40GJB / 40GJC / 40GJD / 40GJF
619KB / 619KC / 619KD / 619KF
High Wall, Ducted, Cassette and Floor Console Multi−Zone Indoor units
Sizes 09 to 24

Service Manual

TABLE OF CONTENTS

SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

Untrained personnel can perform basic maintenance functions such as cleaning coils. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature and on tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Keep quenching cloth and fire extinguisher nearby when brazing. Use care in handling, rigging, and setting bulky equipment.

Read this manual thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: DANGER, WARNING, and CAUTION.

These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage.

NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.

⚠ WARNING

EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury, and/or property damage.

Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Do not bury more than 36 in. (914 mm) of refrigerant pipe in the ground. If any section of pipe is buried, there must be a 6 in. (152 mm) vertical rise to the valve connections on the outdoor units. If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during extended periods of system shutdown. This causes refrigerant slugging and could possibly damage the compressor at start-up.

INTRODUCTION

This Service Manual provides the necessary information to service, repair, and maintain the 40GJ/619K family of heat pumps ; for service of the outdoor 38GJQ/538KR or the indoor 40GRQ/619FB, refer to the 38GJQ/538KR or 40GRQ/619FB service manual. Section 2 of this manual has an appendix with data required to perform troubleshooting. Use the Table of Contents to locate a desired topic.

MODEL / SERIAL NUMBER NOMENCLATURES

INDOOR UNIT

40 GJ Q B 09 D – – 3

40 = FAN COIL UNIT

GJ = CASSETTE, DUCTED, FLOOR CONSOLE, HIGHWALL

SYSTEM TYPE
Q = HEAT PUMP

B=ALL

NOMINAL CAPACITY
09 – 3/4TON
12 – 1TON
18 – 1– 1/2TONS
21 – 1– 3/4TONS
24 – 2TONS

NOT USED

INDOOR FAN COIL TYPE
B= HIGHWALL
H= HIGHWALL (WHITE COLOR 40GRQ)
C = CASSETTE
D = DUCTED
F = FLOOR CONSOLE

VOLTAGE
3 = 208/230–1–60

01 15 V 10001

Week of Manufacture

Year of Manufacture

V = ALL MODELS

Sequential Serial Number

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program For verification of certification for individual products, go to www.ahridirectory.org.

INDOOR UNIT

619 F E Q 009 B B GA

619 = FAN COIL UNIT

F/K = MODEL

VOLTAGE
E = 208–230/1/60

SYSTEM TYPE
Q = HEAT PUMP

NOMINAL CAPACITY
009 – 3/4TON
012 – 1TON
018 – 1–1/2TONS
021 – 1–3/4TONS
024 – 2TONS

GA = ALL MODELS

MAXIMUM NUMBER OF FAN COIL UNITS THAT CAN BE CONNECTED TO THE OUTDOOR UNIT
B=1:1

INDOOR FAN COIL TYPE
B = HIGHWALL
C = CASSETTE
D = DUCTED
F = FLOOR CONSOLE

STANDARD FEATURES AND ACCESSORIES

Table 1—Standard Features and Accessories

Ease of Installation	
Mounting Bracket	S
Low Voltage Controls	S
Comfort Features	
Microprocessor Control	S
Wired Remote Control for High Walls, Cassette and Floor Console	A
Wired Remote Control for Ducted	S
Wireless Remote Control	S
Rapid Cooling and Heating	S
Automatic Air Sweep	S
Cold Blow Prevention	S
Continuous Fan	S
Auto Restart Function	S
Auto Changeover	S
Follow Me	S
Energy Saving Features	
Inverter Driven Compressor	S
Sleep Mode	S
24 Hour Stop/Start Timer	S
46° F Heating Mode (Heating Setback)	S
Safety And Reliability	
Indoor Coil Freeze Protection	S
3 Minute Time Delay For Compressor	S
High Compressor Discharge Temperature	S
Low Voltage Protection	S
Compressor Overload Protection	S
Compressor Over Current Protection	S
IPM Module Protection	S
Ease of Service	
Cleanable Filters	S
Diagnostic	S
Error Messages Displayed On Front Panel	S
Application Flexibility	
Condensate Pumps For High Walls and Floor Console	A
Condensate Pump For Cassette and Ducted	S
Crankcase Heater	S
Base pan Heater	S

Legend
S Standard
A Accessory

INDOOR UNITS

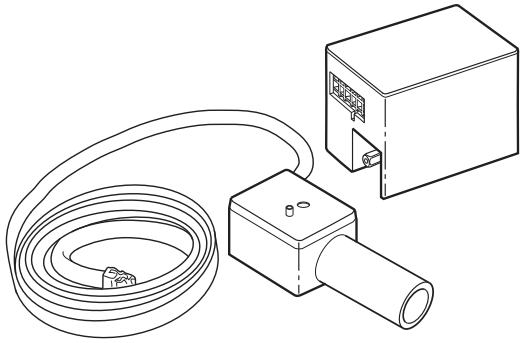


Fig. 1 – Condensate Pump Accessory

On high wall and floor console fan coils, the condensate pump accessory is recommended when adequate drain line pitch cannot be provided, or when the condensate must move up to exit.

The pump has a lift capability of 12 ft. (3.6 m) on the discharge side if the pump is mounted in the fan coil or 6 ft (1.8 m) on the suction side if the pump is remote mounted.

OUTDOOR UNITS

CRANKCASE HEATER

Standard on all unit sizes. Heater clamps around compressor oil stump.

COMBINATION TABLES

Table 2—Combination

Indoor Unit	Nominal Unit Btuh	Indoor Model Number	Indoor Model Number	Outdoor Model Number	Outdoor Model Number
High Wall (40GRQ/619FB)	9,000	40GRQB09B--3	619FEQ009BBGA	**38GJQC18---3 38GJQD24---3**	**538KEQ018RCGA 538KEQ024RDGA**
	12,000	40GRQB12B--3	619FEQ012BBGA		
	18,000	40GRQB18B--3	619FEQ018BBGA		
	9,000	40GRQB09H--3	619FEQ009HBGA		
	12,000	40GRQB12H--3	619FEQ012HBGA		
	18,000	40GRQB18H--3	619FEQ018HBGA		
High Wall (40GJB/619KB)	9,000	40GJQB09B--3	619KEQ009BBGA		
	12,000	40GJQB12B--3	619KEQ012BBGA		
	18,000	40GJQB18B--3	619KEQ018BBGA		
Cassette	12,000	40GJQB12C--3	619KEQ012CBGA		
	18,000	40GJQB18C--3	619KEQ018CBGA		
Ducted	9,000	40GJQB09D--3	619KEQ009DBGA		
	12,000	40GJQB12D--3	619KEQ012DBGA		
	18,000	40GJQB18D--3	619KEQ018DBGA		
Floor Console	9,000	40GJQB09F--3	619KEQ009FBGA		
	12,000	40GJQB12F--3	619KEQ012FBGA		
	18,000	40GJQB18F--3	619KEQ018FBGA		

Table 3—Combination

Indoor Unit	Nominal Unit Btuh	Indoor Model Number	Indoor Model Number	Outdoor Model Number	Outdoor Model Number
High Wall (40GRQ/619FB)	9,000	40GRQB09B--3	619FEQ009BBGA	38GJQF30---3 38GJQG36---3 38GJQG42---3	538KEQ030RFGA 538KEQ036RGGA 538KEQ042RGGA
	12,000	40GRQB12B--3	619FEQ012BBGA		
	18,000	40GRQB18B--3	619FEQ018BBGA		
	9,000	40GRQB09H--3	619FEQ009HBGA		
	12,000	40GRQB12H--3	619FEQ012HBGA		
	18,000	40GRQB18H--3	619FEQ018HBGA		
High Wall (40GJB/619KB)	9,000	40GJQB09B--3	619KEQ009BBGA		
	12,000	40GJQB12B--3	619KEQ012BBGA		
	18,000	40GJQB18B--3	619KEQ018BBGA		
	24,000	40GJQB24B--3	619KEQ024BBGA		
Cassette	12,000	40GJQB12C--3	619KEQ012CBGA		
	18,000	40GJQB18C--3	619KEQ018CBGA		
	24,000	40GJQB24C--3	619KEQ024CBGA		
Ducted	9,000	40GJQB09D--3	619KEQ009DBGA		
	12,000	40GJQB12D--3	619KEQ012DBGA		
	18,000	40GJQB18D--3	619KEQ018DBGA		
	21,000	40GJQB21D--3	619KEQ021DBGA		
	24,000	40GJQB24D--3	619KEQ024DBGA		
Floor Console	9,000	40GJQB09F--3	619KEQ009FBGA		
	12,000	40GJQB12F--3	619KEQ012FBGA		
	18,000	40GJQB18F--3	619KEQ018FBGA		

Table 4—Combination

Indoor Unit	Nominal Unit Btuh	Indoor Model Number	Indoor Model Number	Outdoor Model Number	Outdoor Model Number
High Wall (40GRQ/619FB)	9,000	40GRQB09B--3	619FEQ009BBGA	38GJQK48---3 38GJQL56---3	538KEQ048RKGA 538KEQ056RLGA
	12,000	40GRQB12B--3	619FEQ012BBGA		
	18,000	40GRQB18B--3	619FEQ018BBGA		
	9,000	40GRQB09H--3	619FEQ009HBGA		
	12,000	40GRQB12H--3	619FEQ012HBGA		
	18,000	40GRQB18H--3	619FEQ018HBGA		
High Wall (40GJB/619KB)	9,000	40GJQB09B--3	619KEQ009BBGA		
	12,000	40GJQB12B--3	619KEQ012BBGA		
	18,000	40GJQB18B--3	619KEQ018BBGA		
	24,000	40GJQB24B--3	619KEQ024BBGA		
Cassette	12,000	40GJQB12C--3	619KEQ012CBGA		
	18,000	40GJQB18C--3	619KEQ018CBGA		
	24,000	40GJQB24C--3	619KEQ024CBGA		
Ducted	9,000	40GJQB09D--3	619KEQ009DBGA		
	12,000	40GJQB12D--3	619KEQ012DBGA		
	18,000	40GJQB18D--3	619KEQ018DBGA		
	21,000	40GJQB21D--3	619KEQ021DBGA		
	24,000	40GJQB24D--3	619KEQ024DBGA		
Floor Console	9,000	40GJQB09F--3	619KEQ009FBGA		
	12,000	40GJQB12F--3	619KEQ012FBGA		
	18,000	40GJQB18F--3	619KEQ018FBGA		

PHYSICAL DATA - INDOOR

Table 5—Indoor High Wall (40GRQ/619FB)

	Size		9	12	18
Indoor High Wall 40GRQ/ 619FB	Model (White)		40GRQB09H--3 619FEQ009HBGA	40GRQB12H--3 619FEQ012HBGA	40GRQB18H--3 619FEQ018HBGA
	Model (Silver)		40GRQB09B--3 619FEQ009BBGA	40GRQB12B--3 619FEQ012BBGA	40GRQB18B--3 619FEQ018BBGA
	Unit Width	In.	37.8	37.8	37.8
	Unit Height	In.	12.6	12.6	12.6
	Unit Depth	In.	8.1	8.1	8.1
	Net Weight	Lbs.	30.9	30.9	30.9
	Pipe Connection Size - Liquid	In.	1/4"	1/4"	1/4"
	Pipe Connection Size - Suction	In.	1/2"	1/2"	5/8"
	Number of Fan Speeds		7	7	7
	Airflow (lowest to highest)	CFM	206/235/294/324/353/383/412	265/294/353/383/412/441/471	324/353/412/441/471/500/530
	Sound Pressure (lowest to highest)	dB(A)	22/24/26/30/34/38/41	23/25/27/31/35/39/42	26/28/31/35/39/43/48
	Wireless Remote Controller (°F/°C Convertible)		Standard		
	Wired Remote Controller (°F/°C Convertible)		Not Available		

Table 6—Indoor High Wall (40GJB/619KB)

	Size		9	12	18	24
Indoor High Wall 40GJB/ 619KB	Model		40GJQB09B--3 619KEQ009BBGA	40GJQB12B--3 619KEQ012BBGA	40GJQB18B--3 619KEQ018BBGA	40GJQB24B--3 619KEQ024BBGA
	Unit Width	In.	34.1	34.1	40.1	46.4
	Unit Height	In.	11.5	11.5	12.6	2.8
	Unit Depth	In.	8.2	8.2	9.1	10.4
	Net Weight	Lbs.	24.3	24.3	30.9	38.6
	Pipe Connection Size - Liquid	In.	1/4"	1/4"	1/4"	1/4"
	Pipe Connection Size - Suction	In.	1/2"	1/2"	5/8"	5/8"
	Number of Fan Speeds		7	7	7	7
	Airflow (lowest to highest)	CFM	224/241/271/312/359/394/430	224/241/271/312/659/394/453	282/330/371/418/465/512/589	294/353/412/471/530/588/647
	Sound Pressure (lowest to highest)	dB(A)	23/26/30/34/36/38/42	24/26/30/34/36/38/44	33/36/38/41/44/47/51	38/41/43/45/47/49/52
	Wireless Remote Controller (°F/°C Convertible)		Standard			
	Wired Remote Controller (°F/°C Convertible)		Optional			

Table 7—Indoor Cassette

	Size		12	18	24
Indoor Cassette	Model		40GJQB12C--3 619KEQ012CBGA	40GJQB18C--3 619KEQ018CBGA	40GJQB24C--3 619KEQ024CBGA
	Unit Width	In.	22.4	22.4	22.4
	Unit Height	In.	9.1	9.1	9.4
	Unit Depth	In.	22.4	22.4	33.1
	Net Weight	Lbs.	39.7	39.7	61.7
	Pipe Connection Size - Liquid	In.	1/4"	1/4"	3/8"
	Pipe Connection Size - Suction	In.	3/8"	1/2"	5/8"
	Number of Fan Speeds		3	3	3
	Airflow	CFM	265/294/353	265/294/353	500/ 559/694
	Sound Pressure (lowest to highest)	dB(A)	42/44/46	42/44/46	35/37/39
	Wireless Remote Controller (°F/°C Convertible)		Standard		
	Wired Remote Controller (°F/°C Convertible)		Standard		

Table 8—Indoor Ducted

	Size		9	12	18	21	24
Indoor Ducted	Model		40GJQB09D--3 619KEQ009DBGA	40GJQB12D--3 619KEQ012DBGA	40GJQB18D--3 619KEQ018DBGA	40GJQB21D--3 619KEQ021DBGA	40GJQB24D--3 619KEQ024DBGA
	Unit Width	In.	24.2	24.2	24.2	24.2	24.2
	Unit Height	In.	7.9	7.9	7.9	7.9	7.9
	Unit Depth	In.	27.6	27.6	35.4	43.3	43.3
	Net Weight	Lbs.	48.5	50.7	59.5	68.3	68.3
	Pipe Connection Size - Liquid	In.	1/4"	1/4"	1/4"	3/8"	3/8"
	Pipe Connection Size - Suction	In.	3/8"	3/8"	1/2"	5/8"	5/8"
	Number of Fan Speeds		3	3	3	3	3
	Airflow (lowest to highest)	CFM	147/176/264	176/235/323	294/353/411	323/441/588	323/441/588
	Sound Pressure (lowest to highest)	dB(A)	31/34/37	32/35/39	33/37/41	34/38/42	34/38/42
	Max Static Pressure	In.WG.	0.04	0.04	0.04	0.06	0.06
	Wireless Remote Controller (°F/°C Convertible)		Standard				
	Wired Remote Controller (°F/°C Convertible)		Standard				

Table 9—Indoor Floor Console

	Size		9	12	18
Indoor Floor Console	Model		40GJQB09F--3 619KEQ009FBGA	40GJQB12F--3 619KEQ012FBGA	40GJQB18F--3 619KEQ018FBGA
	Unit Width	In.	8.5	8.5	8.5
	Unit Height	In.	23.6	23.6	23.6
	Unit Depth	In.	27.6	27.6	27.6
	Net Weight	Lbs.	33.1	33.1	33.1
	Pipe Connection Size - Liquid	In.	1/4"	1/4"	1/4"
	Pipe Connection Size - Suction	In.	3/8"	3/8"	1/2"
	Number of Fan Speeds		7	7	7
	Airflow (lowest to highest)	CFM	188/217/253/282/311/ 329/ 382	205/ 264/294/ 323/353/ 382/441	241/311/ 341/ 382/ 423/470/ 494
	Sound Pressure (lowest to highest)	dB(A)	25/ 26/ 30/ 33/ 36/ 38/ 40	27/ 32/ 35/ 37/ 38/ 40/43	33/ 35/ 37/ 41/ 44/ 46/ 48
	Wireless Remote Controller (°F/°C Convertible)		Standard		
	Wired Remote Controller (°F/°C Convertible)		Not Available		

DIMENSIONS - INDOOR

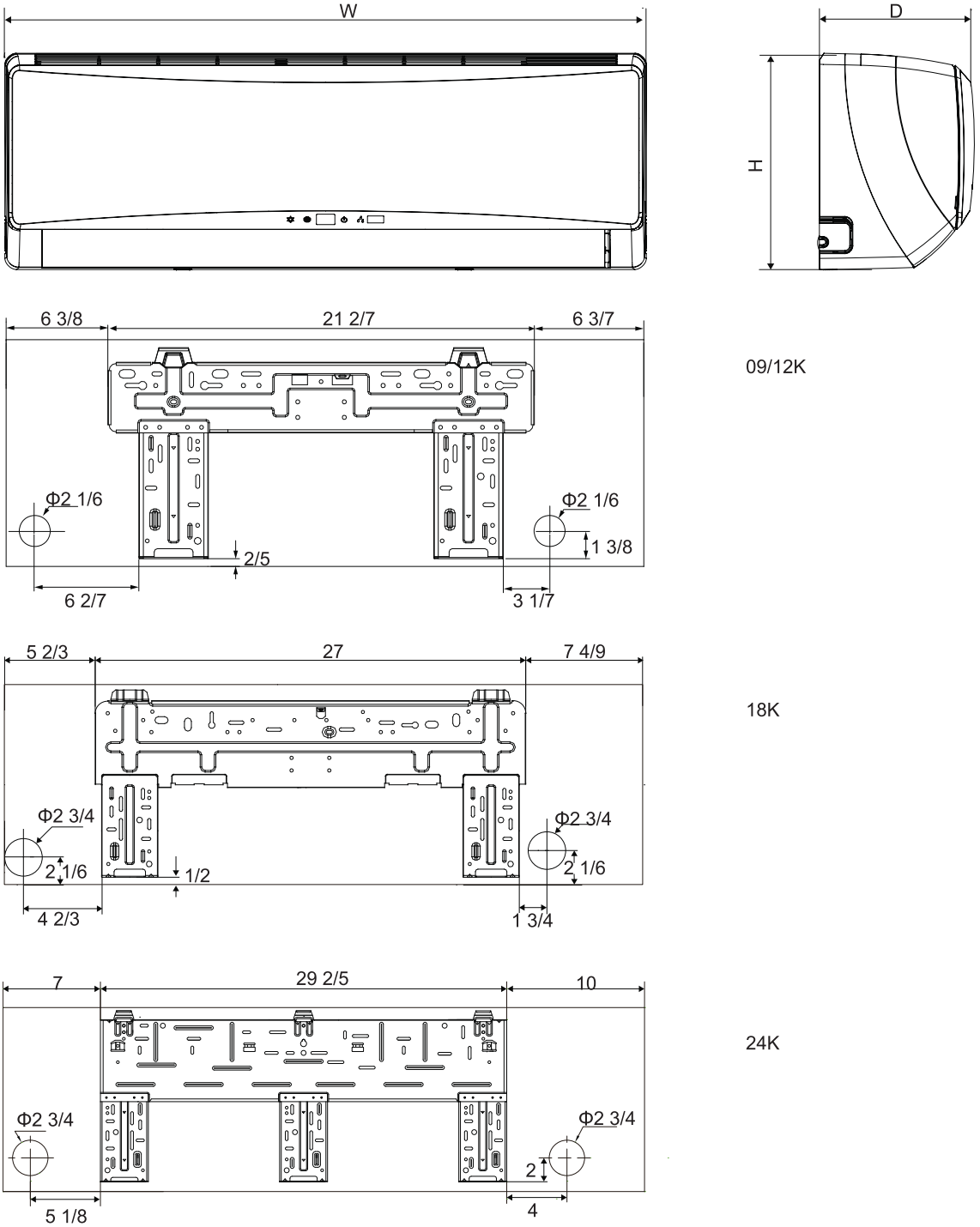


Fig. 2 – 40GJB/619KB High Wall Dimensions

Table 10—40GJB/619KB High Wall

	Dimensions In. (mm)			Operating Weight Lbs. (kg)
Unit Size	**W**	**D**	**H**	
9K	34.1 (866)	8.2 (209)	11.5 (292)	24.3 (11)
12K	34.1 (866)	8.2 (209)	11.5 (292)	24.3 (11)
18K	40.1 (1018)	9.1 (230)	12.6 (320)	30.9 (14)
24K	46.4 (1178)	10.4 (264)	12.8 (325)	38.6 (17.5)

DIMENSIONS - INDOOR (CONTINUED)

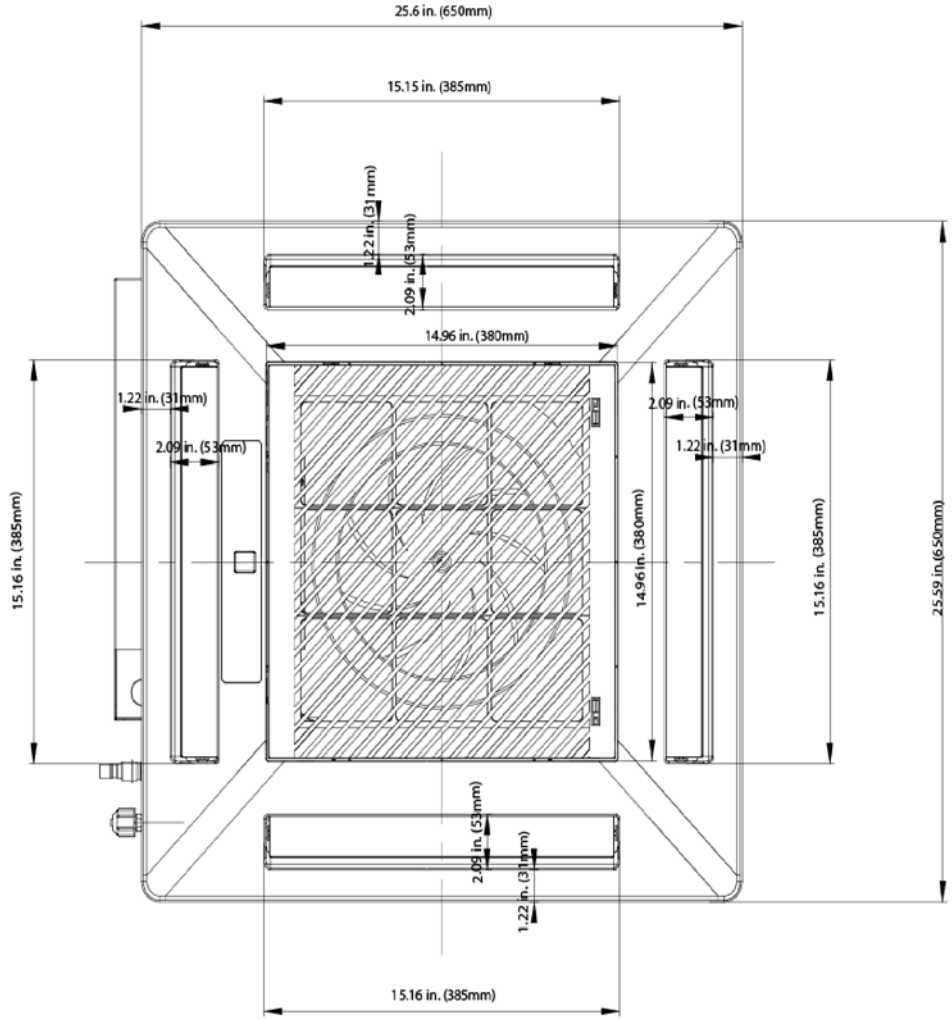


Fig. 3 – Cassette Grill Dimensions

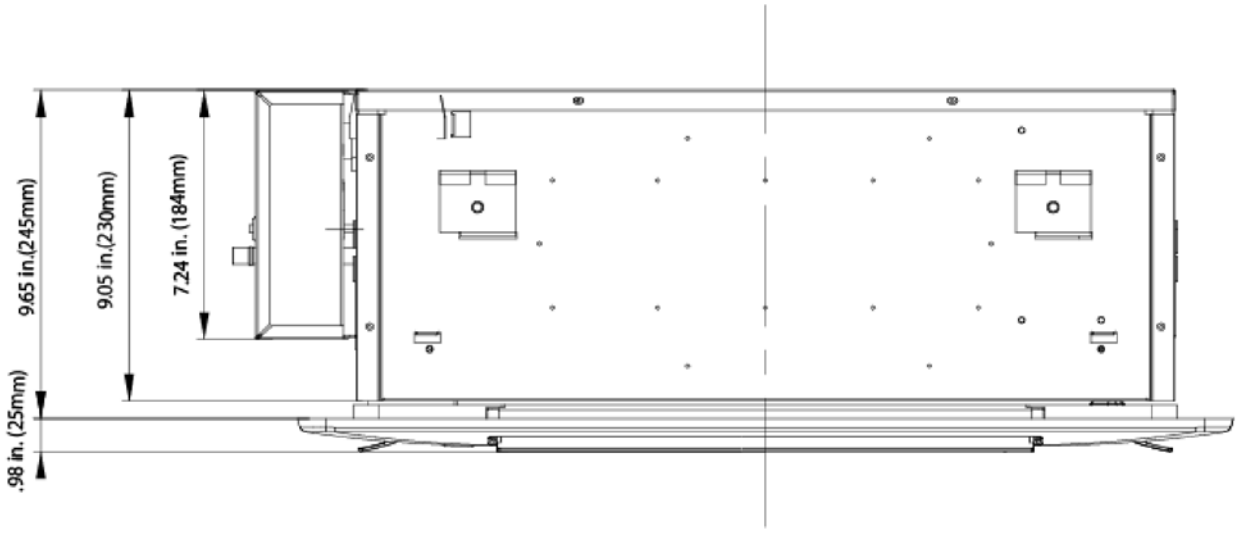


Fig. 4 – Cassette Side View Dimensions

DIMENSIONS - INDOOR (CONTINUED)

