

SPLIT SYSTEM AIR CONDITIONER (R-410A)

INSTALLATION & SERVICE REFERENCE

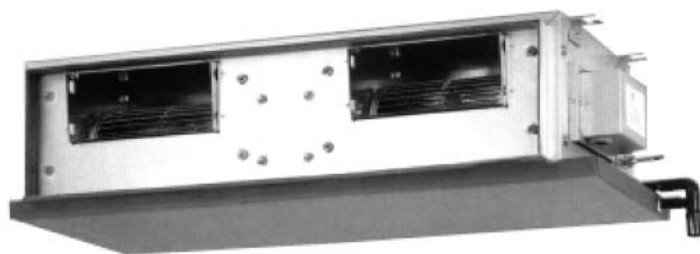
CONDENSING UNIT



MODELS

RR20AVAK9/DX16SA0181XM
RR25AVAK9/DX16SA0241XM
RR30AVAK9/DX16SA0301XM
RR36AVAK9/DX16SA0361XM
RR42AVAK9/DX16SA0421XM

EVAPORATIVE UNIT



MODELS

FDMRN20AVAK
FDMRN25AVAK
FDMRN30AVAK
FDMRN36AVAK
FDMRN42AVAK



1 - CONDENSING UNIT

Important Safety Instructions

This manual provides the procedures of installation to ensure a safe and good standard of operation for the air conditioning unit. Special adjustment may be necessary to adhere to local requirements.

Before using your air conditioner, read this instruction manual carefully and keep it for future reference.

This appliance is intended to be used by expert or trained users in shops, in light industry and on farms, or for commercial use by lay persons.

This appliance is not intended for use by:

- Children.
- People with reduced physical, sensory or mental capabilities
- People with lack of experience and knowledge of these units, unless they have been given supervision or instruction concerning the use of the unit by a person responsible for their safety.
- Children should always be supervised to ensure that they do not play with the unit.

The following symbols and labels are used throughout this manual to indicate immediate or potential safety hazards. It is the owner's and installer's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of personal injury, property damage, and/or product damage.

**WARNING**

HIGH VOLTAGE!
Disconnect ALL power before servicing. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



**WARNING**

Only personnel that have been trained to install, adjust, service or repair (hereinafter, "service") the equipment specified in this manual should service the equipment. The manufacturer will not be responsible for any injury or property damage arising from improper service or service procedures. If you service this unit, you assume responsibility for any injury or property damage which may result. In addition, in jurisdictions that require one or more licenses to service the equipment specified in this manual, only licensed personnel should service the equipment. Improper installation, adjustment, servicing or repair of the equipment specified in this manual, or attempting to install, adjust, service or repair the equipment specified in this manual without proper training may result in product damage, property damage, personal injury or death.

Shipping Inspection

Always keep the unit upright; laying the unit on its side or top may cause equipment damage. Shipping damage, and subsequent investigation is the responsibility of the carrier. Verify the model number, specifications, electrical characteristics, and accessories are correct prior to installation. The distributor or manufacturer will not accept claims from dealers for transportation damage or installation of incorrectly shipped units.

Codes & Regulations

This product is designed and manufactured to comply with national codes. Installation in accordance with such codes and/or prevailing local codes/regulations is the responsibility of the installer. The manufacturer assumes no responsibility for equipment installed in violation of any codes or regulations. Rated performance is achieved after 72 hours of operation. Rated performance is delivered at the specified airflow. See outdoor unit specification sheet for split system models or product specification sheet for packaged and light commercial models. Specification sheets can be found at www.daikin-ksa.com or www.daikincomfort.com for Daikin. Within the website, please select the residential or commercial products menu and then select the submenu for the type of product to be installed, such as air conditioners or heat pumps, to access a list of product pages that each contain links to that model's specification sheet.

The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants. Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. Should you have any questions please contact the local office of the EPA.

If replacing a condensing unit or air handler, the system must be manufacturer approved. **NOTE:** Installation of unmatched systems is strongly discouraged.

Outdoor units are approved for operation above 12 °C (55°F) in cooling mode. Operation below 12 °C (55°F) requires the use of an approved low ambient kit.

Use of this unit as a heating or cooling source during construction or renovation is not approved.

			1.5TR	2TR	2.5TR	3TR	3.5TR
Outdoor Model			RR20AVAK9	RR25AVAK9	RR30AVAK9	RR36AVAK9	RR42AVAK9
Indoor Model			FDMRN20AVAK	FDMRN25AVAK	FDMRN30AVAK	FDMRN36AVAK	FDMRN42AVAK
Actual Cooling Capacity T1 ^(*)		Btu/h	18,000	23,000	28,000	34,000	39,000
		KW	5.27	6.74	8.20	9.96	11.43
Actual Cooling Capacity T3 ^(*)		Btu/h	16,500	21,000	24,000	29,000	33,000
		KW	4.83	6.15	7.03	8.50	9.67
Actual Cooling Input Power T1 ^(*)		Watts	1,385	1,769	2,154	2,615	3,120
Actual Cooling Input Power T3 ^(*)		Watts	1,833	2,333	2,667	3,222	3,667
Total Amps T1 ^(*)		Ampere	6.5	8.3	10.1	12.3	15.1
Total Amps T3 ^(*)		Ampere	8.0	10.3	12.4	15.0	18.3
EER T1 ^(*)		Btu/h/W	13.00	13.00	13.00	13.00	12.50
EER T3 ^(*)		Btu/h/W	9.00	9.00	9.00	9.00	9.00
Voltage		Volt	230	230	230	230	230
Frequency		Hertz	60	60	60	60	60
Refrigeration Charge		Kg	2.211	1.743	2.013	2.381	2.807
Annual Energy Consumption		KWh/Year	3739.5	4776.3	5815.8	7060.5	8424.0
Country of Origin		Indoor Unit	Malaysia				
		Outdoor Unit	United States of America				

(*) : Cooling capacity : Indoor 27°C DB / 19°C WB - Outdoor 35°C DB

(*) : Cooling capacity : Indoor 29°C DB / 19°C WB - Outdoor 46°C DB

Unpacking the Unit

1. Pull the securing flap outwards until it is in line with the carton's surface.

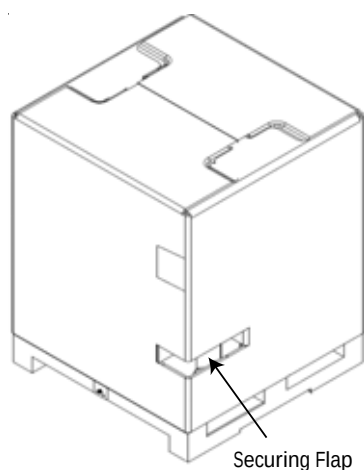


Figure 1

2. Lift and remove the carton and the pad. Figure 2.
3. Remove hold-down brackets.

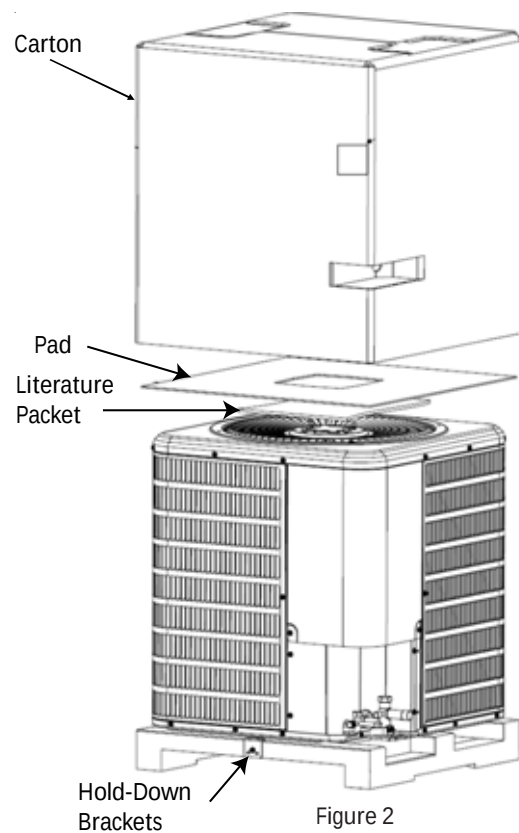


Figure 2

Installation Clearances

Special consideration must be given to location of the condensing unit(s) in regard to structures, obstructions, other units, and any/all other factors that may interfere with air circulation. Where possible, the top of the unit should be completely unobstructed; however, if vertical conditions require placement beneath an obstruction **there should be a minimum of 1.52 meters (60 inches) between the top of the unit and the obstruction(s)**. The specified dimensions meet requirements for air circulation only. Consult all appropriate regulatory codes prior to determining final clearances.

Another important consideration in selecting a location for the unit(s) is the angle to obstructions. Either side adjacent the valves can be placed toward the structure provided the side away from the structure maintains minimum service clearance. Corner installations are strongly discouraged.

This unit can be located at ground floor level or on flat roofs. At ground floor level, the unit must be on a solid, level foundation that will not shift or settle. To reduce the possibility of sound transmission, the foundation slab should not be in contact with or be an integral part of the building foundation. Ensure the foundation is sufficient to support the unit. A concrete slab raised above ground level provides a suitable base.

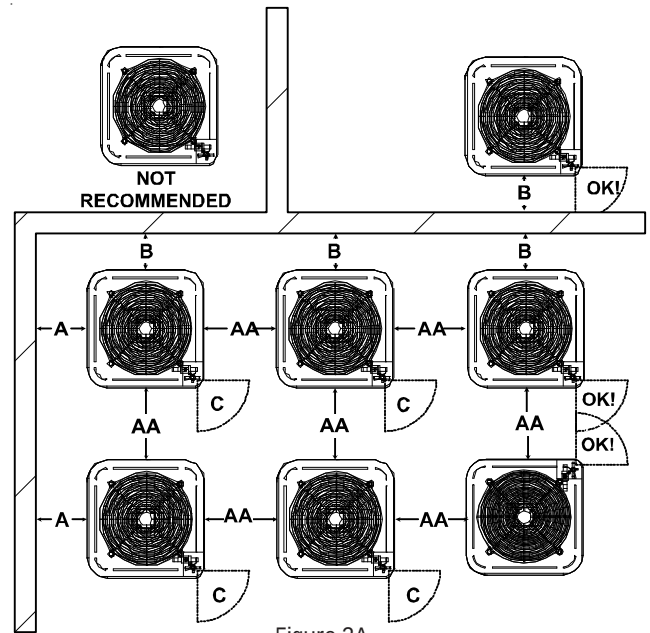


Figure 3A

Minimum Airflow Clearance				
Model Type	A	B	C	AA
Residential	254 mm 10"	254 mm 10"	457 mm 18"	508 mm 20"
Light Commercial	305 mm 12"	305 mm 12"	457 mm 18"	609 mm 24"



WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

Rooftop Installations

If it is necessary to install this unit on a roof structure, ensure the roof structure can support the weight and that proper consideration is given to the weather-tight integrity of the roof. Since the unit can vibrate during operation, sound vibration transmission should be considered when installing the unit. Vibration absorbing pads or springs can be installed between the condensing unit legs or frame and the roof mounting assembly to reduce noise vibration.

Safe Refrigerant Handling

While these items will not cover every conceivable situation, they should serve as a useful guide.



WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- Ensure the cylinder is free of damage which could lead to a leak or explosion.
- Ensure the hydrostatic test date does not exceed 5 years.
- Ensure the pressure rating meets or exceeds 2758 KPa (400 PSIG.).

When in doubt, do not use cylinder.



WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible difficulty in breathing or death:

- Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.
- If an indoor leak is suspected, thoroughly ventilate the area before beginning work.
- Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.
- Always follow EPA regulations. Never burn refrigerant, as poisonous gas will be produced.

