

**38MG / 40MA / 40MB
Multi- Zone Ductless Split System
Size 18k, 27k, 36k and 48k**



Product Data

INDUSTRY LEADING FEATURES / BENEFITS

AN INEXPENSIVE AND CREATIVE SOLUTION TO DESIGN PROBLEMS.

The 38MG / 40MA / 40MB ductless inverter driven multi-zone system provides individual comfort control for up to 5 separate zones. Two, three, four or five space-saving cassette, floor console, high wall, or ducted fan coils can be matched with one outdoor heat pump. The indoor fan coils are connected to the outdoor unit by refrigerant tubing and wires.

The different styles of indoor units can be mounted in several locations to accommodate the application. This selection of fan coils permits inexpensive and creative solutions to design problems such as:

- When adding air conditioning to spaces that are heated by hydronic or electric heat and have no ductwork.
- Historical renovations or any application where preserving the look of the original structure is essential.
- Commercial add-on jobs where the existing air conditioning system cannot be stretched.

These compact indoor fan coil units take up very little space in the room and do not obstruct windows. The fan coils are attractively styled to blend with most room decors.

Advanced system components incorporate innovative technology to provide reliable cooling and heating performance at low sound levels.



INVERTER TECHNOLOGY

The inverter driven compressor is designed to run at various input power frequencies (Hz) which controls the motor speed of the compressor.

Even Temperature – The control package, including the inverter, monitors outdoor and indoor temperatures as they relate to the selected indoor set point and adjusts the speed of the compressor to match the load and keep the system operating continuously rather than cycling and creating temperature swings. This translates to higher comfort levels for the occupants.

Rapid Pull Down/Warm-Up – Comfort is increased by the ability to the inverter system to ramp up the compressor speed enabling the system to reach the user selected room temperature set point quicker.

Humidity Control – Running the system for longer periods and continuously varying the compressor speed will enhance the humidity control.

INDIVIDUAL ROOM COMFORT

Maximum comfort is provided because each space can be controlled individually based on the usage pattern. The air sweep feature provided permits optimal room mixing to eliminate hot and cold spots for the occupant comfort.

LOW SOUND LEVELS

When noise is a concern, ductless split systems are the answer. The indoor units are whisper quiet. There are no compressors indoors, either in the conditioned space or directly over it, and there is none of the noise usually generated by air being forced through ductwork.

When sound ordinances and proximity to neighbors demand quiet operation, the 38MG unit is the right choice. With the inverter technology, these units run at lower speeds most of the time resulting in reduced sound levels.

INVERTER TECHNOLOGY – ENHANCED ECONOMICAL OPERATION

Ductless systems are inherently economical to operate. Individual rooms are heated or cooled only when required, and since the air is delivered directly to the space, there is no need to use additional energy to move the air in the ductwork. This economical operation is enhanced further when the inverter system output matches the load resulting in a more efficient system.

EASY-TO-USE CONTROLS

The multi-zone systems have microprocessor-based controls to provide the ultimate in comfort and efficiency. The user friendly wired and wireless remote controls provide the interface between the user and the unit.

SECURE OPERATION

If security is an issue, outdoor and indoor units are connected only by refrigerant piping and wiring to prevent intruders from crawling through ductwork or wall openings. In addition, since the 38MG can be installed close to an outside wall, coils are protected from vandals and severe weather.

FAST INSTALLATION

This compact ductless split system is simple to install. A mounting bracket is included with the indoor units and only wires and piping need to be run between the indoor and outdoor units. These units are fast and easy to install ensuring minimal disruption to customers in homes or workplace. This makes the 38MG / 40MA / 40MB systems the equipment of choice for retrofit applications.

SIMPLE SERVICING AND MAINTENANCE

Removing the top panel of the outdoor unit provides immediate access to the control compartment, providing the service technician access to the diagnostic LEDs to facilitate the troubleshooting process. In addition, the draw-thru design of the outdoor unit means that dirt accumulates on the outside surface of the coil. Coils can be cleaned quickly from the inside using a pressure hose and detergent.

On the indoor units, service and maintenance expense is reduced due to the permanent easy to clean filters. Also, error codes are displayed on the front panel to alert the user to certain system malfunctions

BUILT-IN RELIABILITY

Ductless split system indoor and outdoor units are designed to provide years of trouble-free operation.

Both the indoor and outdoor units are well protected. Whenever the microprocessor detects abnormal conditions, the unit will stop and an error code is displayed.

Inverter systems provide additional reliability due to soft start. This refers to the ability of the inverter to start the compressor motor using reduced voltage and reduced current. This feature is beneficial from an electrical standpoint (eliminates current spikes) as well as an overall reliability standpoint due to reduced stress on all associated system components.

CONDENSATE PUMP

A condensate pump accessory is available (High Wall and Floor Console) to provide installation flexibility for those applications where gravity cannot be used to dispose of the condensate.

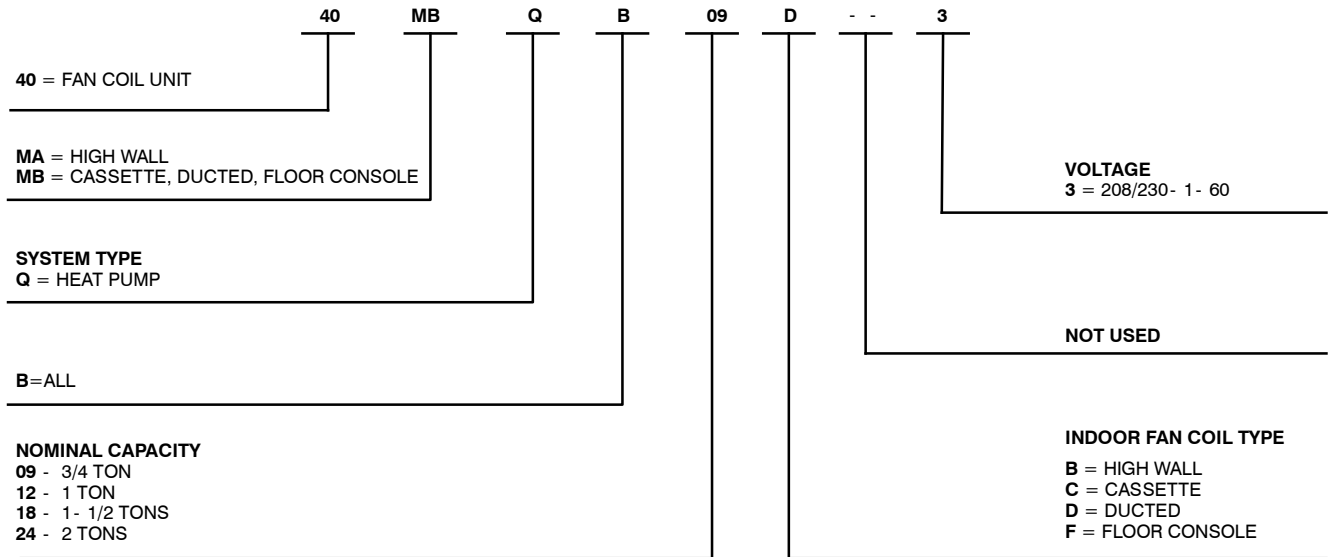
Factory installed condensate pump on the Ducted and Cassette fan coils provides installation flexibility.

AGENCY LISTINGS

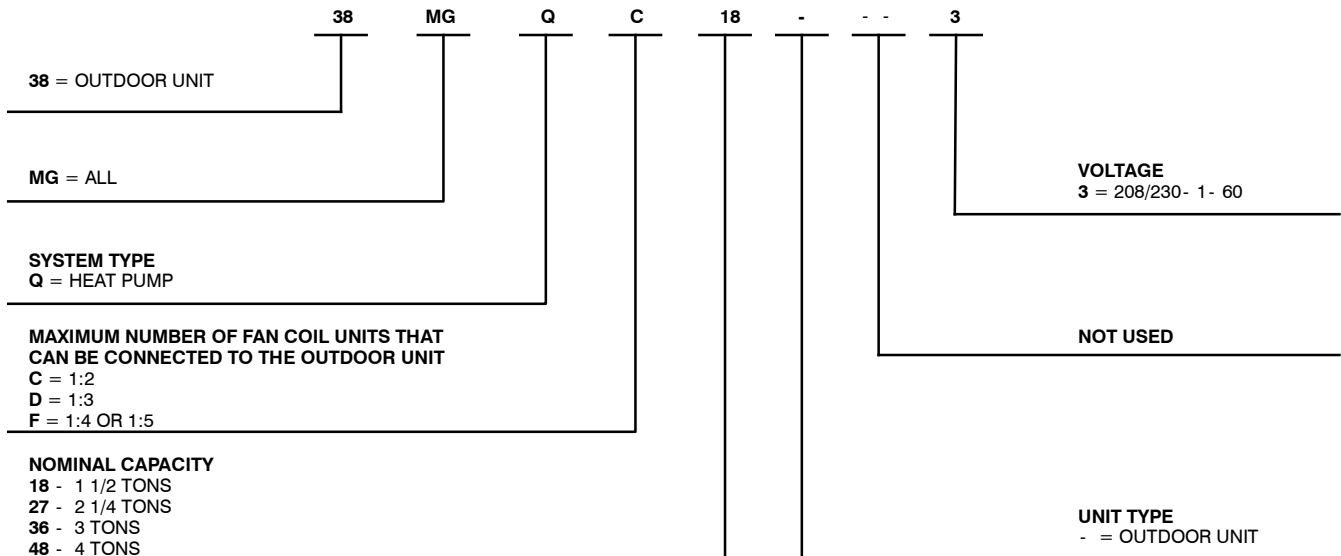
All systems are listed with AHRI (Air conditioning, Heating, and Refrigeration Institute) and are ETL certified per UL 1995 standard.

MODEL NUMBER NOMENCLATURE

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 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

Legend

S Standard

A Accessory

INDOOR UNITS

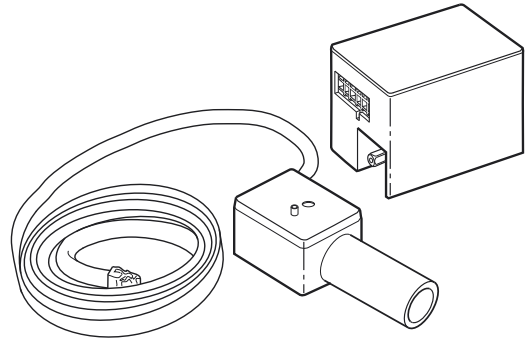


Fig. 1 – Condensate Pump Accessory

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

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

COMBINATION TABLE

Indoor Unit	Nominal Unit Btuh	Indoor Model Number	Outdoor Model Number
High Wall	9,000	40MAQB09B--3	38MGQC18---3
	12,000	40MAQB12B--3	
Cassette	9,000	40MBQB09C--3	
	12,000	40MBQB12C--3	
Ducted	9,000	40MBQB09D--3	
	12,000	40MBQB12D--3	
Floor Console	9,000	40MBQB09F--3	
	12,000	40MBQB12F--3	

Indoor Unit	Nominal Unit Btuh	Indoor Model Number	Outdoor Model Number
High Wall	9,000	40MAQB09B--3	38MGQD27---3
	12,000	40MAQB12B--3	
	18,000	40MAQB18B--3	
Cassette	9,000	40MBQB09C--3	
	12,000	40MBQB12C--3	
	18,000	40MBQB18C--3	
Ducted	9,000	40MBQB09D--3	
	12,000	40MBQB12D--3	
	18,000	40MBQB18D--3	
Floor Console	9,000	40MBQB09F--3	
	12,000	40MBQB12F--3	

Indoor Unit	Nominal Unit Btuh	Indoor Model Number	Outdoor Model Number
High Wall	9,000	40MAQB09B--3	38MGQF36---3 38MGQF48---3
	12,000	40MAQB12B--3	
	18,000	40MAQB18B--3	
	24,000	40MAQB24B--3	
Cassette	9,000	40MBQB09C--3	
	12,000	40MBQB12C--3	
	18,000	40MBQB18C--3	
Ducted	9,000	40MBQB09D--3	
	12,000	40MBQB12D--3	
	18,000	40MBQB18D--3	
	24,000	40MBQB24D--3	
Floor Console	9,000	40MBQB09F--3	
	12,000	40MBQB12F--3	

DIMENSIONS - INDOOR

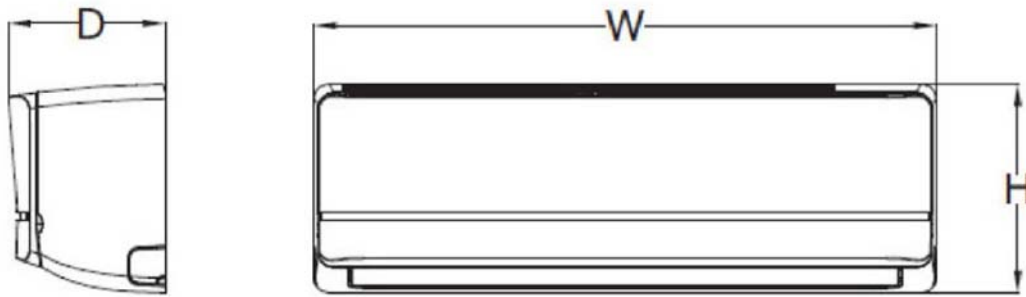


Fig. 2 – High Wall Dimensions

Unit Size	W In. (mm)	D In. (mm)	H In. (mm)	Operating Weight Lbs. (kg)
9K/12K	32.9(835)	7.8(198)	11.0(280)	19.2(8.7)
18K	39.0(990)	8.6(218)	12.4(315)	26.5(12.0)
24K/30K	46.7(1186)	10.2(258)	13.4(343)	40.8(18.5)

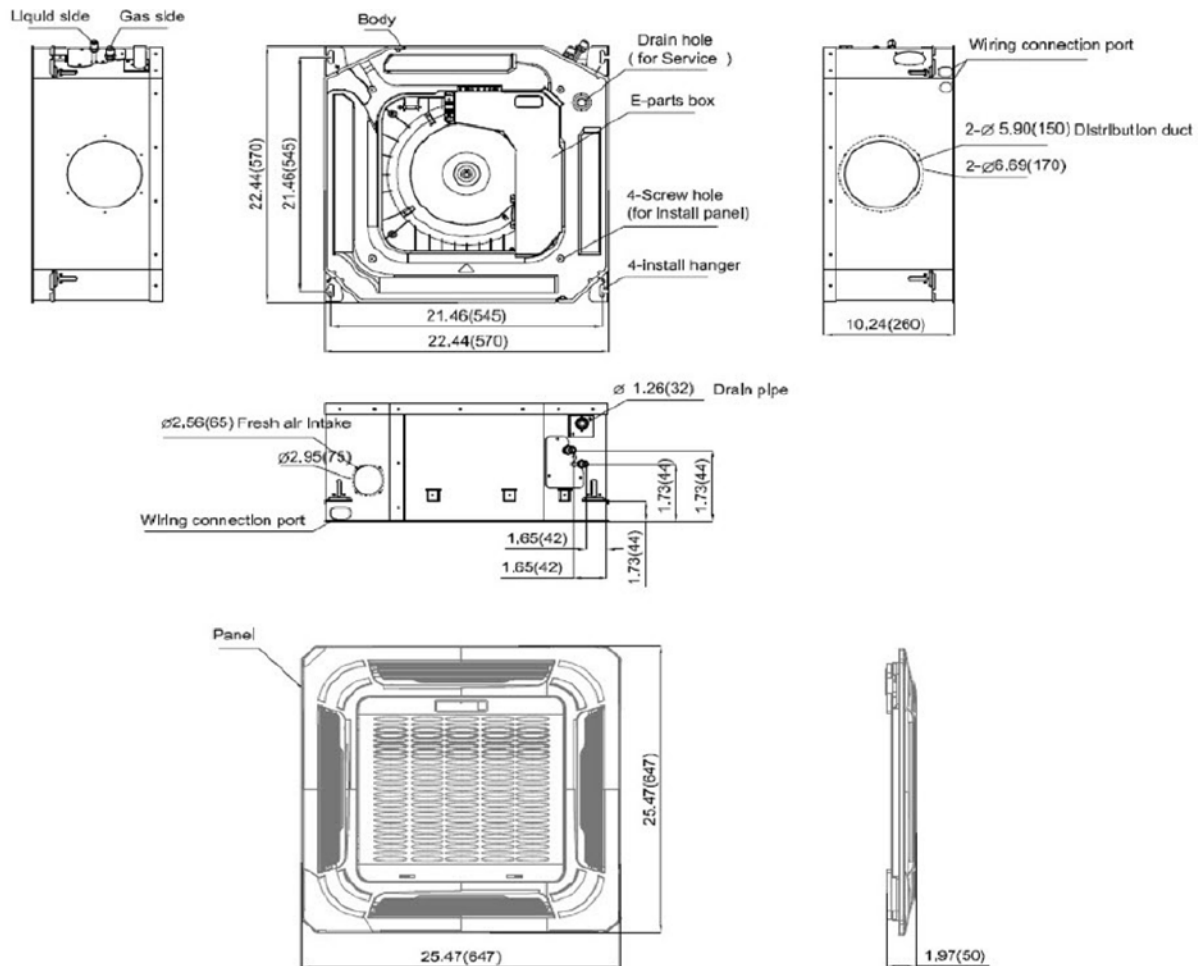


Fig. 3 – Cassette Dimensions

Unit size		9K		12K		18K	
		body	panel	body	panel	body	panel
Height	in(mm)	10.24 (260)	1.97 (50)	10.24 (260)	1.97 (50)	10.24 (260)	1.97 (50)
Width	in(mm)	22.44 (570)	25.47 (647)	22.44 (570)	25.47 (647)	22.44 (570)	25.47 (647)
Depth	in(mm)	22.44 (570)	25.47 (647)	22.44 (570)	25.47 (647)	22.44 (570)	25.47 (647)
Operating Weight	lbs(kg)	35.27 (16)	5.51 (2.5)	35.27 (16)	5.51 (2.5)	39.68 (18)	5.51 (2.5)