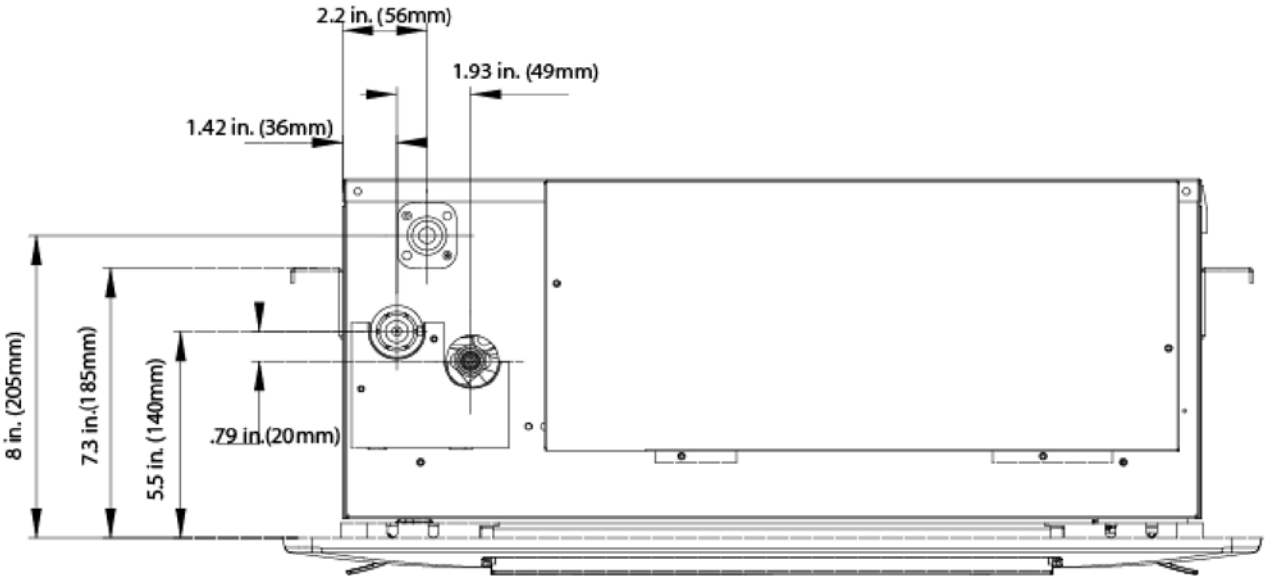


Fig. 5 – Cassette Connection Side View Dimensions

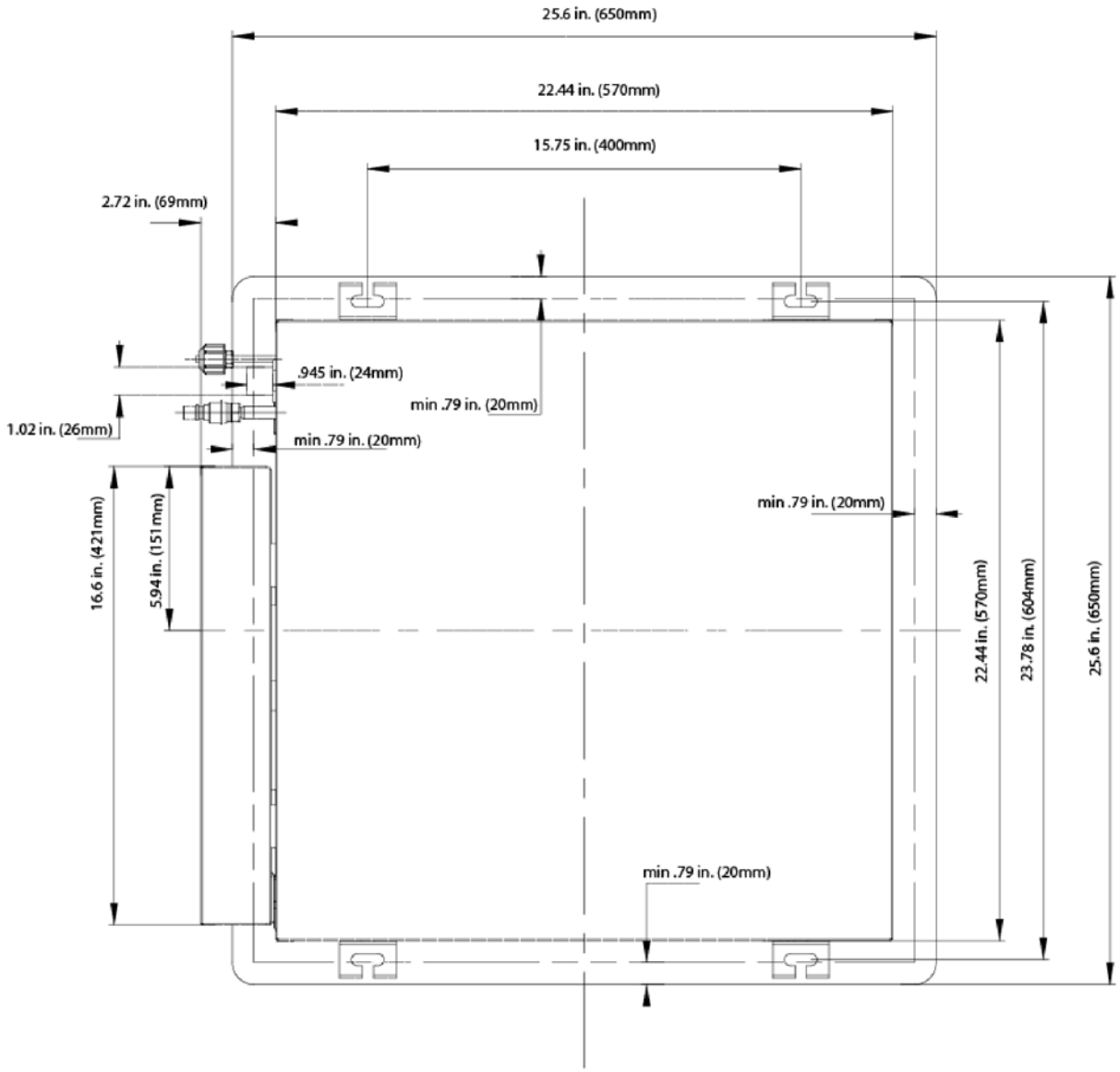


Fig. 6 – Cassette Top View Dimensions

DIMENSIONS - INDOOR (CONTINUED)

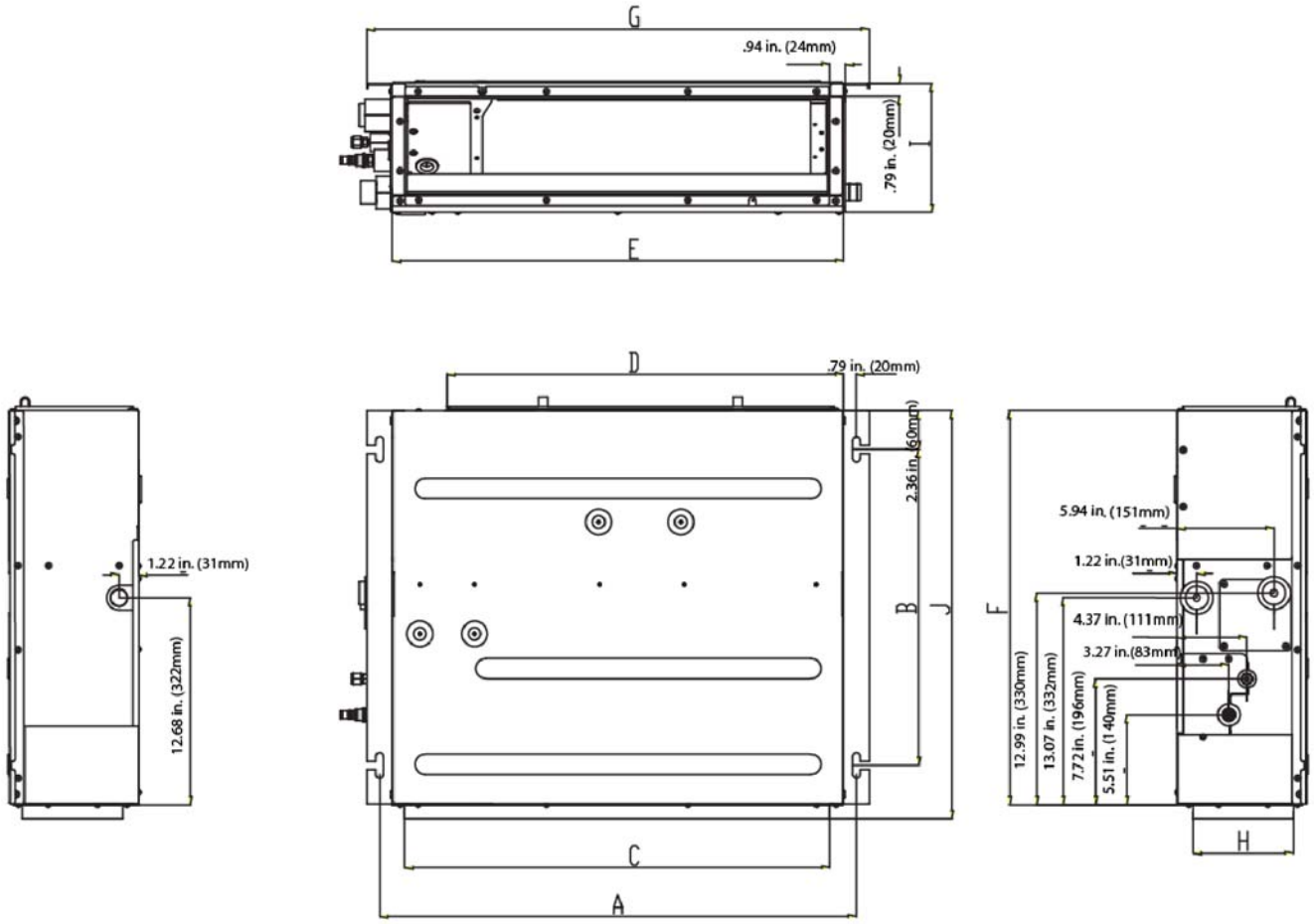


Fig. 7 – Ducted Dimensions

Table 11—Dimensions

	Dimensions In. (mm)										Operating Weight Lbs. (kg)
Unit Size	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	
9K	29.2 (742)	19.3 (491)	26.1 (662)	24.4 (620)	27.6 (700)	24.2 (615)	30.8 (782)	6.1 (156)	7.9 (200)	25 (635)	48.5 (22)
12K	29.2 (742)	19.3 (491)	26.1 (662)	24.4 (620)	27.6 (700)	24.2 (615)	30.8 (782)	6.1 (156)	7.9 (200)	25 (635)	50.7 (23)
18K	37.1 (942)	19.3 (491)	33.9 (862)	32.3 (820)	35.4 (900)	24.2 (615)	38.7 (982)	6.1 (156)	7.9 (200)	25 (635)	59.5 (27)
21K	45 (1142)	19.3 (491)	41.8 (1062)	40.2 (1020)	43.3 (1100)	24.2 (615)	46.5 (1182)	6.1 (156)	7.9 (200)	25 (635)	68.3 (31)
24K	45 (1142)	19.3 (491)	41.8 (1062)	40.2 (1020)	43.3 (1100)	24.2 (615)	46.5 (1182)	6.1 (156)	7.9 (200)	25 (635)	68.3 (31)

DIMENSIONS - INDOOR (CONTINUED)

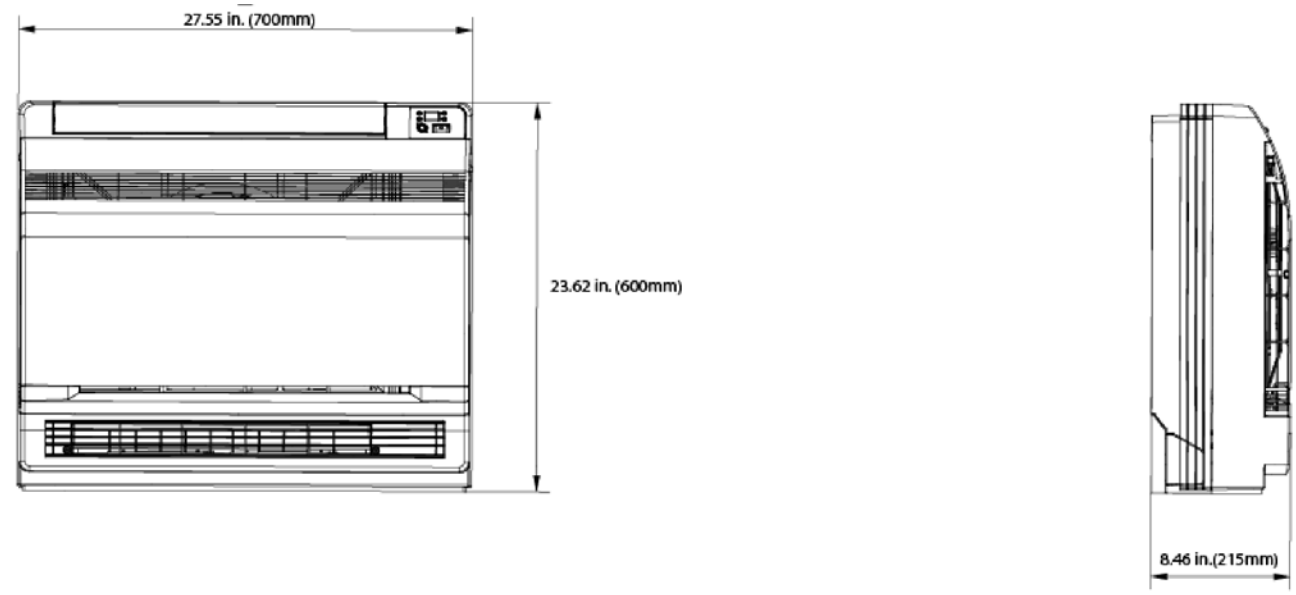


Fig. 8 – Floor Console Dimensions

CLEARANCES - INDOOR

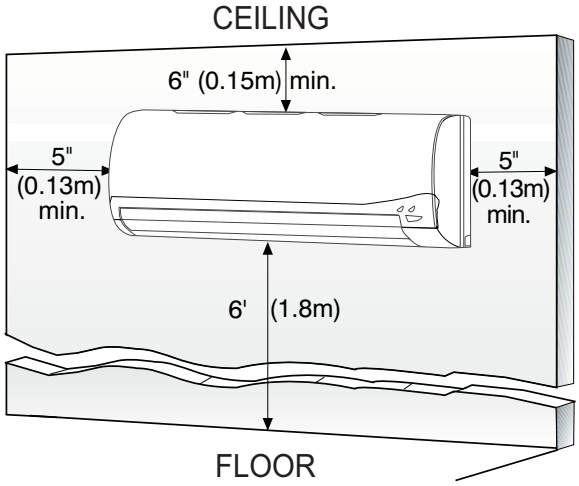


Fig. 9 – 40GRQ/619FB and 40GJB/619KB High Wall Clearance

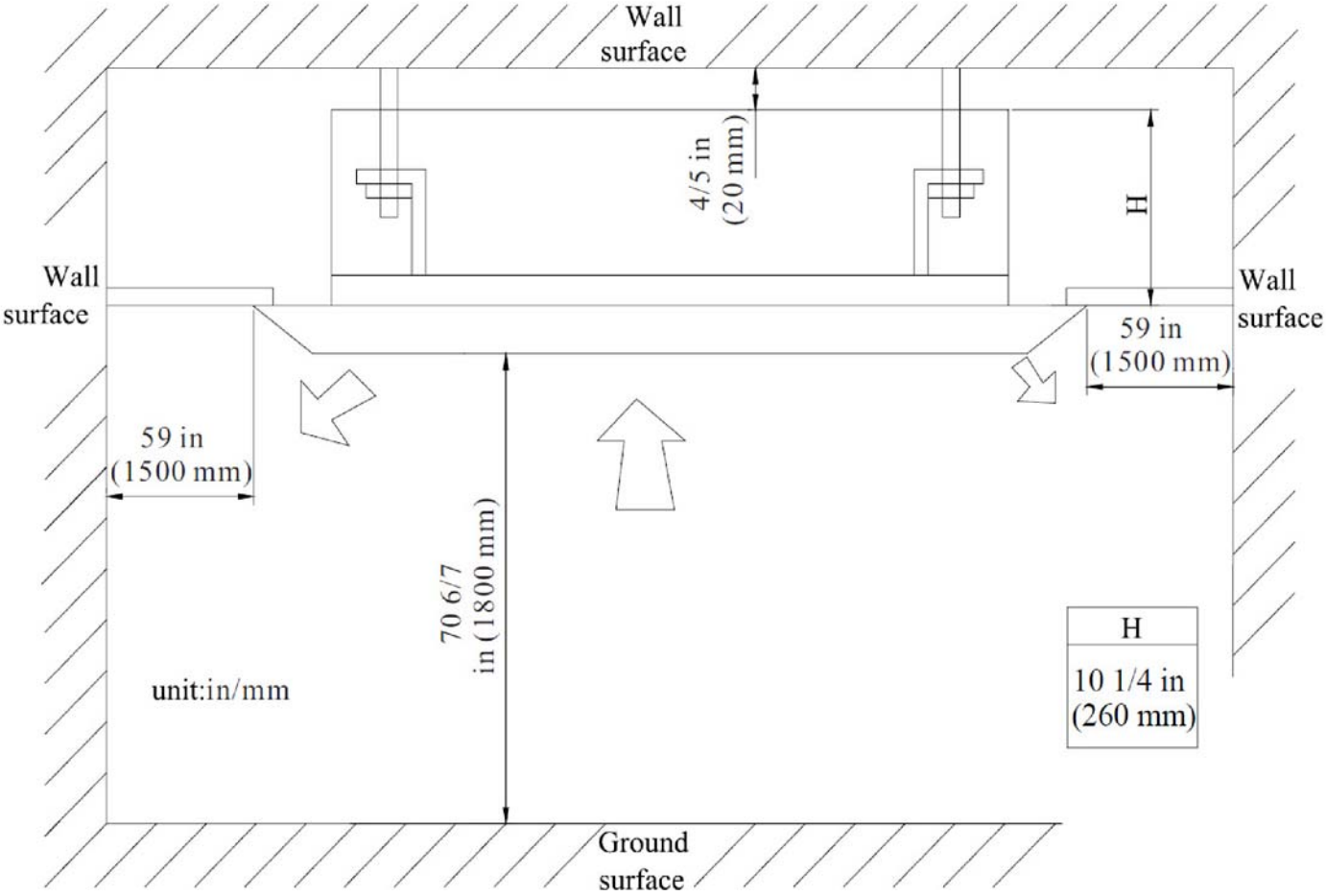


Fig. 10 – Cassette Clearance

CLEARANCES - INDOOR (CONTINUED)

