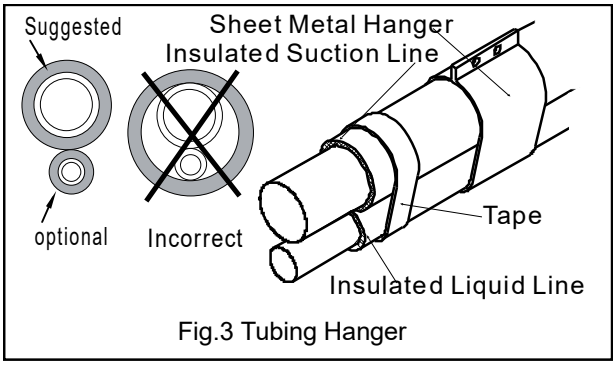


Fig.3 Tubing Hanger

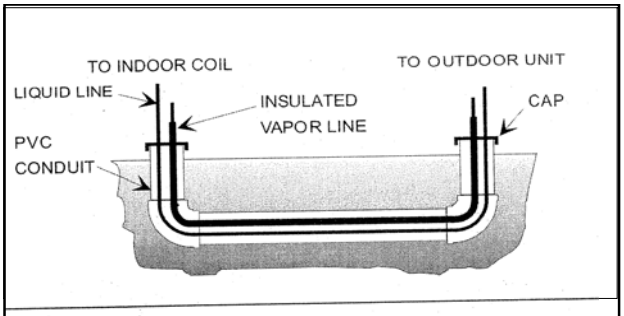
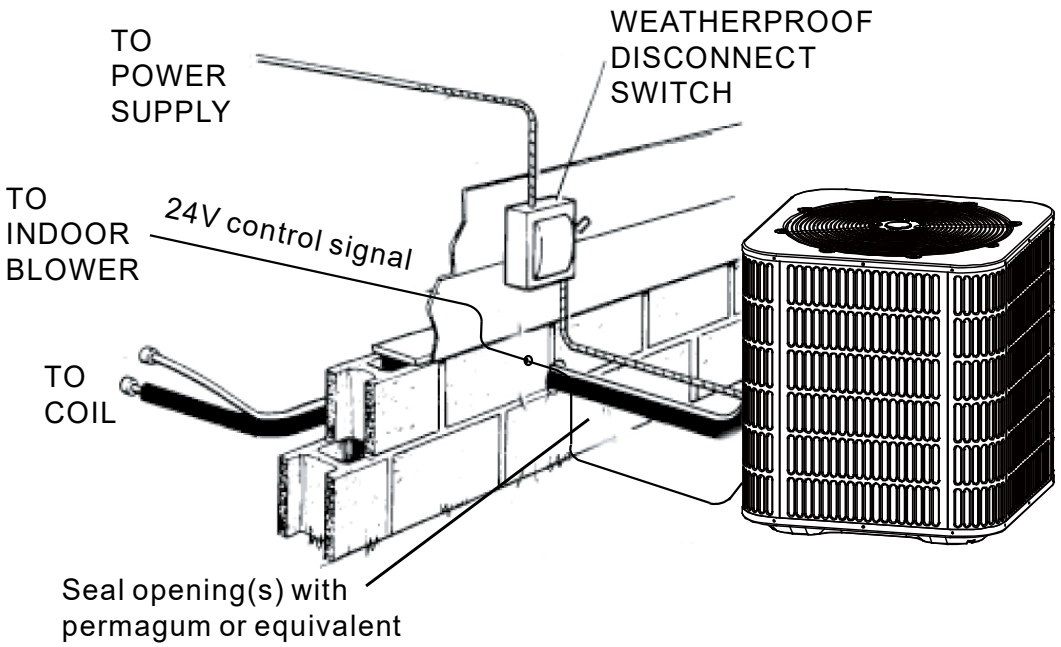


Fig.4 Underground Installation



NOTE:All outdoor wiring must be weather proof

Fig.5 Typical Installation

6.1.8 Precautions During Brazing Of Lines

All outdoor unit and evaporator coil connections are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos-5 or equivalent. DO NOT use soft solder. The outdoor units have reusable service valves on both the liquid and suction connections. The total system refrigerant charge is retained within the outdoor unit during shipping and installation. The reusable service valves are provided to evacuate and charge per this instruction.

Serious service problems can be avoided by taking adequate precautions to assure an internally clean and dry system.

⚠ **CAUTION**
Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature required is high enough to cause oxidation of the copper unless an inert atmosphere is provide. The flow of dry nitrogen should continue until the joint has cooled. Always use a pressure regulator and safety valve to insure that only low pressure dry nitrogen is introduced into the tubing. Only a small flow is necessary to displace air and prevent oxidation.

6.1.9 Precautions During Brazing the Service Valve

Precautions should be taken to prevent heat damage to service valve by wrapping a wet rag around it as shown in Fig.6. Also, protect all painted surfaces, insulation, during brazing. After brazing cool joint with wet rag.

The valve can be opened by removing the plunger cap and fully inserting a hex wrench into the stem and backing out counter-clockwise until valve stem just touches the chamfered retaining wall.

Connect the refrigerant lines using the following procedure:

1. Remove the cap and Schrader core from both the liquid and suction service valve service ports at the outdoor unit. Connect low pressure nitrogen to the liquid line service port.

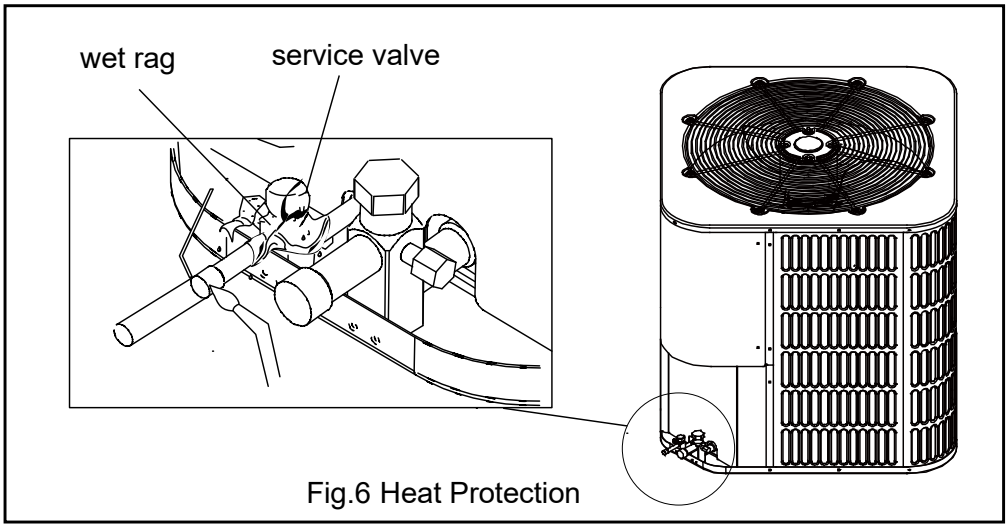


Fig.6 Heat Protection

2. Braze the liquid line to the liquid valve at the outdoor unit. Be sure to wrap the valve body with a wet rag. Allow the nitrogen to continue flowing. Refer to the Tabular Data Sheet for proper liquid line sizing.

3. Carefully remove the rubber plugs from the evaporator liquid and suction connections at the indoor coil.

4. Braze the liquid line to the evaporator liquid connection. Nitrogen should be flowing through the evaporator coil.

5. Slide the plastic cap away from the suction connection at the indoor coil. Braze the suction line to the evaporator suction connection. Refer to the Table 1 for proper suction line sizing.

6. Protect the suction valve with a wet rag and braze the suction line connection to the outdoor unit. The nitrogen flow should be exiting the system from the suction service port connection. After this

connection has cooled, remove the nitrogen source from the liquid fitting service port.

7. Replace the Schrader core in the liquid and suction valves.

8. Leak test all refrigerant piping connections including the service port flare caps to be sure they are leak tight. **Do Not Over Tighten (between 40 and 60 inch -lbs. maximum).**

9. Evacuate the suction line, evaporator, and the liquid line, to 350 microns or less.

Table 1: Recommended Liquid and Suction Tube Diameters (In.)

MODEL SIZE	LIQUID	SUCTION
	Tube Diameter	Tube Diameter
24	3/8	3/4
36	3/8	3/4
48	3/8	7/8
60	3/8	7/8

10. Replace cap on service ports. Do not remove the flare caps from the service ports except when necessary for servicing the system.

11. Release the refrigerant charge into the system. Open both the liquid and suction valves by removing the plunger cap and with an hex wrench back out counter-clockwise until valve stem just touches the chamfered retaining wall.

12. Replace plunger cap finger tight, then tighten an additional 1/12 turn (1/2 hex flat). Cap must be replaced to prevent leaks.

⚠ **WARNING**
Never attempt to repair any brazed connections while the system is under pressure. Personal injury could result.

See "System Charge" section for checking and recording system charge.

6.1.10 Interconnecting Tubing

6.1.10.1 Suction and liquid lines

Keep all lines sealed until connection is made.

Make connections at the indoor coil first.

Refer to Line Size Information in Tables 2 and 3 for correct size and multipliers to be used to determine capacity for various suction line diameters and lengths of run. The losses due to the lines being exposed to outdoor conditions are not included.

The factory refrigerant charge in the outdoor unit is sufficient for 15 feet of standard size interconnecting liquid line. Calculate actual charge required with installed liquid line size and length as below.

5/16” ± .4 oz. per foot 3/8” ± .6 oz . per foot 1/2” ± 1.2 oz . per foot

6.1.10.2 Maximum length of lines

The maximum length of interconnecting line is 150 feet (Just for scroll compressor).
Always use the shortest length possible with a minimu m number of bends.
NOTE: Excessively long refrigerant lines cause loss of equip ment capacity.

6.1.10.3 Verticallift

Keep the vertical lift to a minimum. Use the following guidelines when installing the unit:

1. DO NOT exceed the vertical lift as indicated on Table 3.

2. It is recommended to use the smallest liquid line size permitted to minimize system charge which will maximize compressor reliability.

3. Table 3 may be used for sizing horizontal runs.

6.1.11 Evacuation

It will be necessary to evacuate the system to 350 microns or less. If a leak is suspected, leak test with dry nitrogen to locate the leak. Repair the leak and test again. To verify that the system has no leaks, simply close the valve to the vacuum pump suction to isolate the pump and hold the system under vacuum. Watch the micron gauge for a few minutes. If the micron gauge indicates a steady and continuous rise, it's an indication of a leak. If the gauge shows a rise, then levels off after a few minutes and remains fairly constant, its an indication that the system is leak free but still contains moisture and may require further evacuation if the reading is above 350 microns.

Line Sizing

Table 2: Suction Line Length / Size VS Capacity Multiplier (R410A)

Model size		2 Ton	3 Ton	4 Ton	5 Ton
Suction Line Connection Size		3/4" O.D.	3/4" O.D.	7/8" O.D.	7/8" O.D.
Suction Line Run — Feet		5/8 Opt.	5/8 Opt.	3/4 Opt.	1 1/8 Opt.
		3/4* Std.	3/4* Std.	7/8* Std.	7/8* Std.
25'	Optional	1.00	1.00	1.00	1.00
	Standard	1.00	1.00	1.00	0.99
50'	Optional	0.97	0.97	0.98	0.99
	Standard	0.98	0.99	0.98	0.98
100'	Optional	0.94	0.94	0.95	0.98
	Standard	0.95	0.97	0.97	0.94
150'	Optional	0.90	0.90	0.92	0.97
	Standard	0.92	0.96	0.96	0.90

Table 3 : Liquid Line Size (R410A)

Model Size	Line Size Connection Size (Inch O.D.)	Compressor Type	Line Size Connection And Line Size (Inch O.D.)	Liquid Line Size Outdoor unit above or below indoor coil					
				Total Equivalent Length - Feet					
				25	50	75	100	125	150
				Maximum Vertical Separation - Feet					
1 1/2 Ton	3/8"	Scroll	1/4	25	40	25	9	N/A	N/A
			5/16	25	50	60	58	40	30
			3/8*	25	50	60	60	40	30
		Rotary	3/8*	25	30	30	27	N/A	N/A
2 Ton	3/8"	Scroll	1/4	23	N/A	N/A	N/A	N/A	N/A
			5/16	25	36	29	23	16	9
			3/8*	25	50	60	60	40	30
		Rotary	3/8*	25	30	30	24	N/A	N/A
2 1/2 Ton	3/8"	Scroll	1/4	25	N/A	N/A	N/A	N/A	N/A
			5/16	25	49	38	27	17	6
			3/8*	25	50	60	60	40	30
		Rotary	3/8*	25	30	30	22	N/A	N/A
3 Ton	3/8"	Scroll	5/16	25	50	37	22	7	N/A
			3/8*	25	50	60	60	40	30
3 1/2 Ton	3/8"	Scroll	5/16	25	23	4	N/A	N/A	N/A
			3/8*	25	50	43	36	30	24
4 Ton	3/8"	Scroll	3/8*	25	46	38	30	22	15
			1/2	25	50	56	55	40	30
5 Ton	3/8"	Scroll	3/8*	25	50	56	44	32	20
			1/2	25	50	60	60	40	30

NOTES:
* Standard line size
N/A Application not recommended.

6.1.12 Electrical Connections

6.1.12.1 General information & grounding

Check the electrical supply to be sure that it meets the values specified on the unit nameplate and wiring label.

Power wiring, control (low voltage) wiring, disconnect switches and over current protection must be supplied by the installer. Wire size should be sized per requirements.

⚠ CAUTION
All field wiring must USE COPPER CONDUCTORS ONLY and be in accordance with Local, National Fire, Safety & Electrical Codes. This unit must be grounded with a separate ground wire in accordance with the above codes.

The complete connection diagram and schematic wiring label is located on the inside surface of the unit service access panel and this instruction.

6.1.12.2 Field connections power wiring

1. Install the proper size weatherproof disconnect switch outdoors and within sight of the unit.

2. Remove the screws at the side of the corner panel. Slide corner panel down and remove from unit. See Fig. 7.

3. Run power wiring from the disconnect switch to the unit.

4. Route wires from disconnect through power wiring opening provided and into the unit control box.

5. Install the proper size time-delay fuses or circuit breaker, and make the power supply connections.

6. Energize the crankcase heater if equipped to save time by preheating the compressor oil while the remaining installation is completed.

Note: When changing the motor, remove top cover first.

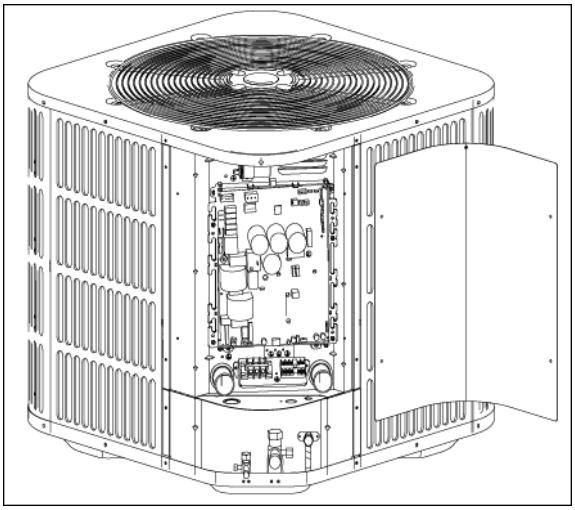
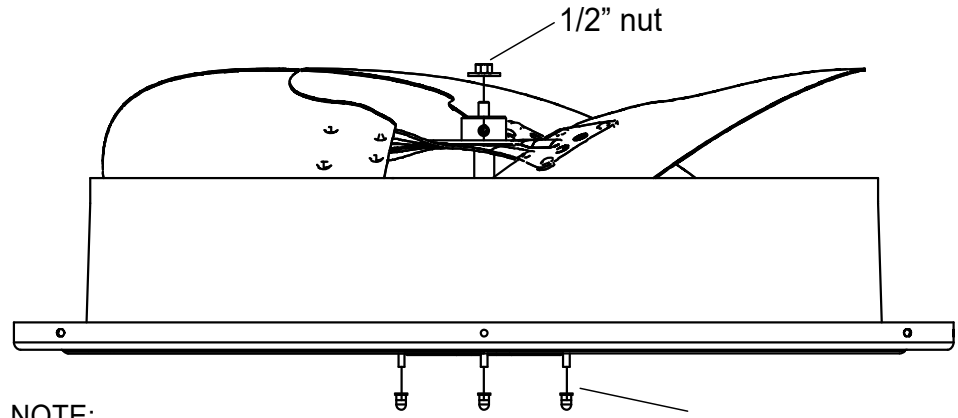


Fig.7

6.1.12.3 Removing the top panel and motor



NOTE:

Damage will occur to condenser unit
if you remove fan nuts prior to cover removal.

Fig.8 COVER AND FAN

When motor requires changing follow the steps below:

Step 1: Go into electrical panel, disconnect motor power lines.

Important note

Disconnect main power to unit. Severe burns and electrical shock will occur if you do not disconnect main power.

Step 2: Remove cover (be careful of motor wires)

Step 3: Be sure to place fan cover unit on the ground as indicated in Fig. 8

Important note

Do not place or lean fan blades on ground or against surface.

Step 4: Remove fan motor by removing 5/16” nuts from cover.

Step 5: Remove fan blade from motor by removing 1/2” nut and place fan on the ground.

Step 6: Reverse removal process to reinstall the fan and motor.

Important note

When connecting motor wires be sure to check motor direction.

6.1.13 Checking Refrigerant Charge

Charge for all systems should be checked against the Charging Chart inside the access corner panel or Charging by weight.

IMPORTANT: Do not operate the compressor without charge in system. Addition of R-410A will raise pressures (suction, liquid and discharge) .

6.1.13.1 Charging by liquid pressure

In order to properly charge the system, the following conditions must be met:

1) Outdoor temperature above 60°F.

2) Indoor temperature between 70°F to 100°F.

3) Installation must be complete with brazed joints and drier visually inspected.

4) The unit electrical installation must be checked and unit powered for one (I) hour if crank case heater is used or five (5) minutes if no crankcase heater is used.

