40MFC / 38MFC
40MFQ / 38MFQ
High Wall Ductless System
Sizes 09 to 22

Carrier
turn to the experts

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.

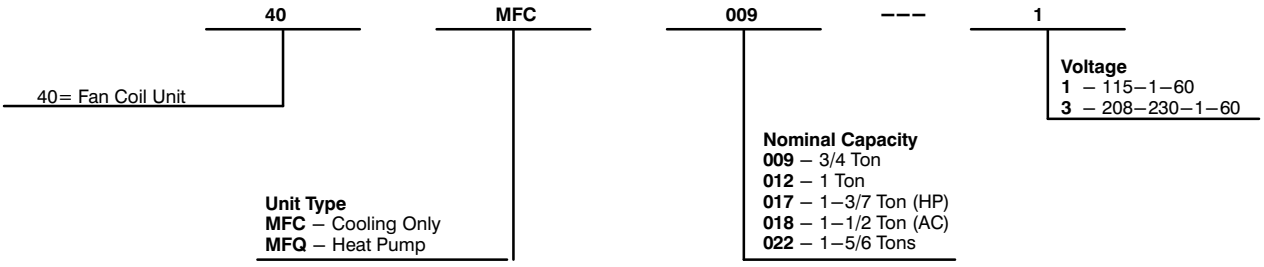
Do not bury more than 36 in. (914 mm) of refrigerant pipe in the ground. If any section of pipe is buried, there must be a 6 in. (152 mm) vertical rise to the valve connections on the outdoor units. If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during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

INTRODUCTION

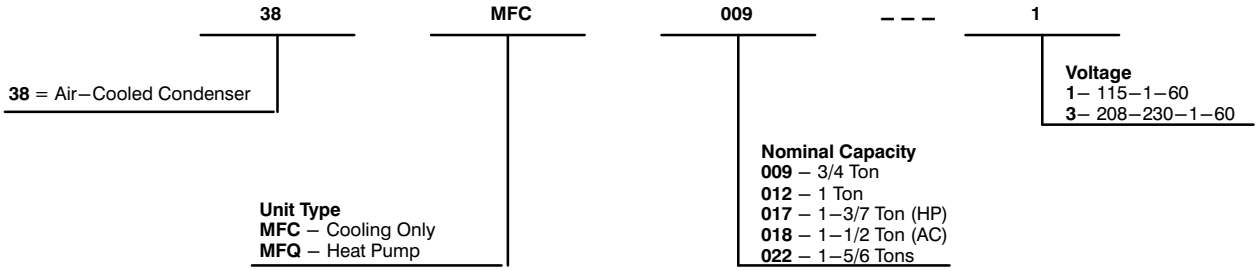
This Service Manual provides the necessary information to service, repair, and maintain the 38−40MF family of Puron air conditioners and heat pumps. Section 2 of this manual is an appendix with data required to perform troubleshooting. Use the Table of Contents to locate a desired topic.

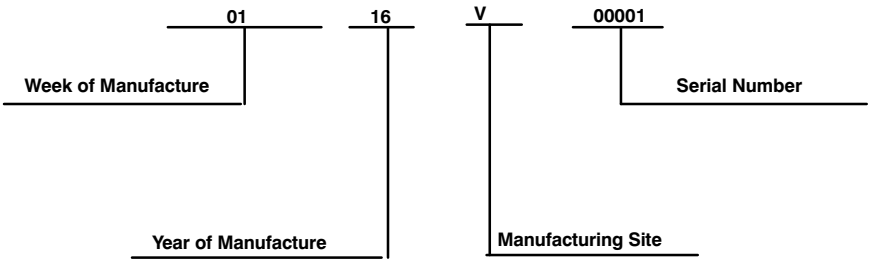
MODEL / SERIAL NUMBER NOMENCLATURES

INDOOR UNIT



OUTDOOR UNIT





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.

STANDARD FEATURES AND ACCESSORIES

Ease Of Installation	
Mounting Brackets	S
Low Voltage Controls	S
Comfort Features	
Microprocessor Controls	S
Wired Remote Control	A
Wireless Remote Control	S
Automatic Horizontal Air Sweep	S
Air Direction Control	S
Auto Restart Function	S
Cold Blow Protection On Heat Pumps	S
Freeze Protection Mode On Heat Pumps	S
Turbo Mode	S
Silence Mode	S
Auto Changeover On Heat Pumps	S
Energy Saving Features	
Sleep Mode	S
Stop/Start Timer	S
Safety And Reliability	
3 Minute Time Delay For Compressor	S
Over Current Protection For Compressor	S
Indoor Coil Freeze Protection	S
Indoor Coil High Temp Protection in Heating Mode	S
Condenser High Temp Protection in Cooling Mode	S
Ease Of Service And Maintenance	
Cleanable Filters	S
Diagnostics	S
Liquid Line Pressure Taps	S
Application Flexibility	
Condensate Pumps	A
Crankcase Heater	S

Legend
S Standard
A Accessory

INDOOR UNITS

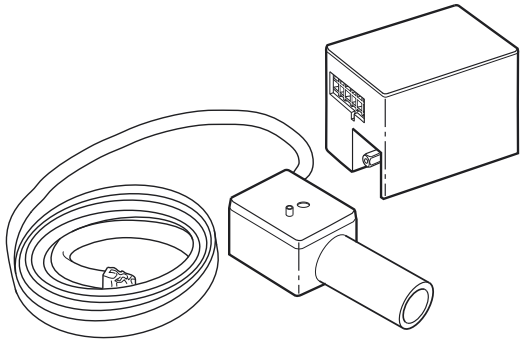


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Fig. 1 – Condensate Pump Accessory

On high wall fan coils, the condensate pump has a lift capability of 12 ft. (3.6 m) on the discharge side with the pump mounted in the fan coil or 6 ft. (1.8 m) on the suction side if the pump is remote mounted. The pump is recommended when adequate drain line pitch cannot be provided, or when the condensate must move up to exit.

NOTE: An external 115v power source is required to run the pump on unit sizes 9k and 12k.

OUTDOOR UNITS

Crankcase Heater

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

SPECIFICATIONS – COOLING ONLY UNITS (MFC SERIES)

Table 1—Specifications – Cooling Only Units (MFC Series)

SYSTEM					
Size (KBTU/Hr)	**09**	**12**		**18**	**22**
Outdoor Model	38MFC009---1	38MFC012---1	38MFC012---3	38MFC018---3	38MFC022---3
Indoor Model	40MFC009---1	40MFC012---1	40MFC012---3	40MFC018---3	40MFC022---3
AHRI Performance Ratings*					
Cooling Rated Capacity Btu/h	9,000	12,000		18,000	22,000
Cooling Cap. Range Min - Max Btu/h	4,000-10,000	4,500-13,000		5,500-19,000	6,500-24,000
SEER	15				
EER	10	9		8.5	10
Operating Range					
Cooling Outdoor DB Min - Max °F	14 - 115				
Cooling Indoor DB Min -Max °F	63 - 90				
Controls					
Wireless (°C, °F, Convertible)	Standard - Convertible				
Wired (°C, °F, Convertible)	Optional: KSACN0101AAA				
Electrical					
System Voltage-PH-Hz	115 -1 -60		208-230-1-60		
Control Voltage	0-15V DC				
Power Supply	Indoor unit powered from outdoor unit				
Outdoor - MCA	19	19	10	14	16
Outdoor - Fuse Rating (MOCP)	30	30	15	20	25
Outdoor Motor					
Rpm/CFM	1000 / 945		940 / 945	860 / 1050	930 / 1390
Diameter (in) ... No. of Blades	15.8 … 3			16.7 … 3	18.3 … 3
Motor (hp)	0.31		0.33	0.68	0.72
Capacitor (µF) / voltage	6 / 250V		2.5 / 400 - 450v	2.5 / 450v	
Indoor Motor					
Motor Watts/ HP	15 / 0.02	15 / 0.02	20 / 0.027	28 / 0.038	45 / 0.061
Rpm/CFM (High)	1200 / 192	1200 / 230	1200 / 232	1200 / 348	1200 / 547
Rpm/CFM (Medium)	1050 / 160	1050 / 194	1050 / 193	1050 / 294	1050 / 458
Rpm/CFM (Low)	900 / 131	900 / 158	900 / 157	900 / 236	900 / 368
Blower Diameter / Length (in)	3.7 / 21.3			3.9 / 28.7	4.2 / 30.7
Capacitor (µF)	3		1.5		3
Refrigerant					
Refrigerant Type	R410A				
Design Pressure (PSIG)	550				
Metering Device	Capillary Tube in Outdoor Unit				
Charge (lb)	1.34	1.43		1.87	2.60
Refrigerant Lines					
Connection Type	Flare				
Pipe Connection Size - Liquid (In) OD	1/4				3/8
Pipe Connection Size - Suction (In) OD	3/8	1/2			5/8
Condensate Drain OD / ID (in)	0.65 / 0.63				
Maximum Piping Length ft (m)	82 (25)				98 (30)
Max Lift (Fan Coil Above) ft (m)	32 (10)			65 (20)	
Max Drop (Fan Coil Below) ft (m)	32 (10)			65 (20)	
Compressor					
Type	Rotary				
Model	DA108X1C-20FZ3			DA130M1C-31FZ	DA150S1C-20FZ
Oil Charge (POE –oz (g))	16.9 (480)				17.6 (500)
Capacitor	45µF / 250VAC		6µF / 450VAC	None	
Rated Current (RLA)	5.3			3.95	9.7
Locked Rotor Amp (LRA)	10			14	17
Outdoor Coil					
Face Area (sq. ft.)	4.10	6.10		7.67	11.16
No. Rows	1	1.5		2	
Fins per inch	21				
Circuits	2	4			
Indoor Coil					
Face Area (sq. ft.)	2.53	2.98		1.61	5.29
No. Rows	1/2				2
Fins per inch	20	21			
Circuits	2			4	5
Dimensions - Outdoor					
Dimensions (W X H X D) In	35.8 x 23 x 13.2			34.9 x 25.4 x 14	38.0 x 29.7 x 15.6
Net Weight (lbs.)	58.4	61.7		76.0	98.1
Dimensions - Indoor					
Dimensions (W X H X D) In	26.8 x 10.0 x 7.0	30.3 x 10.0 x 7.4		35.6 x 10.8 x 7.8	40.6 x 12.4 x 8.6
Net Weight (lbs.)	15.4	16.5		19.8	26.4

***Air Conditioning, Heating & Refrigeration Institute**

– Ratings are net values reflecting the effects of circulating fan heat. Ratings are based on: Cooling Standard: 80°F (26.67°C) db, 67°F (19.44°C) wb air entering indoor unit and 95°F (35°C) db air entering outdoor unit. High Temperature Heating Standard: 70°F (21.11°C) db air entering indoor unit and 47°F (8.33°C) db, 43°F (6.11°C) wb air entering outdoor unit.

– Ratings are based on 25 ft. (7.62 m) of interconnecting refrigerant lines.

– All system ratings are based on fan coil units operating at high fan speed. Consult Specification tables for airflows at all available fan speeds.

Legend

SEER – Seasonal Energy Efficiency Ratio
EER – Energy Efficiency Ratio
MCA – Minimum Circuit Amps
MOCP – Max. Over–Current Protection

SPECIFICATIONS – HEAT PUMP UNITS (MFQ SERIES)

Table 2—Specifications – Heat Pump Units (MFQ Series)

System					
Size (KBTU/Hr)	**09**	**12**		**17**	**22**
Outdoor Model	38MFQ009---1	38MFQ012---1	38MFQ012---3	38MFQ017---3	38MFQ022---3
Indoor Model	40MFQ009---1	40MFQ012---1	40MFQ012---3	40MFQ017---3	40MFQ022---3
AHRI Performance Ratings*					
Cooling Rated Capacity Btu/h	9,000	12,000		17,000	22,000
Cooling Cap. Range Min - Max Btu/h	4,000-10,000	4,500-13,000		5,500-19,000	6,500-24,000
SEER	15				
EER	10.5	10		9	9.5
Heating Rated Capacity Btu/h	9,000	12,000		18,000	22,000
Heating Cap. Range Min - Max Btu/h	4,000-10,500	4,500-13,000		5,500-19,500	6,500-24,500
HSPF	8.2				
COP Btuh, W	8.1	8.0			9.7
Operating Range					
Cooling Outdoor DB Min - Max °F	14 - 115				
Heating Outdoor DB Min - Max °F	5 - 75				
Cooling Indoor DB Min - Max °F	63 - 90				
Heating Indoor DB Min - Max °F	32 - 86				
Controls					
Wireless (°C, °F, Convertible)	Standard - Convertible				
Wired (°C, °F, Convertible)	Optional: KSACN0101AAA				
Electrical					
System Voltage-PH-Hz	115 -1 -60		208-230-1-60		
Control Voltage	0-15V DC				
Power Supply	Indoor unit powered from outdoor unit				
Outdoor - MCA	19		10	14	16
Outdoor - Fuse Rating (MOCP)	30		15	20	25
Outdoor Motor					
Rpm/CFM	1000 / 945		940 / 945	860 / 1050	930 / 1390
Diameter (in) ... No. of Blades	15.8 … 3			16.7 … 3	18.3 … 3
Motor (hp)	0.31		0.33	0.68	0.72
Capacitor (µF)	6		2.5		
Indoor Motor					
Motor Watts/ HP	15 / 0.02	15 / 0.02	20 / 0.027	28 / 0.038	45 / 0.061
Rpm/CFM (High)	1200 / 192	1200 / 230	1200 / 232	1200 / 348	1200 / 547
Rpm/CFM (Medium)	1050 / 160	1050 / 194	1050 / 193	1050 / 294	1050 / 458
Rpm/CFM (Low)	900 / 131	900 / 158	900 / 157	900 / 236	900 / 368
Blower Diameter / Length (in)	3.7 / 21.3			3.9 / 28.7	4.2 / 30.7
Capacitor (µF)	3		1.5		3
Refrigerant					
Refrigerant Type	R410A				
Design Pressure (PSIG)	550				
Metering Device	Capillary Tube in Outdoor Unit				
Charge (lb)	2.6			2.87	3.52
Refrigerant Lines					
Connection Type	Flare				
Pipe Connection Size - Liquid (In) OD	1/4				3/8
Pipe Connection Size - Suction (In) OD	3/8	1/2			5/8
Condensate Drain OD / ID (in)	0.65 / 0.63				
Maximum Piping Length ft (m)	82 (25)				98 (30)
Max Lift (Fan Coil Above) ft (m)	32 (10)			65 (20)	
Max Drop (Fan Coil Below) ft (m)	32 (10)			65 (20)	
Compressor					
Type	Rotary				
Model	DA108X1C-20FZ3			DA130M1C-31FZ	DA150S1C-20FZ
Oil Charge (POE –oz (g))	16.9 (480)				17.6 (500)
Capacitor	45µF / 250VAC		6µF / 450VAC	None	
Rated Load Amps (RLA)	5.3			3.95	9.7
Locked Rotor Amp (LRA)	10			14	17
Outdoor Coil					
Face Area (sq. ft.)	8.19			7.81	11
No. Rows	2				
Fins per inch	17			18	
Circuits	3			4	
Indoor Coil					
Face Area (sq. ft.)	2.53	2.98		1.61	5.29
No. Rows	1/2				2
Fins per inch	20	21			
Circuits	2			4	5
Dimensions - Outdoor					
Dimensions (W X H X D) In	35.8 x 23 x 13.2			34.9 x 25.4 x 14	38.0 x 29.7 x 15.6
Net Weight (lbs.)	70.5			82.7	103.6
Dimensions - Indoor					
Dimensions (W X H X D) In	26.8 x 10.0 x 7.0	30.3 x 10.0 x 7.4		35.6 x 10.8 x 7.8	40.6 x 12.4 x 8.6
Net Weight (lbs.)	15.4	16.5		19.8	26.4

***Air Conditioning, Heating & Refrigeration Institute**

– Ratings are net values reflecting the effects of circulating fan heat. Ratings are based on: Cooling Standard: 80°F (26.67°C) db, 67°F (19.44°C) wb air entering indoor unit and 95°F (35°C) db air entering outdoor unit. High Temperature Heating Standard: 70°F (21.11°C) db air entering indoor unit and 47°F (8.33°C) db, 43°F (6.11°C) wb air entering outdoor unit.