DIMENSIONS - INDOOR (CONTINUED)

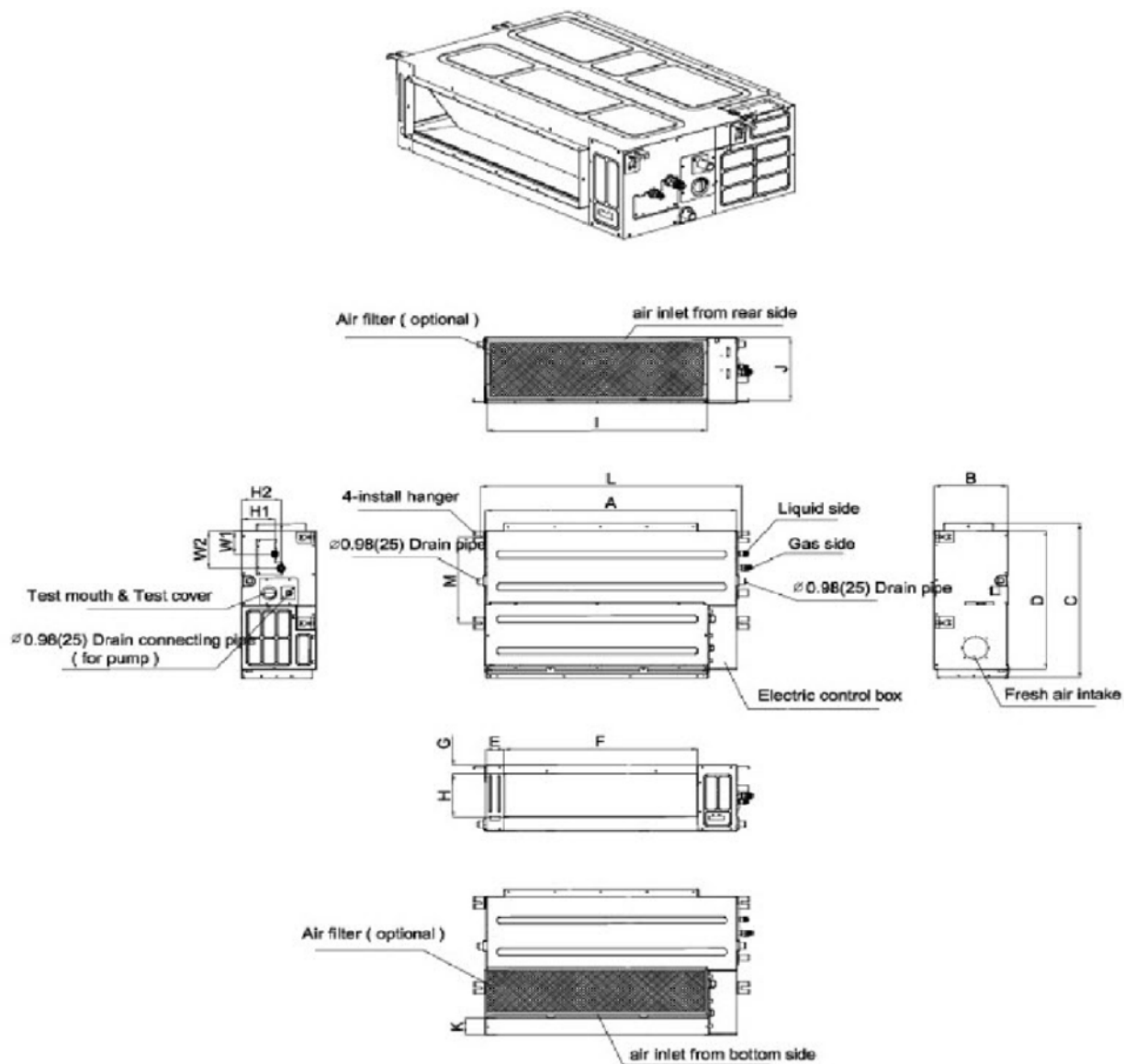


Fig. 4 – Ducted Dimensions

Size	Outline dimensions in(mm)				Air outlet opening size in(mm)				Air return opening size in(mm)			Hanger Brackets in(mm)		Refrigerant Pipe Locations in(mm)				Operating Weight Lbs. (kg) in(mm)
	A	B	C	D	E	F	G	H	I	J	K	L	M	H1	H2	W1	W2	
9	27.6 (700)	8.2 (210)	25 (635)	22.4 (570)	2.5 (65)	19.4 (493)	1.3 (35)	4.6 (119)	23.4 (595)	7.8 (200)	3.1 (80)	29.1 (740)	13.8 (350)	4.7 (120)	5.6 (143)	3.7 (95)	5.9 (150)	39.90 (18.1)
12	27.6 (700)	8.2 (210)	25 (635)	22.4 (570)	2.5 (65)	19.4 (493)	1.3 (35)	4.6 (119)	23.4 (595)	7.8 (200)	3.1 (80)	29.1 (740)	13.8 (350)	4.7 (120)	5.6 (143)	3.7 (95)	5.9 (150)	39.90 (18.1)
18	36.2 (920)	8.2 (210)	25 (635)	22.4 (570)	2.5 (65)	19.4 (493)	1.3 (35)	4.6 (119)	32.0 (815)	7.8 (200)	3.1 (80)	37.8 (960)	13.8 (350)	4.7 (120)	5.6 (143)	3.7 (95)	5.9 (150)	50.7 (23)
24	36.2 (920)	10.6 (270)	25 (635)	22.4 (570)	2.5 (65)	19.4 (493)	1.3 (35)	7.0 (179)	32.0 (815)	10.2 (260)	0.7 (20)	37.8 (960)	13.8 (350)	4.7 (120)	5.6 (143)	3.7 (95)	5.9 (150)	57.32 (26)

DIMENSIONS - INDOOR (CONTINUED)

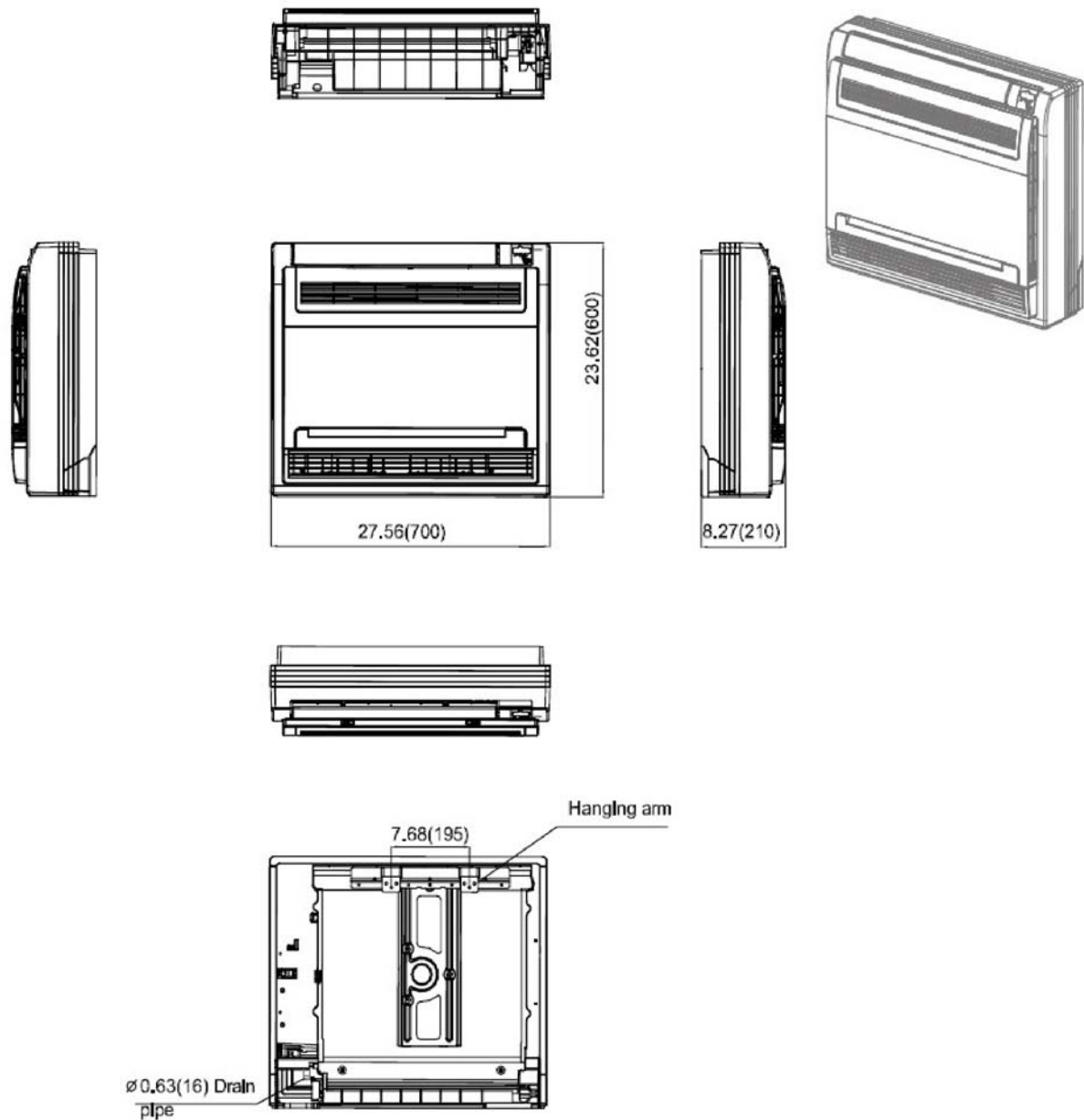


Fig. 5 – Floor Console Dimensions

Unit size		9	12
Height	in (mm)	8.27 (210)	8.27 (210)
Width	in (mm)	27.56 (700)	27.56 (700)
Depth	in (mm)	23.62 (600)	23.62 (600)
Operating Weight	Lbs. (kg)	32.41 (14.7)	32.41 (14.7)

DIMENSIONS - OUTDOOR

Unit Size		18	27	36	48
Height	in (mm)	27.56(700)	31.89(810)	31.89(810)	36.93(938)
Width	in (mm)	33.27(845)	37.20(945)	37.20(945)	53.9(938)
Depth	in (mm)	12.60(320)	15.55(395)	15.55(395)	15.43(392)
Weight -Net	lbs (kg)	114.63(52)	154.76(70.2)	169.75(77)	255.50(115.9)

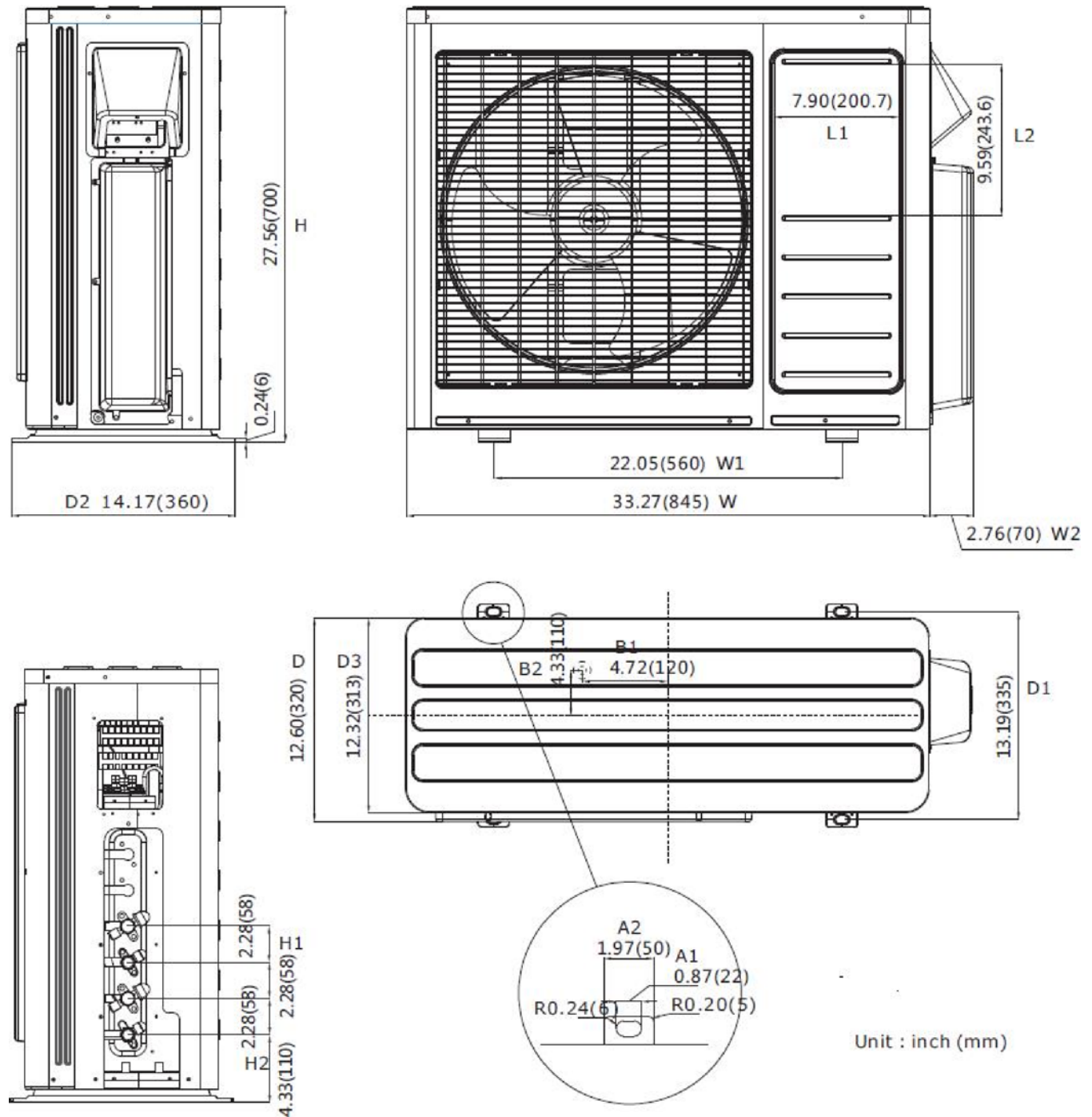


Fig. 6 – Outdoor Dimensions Size 18

DIMENSIONS - OUTDOOR (CONTINUED)