Follow these steps:

1. Run in cooling mode at least 10 minutes.

2. Measure outdoor ambient temperature within 6 inches of coil.

3. Measure suction line pressure.

4. Find the target liquid pressure at the intersection between the suction.

Line pressure and the outdoor ambient temperature, if falls between rows or columns then estimate the target liquid pressure or suction line pressure falls between rows or columns then estimate the target liquid pressure between the rows and columns.

5. Compare the measured liquid line pressure to the target liquid pressure, add charge to raise the pressure or recover charge to lower it.

6. After running unit for 10 minutes if the suction line pressure changes, go back to step 2 otherwise remove test equipment and cover the valves.

6.1.13.2 Charging by weight

For a new installation, evacuation of interconnecting tubing and indoor coil is adequate; otherwise, evacuate the entire system. The factory refrigerant charge in the outdoor unit is sufficient for 15 feet of standard size interconnecting liquid line. Calculate actual charge required with installed liquid line size and length, please see 6.1.10.1 of instruction.

With an accurate scale (+/- 1 oz.) adjust charge difference between that shown on the unit data plate and that calculated for the new system Installation. if the entire system has been evacuated, add the total calculated charge.

6.1.13.3 Final leak testing

After the unit has been properly evacuated and charged, a halogen leak detector should be used to detect leaks in the system. All piping within the condensing unit, evaporator, and interconnecting tubing should be checked for leaks. If a leak is detected, the refrigerant should be recovered before repairing the leak. The clean air act prohibits releasing refrigerant into the atmosphere.

6.2 Indoor Unit Installation

6.2.1 Application

6.2.1.1 Vertical upflow

Vertical upflow configuration is the factory set on all models.

If a side return air opening is required, field fabricate a return air plenum with an opening large enough to supply unit and strong enough to support unit weight.

If return air is to be ducted, install duct flush with floor. Use fireproof resilient gasket 1/8 to 1/4 in. thick between the ducts, unit and floor. Set unit on floor over opening.

Important note

Torque applied to drain connections should not exceed 15.ft.lbs.(see Fig.9)

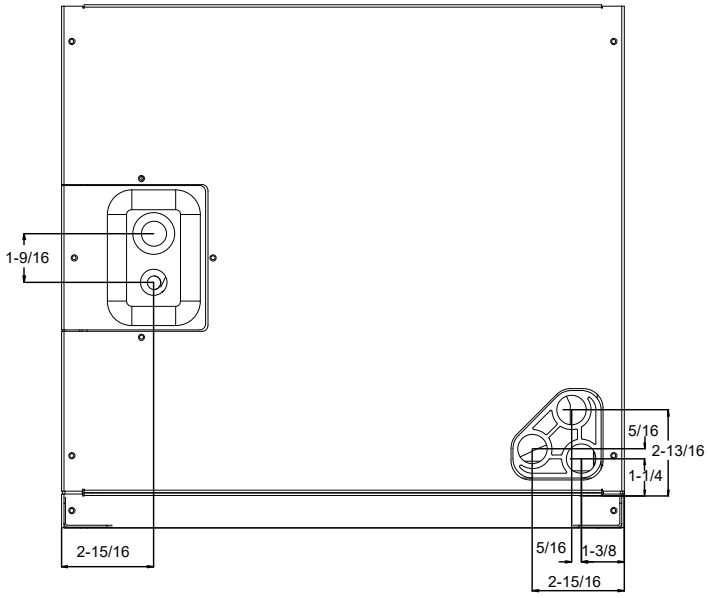


Fig.9 DIMENSIONS FOR FRONT CONNECT COIL

6.2.1.2 Vertical Downflow

Conversion to Vertical Downflow: A vertical upflow unit may be converted to the vertical downflow on it. Remove the door and indoor coil and reinstall 180° from original position. See Fig. 9~10.

Important: To comply with certification agencies and the National Electric Code for horizontal right application, the circuit breaker(s) on field-installed electric heater kits must be re-installed per procedure below so that the breaker switch “on” position and marking is up and, “off” position and marking is down.

- To rotate breaker(s): Rotate one breaker set (circuit) at a time starting with the one on the right. Loosen both lugs on the load side of the breaker. (Make sure that wires are identified and are reinstalled into proper breaker).Wires are bundles with wire ties, one bundle going to the right lug and one bundle going to the left lug.
- Using a screwdriver or pencil, lift blue plastic tab with hole away from breaker until breaker releases from mounting opening.
- With breaker held in hand, rotate breaker so that “on” position is up, “off” position is down with unit in planned vertical mounting position. Insert right wire bundle into top right breaker lug, ensuring all strands of all wires are inserted fully into lug, and no wire insulation is in lug.
- Tighten lug as tight as possible while holding circuit breaker. Check wires and make sure each wire is secure and none are loose. Repeat for left wire bundle in left top circuit breaker lug.
- Replace breaker by inserting breaker mounting tab opposite white pull tab in opening, hook mounting tab over edge in opening.
- With screwdriver or pencil, pull blue tab with hole away from breaker while setting that side of breaker into opening. When breaker is in place, release tab, locking circuit breaker into location in opening.
- Repeat above operation for remaining breaker(s) (if more than one is provided).
- Replace single point wiring jumper bar, if it is used, on line side of breaker and tighten securely.
- Double check wires and lugs to make sure all are secure and tight. Check to make sure unit wiring to circuit breaker load lugs match that shown on the unit wiring diagram.

⚠	**CAUTION**

When using the unit with electrical heater, the switch is used only for electrical heater on the front of panel.

6.2.1.3 Horizontal

Horizontal right is the default factory configuration for the units.

Horizontal left isn't the default factory configuration for the units.

Conversion to horizontal: A vertical upflow unit may be converted to horizontal right by removing indoor coil assembly and reinstalling coil as shown for right hand air supply. And reinstall coil in unit as shown for right hand air supply.

• Rotate unit into the downflow position, with the coil compartment on top and the blower compartment on bottom. See Fig. 11.

• Reinstall the indoor coil 180° from original position. Ensure the retaining channel is fully engaged with the coil rail. See Fig. 10 & Fig.11.

• Secondary drain pan kits are required when the unit is configured for the horizontal right position over a finished ceiling and/or living space.

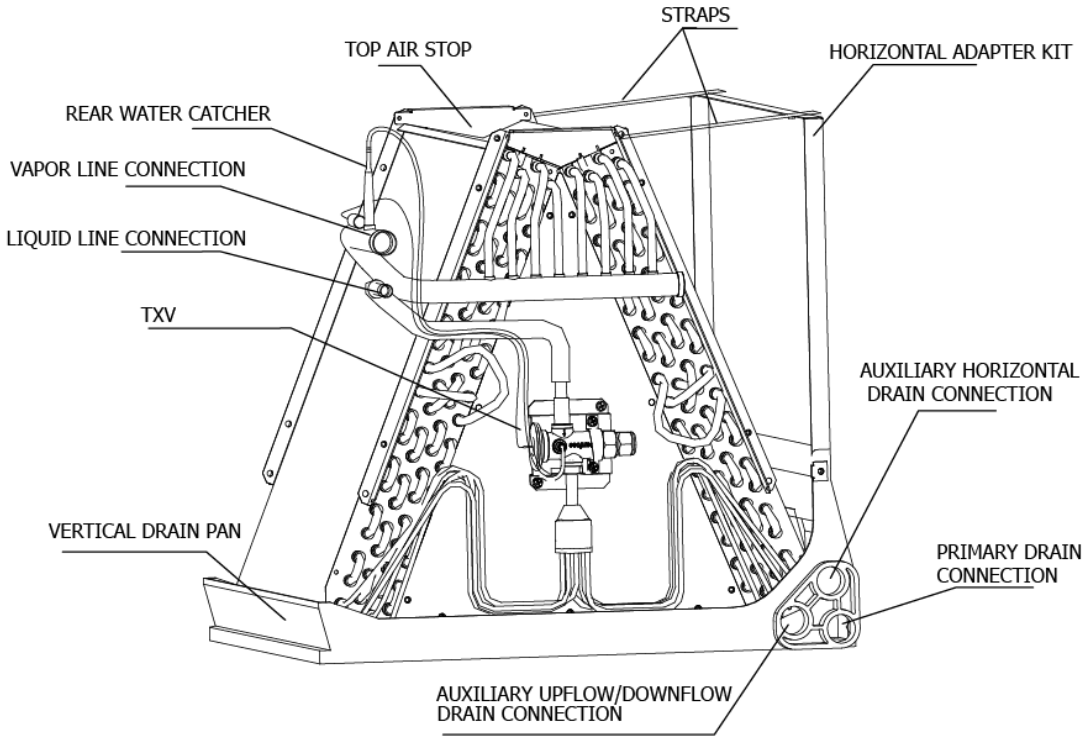


Fig.10 INDOOR COIL AND DRAIN PAN SET-UP

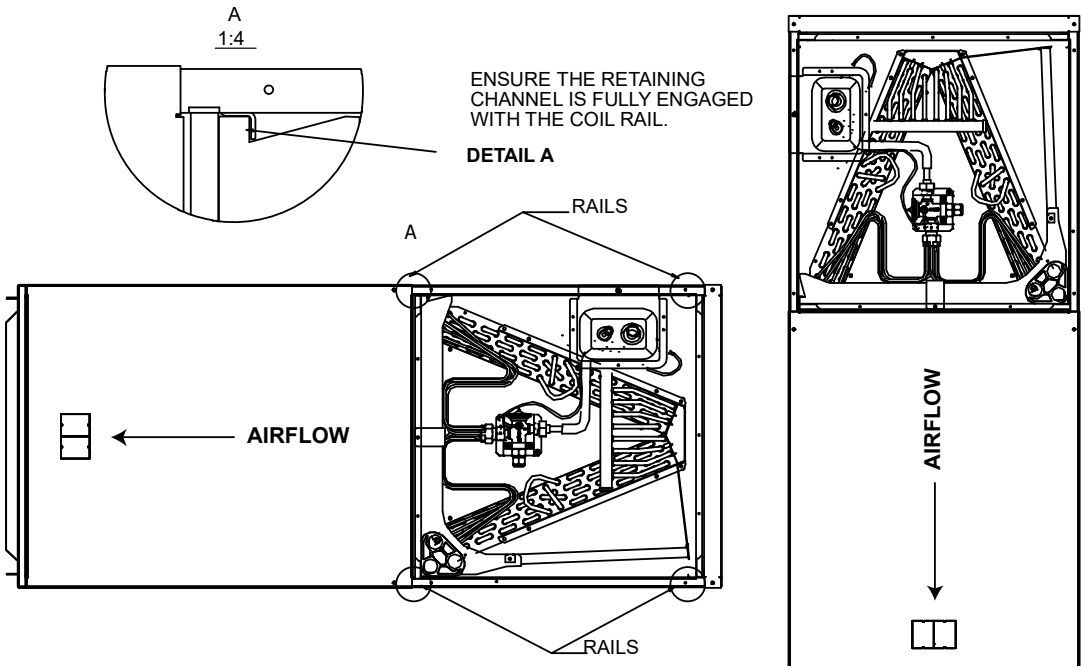


Fig.11 VERTICAL DOWNFLOW & HORIZONTAL LEFT APPLICATIONS
(lower front service panel removed “view”.)

⚠ CAUTION
Horizontal units must be configured for right hand air supply or left hand air supply. Horizontal drain pan must be located under indoor coil. Failure to use the drain pan can result in property damage.

Conversion in horizontal direction: Horizontal left-hand supply can be changed to horizontal right-hand supply by removing the indoor coil and reinstalling 180° from original.

6.2.1.4 Installation an unconditioned space

Important: There are two pairs of coil rails in the air handler for default and counter flow application. If the air handler is installed in an unconditioned space, the two unused coil rails should be removed to minimize air handler surface sweating. The coil rails can be easily removed by taking off the 6 mounting screws from both sides of the cabinet.

6.2.2 Electrical Wiring

Field wiring must comply with the National Electric Code (C.E.C. in Canada) and any applicable local ordinance.

⚠ WARNING
Disconnect all power to unit before installing or servicing. More than one disconnect switch may be required to de-energize the equipment. Hazardous voltage can cause severe personal injury or death.

6.2.2.1 Power wiring

It is important that proper electrical power is available for connection to the unit model being installed. See the unit nameplate, wiring diagram and electrical data in the installation instructions.

• If required, install a branch circuit disconnect of adequate size, located within sight of, and readily accessible to the unit.

• Important: After the Electric Heater is installed, units may be equipped with one, two, or three 30/60 amp. circuit breakers. These breaker(s) protect the internal wiring in the event of a short circuit and serve as a disconnect. Circuit breakers installed within the unit do not provide over-current protection of the supply wiring and therefore may be sized larger than the branch circuit protection.

• Supply circuit power wiring must be 75°C minimum copper conductors only. See Electrical Data In this section for ampacity, wire size and circuit protector requirement. Supply circuit protective devices may be either fuses or “HACR” type circuit breakers.

• Power wiring may be connected to either the right, left side or top. Three 7/8”, 1-3/8”, 1-3/4” dia. concentric knockouts are provided for connection of power wiring to unit.

• Power wiring is connected to the power terminal block in unit electric cabinet.

6.2.2.2 Control Wiring

Important: Class 2 low voltage control wiring should not be run in conduit with main power wiring and must be separated from power wiring, unless class 1 wire of proper voltage rating is used.

• Low voltage control wiring should be 18 Awg. color-coded. For lengths longer than 100 ft., 16 Awg. wire should be used.

• Low voltage control connections are made to low voltage pigtails extending from top of air handler

(upflow position - see Fig 10). Connections for control wiring are made with wire nuts. Control wiring knockouts (518 and 7/8) are also provided on the right and left side of the unit for side connection.

• See wiring diagrams attached to indoor and outdoor sections to be connected.

• Make sure, after installation, separation of control wiring and power wiring has been maintained.

6.2.2.3 Grounding

⚠ **WARNING**
The unit must be permanently grounded. Failure to do so can result In electrical shock causing personal injury or death.

• Grounding may be accomplished by grounding metal conduit when installed in accordance with electrical codes to the unit cabinet.

• Grounding may also be accomplished by attaching ground wire(s) to ground lug(s) provided in the unit wiring compartment.

• Ground lug(s) are located close to wire entrance on left side of unit (up-flow). Lug(s) may be moved to marked locations near wire entrance on right side of unit (upflow). If alternate location is more convenient.

• Use of multiple supply circuits require grounding of each circuit to lug(s) provided in unit.

6.2.2.4 Electric kit MCA/MOP data

Heat Kit Model	Air Handler Model	(kW)Electric Heat	MIN. Circuit Ampacity		MAX.Fuse or Breaker (HACR) Ampacity		Fan speed (AC/HP)		
			230	208	230	208	Low	Medium	High
EHK05A	24	5	27.2	24.6	30	25	●	●	●
EHK08A		7.5	40.8	36.9	45	40	--	●	●
EHK10A		10	54.4	49.2	60	50	--	●	●
EHK05A	36	5	27.2	24.6	30	25	●	●	●
EHK08A		7.5	40.8	36.9	45	40	●	●	●
EHK10A		10	54.4	49.2	60	50	●	●	●
EHK15B		15	81	74	90	80	--	●	●
EHK20B		20	108	98	110	100	--	--	●
EHK05A	48	5	27.2	24.6	30	25	●	●	●
EHK08A		7.5	40.8	36.9	45	40	●	●	●
EHK10A		10	54.4	49.2	60	50	●	●	●
EHK15B		15	81	74	90	80	--	●	●
EHK20B		20	108	98	110	100	--	--	●
EHK05A	60	5	27.2	24.6	30	25	●	●	●
EHK08A		7.5	40.8	36.9	45	40	●	●	●
EHK10A		10	54.4	49.2	60	50	●	●	●
EHK15B		15	81	74	90	80	--	●	●
EHK20B		20	108	98	110	100	--	●	●

* Heat kit suitable for AHU 4-way position installation [• means available, --means not available].

Electric Heater Kits

NO.	Kit#	Description	Ref. Air Handler use
1	EHK05A	5kW Heat Strip	24,36,48,60
2	EHK08A	7.5kW Heat Strip	24,36,48,60
3	EHK10A	10kW Heat Strip	24,36,48,60
4	EHK15B	15kW Heat Strip, Double Breaker's panel	36,48,60
5	EHK20B	20kW Heat Strip, Double Breaker's panel	36,48,60

6.2.3 Ductwork

Field ductwork must comply with the National Fire Protection Association NFPA 90A, NFPA 90B and any applicable local ordinance.

WARNING

Do not, under any circumstances, connect return ductwork to any other heat producing device such as fireplace insert, stove, etc. Unauthorized use of such devices may result in fire, carbon monoxide poisoning, explosion, personal injury or property damage.

Sheet metal ductwork run in unconditioned spaces must be insulated and covered with a vapor barrier. Fibrous ductwork may be used if constructed and installed in accordance with SMACNA

Construction Standard on Fibrous Glass Ducts. Ductwork must comply with National Fire Protection Association as tested by U/L Standard 181 for Class I Air Ducts. Check local codes for requirements on ductwork and insulation.

• Duct system must be designed within the range of external static pressure the unit is designed to operate against. It is important that the system airflow be adequate. Make sure supply and return ductwork, grills, special filters, accessories, etc. are accounted for in total resistance. See airflow performance tables in this manual.

• Design the duct system in accordance with “ACCA” Manual “0” Design for Residential Winter and Summer Air Conditioning and Equipment Selection. Latest editions are available from: “ACCA” Air Conditioning Contractors of America, 1513 16th Street, N.W., Washington, D.C. 20036. If duct system incorporates flexible air duct, be sure pressure drop Information (straight length plus all turns) shown in

“ACCA” Manual “D” is accounted for in system.

• Supply plenum is attached to the 3/4” duct flanges supplied with the unit. Attach flanges around the blower outlet.

Important: If an elbow is included in the plenum close to the unit, it must not be smaller than the dimensions of the supply duct flange on the unit.

• **Important:** The front flange on the return duct if connected to the blower casing must not be screwed into the area where the power wiring is located. Drills or sharp screw points can damage insulation on wires located inside unit.

• Secure the supply and return ductwork to the unit flanges, using proper fasteners for the type of duct used and tape the duct-to-unit joint as required to prevent air leaks.