– Ratings are based on 25 ft. (7.62 m) of interconnecting refrigerant lines.

– All system ratings are based on fan coil units operating at high fan speed. Consult Specification tables for airflows at all available fan speeds.

Legend

SEER – Seasonal Energy Efficiency Ratio
EER – Energy Efficiency Ratio
HSPF – Heating Seasonal Performance Factor
COP – Coefficient of Performance
MCA – Minimum Circuit Amps
MOCP – Max. Over–Current Protection

DIMENSIONS – INDOOR

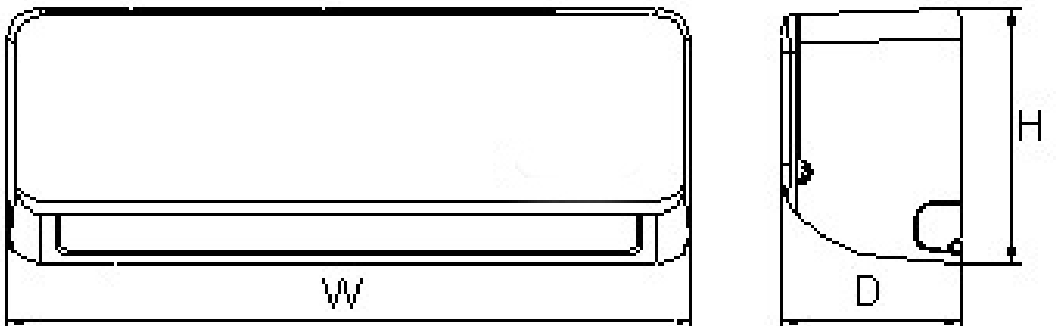

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Fig. 2 – Dimensions – Indoor

Table 3—Dimensions – Indoor

UNIT SIZE	W in (mm)	D in (mm)	H in (mm)	OPERATING WEIGHT lb (kg)
9K	26.8 (680)	7.0 (178)	10.0 (255)	15.4 (7)
12K	30.3 (770)	7.4 (188)	10.0 (255)	16.5 (7.5)
17K HP / 18K AC	35.6 (905)	7.8 (198)	10.8 (275)	19.8 (9)
22K	40.6 (1030)	8.6 (218)	12.4 (315)	26.4 (12)

DIMENSIONS–OUTDOOR

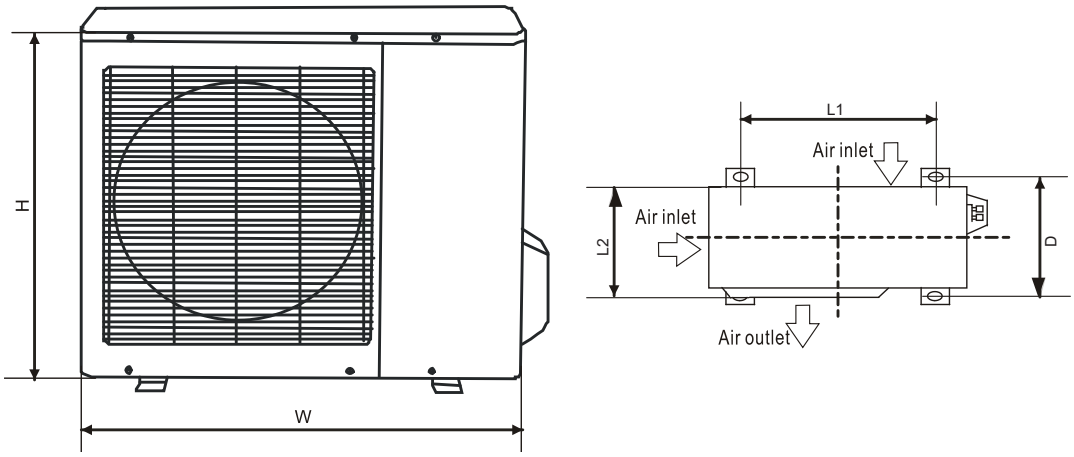

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Fig. 3 – Dimensions – Outdoor

Table 4—Dimensions – Outdoor

Model	W in (mm)	D in (mm)	H in (mm)	L1 in (mm)	L2 in (mm)	HP Operating Weight lb (kg)	AC Operating Weight lb (kg)
9K	30.7 (780)	9.8 (250)	21.2 (540)	21.6 (549)	10.9 (276)	70.5 (32.0)	58.4 (26.5)
12K	30.7 (780)	9.8 (250)	21.2 (540)	21.6 (549)	10.9 (276)	70.5 (32.0)	61.7 (28.0)
17K HP / 18K AC	29.9 (760)	11.2 (285)	23.2 (590)	20.9 (530)	11.4 (290)	82.7 (37.5)	76.0 (47.0)
22K	33.3 (845)	12.6 (320)	27.6 (700)	22.0 (560)	13.2 (335)	103.6 (47.0)	98.1 (44.5)

SERVICE VALVE LOCATIONS

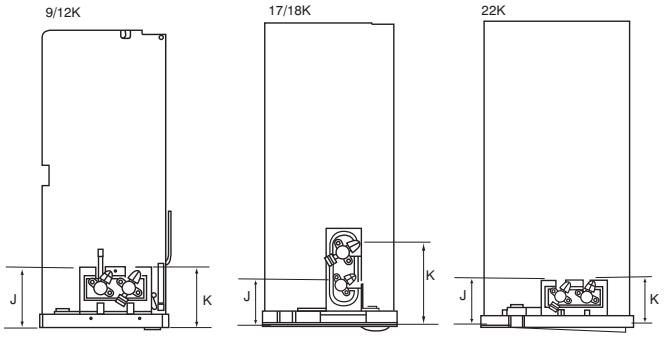

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Fig. 4 – Service Valve Locations

Table 5—Service Valve Locations

Service Valve Locations	9K in. (mm)	12K in. (mm)	18K in. (mm)	22K in. (mm)
J	4.37 (111)	4.37 (111)	4.09 (104)	4.13 (105)
K	4.61 (117)	4.61 (117)	6.34 (161)	4.13 (105)

CLEARANCES – INDOOR

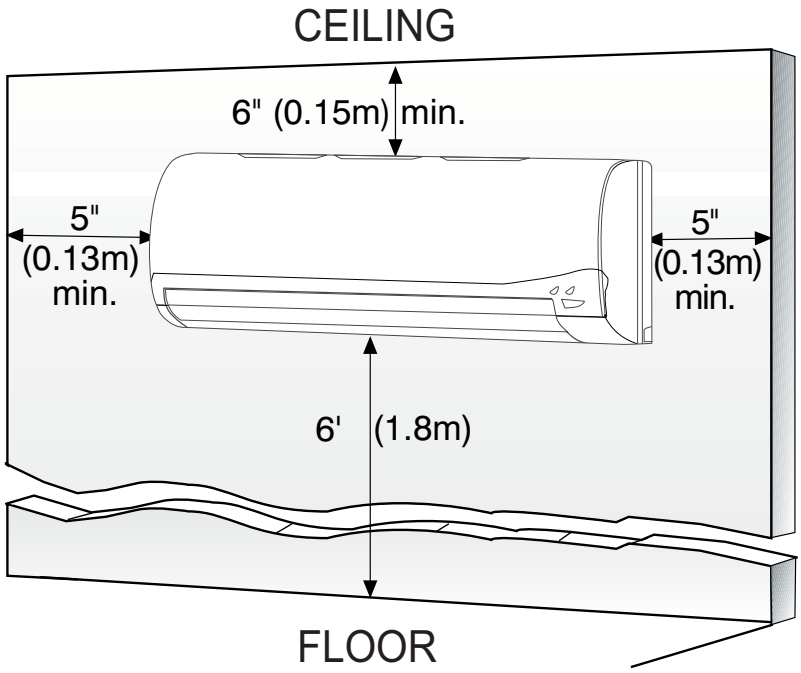

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Fig. 5 – Indoor Unit Clearance

CLEARANCES – OUTDOOR

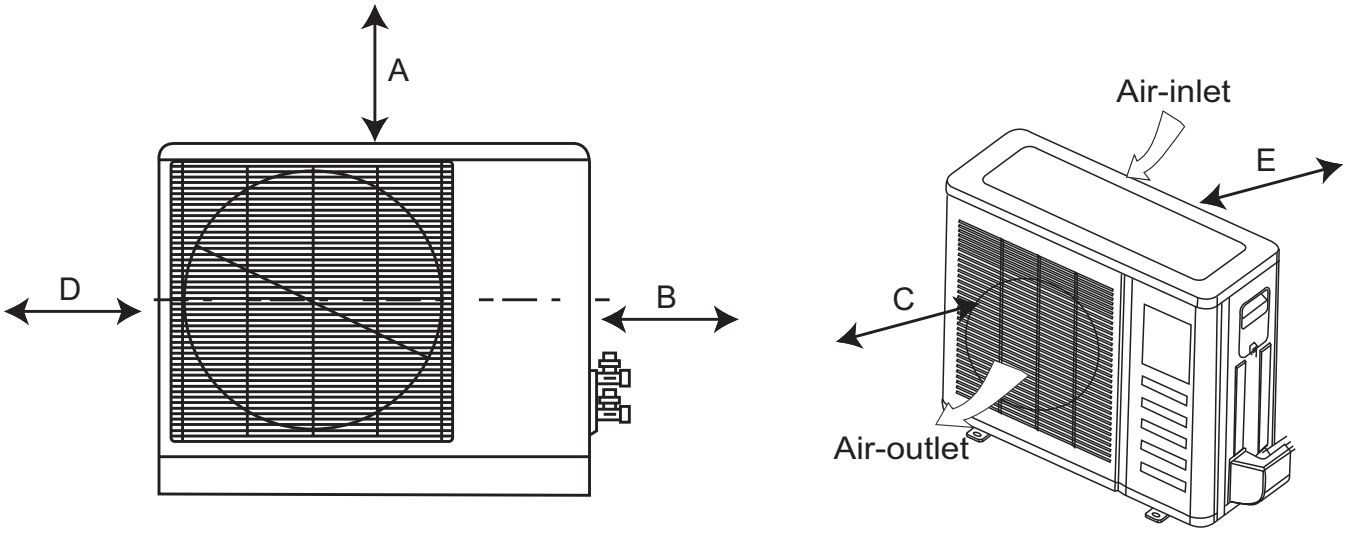

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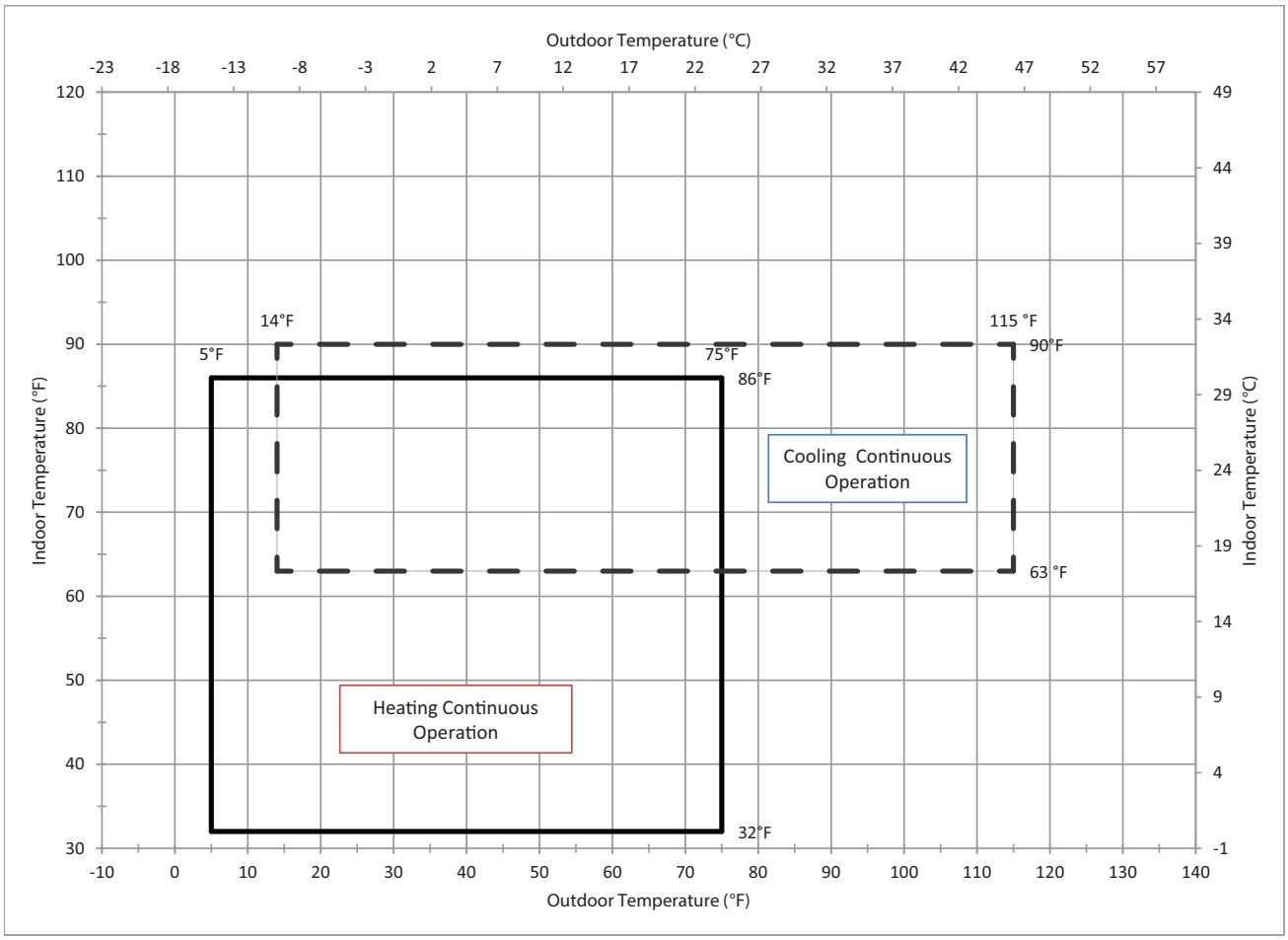
Fig. 6 – Outdoor Unit Clearance

Table 6—Outdoor Unit Clearance Dimensions

UNIT	Minimum Value in. (mm)
A	24 (609)
B	24 (609)
C	24 (609)
D	4 (101)
E	4 (101)

SYSTEM OPERATING ENVELOPE



NOTE: If the system operates beyond the conditions presented in this envelope, certain safety protection features may operate and cause the system to operate abnormally. Optimum performance will be achieved during this operating temperature envelope.

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Fig. 7 – System Operating Envelope

ELECTRICAL DATA

Table 7—Electrical Data

UNIT SIZE	OPER. VOLTAGE MAX / MIN*	COMPRESSOR			OUTDOOR FAN				INDOOR FAN				MCA	MAX FUSE CB AMP
		V–PH–HZ	RLA	LRA	V–PH–HZ	FLA	HP	W	V–PH–HZ	FLA	HP	W		
9K	127 / 104	115–1–60	5.3	10	115–1–60	0.7	0.31	23	115–1–60	0.3	0.020	15	19	30
12K														
12K	253 / 187	208–230–1–60	5.3	10	208–230–1–60	0.3	0.33	24	208–230–1–60	0.2	0.027	20	10	15
017K (HP) 018K (AC)			3.95	14		0.6	0.68	50		0.3	0.038	28	14	20
22K			9.7	17		0.6	0.72	53		0.4	0.061	45	16	25

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

LEGEND

FLA – Full Load Amps
LRA – Locked Rotor Amps
MCA – Minimum Circuit Amps
RLA – Rated Load Amps

WIRING

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 the caution note, only stranded copper conductors with a 600 volt rating and double insulated copper wire must be used.

The use of BX cable is not recommended.

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)

PowerWiring:

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 14/2 stranded with a ground.

Communication Wiring:

A separate shielded Stranded copper conductor only, with a 600 volt rating and double insulated copper wire, must be used as the communication wire from the outdoor unit to the indoor unit. Please use a separate shielded 16GA stranded control wire.

⚠ 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 600 volt rating and double insulated copper wire.

⚠ 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.

The main power is supplied to the outdoor unit. the field supplied connecting cable from the outdoor unit to indoor unit consists of four wires and provides the power for the indoor unit as well as the communication signal between the outdoor unit and indoor unit. Two wires are high voltage AC power (L1 and L2), one is a ground wire, and one is a DC communication wire.