Refrigerant Lines

Use only refrigerant grade (dehydrated and sealed) copper tubing to connect the condensing unit with the indoor evaporator. After cutting the tubing, install plugs to keep refrigerant tubing clean and dry prior to and during installation. Tubing should always be cut square keeping ends round and free from burrs. Clean the tubing to prevent contamination.

Do NOT let refrigerant lines come in direct contact with plumbing, ductwork, floor joists, wall studs, floors, and walls. When running refrigerant lines through a foundation or wall, openings should allow for sound and vibration absorbing material to be placed or installed between tubing and foundation. Any gap between foundation or wall and refrigerant lines should be filled with a pliable silicon-based caulk, RTV or a vibration damping material. Avoid suspending refrigerant tubing from joists and studs with rigid wire or straps that would come in contact with the tubing. Use an insulated or suspension type hanger. Keep both lines separate and always insulate the suction and liquid lines.

These sizes are recommended for line lengths of 24 meters (79 feet) or less to obtain optimum performance. For alternate line sizing options or runs of more than 24 meters (79 feet), refer to Remote Cooling Service Manual or TP-107 Long Line Set Application R-410A or contact your distributor for assistance.

Insulation is necessary to prevent condensation from forming and dropping from the suction line. Armflex (or satisfactory equivalent) with 3/8" min. wall thickness is recommended. In severe conditions (hot, high humidity areas) 1/2" insulation may be required. Insulation must be installed in a manner which protects tubing from damage and contamination.

Where possible, drain as much residual compressor oil from existing systems, lines, and traps; pay close attention to low areas where oil may collect. **NOTE:** If changing refrigerant types, ensure the indoor coil and metering device is compatible with the type of refrigerant being used; otherwise, the indoor coil must be replaced.

Burying Refrigerant Lines

If burying refrigerant lines can not be avoided, use the following checklist.

1. Insulate liquid and suction lines separately.
2. Enclose all underground portions of the refrigerant lines in waterproof material (conduit or pipe) sealing the ends where tubing enters/exits the enclosure.
3. If the lines must pass under or through a concrete slab, ensure lines are adequately protected and sealed.



WARNING

To avoid possible explosion:

- Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.



CAUTION

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

RECOMMENDED INTERCONNECTING TUBING (m / ft)						
Cond Unit Tons	0 - 7.5 m 0 - 24 feet		7.6 - 15 m 25 - 49 feet		15.25 - 24 m* 50 - 79 feet	
	Line Diameter (In. OD)					
	Suct	Liq	Suct	Liq	Suct	Liq
1 1/2	5/8	1/4	3/4	3/8	3/4	3/8
2	5/8	1/4	3/4	3/8	3/4	3/8
2 1/2	5/8	1/4	3/4	3/8	7/8	3/8
3	3/4	3/8	7/8	3/8	1 1/8	3/8
3 1/2	7/8	3/8	1 1/8	3/8	1 1/8	3/8
4	7/8	3/8	1 1/8	3/8	1 1/8	3/8
5	7/8	3/8	1 1/8	3/8	1 1/8	3/8

* Lines greater than 24 meters (79 feet) in length or vertical elevation changes more than 15.25 meters (50 feet) refer to the Remote Cooling Service Manual or contact your distributor for assistance.

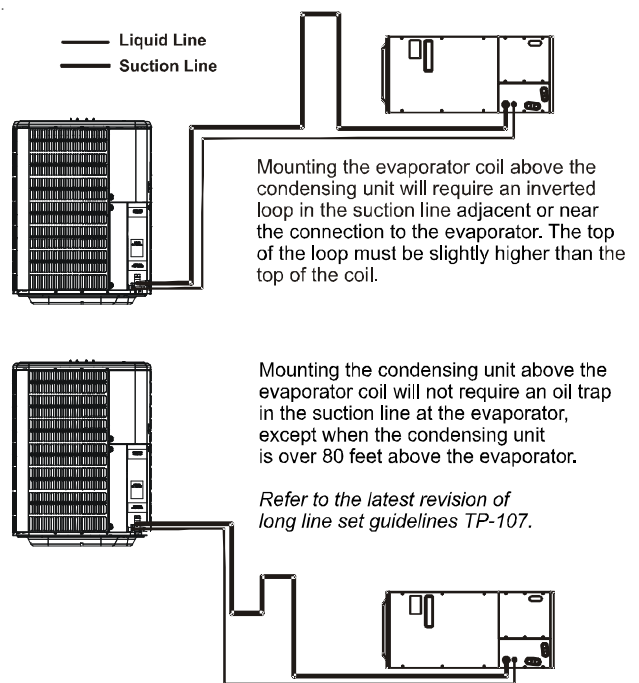


Figure 3B

Refrigerant Line Connections

IMPORTANT

This outdoor unit comes with a factory-installed flowrator which is part of the service valve assembly. The flowrator piston is located within a connector tube (Figure 4) which is torqued to the service valve body. It is imperative that the connector tube is covered with a wet rag while brazing to the service valve. Failure to properly cool the connector tube while brazing could deform the piston and affect system performance. If the connector tube needs to be opened for service, it must be torqued to 15.5-18.5 ft-lbs before the system is charged with refrigerant. If the piston is removed from the connector tube, it must be replaced in the direction shown in Figure 4 to ensure proper flow restriction.

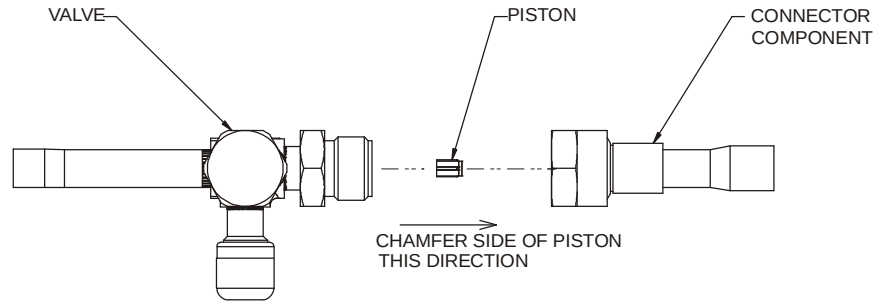


Figure 4
Exploded Top View of Service Valve with Piston and Connector Tube Component

To avoid overheating the service valve, TXV valve, or filter drier while brazing, wrap the component with a wet rag, or use a thermal heat trap compound. Be sure to follow the manufacturer's instruction when using the heat trap compound. Note: Remove Schrader valves from service valves before brazing tubes to the valves. Use a brazing alloy of 2% minimum silver content. Do not use flux.

Torch heat required to braze tubes of various sizes is proportional to the size of the tube. Tubes of smaller size require less heat to bring the tube to brazing temperature before adding brazing alloy. Applying too much heat to any tube can melt the tube. Service personnel must use the appropriate heat level for the size of the tube being brazed. Note: The use of a heat shield when brazing is recommended to avoid burning the serial plate or the finish on the unit.

1. The ends of the refrigerant lines must be cut square, deburred, cleaned, and be round and free from nicks or dents. Any other condition increases the chance of a refrigerant leak.
2. "Sweep" the refrigerant line with nitrogen or inert gas during brazing to prevent the formation of copper-oxide inside the refrigerant lines. The POE oils used in R-410A applications will clean any copper-oxide present from the inside of the refrigerant lines and spread it throughout the system. This may cause a blockage or failure of the metering device.
3. After brazing, quench the joints with water or a wet cloth to prevent overheating of the service valve.
4. Ensure the filter drier paint finish is intact after brazing. If the paint of the steel filter drier has been burned or chipped, repaint or treat with a rust preventative. This is especially important on suction line filter driers which are continually wet when the unit is operating.

NOTE: Be careful not to kink or dent refrigerant lines. Kinked or dented lines will cause poor performance or compressor damage.

Do NOT make final refrigerant line connection until plugs are removed from refrigerant tubing.

NOTE: Before brazing, verify indoor piston size by checking the piston kit chart packaged with indoor unit.

Leak Testing (Nitrogen or Nitrogen-Traced)

Pressure test the system using dry nitrogen and soapy water to locate leaks. If you wish to use a leak detector, charge the system to 10 psi using the appropriate refrigerant then use nitrogen to finish charging the system to working pressure then apply the detector to suspect areas. If leaks are found, repair them. After repair, repeat the pressure test. If no leaks exist, proceed to system evacuation.

System Evacuation

Condensing unit liquid and suction valves are closed to contain the charge within the unit. The unit is shipped with the valve stems closed and caps installed. **Do not open valves until the system is evacuated.**



WARNING

REFRIGERANT UNDER PRESSURE!

Failure to follow proper procedures may cause property damage, personal injury or death.



CAUTION

Prolonged operation at suction pressures less than 138 KPa (20 psig) for more than 5 seconds will result in overheating of the scrolls and permanent damage to the scroll tips, drive bearings and internal seal.

NOTE: Scroll compressors should never be used to evacuate or pump down a heat pump or air conditioning system.

1. Connect the vacuum pump with 250 micron capability to the service valves.
2. Evacuate the system to 250 microns or less using suction **and** liquid service valves. Using both valves is necessary as some compressors create a mechanical seal separating the sides of the system.
3. Close pump valve and hold vacuum for 10 minutes. Typically pressure will rise during this period.
 - If the pressure rises to 1000 microns or less and remains steady the system is considered leak-free; proceed to startup.
 - If pressure rises above 1000 microns but holds steady below 2000 microns, moisture and/or noncondensibles may be present or the system may have a small leak. Return to step 2: If the same result is encountered check for leaks as previously indicated and repair as necessary then repeat evacuation.
 - If pressure rises above 2000 microns, a leak is present. Check for leaks as previously indicated and repair as necessary then repeat evacuation.

Electrical Connections

The condensing unit rating plate lists pertinent electrical data necessary for proper electrical service and overcurrent protection. Wires should be sized to limit voltage drop to 2% (max.) from the main breaker or fuse panel to the condensing unit. Consult the NEC, CEC, and all local codes to determine the correct wire gauge and length.

Local codes often require a disconnect switch located near the unit; do not install the switch on the unit. Refer to the installation instructions supplied with the indoor furnace/air handler for specific wiring connections and indoor unit configuration. Likewise, consult the instructions packaged with the thermostat for mounting and location information.



WARNING

To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 1034 KPa (150 psig).



WARNING

To avoid the risk of fire or explosion, never use oxygen, high pressure air or flammable gases for leak testing of a refrigeration system.

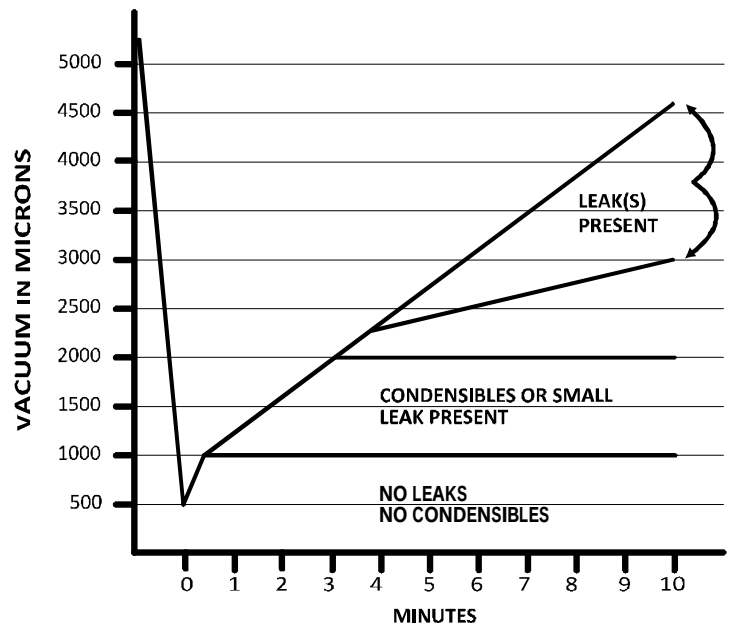


Figure 5



WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing.

Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death due to electric shock. Wiring must conform with NEC or CEC and all local codes. Undersized wires could cause poor equipment performance, equipment damage or fire.



WARNING

To avoid the risk of fire or equipment damage, use copper conductors.

Overcurrent Protection

The following overcurrent protection devices are approved for use.

- Time delay fuses
- HACR type circuit breakers

These devices have sufficient time delay to permit the motor-compressor to start and accelerate its load.

Three Phase Compressor Rotation

Three phase compressors are power phase dependent and can rotate in either direction.

Verify proper rotation for three phase compressors by ensuring the suction pressure drops and discharge pressure rises when the compressor is energized. **NOTE:** When operated in reverse, a three phase scroll compressors is noisier and its current draw substantially reduced compared to marked values.

To correct, disconnect power and switch any two leads at the unit contactor and re-observe.

High Voltage Connections

Route power supply and ground wires through the high voltage port and terminate in accordance with the wiring diagram provided inside the control panel cover.

Condensing unit control wiring requires 230 V, Comp, N, L, E from the indoor unit. Route control wires through the low voltage port and terminate in accordance with the wiring diagram provided inside the control panel cover.

System Start Up

When opening valves with retainers, open each valve only until the top of the stem is 1/8" from the retainer. To avoid loss of refrigerant, DO NOT apply pressure to the retainer. When opening valves without a retainer remove service valve cap and insert a hex wrench into the valve stem and back out the stem by turning the hex wrench counterclockwise. Open the valve until it contacts the rolled lip of the valve body.

NOTE: These are not back-seating valves. It is not necessary to force the stem tightly against the rolled lip.

Adequate refrigerant charge for the matching HSVTC evaporator coil and 15 feet of lineset is supplied with the condensing unit. If using evaporator coils other than HSVTC coil, it may be necessary to add or remove refrigerant to attain proper charge. If line set exceeds 15 feet in length, refrigerant should be added at .6 ounces per foot of liquid line.

NOTE: Charge should always be checked using superheat when using a piston and subcooling when using TXV equipped indoor coil to verify proper charge.

Open the suction service valve first! If the liquid service valve is opened first, oil from the compressor may be drawn into the indoor coil piston, restricting refrigerant flow and affecting operation of the system.

After the refrigerant charge has bled into the system, open the liquid service valve. The service valve cap is the secondary seal for the valves and must be properly tightened to prevent leaks. Make sure cap is clean and apply refrigerant oil to threads and sealing surface on inside of cap. Tighten cap finger-tight and then tighten additional 1/6 of a turn (1 wrench flat), or to the following specification, to properly seat the sealing surfaces.

NOTICE

Units with rotary or reciprocating compressors and non-bleed TXV's require a Hard Start Kit.



CAUTION

Use care when handling scroll compressors. Dome temperatures could be hot.



CAUTION

POSSIBLE REFRIGERANT LEAK

To avoid a possible refrigerant leak, open the service valves until the top of the stem is 3.2 mm (1/8") from the retainer.

- | | |
|--------------------------------|--------------|
| 1. 3/8" valve to 5 - 10 in-lbs | 0.56-1.30 Nm |
| 2. 5/8" valve to 5 - 20 in-lbs | 0.56-2.26 Nm |
| 3. 3/4" valve to 5 - 20 in-lbs | 0.56-2.26 Nm |
| 4. 7/8" valve to 5 - 20 in-lbs | 0.56-2.26 Nm |

Do not introduce liquid refrigerant from the cylinder into the crankcase of the compressor as this may damage the compressor.

1. Break vacuum by fully opening liquid and suction base valves.
2. Set thermostat to call for cooling. Check indoor and outdoor fan operation and allow system to stabilize for 10 minutes for fixed orifices and 20 minutes for expansion valves.



WARNING

REFRIGERANT UNDER PRESSURE!

- Do not overcharge system with refrigerant.
 - Do not operate unit in a vacuum or at negative pressure.
- Failure to follow proper procedures may cause property damage, personal injury or death.



CAUTION

Use refrigerant certified to AHRI standards. Used refrigerant may cause compressor damage. Most portable machines cannot clean used refrigerant to meet AHRI standards.

NOTICE

Violation of EPA regulations may result in fines or other penalties.



CAUTION

Operating the compressor with the suction valve closed will cause serious compressor damage.

Charge Verification

Final Charge Adjustment

The outdoor temperature must be 15°C (60°F) or higher. Set the room thermostat to COOL, fan switch to AUTO, and set the temperature control well below room temperature.

After system has stabilized per startup instructions, check subcooling and superheat as detailed in the following section.

Fixed Orifice

1. Purge gauge lines. Connect service gauge manifold to base-valve service ports. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install a thermometer 105 - 152 mm (4-6") from the compressor on the suction line. Ensure the thermometer makes adequate contact and is insulated for best possible readings. Use vapor temperature to determine superheat.
3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.
4. Disconnect manifold set, installation is complete.



CAUTION

To prevent personal injury, carefully connect and disconnect manifold gauge hoses. Escaping liquid refrigerant can cause burns. Do not vent refrigerant into the atmosphere. Recover all refrigerant during system repair and before final unit disposal.

Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.

SYSTEM SUPERHEAT										
Ambient Condenser Inlet Temperature (C° Dry Bulb)	Return Air Temperature (50% RH)									
	Dry Bulb	Wet Bulb	Dry Bulb	Wet Bulb	Dry Bulb	Wet Bulb	Dry Bulb	Wet Bulb	Dry Bulb	Wet Bulb
	18°	12°	21°	14°	24°	17°	27°	19°	29°	22°
46	---	---	---	---	---	---	---	---	---	3
38	---	---	---	---	---	---	3	---	---	3
35	---	---	---	---	3	---	3*	---	---	5
32	---	---	---	---	3	---	6	---	---	6
29	---	---	3	---	3	---	7	---	---	9
27	3	---	3	---	3	---	10	---	---	11
24	3	---	3	---	6	---	11	---	---	12
21	3	---	3	---	8	---	13	---	---	14
18	3	---	6	---	11	---	14	---	---	16
18	4	---	8	---	12	---	18	---	---	17

SUPERHEAT FORMULA = SUCT. LINE TEMP. - SAT. SUCT. TEMP.

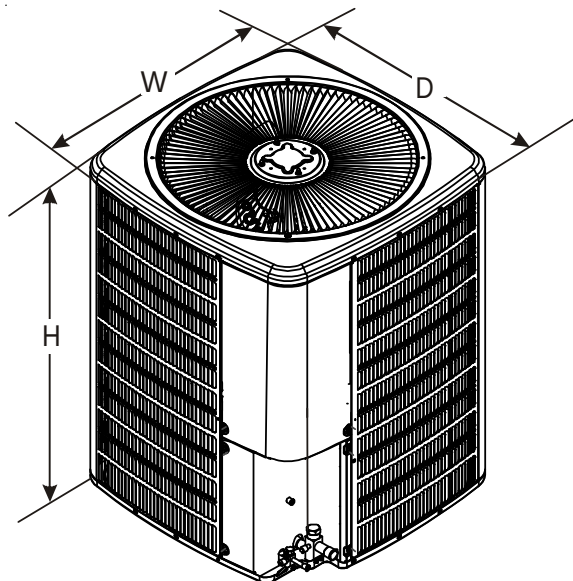
NOTE: Check the Schrader ports for leaks and tighten valve cores if necessary. Install caps finger-tight.

SUCTION PRESSURE KPa	SATURATED SUCTION TEMPERATURE °C
615	-3.3
641	-2.2
668	-1.1
695	0
724	1.1
753	2.2
783	3.3
813	4.4
847	5.6
879	6.7
912	7.8
946	8.9

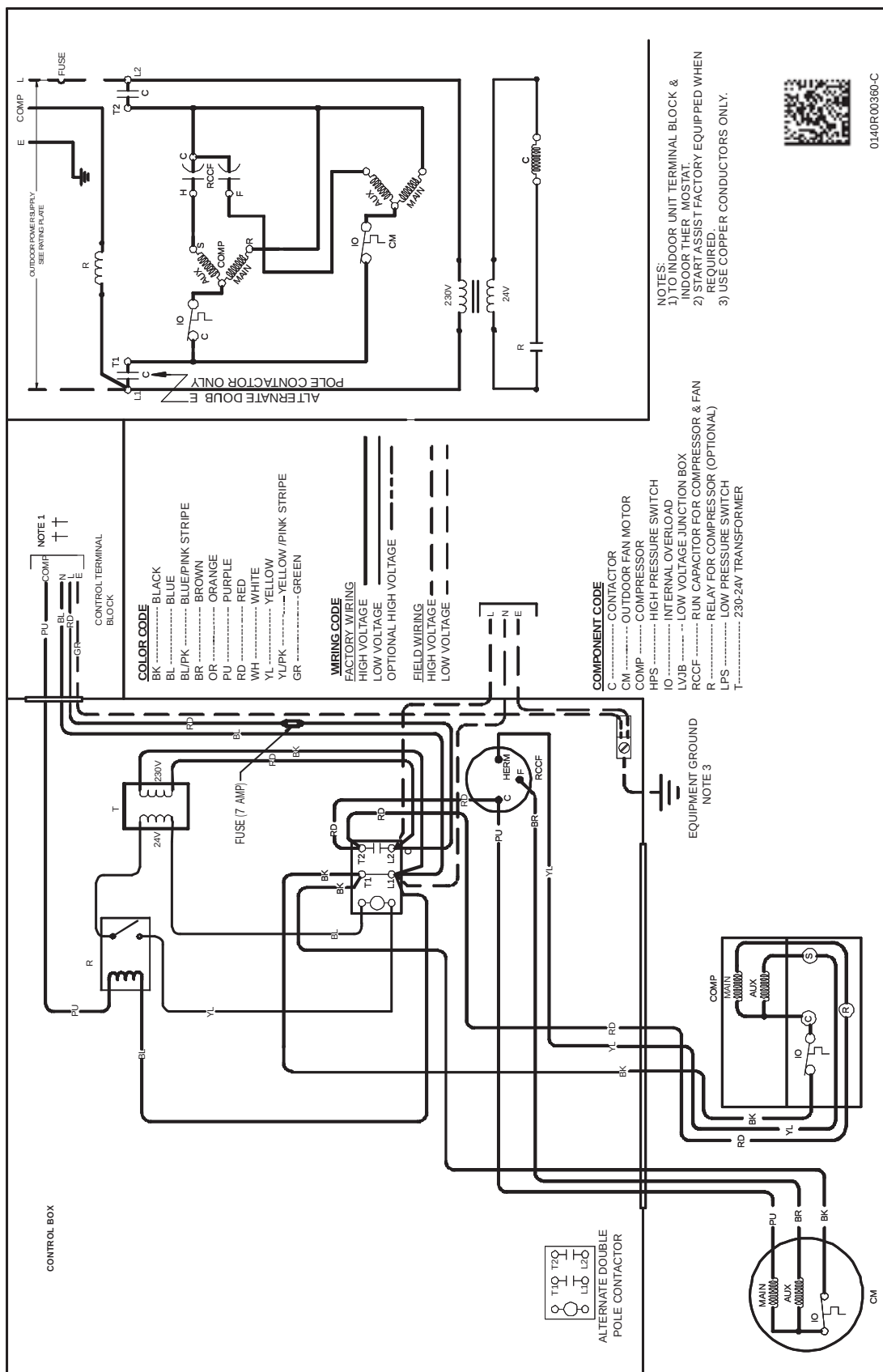
NOTE: SPECIFICATIONS AND PERFORMANCE DATA LISTED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Dimensions and Weights