6.2.4 Refrigerant Connections

Keep the coil connections sealed until refrigerant connections are made. See the Installation Instructions for the outdoor unit for details on line sizing, tubing installation, and charging information.

Coil is shipped with “No charge”. Evacuate the system before charging with refrigerant.

Install refrigerant tubing so that it does not block service access to the front of the unit.

Nitrogen should flow through the refrigerant lines while brazing.

Use a brazing shield to protect the cabinet's paint and a wet rag to protect the rubber grommet from being damaged by torch flames. After the refrigerant connections are made, seal the gap around the connections with pressure sensitive gasket.

6.2.5 Condensate Drain Tubing

Consult local codes for specific requirements.

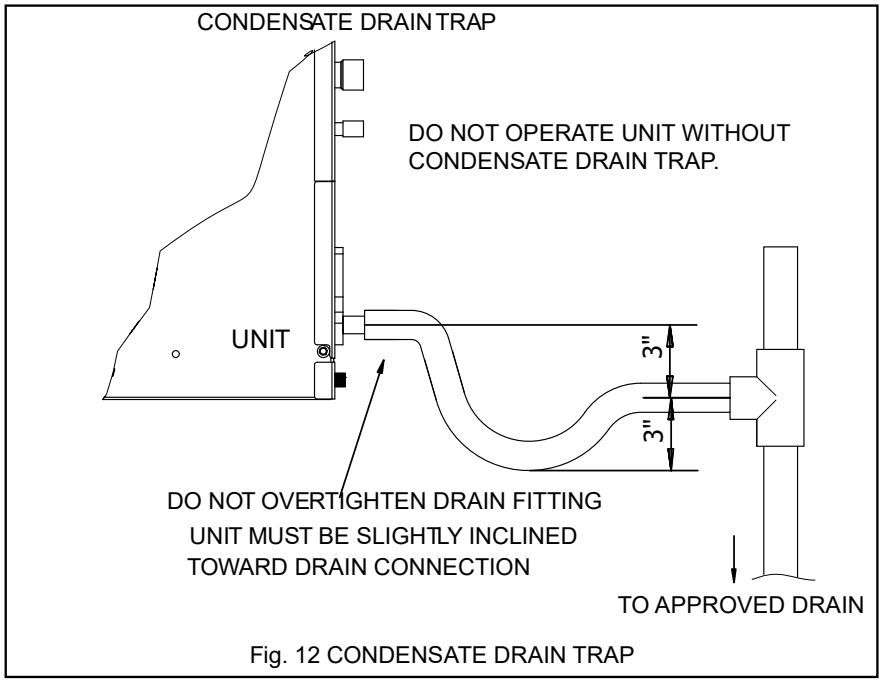


Fig. 12 CONDENSATE DRAIN TRAP

Important:

1. When making drain fitting connections to the drain pan, use a thin layer of Teflon paste, silicone or Teflon tape and install, hand tighten.

2. When making drain fitting connections to drain pan, do not overtighten. Over tightening fittings can split pipe connections on the drain pan.

• Install drain lines so they do not block service access to front of the unit. Minimum clearance of 24 inches is required for filter, coil or blower removal and service access.

• Make sure unit is level or pitched slightly toward primary drain connection so that water will drain completely from the pan. (See Fig. 12)

• Do not reduce drain line size less than connection size provided on condensate drain pan.

• All drain lines must be pitched downward away from the unit a minimum of 1/8” per foot of line to ensure proper drainage.

• Do not connect condensate drain line to a closed or open sewer pipe. Run condensate to an open drain or run line to a safe outdoor area.

• The drain line should be insulated where necessary to prevent sweating and damage due to condensate forming on the outside surface of the line.

• Make provisions for disconnecting and cleaning of the primary drain line should it become necessary. Install a 3 inch trap in the primary drain line as close to the unit as possible. Make sure that the top of the trap is below connection to the drain pan to allow complete drainage of pan (See Fig. 12).

• Auxiliary drain line should be run to a place where it will be noticeable if it becomes operational. Homeowner should be warned that a problem exists if water should begin running from the auxiliary drain line.

• Plug the unused drain connection with the plugs provided in the parts bag, using a thin layer of Teflon paste, silicone or Teflon tape to form a water tight seal.

• Test condensate drain pan and drain line after installation is complete. Pour water into drain pan, enough to fill drain trap and line. Check to make sure drain pan is draining completely, no leaks are found in drain line fittings, and water is draining from the termination of the primary drain line.

6.2.6 Air Filter (Not Factory-Installed)

• External filter or other means of filtration is required. Units should be sized for a maximum of 300 feet/min. air velocity or what is recommended for the type filter installed.

Filter application and placement are critical to airflow, which may affect the heating and cooling system performance. Reduced airflow can shorten the life of the system’s major components, such as motor, limits, elements, heat relays, evaporator coil or compressor. Consequently, we recommend that the return air duct system have only one filter location. For systems with a return air filter grill or multiple filter grills, can have a filter installed at each of the return air openings.

If adding high efficiency filters or electronic air filtration systems, it is very important that the air flow is not reduced. If air flow is reduced the overall performance and efficiency of the unit will be

reduced. It is strongly recommended that a professional installation technician is contacted to ensure installation of these such filtration systems are installed correctly.

Important: Do not double filter the return air duct system. Do not filter the supply air duct system .This will change the performance of the unit and reduce air flow.

⚠ **WARNING**
Do not operate the system without filters. A portion of the dust entrained in the air may temporarily lodge In the duct runs and at the supply registers. Any circulated dust particles could be heated and charred by contact with the air handler elements. This residue could soil ceilings, walls, drapes, carpets and other articles in the house. Soot damage may occur with filters in place, when certain types of candles, oil lamps or standing pilots are burned.

6.2.7 Filter Installation Dimensions

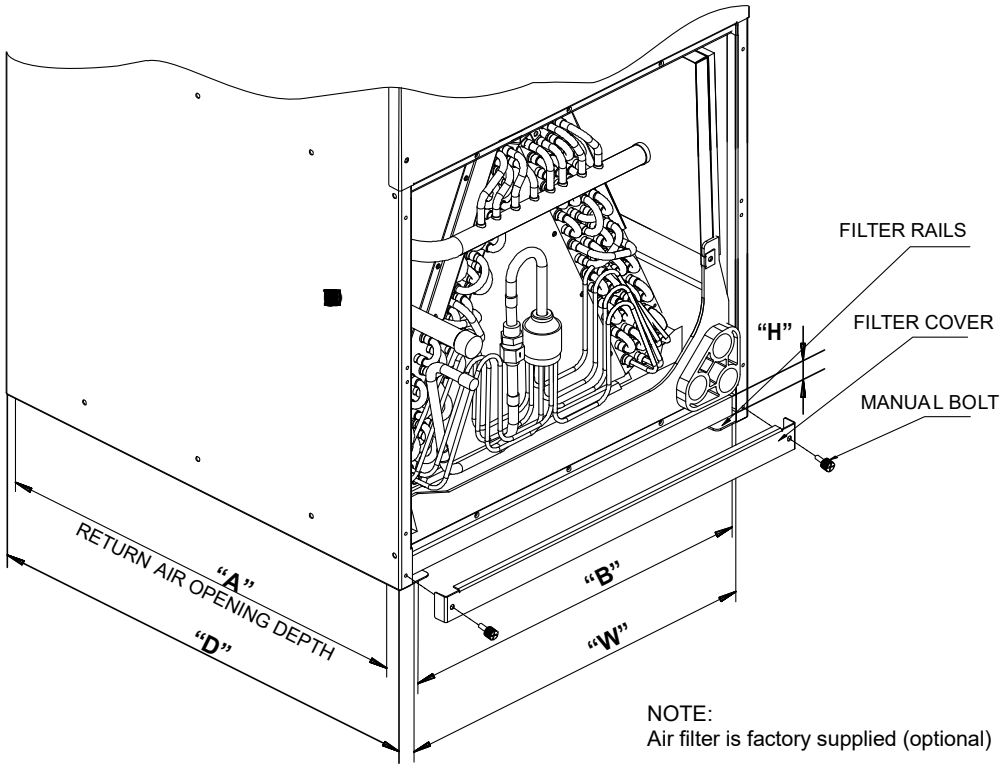


Fig. 13 EXTERNA L FILTER BASE

Dimension Data

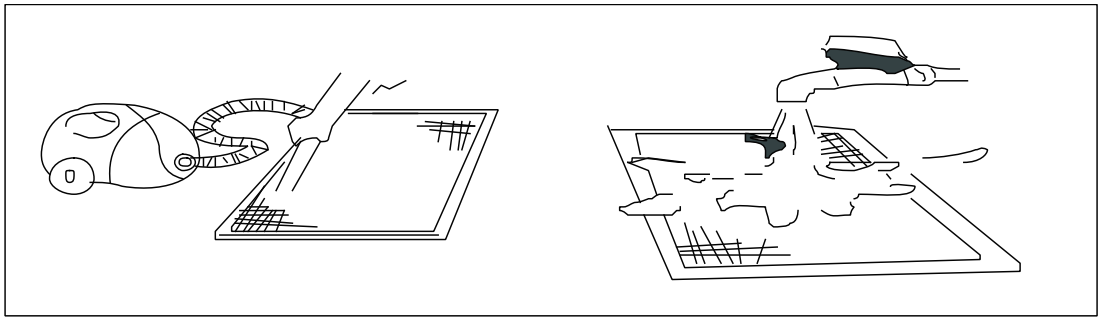
MODEL	FILTER SIZE IN [mm]	"W" IN [mm]	"D" IN [mm]	"H" IN [mm]	Return width "A" IN	Return length "B" IN
24	18X20[457X508]	18.3[466]	21.6[548]	1[25.4]	20.8	16.3
36/48/60	20X22[508X559]	20.7[526]	23.9[608]	1[25.4]	23	18.8

• Air Filter Removal

1. Remove bolts manually, remove air filter recover, see in Fig. 13;

2. Hold the edge of the air filter and extract out.

3. Clean the air filter (Vacuum cleaner or pure water may be used to clean the air filter. If the dust accumulation is too heavy, use soft brush and mild detergent to clean it and dry out in cool place) .



6.2.8 Wiring

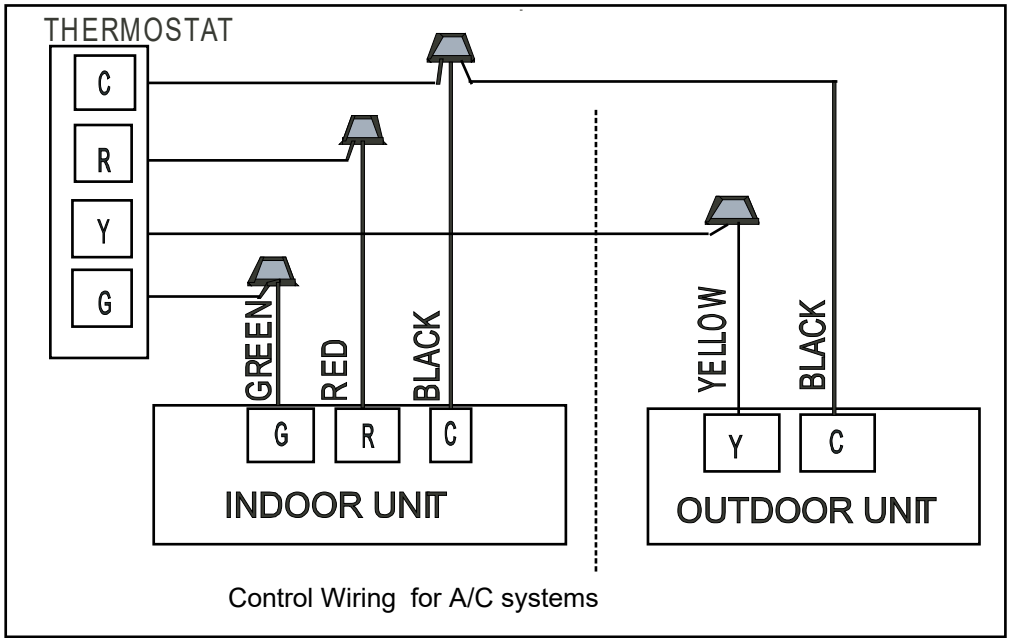
1. To avoid the electrical shock, please connect the air conditioner with the ground lug. The main power plug in the air conditioner has been joined with the ground wiring, please don't change it freely.

2. The power socket is used as the air conditioner specially.

3. Don't pull the power wiring hard.

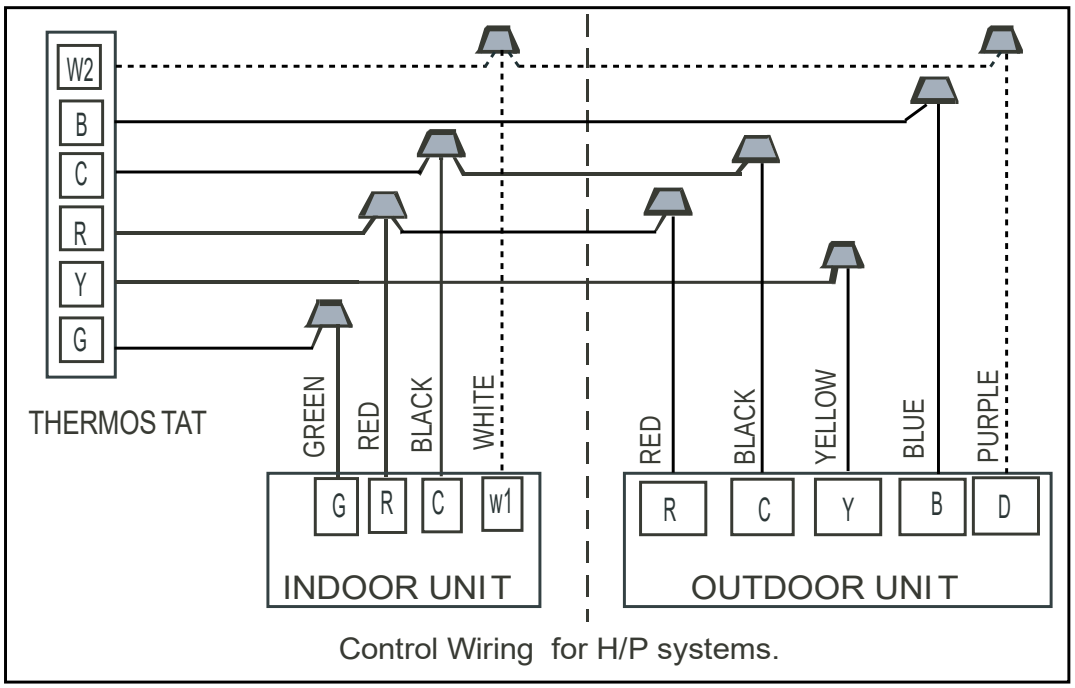
4. When connecting the air conditioner with the ground, observe the local codes.

5. If necessary, use the power fuse or the circuit, breaker or the corresponding scale ampere.



Control Wiring for A/C systems

Suggestion: Thermostat choose KJR-23B or Non-programmed electrical thermostat series of Honeywell, such as TH 5220D. Wiring please refer to the Owner's Manual of the thermostat.



Suggestion: Thermostat choose KJR-25B or Non-programmed electrical thermostat series of Honeywell, such as TH 5220D. Broken lines means H/P system with electric heating. Wiring please refer to the Owner's Manual of the thermostat.

Electric Wiring Gauge

Wiring gauge for A/C systems

Model(Btu/h)			24	36	48	60
Power		Phase	Single			
		Voltage/frequency	208/230V, 60Hz			
Lines Gauge	Input Current Fuse	Indoor unit (A)	15A	15A	15A	15A
	Indoor Unit Power Line	Line Quantity	3	3	3	3
		Line Diameter(AWG)	14	14	14	14
	Outdoor Unit Power Line	Line Quantity	3	3	3	3
		Line Diameter(AWG)	14	12	10	10
	Outdoor -Indoor Signal Line	Line Quantity	2	2	2	2
		Line Diameter(AWG)	18	18	18	18
	Thermostat Signal Line	Line Quantity	4	4	4	4
		Line Diameter(AWG)	18	18	18	18

Note: If indoor unit has auxiliary heating already installed and a different auxiliary heating unit is required the indoor unit (A) and indoor line diameters will be different.

Wiring gauge for H/P systems

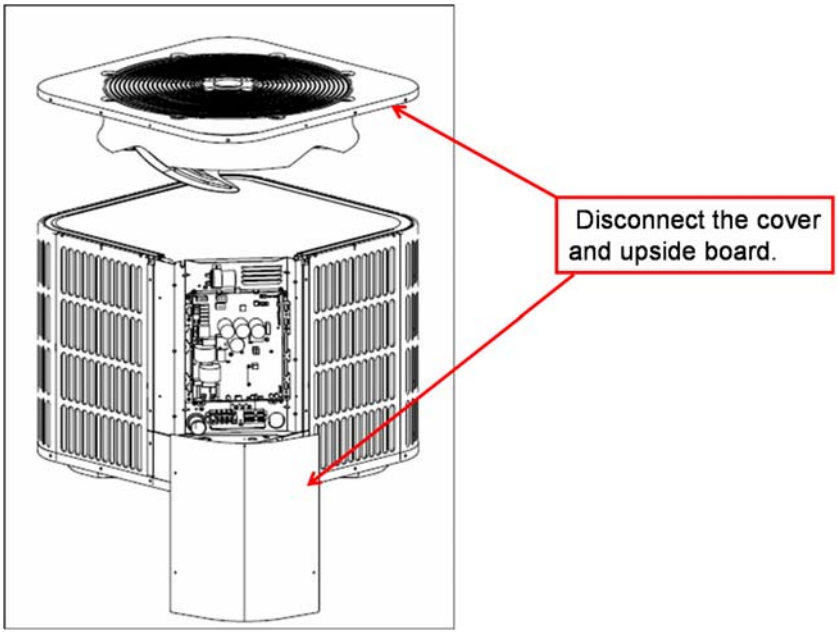
Model(Btu/h)			24	36	48	60
Power		Phase	Single			
		Voltage/frequency	208/230V, 60Hz			
Lines Gauge	Input Current Fuse	Indoor unit (A)	15A	15A	15A	15A
	Indoor Unit Power Line	Line Quantity	3	3	3	3
		Line Diameter(AWG)	14	14	14	14
	Outdoor Unit Power Line	Line Quantity	3	3	3	3
		Line Diameter(AWG)	14	12	10	10
	Outdoor -Indoor Signal Line	Line Quantity	4	4	4	4
		Line Diameter(AWG)	18	18	18	18
	Thermostat Signal Line	Line Quantity	5	5	5	5
		Line Diameter(AWG)	18	18	18	18

NOTE: If indoor unit has auxiliary heating already installed and a different auxiliary heating unit is required the indoor unit (A) and indoor line diameters will be different.