CONNECTION DIAGRAMS

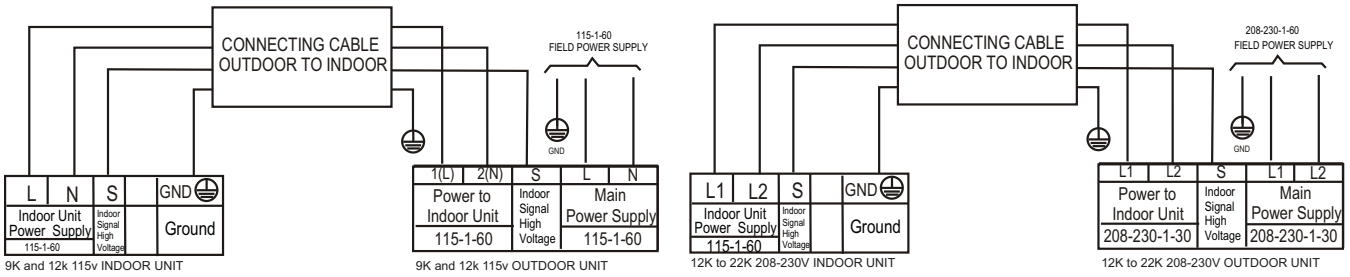

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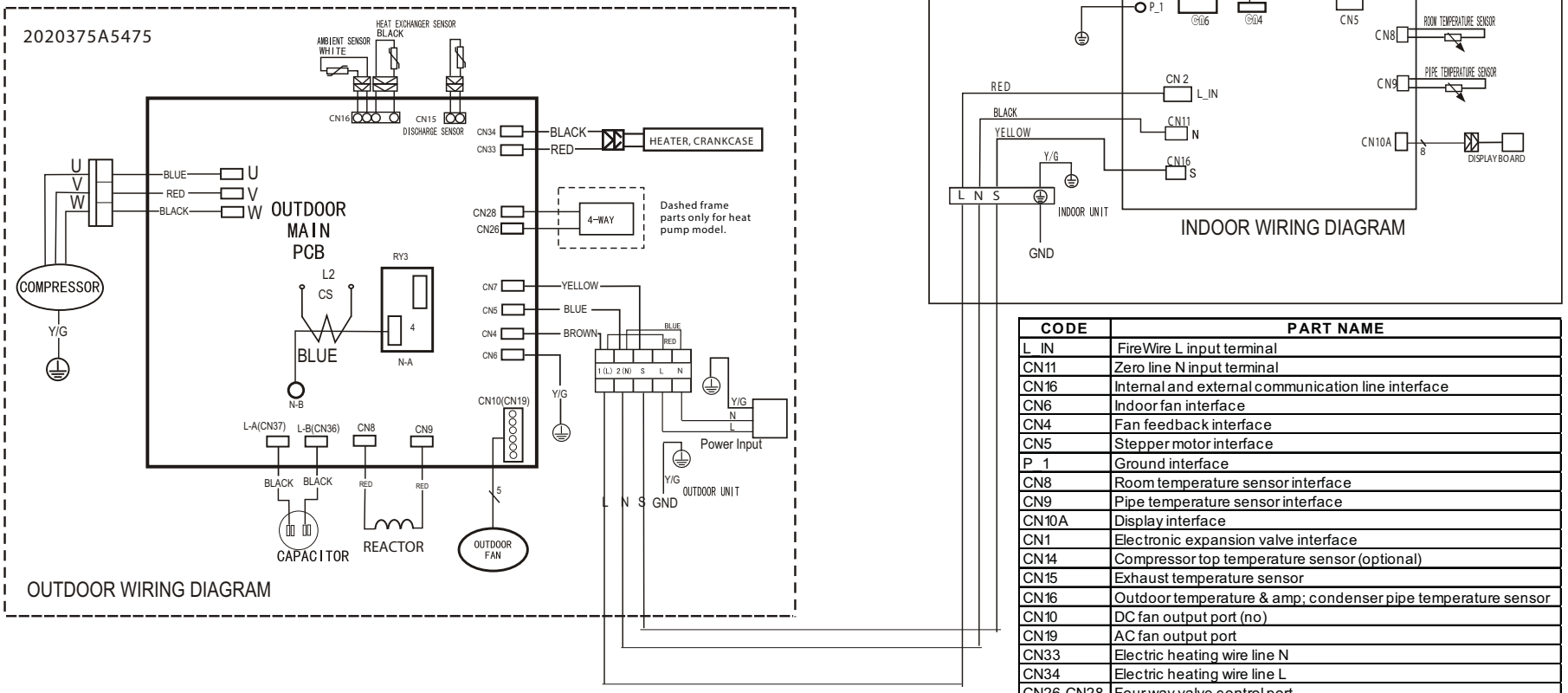
Fig. 8 – Connection Diagrams

Notes:

1. Do not use thermostat wire for any connection between indoor and outdoor units.
2. All connections between indoor and outdoor units must be as shown. **The connections are sensitive to polarity and will result in a fault code.**

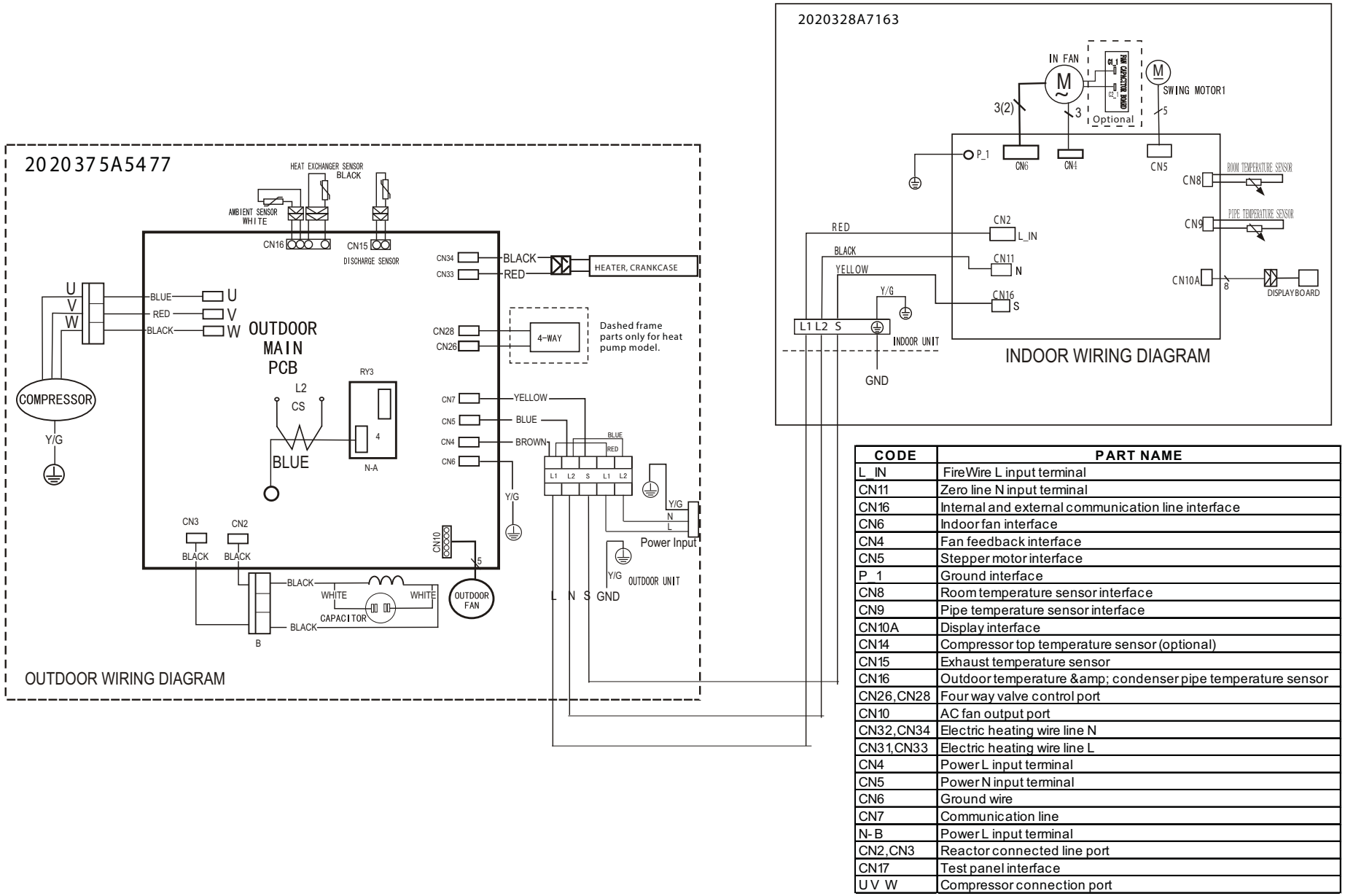
WIRING DIAGRAMS



CODE	PART NAME
L_IN	FireWire L input terminal
CN11	Zero line N input terminal
CN16	Internal and external communication line interface
CN6	Indoor fan interface
CN4	Fan feedback interface
CN5	Stepper motor interface
P_1	Ground interface
CN8	Room temperature sensor interface
CN9	Pipe temperature sensor interface
CN10A	Display interface
CN1	Electronic expansion valve interface
CN14	Compressor top temperature sensor (optional)
CN15	Exhaust temperature sensor
CN16	Outdoor temperature & amp; condenser pipe temperature sensor
CN10	DC fan output port (no)
CN19	AC fan output port
CN33	Electric heating wire line N
CN34	Electric heating wire line L
CN26,CN28	Four way valve control port
CN4	Power L input terminal
CN5	Power N input terminal
CN6	Ground wire
CN7	Communication line
CN8,CN9	Reactor connected line port
CN36,CN37	PFC capacitor connected line port
N-B	Power L input terminal
CN17	Test panel interface
U V W	Compressor connection port

Fig. 9 – Wiring Diagram 38/40MFC/MFQ009 / 38/40MFC/MFQ012 (115V)

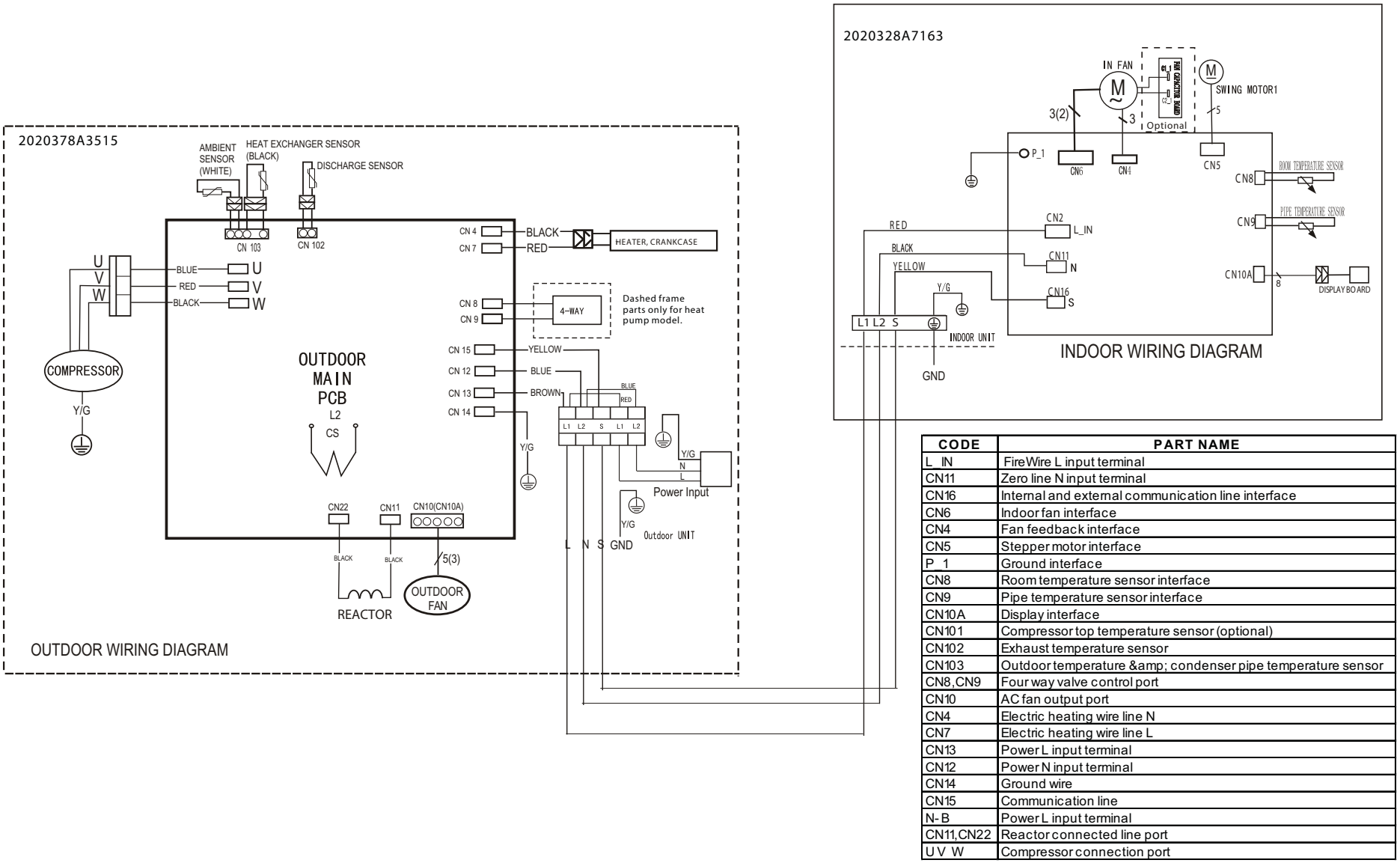
WIRING DIAGRAMS (CONT.)



CODE	PART NAME
L_IN	FireWire L input terminal
CN11	Zero line N input terminal
CN16	Internal and external communication line interface
CN6	Indoor fan interface
CN4	Fan feedback interface
CN5	Stepper motor interface
P_1	Ground interface
CN8	Room temperature sensor interface
CN9	Pipe temperature sensor interface
CN10A	Display interface
CN14	Compressor top temperature sensor (optional)
CN15	Exhaust temperature sensor
CN16	Outdoor temperature & condenser pipe temperature sensor
CN26,CN28	Four way valve control port
CN10	AC fan output port
CN32,CN34	Electric heating wire line N
CN31,CN33	Electric heating wire line L
CN4	Power L input terminal
CN5	Power N input terminal
CN6	Ground wire
CN7	Communication line
N-B	Power L input terminal
CN2,CN3	Reactor connected line port
CN17	Test panel interface
U V W	Compressor connection port

Fig. 10 – Wiring Diagram 38/40MFC/MFQ012 (208–230V)

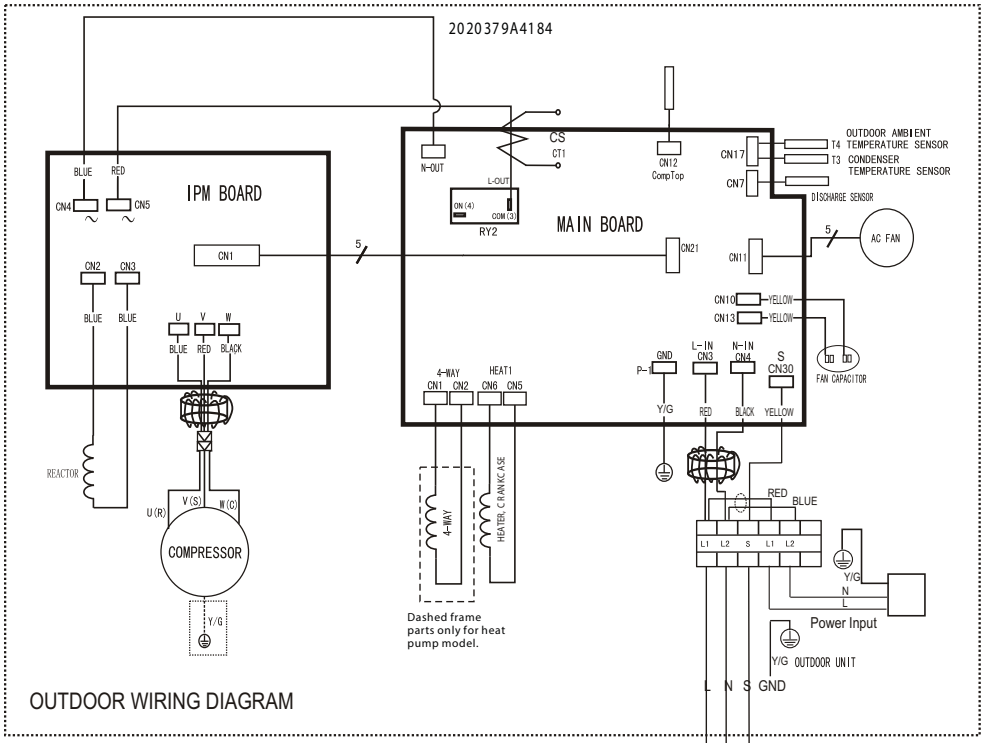
WIRING DIAGRAMS (CONT.)