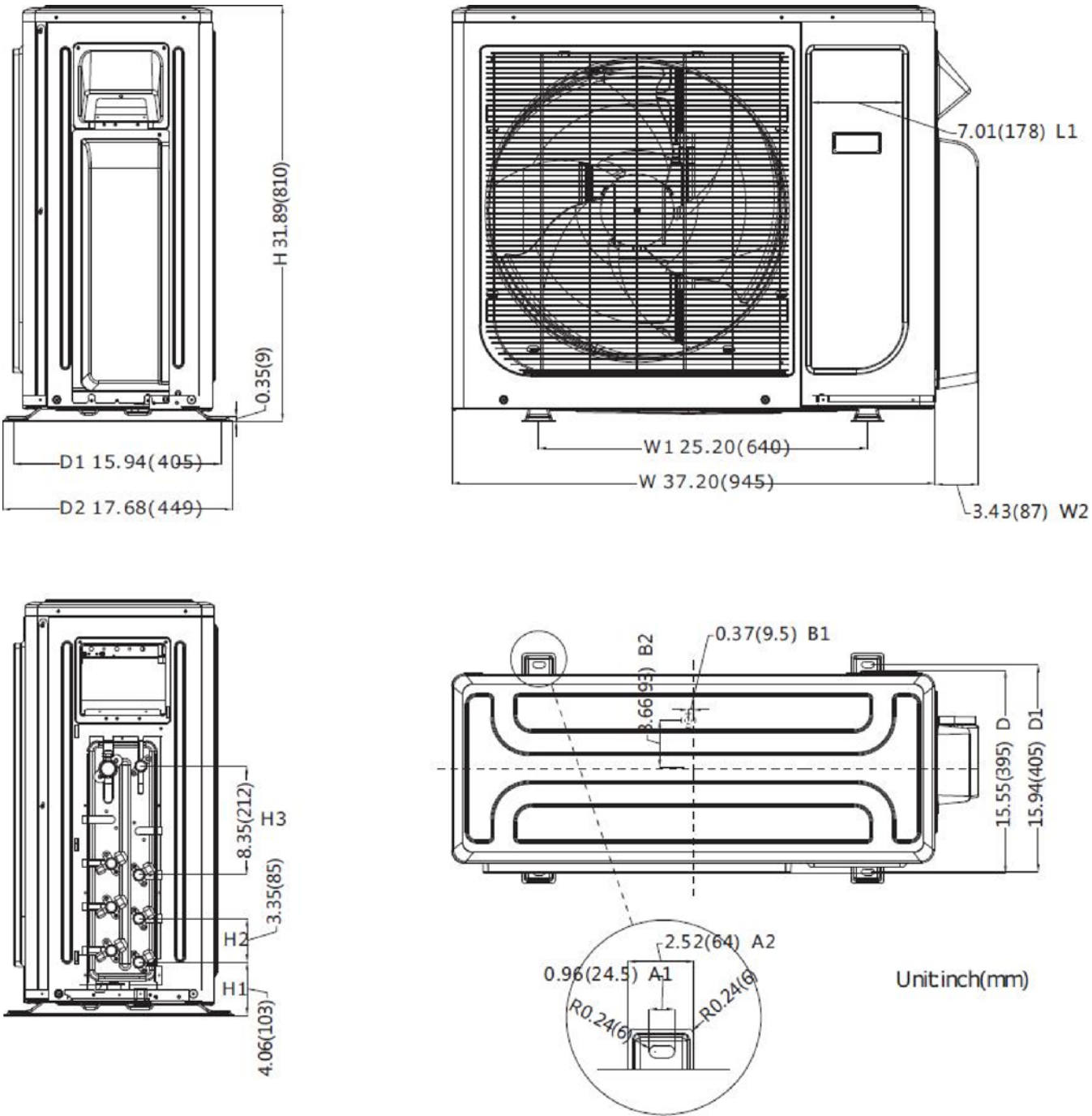


Fig. 7 – Outdoor Dimensions Size 27

DIMENSIONS - OUTDOOR (CONTINUED)

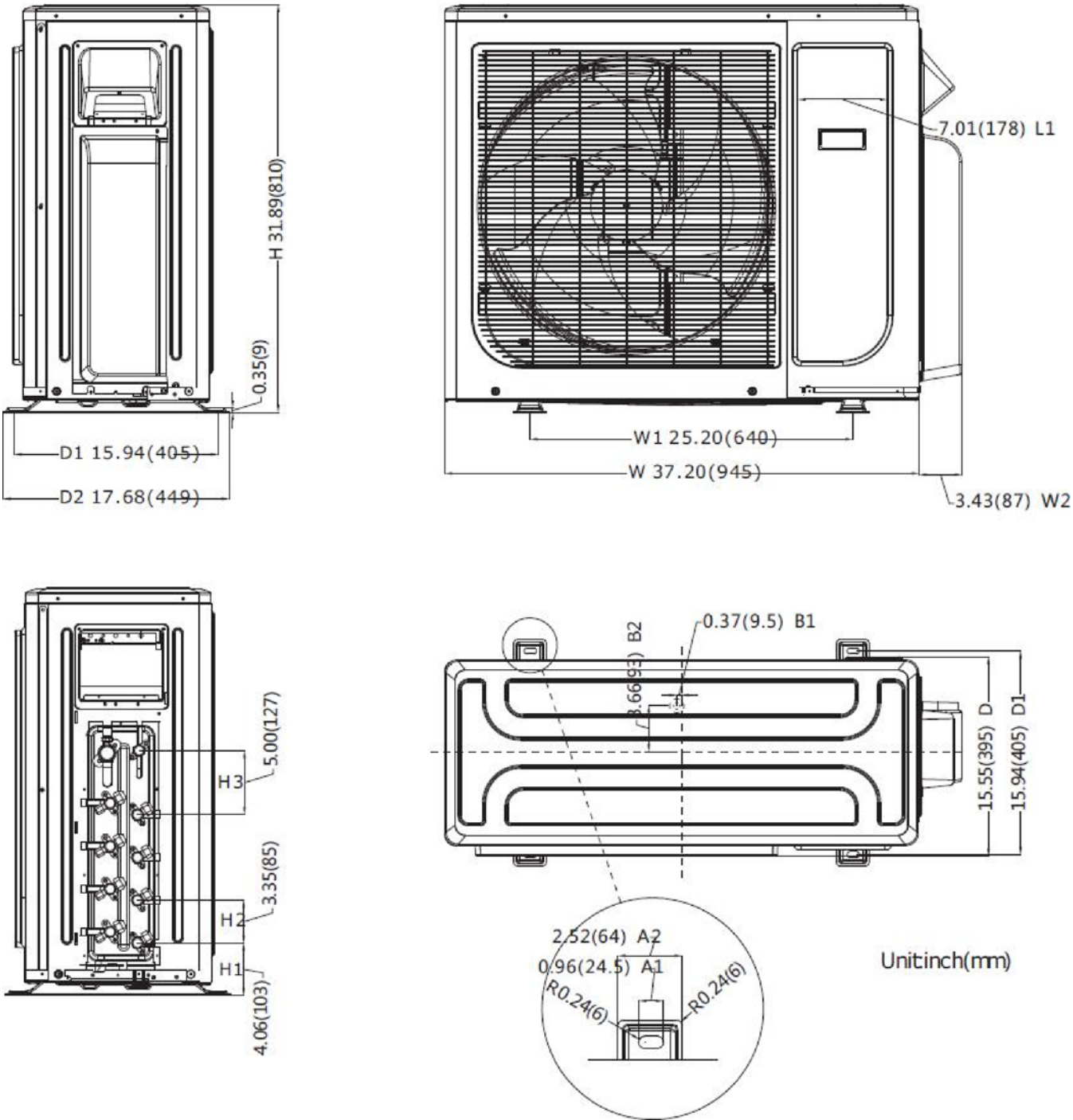


Fig. 8 – Outdoor Dimensions Size 36

DIMENSIONS - OUTDOOR (CONTINUED)

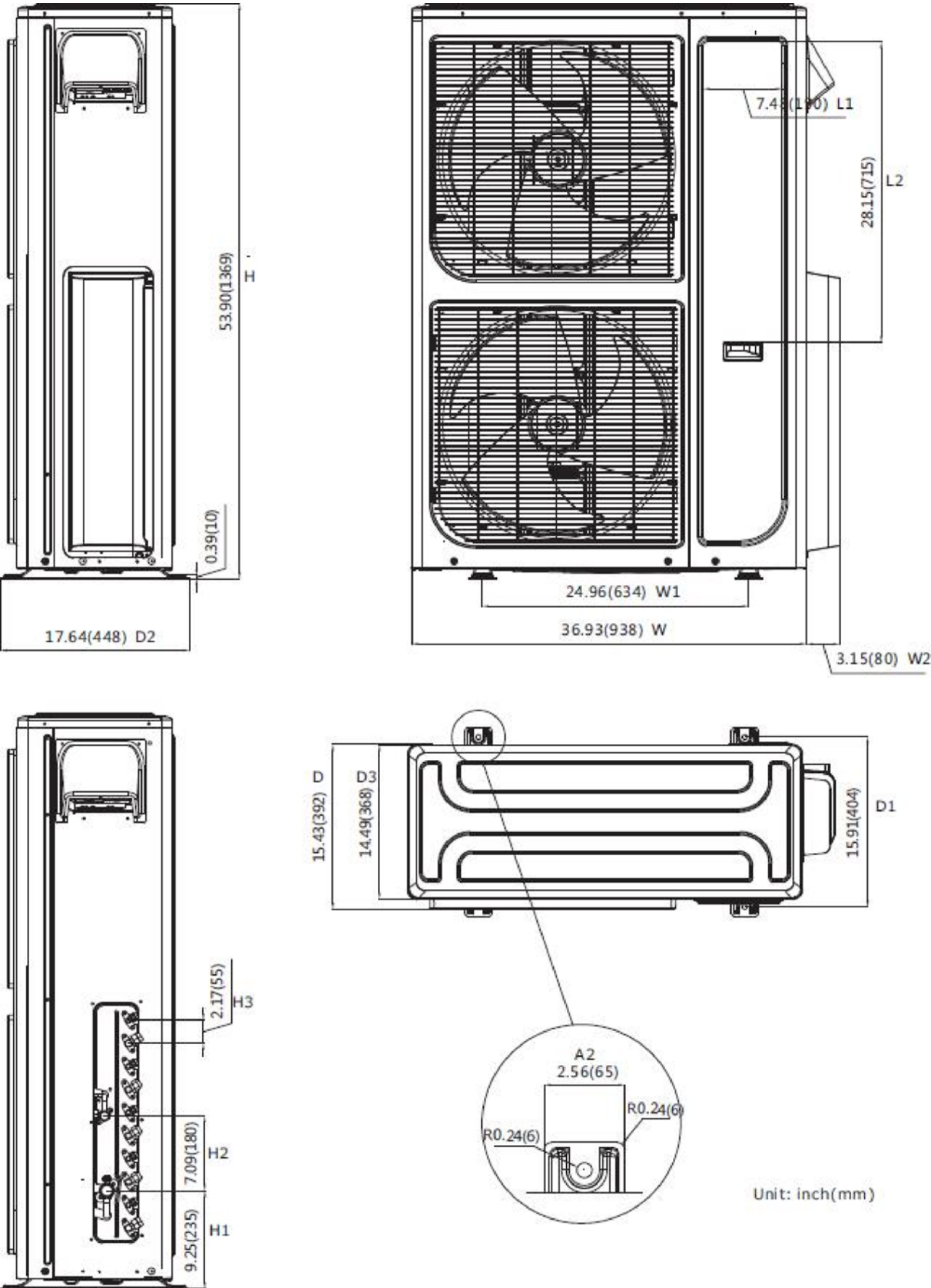


Fig. 9 – Outdoor Dimensions Size 48

CLEARANCES - INDOOR

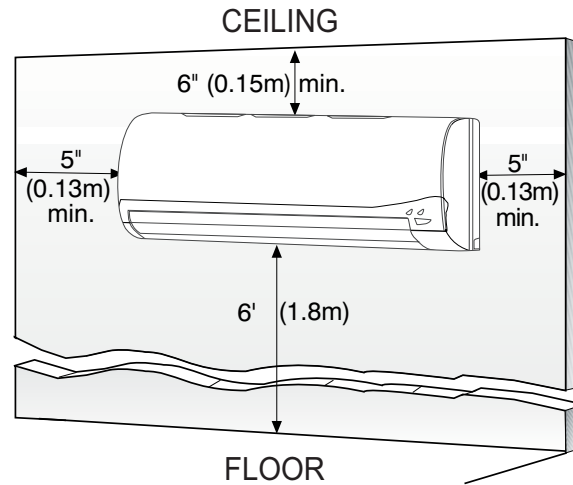
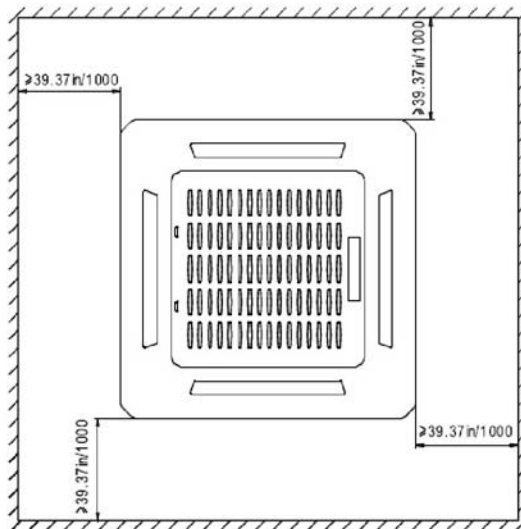
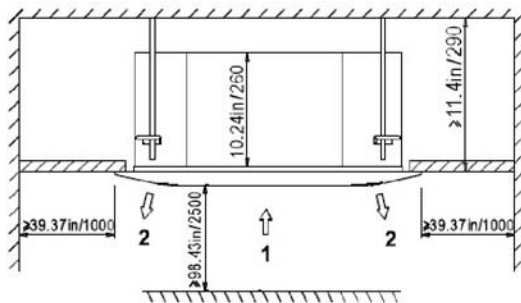
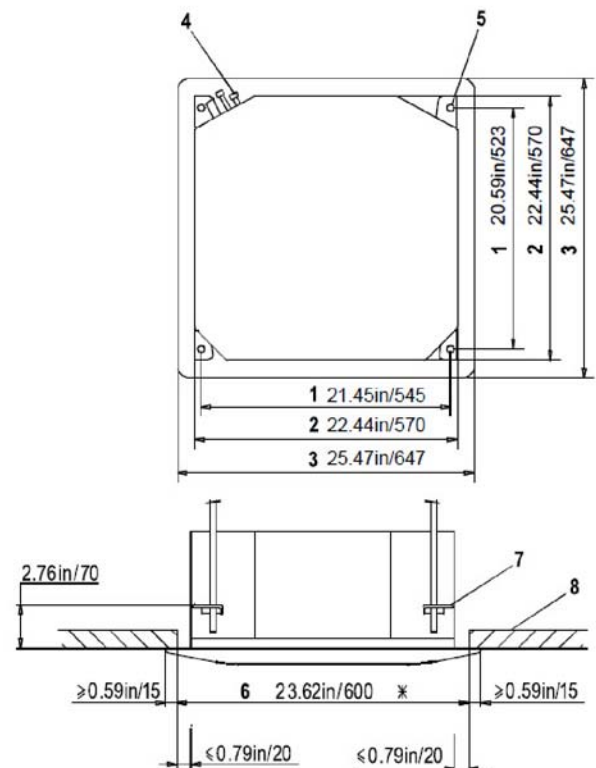


Fig. 10 – High Wall clearance



Unit: in/mm

- 1 Air inlet
- 2 Air outlet



Unit: in/mm

- 1 Installation hook pitch dimensions
- 2 Indoor unit dimensions
- 3 Decoration panel dimensions
- 4 Refrigerant piping
- 5 Installation hook (× 4)
- 6 Ceiling opening dimensions
- 7 Hanger bracket
- 8 False ceiling

Fig. 11 – Cassette Unit Clearance

CLEARANCES - INDOOR (CONTINUED)