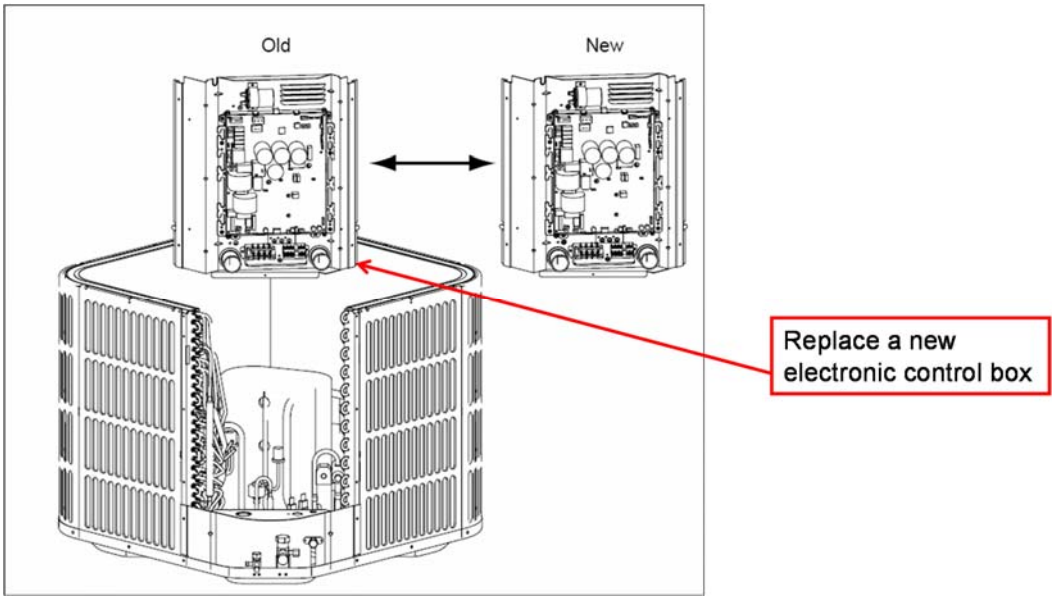
These units must be wired and installed in accordance with all National and Local Safety Codes.

6.3 Maintenance and Replacement Of Outdoor Unit Electronic Control Box

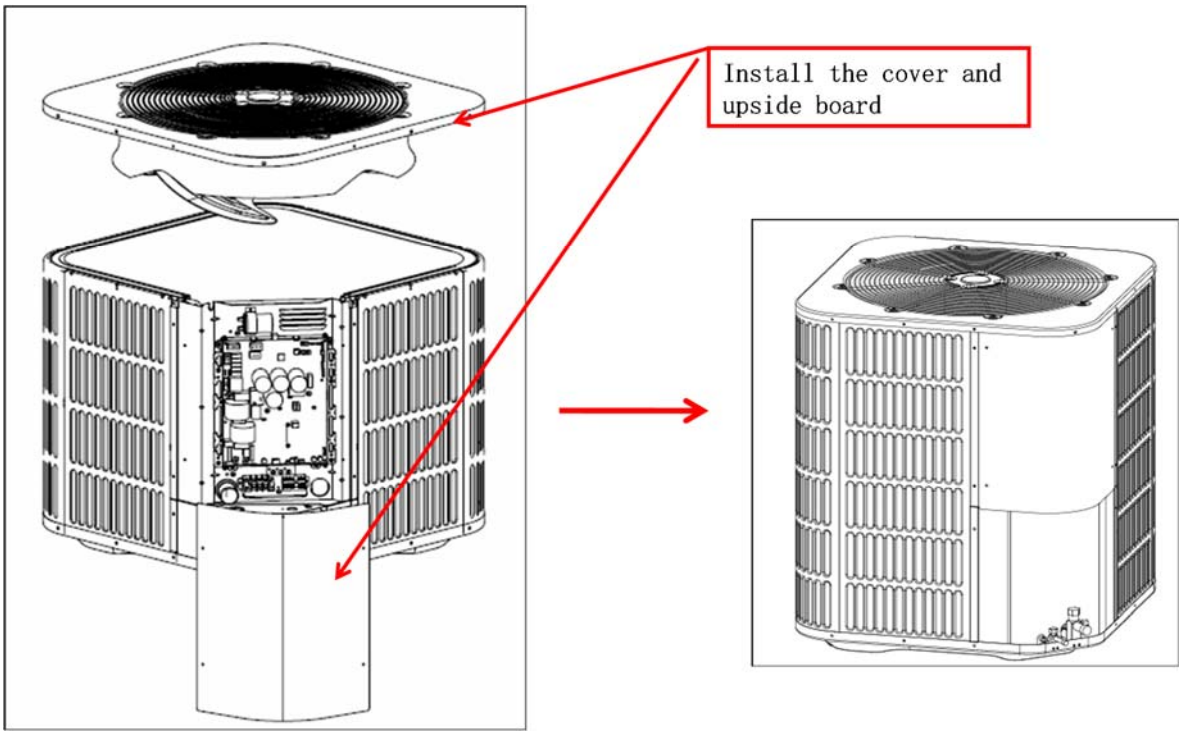
When outdoor unit electronic control box requires changing follow the steps below:
Step 1:



Step 2:


Old
New
Replace a new electronic control box

Step 3:


Install the cover and upside board

7. Operation Characteristics

Temperature / Mode	Cooling operation	Heating operation
Room temperature	≥17℃(62℉)	< 30℃(86℉)
Outdoor temperature	10℃ ~ 48℃ (50℉ ~ 118℉)	-15℃ ~ 30℃ (5℉ ~ 86℉)

CAUTION:

1. If air conditioner is used outside of the above conditions, certain safety protection features may come into operation and cause the unit to function abnormally.

2. Optimum performance will be achieved within this operating temperature.

8. Electronic Function

8.1 Abbreviation

T3: Condenser coil temperature

T4: Ambient temperature

T5: Discharge temperature of compressor

Tf： Heat sink temperature of IPM

8.2 Main Control Logic

8.2.1 Temperature protection of compressor discharge

When the compressor discharge temp. is getting higher, the running frequency will be limited as below rules:

---Compressor discharge temp. T5≥110℃, the system will display P4 protection; H6 error will display when system appear 3 times P4 protection in 100 minutes, it can resume only by restarting the machine.

---105≤T5<110℃, decrease the frequency to the lower level every 30 seconds.

---100≤T5<105℃, keep running at the current frequency.

----T5<90℃, no limit for frequency.

8.2.2 Inverter compressor current protection

When the Inverter compressor current is getting higher, the running frequency will be limited as below rules:

--- Inverter compressor current ≥A, the system will display P3 protection; H3 error will display when system appear 3 times P3 protection in 120 minutes, it cannot resume automatically, and it can resume only by restarting the machine.

---B≤ Inverter compressor current <A, decrease the frequency to the lower level every 30 seconds.

---C≤ Inverter compressor current <B, keep running at the current frequency.

---- Inverter compressor current <D, no limit for frequency.

	2ton	3ton	4ton	5ton
A	16A	16A	22A	22A
B	11.5A	13A	16A	16.5A
C	11A	12A	15A	15.5A
D	10A	11A	14A	14.5A

8.2.3 Condenser temperature T3 protection

When condenser temperature is getting higher, the running frequency will be limited as below rules:

--- When condenser temp. T3≥62℃, the system will display P5 protection; F3 error will display when system appear 5 times P5 protection in 180 minutes, it cannot resume automatically, and it can resume only by restarting the machine.

---59≤T5<62℃, decrease the frequency to the lower level every 30 seconds.

---57≤T5<59℃, keep running at the current frequency.

----T5<55℃, no limit for frequency.

8.2.4 High pressure protection in heating mode

In heating mode, when the high pressure is getting higher, the running frequency will be limited as below rules:

--- The high pressure≥3.4MPa, the system will display Hb protection; F5 error will display when system appear 5 times Hb protection in 180 minutes, it cannot resume automatically, and it can resume only by restarting the machine.

---3.2MPa≤The high pressure <3.4MPa, decrease the frequency to the lower level every 30 seconds.

---3.0MPa≤The high pressure <3.2MPa, keep running at the current frequency.

---- The high pressure <2.8MPa,, no limit for frequency.

8.2.5 Heat sink temperature Tf protection of IPM

When the heat sink temperature Tf is getting higher, the running frequency will be limited as below rules:

8.2.5.1 For 2/3Ton models

--- When the heat sink temp. Tf ≥85℃, the system will display P0 protection; F4 error will display when system appear 3 times P0 protection in 120 minutes, it cannot resume automatically, and it can resume only by restarting the machine.

---80≤Tf<85℃, decrease the frequency to the lower level every 30 seconds.

---77≤Tf<80℃, keep running at the current frequency.

----Tf<74℃, no limit for frequency.

8.2.5.2 For 4/5Ton models

--- When the heat sink temp. Tf ≥85℃, the system will display P0 protection; F4 error will display when system appear 3 times P0 protection in 120 minutes, it cannot resume automatically, and it can resume only by restarting the machine.

---76≤Tf<85℃, decrease the frequency to the lower level every 30 seconds.

---72≤Tf<76℃, keep running at the current frequency.

----Tf<69℃, no limit for frequency.

8.2.6 COMPRESSOR CRANKCASE HEATER (CCH) (Heat pump only,optional)

Refrigerant migration during the off cycle can result in a noisy start up. Add a crankcase heater to minimize refrigeration migration, and to help eliminate any start up noise or bearing “wash out”.

All heaters must be located on the lower half of the compressor shell. Its purpose is to drive refrigerant from the compressor shell during long off cycles, thus preventing damage to the compressor during start-up.

At initial start-up or after extended shutdown periods, make sure the heater is energized for at least 12 hours before the compressor is started. (Disconnect switch on and wall thermostat off.)

The crankcase heating start condition:

1. The crankcase heating start must meet two conditions:

--- Outdoor temperature ＜3℃.

--- Compressor stops working more than 3 hours.

2. The crankcase heating stop must meet condition:

--- Outdoor temperature ≥7 ℃ or compressor start.

8.2.7 Oil Return program(Auto)

--- When the frequency of compressor is below the minimum oil return frequency, the system begins to calculate the oil discharge amount of compressor, and then determine when to enter oil return program.

--- The oil return program starts when the system has continued operating for 8 hours.

--- The program will last for 5 minutes.

--- During the oil return program, the running mode remain the same.

--- During the oil return program, if the system receives a stop order, the oil return program may continue running for 2 minutes.

8.2.8 About defrost cycle:

Start-up conditions of defrost mode:

When JUMP switch is set to “1”, the mode will start up in either of the two following conditions:

--- Compressor operating, when T4 is >-2℃ and T3 is < 0℃ last for 40 minutes.

--- Compressor operating, when T4 is <-2℃ and T3 is < 0℃ last for 50 minutes.

When JUMP switch is set to “0”:

--- Compressor operating, when T3 is < 0℃ last for 30 minutes.

Shut-down conditions of defrost mode:

The mode will shut down in either of the two following conditions:

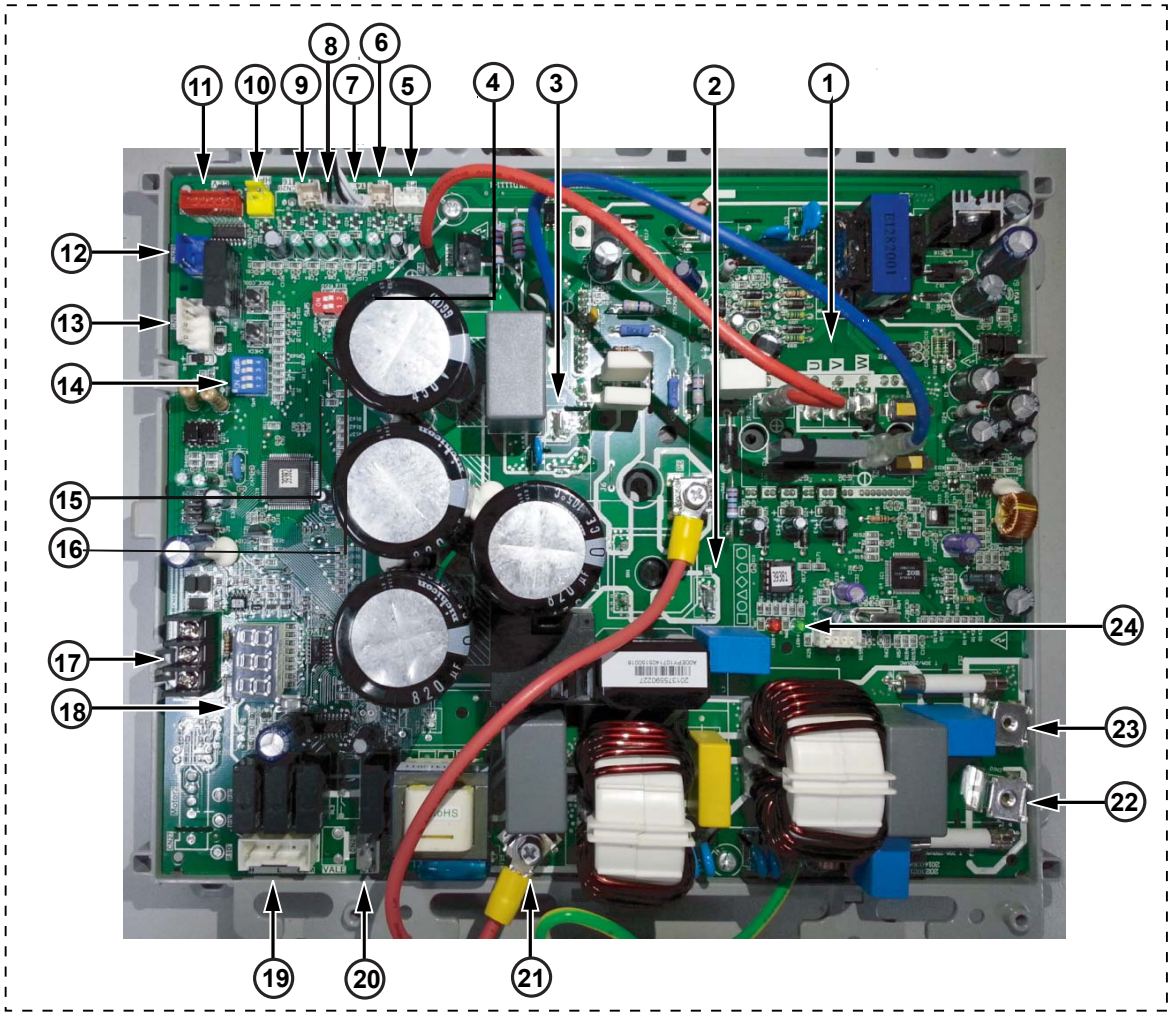
--- The defrosted time lating for 10 minutes;

--- T3 is ≥25℃.

When the compressor has been running more than 10 minutes in the heating mode, holding down the FORCE button for at least 6 seconds, the system enters to the defrost mode, and then exits the defrost mode normally by itself.