Model	Dimensions			Weight	
	W (mm)	D (mm)	H (mm)	Equipment Wt. (KG)	Shipping Wt. (KG)
DX16SA0181XMA*/ RR20AVAK9	737	737	820	66	74
DX16SA0241XMA*/ RR25AVAK9	737	737	820	65	73
DX16SA0301XMA*/ RR30AVAK9	737	737	921	68	76
DX16SA0361XMA*/ RR36AVAK9	737	737	972	74	82
DX16SA0421XMA*/ RR42AVAK9	902	902	921	94	104



WARNING  **HIGH VOLTAGE!**
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

Troubleshooting Information

COOLING ANALYSIS CHART

Complaint	No Cooling							Unsatisfactory Cooling				System Operating Pressures				Test Method Remedy		
POSSIBLE CAUSE DOTS IN ANALYSIS GUIDE INDICATE "POSSIBLE CAUSE"	SYMPTOM	System will not start	Compressor will not start - fan runs	Compressor and Condenser Fan will not start	Evaporator fan will not start	Condenser fan will not start	Compressor runs - goes off on overload	Compressor cycles on overload	System runs continuously - little cooling	Too cool and then too warm	Not cool enough on warm days	Certain areas to cool others to warm	Compressor is noisy	Low suction pressure	Low head pressure		High suction pressure	High head pressure
Power Failure		•																Test Voltage
Blown Fuse		•		•	•													Impact Fuse Size & Type
Loose Connection		•			•	•	•											Inspect Connection - Tighten
Shorted or Broken Wires		•	•	•	•	•	•											Test Circuits with Ohmmeter
Open Overload					•	•												Test Continuity of Overloads
Faulty Thermostat		•		•	•					•								Test Continuity of Thermostat and Wiring
Faulty Transformer		•		•														Check Control Circuit with Voltmeter
Shorted or Open Capacitor			•		•	•	•											Test Capacitor
Internal Compressor Overload Open			•															Test Continuity of Overload
Shorted or Grounded Compressor			•			•												Test Motor Windings
Compressor Stuck		•					•											Use Test Cord
Faulty Compressor Contactor		•	•	•			•											Test Continuity of Coil and Contacts
Faulty Fan Relay					•													Test Continuity of Coil and Contacts
Open Control Circuit																		Test Control Circuit with Voltmeter
Low Voltage			•				•	•										Test Voltage
Faulty Evaporator Fan Motor					•									•				Repair or Replace
Shorted or Grounded Fan Motor					•	•											•	Test Motor Windings
Improper Cooling Anticipator										•								Check Resistance of Anticipator
Shortage or Refrigerant								•	•					•	•			Test For Leaks, Add Refrigerant
Restricted Liquid Line								•	•					•	•			Replace Restricted Part
Undersized Liquid Line									•		•			•				Replace Line
Undersized Suction Line														•				Replace Line
Not Enough Air across Indoor Coil									•		•	•		•				Speed Blower, Check Duct Static Pressure
Too Much Air across Indoor Coil																•		Reduce Blower Speed
Overcharge of Refrigerant							•	•					•			•	•	Recover Part of Charge
Noncondensibles								•			•						•	Recover Charge, Evacuate, Recharge
Recirculation of Condensing Air								•			•						•	Remove Obstruction to Air Flow
Infiltration of Outdoor Air									•		•	•						Check Windows, Doors, Vent Fans, Etc.
Improperly Located Thermostat										•								Relocate Thermostat
Air Flow Unbalanced										•		•						Readjust Air Volume Dampers
System Undersized									•		•							Refigure Cooling Load
Broken Internal Parts													•					Replace Compressor
Broken Valves													•					Test Compressor Efficiency
Inefficient Compressor									•						•	•		Test Compressor Efficiency
High Pressure Control Open				•														Reset and Test Control
Unbalanced Power, 3PH			•				•	•										Test Voltage
Wrong Type Expansion Valve							•	•			•							Replace Valve
Expansion Valve Restricted							•	•	•		•			•	•			Replace Valve
Oversized Expansion Valve													•			•		Replace Valve
Undersized Expansion Valve							•	•	•		•			•				Replace Valve
Expansion Valve Bulb Loose													•			•		Tighten Bulb Bracket
Inoperative Expansion Valve							•		•					•				Check Valve Operation
Loose Hold-down Bolts													•					Tighten Bolts

For detailed service information refer to Remote Condensing Unit service manual.

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SPLIT SYSTEMS

AIR CONDITIONING AND HEAT PUMP HOMEOWNER'S ROUTINE MAINTENANCE RECOMMENDATIONS

We strongly recommend a bi-annual maintenance checkup be performed before the heating and cooling seasons begin by a **qualified servicer**.

REPLACE OR CLEAN FILTER

IMPORTANT NOTE: Never operate unit without a filter installed as dust and lint will build up on internal parts resulting in loss of efficiency, equipment damage and possible fire.

An indoor air filter must be used with your comfort system. A properly maintained filter will keep the indoor coil of your comfort system clean. A dirty coil could cause poor operation and/or severe equipment damage.

Your air filter or filters could be located in your furnace, in a blower unit, or in "filter grilles" in your ceiling or walls. The installer of your air conditioner or heat pump can tell you where your filter(s) are, and how to clean or replace them.

Check your filter(s) at least once a month. When they are dirty, replace or clean as required. Disposable type filters should be replaced. Reusable type filters may be cleaned.

You may want to ask your dealer about high efficiency filters. High efficiency filters are available in both electronic and non-electronic types. These filters can do a better job of catching small airborne particles.

COMPRESSOR

The compressor motor is hermetically sealed and does not require additional oiling.

MOTORS

Indoor and outdoor fan motors are permanently lubricated and do not require additional oiling.

CLEAN OUTSIDE COIL (QUALIFIED SERVICER ONLY)

Air must be able to flow through the outdoor unit of your comfort system. Do not construct a fence near the unit or build a deck or patio over the unit without first discussing your plans with your dealer or other qualified servicer. Restricted airflow could lead to poor operation and/or severe equipment damage.

Likewise, it is important to keep the outdoor coil clean. Dirt, leaves, or debris could also restrict the airflow. If cleaning of the outdoor coil becomes necessary, hire a qualified servicer. Inexperienced people could easily puncture the tubing in the coil. Even a small hole in the tubing could eventually cause a large loss of refrigerant. Loss of refrigerant can cause poor operation and/or severe equipment damage.

Do not use a condensing unit cover to "protect" the outdoor unit during the winter, unless you first discuss it with your dealer. Any cover used must include "breathable" fabric to avoid moisture buildup.

BEFORE CALLING YOUR SERVICER

- Check the thermostat to confirm that it is properly set.
- Wait 15 minutes. Some devices in the outdoor unit or in programmable thermostats will prevent compressor operation for awhile, and then reset automatically. Also, some power companies will install devices which shut off air conditioners for several minutes on hot days. If you wait several minutes, the unit may begin operation on its own.
- Check the electrical panel for tripped circuit breakers or failed fuses. Reset the circuit breakers or replace fuses as necessary.
- Check the disconnect switch near the indoor furnace or blower to confirm that it is closed.
- Check for obstructions on the outdoor unit. Confirm that it has not been covered on the sides or the top. Remove any obstruction that can be safely removed. If the unit is covered with dirt or debris, call a qualified servicer to clean it.
- Check for blockage of the indoor air inlets and outlets. Confirm that they are open and have not been blocked by objects (rugs, curtains or furniture).
- Check the filter. If it is dirty, clean or replace it.
- Listen for any unusual noise(s), other than normal operating noise, that might be coming from the outdoor unit. If you hear unusual noise(s) coming from the unit, call a qualified servicer.

**WARNING**
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING.
MULTIPLE POWER SOURCES MAY BE PRESENT.
FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE,
PERSONAL INJURY OR DEATH.



**CAUTION**
TO AVOID THE RISK OF EQUIPMENT DAMAGE OR FIRE, INSTALL THE SAME AMPERAGE BREAKER OR FUSE AS YOU ARE REPLACING. IF THE CIRCUIT BREAKER OR FUSE SHOULD OPEN AGAIN WITHIN THIRTY DAYS, CONTACT A QUALIFIED SERVICER TO CORRECT THE PROBLEM.
IF YOU REPEATEDLY RESET THE BREAKER OR REPLACE THE FUSE WITHOUT HAVING THE PROBLEM CORRECTED, YOU RUN THE RISK OF SEVERE EQUIPMENT DAMAGE.

2 - EVAPORATIVE UNIT

Important Safety Instructions & Precautions



WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



WARNING

- Installation and maintenance should be performed by qualified persons who are familiar with local code and regulations, and experienced with this type of unit.
 - All field wiring must be installed in accordance with the National Wiring regulation.
 - Ensure that the rated voltage of the unit corresponds to that of the name plate before beginning wiring work, according to the wiring diagram at the rear of this manual.
 - To prevent possible hazard due to insulation failure, the unit must be GROUNDED.
 - All electrical wiring must not touch the refrigerant piping, or any moving part of the fan motors.
 - Confirm the unit has been switched OFF before installing or servicing the unit.
 - Disconnect from the main power supply before servicing the air conditioning unit.
 - DO NOT pull out the power cord when the power is ON. This may cause serious electrical shocks, which may result in fire hazard.
 - Keep the indoor and outdoors units, power cable and transmission wiring at least 1 m from TVs and radios to help prevent distorted pictures and static.
- Depending on the type and source of the electrical waves, static may be heard even when more than 1 m away.

NOTICE: DISPOSAL REQUIREMENTS

Your air conditioning product is marked with this symbol. This means the electrical and electronic products should not be mixed with unsorted household waste.



Do not try to dismantle the system yourself; the dismantling of the air conditioning system, treatment of the refrigerant, oil and other parts must be done by a qualified installer, in accordance with relevant local and national legislation.

Air conditioners must be treated at a specialized treatment facility for reuse, recycling and recovery. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health. Contact the installer or local authority for more information.

Batteries must be removed from the remote control and disposed of separately in accordance with relevant local and national legislation.



CAUTION

When installing the unit, adhere to the following important points:

- DO NOT INSTALL the unit where leakage of flammable gas may occur.
If gas leaks and accumulates around the unit, it may cause fire ignition.
- Ensure that drainage piping is connected properly.
If the drainage pipe is not connected properly, water leakage may occur and could dampen furniture.
- DO NOT OVERCHARGE the unit.
This unit has been charged at the factory. Overcharging will cause over-current or damage to the compressor.
- Ensure the unit's panel is closed after service or installation.
Unsecured panels will cause the unit to operate noisily.
- Sharp edges and coil surfaces are potential locations which may cause injury hazards. Avoid contact with these areas.
- Before turning OFF the power supply, set the remote control's ON/OFF switch to the OFF position to prevent nuisance tripping of the unit. If this is not done, the unit's fans will begin turning automatically when the power resumes. This poses a hazard to service personnel or the user.
- DO NOT INSTALL the unit at or near a doorway.
- DO NOT OPERATE any heating apparatus too close to the air conditioning unit or use in a room where mineral oil, oil vapor or oil steam exists. This may cause the plastic parts to melt or deform as a result of excessive heat or chemical reaction.
- When the unit is used in kitchens, keep flour away from the unit, since flour may be sucked into the unit.
- This unit is not suitable for factory use where cutting oil mist or iron powder exists or where voltage fluctuates greatly.
- DO NOT INSTALL the unit in areas such as hot springs or oil refinery plants where sulphide gas exists.
- Ensure the color of the wires of the outdoor unit and the terminal markings are the same to the indoor, respectively.
- IMPORTANT: DO NOT INSTALL OR USE THE AIR CONDITIONER UNIT IN A LAUNDRY ROOM.
- DO NOT USE joined and twisted wires for incoming power supply.
- This equipment is not intended for use in a potentially explosive atmosphere.