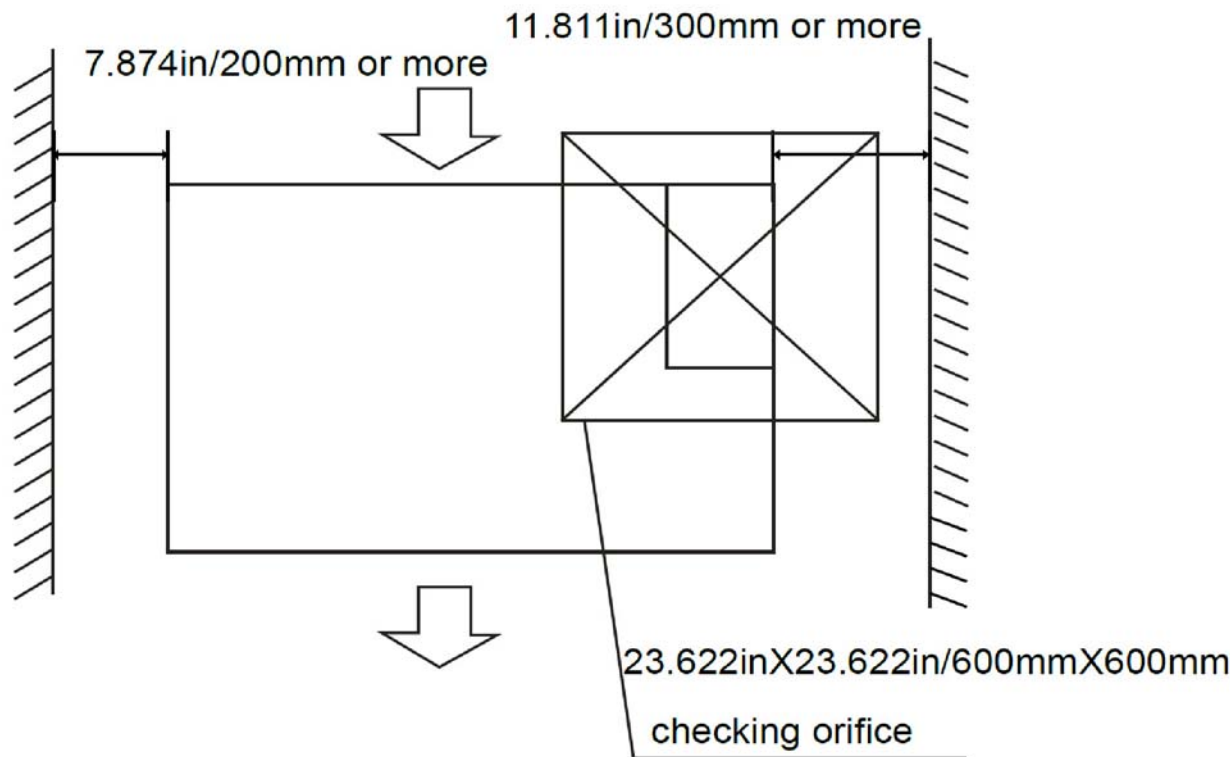


Fig. 12 – Ducted clearance

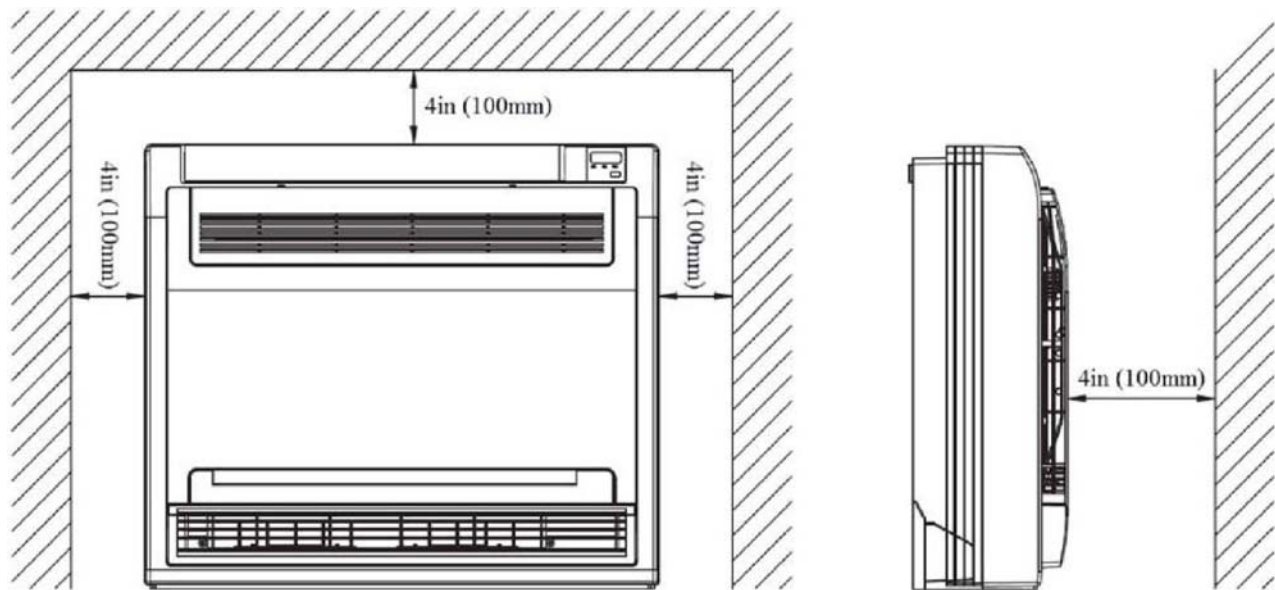


Fig. 13 – Floor Console clearances

CLEARANCES - OUTDOOR

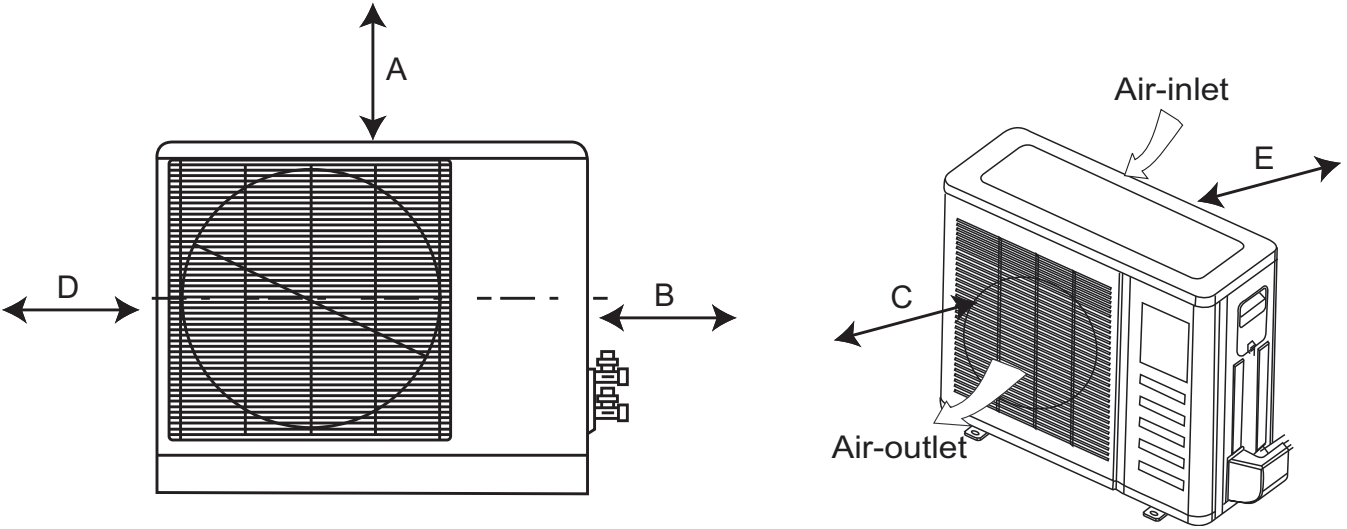


Fig. 14 – Clearances Outdoor

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

PHYSICAL DATA - OUTDOOR

System	Size		18	27	36	48
	Outdoor Model		38MGQC18---3	38MGQD27---3	38MGQF36---3	38MGQF48---3
	Max Number of Zones		2	3	4	5
	Energy Star		YES	YES	NO	YES
Performance Non-Ducted	Cooling Rated Capacity	Btu/h	18,000	25,000	36,000	42,000
	Cooling Cap. Range Min - Max	Btu/h	8,500~20,000	9,000~30,000	9,500~37,000	10,000~50,000
	SEER		21	22	18	20
	EER		12.5	12.5	8.8	12.5
	Heating Rated Capacity	Btu/h	18,500	32,000	36,000	49,000
	Heating Cap. Range Min - Max	Btu/h	9,000~22,000	9,500~32,000	10,000~39,000	10,500~55,000
	HSPF		9.6	9.6	10.0	10.0
Performance Combination Ducted and Non-Ducted	Cooling Rated Capacity	Btu/h	17,500	26,000	35,000	42,000
	Cooling Cap. Range Min - Max	Btu/h	8,500~20,000	9,000~30,000	9,500~36,500	10,000~50,000
	SEER		19.5	19.25	16.5	19
	EER		12.5	11	8.5	11.75
	Heating Rated Capacity	Btu/h	18,250	32,000	36,000	50,000
	Heating Cap. Range Min - Max	Btu/h	9,000~22,000	9,500~32,000	10,000~39,000	10,500~55,000
	HSPF		9.1	9.2	9.7	9.8
Performance Ducted	Cooling Rated Capacity	Btu/h	17,000	27,000	34,000	42,000
	Cooling Cap. Range Min - Max	Btu/h	8,500~20,000	9,000~30,000	9,500~36,000	10000~50000
	SEER		18	16.5	15	18
	EER		12.5	9.5	8.2	11
	Heating Rated Capacity	Btu/h	18,000	32,000	36,000	51,000
	Heating Cap. Range Min - Max	Btu/h	9000~22000	9500~32000	10,000~39,000	10,500~55,000
	HSPF		8.5	8.8	9.3	9.5
Operating Range	Cooling Outdoor DB Min - Max	°F	4~122	4~122	4~122	4~122
	Heating Outdoor DB Min - Max	°F	4~86	4~86	4~86	4~86
Piping	Total Piping Length	Ft.	98	147	196	245
	Piping to furthest FCU	Ft.	98	98	98	98
	Drop (OD above ID)	Ft.	32	32	32	32
	Lift (OD below ID)	Ft.	32	32	32	32
	Pipe Connection Size - Liquid	In.	1/4*2	1/4*3	1/4*4	1/4*5
	Pipe Connection Size - Suction	In.	3/8*2	3/8*3	1/2+3/8*3	1/2*2+3/8*3
Electrical	Voltage, Phase, Cycle	V/Ph/Hz	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
	Power Supply		Indoor unit powered from outdoor unit			
	MCA	A.	15	18	27	29
	MOCP - Fuse Rating	A.	20	30	45	50
Outdoor	Unit Width	In.	33.3	37.2	37.2	36.9
	Unit Height	In.	27.6	31.9	31.9	53.9
	Unit Depth	In.	12.6	15.6	15.6	15.4
	Net Weight	Lbs.	114.6	154.8	169.8	255.5
	Airflow	CFM	1,390	2,130	2,130	3,500
	Sound Pressure	dB(A)	60	63	63	64

PHYSICAL DATA - INDOOR

High Wall Indoor Unit	Size		9	12	18	24
	Model		40MAQB09B--3	40MAQB12B--3	40MAQB18B--3	40MAQB24B--3
	Unit Width	In.	32.9	32.9	39	46.7
	Unit Height	In.	11	11	12.4	13.4
	Unit Depth	In.	7.8	7.8	8.6	10.2
	Net Weight	Lbs.	19.2	19.2	26.5	40.1
	Pipe Connection Size - Liquid	In.	1/4	1/4	1/4	3/8
	Pipe Connection Size - Suction	In.	3/8	1/2	1/2	5/8
	Number of Fan Speeds		4	4	4	4
	Airflow (lowest to highest)	CFM	210/290/360/380	210/300/360/380	310/450/650/680	520/620/780/870
	Sound Pressure (lowest to highest)	dB(A)	27/34/42	27/34/42	33/40/46	39/45/50
	Air throw Data	Ft.	23	23	30	36
	Wireless Remote Controller (°F/°C Convertible)		Standard			
	Wired Remote Controller (°F/°C Convertible)		Optional			

Cassette Indoor Unit	Size		9	12	18
	Model		40MBQB09C--3	40MBQB12C--3	40MBQB18C--3
	Unit Width	In.	22.4	22.4	22.4
	Unit Height	In.	10.2	10.2	10.2
	Unit Depth	In.	22.4	22.4	22.4
	Net Weight	Lbs.	35.3	35.3	39.7
	Pipe Connection Size - Liquid	In.	1/4	1/4	1/4
	Pipe Connection Size - Suction	In.	3/8	1/2	1/2
	Number of Fan Speeds		3	3	3
	Airflow (lowest to highest)	CFM	260/320/380	280/340/400	290/350/420
	Sound Pressure (lowest to highest)	dB(A)	34/39/44	36/39/42	46/48/50
	Wireless Remote Controller (°F/°C Convertible)		Standard		
	Wired Remote Controller (°F/°C Convertible)		Optional		

Ducted Indoor Unit	Size		9	12	18	24
	Model		40MBQB09D--3	40MBQB12D--3	40MBQB18D--3	40MBQB24D--3
	Unit Width	In.	27.6	27.6	36.2	36.2
	Unit Height	In.	8.3	8.3	8.3	10.6
	Unit Depth	In.	25	25	25	25
	Net Weight	Lbs.	39.9	39.9	50.7	57.3
	Pipe Connection Size - Liquid	In.	1/4	1/4	1/4	3/8
	Pipe Connection Size - Suction	In.	3/8	1/2	1/2	5/8
	Number of Fan Speeds		3	3	3	3
	Airflow (lowest to highest)	CFM	290/340/380	290/340/380	400/440/480	590/650/810
	Sound Pressure (lowest to highest)	dB(A)	30/33/36	30/34/38	34/37/38	43/45/48
	Max Static Pressure	In.WG.	0.18 0.18 0.40 0.40	0.18 0.18 0.40 0.40	0.18 0.18 0.40 0.40	0.18 0.18 0.40 0.40
	Wireless Remote Controller (°F/°C Convertible)		Standard			
	Wired Remote Controller (°F/°C Convertible)		Standard			

Floor Console Indoor Unit	Size		9	12
	Model		40MBQB09F--3	40MBQB12F--3
	Unit Width	In.	27.6	27.6
	Unit Height	In.	8.3	8.3
	Unit Depth	In.	23.6	23.6
	Net Weight	Lbs.	32.4	32.4
	Pipe Connection Size - Liquid	In.	1/4	1/4
	Pipe Connection Size - Suction	In.	3/8	1/2
	Number of Fan Speeds		3	3
	Airflow (lowest to highest)	CFM	220/250/280	220/250/280
	Sound Pressure (lowest to highest)	dB(A)	37/38/41	34/41/45
	Wireless Remote Controller (°F/°C Convertible)		Standard	
	Wired Remote Controller (°F/°C Convertible)		Optional	

COOLING PERFORMANCE

Model	Cooling		Outdoor conditions (DB)				
	Indoor Conditions DB			75F(24C)	85F(29.5C)	95F(35C)	105F(40.5C)
	DB	WB					
18	69.8F(21C)	59F(15C)	TC	18.07	18.74	17.22	13.28
			SC	15.00	15.37	14.64	13.01
			Input	1.17	1.54	1.72	1.88
	80.6F(27C)	66.2F(19C)	TC	20.75	21.48	20.43	16.42
			SC	15.97	16.33	15.93	14.62
			Input	1.16	1.56	1.76	1.59
27	69.8F(21C)	59F(15C)	TC	23.99	27.20	24.55	19.31
			SC	22.67	24.08	22.56	19.31
			Input	1.50	2.42	2.67	2.39
	80.6F(27C)	66.2F(19C)	TC	27.40	31.78	29.90	23.85
			SC	23.72	25.06	2.51	22.94
			Input	1.51	2.52	2.83	2.51
36	69.8F(21C)	59F(15C)	TC	28.80	32.69	30.25	23.15
			SC	26.32	28.18	27.02	23.15
			Input	2.17	3.45	3.81	2.99
	80.6F(27C)	66.2F(19C)	TC	33.47	38.11	36.60	28.42
			SC	28.83	30.55	32.94	26.99
			Input	2.21	3.57	3.94	3.25
48	69.8F(21C)	59F(15C)	TC	44.06	42.04	38.95	34.05
			SC	37.89	36.57	35.44	33.37
			Input	3.32	3.78	4.19	4.45
	80.6F(27C)	66.2F(19C)	TC	46.88	49.74	45.99	41.31
			SC	40.32	43.27	41.85	40.07
			Input	2.64	3.90	4.33	4.61