8.3 Main Control Board Ports Instructions

For 24/36K models:

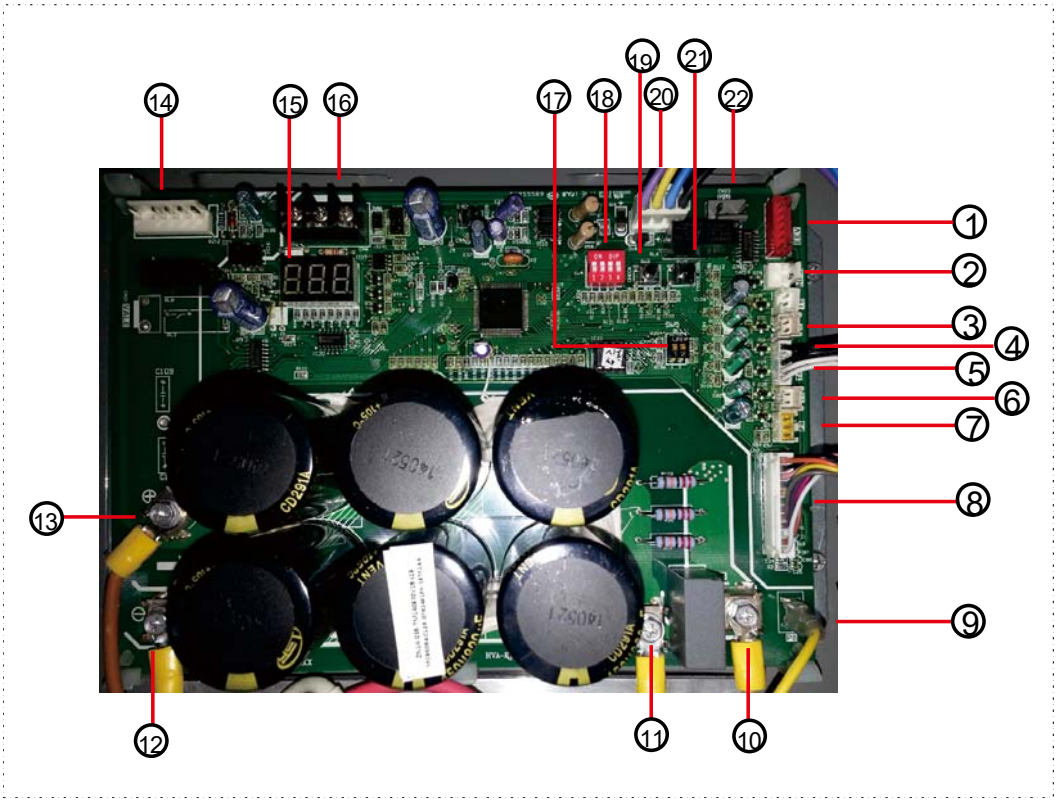


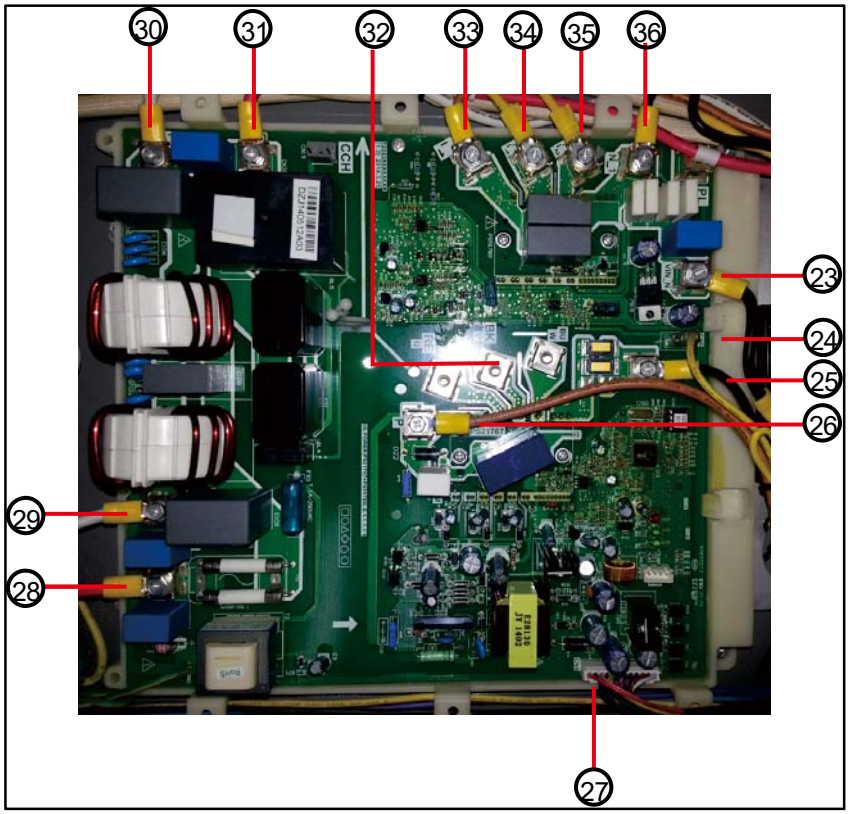
Main control board ports instruction

No.	Content
1	Compressor wiring terminal
2	Reactor wiring terminal (connect a reactor between 2 and 3)
3	Reactor wiring terminal (connect a reactor between 2 and 3)
4	Defrosting function dial code SW5
5	Pressure sensor port
6	Air discharge temp. sensor port
7	Outdoor temp. sensor port (HP only)
8	Condenser temp. sensor port
9	Radiator temp. sensor port
10	High pressure switch port
11	EXV drive port (HP only)

12	4-way valve port (HP only)
13	Temp. controller connection port
14	Function dial code SW4
15	Point check button
16	Forced operation button
17	Reserved
18	Nixie tube display
19	Fan control port
20	Crankcase heating zone control terminal
21	Short wire
22	Power supply connection terminal
23	Power supply connection terminal
24	Indicator lamp

For 48/60K models:





Main control board ports instruction

No.	Content
1	EXV driving port (HP only)
2	High pressure switch port
3	Radiator temp. sensor port
4	Condenser temp. sensor port
5	Outdoor temp. sensor port (HP only)
6	Air discharge temp. sensor port
7	Pressure sensor port
8	Connection wire port between main boards
9	DC motor driving source(15V-P2)
10	The voltage between 10 and 11 is 380Vdc (Compressor is running normally)
11	The voltage between 10 and 11 is 380Vdc (Compressor is running normally)
12	The voltage between 12 and 13 is 380Vdc (Compressor is running normally)
13	The voltage between 12 and 13 is 380Vdc (Compressor is running normally)
14	DC motor control port
15	Nixie tube display
16	Reserved
17	Defrosting function dial code SW5
18	Function dial code SW4
19	Point check button
20	Temp. controller connection port
21	Forced operation button
22	4-way valve port (HP only)
23	Connect the cathode of the rectifier bridge
24	DC motor driving source(15V-P2)
25	The voltage between 25 and 26 is 380Vdc (Compressor is running normally)
26	The voltage between 25 and 26 is 380Vdc (Compressor is running normally)
27	Connection wire port between main boards
28	AC power supply input port
29	AC power supply input port
30	AC power supply output port
31	AC power supply output port
32	Compressor connection terminal
33	The voltage between 33 and 36 is 380Vdc (Compressor is running normally)
34	Reactor L1 wiring terminal
35	Reactor L2 wiring terminal
36	The voltage between 33 and 36 is 380Vdc (Compressor is running normally)

8.4 Outdoor Unit Status Display

Sequence	System operation parameters	Remarks
0	Capacity of outdoor unit	Type + Ton
1	Running mode	0-Stand by、2-Cooling、3-Heating
2	The setting frequency of outdoor unit	
3	Open degree of Electric expansion valve	Actual value /8
4	T3 Pipe temperature	
5	T4 ambient temperature	
6	T5	
7	Reserved	
8	Te Low pressure temp. (suction side saturation temp.)	
9	Tc High pressure temp. (discharge side saturation temp.)	
10	Tf	
11	Pe Low pressure (suction side pressure)	Actual value *10
12	Pc High pressure (discharge side pressure)	Actual value *10
13	Discharge Superheat	
14	Reserved	
15	Reserved	
16	Current of inverter compressor	
17	voltage values	
18	Fan speed	
19	Reserved	
20	Reserved	
21	Reserved	
22	Oil discharge amount of compressor	Actual value /10
23	The last error or protection code	
24	Software version	
25	Remarks “--”	

(1) There’re 3 digits for LED. The first digit is sequence (only display units digit, recycling display), the second and third digits are values. For example, the 8th item is operating low pressure saturation temperature. The 11th item is operationg low pressure. For detailed meanings, please refer to the point check table.

(2) After staying for 20s, it will recover to the normal status display.

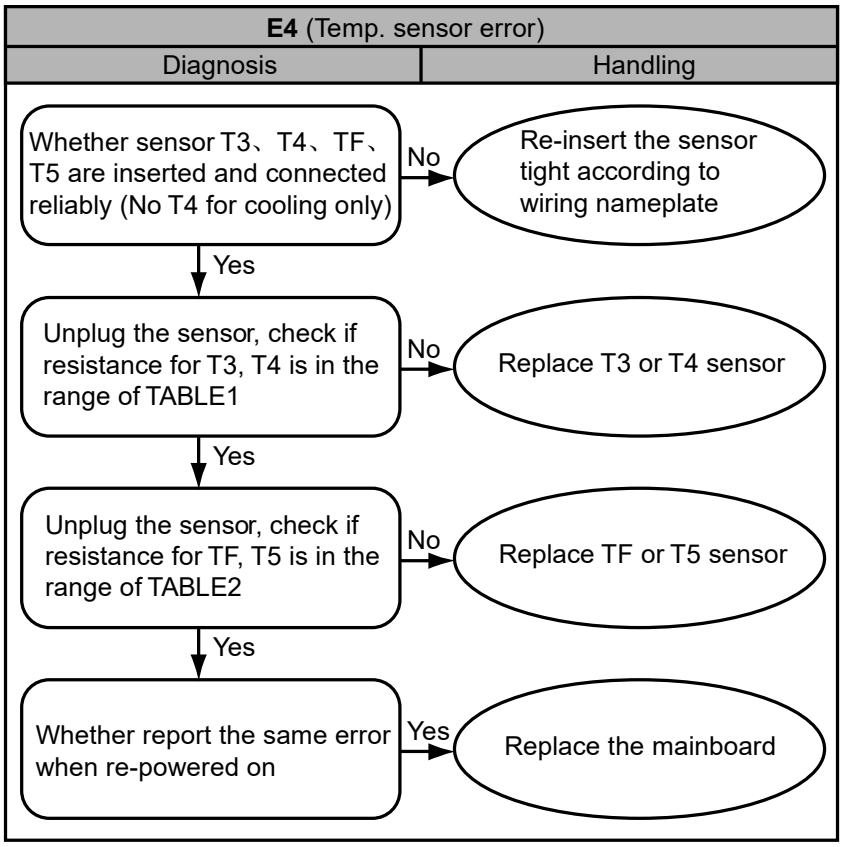
(3) Normal display: when standby, last 2 digits of nixie tube will display ambient temp and the first nixie tube has no display. When operating, last 2 digits of nixie tube will display operating frequency. (If there’s system protection, the first digit of nixie tube will display status code, details for code meaning)

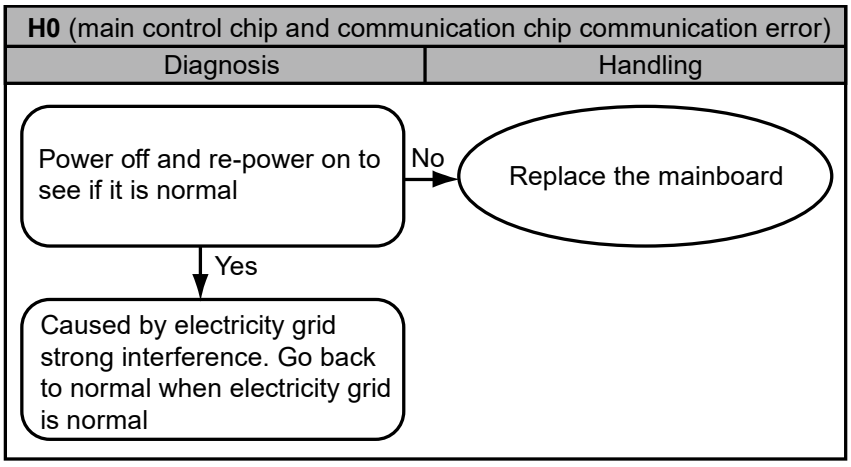
9. Troubleshooting

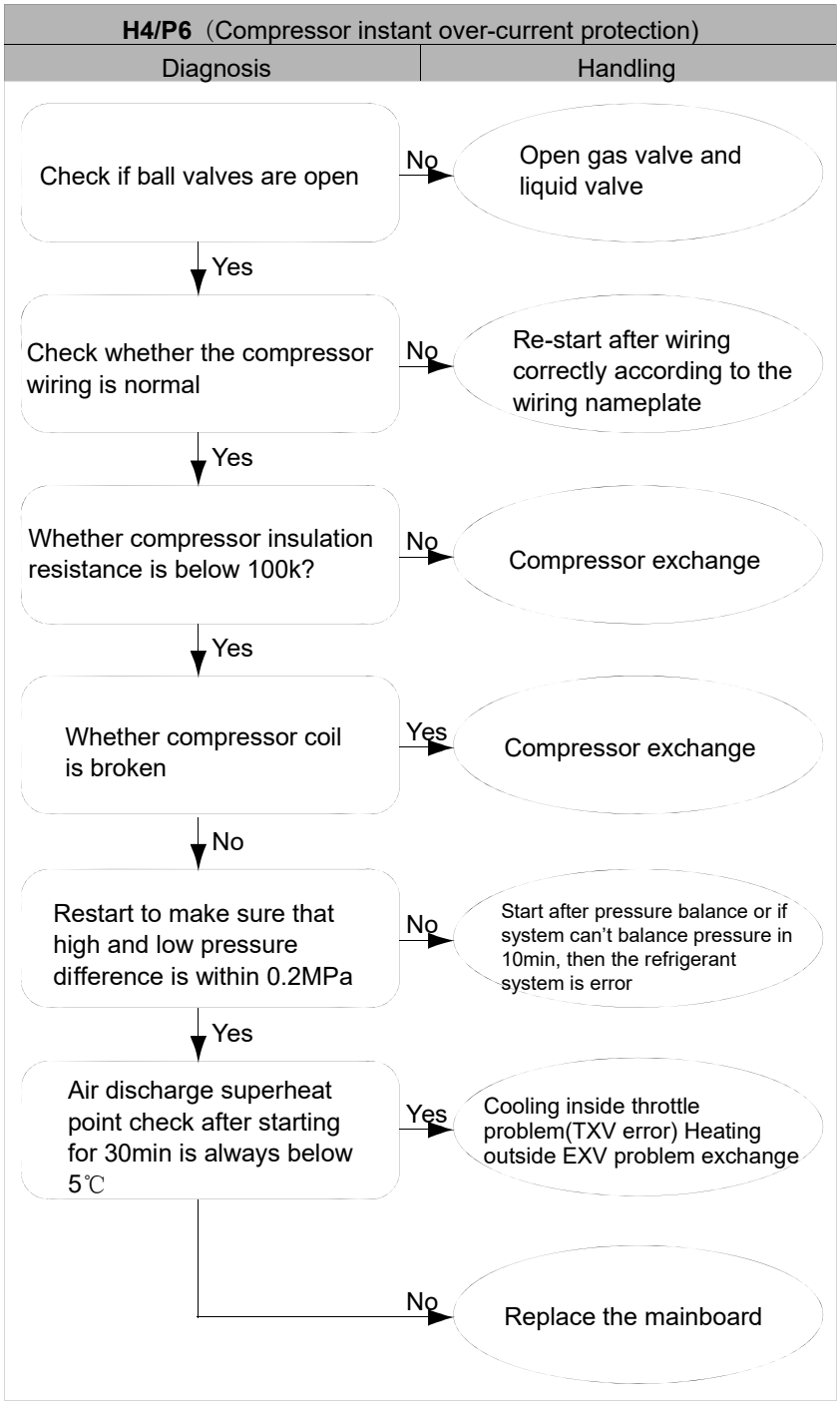
9.1 Outdoor Unit Error Display

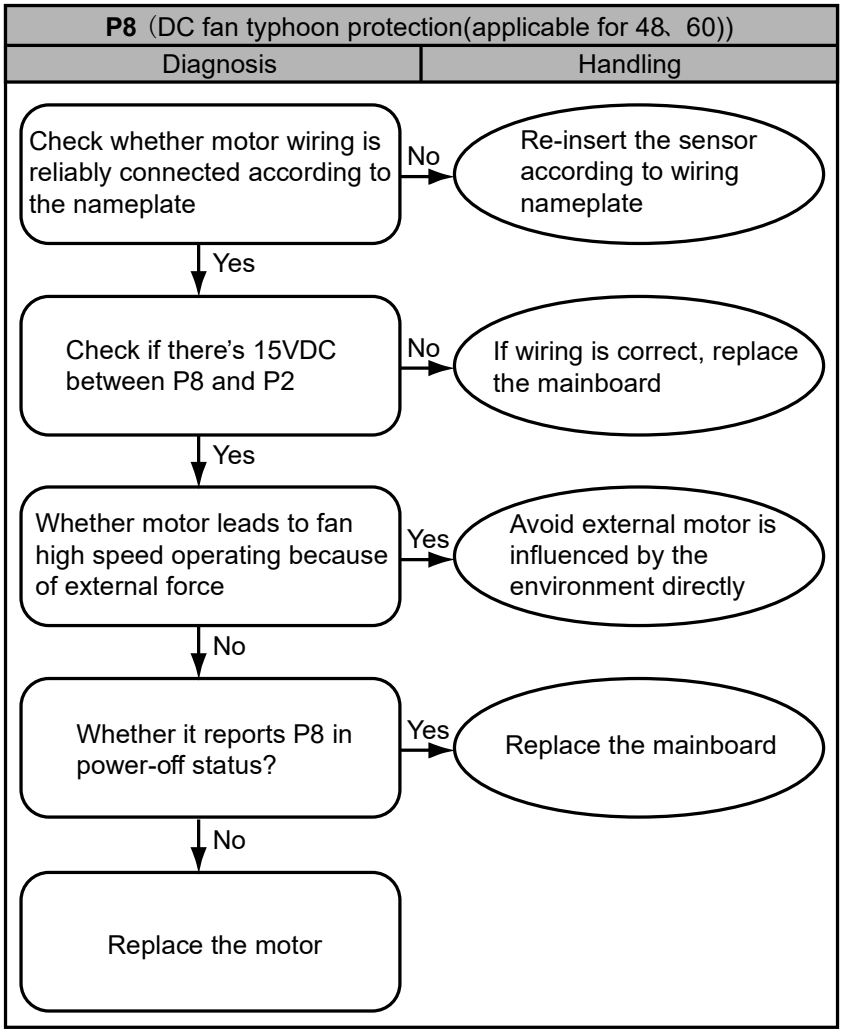
Error code	Content	Note
E4	Environmental temperature sensor fault	
E5	Voltage protection	One time voltage protection can resume automatically, and two times voltage protection can resume only by restarting the machine
E6	DC fan motor error	
Eb	10 minutes appear two times E6 protection	It can resume only by restarting the machine
E7	The exhaust gas sensor is not seated fault	
H0	Communication fault in main control chip	
H3	3 times (P3) protection in 120 minutes	It can resume only by restarting the machine
H4	3 times (P6) protection in 60 minutes	It can resume only by restarting the machine
H5	5 times (P2) protection in 100 minutes	It can resume only by restarting the machine
H6	3 times (P4) protection in 100 minutes	It can resume only by restarting the machine
H8	Pressure sensor fault	
Hb	High pressure protection in heating mode	
HH	Compressor liquid return 3 times in 180 minutes	It can resume only by restarting the machine
P0	The module radiator temp. Tf protection	
P1	High pressure protection	
P2	Low pressure protection	
P3	Over current protection	
P4	The exhaust temp. of the compressor (T5) protection	
P5	T3 tube high temp. protection	
P6	Instantaneous overcurrent protection for compressor	
PH	Compressor liquid return	
P8	DC Fan typhoon protection (for 48、60K models)	It can resume automatically in two minutes
C3	T3 sensor loosely-inserted protection	
CE	5 times (P1) protection in 150 minutes	It can resume only by restarting the machine
F1	High pressure protection switch error	
F3	5 times (P5) protection in 180 minutes	It can resume only by restarting the machine
F4	3 times (P0) protection in 120 minutes	It can resume only by restarting the machine
F5	5 times (Hb) protection in 180 minutes	It can resume only by restarting the machine