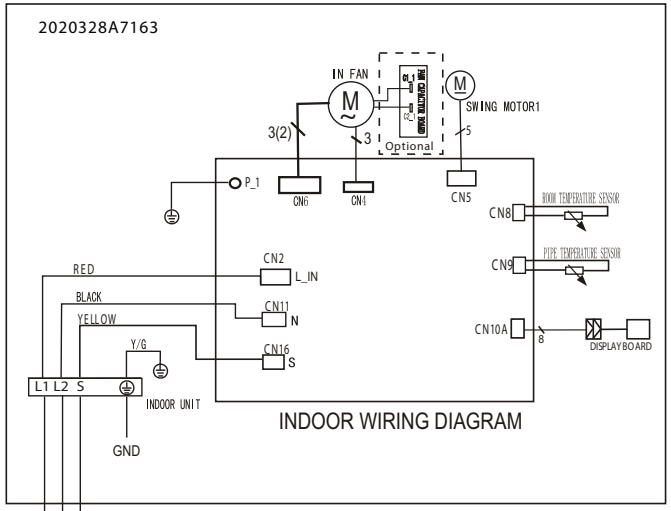


CODE	PART NAME
L_IN	FireWire L input terminal
CN11	Zero line N input terminal
CN16	Internal and external communication line interface
CN6	Indoor fan interface
CN4	Fan feedback interface
CN5	Stepper motor interface
P_1	Ground interface
CN8	Room temperature sensor interface
CN9	Pipe temperature sensor interface
CN10A	Display interface
CN101	Compressor top temperature sensor (optional)
CN102	Exhaust temperature sensor
CN103	Outdoor temperature & condenser pipe temperature sensor
CN8,CN9	Four way valve control port
CN10	AC fan output port
CN4	Electric heating wire line N
CN7	Electric heating wire line L
CN13	Power L input terminal
CN12	Power N input terminal
CN14	Ground wire
CN15	Communication line
N- B	Power L input terminal
CN11,CN22	Reactor connected line port
U V W	Compressor connection port

Fig. 11 – Wiring Diagram 38/40MFC018 – 38/40MFQ017 (208–230V)

WIRING DIAGRAMS (CONT.)





CODE	PART NAME
L_IN	FireWire L input terminal
CN11	Zero line N input terminal
CN16	Internal and external communication line interface
CN6	Indoor fan interface
CN4	Fan feedback interface
CN5	Stepper motor interface
P_1	Ground interface
CN8	Room temperature sensor interface
CN9	Pipe temperature sensor interface
CN10A	Display interface
CN12	Compressor top temperature sensor (optional)
CN7	Exhaust temperature sensor
CN17	Outdoor temperature & condenser pipe temperature sensor
CN1,CN2	Four way valve control port
CN11,CN22	AC fan output port
CN10,CN13	Fan capacitor port
CN5	Electric heating wire line N
CN6	Electric heating wire line L
CN3	Power L input terminal
CN4	Power N input terminal
P1	Ground wire
CN15	Communication line
N-OUT1	Power N Onput terminal
RY2 POWER	Power L Onput terminal
CN26	Test panel interface
CN4	Power L input terminal
CN5	Power N input terminal
CN2 CN3	Reactor connected line port
CN11	Bus voltage positive terminal
CN12	Bus voltage positive terminal
CN1	Main control board and power supply
CN6	Standby power interface
U V W	Compressor connection port

Fig. 12 – Wiring Diagram 38/40MFC(Q)022 (208–230V)

REFRIGERATION CYCLE DIAGRAMS

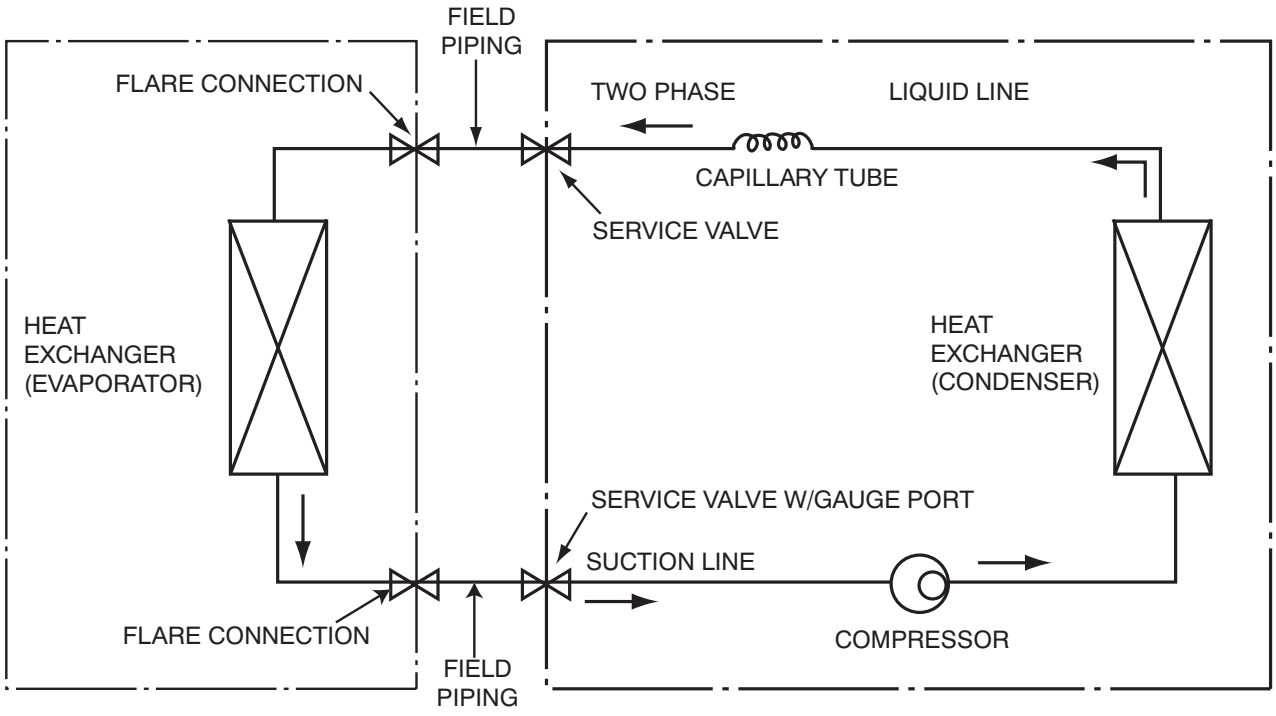


Fig. 13 – Cooling

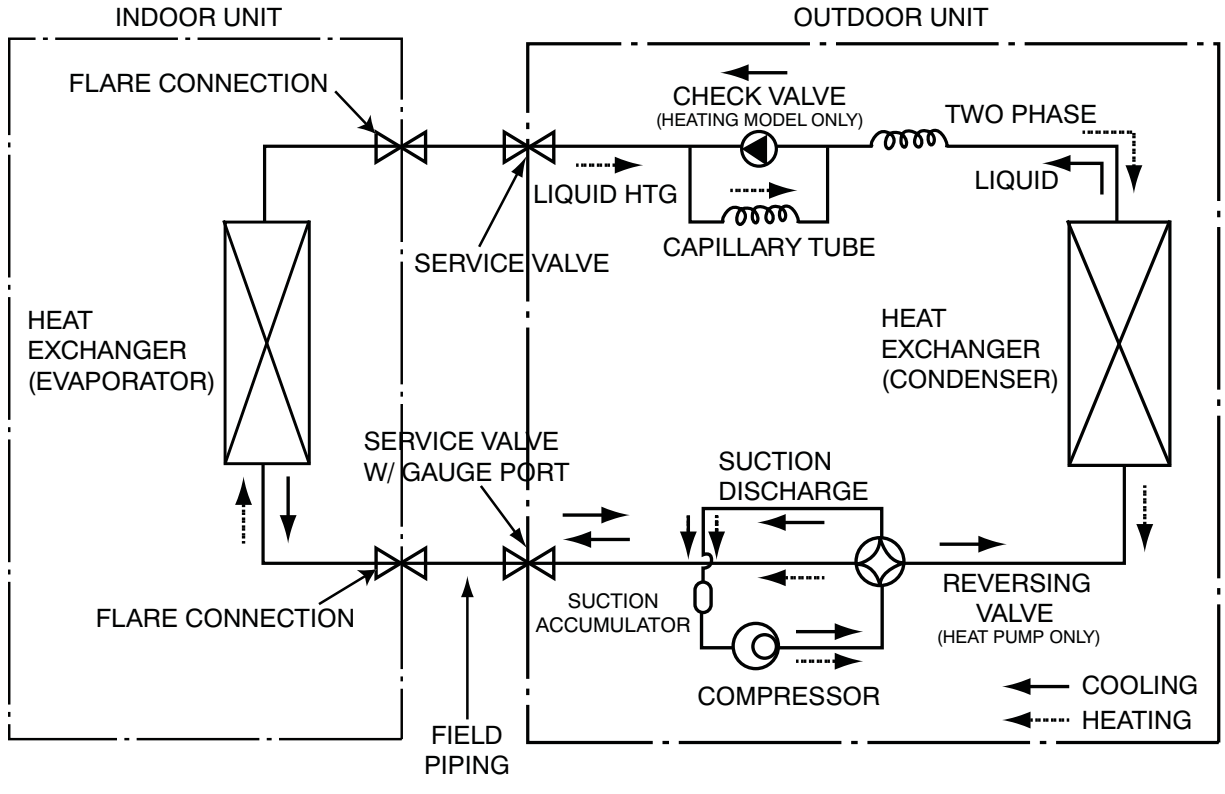


Fig. 14 – Heat Pumps

REFRIGERANT LINES

General refrigerant line sizing:

1 The 38MFC/MFQ units are shipped with a full charge of R410A refrigerant. All charges, line sizing, and capacities are based on runs of 25 ft. (7.6 m). For runs over 25 ft. (7.6 m), consult long−line section on this page for proper charge adjustments.

2 Minimum refrigerant line length between the indoor and outdoor units is 10 ft. (3 m).

3 Refrigerant lines should not be buried in the ground. If it is necessary to bury the lines, not more than 36−in (914 mm) should be buried. Provide a minimum 6−in (152 mm) vertical rise to the service valves to prevent refrigerant migration.

4 Both lines must be insulated. Use a minimum of 1/2−in. (12.7 mm) thick insulation. Closed−cell insulation is recommended in all long−line applications.

5 Special consideration should be given to isolating interconnecting tubing from the building structure. Isolate the tubing so that vibration or noise is not transmitted into the structure.

IMPORTANT: **Both refrigerant lines must be insulated separately.**

- The following maximum lengths are allowed:

Table 8—Refrigerant Line Lengths ft. (m)

Unit Size	Max Line Length	Max Elevation (ID over OD)	Max Elevation (OD over ID)
9K	82 (25)	32 (10)	32 (10)
12K	82 (25)	32 (10)	32 (10)
17K HP	98 (30)	65 (20)	65 (20)
18K AC	98 (30)	65 (20)	65 (20)
22K	98 (30)	65 (20)	65 (20)

- The following are the piping sizes.

Table 9—Pipe Sizes (in)

Unit Size	Mix Phase	Vapor
9K	1/4	3/8
12K	1/4	1/2
17K HP	1/4	1/2
18K AC	1/4	1/2
22K	3/8	5/8

Table 10—Refrigerant Charge lb. (kg)

Unit Size	Air Conditioner (AC)	Heat Pump (HP)
9K	1.34 (0.61)	2.60 (1.18)
12K	1.43 (0.65)	2.60 (1.18)
17K HP	NA	2.87 (1.30)
18K AC	1.87 (0.85)	NA
22K	2.60 (1.18)	3.52 (1.60)

- Above charge is for piping runs up to 25 ft. (7.6 m).
- **For piping runs greater than 25 ft. (7.6 m), add refrigerant up to the allowable length as in Table 11.**

Table 11—Additional Refrigerant Charge

Unit Size	oz./ft. (g/m)
9K – 18K	0.16 (15)
22K	0.32 (30)

- Capillary tubes in outdoor unit are used as metering devices.

Long Line Applications, 38MFC Units:

1 No change in line sizing is required.

2 Add refrigerant per Table 12.

Table 12—Additional Charge Table

Unit Size	Total Line Length ft		Additional Charge, oz/ft. ft (m)		
	Min	Max	10−25 (3−8)	>25−82 (8−25)	>82−131 (25−40)
9K	10	65	None	0.16	
12K					
18K AC 17K HP					
22K		98		0.32	0.32

3 Reduction in capacity due to long lines can be calculated from the Table 13.

Table 13—Capacity Loss

	Capacity,% Loss				
	Line Length ft (m)				
Cooling:	**25 (7.5)**	**33 (10)**	**49 (15)**	**82 (25)**	**98(30)**
9 & 12K	1%	2%	5%	8%	–
18 & 22K	1%	2%	4%	7%	8%
Heating:					
9 &12K	1%	2%	7%	12%	–
17 & 22K	1%	2%	6%	11%	15%

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. The alternate triple evacuation method may be used if the procedure outlined below is followed. Always break a vacuum with dry nitrogen.

System Vacuum and Charge

Using Vacuum Pump

1 Completely tighten flare nuts A, B, C, D, connect manifold gage charge hose to a charge port of the low side service valve (see Fig. 15).

2 Connect charge hose to vacuum pump.

3 Fully open the low side of manifold gage (see Fig. 16).

4 Start vacuum pump

5 Evacuate using either deep vacuum or 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. (8 m) of line length. For refrigerant lines longer than 25 ft. (8 m), 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.

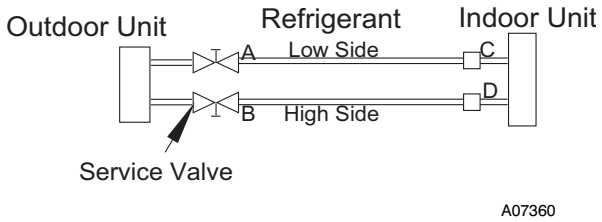


Fig. 15 – Service Valve

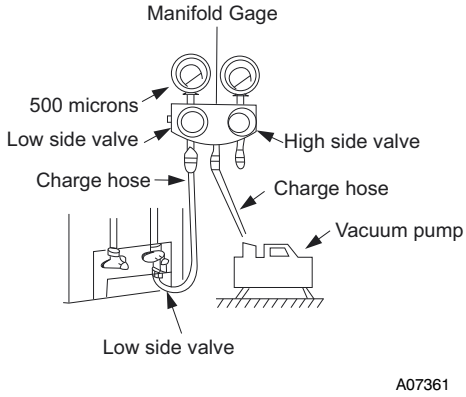


Fig. 16 – Manifold

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. 17).

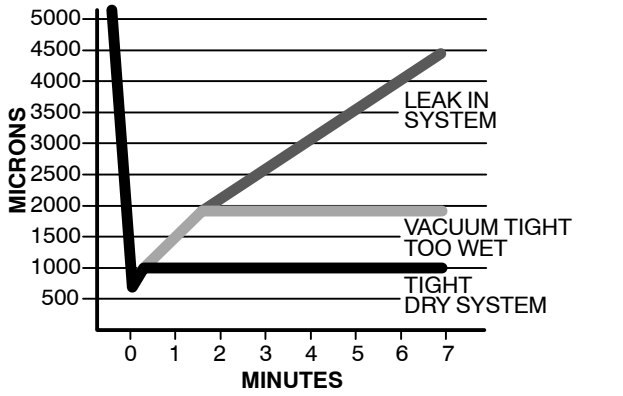


Fig. 17 – Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should only be used when vacuum pump is only capable of pumping down to 28 in. of mercury vacuum and system does not contain any liquid water.