LEGEND

DB --- Dry Bulb

WB --- Wet Bulb

TC --- Total Net Cooling Capacity (1000 Btu/hour)

SC --- Sensible Capacity (1000 Btu/hour)

Input --- Total Power (kW)

HEATING PERFORMANCE

Model	Heating		Outdoor conditions (DB)					
	Indoor Conditions (DB)		57F(13.9C)	47F(8.3C)	35F(1.7C)	17F(-8.3C)	5F(-15C)	-5F(-20C)
18	55F(12.7C)	TH	23.27	20.85	16.80	13.29	10.92	8.63
		Input	1.25	1.33	1.30	1.42	1.35	1.31
	70F(21.1C)	TH	21.69	20.19	16.19	12.32	9.09	7.70
		Input	1.45	1.51	1.49	1.56	1.48	1.41
27	55F(12.7C)	TH	37.85	34.34	28.36	22.77	19.38	16.23
		Input	2.27	2.29	2.29	2.46	2.44	2.40
	70F(21.1C)	TH	36.29	3.23	27.54	20.09	16.37	13.42
		Input	2.68	2.64	2.51	2.53	2.39	2.29
36	55F(12.7C)	TH	41.10	38.52	28.84	28.16	22.87	19.43
		Input	3.17	3.31	2.92	3.22	2.97	2.91
	70F(21.1C)	TH	40.86	38.83	29.89	26.02	20.15	16.70
		Input	3.62	3.73	3.37	3.38	3.05	2.90
48	55F(12.7C)	TH	60.91	53.30	42.81	33.02	26.16	20.01
		Input	4.26	4.04	3.78	3.82	3.56	3.42
	70F(21.1C)	TH	55.22	50.58	40.56	31.81	23.48	17.17
		Input	4.64	4.59	4.20	4.27	3.98	3.88

LEGEND

DB --- Dry Bulb

TH --- Total Net Heating Capacity (1000 Btu/hour)

Input --- Total Power (kW)

PIPING REQUIREMENTS

System size			18K	27K	36K	48K
Piping	Min. Piping Length	ft (m)	10 (3)	10 (3)	10 (3)	10 (3)
	Standard Piping Length	ft (m)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)
	Max. outdoor-indoor height difference (OU higher than IU)	ft (m)	32(10)	32(10)	32(10)	32(10)
	Max. outdoor-indoor height difference (IU higher than OU)	ft (m)	49(15)	49(15)	49(15)	49(15)
	Max. Piping Length with no additional refrigerant charge	ft (m)	24.6(7.5)	24.6(7.5)	24.6(7.5)	24.6(7.5)
	Max. Length for one indoor unit	ft (m)	65.6(20)	82(25)	98(30)	98(30)
	Max. height different between indoor units	ft (m)	32(10)	32(10)	32(10)	32(10)
	Total Maximum Piping Length	Ft. (m)	98(2*15=30)	147(3*15=45)	196(4*15=60)	245(5*15=75)
	Additional refrigerant charge (between Standard – Max piping length)	Oz/ft (g/m)	0.16(15)	0.16(15)	0.16(15)	0.16(15)
	Gas Pipe	in	3/8*2	3/8*3	1/2+3/8*3	1/2+3/8*3
	Liquid Pipe	in	1/4*2	1/4*3	1/4*4	1/4*5
Refrigerant	Refrigerant Type		R410A	R410A	R410A	R410A
	Heat Pump Models Charge Amount	Lbs (kg)	4.19 (1.9)	6.17 (2.8)	7.94 (3.6)	10.14 (4.6)

APPLICATION DATA

UNIT SELECTION

When selecting a variable speed system match the system capacity range to the anticipated load range. Since a variable speed system can accommodate a wide range of loads it is important to understand the percentage of time that the system will be required to run at the both the maximum and the minimum load points. This differential is most evident when a residential application is compared with a commercial application.

Generally there will be more load diversification in the residential application (shifting from low load to high load).

The commercial application will tend to be more steady during the normal day time hours, and will go to low load levels after normal business hours. If it is anticipated that the system will be required to run at the maximum load point for the majority of the time, the next larger system capacity should be selected.

The Application Table on page 20 is a guideline for selecting the proper size for the application.

APPLICATION DATA

Outdoor Unit Model		Cooling Capacity (Btu/h)					Heating Capacity (Btu/h)				
38MGQC18---3	Type	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
9K + 9K	2-Zone	9,000	9,000				9,500	9,500			
9K + 12K		8,500	10,500				9,000	11,000			
12K+12K		9,500	9,500				10,000	10,000			
38MGQD27---3		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
9K + 9K	2-Zone	9,500	9,500				10,000	10,000			
9K + 12K		9,500	12,000				10,000	13,000			
9K + 18K		8,400	16,600				9,000	18,000			
12K + 12K		12,000	12,000				13,000	13,000			
12K + 18K		10,000	15,000				11,200	16,800			
9+9+9	3-Zone	9,000	9,000	9,000			9,500	9,500	9,500		
9+9+12		8,667	8,667	11,667			9,500	9,500	12,000		
9+9+18		8,333	8,333	13,333			9,000	9,000	14,000		
9+12+12		8,500	10,000	10,000			8,500	11,000	11,000		
12+12+12		9,667	9,667	9,667			10,667	10,667	10,667		
38MGQF36---3		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
9+18	2-Zone	9,500	17,500				10,000	18,000			
12+12		12,000	12,000				13,000	13,000			
12+18		12,000	18,000				13,000	18,000			
18+18		16,500	16,500				17,000	17,000			
9+24		8,500	22,500				9,500	22,500			
12+24		10,500	21,000				11,000	22,000			
9+9+9	3-Zone	9,333	9,333	9,333			9,667	9,667	9,667		
9+9+12		9,000	9,000	12,000			9,500	9,500	12,500		
9+9+18		8,000	8,000	16,000			8,500	8,500	17,000		
9+12+12		8,500	11,500	11,500			9,000	12,000	12,000		
9+12+18		8,000	11,000	15,000			8,500	11,500	16,000		
9+18+18		8,000	14,000	14,000			8,500	14,500	14,500		
12+12+12		11,333	11,333	11,333			12,000	12,000	12,000		
12+12+18		11,000	11,000	14,000			12,000	12,000	15,000		
12+18+18		9,333	13,333	13,333			9,500	14,000	14,000		
9+9+9+9	4-Zone	9,000	9,000	9,000	9,000		9,500	9,500	9,500	9,500	
9+9+9+12		8,500	8,500	8,500	11,500		9,000	9,000	9,000	12,000	
9+9+9+18		8,000	8,000	8,000	14,000		8,500	8,500	8,500	14,000	
9+9+12+12		8,000	8,000	10,500	10,500		8,500	8,500	11,000	11,000	
9+9+12+18		7,500	7,500	9,000	14,000		8,000	8,000	9,500	14,500	
9+12+12+12		7,000	10,000	10,000	10,000		8,000	10,500	10,500	10,500	
12+12+12+12		9,500	9,500	9,500	9,500		10,000	10,000	10,000	10,000	
38MGQF48---3		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
18+18	2-Zone	18,500	18,500				19,000	19,000			
18+24		17,500	22,500				18,000	23,000			
24+24		21,000	21,000				22,000	22,000			
9+24		9,000	23,000				10,000	23,000			
9+18		9,500	18,500				10,500	19,000			
9+9+18	3-Zone	9,500	9,500	18,000			10,000	10,000	19,000		
9+9+24		9,000	9,000	22,500			9,500	9,500	23,500		
9+12+12		9,500	12,500	12,500			10,000	10,000	13,000		
9+12+18		9,000	12,000	18,000			9,500	9,500	19,000		
9+12+24		9,000	12,000	21,500			9,500	12,500	22,000		
9+18+18		9,000	18,000	18,000			9,500	18,500	18,500		
9+18+24		8,500	15,500	21,000			9,000	16,000	21,500		
9+24+24		8,000	20,000	20,000			8,500	21,000	21,000		
12+12+12		12,000	12,000	12,000			13,000	13,000	13,000		
12+12+18		12,000	12,000	17,000			12,500	12,500	18,000		
12+12+24		11,000	11,000	22,000			11,500	11,500	23,000		
12+18+18		11,000	16,500	16,500			11,500	17,000	17,000		
12+18+24		10,500	15,500	21,500			11,000	16,000	22,000		
12+24+24		10,000	20,000	20,000			11,000	20,500	20,500		
18+18+18		16,000	16,000	16,000			16,500	16,500	16,500		
18+18+24	15,000	15,000	20,000	15,500	15,500	21,000					
9+9+9+9	9,250	9,250	9,250	9,250	9,500	9,500			9,500	9,500	
9+9+9+12	9,000	9,000	9,000	12,000	9,500	9,500			9,500	12,500	
9+9+9+18	9,000	9,000	9,000	17,000	9,500	9,500			9,500	17,500	
9+9+9+24	8,500	8,500	8,500	20,500	9,000	9,000			9,000	21,000	
9+9+12+12	9,000	9,000	12,000	12,000	9,500	9,500			13,000	13,000	
9+9+12+18	9,000	9,000	11,000	17,000	9,500	9,500			11,500	17,500	
9+9+12+24	8,500	8,500	10,500	20,500	9,000	9,000			11,100	21,000	
9+9+18+18	8,500	8,500	15,500	15,500	9,000	9,000			16,000	16,000	
9+9+18+24	8,000	8,000	14,500	20,000	8,500	8,500			15,000	20,000	
9+12+12+12	9,000	12,000	12,000	12,000	9,500	12,500			12,500	12,500	
9+12+12+18	9,000	11,000	11,000	16,000	9,500	11,500			11,500	16,500	
9+12+12+24	8,500	10,000	10,000	20,000	9,000	10,500			10,500	20,500	
9+12+18+18	8,500	10,000	15,000	15,000	9,000	10,500			15,500	15,500	
9+18+18+18	8,000	14,000	14,000	14,000	8,500	14,500			14,500	14,500	
12+12+12+12	12,000	12,000	12,000	12,000	12,500	12,500	12,500	12,500			
12+12+12+18	11,000	11,000	11,000	16,000	11,500	11,500	11,500	16,500			
12+12+12+24	10,000	10,000	10,000	20,000	10,500	10,500	10,500	20,500			
12+12+18+18	10,000	10,000	15,000	15,000	10,500	10,500	15,500	15,500			
9+9+9+9+9	9,000	9,000	9,000	9,000	9,000	9,500	9,500	9,500	9,500	9,500	
9+9+9+9+12	9,000	9,000	9,000	9,000	12,000	9,500	9,500	9,500	9,500	13,000	
9+9+9+9+18	8,500	8,500	8,500	8,500	16,000	9,000	9,000	9,000	9,000	16,500	
9+9+9+9+24	7,750	7,750	7,750	7,750	19,500	8,000	8,000	8,000	8,000	20,000	
9+9+9+12+12	9,000	9,000	9,000	11,500	11,500	9,500	9,500	9,500	12,000	12,000	
9+9+9+12+18	8,000	8,000	8,000	11,000	16,000	8,500	8,500	8,500	11,500	16,500	
9+9+9+18+18	8,000	8,000	8,000	11,000	16,000	8,500	8,500	8,500	16,500	16,500	
9+9+12+12+12	8,500	8,500	11,000	11,000	11,000	9,000	9,000	12,000	12,000	12,000	
9+9+12+12+18	8,500	8,500	10,000	10,000	15,000	8,500	8,500	10,500	10,500	15,500	
9+12+12+12+12	8,000	11,000	11,000	11,000	11,000	8,500	11,500	11,500	11,500	11,500	
9+12+12+12+18	7,500	10,000	10,000	10,000	14,500	8,000	10,500	10,500	10,500	15,000	
12+12+12+12+12	10,500	10,500	10,500	10,500	10,500	11,000	11,000	11,000	11,000	11,000	

UNIT MOUNTING (INDOOR)

Mounting Bracket – The fan coil units are furnished with mounting brackets or dedicated mounting holes to hang the unit.

Support – Adequate support must be provided to handle the weight of all fan coils. Refer to the Physical Data section for weights, and the base unit dimensional drawings.

Unit Leveling – For reliable operation, units should be level in all planes.

Clearances – Minimum clearance as shown in Fig. 13-14.

Unit location – Select a location which will provide the best air circulation for the room. These units should be positioned as high to have adequate air circulation. The unit return and discharge should not be obstructed by furniture, curtains, or anything which may cause the unit to short cycle or air to recycle.

UNIT MOUNTING (OUTDOOR)

Support – A location which can bear the weight of outdoor unit. Refer to the Physical Data section for weights, and base dimensional drawings.

Unit Leveling – For reliable operation, units should be level in all planes.

Clearances – Minimum clearances, as shown in Fig. 14, must be provided for airflow. The outdoor units are designed for free-blow applications. Air inlets and outlets should not be restricted.

Unit location – A location which is convenient to installation and not exposed to strong wind.

SYSTEM OPERATING CONDITIONS

Cooling operating range:

Operating Range Min / Max °F (°C)		
	Cooling	Heating
Outdoor DB	4 / 122 (-20 / 50)	4 / 86 (-20 / 30)
Indoor DB	63 / 90 (17 / 32)	32 / 86 (0 / 30)
Indoor WB	59 / 84 (15 / 29)	

Heating operating range:

Non-Operating Temperature Range Min / Max °F (°C)	
Indoor/Outdoor DB	32 / 86 (0 / 30)

METERING DEVICES

The outdoor unit has multiple electronic expansion valves to manage the refrigerant flow to the different indoor fan coils connected to that unit.

REFRIGERANT LINES

General Guidelines:

1. The outdoor units are shipped with full charge of R-410A refrigerant. All charges, line sizing, and capacities are based on runs of 25 ft (7.6 m). For runs over 25 ft (7.6m), consult long-line section on this page for proper charge adjustments.
2. Refrigerant lines should not be buried in the ground. If it is necessary to bury the lines, not more than 36 inches (914 mm) should be buried. Provide a minimum of 6 inch (152 mm) vertical rise to service valves to prevent refrigerant migration.
3. Both lines must be insulated. Use a minimum of ½-inch (12.7 mm) thick insulation. Closed-cell insulation is recommended in all long-line applications.
4. 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.

Long Line Applications:

- No change in line sizing is required.

Unit Size	Total Line Length ft per indoor unit		Additional Charge, oz/ft. ft (m)			
	Min	Max	10 - 25 (3 - 8)	>25 - 66 (8 - 20)	>66 - 82 (20 - 25)	>82 - 98 (25 - 30)
18	10	66	None	0.16		
27		82				
36		98			0.16	0.16
48						

DRAIN CONNECTIONS

Install drains to meet the local sanitation codes. If adequate gravity drainage cannot be provided, a field installed condensate pump accessory should be used. Refer to the Installation Instructions of the condensate pump for detailed specifications. (Condensate Pump built-in on Ducted and Cassette indoor units).

NOTE: The high wall fan coils have internal condensate trap. An external trap is not required.

WIRING

The main power is supplied to the outdoor unit. Four field supplied connecting cables from the outdoor unit to each of the indoor units are: L1, L2, Ground, and S for communication between the outdoor unit and each indoor unit.

CONTROL SYSTEM

The 38MG / 40MA / 40MB unit is equipped with a microprocessor control to operate the system and give optimum levels of comfort and operating efficiency.

There are microprocessor boards and thermistors located in both the indoor and outdoor units. The thermistors monitor the system operation and control the operating mode. The change in the settings or the modes of operation, use the factory supplied wireless remote control.