Unpacking the Evaporative Unit

- UNPACKING:
- 1. After taking off the bands, lift carton box.
 - 2. Remove the top cushion.
 - 3. Lift the unit and remove the bottom carton.

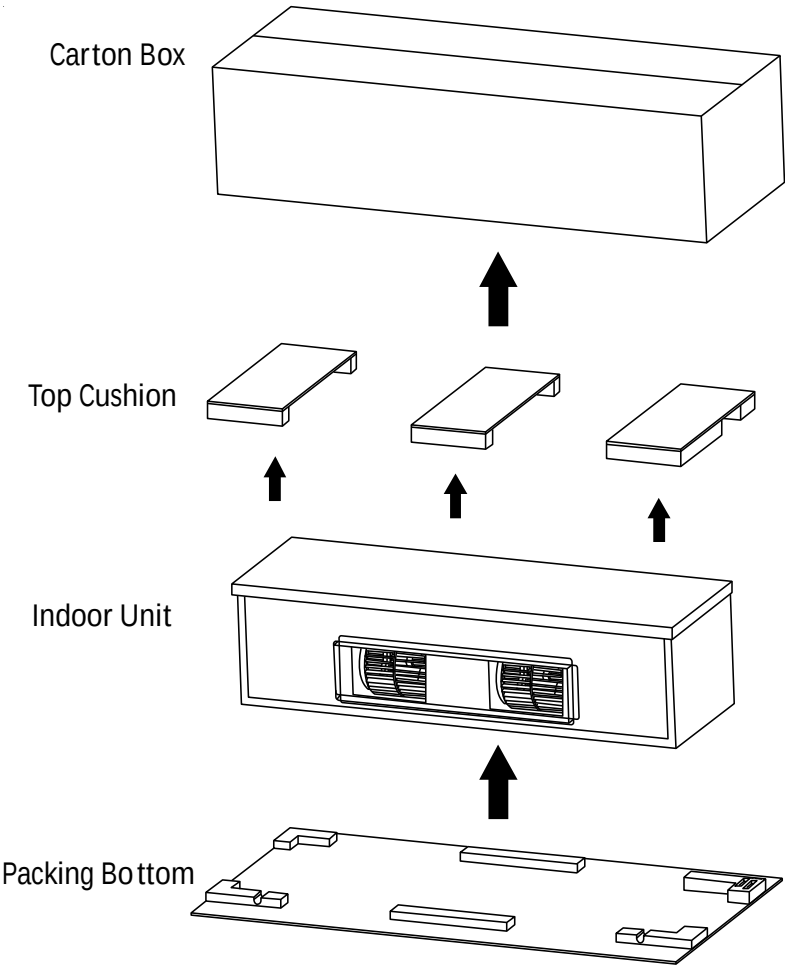


Figure 6

Dimensions

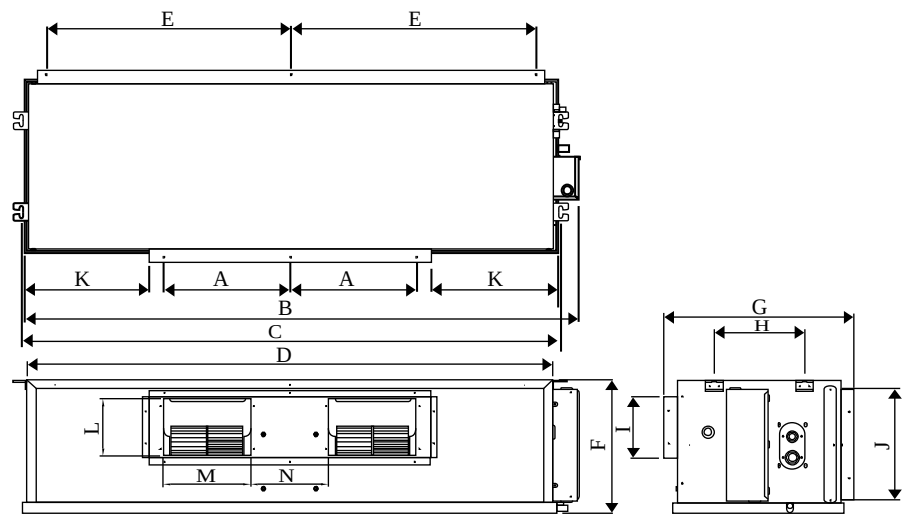
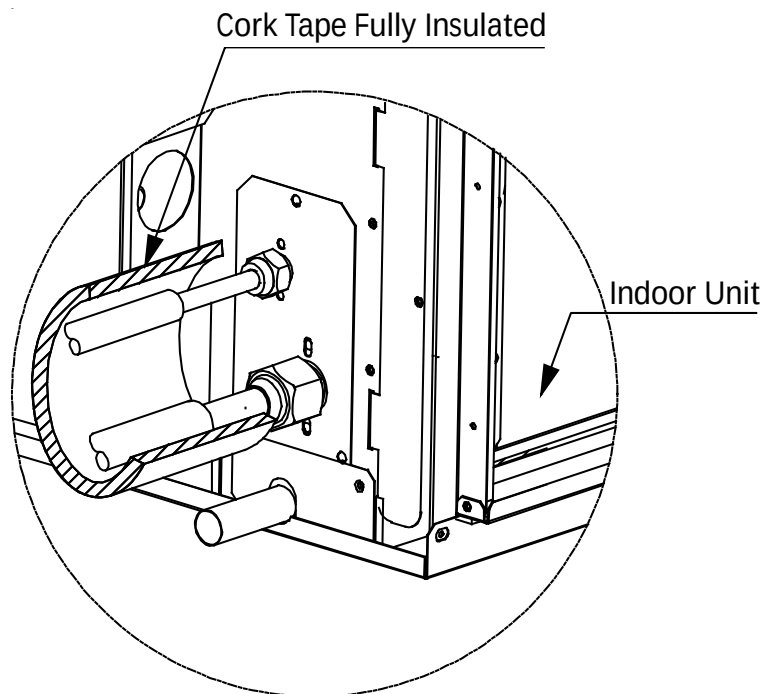


Figure 7

Model	Dimensions in mm													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
FDMRN20AVAK FDMRN25AVAK FDMRN30AVAK	359	1115	1072	1030	467	378	541	256	180	306	119	170	234	234
FDMRN36AVAK FDMRN42AVAK	359	1369	1326	1287	594	378	541	256	180	306	256	170	234	234

Installation Diagram



Insulation for Indoor Connecting Pipe
Figure 8

Installation of the Indoor Unit

The indoor unit must be installed so there is no short circuit of the cool discharge. Respect the installation clearances.

Do not install the indoor unit where there is direct sunlight on the unit and the location must be suitable for proper piping and drainage. Maintain a suitable distance between doors and the unit.

Ceiling Concealed Mounting

- Use the hanger supplied with the unit.

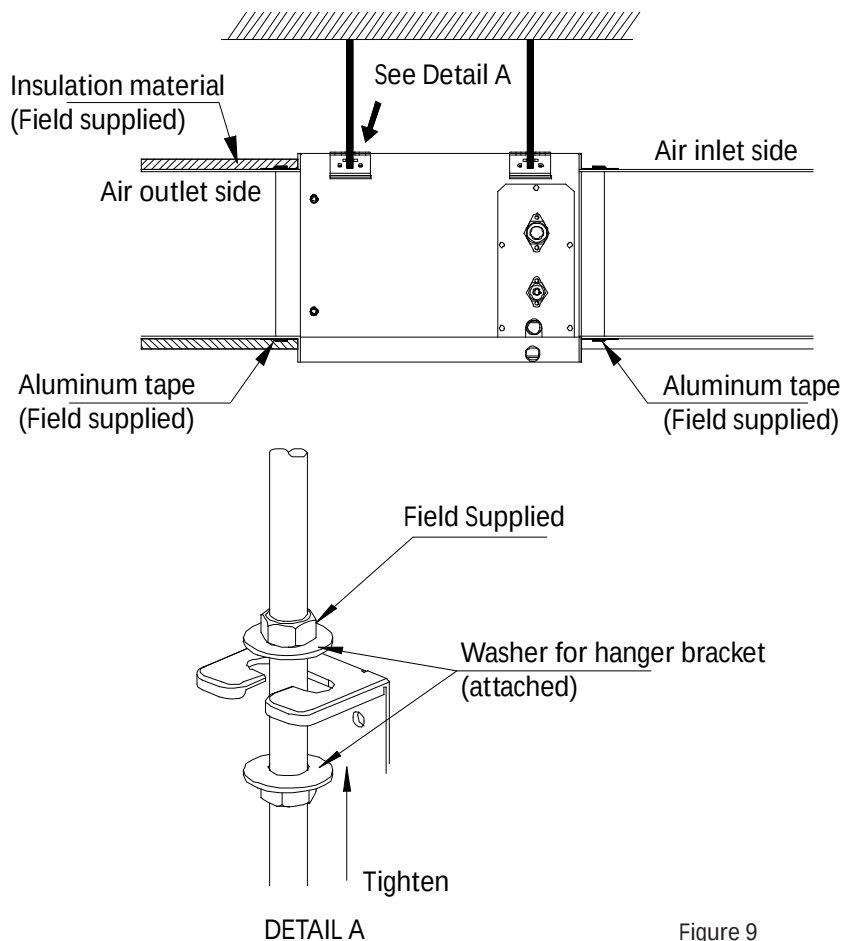


Figure 9

- Ensure that the ceiling is structurally sufficient to withstand the weight of the suspended unit.
- Center distance of axle, see Figure 10.

Model	A mm (inch)	L mm (inch)
FDMRN20AVAK FDMRN25AVAK FDMRN30AVAK	1072 (21.5)	256 (10.1)
FDMRN36AVAK FDMRN42AVAK	1336 (52.2)	256 (10.1)

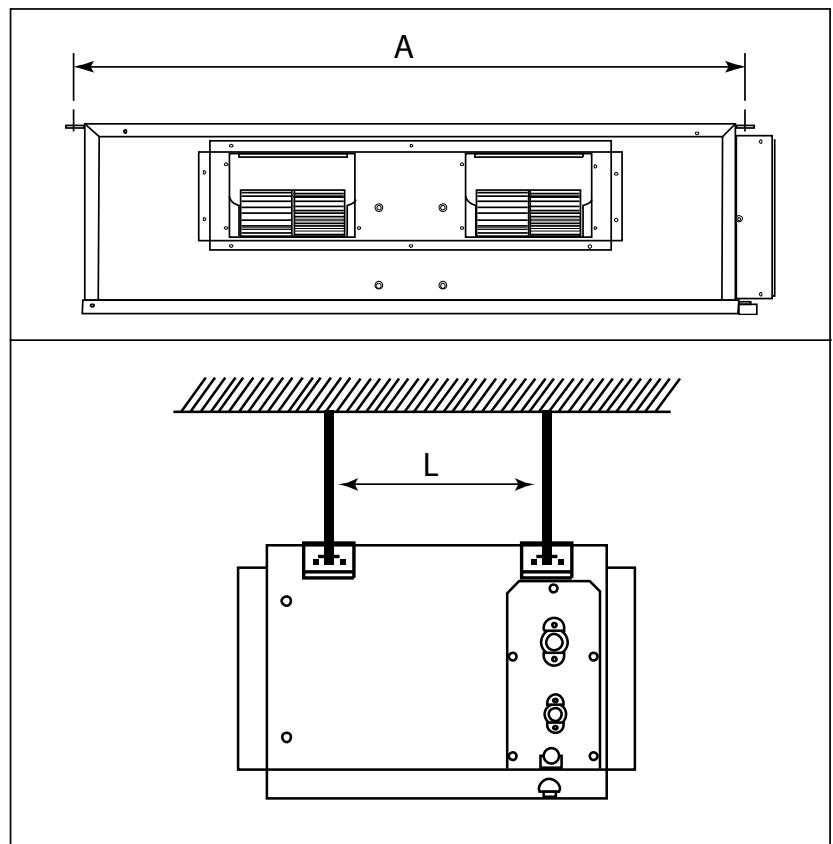


Figure 10

Provide clearance for servicing ease and optimal air flow as shown in Figure 11.