Refer to Fig. 18 and proceed as follows:

1 Pump system down to 28 in. of mercury and allow pump to continue operating for an additional 15 minutes.

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 1 hr. During this time, dry nitrogen will be able to diffuse throughout the system absorbing moisture.

5 Repeat this procedure as indicated in Fig. 18. The system will be freed of any contaminants and water vapor.

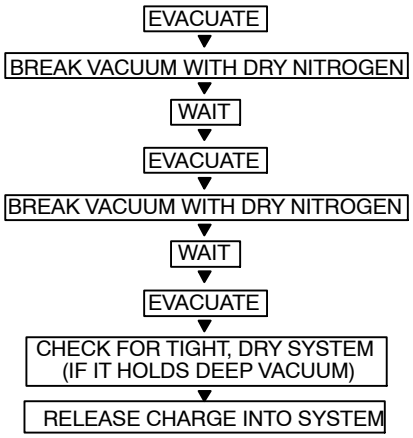


Fig. 18 – Triple Evacuation Method

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.

CONTROL SYSTEM

The 40MFC/MFQ unit is equipped with a microprocessor control to perform two functions:

1 Provide safety for the system

2 Control the system and provide optimum levels of comfort and efficiency.

The main microprocessor is located on the control board of outdoor unit. Outdoor and indoor units have thermistors used to monitor the system operation to maintain the unit within acceptable parameters and control the operating mode.

SYSTEM SAFETIES

3 Minute Time Delay

To protect the compressor, there is a 3 minute delay on break even if the control is calling for heating or cooling. The compressor will have an additional 1 minute delay when powering the unit on for the first time, or after a power failure.

Compressor Top Temperature Protection

The unit will stop working when the compressor top temperature protector cuts off, and will restart after the compressor top temperature protector restarts.

Compressor Discharge Temperature Protection

When the compressor discharge temperature reaches a higher one than in normal operation, the running frequency will be limited based on the algorithm presented below:

- If the compressor discharge temperature is lower than 194°F (90°C), there is no limit in the frequency.
- If this value is between 194°F and 221°F (90<T5<105°C), the compressor will continue running at the current frequency.
- If this value is now between 221°F and 239°F (105<T5<115°C), the frequency will decrease to a lower level every 3 minutes.
- When the compressor discharge temperature reaches a value higher than 239°F (115°C), and has been running at this condition for 5 seconds, the compressor stops.

Fan Speed Protection

When the indoor fan speed has been too low (300RPM) for certain time, the unit will stop and the LED will display the failure.

Inverter Module Protection

The Inverter module is protected for abnormalities in current, voltage and temperature. If abnormal values of any of these take place, the corresponding code will be displayed in the indoor unit and the unit will stop.

Indoor Fan Delayed Operation

When the unit starts up, the louver will be active immediately and the indoor fan will operate 10s later. If the operating mode is heating, the indoor fan will also be controlled by the anti−cold blow function.

Compressor Preheating Function

The compressor crankcase heater will activate if:

- The outdoor ambient temperature, T4, is lower than 37°F (3°C) and power has been recently supplied to the machine.
- If T4 < 37°F (3°C) and the compressor has not been operating for over 3 hours.

During the preheating mode, a weak current flow flows through the compressor coil from the wiring terminal of the compressor. The compressor is heated when this is not operating.

The preheating function will deactivate If T4 is greater than 41°F (5°C) or the compressor starts operating.

Zero Crossing Detection Error Protection

If the a detected zero crossing time interval is not correct for a continuous 240 seconds, the unit will stop and the LED will display the failure. The correct zero crossing signal time interval should be between 6 to 13 minutes.

Condenser Temperature Protection

The condenser temperature protection function acts as follows:

- If the condenser coil temperature (T3) is between 131°F and 140°F (55C°<T3<60°C), the compressor frequency will decrease to a lower level until it reaches the lowest value, F1. It then runs at this F1 frequency. Once T3<129°F (54°C), the compressor will continue running at the current frequency.
- When the coil temperature reaches a value lower than 126°F (52°C), the compressor will not limit the frequency and resumes to the required frequency.
- If T3>140°F (60°C) for 5 seconds, the compressor will stop and restart once the coil temperature reaches a value lower than 126°F (52°C).

Evaporator Temperature Protection

The evaporator temperature protection function acts as follows:

- If the evaporator coil temperature (T2) is lower than 32°F (0°C), the compressor will stop and restarts once T2 ≥ 41°F (5°C).
- If 32°F ≤ T2 <39°F (0°C ≤T2 <4°C), the compressor frequency will be limited and decreased to a lower level.
- Now, if 39°F ≤T2 <45°F (4°C ≤T2 <7°C), the compressor continue running at the current frequency.
- If T2>45°F (7°C), the compressor frequency will not be limited, and operation is normal.

OPERATION SEQUENCE

Interface

A wireless remote control, supplied with the unit, is the interface between the fan coil and the user. The wireless remote control has the following characteristics:

- Capable of displaying °C and °F with °F being the default setting. To change the default setting, refer to the Owner's Manual.
- The remote control setpoint range is from 62°F (17°C) to 86°F (30°C) in increments of 1°F (1°C).
- The wireless remote control has an operating range of 25 ft. (7.62 m).
- The same remote control can be used to control more than one unit.
- If the remote control is lost, damaged, or the batteries are exhausted, the system can be operated by using the manual button (forced Auto) located under the front panel.

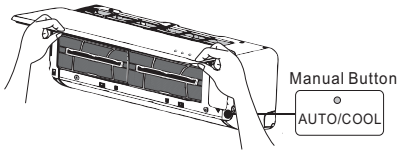


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Fig. 19 – Manual Button Location on Unit

OPERATION MODES

Cooling Mode

In this mode, the system cools and dries the room air with the fan running continuously, either at a selected fan speed or Auto fan speed. The fan runs even when the compressor cycles off. This feature enhances room comfort and efficiency of the system.

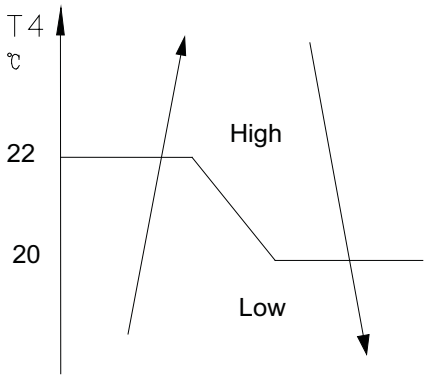
Compressor operation in cooling mode:

In cooling mode, the maximum operation frequency (Fmax) of the compressor, after it starts running, depends on the outdoor ambient temperature (T4).

Once the system starts running, the compressor will run at the Fmax frequency for 7 minutes at a specific T4. During this time, the frequency limitation is active, therefore the compressor will continue running even if the set point condition is satisfied. The compressor running frequency will then be controlled based on the difference between the room temperature and the temperature set point (T1−Ts).

Outdoor Fan Operation in Cooling Mode:

When in cooling mode, the outdoor fan motor cycles based on the outdoor ambient temperature as shown below:



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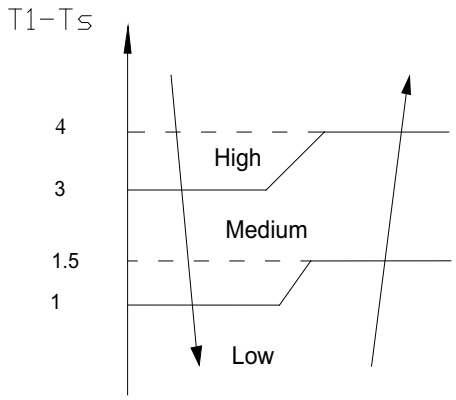
Indoor Fan Operation in Cooling Mode:

When in cooling mode, the indoor fan runs continuously either at the chosen set speed (high, medium, or low), or in Auto mode, where the speed is determined by the microprocessor based on the difference between the room temperature and the temperature set point as shown below:



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Heating Mode

In this mode, the system heats the room air with the indoor fan running at either the selected speed or on Auto. As in the cooling mode, the indoor fan will run continuously unless interrupted by the cold blow algorithm. This algorithm will not allow the fan to run if the indoor coil temperature drops below a preset value.

Defrost is controlled by the on−board microprocessor.

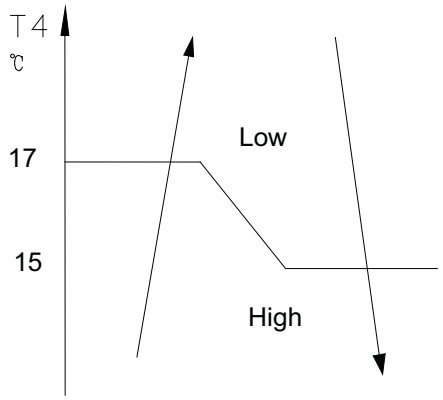
Compressor operation in heating mode

In heating mode, the maximum operation frequency (Fmax) of the compressor, after it starts running, depends on the outdoor ambient temperature (T4).

Once the system starts running, the compressor will run at the Fmax frequency for 7 minutes at a specific outdoor ambient temperature (T4). During this time, the frequency limitation is active, therefore the compressor will continue running even if the set point condition is satisfied. The compressor running frequency will then be controlled based on the difference between the room temperature, the temperature set point, and a temperature difference that takes a default value of 0°C (T1−Ts−ΔT).

Outdoor fan Operation in Heating Mode

When in heating mode, the outdoor fan motor cycles based on the outdoor ambient temperature as shown below:



A14475

Indoor Fan Operation in Heating Mode

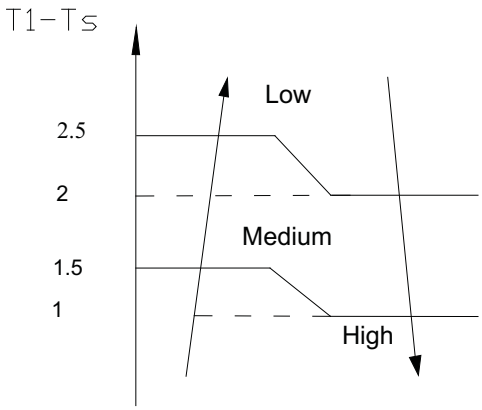
In heating mode, the indoor fan runs depending on the evaporator coil temperature (T2).

If the set point conditions are satisfied and the compressor stops, the indoor fan will be forced to run for 127 seconds with breeze. During this period, the anti−cold−wind is disabled.

If the machine is running at the rated capacity test mode, the indoor fan will run at the rated speed and the anti−cold−wind function is disabled.

Auto Mode in Heating Mode

In heating mode, When the fan speed is set to Auto, the fan will run at a speed determined by the microprocessor based on the difference between the room temperature and the temperature set point as shown below:



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Defrost

Defrost on heat pump units is controlled by the microprocessor and is initiated if either of the following conditions occur:

1 If for the outdoor temperature, T4>32°F (0°C):

— The outdoor coil temperature (T3) has been lower than 37°F (3℃) for about 40 minutes and during that period, the coil temperature is lower than TCDI for more than 3 minutes.

— The outdoor coil temperature (T3) has been lower than 37°F (3℃) for about 80 minutes and during that period, the coil temperature is lower than (TCDI+2℃) for more than 3 minutes.

2 If for the outdoor temperature, T4＜32°F (0°C):

— If the conditions described above are satisfied, then the program judges if the evaporator coil temperature (T2) has decreased more than 41°F (5℃). When the evaporator coil temperature has decreased more than 41°F (5℃), the defrost mode starts.

3 At any value of outdoor ambient temperature (T4):

— If the machine runs with a condenser coil temperature lower than 37°F (3℃) for more than 120 minutes and the outdoor coil temperature (T3) has been lower than (TCDI+4℃) for more than 3 minutes, the machine will enter into defrost mode.

Where: TCDI = −7°C = 19.4°F

Defrost Cycle Termination:

If any one of the following conditions is satisfied, the defrost cycle will end and the system will return to normal operation:

1 The outdoor coil temperature (T3) reaches (TCDE1).

— For 9K−12K: TCDE1 = (64°F) 18°C

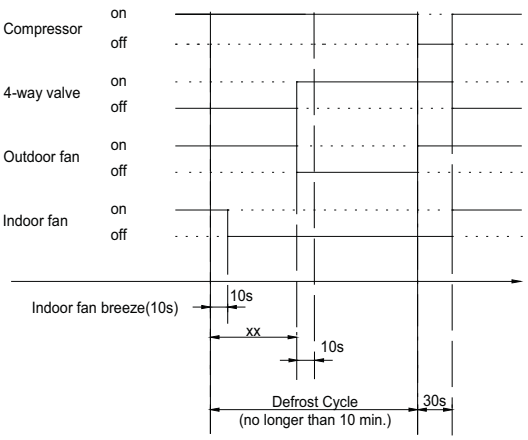
— For 17K−22K: TCDE1 = (59°F) 15°C

2 The outdoor coil temperature (T3) is kept at about 46°F (8℃) for at least 80 seconds.

3 The defrost cycle reaches 10 minutes.

The cycles of defrost algorithm are shown below:

For 9K,12K models:



xx=60s for 9k & 12k models

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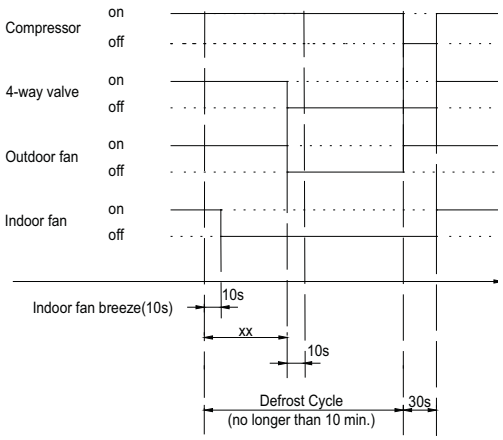
For 17K, 22K models:



XX=60 for 17k model, XX=90 for 22k model

A14479

Auto Mode

In the Auto mode, the temperature can be set to values between 62~86°F (17~30℃). In this mode, the machine will choose cooling, heating or fan−only mode according to ΔT.

NOTE: ΔT =T1−Ts, where T1 represents the indoor room temperature and Ts represents the set temperature.

Table 14—¿T=T1−Ts (Running Mode)

ΔT=T1−Ts	RUNNING MODE
ΔT＞1℃	Cooling
−1<ΔT≤1℃	Fan−only
ΔT≤−1℃	Heating

Indoor fan will run at an automatic fan speed for each running mode. The louver will also operate depending in relevant mode taking place.

If the machine switches mode between heating and cooling, the compressor will stop for 15 minutes and then choose a mode according to ΔT.

If a new set temperature is commanded, the system will choose a running mode according to ΔT.

Forced Operation Function

When the machine is off, pressing the manual button will carry the machine to forced auto mode. Pressing the button once again, within 5 seconds, the machine will turn into forced cooling mode.

In forced auto, forced cooling or any other operation mode, pressing the manual button will turn off the machine.

When in this mode, all general protections and remote control functions are available.

Forced Cooling Mode:

The compressor runs at F2 frequency and indoor fan runs as breeze.

After running for 30 minutes, the machine will turn to auto mode with a 75°F (24℃) set temperature.

Forced Auto Mode:

The action of forced auto mode is the same as normal auto mode with a 75°F (24°C) set temperature.

Timer Function

Timing range is 24 hours.

The timer function will not change the system's current operation mode.

The setting time is relative time.

Timer on

The machine will turn on automatically when reaching the set time.

Timer off

The machine will turn off automatically when reaching the setting time.

Timer on/off

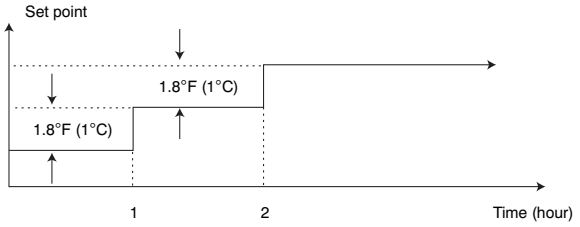
The machine will turn on automatically when reaching the set "on" time, and then turn off automatically when reaching the set "off" time.

Sleep Mode Function

Operation time in sleep mode is 7 hours. After 7 hours the system turns off.