The 38MG / 40MA / 40MB unit has the following operating modes:

- Fan Only
- Auto
- Heating (on Heat Pumps only)
- Cooling
- Dehumidification (Dry)

FAN ONLY - In Fan Only mode, the system filters and circulates the room air without changing the room air temperature.

AUTO - In Auto mode, the system will automatically select one of the following operating modes: cooling, heating or fan only based on the difference between the room temperature and the set point temperature.

HEATING - In the Heating mode, the system heats and filters room air.

COOLING - When in Cooling mode, the fan runs all the time and the system cools, dries and filters room air.

DEHUMIDIFICATION (DRY) - in Dehumidification (Dry) mode, the system dries, filters and slightly cools room temperature. This mode does not take place of a dehumidifier.

In addition to the above modes that are selected by using the remote control, the unit can run in emergency mode by using a manual button. This mode is used when the remote is misplaced or the batteries in the remote have died. In this mode, the unit will run in AUTO mode with a predetermined set point (76°F/24.4°C)

WIRELESS REMOTE CONTROL

1. A wireless remote control is supplied for system operation.
2. Each battery-operated wireless remote control may be used to control more than one unit.
3. The wireless remote control has a range of 25 ft. (7.6 m).



Fig. 15 – Wireless remote control

WIRED REMOTE CONTROL (STANDARD ON DUCTED UNITS)

1. Optional wired remote controller used for system operation of all high-wall, cassette and floor console units.
2. Kit includes a wired remote controller and a connecting cable.
3. Connect with wire terminal between remote controller and indoor unit.
4. Display in °F or °C and temperature increments every 1°F or every 1°C.



Fig. 16 – Wired remote control

SEQUENCE OF OPERATION

Simultaneous heating and cooling is not allowed. At start-up, the first indoor unit to call for operation (heating or cooling) will control from the preset position, the mode of operation for the rest of the indoor units connected to the same outdoor unit. If the other units conflict in mode with the first unit an error message will be displayed on those units.

When a unit is set to COOL, HEAT or DRY mode, the electronic expansion valve is first initialized (closed) and then is opened to a preset position.

Superheat heat for each fan coil (the ones that are energized) is monitored and the position of the electronic expansion valve is adjusted to ensure that each fan coil gets the appropriate amount of refrigerant to maintain the required superheat. After the set point is satisfied and the fan coil shuts off, the electronic expansion valve stays open for a specified time to ensure that system pressures equalize.

When the system is set for COOL, HEAT or DRY mode, the compressor speed is varied by comparing the indoor air temperature with the set point and continuously adjusting the compressor speed (to keep the compressor running as long as possible) in an effort to maintain the greatest comfort possible.

The indoor fan can be running in MANUAL or AUTO mode. When the fan is running in AUTO mode, the speed is determined by comparing the room temperature to the set point.

In COOLING mode, when the set point is satisfied, the fan will continue running. In HEATING mode, when the set point is satisfied, the fan speed will be reduced and then will run continuously until the coil temperature drops to a point cold air is blown on the occupants in the space, at which time the indoor fan is de-energized.

When the unit goes through the defrost cycle, the indoor fans are de-energized and the refrigerant is circulated through all the fan coils (even if they were off or on standby before the defrost cycle) to maximize the heat transfer surface area available for defrost operation.

AIR FLOW DATA

High Wall					
System size		9	12	18	24
Indoor (CFM)	Turbo	380	380	680	870
	High	360	360	650	780
	Medium	290	300	450	620
	Low	210	210	310	520

Cassette				
System size		9	12	18
Indoor (CFM)	High	380	400	420
	Medium	320	340	350
	Low	260	280	290

Ducted					
System size		9	12	18	24
Indoor (CFM)	High	380	380	480	810
	Medium	340	340	440	650
	Low	290	290	400	590

Floor Console			
System size		9	12
Indoor (CFM)	High	280	280
	Medium	250	250
	Low	220	220

Outdoor Multi-Zone				
System Size	18	27	36	48
Outdoor (CFM)	1390	2130	2130	3500

SOUND PRESSURE

High Wall					
System size		9	12	18	24
Cooling operation Indoor Sound Pressure	dBa (L/M/H)	42/34/27	42/34/27	46.5/40/33	50/45/39
Heating operation Indoor Sound Pressure	dBa (L/M/H)	40/33/26	41/34/27	45/39/32	47/44/38

Cassette				
System size		9	12	18
Cooling operation Indoor Sound Pressure	dBa (L/M/H)	34/39/44	36/39/42	46/48/50
Heating operation Indoor Sound Pressure	dBa (L/M/H)	31/37/42	36/39/42	46/47/49

Ducted					
System size		9	12	18	24
Cooling operation Indoor Sound Pressure	dBa (L/M/H)	30/33/36	30/34/38	34/37/38	43/45/48
Heating operation Indoor Sound Pressure	dBa (L/M/H)	30/33/36	30/34/38	34/37/39	44/45/48

Floor Console			
System size		9	12
Cooling operation Indoor Sound Pressure	dBa (L/M/H)	37/38/41	34/41/45
Heating operation Indoor Sound Pressure	dBa (L/M/H)	37/38/41	34/41/45

Outdoor Multi-Zone					
System size		18	27	36	48
Sound pressure level	dBa	60	63	63	64

ELECTRICAL DATA

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	0.07	0.027	20
12				0.07	0.027	20
18				0.17	0.077	58
24				0.23	0.08	60
30				0.23	0.08	60

Ducted						
UNIT SIZE	System Voltage	OPERATING VOLTAGE	INDOOR FAN			
	VOLT / PHASE / HZ	MAX / MIN	FLA	HP	W	
9	208-230/1/60	253 / 187	1.03	0.073	55	
12			1.03	0.073	55	
18			0.83	0.12	90	
24			0.83	0.12	90	
36			1.263	0.2	150	
48			2.23	0.32	240	

Cassette						
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	0.146	0.061	46
12				0.146	0.061	46
18				0.146	0.061	46

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	0.21	0.027	20
12				0.21	0.027	20

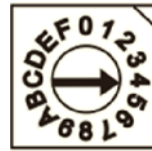
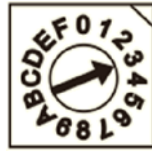
Multi Zone Outdoor Unit								
UNIT SIZE	System Voltage	OPERATING VOLTAGE	COMPRESSOR	OUTDOOR FAN			MCA	MAX FUSE/CB AMP
	VOLT / PHASE / HZ	MAX / MIN	RLA	FLA	HP	W		
18	208-230/1/60	253 / 187	9.7	3	0.16	50	15	20
27			8.85	3	0.16	120	18	30
36			13.4	3	0.16	120	27	45
48			13.5	3	0.11	85	29	50

MAX STATIC PRESSURE - DUCTED

System size		9	12	18	24
Max static pressure	Pa	40	40	70	70
	In.WG	0.16	0.16	0.28	0.28

FAN PERFORMANCES (DUCTED UNITS)

Static pressure curve (static pressure deducted)



Code	0	1	2	3	4	Max Static Pressure
Sizes 9 & 12	0.00	0.04	0.08	0.12	0.16	0.18
Sizes 18 & 24	0.04	0.10	0.16	0.22	0.28	0.40
Sizes 36 & 48	0.08	0.14	0.20	0.26	0.32	0.40
			Default Setting			