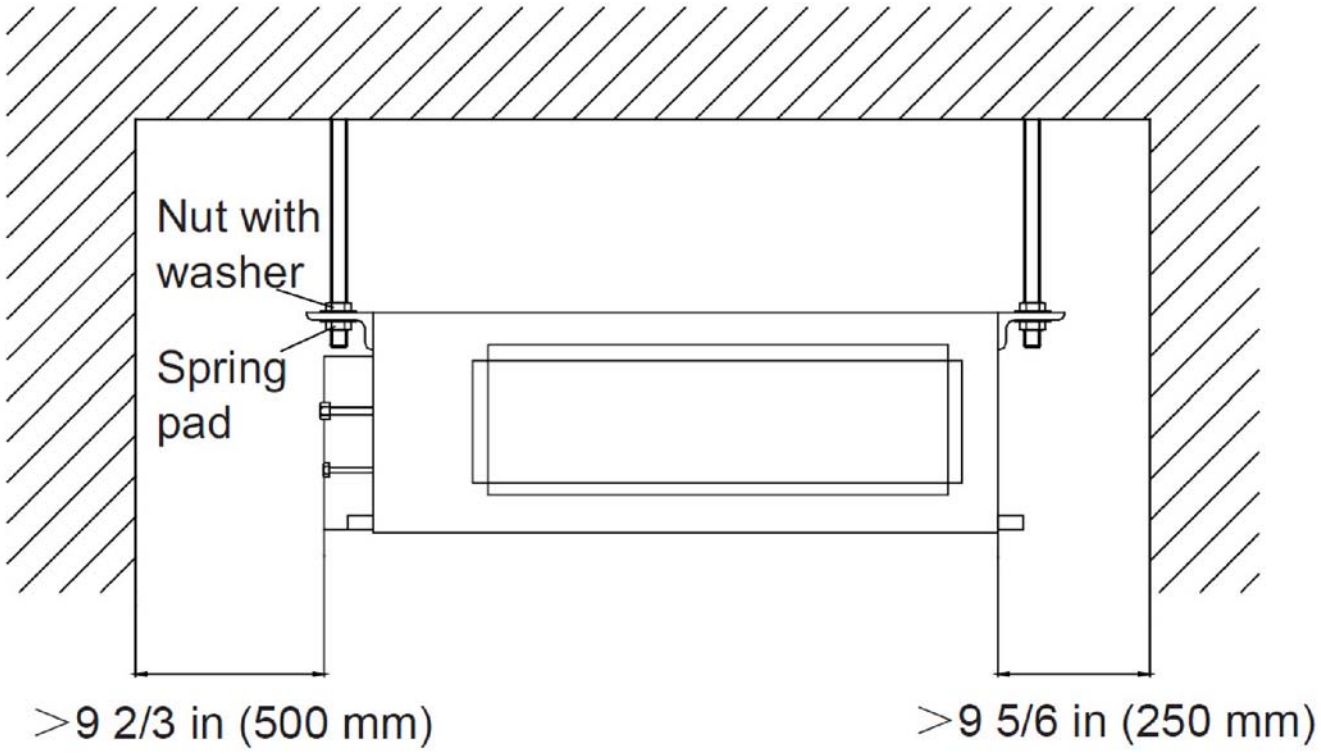


Fig. 11 – Ducted Clearance

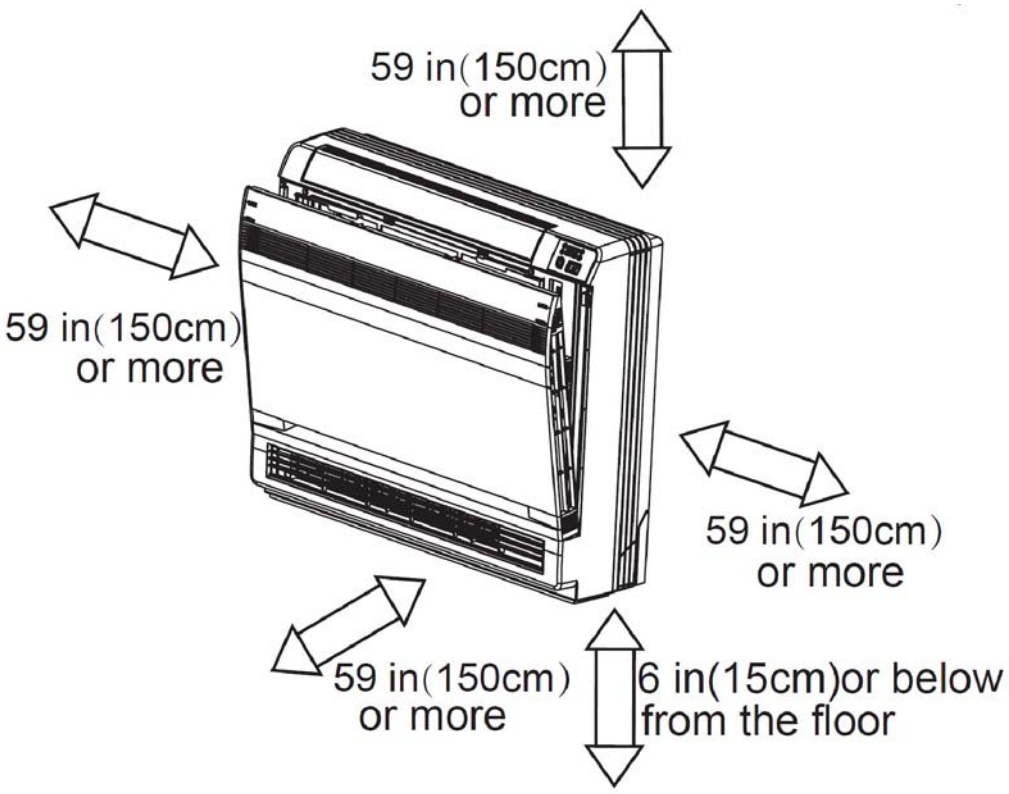


Fig. 12 – Floor Console Clearance

ELECTRICAL DATA

Table 12—40GRQ/619FB High Wall

UNIT SIZE	SYSTEM VOLTAGE	OPERATING VOLTAGE	INDOOR FAN			
	VOLT / PHASE / HZ	MAX / MIN	V-PH-HZ	FLA	HP	W
9	208-230/1/60	253 / 187	208-230/1/60	0.1	0.0268	20
12				0.1	0.0268	20
18				0.1	0.0268	20

Table 13—40GJB/619KB High Wall

UNIT SIZE	System Voltage	OPERATING VOLTAGE	INDOOR FAN			
	VOLT / PHASE / HZ	MAX / MIN	V-PH-HZ	FLA	HP	W
9	208-230/1/60	253 / 187	208-230/1/60	0.17	1/72	10
12				0.17	1/72	10
18				0.3	1/29	25
24				0.38	1/10	70

Table 14—Cassette

UNIT SIZE	System Voltage	OPERATING VOLTAGE	INDOOR FAN			
	VOLT / PHASE / HZ	MAX / MIN	V-PH-HZ	FLA	HP	W
12	208-230/1/60	253 / 187	208-230/1/60	0.18	1/72	46
18				0.18	1/72	46
24				0.43	1/20	46

Table 15—Ducted

UNIT SIZE	System Voltage	OPERATING VOLTAGE	INDOOR FAN			
	VOLT / PHASE / HZ	MAX / MIN	V-PH-HZ	FLA	HP	W
9	208-230/1/60	253 / 187	208-230/1/60	0.28	1/24	80
12				0.31	1/18	80
18				0.41	1/12	100
21				0.5	1/36'	124
24				0.5	1/36'	124

Table 16—Floor Console

UNIT SIZE	System Voltage	OPERATING VOLTAGE	INDOOR FAN			
	VOLT / PHASE / HZ	MAX / MIN	V-PH-HZ	FLA	HP	W
9	208-230/1/60	253 / 187	208-230/1/60	0.14	1/24	30
12				0.14	1/24	30
18				0.14	1/24	30

*Permissible limits of the voltage range at which the unit will operate satisfactorily.

LEGEND

FLA – Full Load Amps

MCA – Minimum Circuit Amps

RLA – Rated Load Amps

WIRING

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

- Wires should be sized based on NEC and local codes.
- Use copper conductors only with a minimum 300 volt . rating and 2/64 inch thick insulation.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

- Be sure to comply with local codes while running wire from indoor unit to outdoor unit.
- Every wire must be connected firmly. Loose wiring may cause terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, be sure all wiring is tightly connected.
- No wire should be allowed to touch refrigerant tubing, compressor or any moving parts.
- Disconnecting means must be provided and shall be located within sight and readily accessible from the air conditioner.
- Connecting cable with conduit shall be routed through hole in the conduit panel.

All wires must be sized per NEC (National Electrical Code) or CEC (Canadian Electrical Code) and local codes. Use Electrical Data table MCA (minimum circuit amps) and MOCP (maximum over current protection) to correctly size the wires and the disconnect fuse or breakers respectively.

Per caution note, only copper conductors with a minimum 300 volt rating and 2/64-inch thick insulation must be used. The use of BX cable is not recommended.

SIZES 18-42

Recommended Connection Method for Power and Communication -Wiring - Power and Communication Wiring:

The main power is supplied to the outdoor unit. The field supplied 14/3 power/communication wiring from the outdoor unit to indoor unit consists of four (4) wires and provides the power for the indoor unit. Two wires are high voltage AC power; one is communication wiring and the other is a ground wire.

Recommended Connection Method for Power and Communication Wiring (To minimize communication wiring interference)

Power Wiring:

The main power is supplied to the outdoor unit. The field supplied power wiring from the outdoor unit to indoor unit consists of three (3) wires and provides the power for the indoor unit. Two wires are high voltage AC power and one is a ground wire. To minimize voltage drop, the factory recommended wire size is 14/3 stranded with a ground.

Communication Wiring:

A separate shielded copper conductor, with a minimum 300 volt rating and 2/64-inch thick insulation, must be used as the communication wire from the outdoor unit to the indoor unit.
Please use a separate shielded 16GA stranded control wire.

FOR SIZES 48-56

Recommended Connection Method for Power and Communication -Wiring - Power and Communication Wiring:
Power Wiring OUTDOOR UNIT& BRANCH BOXES:

Separate power supplies are required for the outdoor unit and the Branch Boxes. The indoor units are powered from the Branch Boxes.
The field supplied 14/3 power wiring from the **OUTDOOR UNIT** consists of three (3) wires. Two wires are high voltage AC power, one is a ground wire.
The field supplied 14/3 power wiring from the **BRANCH BOXES** consists of three (3) wires. Two wires are high voltage AC power, one is a ground wire.
Up to three (3) Branch Boxes can be powered from the same 15 amp breaker.

Communication Wiring:

A separate shielded copper conductor only, with a minimum 300 volt rating and 2/64-inch thick insulation, must be used as the communication wire from the **OUTDOOR UNIT** to the **BRANCH BOX**.
Please use a separate shielded 16GA stranded control wire.
Power and Communication Wiring BRANCH BOXES to INDOOR UNITS:
The field supplied 14/3 power/communication wiring from the **BRANCH BOX** to the **INDOOR UNIT** consists of four (4) wires and provides the power for the indoor unit. Two wires are high voltage AC power, one is communication wiring "2" and the other is a ground wire "N(1)"
See diagram below for details on wiring for sizes 48-56.