Operation process in sleep mode is as follow:

When in cooling mode, the set temperature rises 1.8°F (1°C) (up to a maximum 86°F (30°C)) every one hour. Two hours later the set temperature stops rising and indoor fan is fixed at low speed.

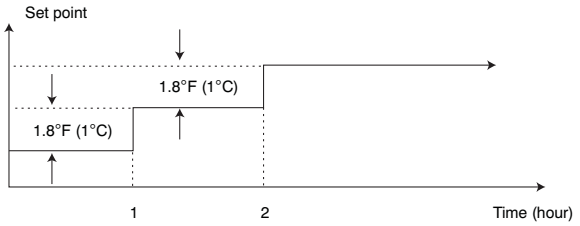


A08108

Fig. 20 – Sleep Mode – Cooling

When in heating mode, the set temperature decreases 1.8°F (1°C) (down to a minimum 62°F (17°C)) every one hour. Two hours later the set temperature stops rising and indoor fan is fixed at low speed.

NOTE: Anti-cold wind function has the priority



A08110

Fig. 21 – Sleep Mode – Heating

When the user uses timer off function in sleep mode (or sleep function in timer off mode), if the timing is less than 7 hours, sleep function will be cancelled when reaching the setting time. If the timing is more than 7 hours, the machine will not stop until it reaches the set time in sleep mode.

Auto–Restart Function

The indoor unit is equipped with auto-restart function, which is carried out through an auto-restart module. In case of a sudden power failure, the module memorizes the setting conditions present previous to the power failure. The unit will automatically resume to the previous operation settings (not including swing function) 3 minutes after the power returns.

If the memorization condition is forced cooling mode, the unit will run in cooling mode for 30 minutes and turn to auto mode at a 75°F (24°C) set temp.

If the equipment was off before the power went off, and it is required to start up after this power failure, the compressor will have a 1 minute delay when powering on. In other conditions, the compressor will have a 3 minutes delay at re-start.

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

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 appendix A8 and A9.

Problems may occur that are not covered by a diagnostic code, but 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 please 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 pulse will give continuously variable readings.

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).

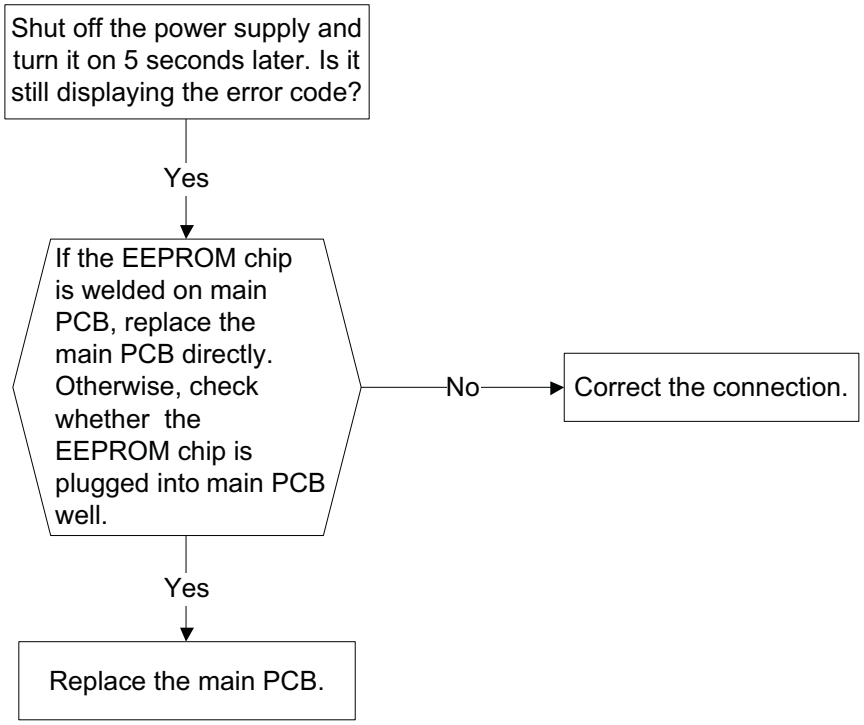
11 Reconnect the main power and repeat steps 5,6, and 7.

12 Disconnect main power before reinstalling board to avoid shock hazard and board damage.

1 – EEPROM parameter error – diagnosis and solution (E0/F4)

Error Code	E0/F4
Malfunction conditions	Indoor or outdoor PCB main chip does not receive feedback from EEPROM chip.
Possible Causes	• Installation mistake • Defective PCB

Troubleshooting:

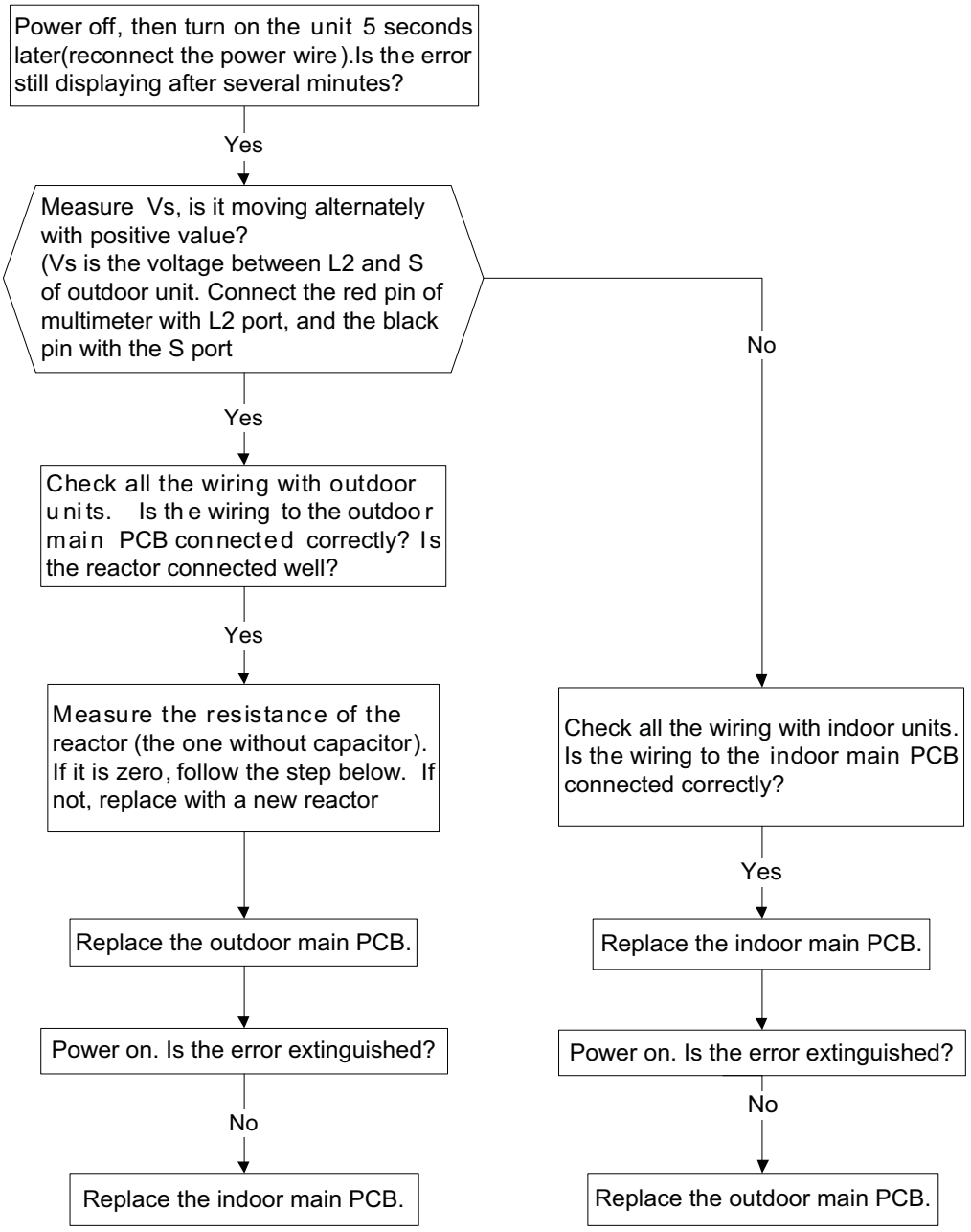


A14480

2 — Indoor / outdoor units' communication error — diagnosis and solution (E1)

Error Code	E1
Malfunction conditions	Indoor unit does not receive feedback from outdoor unit in a 110 seconds period, and this condition occurs continuously four times.
Possible Causes	• Wiring connection mistake • Defective Indoor or outdoor PCB

Troubleshooting:



A14481

Notes:

- Make sure wires are connected per connection diagrams. Failing to do that will result in a communication error.
- Before measuring the Volts DC on outdoor TB, disconnect the field wire on terminal 1.
- Before measuring the Volts DC on Indoor TB, disconnect the field wire on terminal 1.
- **Have the red probe of the meter on terminal L2 and the black probe on terminal S. Reconnect wiring when measurements are complete.**
- When the system is running normally, the voltage will alternate between -50V to 50V.
- If the outdoor unit is malfunctioning, the voltage will move alternately with positive value. In the other hand, if the indoor unit is malfunctioning, the voltage will have a specific voltage value.

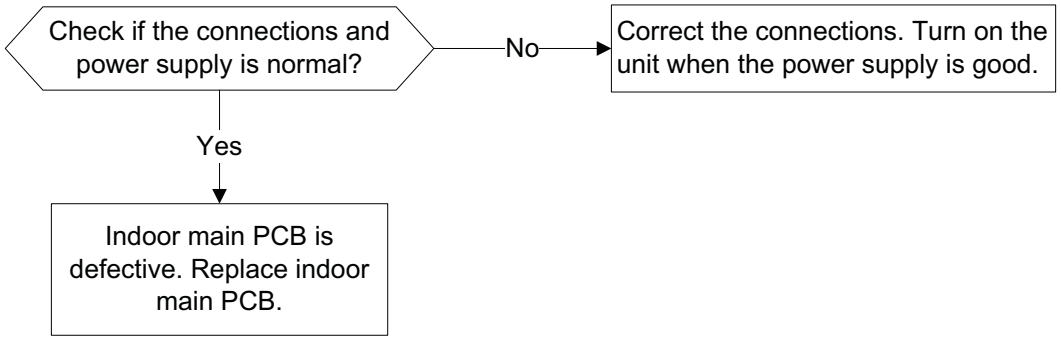
Remark:

Use a multimeter to test the resistance of the reactor not connected to the capacitor.
The normal value should be around zero ohm. Otherwise, the reactor is defective and need to be replaced.

3 – Zero crossing signal detection error – diagnosis and solution (E2)

Error Code	E2
Malfunction conditions	When PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.
Possible Causes	• Connection mistake • Defective PCB

Troubleshooting:

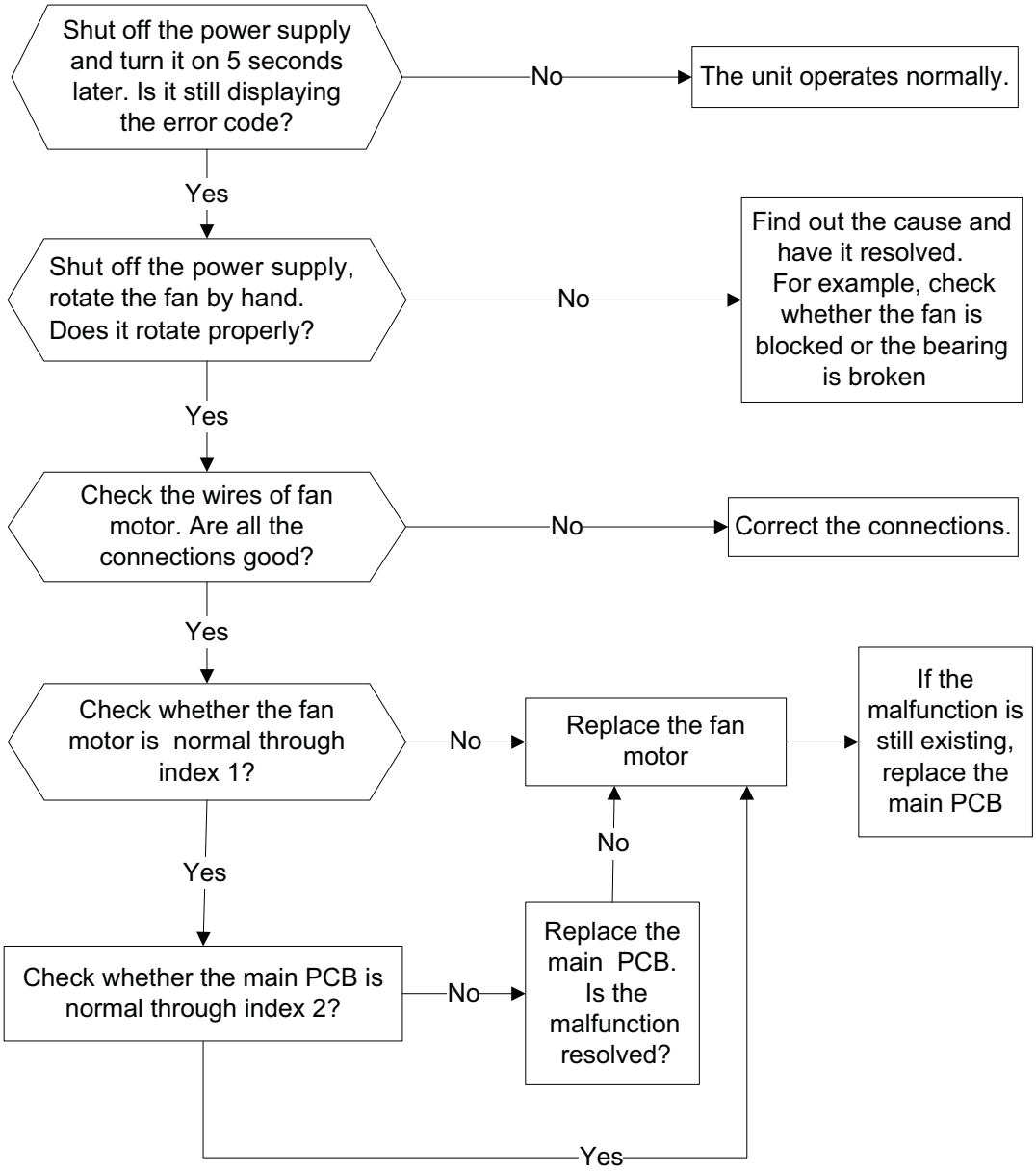


A14482

4 — Fan speed out of control — diagnosis and solution (E3)

Error Code	E3
Malfunction conditions	When the indoor fan speed has been too low (300RPM) for certain time, the unit will stop and the LED will display the failure.
Possible Causes	• Wiring mistake • Defective fan assembly • Defective fan motor • Defective PCB

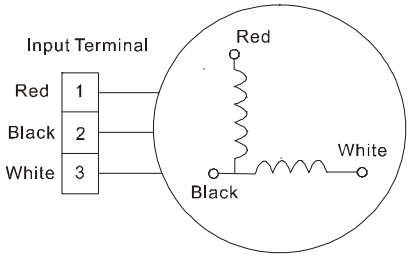
Troubleshooting:



A14483

Index 1:
Indoor fan motor
Measure the resistance value of each winding by using the tester. For the definite value of the resistance, refer to Appendix A5 and A6.

Index 2:
Indoor fan motor
Power on and set the unit running in fan mode (at high fan speed). After it has been running for 15 seconds, measure the voltage of pin1 and pin2. If the value of the voltage is less than 100V (208~240V power supply) or 50V (115V power supply), the PCB must have problems and needs to be replaced.