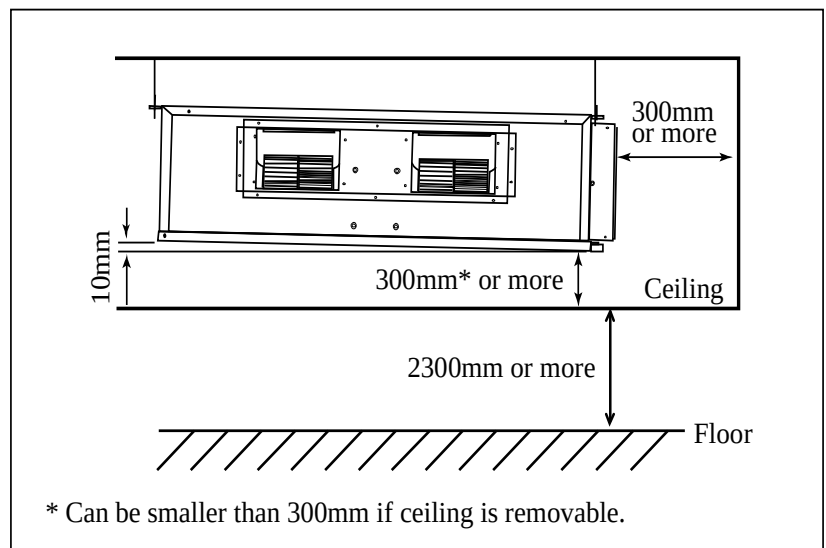


Figure 11

Ceiling Concealed Drain Piping Work

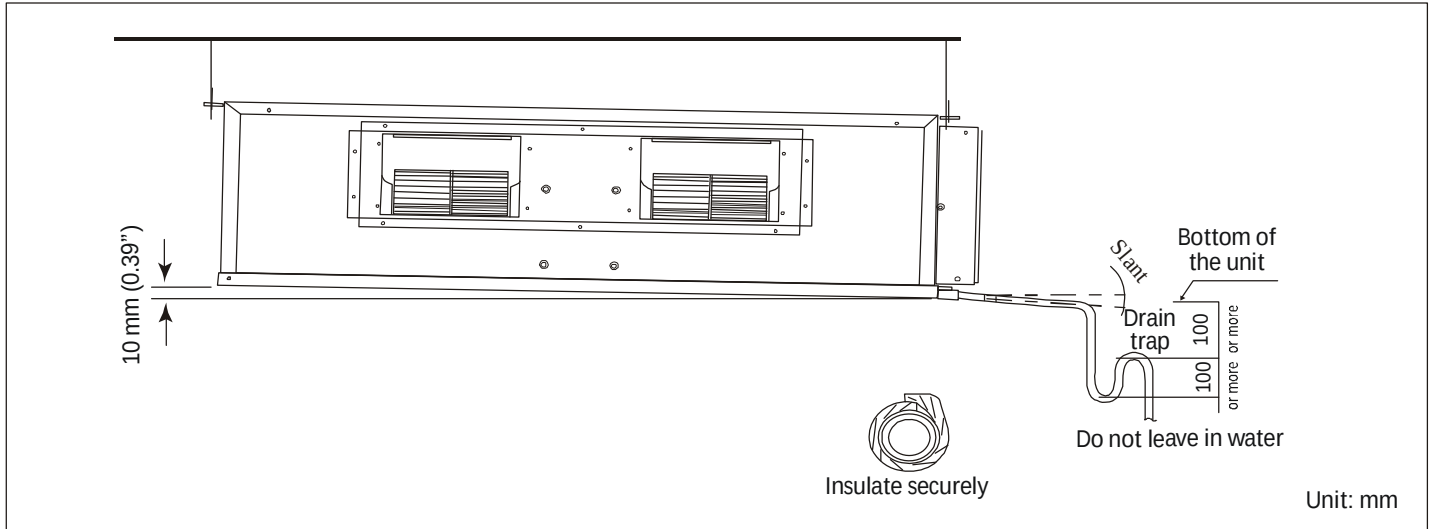


Figure 12

- To avoid damage caused by leaks and condensation, the drain pipe must be installed as shown in Figure 12.
- For best results, keep the piping as short as possible. Slant the piping at an angle to improve the flow.
- Ensure the drain pipe is securely insulated.
- It is necessary to provide a drain trap in the drain outlet to relieve pressure that exists within the unit as compared to the outside atmospheric pressure when the unit is operating. The drain trap is to avoid the possibility of splashes or an odor.
- Keep pipes as straight as possible for easy cleaning and to prevent the accumulation of dirt and debris.
- Conduct a water drainage test after the installation is completed. Make sure that the drainage flow is smooth.
- In humid environments, use an extra drain pan to cover the entire area of the indoor unit.

Piping Works and Flaring Techniques

- Do not use contaminated or damaged copper tubing. If any piping, evaporator or condenser has been exposed or has been opened for 15 second or more, the system must be vacuumed. Generally, do not remove plastic, rubber plugs and brass nuts from the valves, fittings, tubings and coils until it is ready for connection.
- If brazing work is required, ensure that nitrogen gas is passed through the piping and joints while the brazing work is being done. This will eliminate soot formation on the inside walls of the copper tubings.
- Cut the pipe stage by stage, advancing the blade of pipe cutter slowly. Extra force and deep cuts will cause more distortion of the pipe and therefore, extra burrs. See Figure 13A.
- Remove burrs from cut edges of pipes with a remover, as shown in Figure 13B. This will avoid unevenness on the flare faces, which will cause gas leaks.

Hold the pipe on the top position and burr remover at the lower position to prevent metal chips from entering the pipe.

Figure 13A

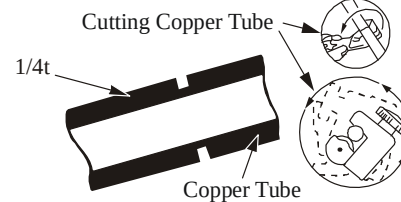


Figure 13B

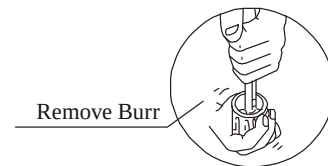
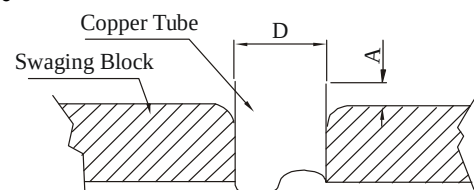


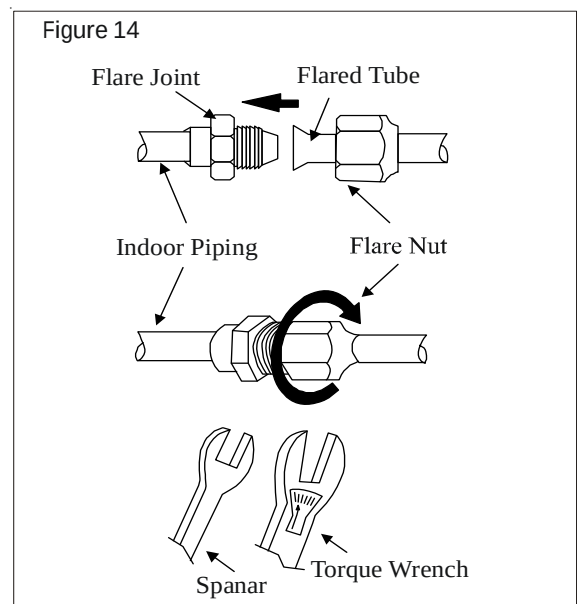
Figure 13C



- Insert the flare nuts mounted on the connection parts of both indoor and outdoor unit into the copper pipes.
- The exact length of pipe protruding from the face of the swaging block is determined by the flaring tool. See Figure 13C.
- Affix the pipe firmly on the swaging block. Match the centers of both the flare die and the flaring punch. Tighten the flare punch fully.

Piping Connection to the Units

- Align the center of the piping and sufficiently tighten the flare nut with your fingers. See Figure 14.
- Tighten the flare nut with a torque wrench until the wrench clicks. When tightening the flare nut with the torque wrench, make sure you tighten in the direction of the arrow on the wrench.
- The refrigerant pipe connections are insulated by closed cell polyurethane.



Ø Tube, D		A (mm)	
Inch	mm	Imperial (Wing-Nut Type)	Rigid (Clutch Type)
1/4	6.35	1.3	0.7
3/8	9.52	1.6	1.0
1/2	12.70	1.9	1.3
5/8	15.88	2.2	1.7
3/4	19.05	2.5	2.0

Pipe Size mm (in)	Torque Nm / (ft-lb)
6.35 (1/4")	18 (13.3)
9.52 (3/8")	42 (31.0)
12.70 (1/2")	55 (40.6)
15.88 (5/8")	65 (48.0)
19.05 (3/4")	78 (57.6)

Electrical Wire Connection

- All wires must be firmly connected.
- Make sure none of the wires touch the refrigerant pipings, compressor or any moving parts.
- The connecting wire between the indoor unit and the outdoor unit must be clamped by using provided cord anchor.
- The power supply cord must be equivalent to H07RN-F, which is the minimum requirement.
- Make sure no external pressure is applied to the terminal connectors and wires.
- To avoid gaps, make sure all covers are properly fixed.
- Use round, crimp-style terminal for connecting wires to the power supply terminal block. Connect the wires by matching to the indication on the terminal block. Refer to the wiring diagram attached to the unit.

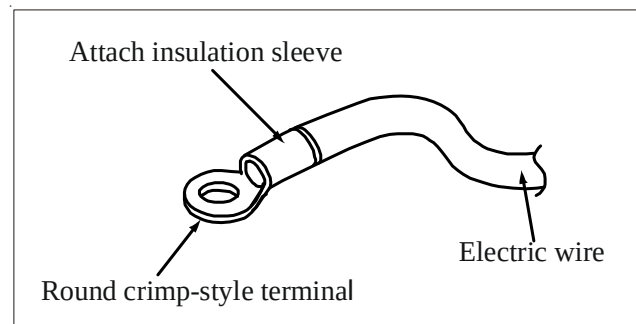


Figure 15

- Always use the correct screwdriver to tighten the terminal screws. Unsuitable screwdrivers can damage the screw's head.

- Over-tightening can damage the terminal screws.
- Do not connect wires of different gauge to same terminal.
- Keep wiring in an orderly manner. Prevent the wiring from obstructing other parts and the terminal box cover.

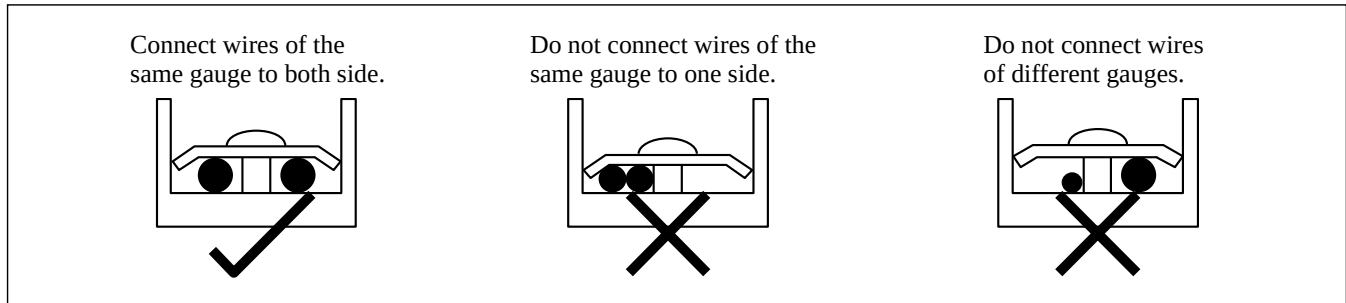


Figure 16

Special Precautions When Using R-410A Unit

R-410A is an HFC refrigerant that does not damage the ozone layer. The working pressure of this refrigerant is 1.6 times higher than conventional refrigerant (R-22). Proper installation and servicing of R-410A units is essential.