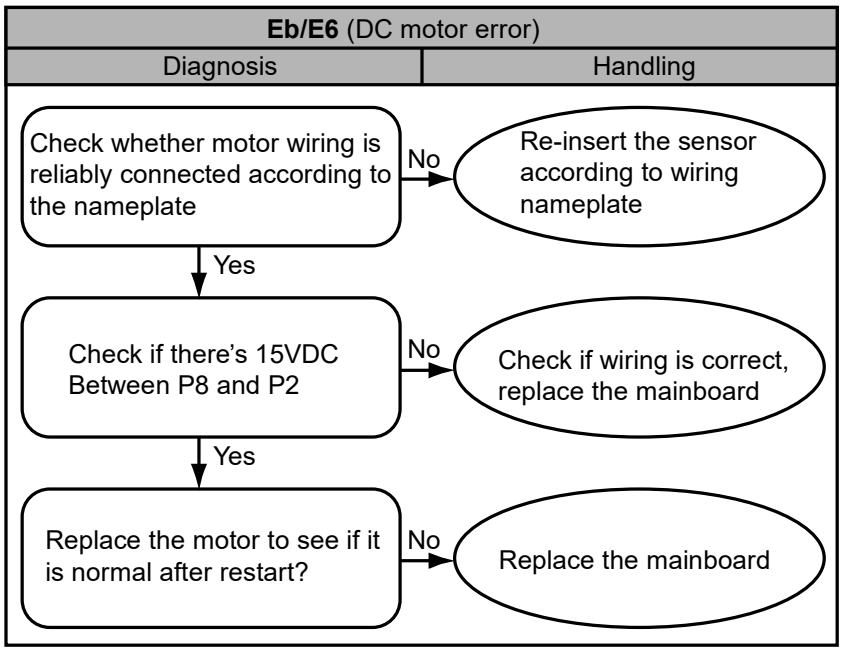
9.2 Diagnosis And Solution

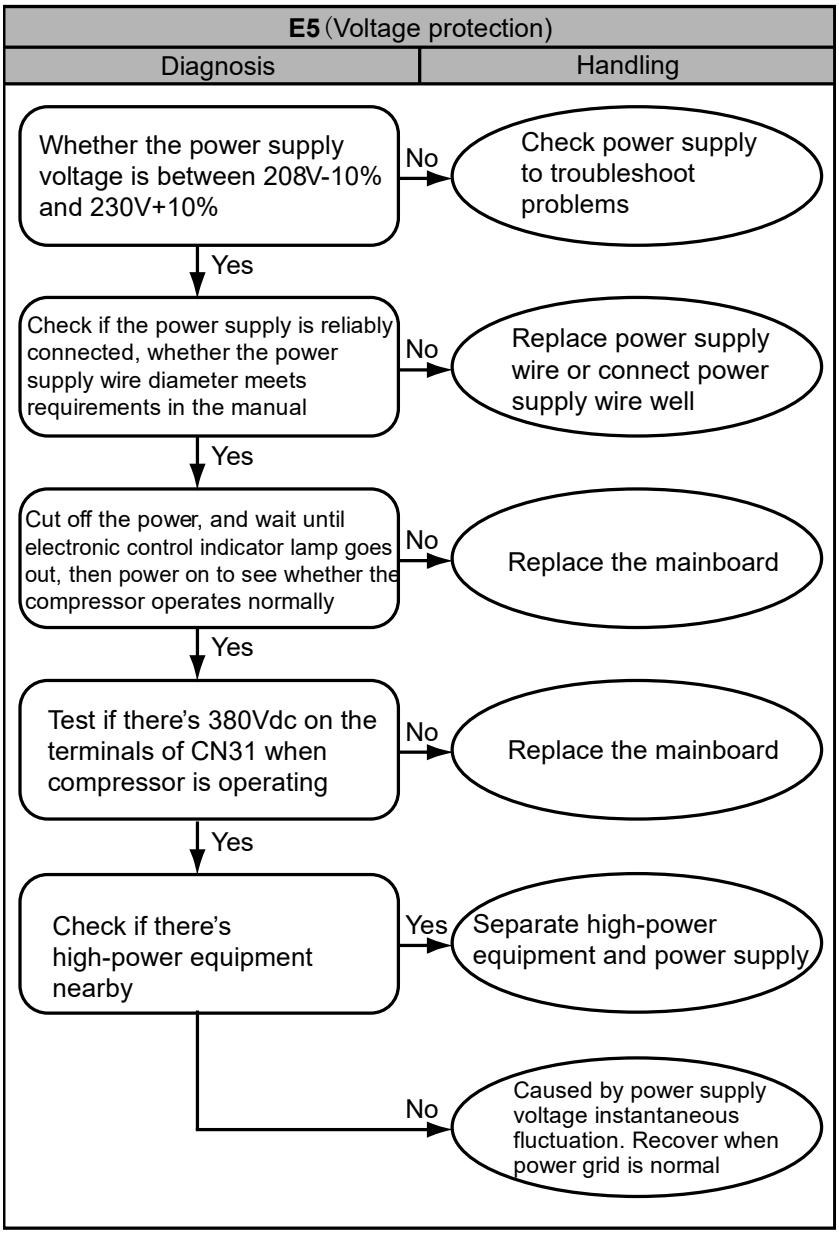


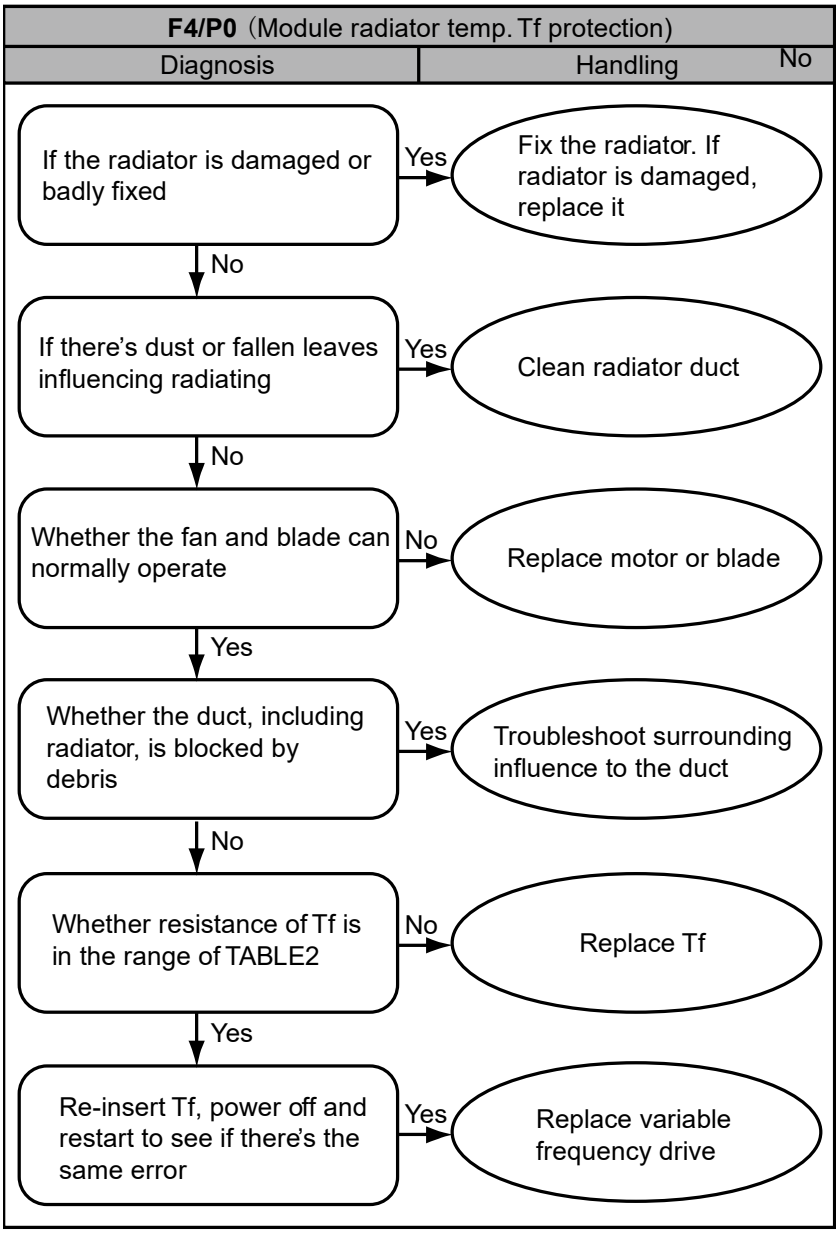


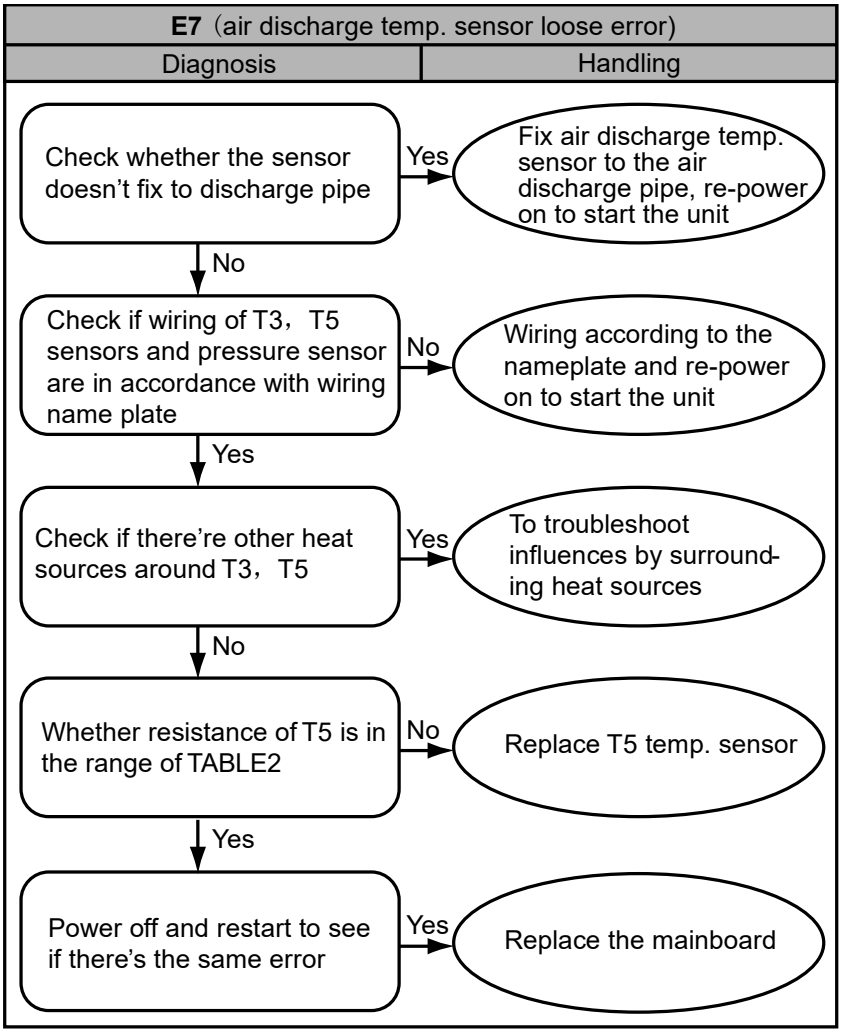

H4/P6（Compressor instant over-current protection)
Diagnosis
Handling
Check if ball valves are open
No
Open gas valve and liquid valve
Yes
Check whether the compressor wiring is normal
No
Re-start after wiring correctly according to the wiring nameplate
Yes
Whether compressor insulation resistance is below 100k?
No
Compressor exchange
Yes
Whether compressor coil is broken
Yes
Compressor exchange
No
Restart to make sure that high and low pressure difference is within 0.2MPa
No
Start after pressure balance or if system can't balance pressure in 10min, then the refrigerant system is error
Yes
Air discharge superheat point check after starting for 30min is always below 5℃
Yes
Cooling inside throttle problem(TXV error) Heating outside EXV problem exchange
No
Replace the mainboard

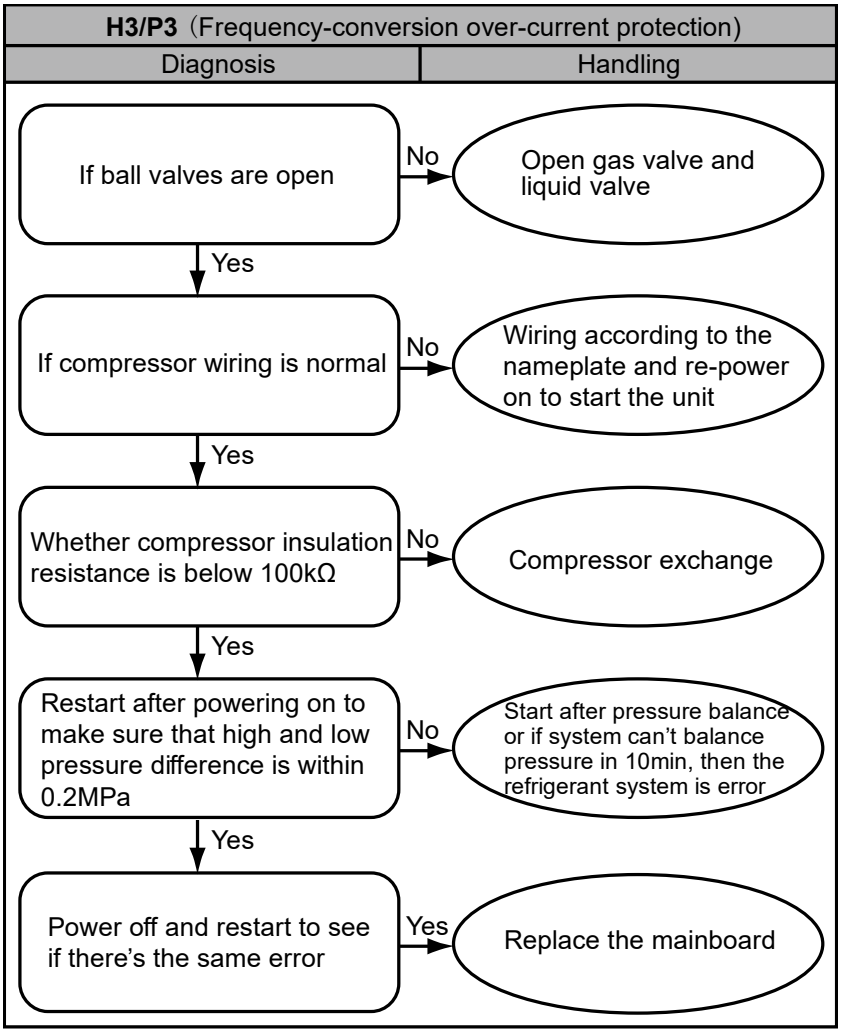

P8（DC fan typhoon protection(applicable for 48、60))
Diagnosis
Handling
Check whether motor wiring is reliably connected according to the nameplate
No
Re-insert the sensor according to wiring nameplate
Yes
Check if there's 15VDC between P8 and P2
No
If wiring is correct, replace the mainboard
Yes
Whether motor leads to fan high speed operating because of external force
Yes
Avoid external motor is influenced by the environment directly
No
Whether it reports P8 in power-off status?
Yes
Replace the mainboard
No
Replace the motor

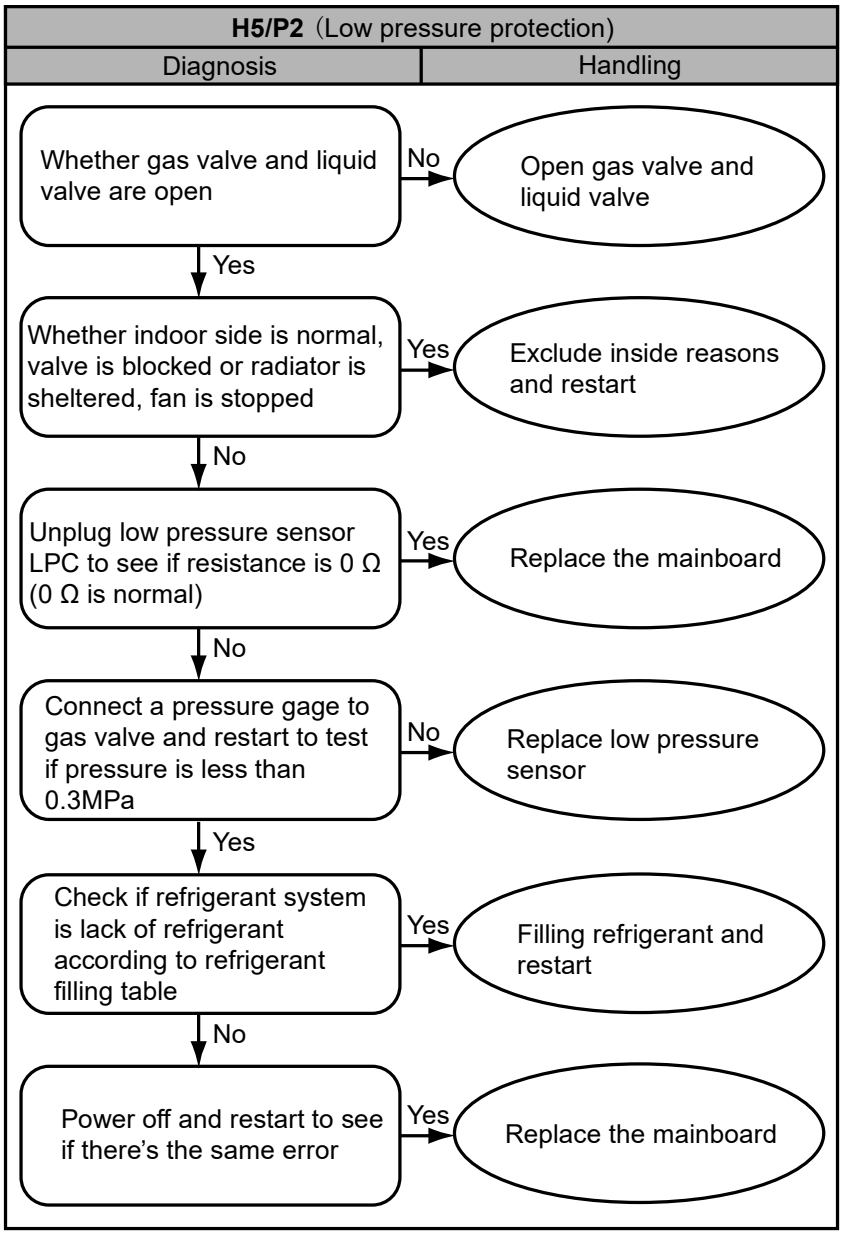

Eb/E6 (DC motor error)
Diagnosis
Handling
Check whether motor wiring is reliably connected according to the nameplate
No
Re-insert the sensor according to wiring nameplate
Yes
Check if there's 15VDC Between P8 and P2
No
Check if wiring is correct, replace the mainboard
Yes
Replace the motor to see if it is normal after restart?
No
Replace the mainboard