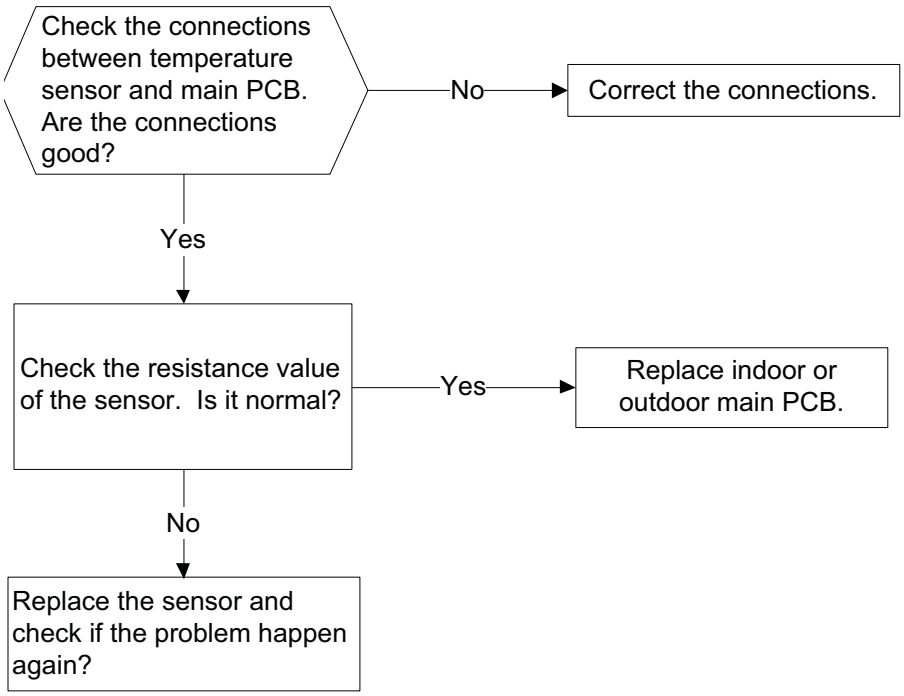


A14484

5 — Evaporator coil temperature sensor Open or short circuited — diagnosis and solution (E5)

Error Code	E5
Malfunction conditions	If the reading voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.
Possible Causes	• Wiring mistake • Defective sensor • Defective PCB

Troubleshooting:

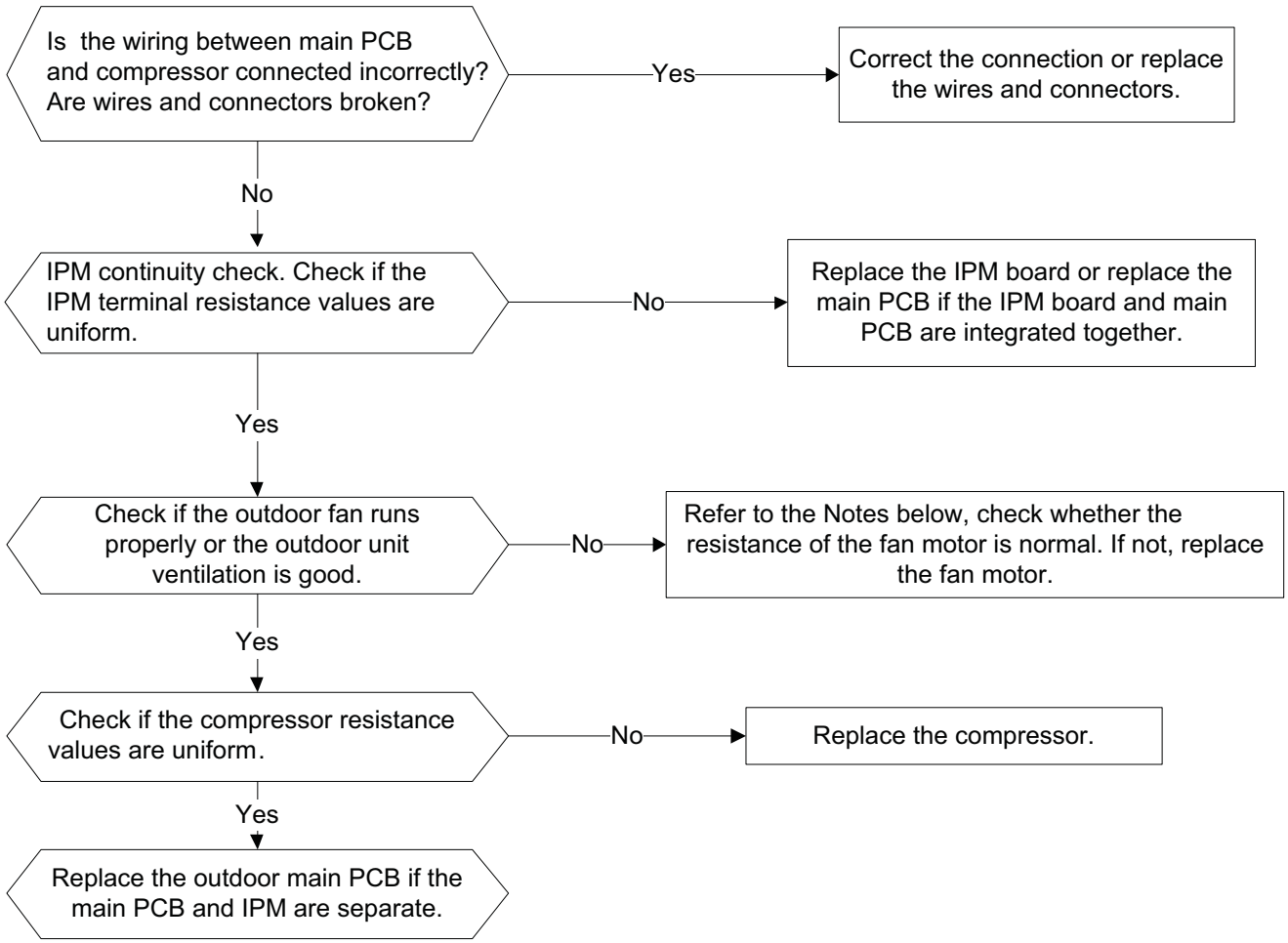


A14485

6 — IPM malfunction or IGBT over—strong current protection — diagnosis and solution (P0)

Error Code	P0
Malfunction conditions	When the voltage signal that IPM sends to compressor drive chip is abnormal, the display LED will shows “P0” and the system will turn off.
Possible Causes	• Wiring mistake • IPM malfunction • Defective outdoor fan assembly • Compressor malfunction; Outdoor PCB faulty

Troubleshooting:



A14486

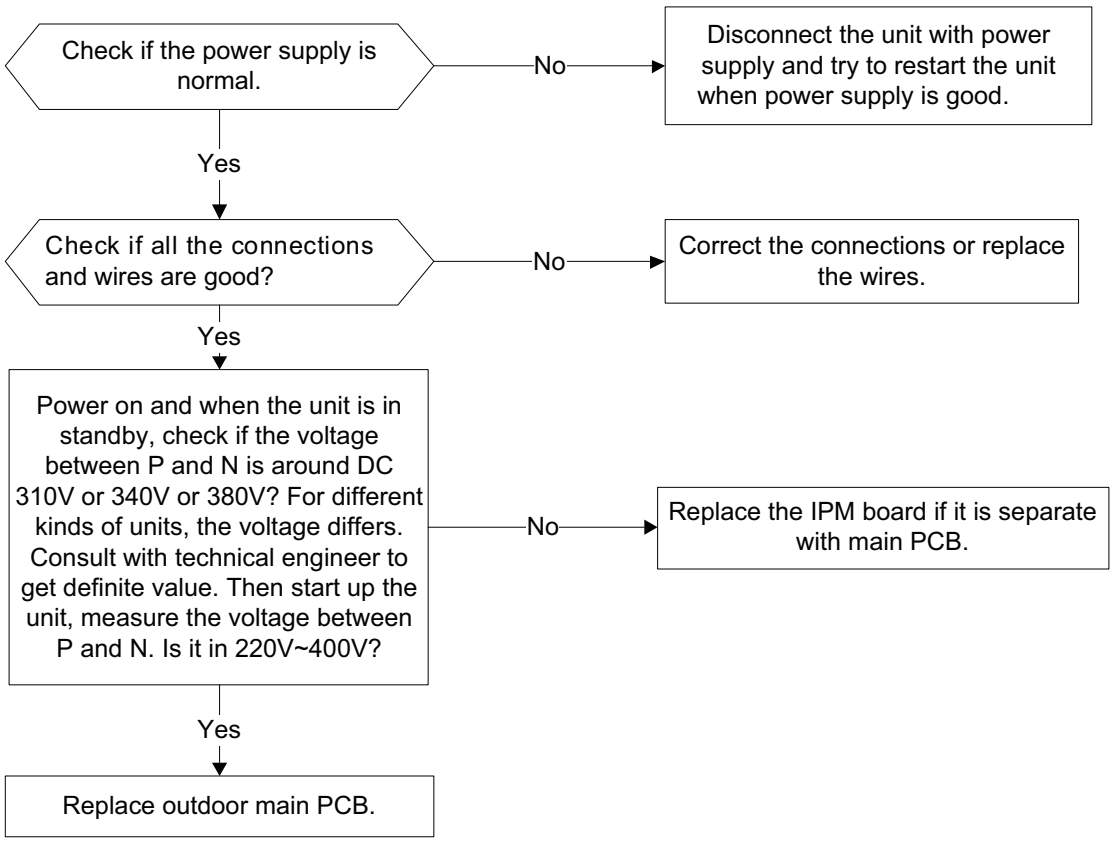
Note:
Measure the black pin and red pin of the motor terminals, the resistance should be around the value specified below:

Model size	Voltage	Resistance Value at 68°F(20°FC)
9K and 12K	115	50Ω
12K	208-230	293Ω
18K AC / 17K HP		84.5Ω
22K		88.5Ω

7 — Abnormal high voltage or abnormal low voltage protection — diagnosis and solution (P1)

Error Code	P1
Malfunction conditions	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
Possible Causes	• Power supply problems • System leakage or block • PCB faulty

Troubleshooting:



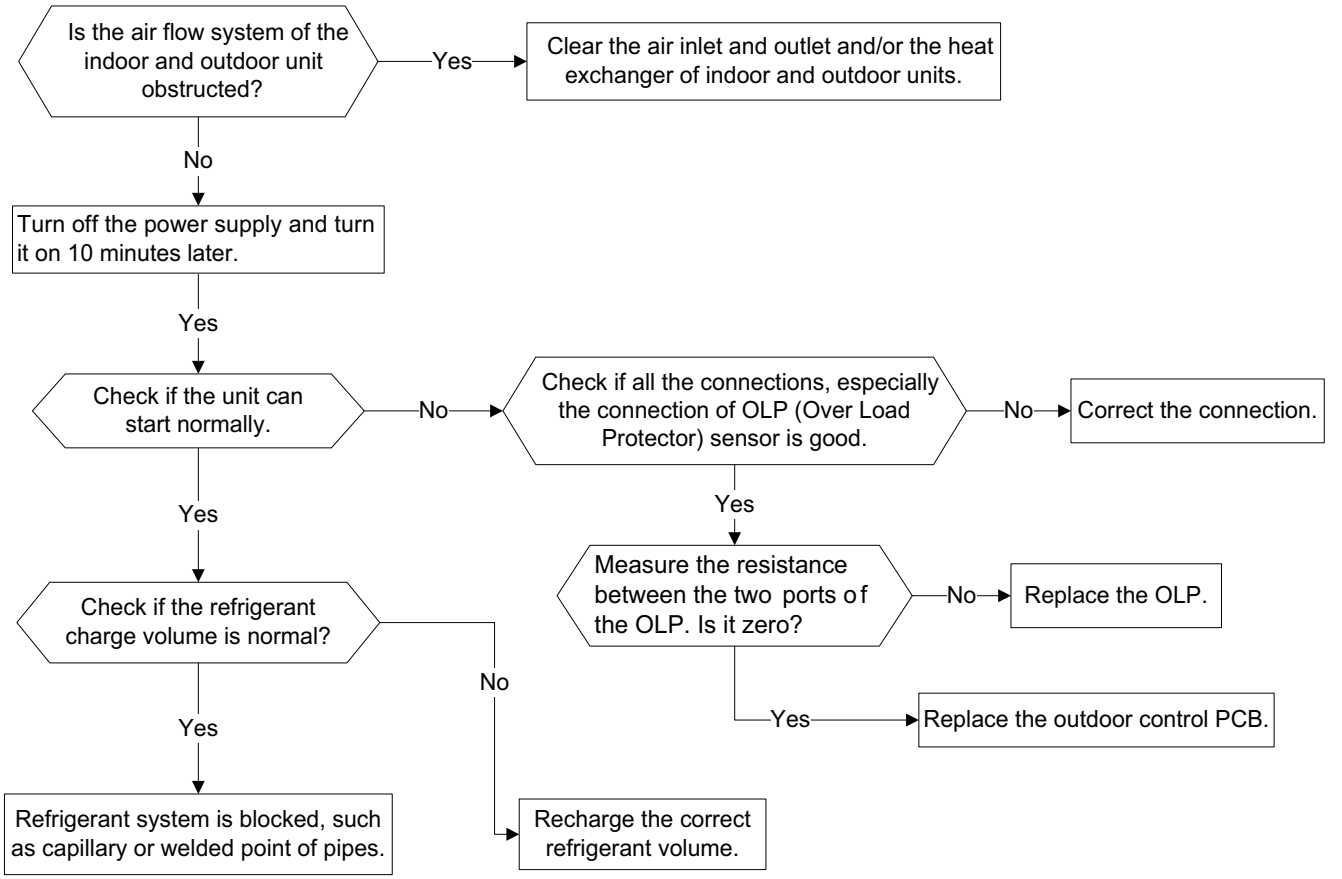
A14487

Note:
Measure the DC voltage between the P and N ports. The normal value should be around 310V.

8 – Compressor Top – High temperature protection diagnosis and solution (P2)

Error Code	P2
Malfunction conditions	If the sampling voltage is not 5V, the LED will display the failure.
Possible Causes	• Power supply problems • System leakage or block • Defective PCB

Troubleshooting:

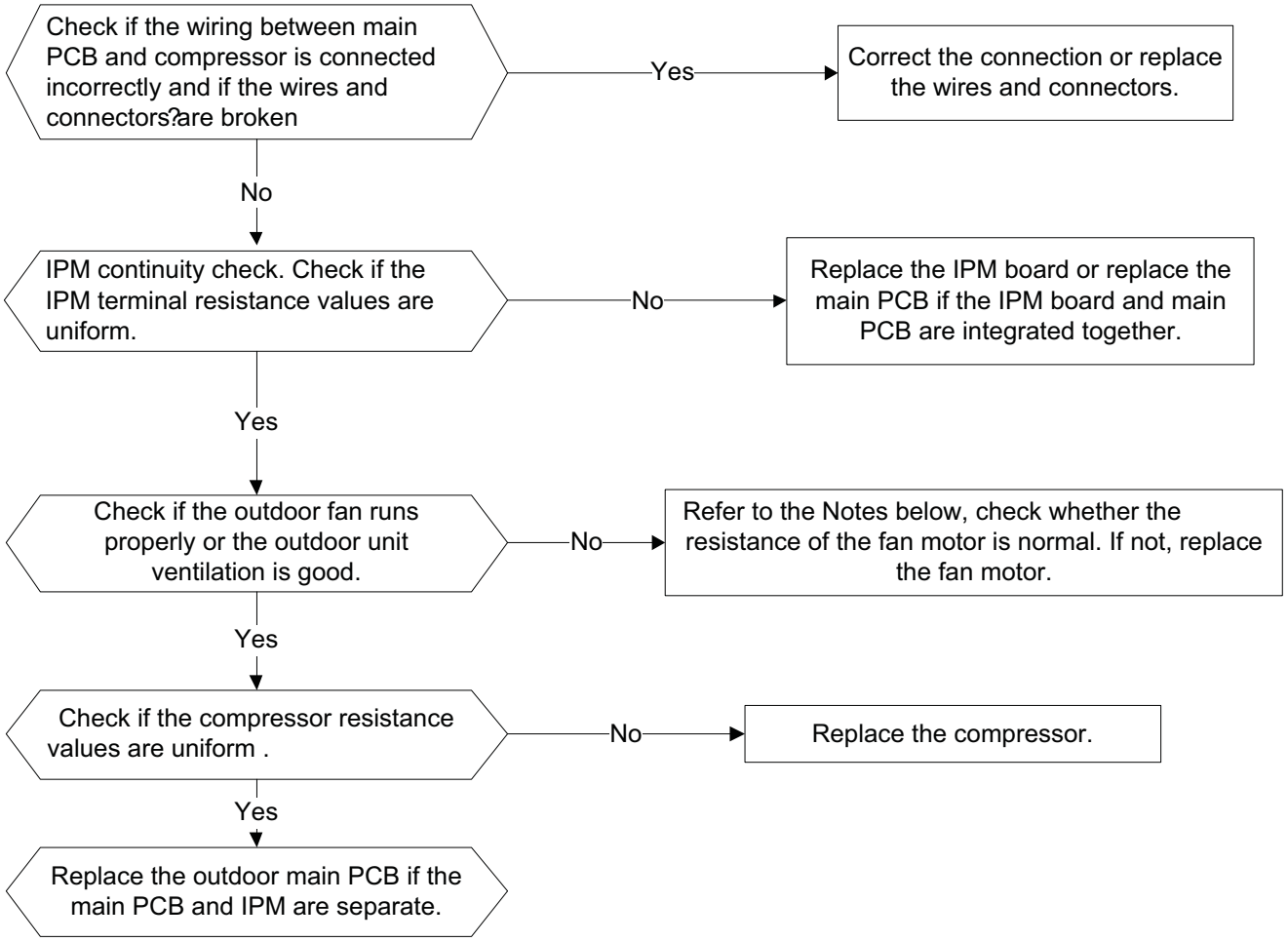


A14488

9 — Inverter compressor drive error — diagnosis and solution (P4)

Error Code	P4
Malfunction conditions	An abnormal inverter compressor drive is detected by a special detection circuit. This includes communication signal, voltage, and compressor rotation speed signal detections to mention some.
Possible Causes	• Wiring mistake • IPM malfunction • Defective outdoor fan assembly • Defective compressor malfunction • Defective PCB

Troubleshooting:



A14489

Note:
Measure the black pin and red pin of the motor terminals, the resistance should be around the value specified below:

Model size	Voltage	Resistance Value at 68°F(20°FC)
9K and 12K	115	50Ω
12K	208-230	293Ω
18K AC / 17K HP		84.5Ω
22K		88.5Ω

ADDITIONAL INFORMATION FOR CRITICAL PARTS:

Temperature sensor troubleshooting

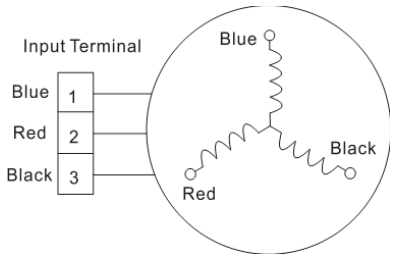
Disconnect the temperature sensor from the PCB, and measure the resistance value with a multimeter.