- Never use refrigerant other than R-410A in an air conditioner which is designed to operate with R-410A.
- POE or PVE oil is used as lubricant in R-410A compressors. These oils are different from the mineral oil used in R-22 compressors. During installation or servicing, extra precaution must be taken not to expose the R-410A system too long to moist air. Residual POE or PVE oil in the piping and components can absorb moisture from the air.
- To prevent mischarging, the diameter of the service port on the Flare valve is different from that of R-22.
- Use tools and material exclusively for refrigerant R-410A. These tools include manifold valve, charging hose, pressure gauge, gas leak detector, flare tools, torque wrench, vacuum pump and refrigerant cylinder.
- As an R-410A air conditioner incurs higher pressure than R-22 units, it is essential to choose the copper pipes correctly. Never use copper pipes thinner than 0.8mm even though they are available on the market.
- If refrigerant gas leakage occurs during installation or servicing, be sure to ventilate fully. If the refrigerant gas comes in contact with fire, a poisonous gas may occur.
- When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigerant cycle.

WARNING

To avoid possible explosion:

- Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.

CAUTION

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible difficulty in breathing or death:

- Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.
- If an indoor leak is suspected, thoroughly ventilate the area before beginning work.
- Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.
- Always follow EPA regulations. Never burn refrigerant, as poisonous gas will be produced.

System Evacuation and Charging

Evacuating (vacuuming) the system is necessary to eliminate all moisture and air from the unit.

Evacuating (Vacuuming) The Piping and The Indoor Unit

The indoor unit and the refrigerant connecting pipes must be air-purged because the air containing moisture that remains in the refrigerant cycle may cause a malfunction of the compressor.

1. Remove the caps from the valve and the service port.
2. Connect the center of the charging gauge to the vacuum pump.

3. Connect the charging gauge to the service port of the 3-way valve.
4. Start the vacuum pump. Using a micron gauge, evacuate the system for a minimum of 250 microns and wait for 5 minutes to ensure the readings will not change. The evacuation time varies with different vacuum pump capacity. Confirm that the charging gauge needle has moved towards -760mmHg. *See Caution at right is the needle does not move towards -70mmHg.*
5. If no leak is detected, close the valve of the charging gauge and stop the vacuum pump.



CAUTION

POSSIBLE REFRIGERANT LEAK

If the gauge needle does not move to -760mmHg, use a refrigerant detector at the flare type connection of the indoor and outdoor unit to check for a refrigerant leak. If a leak is detected, repair the leak.

Indicator Lights

Fault Diagnosis

If an abnormal condition is detected, the controller will blink the error code.

NOTE: The unit will not detect sensor missing when the compressor is ON. Call your dealer immediately when this error happens.

Error Code	Diagnosis
E1	Room Sensor is open or there is a short
E2	Indoor Coil Sensor is open
E4	Compressor overload; Indoor coil sensor short

Checklist

Make sure:

1. The unit is mounted solidly and is rigid in position.
2. Piping and connections are leak proof after charging.
3. Proper wiring has been done.
4. Drainage check: Pour water into left side of drain pan; the water should drain from the right side of the unit.

TEST RUN:

1. Conduct a test run of the unit after the water drainage test and gas leakage test have been completed.
2. Confirm the following:
 - a. Is the electrical plug firmly inserted into the socket?
 - b. Are there any abnormal sounds coming from the unit?
 - c. Is there a smooth drainage of water?
 - d. Is the condenser fan running, with warm air blowing off the condensing unit?
 - e. Is the evaporator blower running and discharging cool air?
 - f. Is the remote control incorporating a 3-minute delay in the circuit?

It requires approximately 3-minutes before the outdoor condensing unit can start.

Service and Maintenance

Service Parts	Maintenance Procedure	Period
Indoor Air Filter	1. Remove any dust on the filter by using a vacuum cleaner or wash in lukewarm water (below 40°C) with neutral cleaning detergent. 2. Rinse well and dry the filter before placing it back into the unit. Do not use gasoline, volatile substances or chemicals to clean the filter.	At least once every two weeks. Clean more frequently if necessary.
Indoor Unit	1. Clean any dirt or dust on the grille or panel by wiping it with a soft cloth soaked in lukewarm water (below 40°C). Use only a neutral detergent solution. 2. Do not use gasoline, volatile substances or chemicals to clean the filter.	At least once every two weeks. Clean more frequently if necessary.
Indoor Fan	1. Check for any abnormal noise.	When necessary.

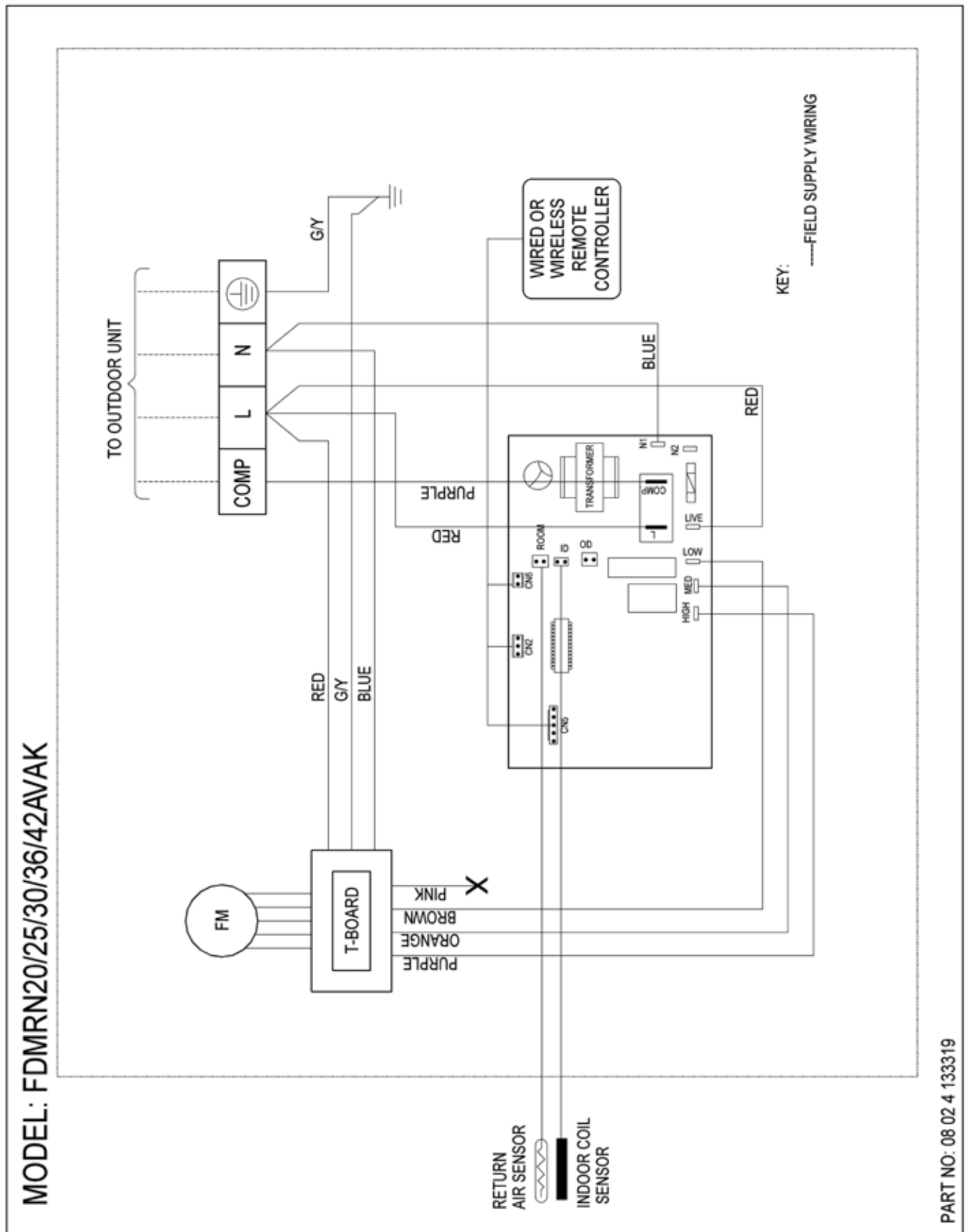
Wiring Diagram



WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



APPENDIX - LONG LINE SET APPLICATION R-410A

ATTENTION INSTALLING PERSONNEL

As a professional installer you have an obligation to know the product better than the customer. This includes all safety precautions and related items.

Prior to actual installation, thoroughly familiarize yourself with this Instruction Manual. Pay special attention to all safety warnings. Often during installation or repair it is possible to place yourself in a position which is more hazardous than when the unit is in operation.

Remember, it is **your** responsibility to install the product safely and to know it well enough to be able to instruct a customer in its safe use.

Safety is a matter of common sense...a matter of thinking before acting. Most dealers have a list of specific good safety practices...follow them.

The precautions listed in this Installation Manual are intended as supplemental to existing practices. However, if there is a direct conflict between existing practices and the content of this manual, the precautions listed here take precedence.



RECOGNIZE THIS SYMBOL AS A SAFETY PRECAUTION.



WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



- Only allow qualified, experienced technicians to install or service this unit.
- Units must be installed in accordance with Regulations of the National Fire Protection Association and applicable local codes. Where local regulations are at a variance with instructions, installer should adhere to local codes.
- Before connecting tubing, read the outdoor unit installation manual. Pay particular attention to all safety precautions.

INDEX - LONG LINE SET SECTIONS

SECTION 1. General Requirements for All Long Line Set Applications	27
SECTION 2. Outdoor Unit and Indoor Unit are at the Same Elevation	29
SECTION 3. Outdoor Unit is Above the Indoor Unit	30
SECTION 4. Outdoor Unit is Below the Indoor Unit	31
SECTION 5. Calculations - Tubing Equivalent Length, Tube Size and Refrigerant	32

This long line set application guideline applies to all AHRI listed R-410A air conditioner and heat pump split system matches of nominal capacity 18,000 to 60,000 Btuh. This guideline will cover installation requirements and additional accessories needed for split system installations where the line set exceeds 80 feet (24.4 m) in actual length. The long line sets can have three different configurations (1) Outdoor unit and Indoor unit are at the same level, (2) Outdoor unit is above the Indoor unit coil, (3) Outdoor unit is below the Indoor unit.

This guideline is meant to provide installation instructions based on most common long line set applications. Installation variables may affect the system operation.