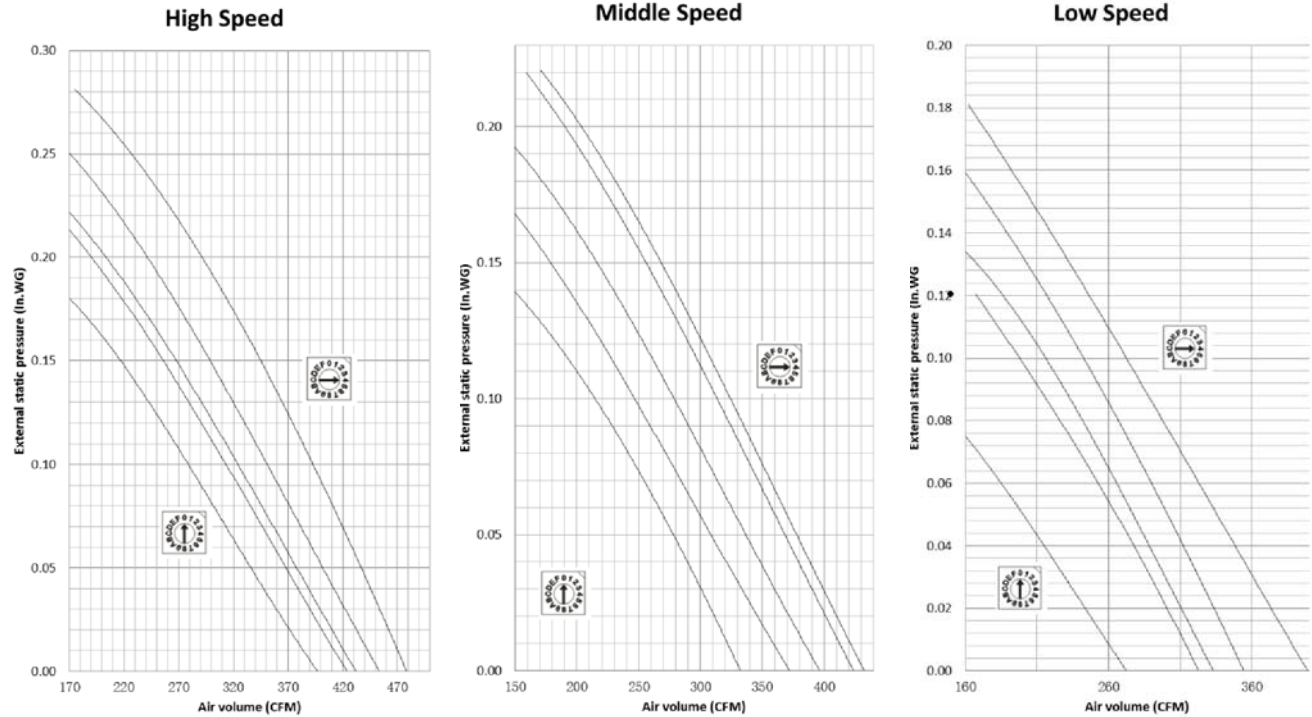


Fig. 17 – 9K and 12K

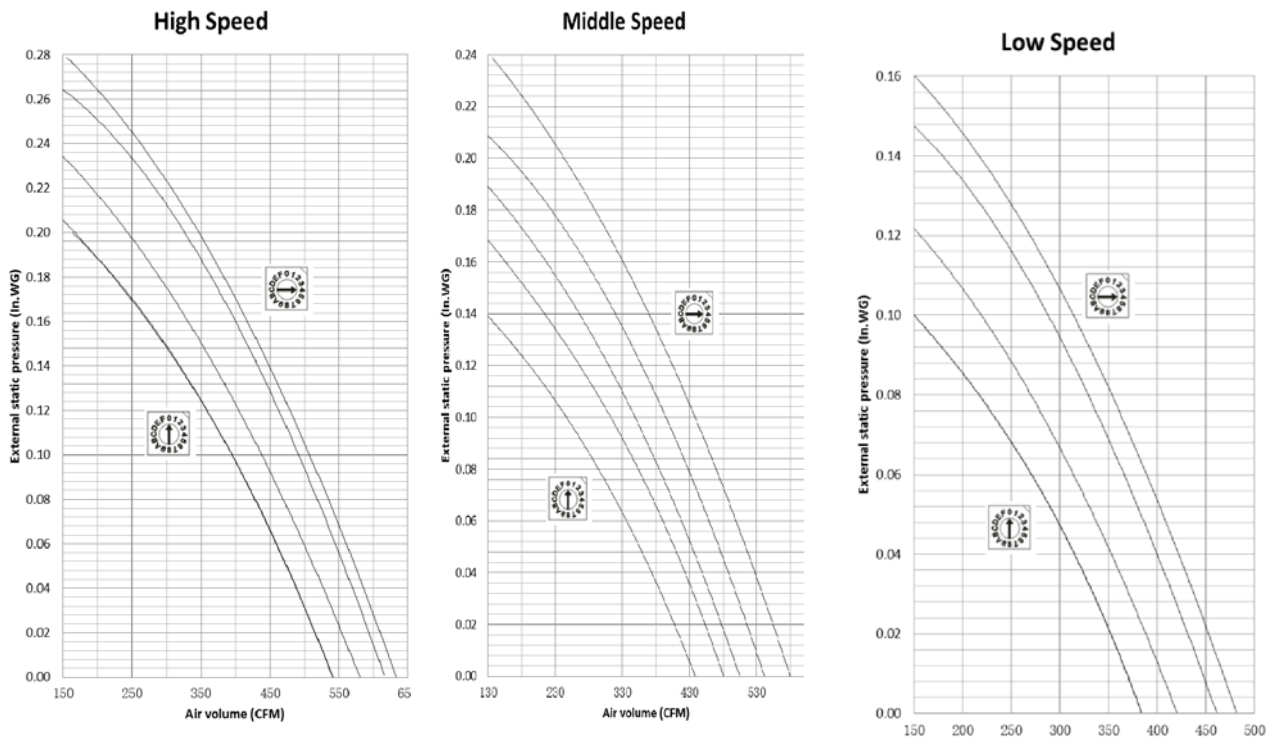


Fig. 18 – 18K

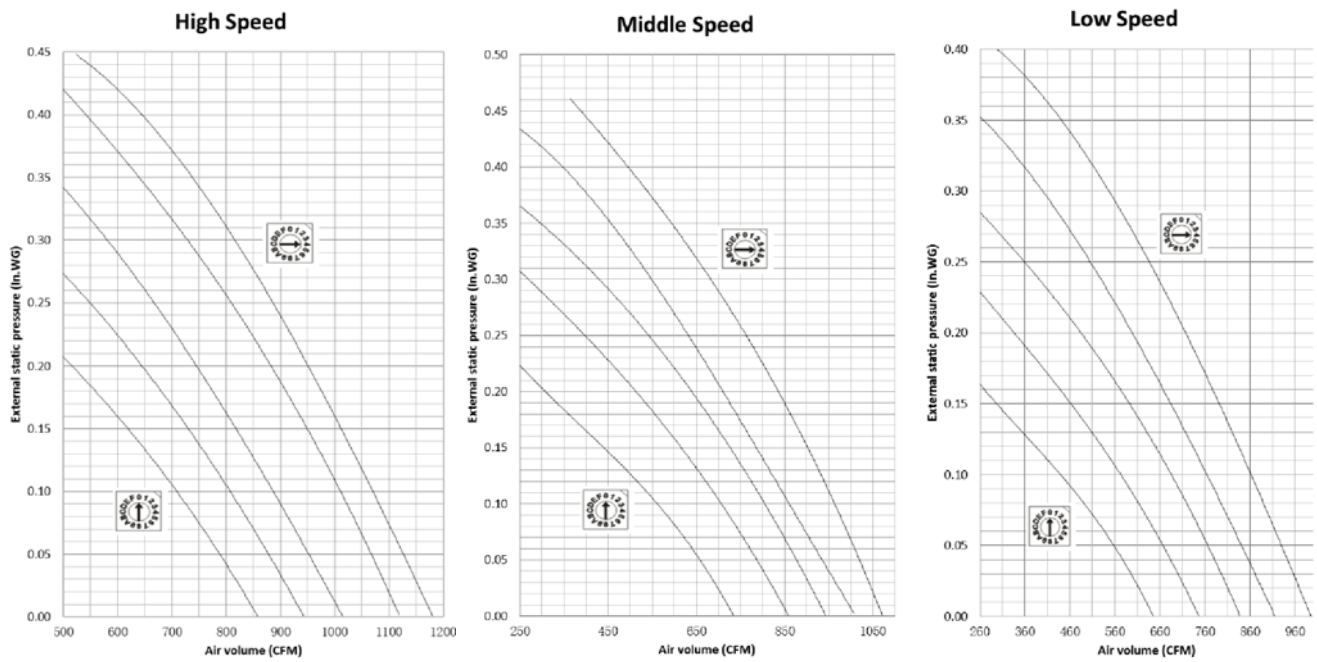


Fig. 19 – 24K

WIRING DIAGRAMS

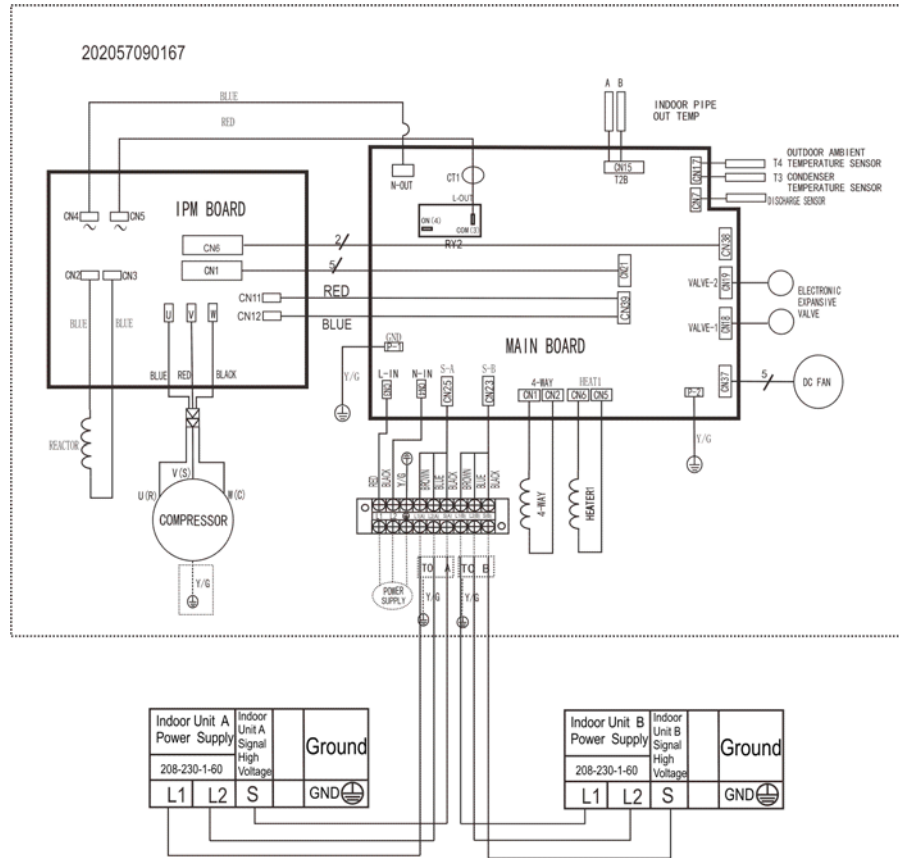


Fig. 20 – Wiring Diagrams 18k

OUTDOOR UNIT CONTROL BOARD SIZE 18

CODE	PART NAME
CN18/CN19/CN22	Output: Pin5&6(12V) Pin1-Pin4:Pulse waveform,(0-12V)
CN17	Input: Pin3~4 (5V) Pin2(0V), Pin1, Pin5(0-5V)
CN7	Input: Pin1 (0-5V) Pin2(5V)
CN1~CN2, CN5~CN6	Output: CN1~CN2, CN5~CN6 (230VAC High voltage)
P1~P2	Output: Connection of the high voltage
CN3~CN4	Input: 230VAC High voltage
CN14	Input: Pin1, Pin3(0V), Pin2, Pin4 (0~5V)
P-1, P-2	Connection to the earth
CN20, CN23, CN25	Output: Pin1 (Connection of the high voltage), Pin2~Pin3 (230VAC High voltage)
CN15	Input: Pin1, Pin3, Pin5(5V), Pin2, Pin4, Pin6 (0~5V)
CN37	Output: Pulse(0-320VDC) for DC FAN
CN38	Input: Pin1~Pin2 (17VDC)
N-OUT~L-OUT	Output: 230VAC High voltage
CN21	input: Pin1~Pin3 (12VDC), Pin2~Pin3 (5VDC), Pin4~Pin3 (0~5VDC), Pin5~Pin3 (0~5VDC)
CN39	Input: 270~370VDC High voltage
OUTDOOR UNIT IPM BOARD	
CN4~CN5	Output: 230VAC High voltage
CN2, CN3	Connect to Reactor, (270~370VDC)
CN6	Output: Pin1~Pin2 (17VDC)
CN1	Output: Pin1~Pin3 (12VDC), Pin2~Pin3 (5VDC), Pin4~Pin3 (0~5VDC), Pin5~Pin3 (0~5VDC),
CN11~CN12	Output: 270~370VDC High voltage
U~V~W	Connect to compressor voltage among phases 0~200VAC



CODE	PART NAME
CN18/CN19/CN22	Output:Pin5&6(12V) Pin1-Pin4:Pulse waveform,(0-12V)
CN17	Input:Pin3~4 (5V) Pin2(0V),Pin1,Pin5(0-5V)
CN7	Input:Pin1 (0-5V) Pin2(5V)
CN1~CN2, CN5~CN6	Output: CN1~CN2, CN5~CN6 (230VAC High voltage)
P1~P2	Output: Connection of the high voltage
CN3~CN4	Input:230VAC High voltage
CN14	Input: Pin1,Pin3(0V), Pin2,Pin4 (0~5V)
P-1,P-2	Connection to the earth
CN20,CN23,CN25	Output: Pin1 (Connection of the high voltage) , Pin2~Pin3 (230VAC High voltage)
CN15	Input: Pin1,Pin3,Pin5(5V), Pin2,Pin4,Pin6 (0~5V)
CN37	Output: Pulse(0-320VDC) for DC FAN
CN38	Input: Pin1~Pin2 (17VDC)
N-OUT~L-OUT	Output: 230VAC High voltage
CN21	input: Pin1~Pin3 (12VDC) , Pin2~Pin3 (5VDC) , Pin4~Pin3 (0~5VDC) , Pin5~Pin3 (0~5VDC)
CN39	Input: 270~370VDC High voltage
OUTDOOR UNIT IPM BOARD	
CN4~CN5	Output: 230VAC High voltage
CN2,CN3	Connect to Reactor, (270~370VDC)
CN6	Output: Pin1~Pin2 (17VDC)
CN1	Output: Pin1~Pin3 (12VDC) , Pin2~Pin3 (5VDC) , Pin4~Pin3 (0~5VDC) , Pin5~Pin3 (0~5VDC) ,
CN11~CN12	Output: 270~370VDC High voltage
U~V~W	Connect to compressor voltage among phases 0~200VAC

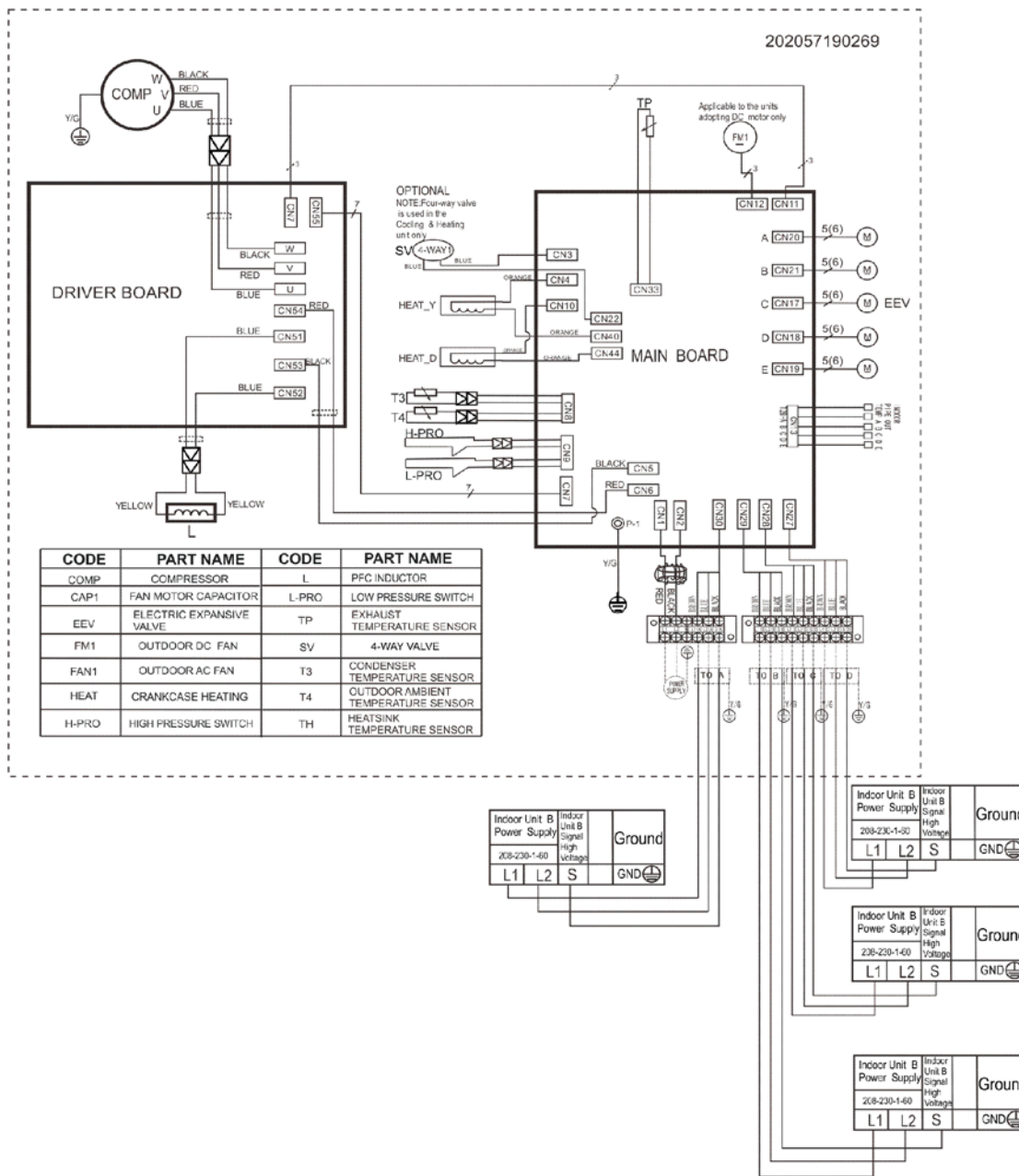


Fig. 22 – Wiring Diagram 36k

OUTDOOR UNIT CONTROL BOARD SIZE 36

CODE	PART NAME
CN17/CN18/CN19/CN20/CN21	Output:Pin5&6(12V) Pin1-Pin4:Pulse waveform,(0-12V)
CN8	Input:Pin3~4 (5V) Pin2(0V),Pin1,Pin5(0-5V)
CN33	Input:Pin1 (0-5V) Pin2(5V)
CN4~CN40, CN10~CN44	Output: CN4~CN40, CN10~CN44 (230VAC High voltage)
CN3~CN22	Output: High voltage for 4-way control
CN1~CN2	Input:230VAC High voltage
CN9	Input: Pin1,Pin3(0V), Pin2,Pin4 (0~5V)
P-1	Connection to the earth
CN27,CN28,CN29,CN30	Output: Pin1 (Connection of the high voltage) , Pin2~Pin3 (230VAC High voltage)
CN13	Input: Pin1,Pin3,Pin5(5V), Pin2,Pin4,Pin6 (0~5V)
CN12	Output: Pulse(0-200VAC) for DC FAN
CN11	Output: Pulse(0-200VAC) for DC FAN
CN5~CN6	Output: 230VAC High voltage
CN7	input: Pin1~Pin3 (12VDC) , Pin2~Pin3 (5VDC) , Pin4~Pin3 (0~5VDC) , Pin5~Pin3 (0~5VDC) , Pin6~Pin3 (0~5VDC) , Pin7~Pin3 (0~5VDC)
OUTDOOR UNIT IPM BOARD	
CN4~CN5	Output: 230VAC High voltage
CN2,CN3	Connect to Reactor, (270~370VDC)
CN6	Output: Pin1~Pin2 (17VDC)
CN1	Output: Pin1~Pin3 (12VDC) , Pin2~Pin3 (5VDC) , Pin4~Pin3 (0~5VDC) , Pin5~Pin3 (0~5VDC) ,
CN11~CN12	Output: 270~370VDC High voltage
U~V~W	Connect to compressor voltage among phases 0~200VAC

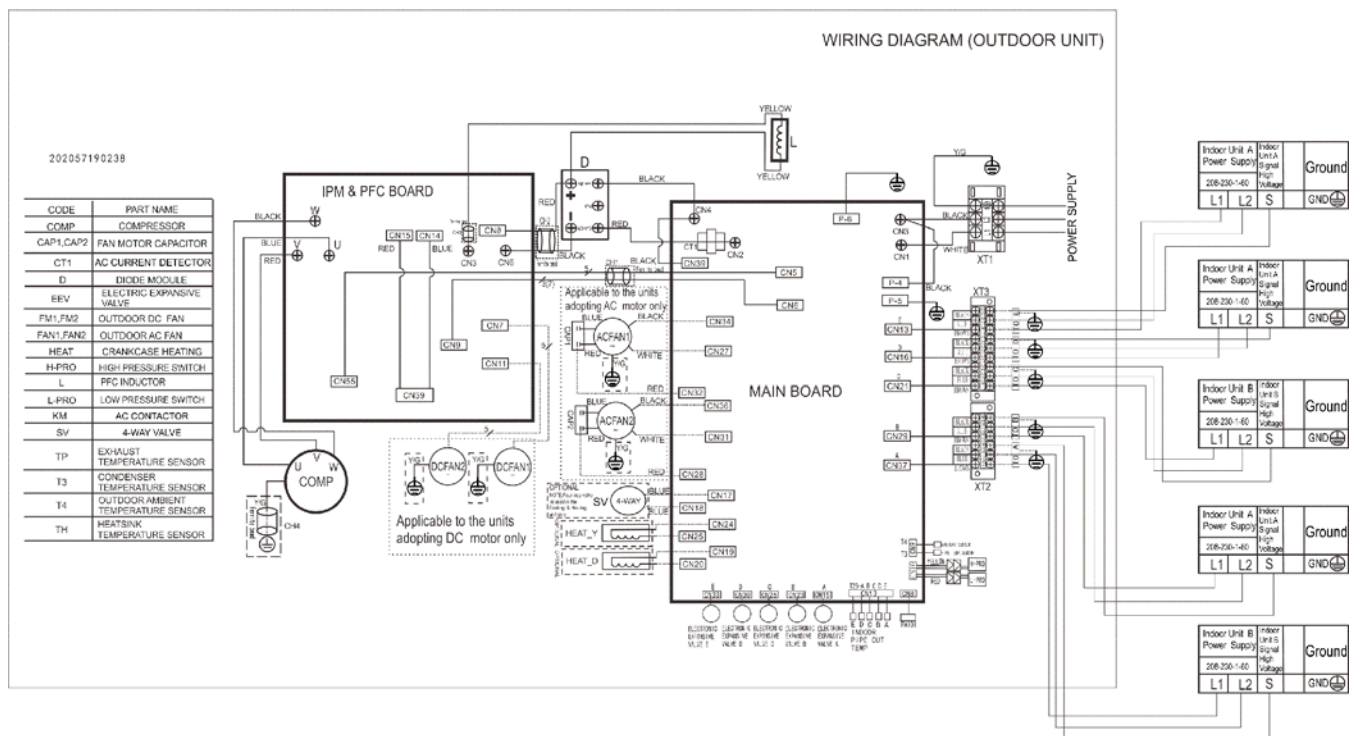


Fig. 23 – Wiring Diagrams 48K

OUTDOOR UNIT CONTROL BOARD SIZE 48

CODE	PART NAME
CN1,CN3、P-1	Power input: 230V AC
CN2,CN4	Output: Power output for DRIVER BOARD (230V AC)
CN5	Input: Communication Main board and IPM Board ,Pin1(5V DC)
CN6	Input: DC FAN motor1 and DC FAN motor2 control, (Pin7 5V DC)
CN8,CN9	Input: Temperature sensor(5V DC)
CN10	Input: Pressure test (5V DC)
CN13	Input: Indoor pipe Temperature sensor,Pin1&Pin3&Pin5&Pin7&Pin9&Pin11 (5V DC)
CN15,CN23,CN26, CN30,CN33	Output: PMV control, Pin5(12V DC),Pin6(12V DC)
CN17,CN18	Output: High voltage for 4-way(SV) control (230V AC)
CN19,CN20	Output: High voltage for HEAT_D control (230V AC)
CN13,CN16,CN21, CN29,CN37	Output: Communication to indoor unit,Pin2 and Pin3 (230V AC),Pin1 (S, connection to high voltage)
CN24,CN25	Output: High voltage for HEAT_Y control(230V AC)
CN27、CN32、CN34、CN28、CN31、CN36	Output: Power output for AC FAN motor1 and AC FAN motor2 (230V AC)
CN39	Output: L2 for AC FAN、SV and HEAT ,High voltage (AC)
P-5,P-6	Connection to the earth

OUTDOOR UNIT IPM BOARD	
U V W	Output: Pulse(0-380VDC) for COMPRESSOR
CN3	Output: Connect PFC Inductance, high DC voltage
CN6 ,CN8	Input: Power input for DRIVER BOARD (200-320V DC)
CN7,CN11	Output: DC FAN motor1 and DC FAN motor2 control (Pin1 310V or 380V DC)
CN9	Output: Communication Main board and IPM Board Pin7(5V DC)
CN55	Output: Communication IPM Board and Main board Pin1(12V DC)
CN14、CN15-- CN39,	Output: High DC voltage (310V or 380V DC)

GUIDE SPECIFICATIONS

HORIZONTAL DISCHARGE OUTDOOR UNITS

Size Range: 1 1/2, 2 1/4, 3 and 4 Ton Nominal Cooling and Heating Capacity
Carrier Model Number: 38MG

PART 1 – GENERAL

1.01 System Description

- A. Outdoor air-cooled split system compressor sections suitable for on-the-ground, rooftop, wall hung or balcony mounting. Units shall consist of a variable speed rotary compressor, an air-cooled coil, propeller-type draw-through outdoor fan, reversing valve, accumulator, electronic expansion valves, multiple service valves, and controls that allows multiple indoor units to be connected to the outdoor unit. Units shall discharge horizontally as shown on the contract drawings. Units shall function as the outdoor component of an air-to-air heat pump system.
- B. Units shall be used in a refrigeration circuit matched to two, three, four, or five multi style heat pump fan coil units.