Temperature sensors:

1. Room temperature (T1) sensor,
2. Indoor coil temperature (T2) sensor,
3. Outdoor coil temperature (T3) sensor,
4. Outdoor ambient temperature (T4) sensor,
5. Compressor discharge temperature (T5) sensor

Compressor troubleshooting

Measure the resistance value of each winding by using the multi−meter.



A14490

Table 15—Resistance Value

Position	Resistance Value at 68°F (20°C)		
	Unit size: 9K and 12K	Unit size: 17 and 18K	Unit size: 22K
Blue − Red	0.71Ω	1.77Ω	0.95Ω
Blue − Black			
Red − Blue			

IPM Continuity Check

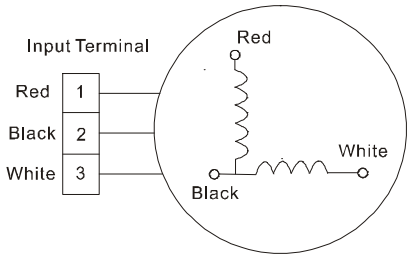
Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital multimeter to measure the resistance between P and UVWN; UVW and N.

Table 16—IPM Continuity Check

Digital Tester		Normal Resistance Value	Digital Tester		Normal Resistance Value
(+)Red	(−)Black	∞ (MΩ)	(+)Red	(−)Black	∞ (MΩ)
P	N		U	N	
	U		V		
	V		W		
	W		(+)Red		

Indoor Fan Motor

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



A14484

Table 17—Resistance Value

Position	Resistance Value at 20℃ (68℉)				
	9k &12K (115V) Ω ± 8%	12K (208−230V) Ω ± 8%	18K (208−230V) Ω ± 8%	22K (208−230V) Ω ± 8%	
Black − Red	75	381	183.6	112	118.5
White − Black	150	267	206	82	78.5

Pressure on Service Port

Table 18—Cooling Chart

°F(°C)	IDT / ODT	75 （24）	85 （30）	95 (35）	105（41）	115 (46）
PSI	70/59	119	113	117	125	147
PSI	75/63	124	120	126	132	155
PSI	80/67	135	129	132	140	162

°F(°C)	IDT / ODT	75 （24）	85 （30）	95 (35）	105（41）	115 (46）
MPA	70/59	0.82	0.78	0.81	0.86	1.01
MPA	75/63	0.86	0.83	0.87	0.91	1.07
MPA	80/67	0.93	0.89	0.91	0.96	1.12

Table 19—Heating Chart

°F(°C)	IDT / ODT	57/53 (14/12)	47/43 (8/6)	37/33 (3/1)	27/23 (−3/−5)	17/13 (−8 /−11)
PSI	55	439	413	367	330	302
PSI	65	471	435	386	368	339
PSI	75	489	457	403	381	362

°F(°C)	IDT / ODT	57/53 (14/12)	47/43 (8/6)	37/33 (3/1)	27/23 (−3/−5)	17/13 (−8 /−11)
MPA	55	3.03	2.85	2.53	2.28	2.08
MPA	65	3.25	3.00	2.66	2.54	2.33
MPA	75	3.38	3.15	2.78	2.63	2.49

APPENDIX

APPENDIX TABLE OF CONTENTS

A1 – Control Board Input/Output Value – 38–40MFC(Q)009---1 / 38–40MFC(Q)012---1

Table 20—38MFC(Q)009---1 / 38MFC(Q)012---1

CONNECTOR	38MFC(Q)009---1 / 38MFC(Q)012---1
	CONTROL BOARD INPUT or OUTPUT VALUE
L_IN	Voltage ：AC 110V
CN11	Voltage ：AC110V
CN16	Relative to the N terminal voltage：DC 24V
CN6	Maximum output voltage ：ac110V
CN4	Maximum voltage：DC12V
CN5	Maximum voltage between the lines：DC12V
P_1	Ground
CN8	Maximum voltage：DC5V
CN9	Maximum voltage：DC5V
CN10A	Maximum voltage between the lines：DC5V

Table 21—40MFC(Q)009---1 / 40MFC(Q)012---1

CONNECTOR	40MFC(Q)009---1 / 40MFC(Q)012---1
	CONTROL BOARD INPUT or OUTPUT VALUE
CN1	Output:Pin5&6(12V) Pin1-Pin4:Pulse waveform,(0-12V)
CN14	Input:Pin1 (3.3V) Pin2(0-3.3V),Normal value about3.3V
CN15	Input:Pin1 (0-1.8V) Pin2(1.8V)
CN16	Input:Pin3 & Pin4(0-1.8V) Pin1 & Pin5(1.8V)
CN10	Output:Pin1-Pin5(0-115V high voltage)
CN33	Output:115V high voltage
CN34	Output:115V high voltage
CN26,CN28	Output:115V high voltage
CN4	Input:115V high voltage
CN5	Input:115V high voltage
CN6	Connection to the earth
CN7	Output: Connection of the high voltage
CN8,CN9	Output:High voltage
CN36,CN37	Output:High voltage
N-B	Output:High voltage
CN17	Output:Pin1(3.3V) Pin2(GND) Pin3-4 Pulse(0-3.3V)
U V W	Output:Pulse(0-320V)

A2 – Control Board Input/Output Value – 38–40MFC(Q)012---3

Table 22—38MFC(Q)012---3

CONNECTOR	38MFC(Q)012---3
	CONTROL BOARD INPUT or OUTPUT VALUE
L_IN	Voltage ：AC 230V
CN11	Voltage ：AC230V
CN16	Relative to the N terminal voltage：DC 24V
CN6	Maximum output voltage ：AC230V
CN4	Maximum voltage：DC12V
CN5	Maximum voltage between the lines：DC12V
P_1	Ground
CN8	Maximum voltage：DC5V
CN9	Maximum voltage：DC5V
CN10A	Maximum voltage between the lines：DC5V

Table 23—40MFC(Q)012---3

CONNECTOR	40MFC(Q)012---3
	CONTROL BOARD INPUT or OUTPUT VALUE
CN14	Input:Pin1 (5V) Pin2(0-5V),Normal value about3.3V
CN15	Input:Pin1 (5V) Pin2(0-5V)
CN16	Input:Pin3 & Pin4(5V) Pin1 & Pin5(0-5V)
CN26,CN28	Output:230V High voltage
CN10	Output:Pin1-Pin5(0-230VHigh voltage)
CN32,CN34	Output:230V High voltage
CN31,CN33	Output:230V High voltage
CN4	Input:230V High voltage
CN5	Input:230V High voltage
CN6	Connection to the earth
CN7	Output:Connection to high voltage
N-B	Output:High voltage
CN2,CN3	Output:High voltage
CN17	Output:Pin1(5V) Pin2(GND) Pin3-4 Pulse(0-3.3V)
U V W	Output:Pulse(0-320V)

A3 – Control Board Input/Output Value – 38–40MFC018---3 (AC) / 38–40MFQ017---3 (HP)

Table 24—38MFC018---3 (AC) / 38MFQ017---3 (HP)

CONNECTOR	38MFC018---3 (AC) / 38MFQ017---3 (HP)
	CONTROL BOARD INPUT or OUTPUT VALUE
L_IN	Voltage ：AC 230V
CN11	Voltage ：AC230V
CN16	Relative to the N terminal voltage：DC 24V
CN6	Maximum output voltage ：AC230V
CN4	Maximum voltage：DC12V
CN5	Maximum voltage between the lines：DC12V
P_1	Ground
CN8	Maximum voltage：DC5V
CN9	Maximum voltage：DC5V
CN10A	Maximum voltage between the lines：DC5V

Table 25—40MFC018---3 (AC) / 40MFQ017---3 (HP)

CONNECTOR	40MFC018---3 (AC) / 40MFQ017---3 (HP)
	CONTROL BOARD INPUT or OUTPUT VALUE
CN101	Input:Pin1 (5V) Pin2(0-5V),Normal value about5V
CN102	Input:Pin1 (5V) Pin2(0-5V)
CN103	Input:Pin3 & Pin4(5V) Pin1 & Pin5(0-5V)
CN8,CN9	Output:230V High voltage
CN10	Output:Pin1-Pin5(0-230VHigh voltage)
CN5	Output:230V High voltage
CN7	Output:230V High voltage
CN13	Input:230V High voltage
CN12	Input:230V High voltage
CN14	Connection to the earth
CN15	Output:Connection to high voltage
N-B	Output:High voltage
CN11,CN22	Output:High voltage
U V W	Output:Pulse(0-320V)

A4 – Control Board Input/Output Value – 38–40MFC(Q)022---3

Table 26—38MFC(Q)022---3

CONNECTOR	38MFC(Q)022---3
	CONTROL BOARD INPUT or OUTPUT VALUE
L_IN	Voltage ：AC 230V
CN11	Voltage ：AC230V
CN16	Relative to the N terminal voltage：DC 24V
CN6	Maximum output voltage ：AC230V
CN4	Maximum voltage：DC12V
CN5	Maximum voltage between the lines：DC12V
P_1	Ground
CN8	Maximum voltage：DC5V
CN9	Maximum voltage：DC5V
CN10A	Maximum voltage between the lines：DC5V

Table 27—40MFC(Q)022---3

CONNECTOR	40MFC(Q)022---3
	CONTROL BOARD INPUT or OUTPUT VALUE
CN12	Input:Pin1 (5V) Pin2(0-5V),Normal value about5V
CN7	Input:Pin1 (5V) Pin2(0-5V)
CN17	Input:Pin3 & Pin4(5V) Pin1 & Pin5(0-5V)
CN1,CN2	Output:230V High voltage
CN11,CN22	Output:Pin1-Pin5(0-230VHigh voltage)
CN10,CN13	Output:230V High voltage
CN5	Output:230V High voltage
CN6	Input:230V High voltage
CN3	Input:230V High voltage
CN4	Input:230V High voltage
P1	Connection to the earth
CN15	Output:Connection to high voltage
N-OUT1	Output:230V High voltage,N line, Connected to the drive PCB
RY2 POWER	Output:230V High voltage,L line, Connected to the drive PCB
CN26	Output:Pin1(5V) Pin2(GND) Pin3-4 Pulse(0-3.3V)
CN4	Input:230V High voltage
CN5	Input:230V High voltage
CN2 CN3	Output:High voltage
CN11	Output:320V High voltage
CN12	Output:GND
CN1	Pin1:15V Pin2:5V Pin3:GND Pin4&Pin5:Main control chip communication terminal,Pulse wave(0-5V)
CN6	Pin1:17V Pin2:GND
U V W	Output:Pulse(0-320V)

A5 – Temperature Sensor Resistance Value Table for T1, T2, T3, T4

Table 28—Temperature Sensor Resistance Value Table for T1, T2, T3, T4

°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

A6 – Temperature Sensor Resistance Value Table for T5

Table 29—Temperature Sensor Resistance Value Table for T5

°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			

A7 – Fuse Chart

Table 30—Fuse Chart

Unit Size	Fuse Rating		
	Indoor unit	Outdoor unit	Outdoor unit
9K (115V)	3.15A / 250V	30A / 250V	–
12K (115V)	3.15A / 250V	30A / 250V	–
12K (230V)	3.15A / 250V	20A / 250V	–
17K HP / 18K AC (230V)	3.15A / 250V	20A / 250V	–
22K (230V)	3.15A / 250V	30A / 250V	5A / 250V

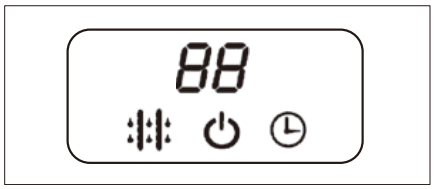
A8 – Indoor Unit Diagnostic Guides

Table 31—Indoor Unit Diagnostic Guides

Operation lamp	Timer Lamp	Display	LED STATUS	Diagnostic Chart Number
☆ 1 time	X	E0	Indoor unit EEPROM parameter error	1
☆ 2 times	X	E1	Indoor / outdoor units communication error	2
☆ 3 times	X	E2	Zero-crossing signal detection error	3
☆ 4 times	X	E3	Indoor fan speed has been out of control	4
☆ 5 times	X	E4	Indoor room temperature sensor T1 open circuit or short circuited	†
☆ 6 times	X	E5	Evaporator coil temperature sensor T2 open circuit or short circuited	5
☆ 2 times	On	F1	Outdoor temperature sensor T4 open circuit or short circuited	†
☆ 3 times	On	F2	Condenser coil temperature sensor T3 open circuit or short circuited	†
☆ 4 times	On	F3	Compressor discharge temperature sensor T5 open circuit or short circuited	†
☆ 5 times	On	F4	Outdoor unit EEPROM parameter error	1
☆ 1 times	☆	P0	IPM malfunction or IGBT over-strong current protection	6
☆ 2 times	☆	P1	Over voltage or over low voltage protection	7
☆ 3 times	☆	P2	High temperature protection of compressor top diagnosis and solution (only for 22K models)	8
☆ 5 times	☆	P4	Inverter compressor drive error	9

☆ = Flashing X = Off

† Refer to *Additional Information for Critical Parts* on page 31 and Appendices A5 and A6 .



SELECTED TEMPERATURE / SELF-DIAGNOSTIC CODES indicator

DEFROST indicator
Illuminates when the coil is warming up to prevent cold blow or when the unit goes into defrost mode.

OPERATION indicator
This indicator flashes once per second after power is on and illuminates when the unit is in operation.

TIMER indicator
Illuminates during TIMER operation

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Fig. 22 – LED Display

A9 – Outdoor Unit Diagnostic Guides

Table 32—Outdoor Unit Diagnostic Guides

Green Lamp	Red Lamp	Failure Mode	Diagnostic Chart Number
On	X	Standby, normal	N/A
X	On	Operation, normal	N/A
On	On	High/Low voltage protection on compressor terminal	9
On	☆	EEPROM error	1
X	☆	Compressor's speed is out of control	9
☆	On	Zero−crossing signal detection error; lack of phase; synchronization error	3
☆	X	IGBT or Module protection	6
☆	☆	Communication error	2

☆ = Flashing X = Off

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