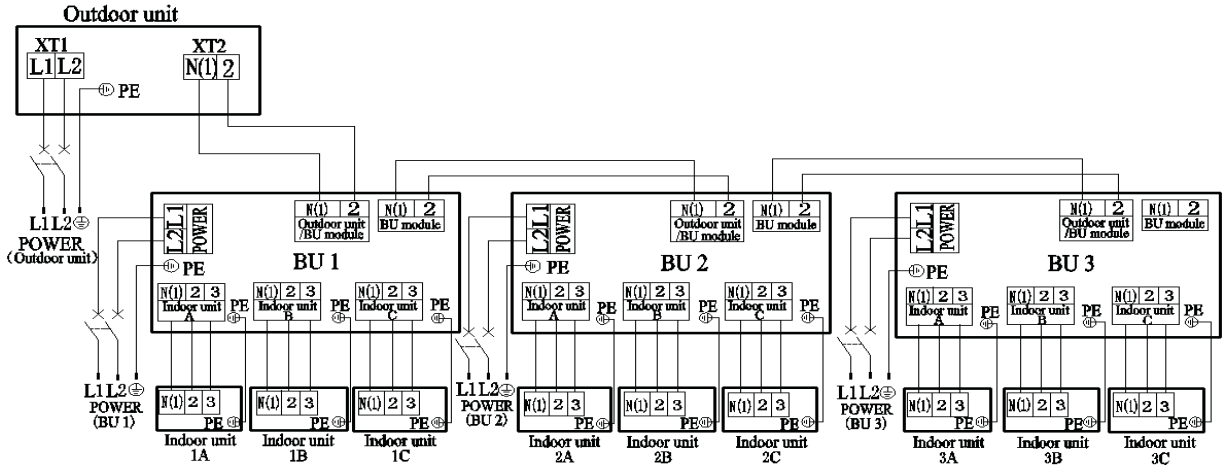


Fig. 13 – Wiring Connection

WIRING DIAGRAMS

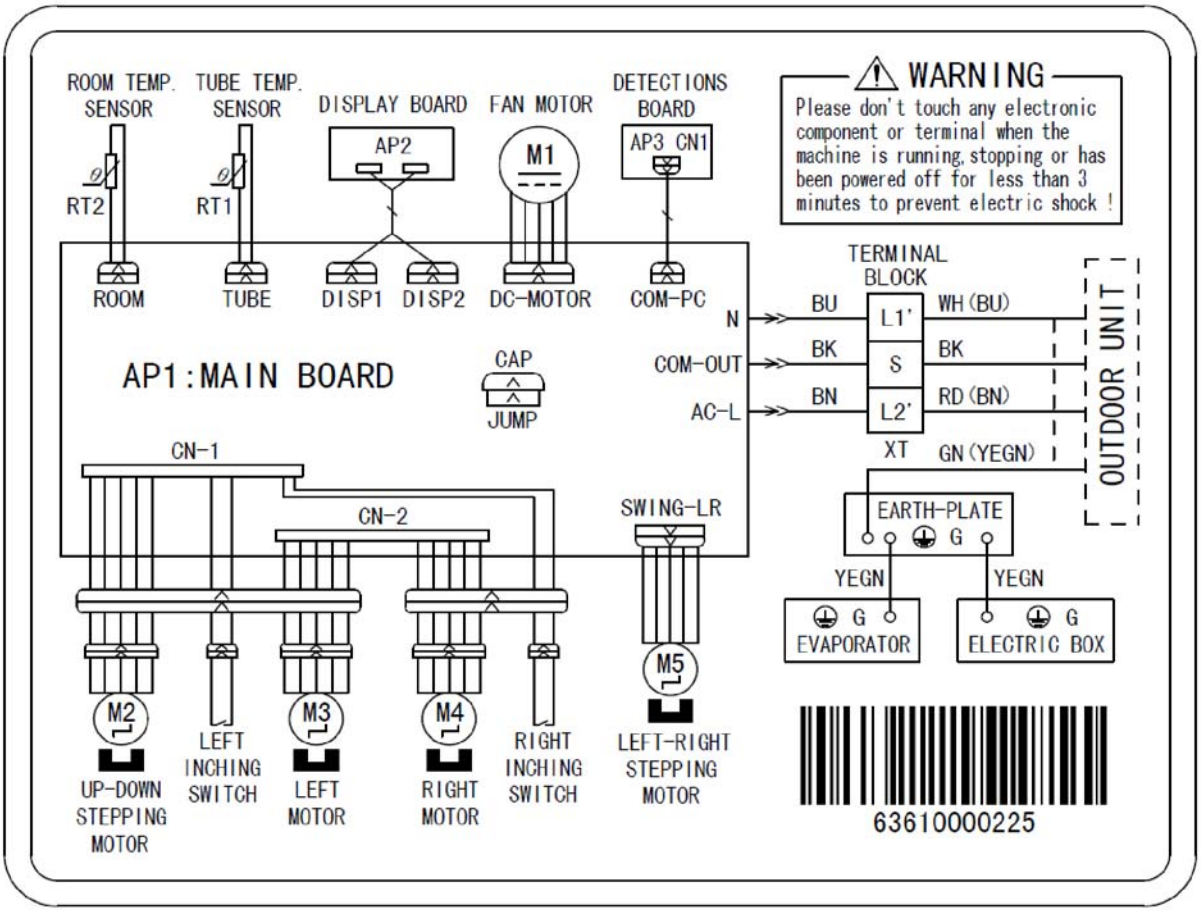


Fig. 14 – Wiring Diagrams 40GRQ/619FB High Wall 9k, 12k and 18k

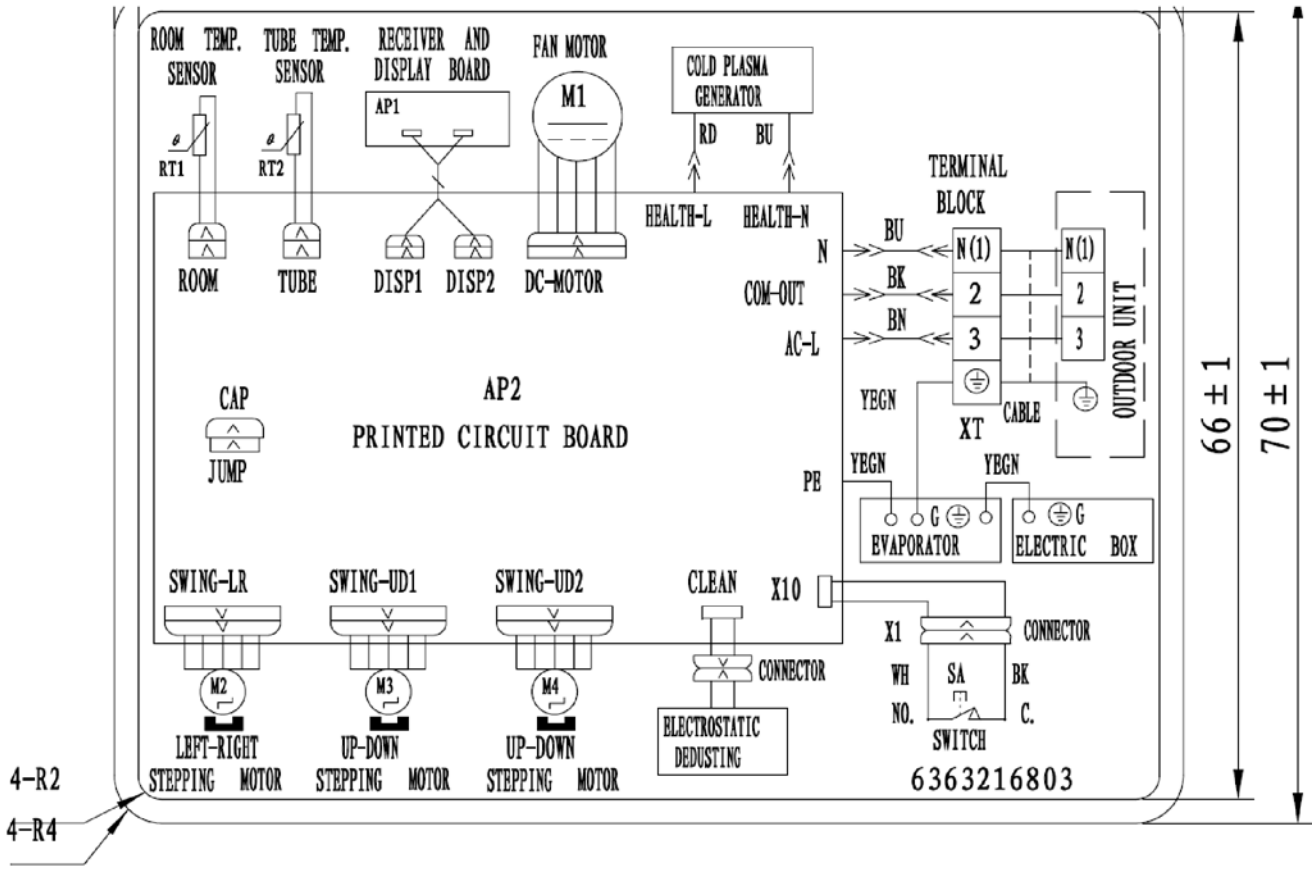


Fig. 15 – Wiring Diagrams 40GJB/619KB High Wall 9k, 12k, 18k and 24k

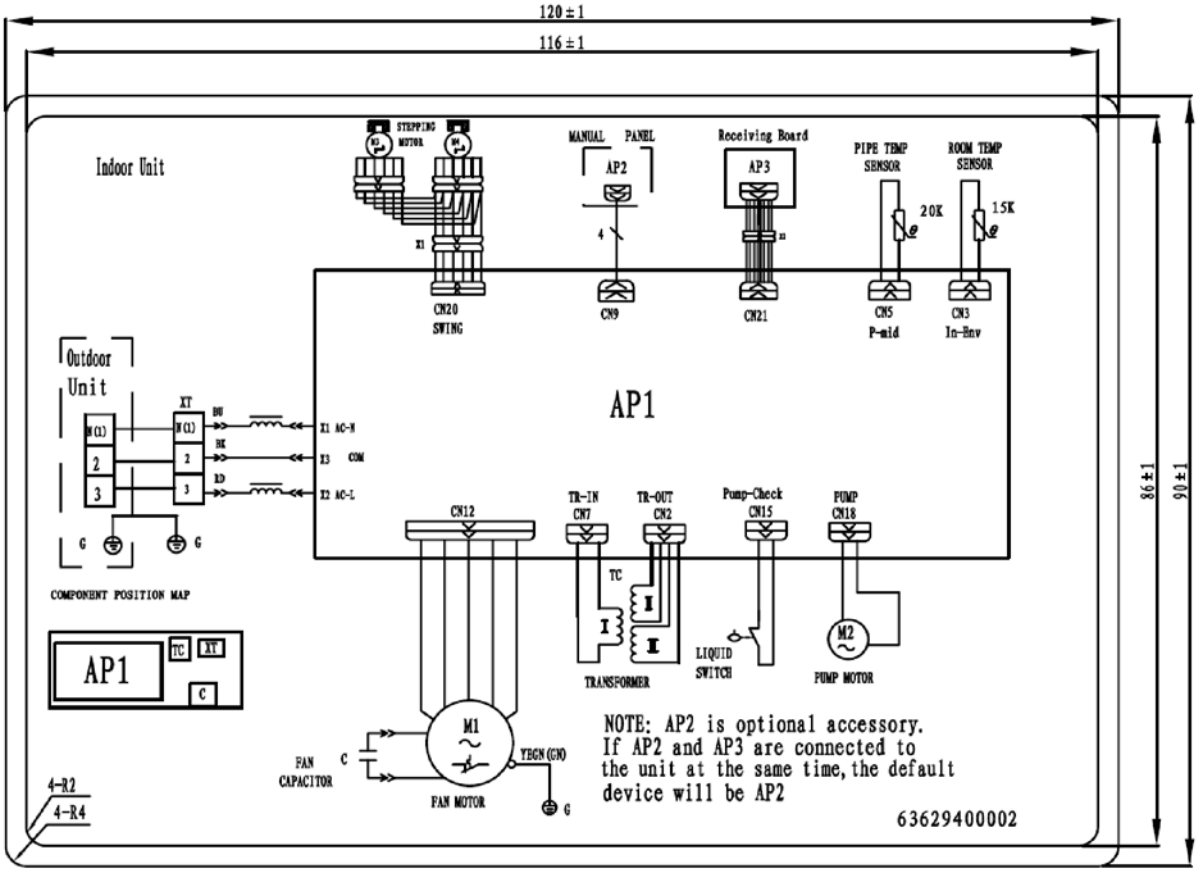


Fig. 16 – Wiring Diagram Cassette 12k, 18k

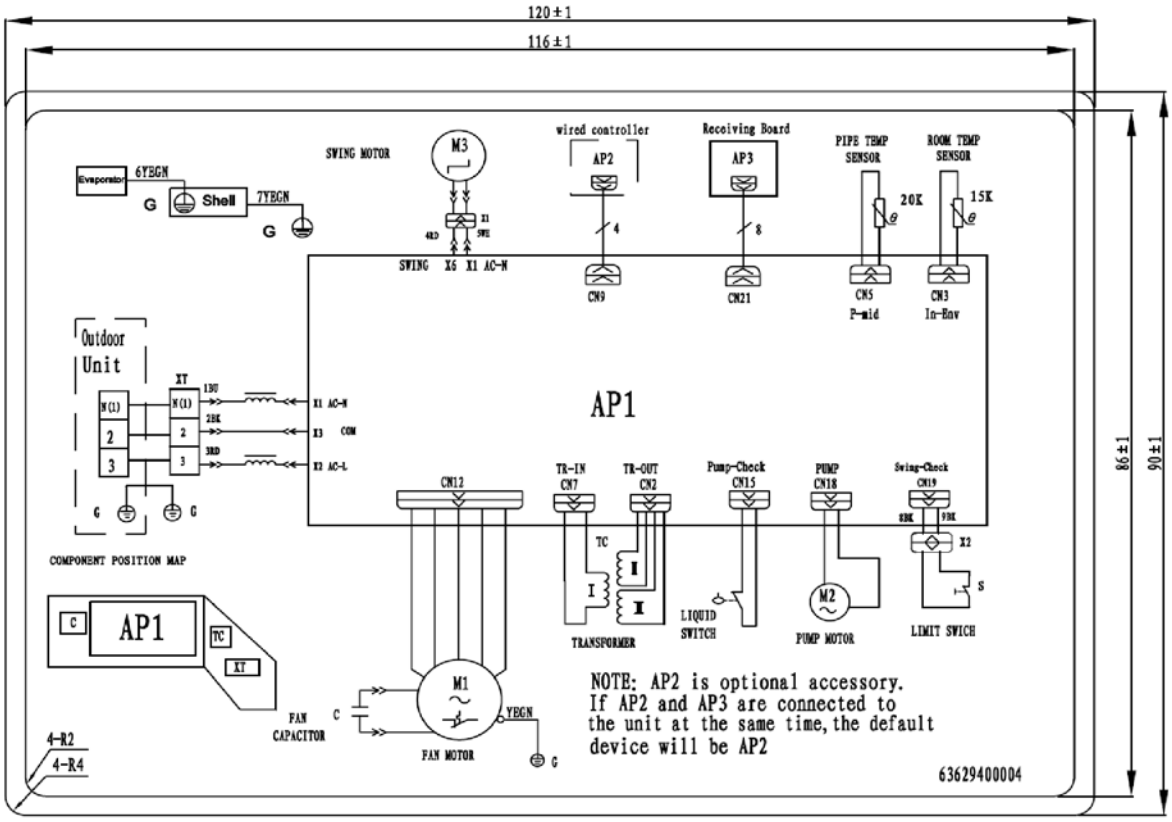


Fig. 17 – Wiring Diagram Cassette 24k

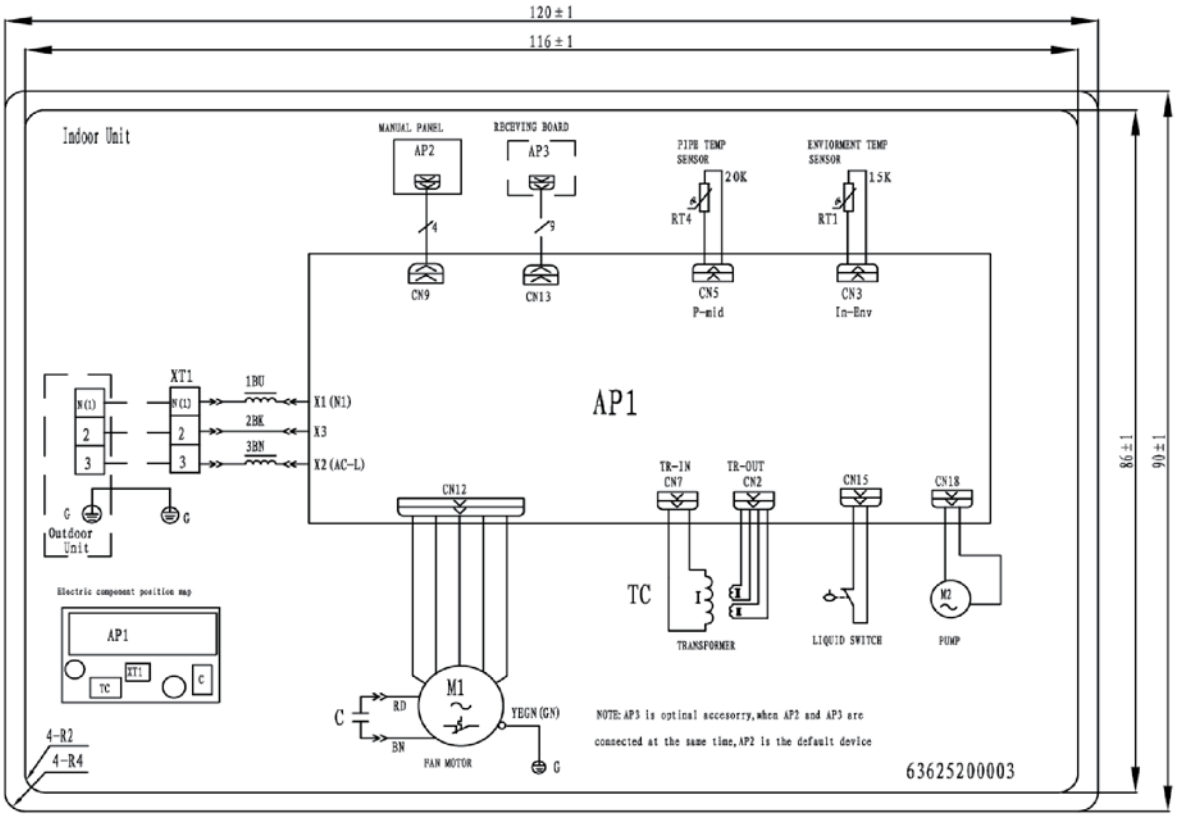


Fig. 18 – Wiring Diagram Ducted 9k, 12k, 18, 21k and 24k

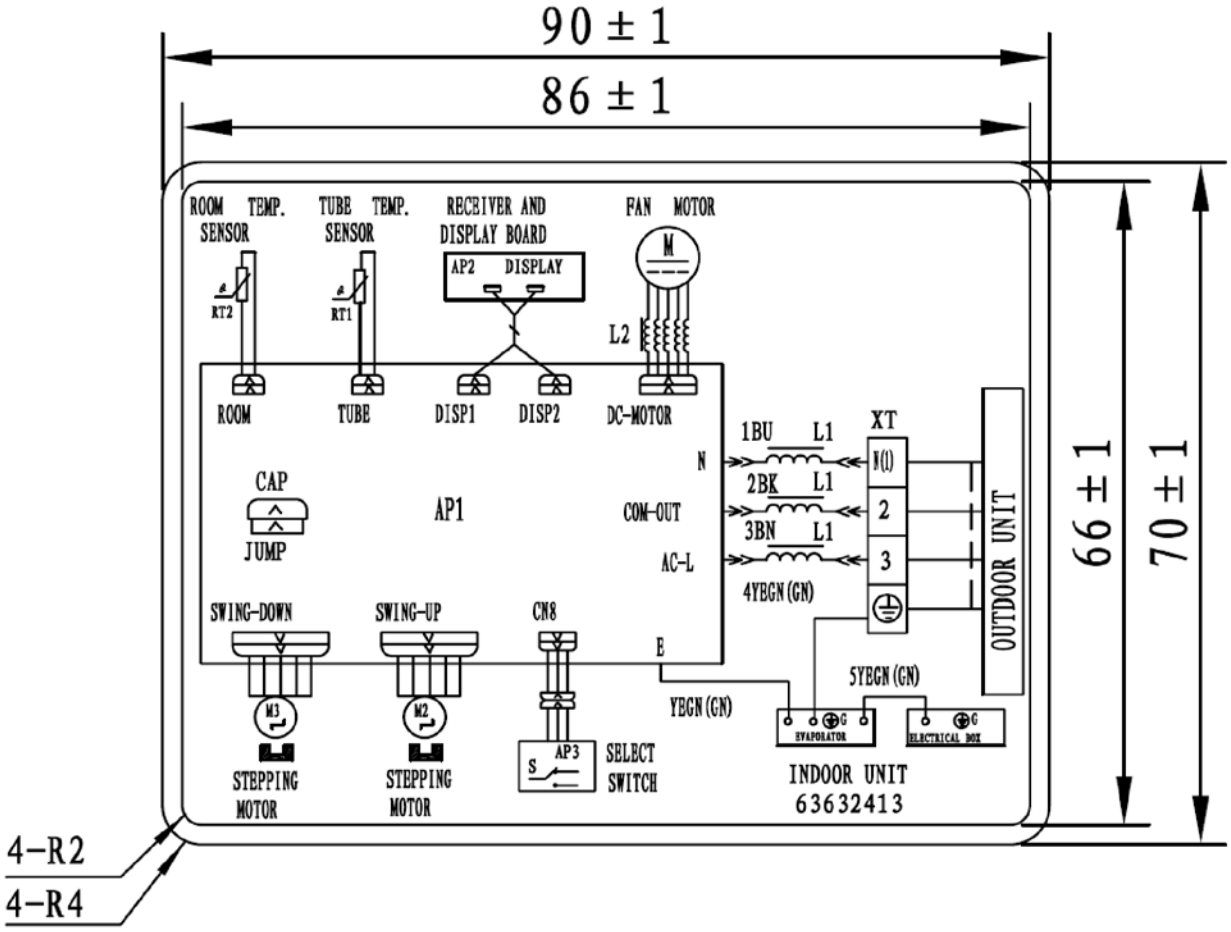


Fig. 19 – Wiring Diagrams Floor Console 9k, 12k and 18k

FAN AND MOTOR SPECIFICATIONS

Table 17—40GRQ/619FB High Wall

System size			9	12	18
Voltage			208/230-1-60	208/230-1-60	208/230-1-60
Indoor fan	Type		Cross-flow	Cross-flow	Cross-flow
	Diameter	in	4 1/5	4 1/5	4 1/5
	Height	in	27 1/2	27 1/2	27 1/2
Indoor fan motor	Type		DC	DC	DC
	Phase		3	3	3
	FLA		0.1	0.1	0.1
	Insulation class		Class E	Class E	Class E
	Safe class		IP20	IP20	IP20
	Output	W	20	20	20
	Rated current	Amps	0.1	0.1	0.1
	Rated HP	HP	0.0268	0.0268	0.0268
	Speed	rev/min			
	Rated RPM	rev/min	1250	1250	1250

Table 18—40GJB/619KB High Wall

System size			9	12	18	24
Voltage			208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
Indoor fan	Type		Cross-Flow	Cross-Flow	Cross-Flow	Cross-Flow
	Diameter	in	3.85	3.85	3-15/16	4 1/6
	Height	in	26-1/16	26-1/16	30.12	35
Indoor fan motor	Type		Direct Drive	Direct Drive	Direct Drive	Direct Drive
	Phase		1	1	1	1
	FLA		0.17	0.17	0.3	0.38
	Insulation class		E	E	E	E
	Safe class		IP41	IP41	IP41	IP20
	Output	W	10	10	25	70
	Rated current	Amps	0.07	0.07	0.1	0.28
	Rated HP	HP	1/72	1/72	1/29	1/10
	Speed	rev/min	1400	1400	1350	1500
	Rated RPM	rev/min	1400	1400	1350	1500

Table 19—Cassette

System size			12	18	24
Voltage			208/230-1-60	208/230-1-60	208/230-1-60
Outdoor Fan	Type		Centrifugal	Axial-flow	Centrifugal
	Diameter	in	11.1	11.1	17.7
	Height	in	5.8	5.8	4.4
Indoor fan motor	Model				
	Type		Direct Drive	Direct Drive	Direct Drive
	Phase		1	1	1
	FLA		.18	.18	.43
	Insulation class		B	B	B
	Safe class		IP20	IP20	IP20
	Input	W	50	50	100
	Output	W	11	11	35
	Rated current	Amps	.23	.23	.43
	Capacitor	µF	1	1	3
	Rated HP	HP	1/72	1/72	1/20
	Speed	rev/min	845	845	620
	Rated RPM	rev/min	845	845	620

FAN AND MOTOR SPECIFICATIONS (CONT)

Table 20—Ducted

System size			9	12	18	21	24
Voltage			**208/230-1-60**	**208/230-1-60**	**208/230-1-60**	**208/230-1-60**	**208/230-1-60**
Indoor fan	Type		Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
	Diameter	in	5.49	5.49	5.49	5.49	5.49
	Height	in	5.3	5.3	5.3	5.3	5.3
Indoor fan motor	Type		Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
	Phase		1	1	1	1	1
	FLA		0.28	0.31	0.41	0.5	0.5
	Insulation class		B	B	B	B	B
	Safe class		IP20	IP20	IP20	IP20	IP20
	Input	W	80	80	100	124	124
	Output	W	30	40	60	20	20
	Rated current	Amps	0.35	0.35	0.43	0.54	0.54
	Capacitor	µF	1.5	3	3	3	3
	Rated HP	HP	1/24	1/18	1/12	1/36	1/36
	Speed	rev/min	970	960	920	985	985
	Rated RPM	rev/min	970	960	950	985	985

Table 21—Floor Console

System size			9	12	18
Voltage			**208/230-1-60**	**208/230-1-60**	**208/230-1-60**
Indoor fan	Type		Centrifugal	Centrifugal	Centrifugal
	Diameter	in	14.5	14.5	14.5
	Height	in	3.15	3.15	3.15
Indoor fan motor	Type		Direct Drive	Direct Drive	Direct Drive
	Phase		1	1	1
	FLA		.14	.14	.14
	Insulation class		E	E	E
	Safe class		IP20	IP20	IP20
	Output	W	30	30	30
	Rated current	Amps	.14	.14	.14
	Rated HP	HP	1/24	1/24	1/24
	Speed	rev/min	650	750	840
	Rated RPM	rev/min	650	750	840

ENVIRONMENTAL SPECIFICATIONS

Table 22—Environmental Specifications

Cooling Operating Range	Indoor Min - Max DB	°F	64-95
	Indoor Min - Max WB	°F	55
Heating Operating Range	Indoor Min –Max DB	°F	32~86
Non-operating environment	Temperature range (DB)	°F	32~86
Operation Humidity		dBa	0~80%
Ambient Humidity		%	0~80%

AIRFLOW SPECIFICATIONS

Table 23—40GJB/619KB High Wall

System size			9	12	18	24
Indoor Airflow	SS	CFM	430	453	589	647
	H	CFM	394	394	512	588
	MH	CFM	359	659	465	530
	M	CFM	312	312	418	471
	ML	CFM	271	271	371	412
	L	CFM	241	241	330	353
	SL	CFM	224	224	282	294

Table 24—Cassette

System size			12	18	24
Indoor Airflow	H	CFM	353	353	694
	M	CFM	294	294	559
	L	CFM	265	265	500

Table 25—Floor Console

System size			9	12	18
Indoor Airflow	SS	CFM	382	441	494
	H	CFM	329	382	470
	MH	CFM	311	353	423
	M	CFM	282	323	382
	ML	CFM	253	294	341
	L	CFM	217	264	311
	SL	CFM	188	205	241

Table 26—Ducted

System size			9	12	18	21	24
Indoor Airflow	H	CFM	264	323	411	588	588
	M	CFM	176	235	353	441	441
	L	CFM	147	176	294	323	323

AIR THROW DATA

Table 27—40GJB/619KB High Wall

System size		9	12	18	24
SH	Ft.	27.2	28.9	28.9	30.2

Table 28—Floor Console

System size		9	12	18
SH	Ft.	11.2	14.8	16.4

MAX STATIC PRESSURE - DUCTED

Table 29—Static Pressure Ducted Indoor Units

System size		9	12	18	21	24
Max Static Pressure	Pa	10	10	10	15	15
	In.WG	0.04	0.04	0.04	0.06	0.06

SYSTEM EVACUATION AND CHARGING

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Never use the system compressor as a vacuum pump.

Refrigerant tubes and indoor coil should be evacuated using the recommended deep vacuum method of 500 microns. Always break a vacuum with dry nitrogen.

SYSTEM VACUUM AND CHARGE

Using Vacuum Pump

1 Pump system down to 500 MICRONS of mercury and allow pump to continue operating for an additional 15 minutes. Unit must maintain 500 microns or less for 30 minutes or more to ensure a dry system.

2 Connect charge hose to vacuum pump.

3 Fully open the low side of manifold gage (see Fig. 21).

4 Start vacuum pump

5 Evacuate using the triple evacuation method.

6 After evacuation is complete, fully close the low side of manifold gage and stop operation of vacuum pump.

7 The factory charge contained in the outdoor unit is good for up to 25 ft. (8m) of line length. For refrigerant lines longer than 25 ft. (8m), add refrigerant as specified in the *ADDITIONAL REFRIGERANT CHARGE* table in this document.

8 Disconnect charge hose from charge connection of the low side service valve.

9 Fully open service valves B and A.

10 Securely tighten caps of service valves.

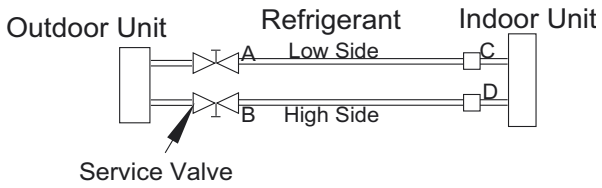


Fig. 20 – Service Valve

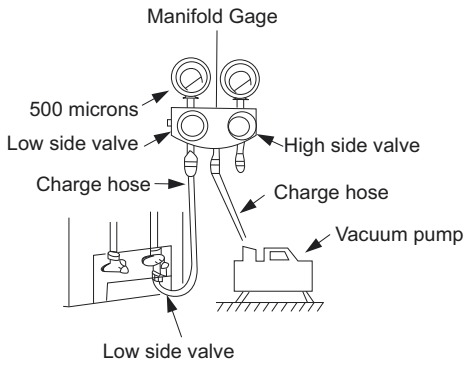


Fig. 21 – Manifold

Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 microns and a vacuum gage capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water (see Fig. 22).

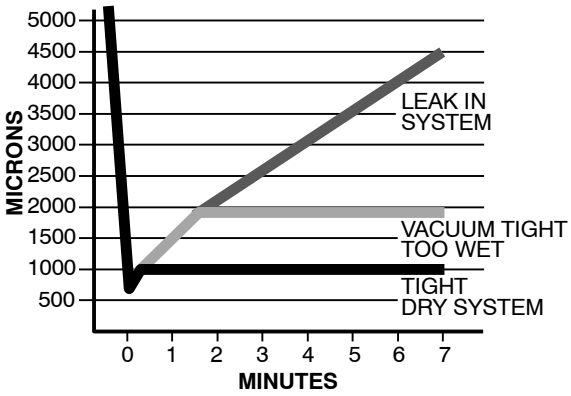


Fig. 22 – Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should be used. Refer to Fig. 23 and proceed as follows:

1 Pump system down to 500 MICRONS of mercury and allow pump to continue operating for an additional 15 minutes. Unit must maintain 500 microns or less for 30 minutes or more to ensure a dry system.

2 Close service valves and shut off vacuum pump.

3 Connect a nitrogen cylinder and regulator to system and open until system pressure is 2 psig.

4 Close service valve and allow system to stand for 10 minutes. During this time, dry nitrogen will be able to diffuse throughout the system absorbing moisture.

5 Repeat this procedure as indicated in Fig. 23. System will then be free of any contaminants and water vapor.

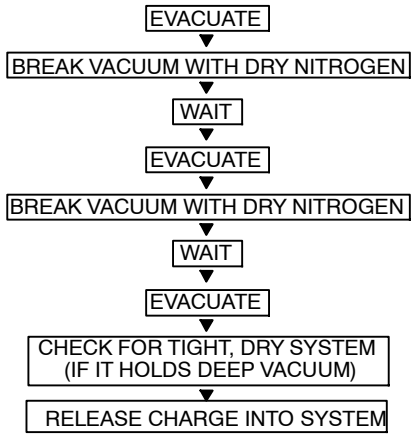


Fig. 23 – Triple Evacuation Method

Final Tubing Check

IMPORTANT: Check to be certain factory tubing on both indoor and outdoor unit has not shifted during shipment. Ensure tubes are not rubbing against each other or any sheet metal. Pay close attention to feeder tubes, making sure wire ties on feeder tubes are secure and tight.

MAIN LOGIC

Control Function of Outdoor Unit

Cooling Mode

1 **Cooling conditions and process:** If the compressor is in stop status and you start the unit for cooling operation, when one of the indoor units reaches the cooling set point, the unit starts cooling operation; in this case, the electronic expansion valve, the outdoor fan and the compressor start operation.

2 **Stop in cooling operation**

a. Compressor stops - The compressor stops gradually, the outdoor fan stops after 1 min.

b. Some of the indoor units reach the stop condition (the compressor does not stop). The compressor operates according to the required frequency. For the indoor unit with no requirement, the corresponding electronic expansion valve is closed to 0P.

3 **Cooling mode transfers to heating mode:** When the unit transfers to heating mode, the 4-way valve is energized after the compressor runs for 40s.

4 **4-way valve:** In this mode, the 4-way valve is closed.

5 **Outdoor fan control in cooling mode:** The outdoor fan starts before 5s of the starting of compressor. The outdoor fan runs in high speed for 40s after starting and then it will run in set speed. The fan will run at every speed for at least 80s. (When the quantity of indoor unit changes, the control part adjusts the outdoor fan according to the quantity of indoor units and outdoor temperature.); when the compressor stops, the outdoor fan runs at present speed and stops after 1 min.

Dry Mode

1 The dry conditions and process are the same as those in cooling mode;

2 The status of 4-way valve: closed;

3 The temperature setting range: 60 - 86°F;

4 Protection function: the same as those in cooling mode;

5 In Dry mode, the maximum value A of the capacity requirement percentage of single unit is 90% of that in Cooling mode. The open condition of the electronic expansion valve, outdoor fan and compressor is the same as those in cooling mode.

Heating Mode

1 **Heating conditions and process:** When one of the indoor units reaches the heating operation condition, the unit starts heating operation.

2 **Stop in heating operation:**

a. When all the indoor units reach the stop condition, the compressor stops and the outdoor fan stops after 1 min;

b. Some of the indoor units reach the stop condition. The compressor reduces the frequency immediately and operates according to the required frequency;

c. Heating mode transfers to cooling mode (dry mode), fan mode:

— The compressor stops;

— The outdoor fan stops after 1min;

— The status of 4-way valve: energized;

3 **Outdoor fan control in heating mode**: The outdoor fan starts 5s before the compressor and will run in high speed for 40s; The fan will run at every speed for at least 80s; When the compressor stops, the outdoor fan stops after 1min.

4 **Defrosting function**: When the defrosting condition is met, the frequency of the compressor starts to decrease and waits for defrosting. The outdoor fan stops after the 4-way valve closes, meanwhile the 4-way valve reverses the direction; after the 4-way valve reverses the direction.
The compressor frequency starts to rise and then begins to calculate the time of defrosting, the frequency of the compressor rises to reach the defrosting frequency.

5 **Oil-returned control in heating mode**

a. Oil-returned condition: The whole unit is operating in low frequency for a long time

b. **Oil-returned process in heating mode:** The indoor unit displays "H1".

c. **Oil-returned finished condition in heating mode:** The duration reaches 5min.

Fan Mode

The compressor, the outdoor fan and the 4-way valve are closed; temperature setting range is 60 - 86°F.

Protection Function

Mode Conflict Protection of Indoor Unit

When the setting mode is different between the indoor units, the unit runs in below status:

1 The mode of the first operating indoor unit is the priority mode, when compare the mode of the other indoor units to see if there is a conflict. Cooling mode (dry mode) is in conflict with heating mode.

2 Fan mode is in conflict with heating mode and the heating mode is the priority mode. No matter which indoor unit operates first, the unit will run in heating mode.

Overload Protection Function

When the tube temperature is too low, the compressor raises the operation frequency; when the tube temperature is too high, the compressor frequency is restricted or lows down the operation frequency; when the tube temperature is too high, the compressor protection stops running. If the discharge temperature protection continuously appears for 6 times, the compressor can resume running after cutting off the power and restarting the power. (If the running time of the compressor is longer than 7min, the protection times record will be cleared).

Discharge Protection Function

When the discharge temperature is low, the compressor raises the operation frequency; when the discharge temperature is high, the compressor frequency is restricted when the discharge temperature is too high, the compressor protection stops running. If the discharge temperature protections continuously appears for 6 times, the compressor can not resume running. The compressor can resume running after cutting off the power and then putting through the power. (If the running time of the compressor is longer than 7min, the protection times record will be cleared).

Communication Malfunction

Detection of the quantity of installed indoor units and Branch Box: After 3min of energizing, if the outdoor unit does not receive the communication data of certain indoor unit, the outdoor unit will judge that indoor unit is not installed and will treat it as it is not installed. If the outdoor unit receives the communication data of that indoor unit later, the outdoor unit will treat that unit as it is installed.

Compressor high-pressure protection

1 When the high-pressure switch is detected cut off for 3s continuously, the compressor will enter high-pressure protection as it stops when reaching set temperature. Meanwhile, the outdoor unit will send the signal of "high-pressure protection" to the indoor units;

2 After the issue is fixed, the compressor can resume running only after performing a power cycle.

3 High pressure protection activates at 638 PSI and allows the system to run again at 464 PSI.

Compressor low-pressure protection

1 1) Low Pressure Protection for Shutdown

a. After the compressor stops for five minutes, if it is detected that the low pressure protection is active, then a low pressure protection signal will be send out.

b. If it is detected continuously for three seconds that the low pressure protection is active after the compressor stops for less than five minutes, then a low pressure protection signal will be send out. However, if the low pressure protection occurs twice in one hour, then it becomes unrecoverable and has to be recovered by powering the outdoor unit again.

2 Low Pressure Protection during the Operation

a. When it is detected continuously for three seconds that the low pressure protection is work, then the whole unit should be shut off and a low pressure protection signal should be sent to the indoor unit.

b. On condition that a low pressure protection error occurs and the whole unit has stopped for more than three minutes and it is detected continuously for six seconds that the low pressure protection switch is closed, then this error can be eliminated. However, if the low pressure protection occurs twice in one hour, then it has to eliminate the error by powering the outdoor unit again.

c. Low pressure protection activates at 20 PSI and allows the system to run again at 44 PSI.