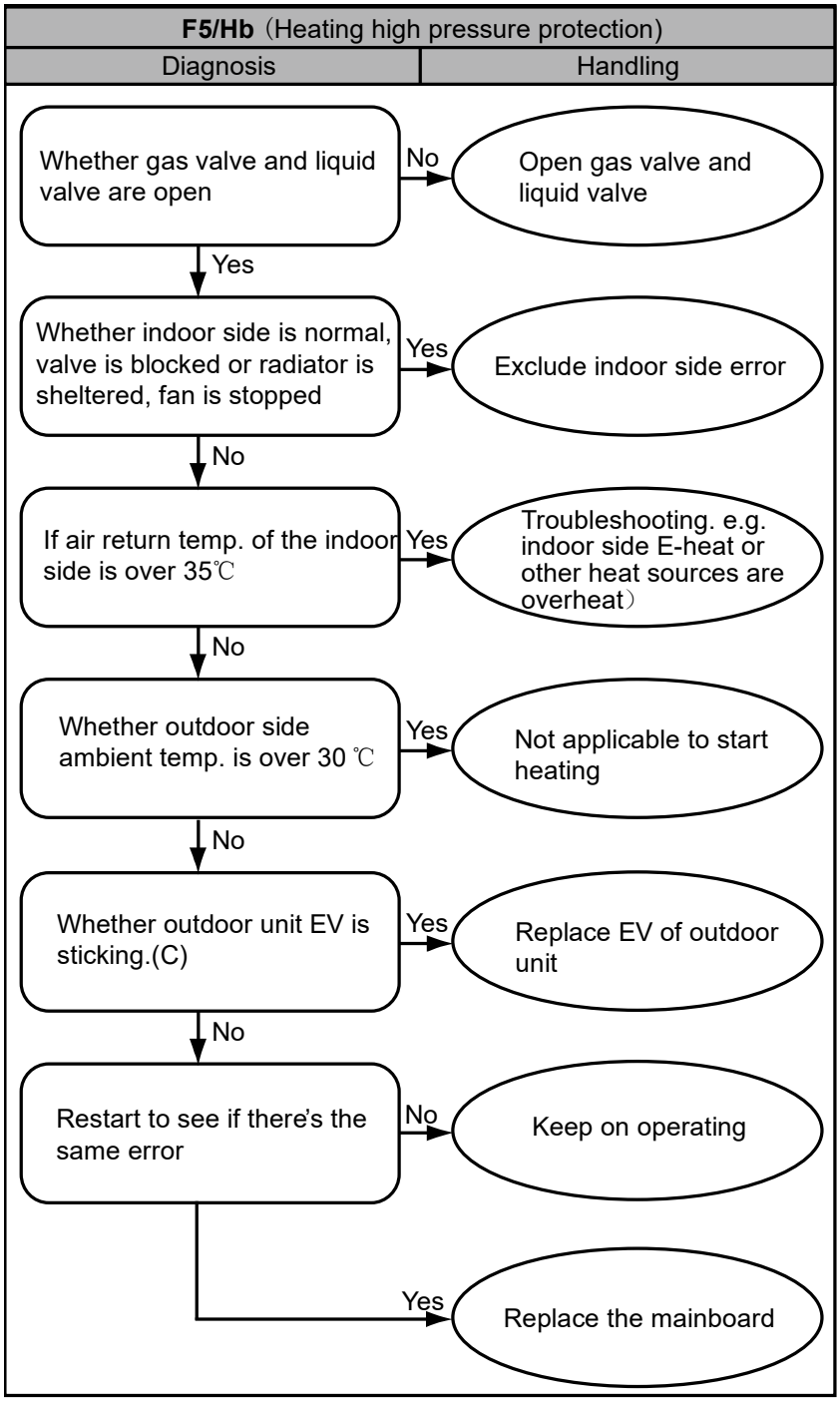

E5 (Voltage protection)
Diagnosis
Handling
Whether the power supply voltage is between 208V-10% and 230V+10%
No
Check power supply to troubleshoot problems
Yes
Check if the power supply is reliably connected, whether the power supply wire diameter meets requirements in the manual
No
Replace power supply wire or connect power supply wire well
Yes
Cut off the power, and wait until electronic control indicator lamp goes out, then power on to see whether the compressor operates normally
No
Replace the mainboard
Yes
Test if there's 380Vdc on the terminals of CN31 when compressor is operating
No
Replace the mainboard
Yes
Check if there's high-power equipment nearby
Yes
Separate high-power equipment and power supply
No
Caused by power supply voltage instantaneous fluctuation. Recover when power grid is normal

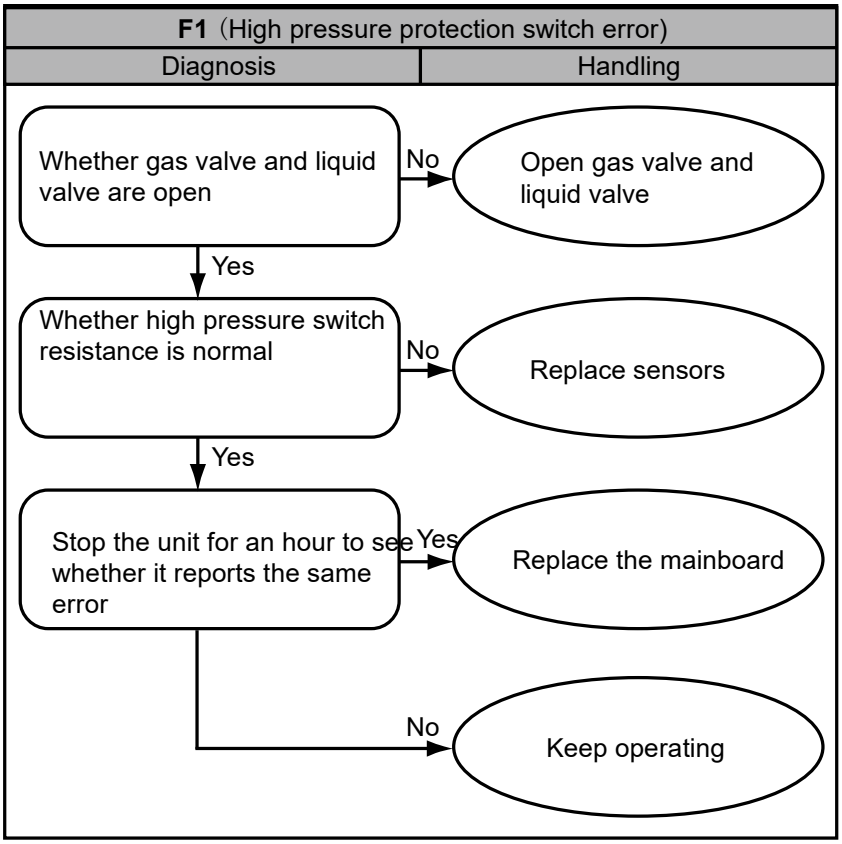

F4/P0（Module radiator temp. Tf protection)
Diagnosis
Handling
No
If the radiator is damaged or badly fixed
Yes
Fix the radiator. If radiator is damaged, replace it
No
If there's dust or fallen leaves influencing radiating
Yes
Clean radiator duct
No
Whether the fan and blade can normally operate
No
Replace motor or blade
Yes
Whether the duct, including radiator, is blocked by debris
Yes
Troubleshoot surrounding influence to the duct
No
Whether resistance of Tf is in the range of TABLE2
No
Replace Tf
Yes
Re-insert Tf, power off and restart to see if there's the same error
Yes
Replace variable frequency drive

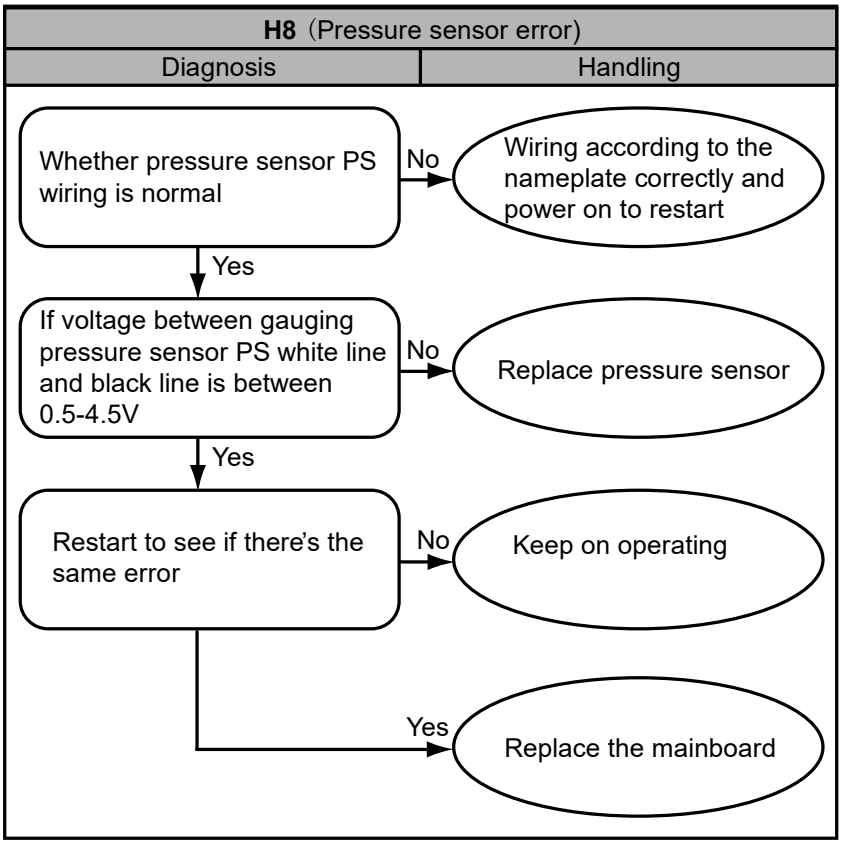

E7 (air discharge temp. sensor loose error)
Diagnosis
Handling
Check whether the sensor doesn't fix to discharge pipe
Yes
Fix air discharge temp. sensor to the air discharge pipe, re-power on to start the unit
No
Check if wiring of T3，T5 sensors and pressure sensor are in accordance with wiring name plate
No
Wiring according to the nameplate and re-power on to start the unit
Yes
Check if there're other heat sources around T3，T5
Yes
To troubleshoot influences by surrounding heat sources
No
Whether resistance of T5 is in the range of TABLE2
No
Replace T5 temp. sensor
Yes
Power off and restart to see if there's the same error
Yes
Replace the mainboard

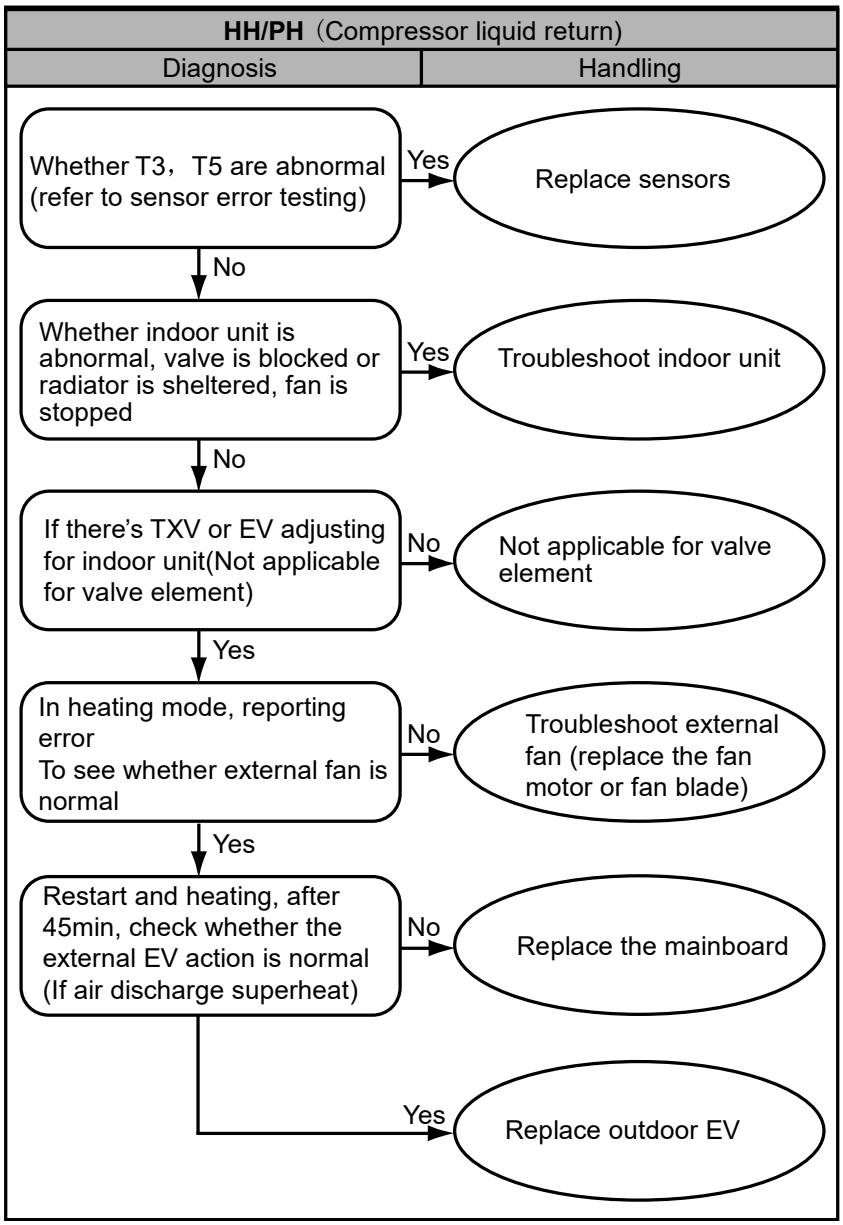

H3/P3 (Frequency-conversion over-current protection)
Diagnosis
Handling
If ball valves are open
No
Open gas valve and liquid valve
Yes
If compressor wiring is normal
No
Wiring according to the nameplate and re-power on to start the unit
Yes
Whether compressor insulation resistance is below 100kΩ
No
Compressor exchange
Yes
Restart after powering on to make sure that high and low pressure difference is within 0.2MPa
No
Start after pressure balance or if system can't balance pressure in 10min, then the refrigerant system is error
Yes
Power off and restart to see if there's the same error
Yes
Replace the mainboard

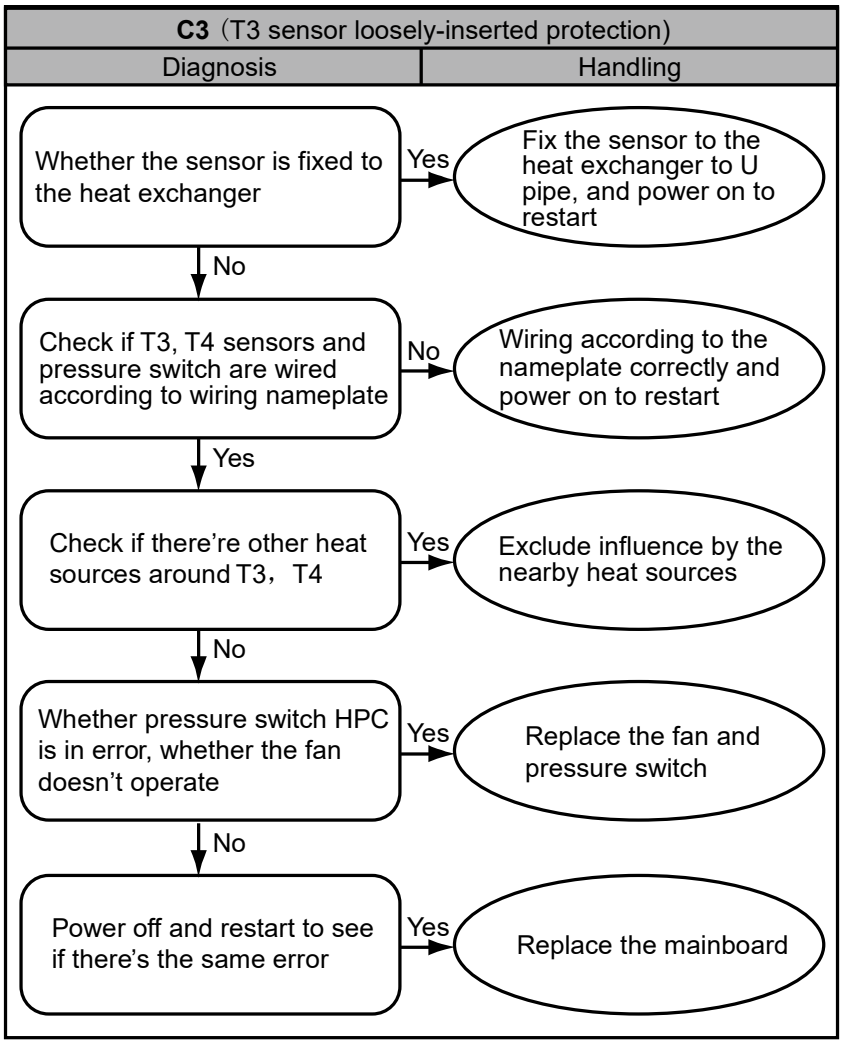

H5/P2 (Low pressure protection)
Diagnosis
Handling
Whether gas valve and liquid valve are open
No
Open gas valve and liquid valve
Yes
Whether indoor side is normal, valve is blocked or radiator is sheltered, fan is stopped
Yes
Exclude inside reasons and restart
No
Unplug low pressure sensor LPC to see if resistance is 0 Ω (0 Ω is normal)
Yes
Replace the mainboard
No
Connect a pressure gage to gas valve and restart to test if pressure is less than 0.3MPa
No
Replace low pressure sensor
Yes
Check if refrigerant system is lack of refrigerant according to refrigerant filling table
Yes
Filling refrigerant and restart
No
Power off and restart to see if there's the same error
Yes
Replace the mainboard