1.02 Agency Listings

- A. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, and with NEC.
- B. Units shall be evaluated in accordance with UL standard 1995.
- C. Units shall be listed in CEC directory.
- D. Unit cabinet shall be capable of withstanding 500-hour salt spray test per Federal Test Standard no. 141 (method 6061).
- E. Air-cooled condenser coils shall be leak tested at 550 psig.

1.03 Delivery, Storage, And Handling

Units shall be shipped in one piece and shall be stored and handled per manufacturer's recommendations.

1.04 Warranty (For Inclusion By Specifying Engineer)

PART 2 – PRODUCTS

2.01 Equipment

A. General:

Factory assembled, single piece, air-cooled outdoor unit. Contained within the enclosure shall be all factory wiring, piping, controls, and compressor.

B. Unit Cabinet:

- 1. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with baked-enamel finish on inside and outside.
- 2. Unit access panel should be removable with minimal screws and shall provide full access to the compressor, fan, and control components.
- 3. Outdoor compartment shall be isolated and have an acoustic lining to assure quiet operation.

C. Fans:

- 1. Outdoor fans shall be direct-drive propeller type, and shall discharge air horizontally. Fan shall draw air through the outdoor coil.
- 2. Outdoor fan motors shall be multi-speed, totally-enclosed, single phase motors with permanently lubricated ball bearings. Motor shall be protected by internal thermal overload protection.
- 3. Shaft shall have inherent corrosion resistance.
- 4. Outdoor fan openings shall be equipped with metal/mesh PVC coated protection grille over fan.

D. Compressor

- 1. Compressor shall be fully hermetic variable speed rotary type.
- 2. Compressor shall be single phase, inverter driven.
- 3. Compressor shall be equipped with oil system, operating oil charge, and motor.
- 4. Motor shall be suitable for operation in refrigerant and oil atmosphere.
- 5. Compressor assembly shall be installed on rubber vibration isolators.
- 6. The inverter and compressor shall be protected against over temperature and over current.

E. Outdoor Coil:

Coil shall be constructed of Aluminum fins mechanically bonded to seamless copper tubes, which are cleaned, dehydrated and sealed.

F. Refrigerant Components:

Refrigerant circuit components shall include multiple brass external liquid line service valves with service gauge connection port, multiple suction line service valves with service gauge connection port, accumulator, reversing valve, electronic expansion valves.

G. Safeties:

Operating safeties shall be factory selected, assembled, and tested. The minimum functions shall include the following:

- 1. Compressor discharge over temperature protection.
- 2. System low voltage protection.
- 3. Compressor overload protection.
- 4. Compressor over current protection.
- 5. IPM module protection.

H. Electrical Requirements:

- 1. Units shall operate on single-phase, 60 Hz power at 208/230 v.
- 2. Unit electrical power shall be a single point connection.
- 3. All power and control wiring must be installed per NEC and all local electrical codes.
- 4. Units shall have multiple terminal blocks to connect to multiple indoor units.

INDOOR WALL-MOUNTED DUCTLESS UNITS

Size Range: 3/4 to 2 Ton Nominal Cooling and Heating Capacity

Carrier Model Number: 40MAQ

PART 1 – GENERAL

1.01 System Description

Indoor, wall-mounted, direct expansion fan coils are matched with heat pump outdoor units.

1.02 Agency Listings

Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system.

1.03 Delivery, Storage, And Handling

Units shall be shipped in one piece and shall be stored and handled per manufacturer's recommendations.

1.04 Warranty (For Inclusion By Specifying Engineer)

PART 2 – PRODUCTS

2.01 Equipment

A. General:

Indoor, direct-expansion, wall-mounted fan coil. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral wall mounting bracket and mounting hardware.

B. Unit Cabinet:

Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal / acoustic performance.

C. Fans:

1. Fan shall be tangential direct-drive blower type with air intake at the top of the unit and discharge at the bottom front. Automatic, motor-driven vertical air sweep shall be provided standard.
2. Air sweep operation shall be useable selectable. The vertical sweep may be adjusted (using the remote control) and the horizontal air direction maybe be set manually.

D. Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap.

E. Motors:

Motors shall be totally enclosed, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

F. Controls:

Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 62°F to 86°F (17°C to 30°C) in increments of 1°F or 1°C, and have 46°F Heating Mode (Heating Setback). The wireless remote controller shall have the ability to act as the temperature sensing location for room comfort.

The unit shall have the following functions as a minimum:

- An automatic restart after power failure at the same operating conditions as at failure.
- A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
- Temperature-sensing controls shall sense return air temperature.
- Indoor coil freeze protection.
- Wireless infrared remote control to enter set points and operating conditions.
- Automatic air sweep control to provide on or off activation of air sweep louvers.
- Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
- Fan-only operation to provide room air circulation when no cooling is required.
- Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit.
- Fan speed control shall be user-selectable: turbo, high, medium, low, or microprocessor controlled automatic operation during all operating modes.
- Automatic heating-to-cooling changeover in heat pump mode. Control shall include deadband to prevent rapid mode cycling between heating and cooling.
- Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.

G. Filters:

Units shall have filter track with factory-supplied cleanable filters.

H. Electrical Requirements:

Indoor fan motor to operate on 208-230V. Power is supplied from the outdoor unit.

I. Operating Characteristics:

The system shall have a minimum SEER (Seasonal Energy Efficiency Ratio) and HSPF at AHRI conditions, as listed on the specifications table.

J. Refrigerant Lines:

All units should have refrigerant lines that can be oriented to connect from the left, right or back of unit. Both refrigerant lines need to be insulated.

K. Special Features (Field Installed):

1. Condensate Pump:

The condensate pump shall remove condensate from the drain pan when gravity drainage cannot be used. Pump shall be designed for quiet operation. Pump shall consist of two parts: an internal reservoir/sensor assembly, and a remote sound-shielded pump assembly. A liquid level sensor in the reservoir shall stop cooling operation if the liquid level in the reservoir is unacceptable.

GUIDE SPECIFICATIONS

INDOOR CASSETTE DUCTLESS UNITS

Size Range: 3/4 to 1 1/2 Ton Nominal Cooling and Heating Capacity

Carrier Model Number: 40MB*C

PART 1 - GENERAL

1.01 System Description

Indoor, in-ceiling, direct-expansion fan coils are matched with heat pump outdoor unit.

1.02 Agency Listings

Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system.

1.03 Delivery, Storage, And Handling

Units shall be stored and handled per unit manufacturer's recommendations.

1.04 Warranty (For Inclusion By Specifying Engineer)

PART 2 - PRODUCTS

2.01 Equipment

General:

Indoor, direct-expansion, in-ceiling cassette fan coil. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing.

Unit Cabinet:

Cabinet shall be constructed of zinc-coated steel. Fully insulated discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Grille shall have hinges and can be opened to obtain access to the cleanable filters, indoor fan motor and control box.

Fans:

- Fan shall be centrifugal direct-drive blower type with air intake in the center of the unit and discharge at the perimeter. Automatic, motor-driven vertical air sweep shall be provided standard. Automatic motor-driven louvers shall be provided standard and shall be adjustable for 2, 3 or 4-way discharge.
- Air sweep operation shall be user selectable.

Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion and specially coated for enhanced wet-ability. A drip pan under the coil shall have a factory installed condensate pump and drain connection for hose attachment to remove condensate.

Motors:

Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 4-speed.

Controls:

Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 62°F to 86°F (17°C to 30°C) in increments of 1°F or 1°C, and have 46°F Heating Mode (Heating Setback). The wireless remote controller, shall have the ability to act as the temperature sensing location for room comfort.

The unit shall have the following functions as a minimum:

- An automatic restart after power failure at the same operating conditions as at failure.
- A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
- Temperature-sensing controls shall sense return air temperature.
- Indoor coil freeze protection.
- Wireless infrared remote control to enter set points and operating conditions.
- Automatic air sweep control to provide on or off activation of air sweep louvers.
- Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
- Fan-only operation to provide room air circulation when no cooling is required.
- Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit.
- Fan speed control shall be user-selectable: high, medium, low, or microprocessor controlled automatic operation during all operating modes.
- Automatic heating-to-cooling changeover in heat pump mode. Control shall include deadband to prevent rapid mode cycling between heating and cooling.
- Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.

Filters:

Unit shall have filter track with factory-supplied cleanable filters.

Electrical Requirements:

Indoor fan motor to operate on 208-230V. Power is supplied from the outdoor unit.

Operating Characteristics:

The system shall have a minimum SEER (Seasonal Energy Efficiency Ratio) and HSPF at AHRI conditions, as listed on the specifications table.

Refrigerant Lines:

All units should have refrigerant lines that can be oriented to connect from the left, right or back of unit. Both refrigerant lines need to be insulated.

GUIDE SPECIFICATIONS

INDOOR DUCTED UNITS

Size Range: 3/4 to 2 Ton Nominal Cooling and Heating Capacity

Carrier Model Number: 40MB*D

PART 1 - GENERAL

1.01 System Description

Indoor, ceiling-mounted, direct-expansion fan coils are matched with a heat pump outdoor unit.

1.02 Agency Listings

Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system.

1.03 Delivery, Storage, And Handling

Units shall be stored and handled per unit manufacturer's recommendations.

1.04 Warranty (For Inclusion By Specifying Engineer)

PART 2 - PRODUCTS

2.01 Equipment

A. General:

Indoor, direct-expansion, ceiling-mounted fan coil. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing.

B. Unit Cabinet:

Unit cabinet shall be constructed of galvanized steel. Cabinet shall be fully insulated for improved thermal and acoustic performance.

C. Fans:

Fan shall be tangential direct-drive blower type with air intake at the rear or bottom of the unit and discharge at the front.

D. Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a factory installed condensate pump and drain connection for hose attachment to remove condensate.

E. Motors:

Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

F. Controls:

Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 62°F to 86°F (17°C to 30°C) in increments of 1°F or 1°C, and have 46°F Heating Mode (Heating Setback). The wireless remote controller shall have the ability to act as the temperature sensing location for room comfort.

The unit shall have the following functions as a minimum:

1. An automatic restart after power failure at the same operating conditions as at failure.
2. A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
3. Temperature-sensing controls shall sense return air temperature.
4. Indoor coil freeze protection.
5. Wireless infrared remote control to enter set points and operating conditions.
6. De-humidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
7. Fan-only operation to provide room air circulation when no cooling is required.
8. Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit.
9. Fan speed control shall be user-selectable: high, medium, low, or microprocessor controlled automatic operation during all operating modes.
10. Automatic heating-to-cooling changeover in heat pump mode. Control shall include deadband to prevent rapid mode cycling between heating and cooling.
11. Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.

G. Electrical Requirements:

Indoor fan motor to operate on 208-230V. Power is supplied from the outdoor unit.

H. Operating Characteristics:

The system shall have a minimum SEER (Seasonal Energy Efficiency Ratio) and HSPF at AHRI conditions, as listed on the specifications table.

I. Refrigerant Lines:

All units should have refrigerant lines that can be oriented to connect from the side of the unit. Both refrigerant lines need to be insulated.

GUIDE SPECIFICATIONS

INDOOR FLOOR CONSOLE DUCTLESS UNITS

Size Range: 3/4 to 1 Ton Nominal Cooling and Heating Capacity

Carrier Model Number: 40MB*F

PART 1 - GENERAL

1.01 System Description

Indoor, wall- mounted, direct- expansion fan coils are matched with a heat pump outdoor unit.

1.02 Agency Listings

Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system.

1.03 Delivery, Storage, And Handling

Units shall be stored and handled per unit manufacturer's recommendations.

1.04 Warranty (For Inclusion By Specifying Engineer)

PART 2 - PRODUCTS

2.01 Equipment

A. General:

Indoor, direct-expansion, floor-mounted fan coil. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral mounting bracket and mounting hardware.

B. Unit Cabinet:

Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal and acoustic performance.

C Fans:

1. Fan shall be tangential direct-drive blower type with air intake in the center of the unit and discharge at the top and bottom front. Automatic, motor-driven vertical air sweep shall be provided standard.
2. Air sweep operation shall be user selectable. The vertical sweep may be adjusted (using the remote control) and the horizontal air direction may be set manually.

D. Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap.

E. Motors:

Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

F Controls:

Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 62°F to 86°F (17°C to 30°C) in increments of 1°F or 1°C, and have 46°F Heating Mode (Heating Setback). The wireless remote controller shall have the ability to act as the temperature sensing location for room comfort.

The unit shall have the following functions as a minimum:

1. An automatic restart after power failure at the same operating conditions as at failure.
2. A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
3. Temperature-sensing controls shall sense return air temperature.
4. Indoor coil freeze protection.
5. Wireless infrared remote control to enter set points and operating conditions.
6. Automatic air sweep control to provide on or off activation of air sweep louvers.
7. De humidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
8. Fan-only operation to provide room air circulation when no cooling is required.
9. Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit.
10. Fan speed control shall be user-selectable: high, medium, low, or microprocessor controlled automatic operation during all operating modes.
11. Automatic heating-to-cooling changeover in heat pump mode. Control shall include deadband to prevent rapid mode cycling between heating and cooling.
12. Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.

G. Filters: Unit shall have filter track with factory-supplied cleanable filters.

H. Electrical Requirements: Indoor fan motor to operate on 208- 230V as specified. Power is supplied from the outdoor unit.

I. Operating Characteristics: The system shall have a minimum SEER (Seasonal Energy Efficiency Ratio) and HSPF at AHRI conditions, as listed on the specifications table.

J. Refrigerant Lines:

All units should have refrigerant lines that can be oriented to connect from the left, right or back of unit. Both refrigerant lines need to be insulated.

K. Special Features (Field Installed):

1. Condensate Pump: The condensate pump shall remove condensate from the drain pan when gravity drainage cannot be used. Pump shall be designed for quiet operation. Pump shall consist of two parts: an internal reservoir/sensor assembly, and a remote sound-shielded pump assembly. A liquid level sensor in the reservoir shall stop cooling operation if the liquid level in the reservoir is unacceptable.