Compressor overload protection

If the compressor overload switch is detected, the indoor unit displays the corresponding malfunction as it stops when the indoor temperature reaching set temperature. When the compressor stops for more than 3min and the compressor overload switch is reset, the unit will resume operation status automatically. If the protection appears for more than 6 times (if the running time of the compressor is longer than 30min, the protection times record will be cleared), the unit can not resume operation status automatically, but can resume running only after cutting off the power and then putting through the power.

Control Function of Indoor Unit

Running Mode

1 COOL 2.DRY 3.HEAT 4.AUTO 5 FAN

Basic Functions of the System

1 COOL Mode: Under this mode, the fan and swing function goes as the set conditions, and the set temperature range is 60 - 86°F.

2 DRY Mode: Under this mode, the fan runs at the low speed and the Swing function is performed under the set conditions. The set temperature range is 60-86°F.

3 FAN Mode: Under this mode, only the fan of the indoor unit runs. And if the auto speed is set, the fan runs under the same condition as the COOL mode.

4 HEAT Mode:

a. Under this mode, the set temperature range is 60-86°F.

b. The defrosting symbol "H1" appears when the defrosting signal is received from the outdoor unit.

5 AUTO Mode

a. When the ambient temperature is higher than 7 °F, the unit will run in the Cool Mode.

b. For the cooling and heating unit, if the ambient temperature is or lower than 71 °F, the unit will run in the HEAT mode.

c. When the indoor ambient temperature is higher than 71 °F however lower than 78 °F, the unit starts to work under the AUTO or DRY mode and shifts to the FAN mode, while the unit which starts to work under the other mode keeps the current running mode.

Other Control

1 Beeper Control: When the controller is powered on or it receives a valid either press button signal or remote control signal, the beeper will utter a warning tone.

2 Auto Speed Control:

a. Under the HEAT mode:

- If the ambient temperature is equal or higher than the set temperature, the fan runs at the low speed;
- If the ambient temperature minus 37 °F is equal or lower than the set temperature, the fan runs at the medium speed.
- If the ambient temperature minus 37 °F is lower than the set temperature minus 37 °F the fan runs at the high speed.

b. Under the COOL mode:

- If the ambient temperature is equal to or lower than the set temperature, the fan runs at the low speed.
- If the ambient temperature is between the set temperature and the set temperature minus 37 °F, the fan runs at the medium speed.
- If the ambient temperature is higher than the set temperature plus 37 °F, the fan runs at the high speed.

c. Under the FAN mode:

- The fan runs at the medium speed constantly
- Once the fan starts, its speed cannot be changed until it has run for at least 30 seconds at the currently set speed.
- When the ambient temperature is lower than the set temperature, the indoor unit runs at the high speed.
- When the ambient temperature is higher than the set speed however lower than the set temperature plus 4°F, the indoor fan runs at the medium speed.
- When the ambient temperature is lower than the set temperature plus 4°F, the fan runs at the low speed.

d. Under the Cool and Fan Modes:

- When the ambient temperature is higher than the set temperature plus 6°F, the indoor unit runs at high speed.
- When the ambient temperature is higher than the set temperature plus 2°F, however lower than the set temperature plus 6°F, the indoor unit fan runs at the medium speed.
- When the ambient temperature is lower that the set temperature plus 2°F, the fan runs at the low speed.

e. Once the fan starts at a certain speed, it keeps running at this speed for no less than 30 seconds prior to any changeover stated above.

3 **AUTO Press Button:** The unit runs under the AUTO mode by pressing this button when the unit is on. In this state, the fan of the indoor unit runs at the auto speed with the swing function activated. When the unit is on, it will be turned off by pressing this button.

NOTE: This button is unavailable on the floor/ceiling unit.

4 Sleep: Under this mode, the proper sleep curve is adopted in accordance with different set temperatures. Under the COOL mode or the DRY mode, the temperature increases by 2°F after one hour and by another 2°F after another hour, after that, the temperature will be kept on. Under the HEAT mode, the temperature decreases by 2°F after one hour and by another 2°F after another hour. After that the temperature will remain.

5 Timer:

a. **Timer On:** When the unit is powered on however in the idle state, it is available to set when the a user starts the unit. When the unit starts, it runs as in the previously set mode. The set range of the timer is 0.5~24 hours with a interval of 0.5 hour.

b. **Timer Off**: When the unit is on, a user can set when to stop the unit. The set range of the time is 0.5~24 hours with a interval of 0.5 hour.

6 Memory

a. Memorizing Objects: modes (AUTO, COOL, DRY, FAN, HEAT), swing, set temperature, set fan speed, etc.

b. When the indoor unit works without the wired controller, it resumes the working condition as the power failure occurs after it is powered on again. When the indoor unit is with the wired controller, it is available to set the memory function by pressing the corresponding buttons of the wired controller.

c. When the indoor unit works without the wired controller, if the timer is not set for the last remote control instruction, the system memorizes this last instruction and works following it; if the timer is set, it will be canceled as the power failure occurs and will have to be reset.

d. When the indoor unit works with the wired controller, it works as the message sent by the wired controller after it is powered on again.

7 Selection of the Indoor Temperature Sensor

a. For the duct type indoor unit: Under the COOL, HEAT, DRY, or FAN mode, the return air temperature sensor is adopted; while under the HEAT mode, it is the receiver temperature sensor.
For the cassette type, floor ceiling type indoor unit: Under all modes, the return air temperature sensor is adopted.

b. When the duct type, cassette type, or the floor ceiling type indoor unit works with the wired controller, the ambient temperature sensor can be set in the following four ways:

- 01: The indoor temperature sensor is set for the return air.
- 02: The indoor temperature sensor is set for the wired controller.
- 03: The indoor temperature sensor is set for the wired controller under the HEAT mode, and for the return air under any other mode.
- 04: The indoor temperature sensor is set for the return air under the HEAT mode, and for the wired controller under any other mode

c. Setting of the Ambient Temperature Sensor of the Wired Controller.

- When the unit is off, it is available to go to the debugging status by pressing the "Function" and "Timer" buttons for five seconds, and the corresponding code appears on the temperature area of the wired controller. There are four kinds of codes which can be adjusted through the ▼/▲ button.
- The 03 is the default code. The setting of the ambient temperature sensor of the wired controller should be memorized.
- Press the Enter/ Cancel button to confirm and exit the setting. If there is no response to the last button press within 20 seconds, the system exits the setting and enters the normal "Off" status however with the setting still saved.

8 **Switchover of the Defrosting Mode:** On condition that the unit is off, if "H1" does not appear on the wireless controller, then the unit enters the setting status of the "Defrosting Mode 1" as it is turned on through the wired controller. Once the indoor unit receives this signal, it sends it to the outdoor unit. In contract, if "H1" is displayed, the unit enters the setting status of the "Defrosting Mode 2", and the indoor unit also sends this signal to the outdoor unit as soon as it receives it.
On condition that the unit is off, it is available to switch over the "Defrosting Mode 1" and "Defrosting Mode 2" by pressing the "MODE" and "BLOW" buttons simultaneously.

9 **Turbo:** As soon as the controller receives the "Turbo" instruction, the indoor unit fan runs at the high speed.

10 **Blow Function:** This function automatically blows away moisture inside the indoor unit exchanger to prevent mold from growing after the unit is shut off.

a. On condition that this function is activated, when the "On/Off" press button is operated, the fan of the indoor unit still runs for ten minutes (with the symbol "BLOW" displayed). At this time, the fan will stop as this function is deactivated.

b. This function is unavailable under the AUTO, FAN, and HEAT modes.

I FEEL

1 If the indoor PCB receives the signal which results from pressing the I FEEL button on the remote controller, the buzzer emits a sound and this indicates the I FEEL function is initiated. However when the indoor PCB receives a signal which was sent from the remote controller every 3 minutes, the buzzer will not respond. When the unit is running with the I FEEL function, the PCB controls the unit according to the temperature from I FEEL signal, and the temperature collection function of room temperature sensor will be shielded, however the error detective function of room temperature sensor will be still valid.

2 When the I FEEL function is available, the PCB controls the unit according to the room temperature from the remote controller and the setting temperature.

3 The PCB take actions to the mode change information from remote controller signal, however it will not affected by the setting temperature.

4 When the unit is running with I FEEL function, if the PCB does not receive any signal from remote controller for 7 minutes or pressing I FEEL button again, the I FEEL function will be turned off automatically, and the temperature controls the unit according to the room temperature detected from its own room temperature sensor and setting temperature.

Louver Position Memory Function (High Wall, Floor Console)

When starting the unit again after shutting down, its louver returns to the angle originally set by the user, however the precondition is that the angle must be within the allowable range, if it exceeds, it will memorize the maximum angle of the louver. During operation, if the power fails the louver will return to the default angle.

46°F (8°C) Heating (heating setback) (All Indoor Units)

In heating operation, the preset temperature of the air conditioner can be as low as 46°F, which keeps the room temperature steady at 46°F and prevents household pipes from freezing when the house is unoccupied for a long time in severe cold weather.

Silence Operation (High Wall, Cassette, Floor Console)

Press the “silence” button on remote controller to initiate SILENCE function. When the silent function is active , the fan speed will run below its rated ” low” fan speed on the remote and supply a faint breeze to the occupied space, which reduces noise and creates a comfortable environment.

TROUBLESHOOTING

This section provides the required flow charts to troubleshoot problems that may arise.

NOTE: **Information required in the diagnoses can be found either on the wiring diagrams or in the appendix.**

Required Tools:

The following tools are needed when diagnosing the units:

- Digital multimeter
- Screw drivers (Phillips and straight head)
- Needle-nose pliers
- Refigeration gauges

Recommended Steps

1. Refer to the diagnostic hierarchy charts below and determine the problem at hand.
2. Go to the chart listed in the diagnostic hierarchy and follow the steps in the chart for the selected problem.

For the ease of service, the systems are equipped with diagnostic code display LED’s on both the indoor and outdoor units. The outdoor diagnostic display is on the outdoor unit board and is limited to very few errors. The indoor diagnostic display is a combination of flashing LED’s on the display panel on the front of the unit. If possible always check the diagnostic codes displayed on the indoor unit first.

The diagnostic codes for the indoor and outdoor units are listed in the appendix.

Problems may occur that are not covered by a diagnostic code, however are covered by the diagnostic flow charts. These problems will be typical air conditioning mechanical or electrical issues that can be corrected using standard air conditioning repair techniques.

For problems requiring measurements at the control boards, note the following:

1. Always disconnect the main power.
2. When possible check the outdoor board first.
3. Start by removing the outdoor unit top cover.
4. Reconnect the main power
5. Probe the outdoor board inputs and outputs with a digital multi-meter referring to the wiring diagrams.
6. Connect the red probe to hot signal and the black probe to the ground or negative.
7. Note that some of the DC voltage signals are pulsating voltages for signal. this pulse should be rapidly moving at all times when there is a signal present.
8. If it is necessary to check the indoor unit board you must start by disconnecting the main power.
9. Next remove the front cover of the unit and then control box cover.
10. Carefully remove the indoor board from the control box, place it face up on a plastic surface (not metal).
11. Reconnect the main power and repeat steps 5,6, and 7.
12. Disconnect main power before reinstalling board to avoid shock hazard and board damage.

TROUBLESHOOTING (CONT)

This unit has on-board diagnostics. Error codes are displayed on the wired remote controller and the outdoor unit microprocessor board with colored LED lights. The table below explains the error codes on both.

SIZES 18 & 24

Table 30—Malfunction Status

Malfunction name	Malfunction type	Indoor display
Zero cross detection circuit malfunction(for indoor unit)	Hardware malfunction	U8
Malfunction protection of jumper cap(for indoor unit)	Hardware malfunction	C5
Feedback of without I DU motor(for indoor unit)	Hardware malfunction	H6
Indoor ambient temperature sensor is open/short circuited	Hardware malfunction	F1
Indoor evaporator temperature sensor is open/short circuited	Hardware malfunction	F2
Liquid valve temperature sensor is open/short circuited	Hardware malfunction	b5
Gas valve temperature sensor is open/short circuited	Hardware malfunction	b7
Modular temperature sensor is open/short circuited	Hardware malfunction	P7
Outdoor ambient temperature sensor is open/short circuited	Hardware malfunction	F3
Outdoor condenser middle pipe temperature sensor is open/short circuited	Hardware malfunction	F4
Outdoor discharge temperature sensor is open/short circuited	Hardware malfunction	F5
Communication malfunction	Hardware malfunction	E6
Malfunction of phase current detection circuit for compressor	Hardware malfunction	U1
Module high temperature protection	Viewing malfunction code through remote controller within 200s; displayed directly on the indoor display after 200s	P8
Refrigerant lacking or blockage protection of system (not available for residential ODU)		F0
Charging malfunction of capacitor	Hardware malfunction	PU
High pressure protection of system	Hardware malfunction	E 1
Low pressure protection of system (reserved)	Hardware malfunction	E3
Compressor overload protection	Viewing malfunction code through remote controller within 200s; displayed directly on the indoor display after 200s	H3
Indoor unit and outdoor unit do not match	Hardware malfunction	LP
Malfunction of memory chip	Hardware malfunction	E E
Wrong connection of communication wire or malfunction of electronic expansion valve	Hardware malfunction	dn
Malfunction protection of outdoor fan 1	Hardware malfunction	L3
Detection status of wrong connection of communication wire or malfunction of electronic expansion valve	Operation status	dd
Mode conflict	Operation status	E7
Refrigerant recycling mode	Operation status	Fo
X-fan	Operation status	AL
Defrosting or oil return i n heating mode	Operation status	H 1
Start failure of compressor	Viewing malfunction code through remote controller within 200s; displayed directly on the indoor display after 200s	Lc
High discharge temperature protection of compressor		E4
Overload protection		E8
Whole unit over-current protection		E5
Compressor phase current protection		P5
Compressor de-synchronizing		H7
Compressor phase-lacking/phase-inverse protection		Ld
IPM modular protection		H5
DC bus-bar low voltage protection		PL
DC bus-bar high voltage protection		PH
PFC protection		HC
The four-way valve is abnormal		U7

TROUBLESHOOTING (CONT)

This unit has on-board diagnostics. Error codes are displayed on the wired remote controller and the outdoor unit microprocessor board with colored LED lights. The table below explains the error codes on both.

SIZES 30, 36 & 42

Table 31—Malfunction Status

Name of malfunction	The indicator display			Indoor display
	Yellow light	Red light	Green light	
Compressor runs	Flash once			
Defrost	Flash twice			H1
Anti-freezing protection	Flash 3 times			E2
IPM protection	Flash 4 times			H5
AC over-current protection	Flash 5 times			E5
Over-burden protection	Flash 6 times			H4
Compressor exhaust high temperature protection	Flash 7 times			E4
Compressor overload protection	Flash 8 times			H3
Power protection	Flash 9 times			L9
EEPROM reads and write protection	Flash 11 times			
Low PN voltage protection	Flash 12 times			PL
Over voltage protection for PN	Flash 13 times			PH
PFC protection	Flash 14 times			HC
PFC module temperature protection	Flash 15 times			oE
Low pressure protection	Flash 17 times			E3
High pressure protection	Flash 18 times			E1
Limit/decline frequency(electric current)		Flash 1 times		
Frequency limit exhaust)		Flash 2 times		
Frequency limit(Over-burden)		Flash 3 times		
Outdoor ambient sensor malfunction		Flash 6 times		F3
Outdoor tube sensor malfunction		Flash 5 times		F4
Exhaust sensor malfunction		Flash 7 times		F5
Attain the temperature of switch on		Flash 8 times		
Frequency limit(power)		Flash 13 times		
Outdoor fan malfunction		Flash 14 times		
Frequency limit(PFC module temperature)		Flash 15 times		
PFC module sensor malfunction		Flash 16 times		oE
Liquid pipe temperature sensor malfunction of A		Flash 17 times		
Gas pipe temperature sensor malfunction of A		Flash 18 times		
Liquid pipe temperature sensor malfunction of B		Flash 19 times		
Gas pipe temperature sensor malfunction of B		Flash 20 times		
Liquid pipe temperature sensor malfunction of C		Flash 21 times		
Gas pipe temperature sensor malfunction of C		Flash 22 times		
Liquid pipe temperature sensor malfunction of D		Flash 23 times		
Gas pipe temperature sensor malfunction of D		Flash 24 times		
Liquid pipe temperature sensor malfunction of E		Flash 25 times		
Gas pipe temperature				
sensor malfunction of E		Flash 26 times		
Exit of the condenser tube sensor malfunction		Flash 27 times		
Correspondence is normal			Flash 7 times (n = indoor unit number)	
Communication failure between indoor unit and outdoor unit			Often bright	
(indoor unit all Communication failure)				
Indoor ambient sensor malfunction				F1
Indoor evaporate sensor malfunction				F2
Mode conflict				E7
Accept fluorine mode				Fo
Jumper cap malfunction protection				C5

TROUBLESHOOTING (CONT)

This unit has on-board diagnostics. Error codes are displayed on the wired remote controller and the outdoor unit microprocessor board with colored LED lights. The table below explains the error codes on both.

SIZES 48 - 56

Table 32—Malfunction Status

Errors of Definition	Main control display for outdoor unit			Indoor unit code	Testing Board Code
	Yellow LED	Red LED	Green LED		
The compressor is start up	Flash 1 time				
IPM current protection	Flash 3 times			H5	H5
IPM temperature protection	Flash 5 times			P8	P8
PFC current protection	Flash 7 times			HC	HC
PFC temperature protection	Flash 8 times			P8	P8
Low voltage protection	Flash 9 times			PL	PL
High voltage protection	Flash 10 times			PH	PH
Low pressure protection	Flash 11 times			E3	E3
High pressure protection	Flash 12 times			E8	E8
High pressure switch protection	Flash 13 times			E1	E1
Capacitor charging error	Flash 14 times			PU	PU
Current protection	Flash 15 times			E5	E5
Memory card error	Flash 16 times			EE	EE
Compressor demagnetizing protection	Flash 17 times			HE	HE
Compressor de-synchronizing	Flash 18 times			H7	H7
Compressor phase lack	Flash 19 times			U2	U2
Compressor phase circuit detection error	Flash 20 times			U1	U1
Compressor current protection	Flash 21 times			L9	L9
Compressor overload protection	Flash 22 times			H3	H3
Compressor discharge temperature protection	Flash 23 times			E4	E4
Lack of refrigerant or jam protection	Flash 31 times			F0	F0
Normal operation		Flash 1 time			
Frequency limitation for current protection		Flash 2 times			F8
Oil returning mode		Flash 3 times		F7	F7
Defrosting mode		Flash 4 times		H1	H1
Frequency limitation for IPM temperature protection		Flash 5 times		EU	EU
Frequency limitation for PFC temperature protection		Flash 6 times		EU	EU
Frequency limitation for compressor overload protection		Flash 8 times			LU
Frequency limitation for discharge temp. protection		Flash 9 times			F9
Frequency limitation for low pressure protection		Flash 10 times			Pn
Frequency limitation for high pressure protection		Flash 11 times		F6	F6
Discharge temperature sensor error		Flash 12 times		F5	F5
Outside temperature sensor error		Flash 13 times		F3	F3
Suction temperature sensor error		Flash 15 times			dc
Condenser temperature sensor error		Flash 16 times		A7	A7
Sub-cool temperature sensor error		Flash 17 times			bC
Low pressure sensor error		Flash 18 times			dL
High pressure sensor error		Flash 19 times			e1
Fan motor protection		Flash 20 times		H6	H6
Driving board is connected			Flash 1 time		
Testing board is connected			Flash 2 times		
Computer is connected			Flash 4 times		
Indoor unit 1 is connected			Flash 5 times		
Indoor unit 2 is connected			Flash 6 times		

TROUBLESHOOTING (CONT)

This unit has on-board diagnostics. Error codes are displayed on the wired remote controller and the outdoor unit microprocessor board with colored LED lights. The table below explains the error codes on both.

SIZES 48 - 56

Table 33—Troubleshooting

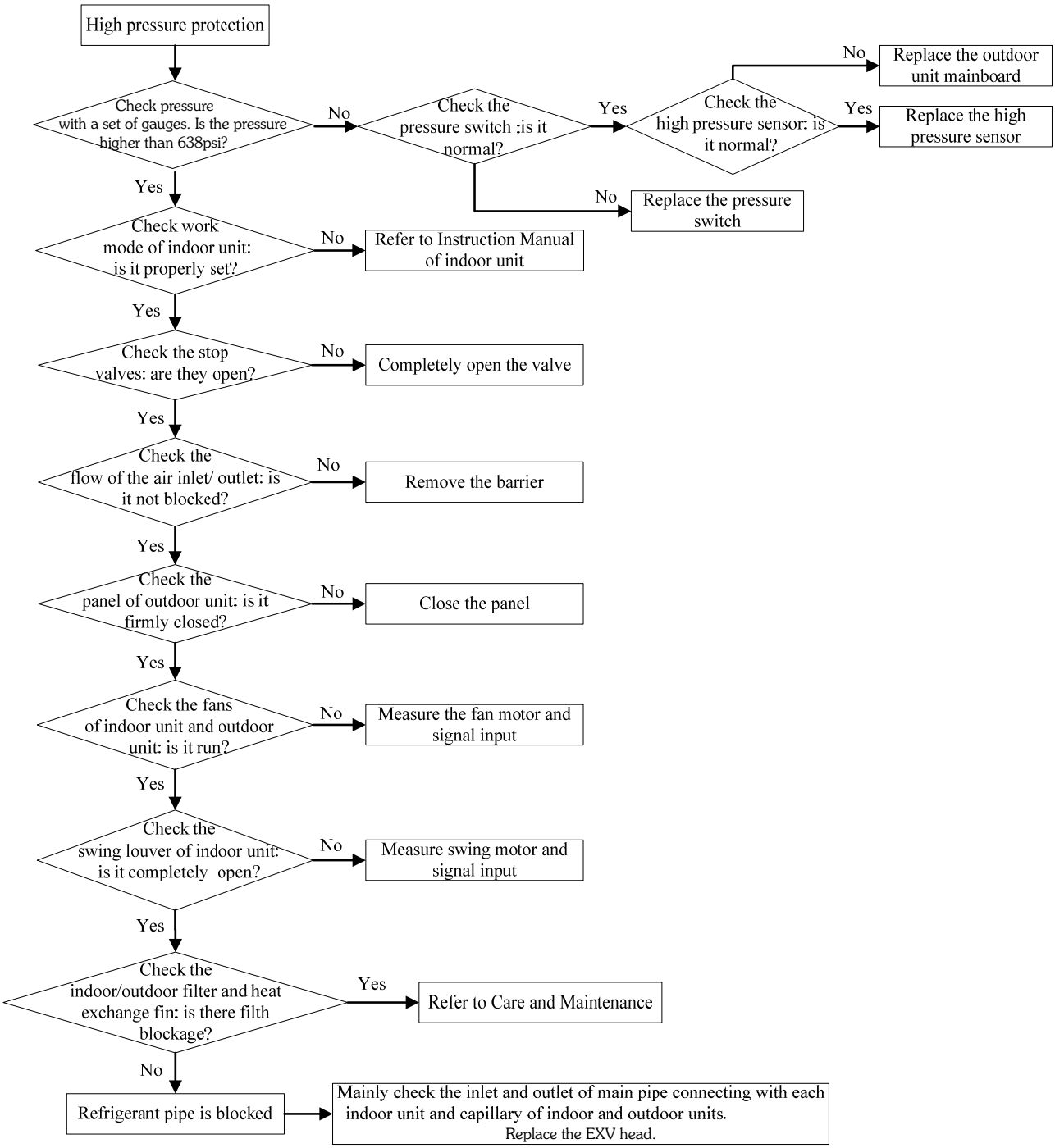
Errors of definition	Main control display for outdoor unit			Indoor unit code	Testing board code
	Yellow LED	Red LED	Green LED		
Indoor unit 3 is connected			Flash 7 times		
Indoor unit 4 is connected			Flash 8 times		
Indoor unit 5 is connected			Flash 9 times		
Indoor unit 6 is connected			Flash 10 times		
Indoor unit 7 is connected			Flash 11 times		
Indoor unit 8 is connected			Flash 12 times		
Indoor unit 9 is connected			Flash 13 times		
Indoor anti-freeze protection				E2	E2
Inside temperature sensor error				F1	F1
Evaporator midway temp sensor error				F2	F2
Liquid pipe of Branch Box temperature sensor error				b5	b5
Gas pipe of Branch Box temperature sensor error				b7	b7
Mode conflicts				E7	E7
Communication error	BU 1	Indoor unit A			
		Indoor unit B			
		Indoor unit C			
	BU 2	Indoor unit A			
		Indoor unit B			
		Indoor unit C			
	BU 3	Indoor unit A			
		Indoor unit B			
		Indoor unit C			
Communication error between the main board and driving board					P6
Communication error between the main board and testing board					CE
Indoor unit gas sensor error					Fn
Indoor unit humidity sensor error					L1
Indoor unit water full protection					E9
Jumper terminal error				C5	C5
Power supply phase lack					dJ
Outdoor unit fan motor error					L3
Refrigerant recovery mode				Fo	Fo