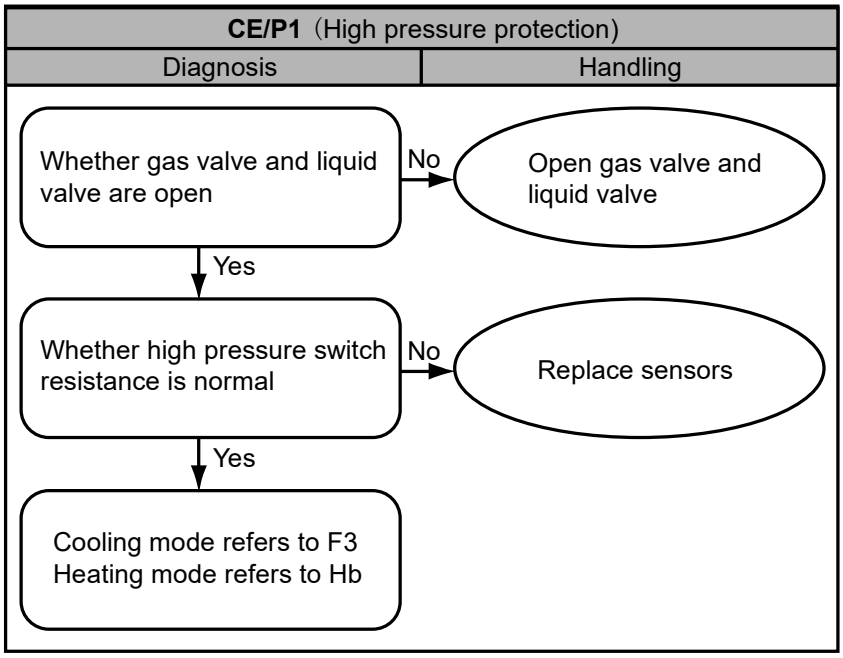

F5/Hb（Heating high pressure protection)
Diagnosis
Handling
Whether gas valve and liquid valve are open
No
Open gas valve and liquid valve
Yes
Whether indoor side is normal, valve is blocked or radiator is sheltered, fan is stopped
Yes
Exclude indoor side error
No
If air return temp. of the indoor side is over 35℃
Yes
Troubleshooting. e.g. indoor side E-heat or other heat sources are overheat）
No
Whether outdoor side ambient temp. is over 30 ℃
Yes
Not applicable to start heating
No
Whether outdoor unit EV is sticking.(C)
Yes
Replace EV of outdoor unit
No
Restart to see if there's the same error
No
Keep on operating
Yes
Replace the mainboard

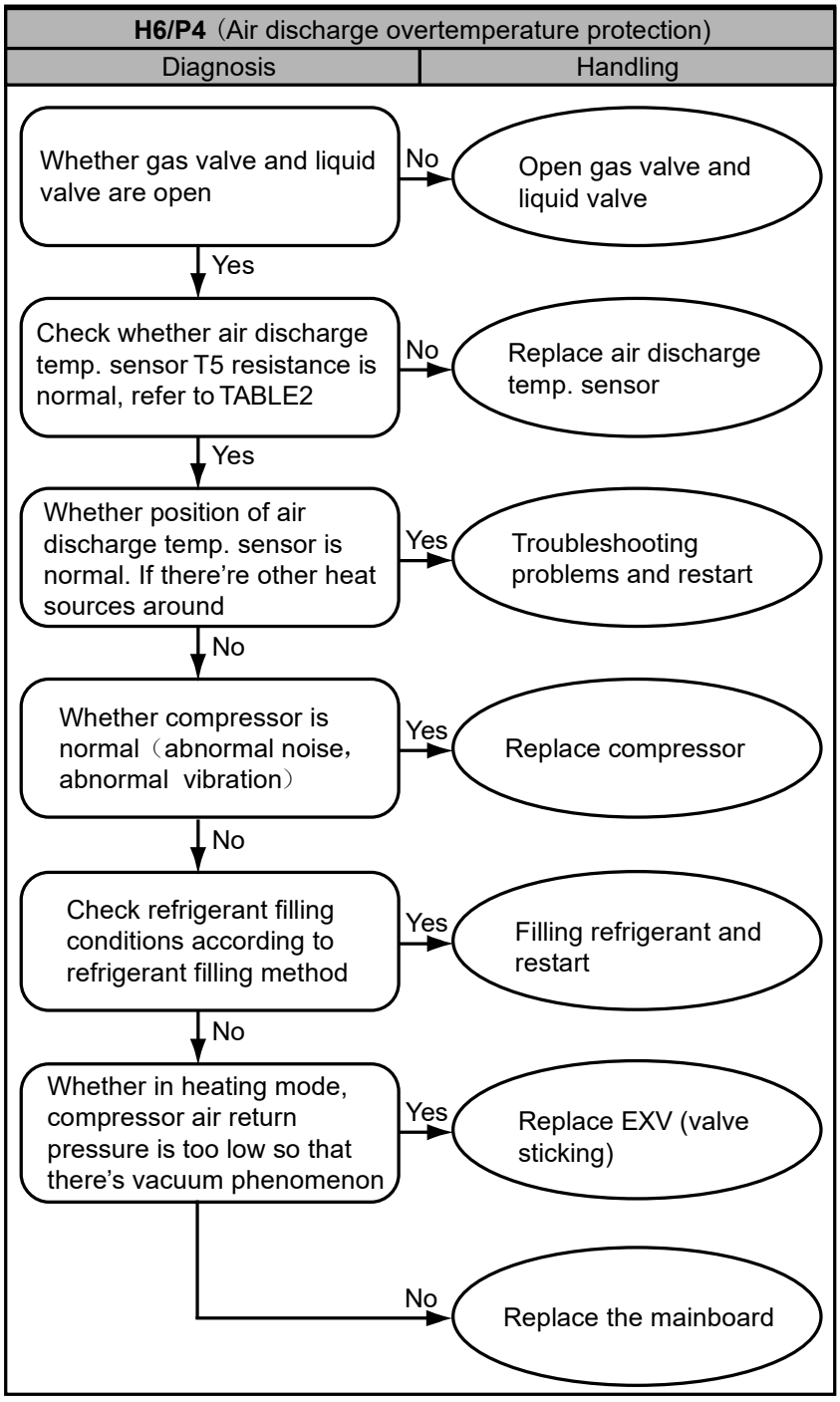

F1（High pressure protection switch error)
Diagnosis
Handling
Whether gas valve and liquid valve are open
No
Open gas valve and liquid valve
Yes
Whether high pressure switch resistance is normal
No
Replace sensors
Yes
Stop the unit for an hour to see whether it reports the same error
Yes
Replace the mainboard
No
Keep operating


H8（Pressure sensor error)
Diagnosis
Handling
Whether pressure sensor PS wiring is normal
No
Wiring according to the nameplate correctly and power on to restart
Yes
If voltage between gauging pressure sensor PS white line and black line is between 0.5-4.5V
No
Replace pressure sensor
Yes
Restart to see if there's the same error
No
Keep on operating
Yes
Replace the mainboard


HH/PH（Compressor liquid return）
Diagnosis
Handling
Whether T3，T5 are abnormal (refer to sensor error testing)
Yes
Replace sensors
No
Whether indoor unit is abnormal, valve is blocked or radiator is sheltered, fan is stopped
Yes
Troubleshoot indoor unit
No
If there's TXV or EV adjusting for indoor unit(Not applicable for valve element)
No
Not applicable for valve element
Yes
In heating mode, reporting error
To see whether external fan is normal
No
Troubleshoot external fan (replace the fan motor or fan blade)
Yes
Restart and heating, after 45min, check whether the external EV action is normal (If air discharge superheat)
No
Replace the mainboard
Yes
Replace outdoor EV


C3（T3 sensor loosely-inserted protection)
Diagnosis
Handling
Whether the sensor is fixed to the heat exchanger
Yes
Fix the sensor to the heat exchanger to U pipe, and power on to restart
No
Check if T3, T4 sensors and pressure switch are wired according to wiring nameplate
No
Wiring according to the nameplate correctly and power on to restart
Yes
Check if there're other heat sources around T3，T4
Yes
Exclude influence by the nearby heat sources
No
Whether pressure switch HPC is in error, whether the fan doesn't operate
Yes
Replace the fan and pressure switch
No
Power off and restart to see if there's the same error
Yes
Replace the mainboard


CE/P1（High pressure protection)
Diagnosis
Handling
Whether gas valve and liquid valve are open
No
Open gas valve and liquid valve
Yes
Whether high pressure switch resistance is normal
No
Replace sensors
Yes
Cooling mode refers to F3
Heating mode refers to Hb


H6/P4（Air discharge overtemperature protection)
Diagnosis
Handling
Whether gas valve and liquid valve are open
No
Open gas valve and liquid valve
Yes
Check whether air discharge temp. sensor T5 resistance is normal, refer to TABLE2
No
Replace air discharge temp. sensor
Yes
Whether position of air discharge temp. sensor is normal. If there're other heat sources around
Yes
Troubleshooting problems and restart
No
Whether compressor is normal（abnormal noise, abnormal vibration）
Yes
Replace compressor
No
Check refrigerant filling conditions according to refrigerant filling method
Yes
Filling refrigerant and restart
No
Whether in heating mode, compressor air return pressure is too low so that there's vacuum phenomenon
Yes
Replace EXV (valve sticking)
No
Replace the mainboard

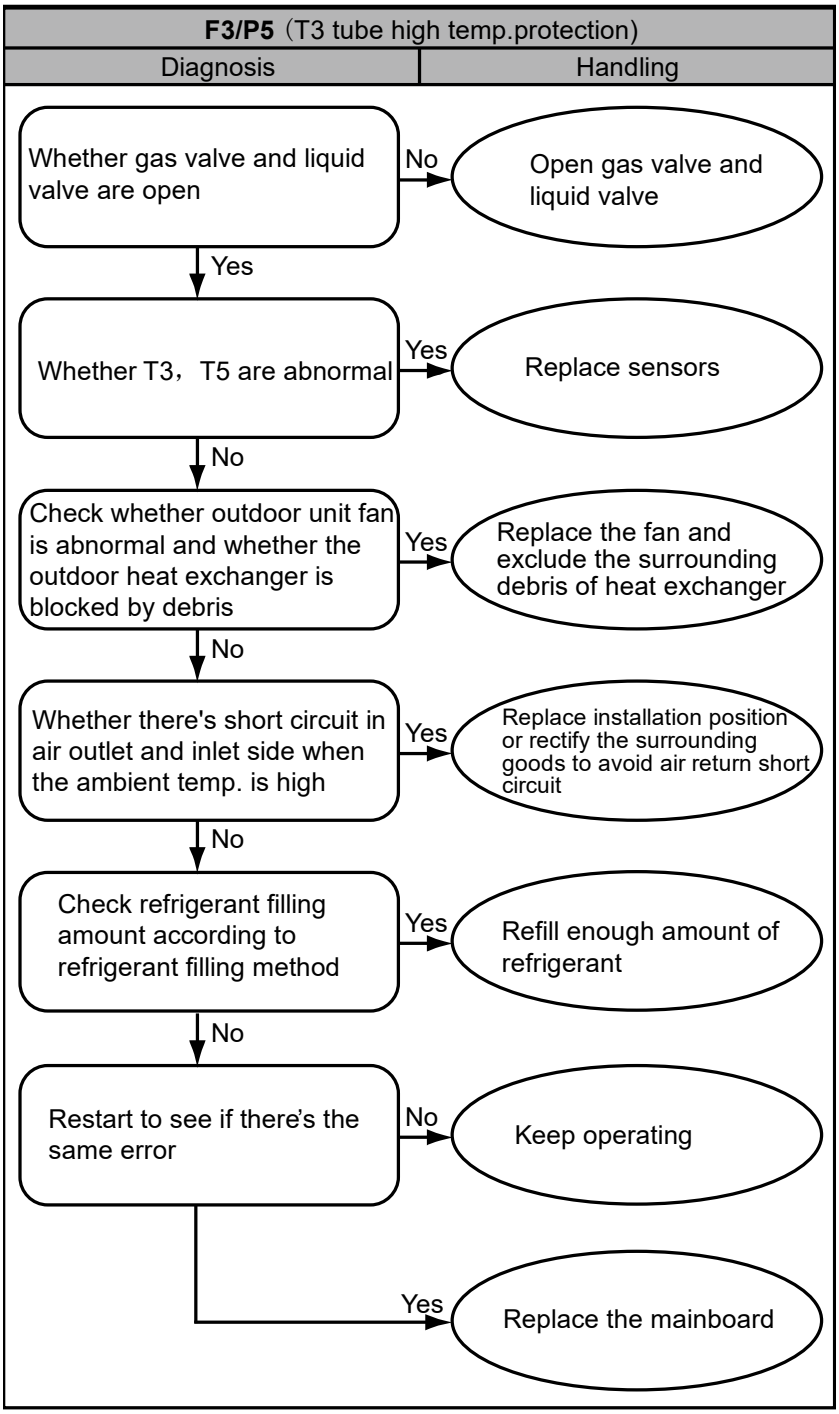

F3/P5（T3 tube high temp.protection)
Diagnosis
Handling
Whether gas valve and liquid valve are open
No
Open gas valve and liquid valve
Yes
Whether T3，T5 are abnormal
Yes
Replace sensors
No
Check whether outdoor unit fan is abnormal and whether the outdoor heat exchanger is blocked by debris
Yes
Replace the fan and exclude the surrounding debris of heat exchanger
No
Whether there's short circuit in air outlet and inlet side when the ambient temp. is high
Yes
Replace installation position or rectify the surrounding goods to avoid air return short circuit
No
Check refrigerant filling amount according to refrigerant filling method
Yes
Refill enough amount of refrigerant
No
Restart to see if there's the same error
No
Keep operating
Yes
Replace the mainboard

Table 1: comparison table about temperature, resistance and voltage, it is suitable for T3/T4 sensor.

TEMP F	TEMP C	RESISTANCE kΩ	VOLTS DC
-5	-20.6	107.73	4.65
0	-17.8	93.54	4.6
5	-15	79.52	4.54
10	-12.2	67.80	4.47
15	-9.4	57.95	4.39
20	-6.7	49.65	4.3
25	-3.9	42.65	4.21
30	-1.1	36.71	4.1
35	1.7	31.67	3.99
40	4.4	27.39	3.86
45	7.2	23.73	3.73
50	10	20.61	3.59
55	12.8	17.94	3.45
60	15.6	15.65	3.3
65	18.3	13.68	3.15
70	21.1	11.99	2.99
75	23.9	10.53	2.83
80	26.7	9.27	2.67
85	29.4	8.17	2.52
90	32.2	7.23	2.36
95	35	6.40	2.21
100	37.8	5.68	2.07
105	40.6	5.06	1.93
110	43.3	4.51	1.79
115	46.1	4.03	1.67
120	48.9	3.61	1.55
125	51.7	3.23	1.43
130	54.4	2.90	1.32
135	57.2	2.61	1.22
140	60	2.35	1.13
145	62.8	2.12	1.04
150	65.6	1.91	0.96
155	68.3	1.73	0.88
160	71.1	1.57	0.82
165	73.9	1.42	0.75
170	76.7	1.28	0.68

Table 2: comparison table about temperature, resistance and voltage, it is suitable for T5/Tf sensor.

TEMP F	TEMP C	RESISTANCE kΩ	VOLTS DC
-5	-20.6	600.13	4.93
0	-17.8	505.55	4.92
5	-15	427.46	4.91
10	-12.2	362.74	4.89
15	-9.4	308.89	4.87
20	-6.7	265.40	4.85
25	-3.9	227.48	4.83
30	-1.1	195.60	4.8
35	1.7	168.71	4.77
40	4.4	146.70	4.74
45	7.2	127.26	4.7
50	10	110.71	4.66
55	12.8	96.57	4.61
60	15.6	84.47	4.56
65	18.3	74.41	4.51
70	21.1	65.41	4.45
75	23.9	57.63	4.39
80	26.7	50.90	4.32
85	29.4	45.26	4.24
90	32.2	40.15	4.16
95	35	35.70	4.08
100	37.8	31.81	3.99
105	40.6	28.40	3.89
110	43.3	25.51	3.8
115	46.1	22.86	3.7
120	48.9	20.53	3.59
125	51.7	18.47	3.48
130	54.4	16.71	3.37
135	57.2	15.09	3.26
140	60	13.64	3.14
145	62.8	12.36	3.03
150	65.6	11.21	2.91
155	68.3	10.23	2.8
160	71.1	9.31	2.68
165	73.9	8.49	2.56
170	76.7	7.75	2.45
175	79.4	7.11	2.34
180	82.2	6.50	2.23
185	85	5.96	2.13

190	87.8	5.47	2.02
195	90.6	5.03	1.92
200	93.3	4.65	1.83
205	96.1	4.28	1.73
210	98.9	3.95	1.64
215	101.7	3.65	1.56
220	104.4	3.38	1.48
225	107.2	3.13	1.4
230	110	2.90	1.32
235	112.8	2.69	1.25
240	115.6	2.50	1.18
245	118.3	2.33	1.12
250	121.1	2.17	1.06
255	123.9	2.02	1
260	126.7	1.89	0.95
265	129.4	1.77	0.9
270	132.2	1.65	0.85
275	135	1.54	0.8
280	137.8	1.45	0.76