DIAGNOSIS AND SOLUTION

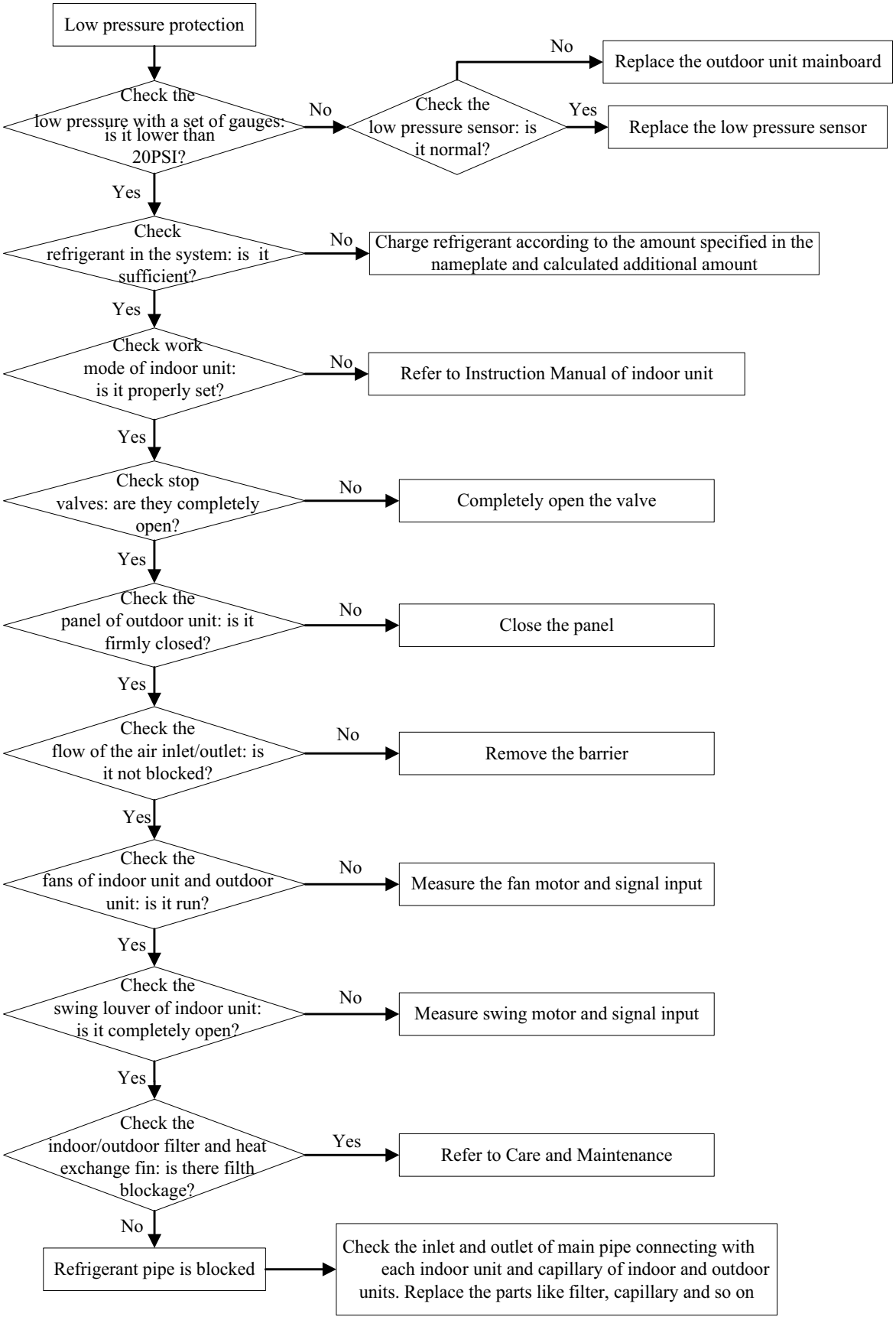
Service personnel shall collect the malfunction information as much as possible and research them thoroughly, list these electrical parts which may cause malfunction, service personnel shall be able to determine the specific reason and solve the faulted parts.
Observe the status of the complete device and do not observe the partial.

It is advised to start from the simple operation during analyzing, judging and confirming malfunction reason, then conduct the complicated operations such removal of device, part replacement and refrigerant filling. Find the malfunction reason carefully as unit may occur several malfunction at the same time and one malfunction may develop into several malfunction, so entire system analysis shall be established to make the judged result exact and credible.

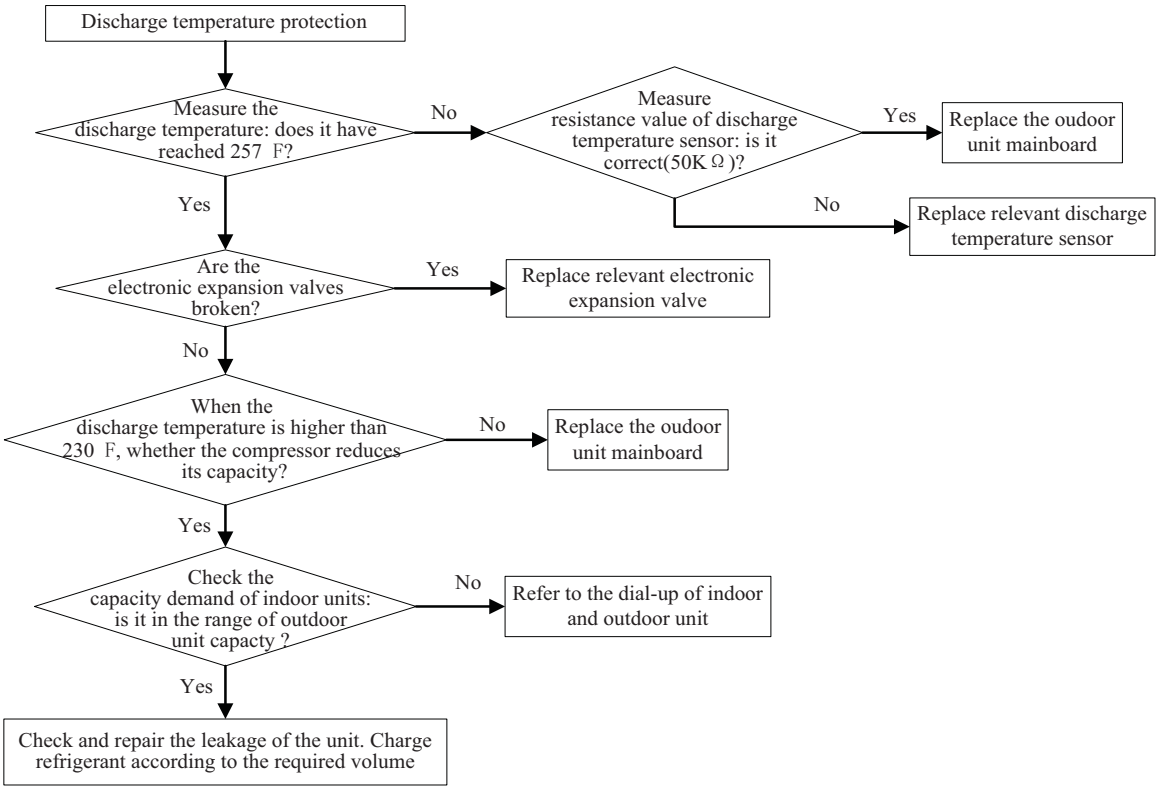
Malfunction Display: High Pressure Protection



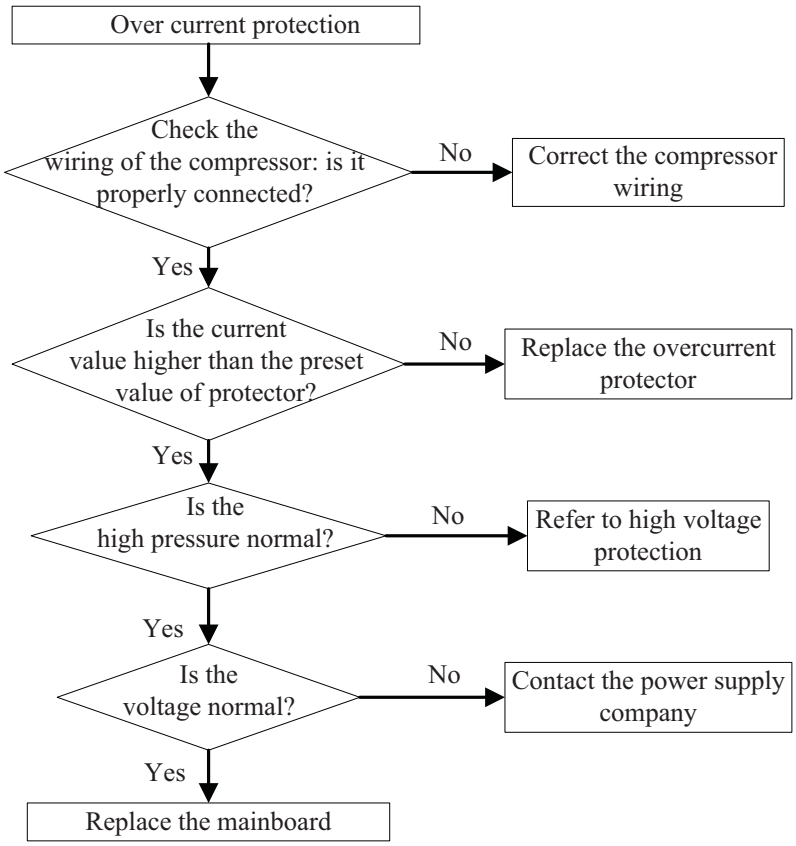
Malfunction Display: Low Pressure Protection



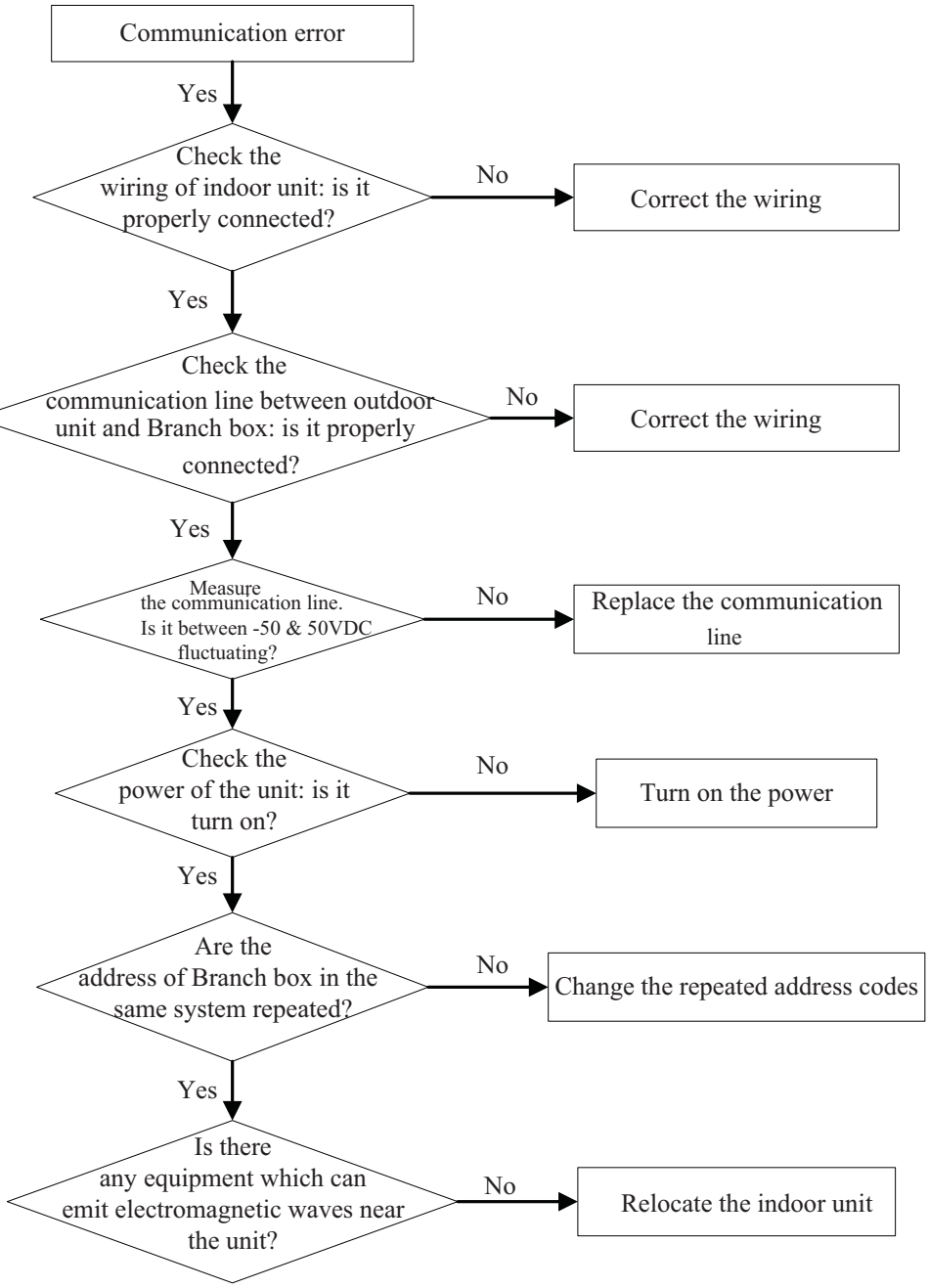
Malfunction Display: Discharge Temperature Protection



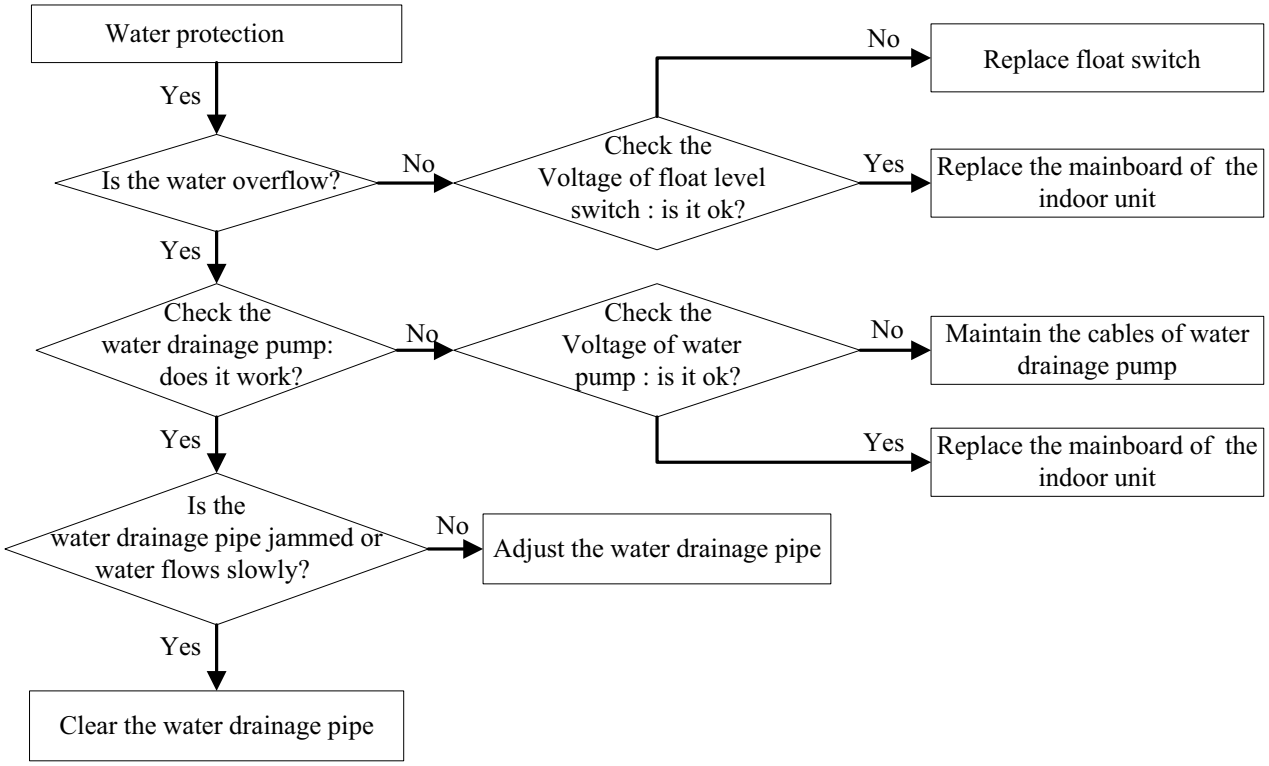
Malfunction Display: Over Current Protection



Malfunction Display: Communication Error

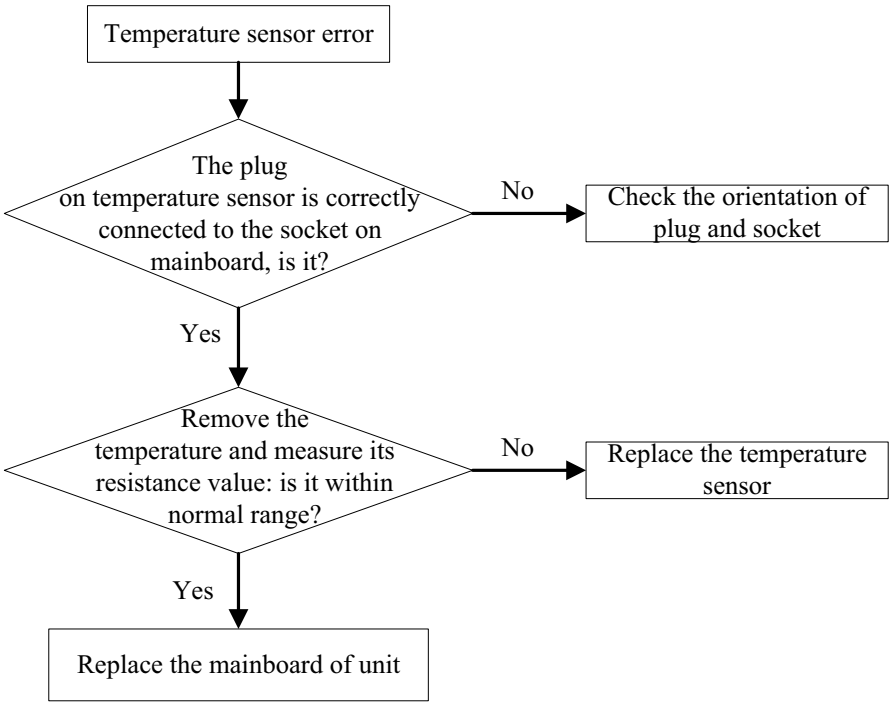


Malfunction Display: Indoor Unit Water Protection

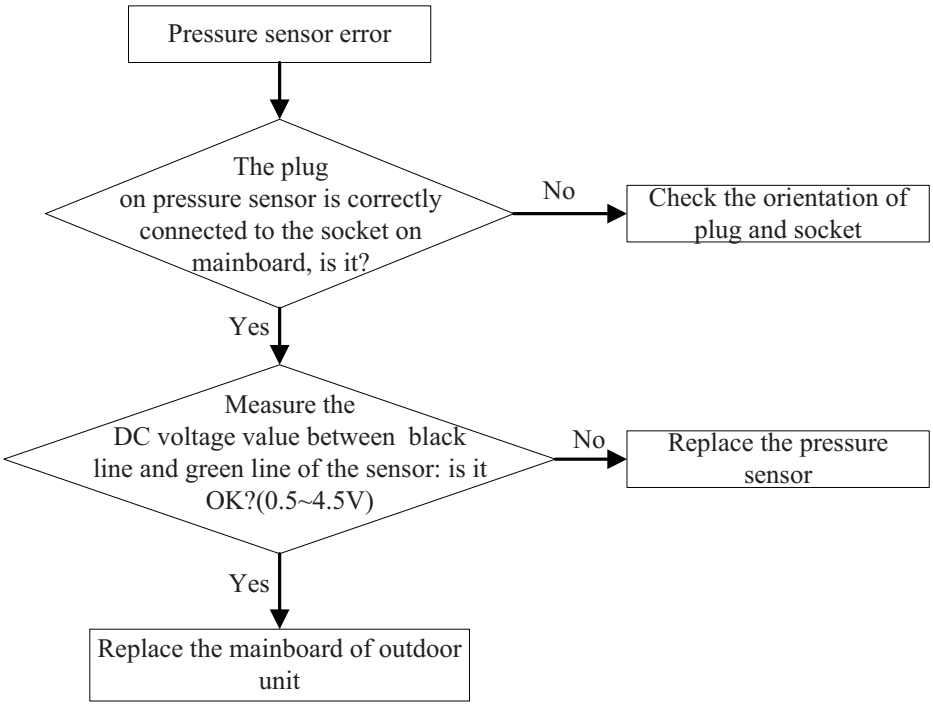


Malfunction Display: Temperature Sensor Error

The resistance value of discharge temperature sensor is 50 KΩ;
The resistance value of outside temperature sensor and inside temperature sensor are all 15 KΩ;
The others are 20 KΩ.



Malfunction Display: High/Low Pressure Sensor Error



NOTE: High pressure switch is energized at 638PSI and d-energized at 464PSI Low pressure switch is energized at 20PSI and d-energized at 44PSI.

Compressor Checking

Measure the resistance value of each winding by using the tester.

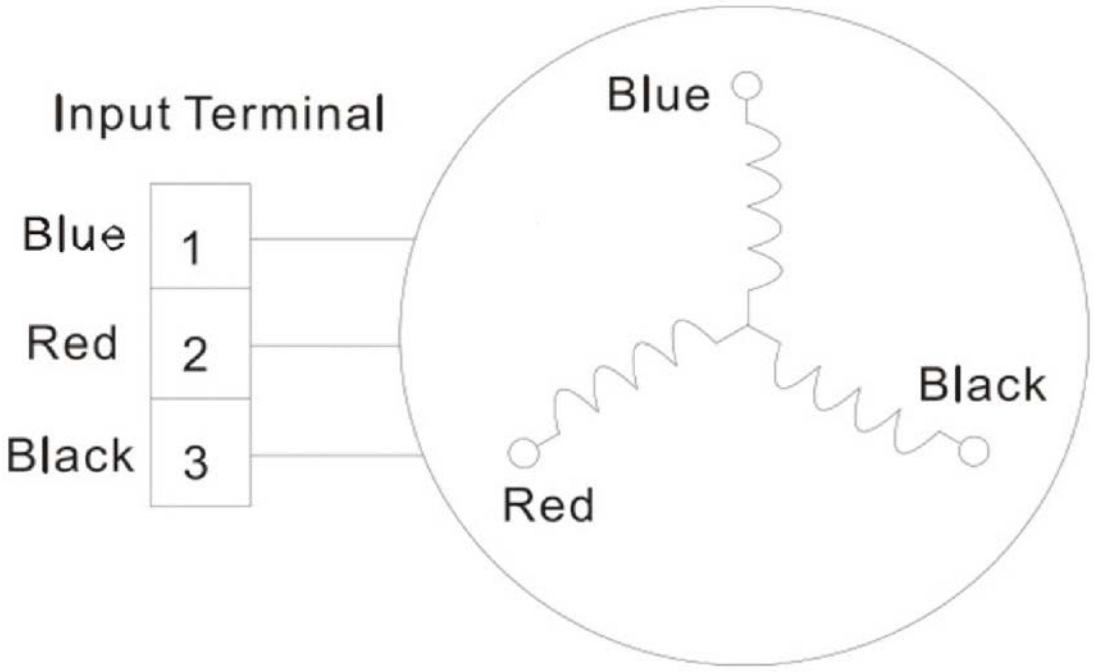


Fig. 24 – Tester

Terminal	Resistance Value		
	Terminal one	Terminal two	Terminal three
Blue - Red	0.8Ω (68°F/20°C)	1.77Ω (68°F/20°C)	0.55Ω (68°F/20°C)
Blue - Black			
Red - Blue			

Fig. 25 – Compressor Checking

IPM Continuity Check

Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital tester to measure the resistance between P and UVWN; UVW and N.

Digital tester		Normal resistance value	Digital tester		Normal resistance value
(+)Red	(-)Black		(+)Red	(-)Black	
P	N	∞ (Several MΩ)	U	N	∞ (Several MΩ)
	U		V		
	V		W		
	W		(+)Red		

Indoor AC Fan Motor

Measure the resistance value of each winding by using the tester.

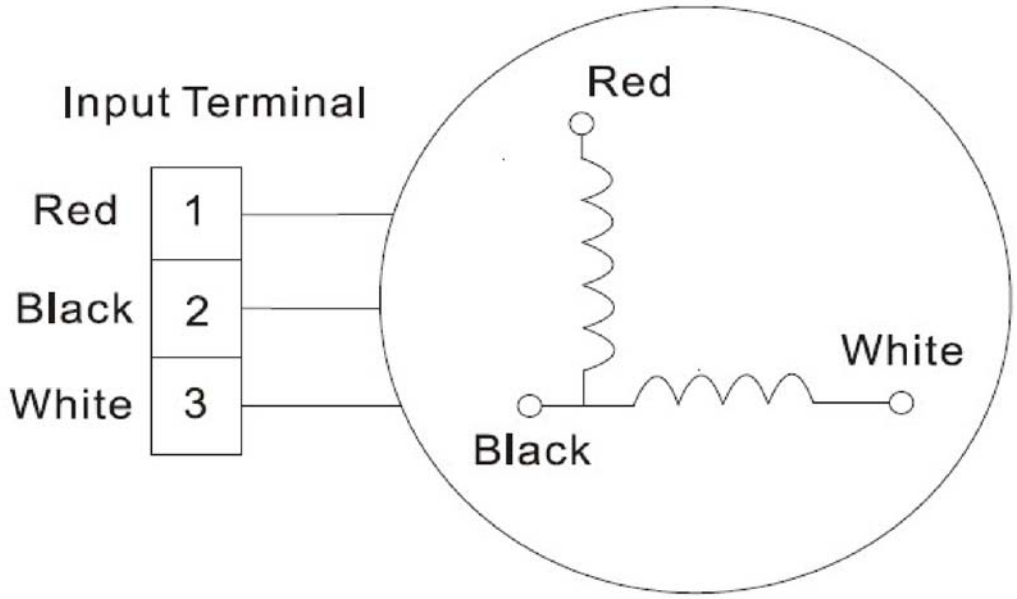


Fig. 26 – Indoor AC Fan Motor

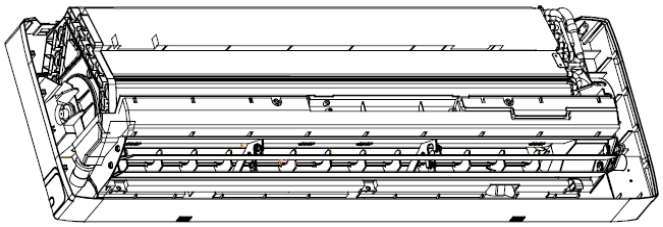
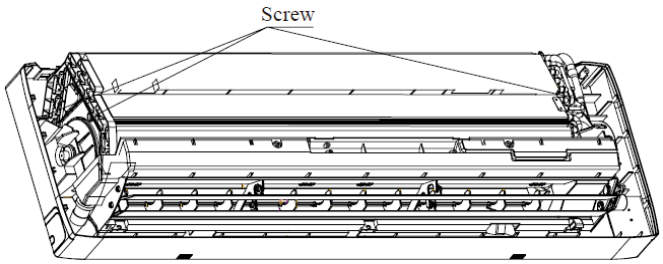
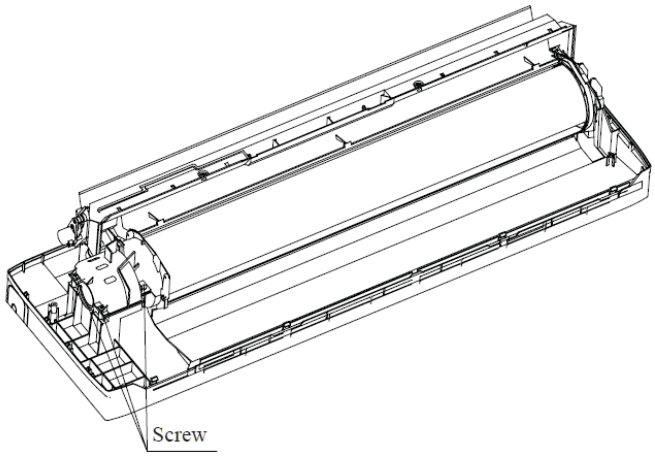
Terminal	Resistance Value	
Black - Red	100.5Ω±8% (20°C /68°F)	100Ω±8% (20°C /68°F)
White - Black	64.5Ω±8% (20°C /68°F)	68.5Ω±8% (20°C /68°F)

DISSASSEMBLY INSTRUCTIONS

High Wall Unit

Removal and Assembly of the Fan Motor

IMPORTANT: Prior to assembly of the motor, ensure the power supply is cut off.

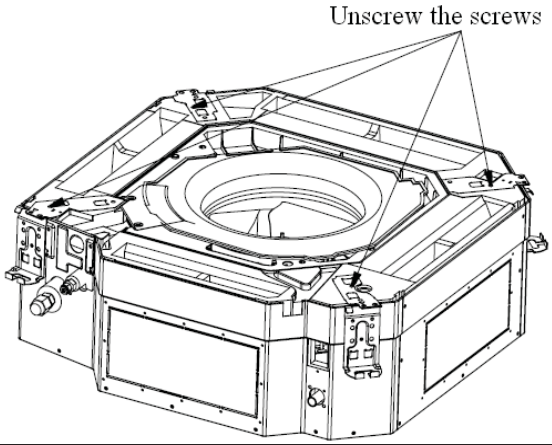
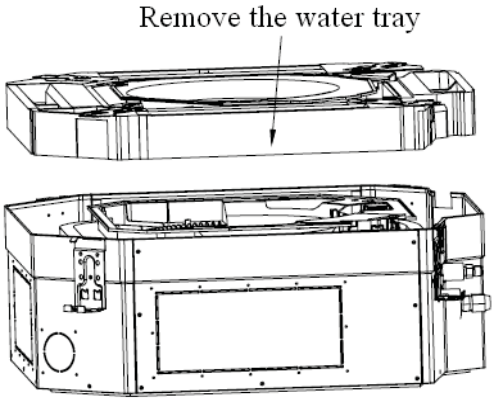
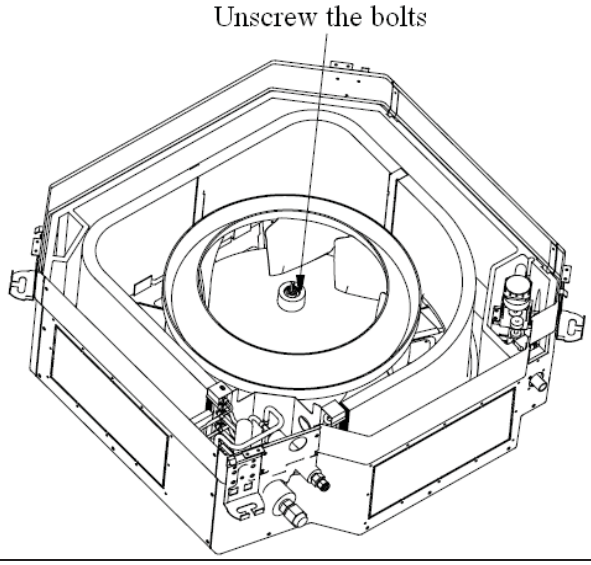
Steps	Illustrations	Operation Instructions
1.Remove the front panel, front case and electric box		a) Loosen the screws； b) Unplug the motor terminals in the electric box. Loosen the earth screws and lift up
2.Remove the evaporator		Unscrew the fixed screws of the evaporator, and then remove it
3.Remove the motor and cross flow fan		a) Unscrew the fixed screws of the motor press plate and cross flow fan b) Separate the motor from the cross flow fan.

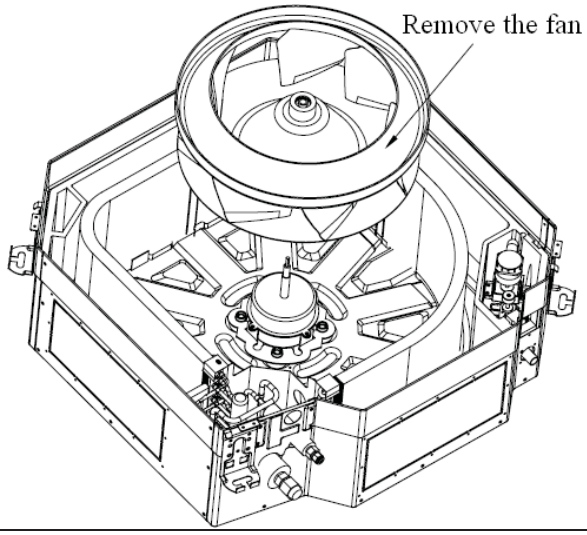
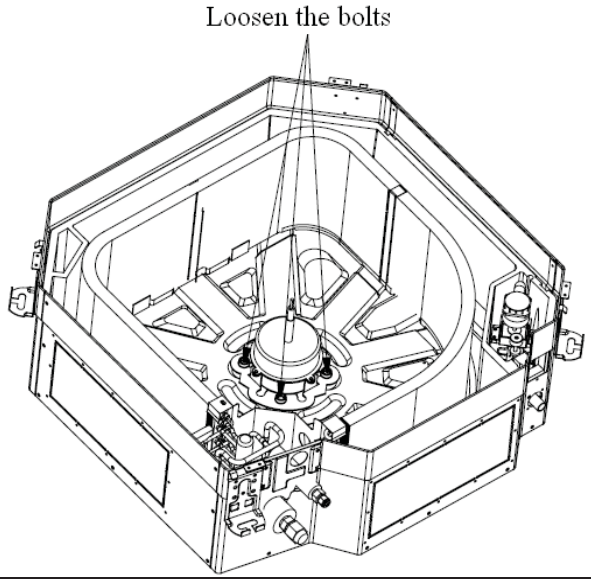
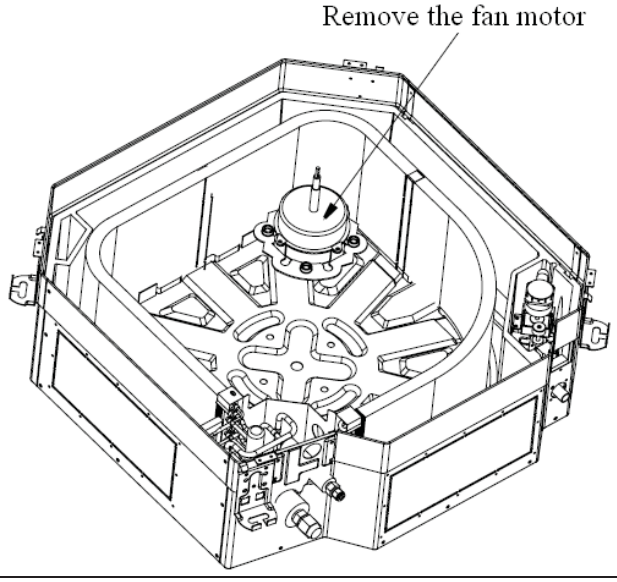
DISSASSEMBLY INSTRUCTIONS (CONT)

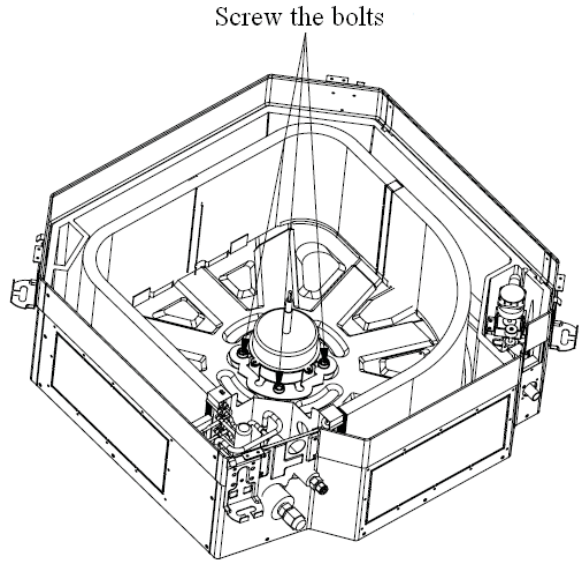
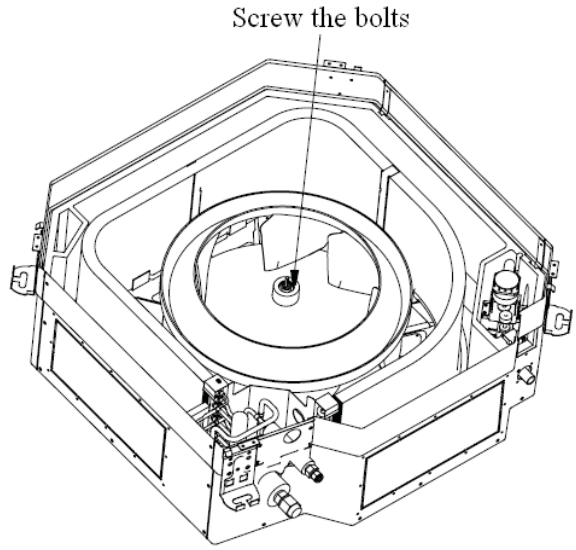
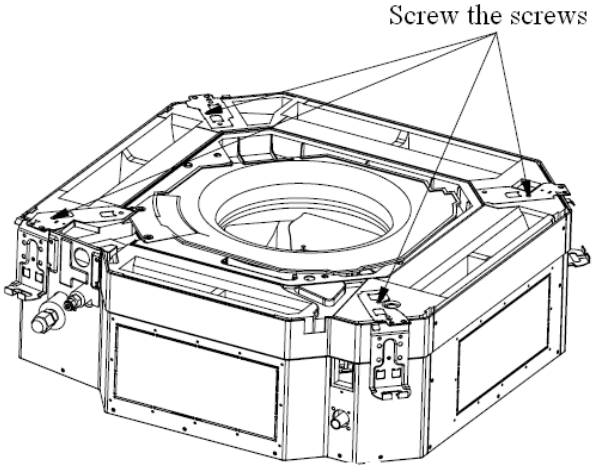
Cassette

Removal and Assembly of the Fan Motor

IMPORTANT: Prior to assembly of the motor, ensure the power supply is cut off.

Steps	Illustrations	Operation Instructions
1.Unscrew the fixed screws of the water tray		Unscrew the fixed screws of the water tray
2.Remove the water tray		Remove the water tray
3.Unscrew the fixed bolts of the fan		Unscrew the fixed bolts of the fan with the spanner

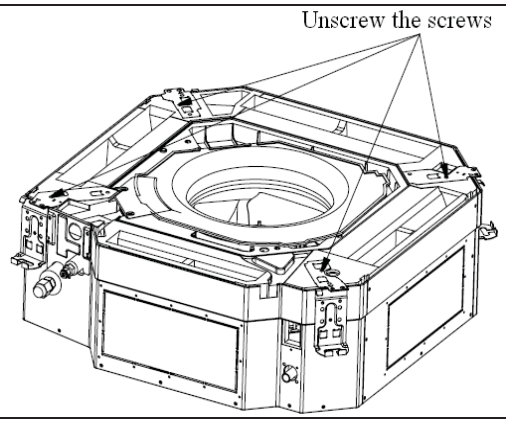
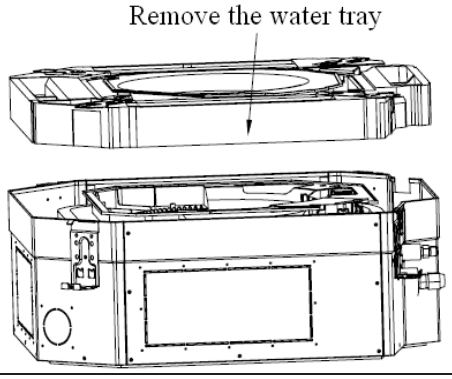
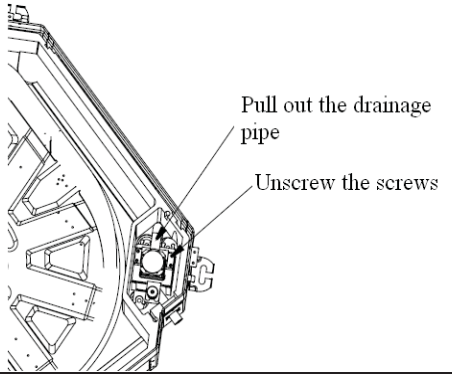
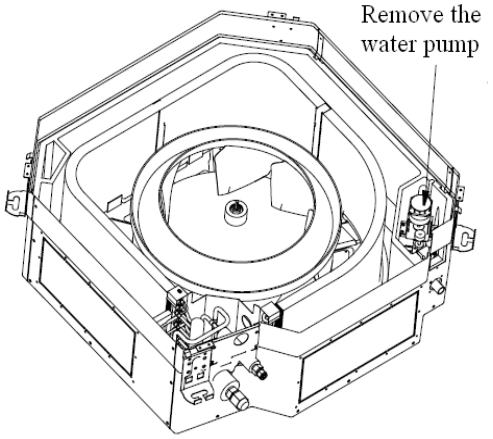
4.Remove the fan		Remove the fan
5.Loosen the fixed bolts of the fan motor		Loosen the fixed bolts of the fan motor
6.Remove the motor and replace it		Remove the motor and replace it

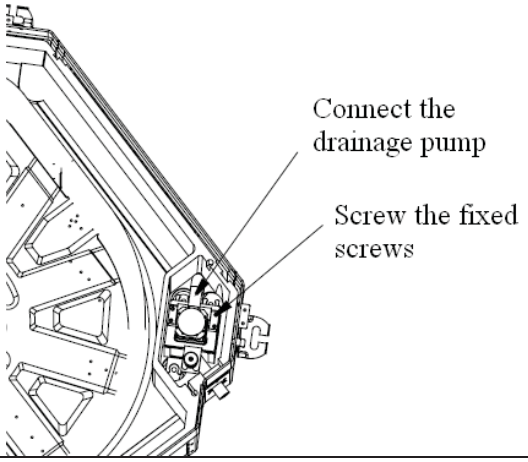
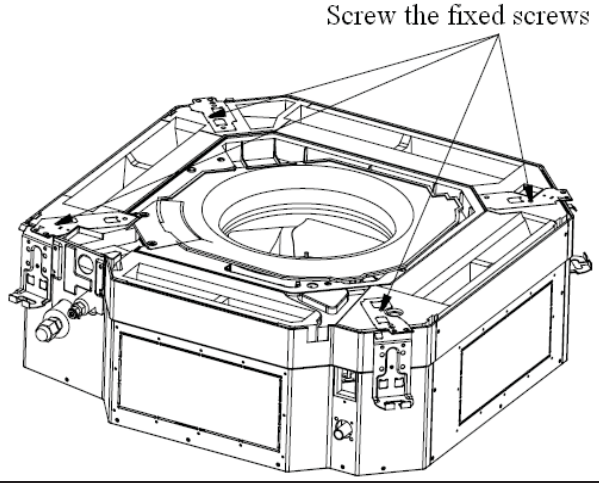
7.Screw the fixed bolts of the motor		Screw the fixed bolts of the motor
8.Mount the fan and screw the fixing bolts		Mount the fan and screw the fixing bolts
9.Mount the water tray and screw the screws		Mount the water tray and screw the screws

DISSASSEMBLY INSTRUCTIONS (CONT)

Removal and Assembly of the Drainage Pump

IMPORTANT: Prior to assembly of the motor, ensure the power supply is cut off.

Steps	Illustrations	Operation Instructions
1.Unscrew the fixed screws of the water tray		Unscrew the fixed screws of the water tray
2.Remove the water tray		Remove the water tray
3. Pull out the drainage pipe and unscrew the fixed screws the water pump.		Pull out the drainage pipe and unscrew the fixed screws the water pump.
4.Take out the pump and replace it		Take out the pump and replace it

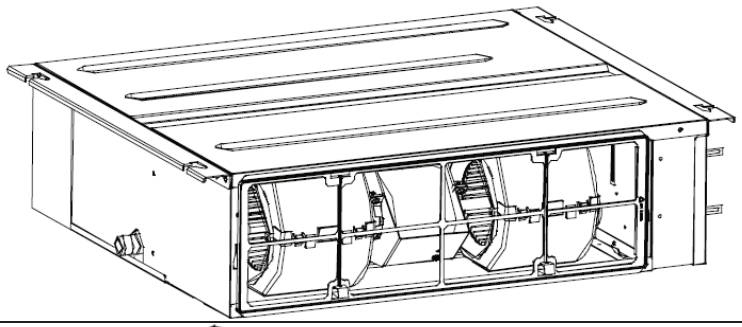
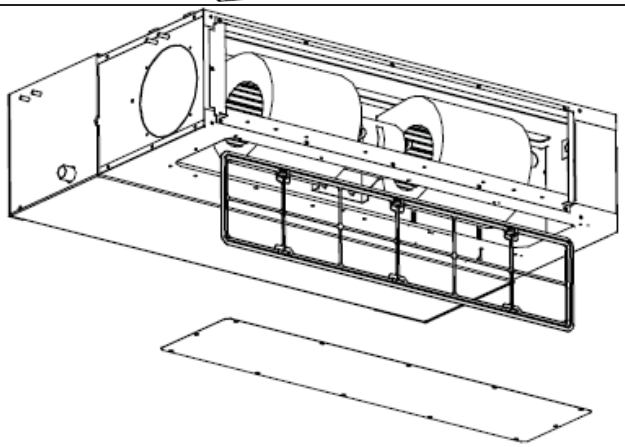
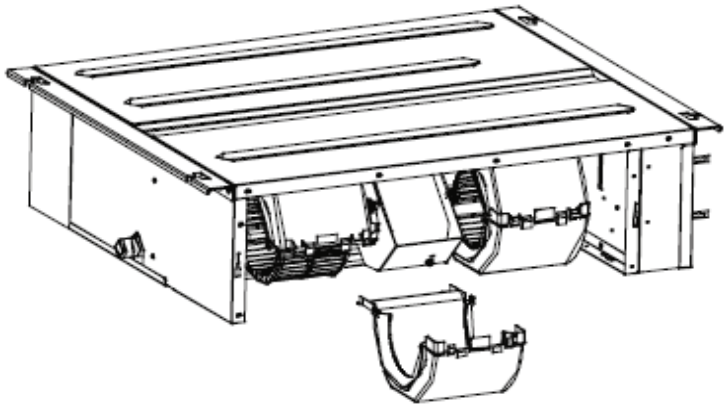
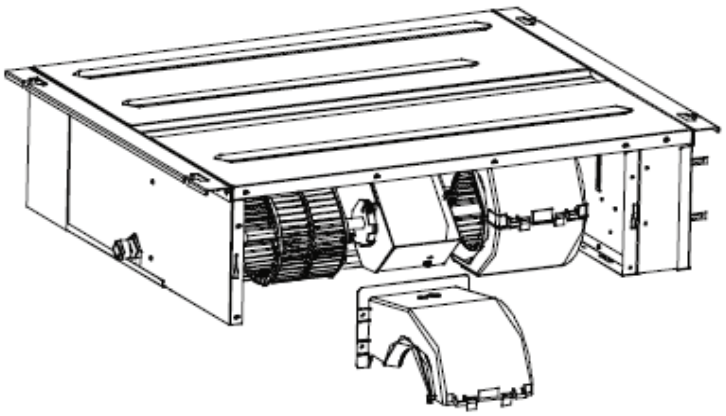
5. Connect the drainage pipe and screw the fixed screws the water pump.		Connect the drainage pipe and screw the fixed screws the water pump.
6.Mount the water tray and tighten the screws		Mount the water tray and tighten the screws

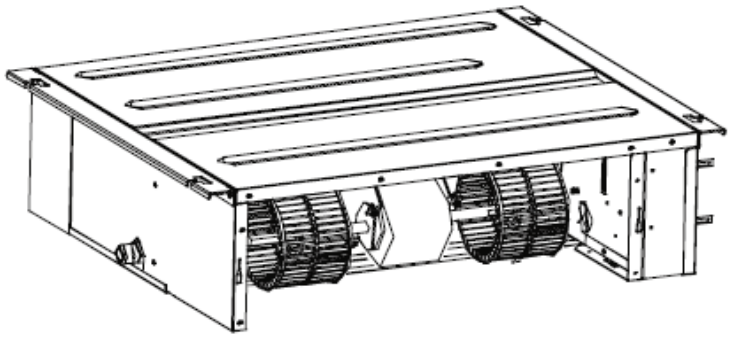
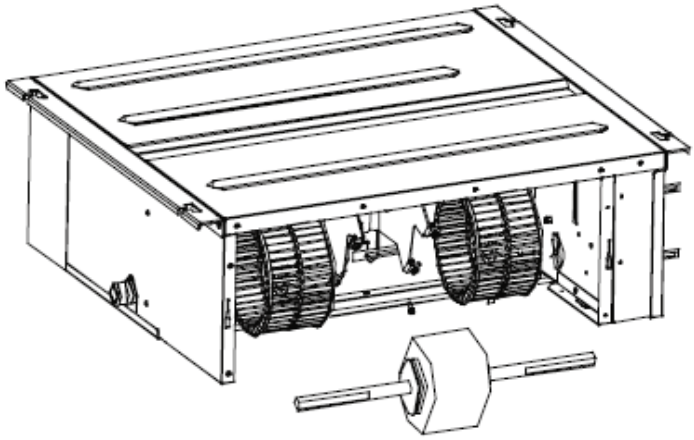
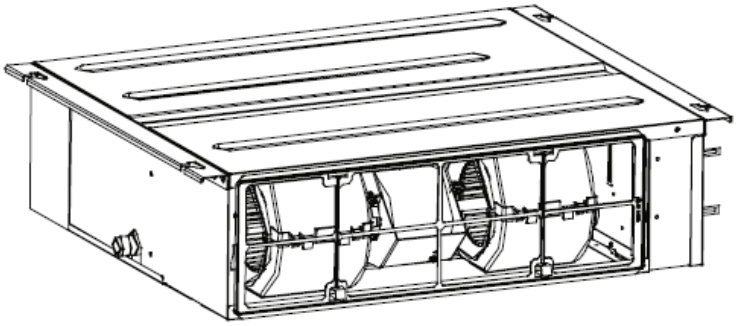
DISSASSEMBLY INSTRUCTIONS (CONT)

Ducted Unit

Removal and Assembly of the Fan Motor

IMPORTANT: Prior to assembly of the motor, ensure the power supply is cut off.

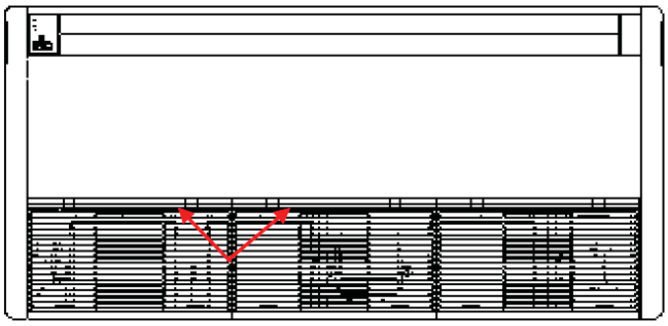
Steps	Illustrations	Operation Instructions
1.Pull out the electric wire of the motor		Open the cover plate of the electric box and then pull out the electric wire inside the box.
2.Remove the cover plate for return air		a) Remove the filter screen b) Unscrew the fixed screws of the return air
3.Remove the rear volute		Undo the buckle of the rear and front volutes and then remove the rear volute away.
4. Remove the front volute		Unscrew the fixed screws of the front volute and then remove it away

5.Loosen the fan blade and fan motor		Unscrew the fixed screws of the fan blades and then undo the buckle of the motor
6. Remove the motor away.		a) Separate the motor away from the motor support. b) Remove the fan blade c) Take the motor out from the return air frame Note: the motor support shall be removed in advance and then changed to the unit.
7.Replace with a new motor		Assemble the fan as the reverse disassembly order and then take a power-on test.

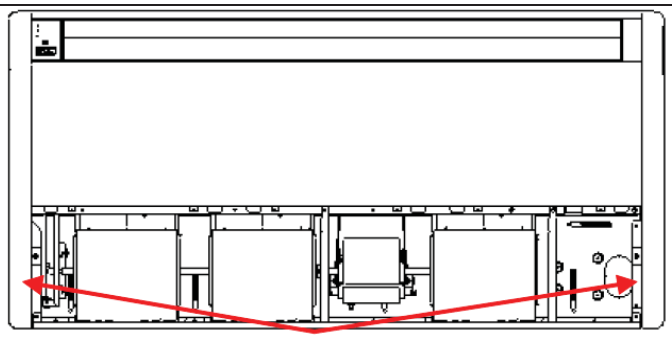
Floor Console

IMPORTANT: Prior to the assembly of the indoor unit, make sure the power supply is cut off.

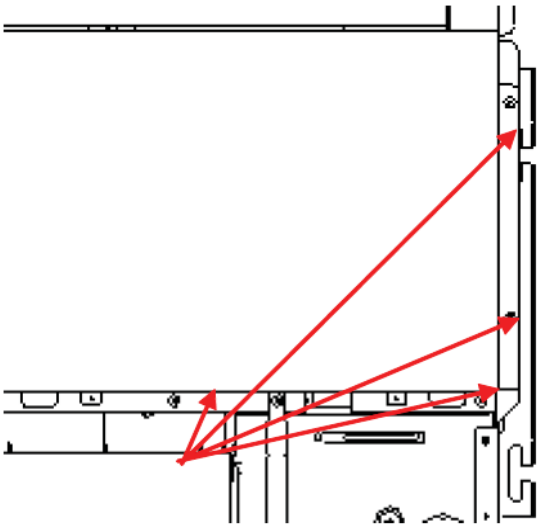
Removal panel grating module.

Steps	Illustrations	Operation Instructions
Remove sub-assy of front grill		Move down the clip of the sub-assy of fromt grill until the front grill is open. (As is shown in the graph, arrow represents the position of bottons. There are two clips for each grating.)

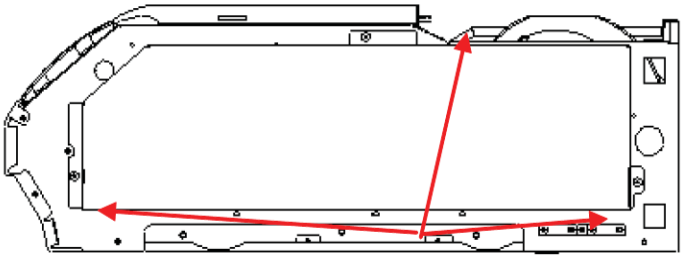
◆ Remove right and left finishing plates

Steps	Illustrations	Operation Instructions
Remove right and left finishing plates		Remove the screws as shown in the graph with screwdriver and then push upward to remove the right and left finishing plates. (As is shown in the graph, arrow represents the position of screws.)

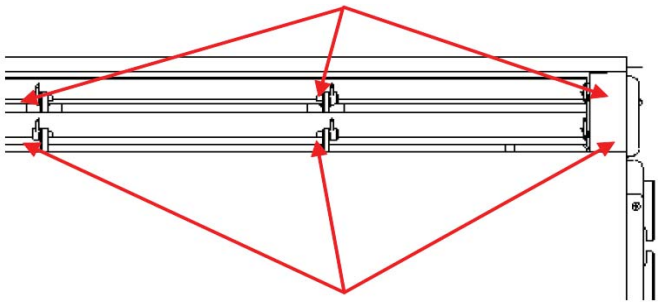
◆ Remove panel parts

Steps	Illustrations	Operation Instructions
Remove panel parts		Remove the screws shown by the arrow in the graph with screwdriver (two on both right and left and 4 in the front) and then remove the panel parts.

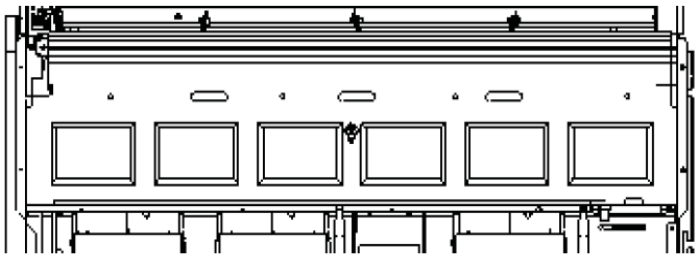
Remove Sub-Assy of Electric Box

Steps	Illustrations	Operation Instructions
Remove of electric box cover		Remove 3 screws as shown by the arrow in the graph on left and remove the electric box cover.

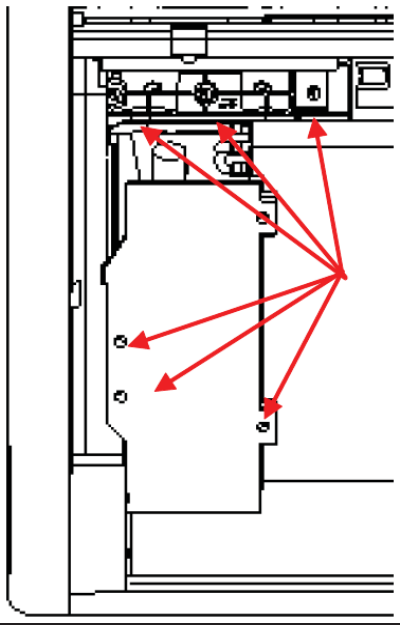
◆ Remove air deflecting plate modules

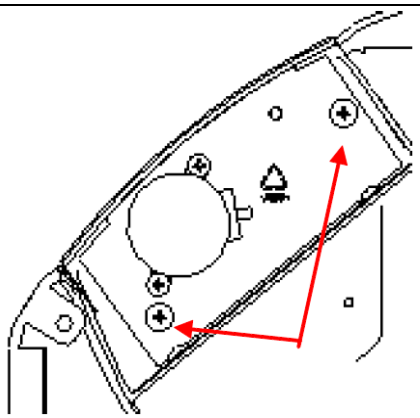
Steps	Illustrations	Operation Instructions
Remove sub-assy of air deflecting plate		Remove the air deflecting plates from the air deflecting plate support assembly, and then remove both ends from the air sweeping motor. joint (As is shown in the graph, arrow represents the support assembly and circle the air sweeping motor joint.)

◆ Remove the water tray

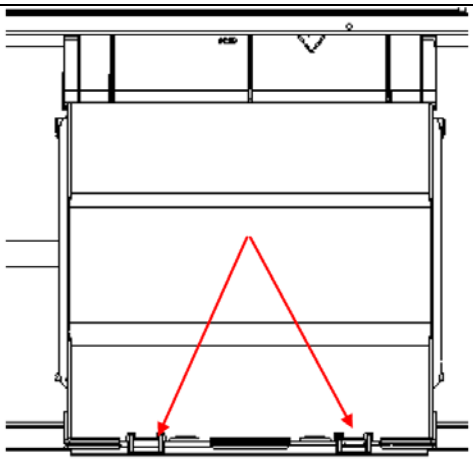
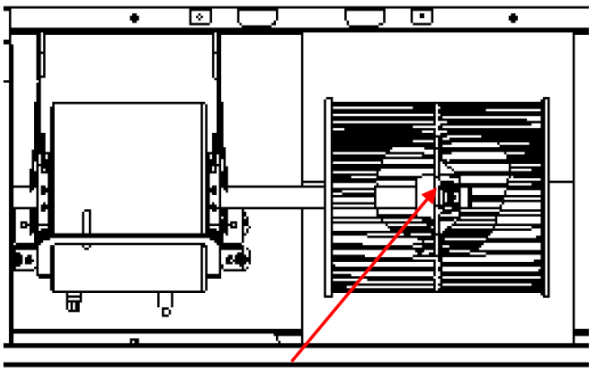
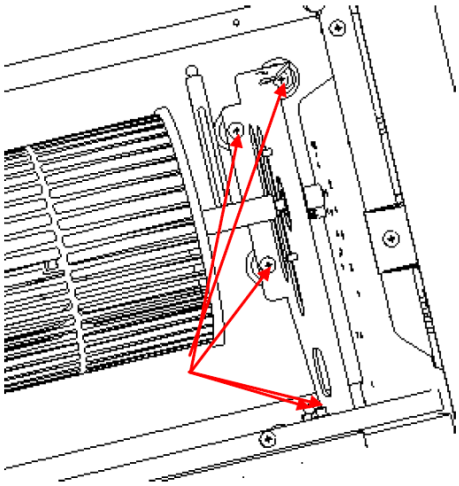
Steps	Illustrations	Operation Instructions
Remove the water tray		Remove the water tray

◆ Remove the evaporator

Steps	Illustrations	Operation Instructions
Remove the evaporator		Remove the screws as shown by the arrow in the graph (There are 6 screws on left and right of the evaporator and 5 on evaporator outlet press plate modules)

Steps	Illustrations	Operation Instructions
Remove fixing plate sub-assy for air sweeping fans		Remove the screws shown in the graph

◆ Remove fan and motor components

Steps	Illustrations	Operation Instructions
1. Remove front and back scroll cases		Press the buckle at the joints of front and back scroll cases with hands and pull upward to remove the front scroll case. Then remove the screws on the back scroll case. Lift the buckle of back scroll case with hands and remove it.(As is shown in the graph, circle represents 2 screws on left and right.)
2.Remove fans		Remove the fixed screws of fan wheel with inner hexagonal and remove the wheel. The inner hexagonal and its direction of effect are shown by the arrow in the graph.
3. Remove bearing fixing plates		Remove 4 screws on the bearing fixing plates with screwdriver. (As shown in the box in the graph)

APPENDIX 1

Temperature Sensor Resistance Value Table for T1, T2, T3, T4 (°C--K)

°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm
-20	-4	115.266	20	68	12.6431	60	140	2.35774	100	212	0.62973
-19	-2	108.146	21	70	12.0561	61	142	2.27249	101	214	0.61148
-18	0	101.517	22	72	11.5	62	144	2.19073	102	216	0.59386
-17	1	96.3423	23	73	10.9731	63	145	2.11241	103	217	0.57683
-16	3	89.5865	24	75	10.4736	64	147	2.03732	104	219	0.56038
-15	5	84.219	25	77	10	65	149	1.96532	105	221	0.54448
-14	7	79.311	26	79	9.55074	66	151	1.89627	106	223	0.52912
-13	9	74.536	27	81	9.12445	67	153	1.83003	107	225	0.51426
-12	10	70.1698	28	82	8.71983	68	154	1.76647	108	226	0.49989
-11	12	66.0898	29	84	8.33566	69	156	1.70547	109	228	0.486
-10	14	62.2756	30	86	7.97078	70	158	1.64691	110	230	0.47256
-9	16	58.7079	31	88	7.62411	71	160	1.59068	111	232	0.45957
-8	18	56.3694	32	90	7.29464	72	162	1.53668	112	234	0.44699
-7	19	52.2438	33	91	6.98142	73	163	1.48481	113	235	0.43482
-6	21	49.3161	34	93	6.68355	74	165	1.43498	114	237	0.42304
-5	23	46.5725	35	95	6.40021	75	167	1.38703	115	239	0.41164
-4	25	44	36	97	6.13059	76	169	1.34105	116	241	0.4006
-3	27	41.5878	37	99	5.87359	77	171	1.29078	117	243	0.38991
-2	28	39.8239	38	100	5.62961	78	172	1.25423	118	244	0.37956
-1	30	37.1988	39	102	5.39689	79	174	1.2133	119	246	0.36954
0	32	35.2024	40	104	5.17519	80	176	1.17393	120	248	0.35982
1	34	33.3269	41	106	4.96392	81	178	1.13604	121	250	0.35042
2	36	31.5635	42	108	4.76253	82	180	1.09958	122	252	0.3413
3	37	29.9058	43	109	4.5705	83	181	1.06448	123	253	0.33246
4	39	28.3459	44	111	4.38736	84	183	1.03069	124	255	0.3239
5	41	26.8778	45	113	4.21263	85	185	0.99815	125	257	0.31559
6	43	25.4954	46	115	4.04589	86	187	0.96681	126	259	0.30754
7	45	24.1932	47	117	3.88673	87	189	0.93662	127	261	0.29974
8	46	22.5662	48	118	3.73476	88	190	0.90753	128	262	0.29216
9	48	21.8094	49	120	3.58962	89	192	0.8795	129	264	0.28482
10	50	20.7184	50	122	3.45097	90	194	0.85248	130	266	0.2777
11	52	19.6891	51	124	3.31847	91	196	0.82643	131	268	0.27078
12	54	18.7177	52	126	3.19183	92	198	0.80132	132	270	0.26408
13	55	17.8005	53	127	3.07075	93	199	0.77709	133	271	0.25757
14	57	16.9341	54	129	2.95896	94	201	0.75373	134	273	0.25125
15	59	16.1156	55	131	2.84421	95	203	0.73119	135	275	0.24512
16	61	15.3418	56	133	2.73823	96	205	0.70944	136	277	0.23916
17	63	14.6181	57	135	2.63682	97	207	0.68844	137	279	0.23338
18	64	13.918	58	136	2.53973	98	208	0.66818	138	280	0.22776
19	66	13.2631	59	138	2.44677	99	210	0.64862	139	282	0.22231

APPENDIX 2

Temperature Sensor Resistance Value Table for T5 (°C--K)

°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm
-20	-4	542.7	20	68	68.66	60	140	13.59	100	212	3.702
-19	-2	511.9	21	70	65.62	61	142	13.11	101	214	3.595
-18	0	483	22	72	62.73	62	144	12.65	102	216	3.492
-17	1	455.9	23	73	59.98	63	145	12.21	103	217	3.392
-16	3	430.5	24	75	57.37	64	147	11.79	104	219	3.296
-15	5	406.7	25	77	54.89	65	149	11.38	105	221	3.203
-14	7	384.3	26	79	52.53	66	151	10.99	106	223	3.113
-13	9	363.3	27	81	50.28	67	153	10.61	107	225	3.025
-12	10	343.6	28	82	48.14	68	154	10.25	108	226	2.941
-11	12	325.1	29	84	46.11	69	156	9.902	109	228	2.86
-10	14	307.7	30	86	44.17	70	158	9.569	110	230	2.781
-9	16	291.3	31	88	42.33	71	160	9.248	111	232	2.704
-8	18	275.9	32	90	40.57	72	162	8.94	112	234	2.63
-7	19	261.4	33	91	38.89	73	163	8.643	113	235	2.559
-6	21	247.8	34	93	37.3	74	165	8.358	114	237	2.489
-5	23	234.9	35	95	35.78	75	167	8.084	115	239	2.422
-4	25	222.8	36	97	34.32	76	169	7.82	116	241	2.357
-3	27	211.4	37	99	32.94	77	171	7.566	117	243	2.294
-2	28	200.7	38	100	31.62	78	172	7.321	118	244	2.233
-1	30	190.5	39	102	30.36	79	174	7.086	119	246	2.174
0	32	180.9	40	104	29.15	80	176	6.859	120	248	2.117
1	34	171.9	41	106	28	81	178	6.641	121	250	2.061
2	36	163.3	42	108	26.9	82	180	6.43	122	252	2.007
3	37	155.2	43	109	25.86	83	181	6.228	123	253	1.955
4	39	147.6	44	111	24.85	84	183	6.033	124	255	1.905
5	41	140.4	45	113	23.89	85	185	5.844	125	257	1.856
6	43	133.5	46	115	22.89	86	187	5.663	126	259	1.808
7	45	127.1	47	117	22.1	87	189	5.488	127	261	1.762
8	46	121	48	118	21.26	88	190	5.32	128	262	1.717
9	48	115.2	49	120	20.46	89	192	5.157	129	264	1.674
10	50	109.8	50	122	19.69	90	194	5	130	266	1.632
11	52	104.6	51	124	18.96	91	196	4.849			
12	54	99.69	52	126	18.26	92	198	4.703			
13	55	95.05	53	127	17.58	93	199	4.562			
14	57	90.66	54	129	16.94	94	201	4.426			
15	59	86.49	55	131	16.32	95	203	4.294			
16	61	82.54	56	133	15.73	96	205	4.167			
17	63	78.79	57	135	15.16	97	207	4.045			
18	64	75.24	58	136	14.62	98	208	3.927			
19	66	71.86	59	138	14.09	99	210	3.812			

APPENDIX 3

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-5	23	21	69.8	51	123.8	82	179.6	113	235.4
-4	24.8	22	71.6	52	125.6	83	181.4	114	237.2
-3	26.6	23	73.4	53	127.4	84	183.2	115	239
-2	28.4	24	75.2	54	129.2	85	185	116	240.8
-1	30.2	25	77	55	131	86	186.8	117	242.6
0	32	25.5	77.9	56	132.8	87	188.6	118	244.4
0.5	32.9	26	78.8	57	134.6	88	190.4	119	246.2
1	33.8	27	80.6	58	136.4	89	192.2	120	248
1.5	34.7	28	82.4	59	138.2	90	194	121	249.8
2	35.6	29	84.2	60	140	91	195.8	122	251.6
2.5	36.5	30	86	61	141.8	92	197.6	123	253.4
3	37.4	31	87.8	62	143.6	93	199.4	124	255.2
3.5	38.3	32	89.6	63	145.4	94	201.2	125	257
4	39.2	33	91.4	64	147.2	95	203	126	258.8
4.5	40.1	34	93.2	65	149	96	204.8	127	260.6
5	41	35	95	66	150.8	97	206.6	128	262.4
6	42.8	36	96.8	67	152.6	98	208.4	129	264.2
7	44.6	37	98.6	68	154.4	99	210.2	130	266
8	46.4	38	100.4	69	156.2	100	212	131	267.8
9	48.2	39	102.2	70	158	101	213.8	132	269.6
10	50	40	104	71	159.8	102	215.6	133	271.4
11	51.8	41	105.8	72	161.6	103	217.4	134	273.2
12	53.6	42	107.6	73	163.4	104	219.2	135	275
13	55.4	43	109.4	74	165.2	105	221	136	276.8
14	57.2	44	111.2	75	167	106	222.8	137	278.6
15	59	45	113	76	168.8	107	224.6	138	280.4
16	60.8	46	114.8	77	170.6	108	226.4	139	282.2
17	62.6	47	116.6	78	172.4	109	228.2	140	284
18	64.4	48	118.4	79	174.2	110	230	141	285.8
19	66.2	49	120.2	80	176	111	231.8	142	287.6
20	68	50	122	81	177.8	112	233.6	143	289.4

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Replaces: NEW