*Contact Technical Services
for variations or applications outside those outlined in this document.*

SECTION 1. GENERAL REQUIREMENTS FOR ALL LONG LINE SET APPLICATIONS

1. Equivalent length must be used to determine acceptability of any long line set application. See Section 5 for equivalent length calculations.
2. **For any residential split system installed with a long line set, 3/8" liquid line size must be used.** Limiting the liquid line size to 3/8" is critical since an increased refrigerant charge level from having a larger liquid line could possibly shorten a compressor's life-span.
 - a. Exceptions for air conditioning (cooling only) applications, 1/4" liquid line may be used in:
 - i. 1.5 ton applications for up to 100 equivalent feet (30.5 equivalent meters) with maximum 40' (12.2 m) vertical lift
 - ii. 2.0 ton applications for up to 75 equivalent feet (22.9 equivalent meters) with maximum 20' (6.1 m) vertical lift
 - b. Exceptions for air conditioning (cooling only) applications, 5/16" liquid line may be used in:
 - i. 1.5 ton applications for up to 250 equivalent feet (76.2 equivalent meters) with maximum 60' (18.3 m) vertical lift
 - ii. 2.0 ton applications for up to 200 equivalent feet (61.0 equivalent meters) with maximum 40' (12.2 m) vertical lift
 - iii. 2.5 ton applications for up to 175 equivalent feet (53.3 equivalent meters) with maximum 30' (9.1 m) vertical lift
3. Most refrigerant tubing kits are supplied with 3/8" (9.5 mm) thick insulation on the suction line. For long line installations over 80 feet (24.4 m), if the line set passes through a high ambient temperature zone, 1/2" (12.7 mm) thick suction line insulation is required to reduce loss of capacity. The liquid line must be insulated if more than 50 feet (15.2 m) of liquid line will pass through an area that might reach temperatures of 30°F or higher than outdoor ambient. Never attach a liquid line to any uninsulated portion of the suction line.
4. A crankcase heater must be installed on *any* compressor (if crankcase heater is not already factory installed).
5. Hard start assist kit is required.
6. Use of a thermostatic expansion valve (TXV) is required in all long line set applications. Unit must be charged to 7 to 9 °F subcooling at the indoor unit.
7. Maximum equivalent length of line set is:
 - a. 250 feet (76.2 m) for single stage units with scroll or reciprocating compressors.
 - b. 150 feet (45.7 m) for single stage units with rotary compressors.
 - c. 150 feet (45.7 m) for two stage units.
8. Maximum linear length of line set is:
 - a. 200 feet (61.0 m) for single stage units with scroll or reciprocating compressors.
 - b. 150 feet (45.7 m) for single stage units with rotary compressors.
 - c. 150 feet (45.7 m) for two stage units.
9. **Low voltage wiring.** Verify low voltage wire gauge is adequate for the length used due to increased line set application.
10. **Vibration and Noise:** In long line applications, refrigerant tubing is highly prone to transmit noise and vibration to the adjoining structure. Use adequate vibration-isolating hardware when mounting line set to structural members. See Figures 1-1, 1-2 and 1-3 for example of proper mounting.

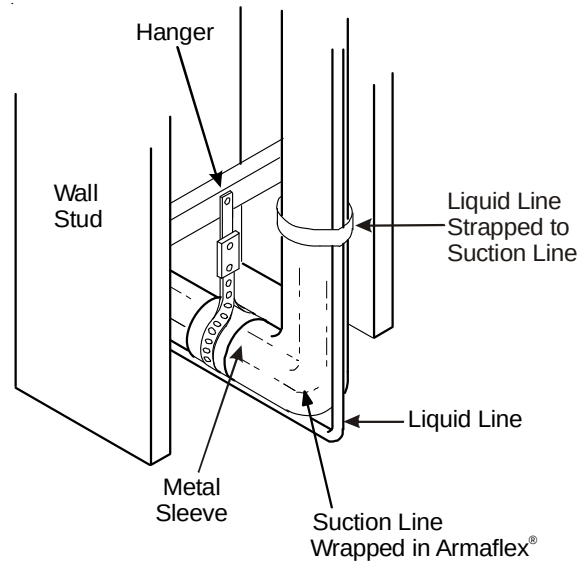


Figure 1-1.
Installation of Refrigeration Piping From Vertical to Horizontal

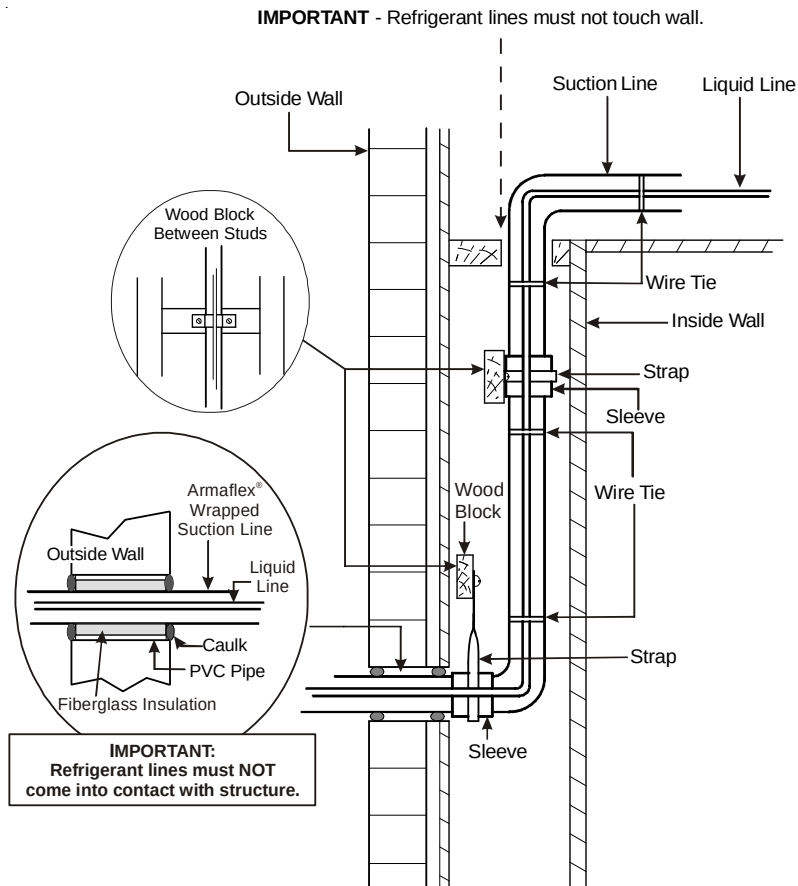


Figure 1-2. Installation of Refrigerant Piping (Vertical)

New construction shown

NOTE: If line set is installed on the exterior of an outside wall, similar installation practices are to be used.

Figure 1-3. Installation of Refrigerant Piping (Horizontal)

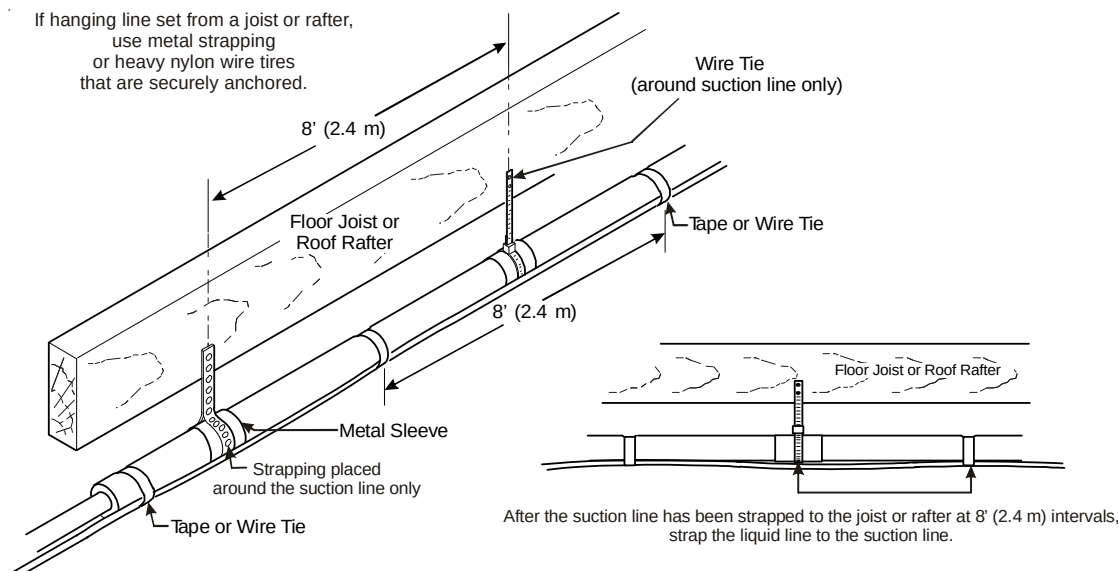


Figure 1-3. Installation of Refrigerant Piping (Horizontal)

11. **Heat Pump Application Only.** Liquid line solenoid must be installed less than 2 feet (61cm) from the outdoor unit following the solenoid supplier information for installation.
12. **Heat Pump Application Only.** Heating piston change (in the outdoor unit) is not required.
13. **Final Charge Adjustment.** All units must have refrigerant charge verified by proper adjustment of subcooling at the indoor unit after initial charge adjustment per Section 5. Proper adjustment means pressure and temperature of the liquid line at the indoor unit must be measured to calculate subcooling at the indoor unit. If subcooling at the indoor unit is less than 5°F, then additional refrigerant must be added until this subcooling level is achieved. If subcooling at the indoor unit is more than 7°F, then refrigerant must be removed until this subcooling level is achieved.

Section 2. Outdoor Unit and Indoor Unit are at the Same Elevation

Accessory	Air Conditioner (AC)	Heat Pump (HP)
Crankcase Heater (40 watts minimum)	Yes	Yes
Hard Start Assist	Yes (See manual for each product)	Yes (See manual for each product)
TXV (Indoor)	Yes	Yes
Liquid Line Solenoid at Outdoor (Kit # LSK02*)	No	Yes *See Note 6
Inverted Refrigerant Trap at Indoor	No	No
Oil Trap at Indoor	No	No

1. In a completely horizontal installation with a long line set where the indoor unit is at the same altitude as (or slightly below) the outdoor unit, the line set should be sloped continuously towards the indoor unit. This helps reduce refrigerant migration to the outdoor unit during a system's off-cycle.
2. The maximum elevation (vertical) difference for this section to be applicable is 10 feet (3.0 m) separation between outdoor unit and indoor unit. If outdoor unit is more than 10 feet (3.0 m) above indoor unit use Section 3. If outdoor unit is more than 10 feet (3.0 m) below indoor unit use Section 4.
3. Inverted suction loop is not required at either unit.

4. An accumulator is not required for air conditioners (accumulators are factory installed on heat pumps).
5. An oil trap at the indoor unit is not required.
6. Liquid Line Solenoid not required if non-bleed TXV is used on the outdoor unit.

SECTION 3. OUTDOOR UNIT IS ABOVE THE INDOOR UNIT

Accessory	Air Conditioner (AC)	Heat Pump (HP)
Crankcase Heater (40 watts minimum)	Yes	Yes
Hard Start Assist	Yes (See manual for each product)	Yes (See manual for each product)
TXV (Indoor)	Yes	Yes
Liquid Line Solenoid at Outdoor (Kit # LSK02*)	No	Yes *See Note 5
Inverted Refrigerant Trap at Indoor	No	No
Oil Trap at Indoor	Yes**	Yes**

**An oil trap at the indoor unit is required if the elevation difference exceeds 80' (24.4 m). The trap can be constructed of standard refrigerant fitting (See Figure 3-1.)

1. Suction line must be sloped continuously towards the indoor unit.
2. The maximum elevation (vertical) difference between the outdoor unit and indoor unit is:
 - a. not restricted in this configuration for single stage air conditioning units (must adhere to maximum equivalent length).
 - b. 80 feet (24.4m) for single stage heat pump units. Exception: 200ft (61 m) vertical separation allowed for 14 SEER Long Line Set models and 16 SEER single stage HP models.
 - c. 25 feet (7.6 m) for two stage units.
3. Inverted suction loop is not required at either unit.
4. An accumulator is not required for air conditioners (accumulators are factory installed on heat pumps).
5. Liquid Line Solenoid not required if non-bleed TXV is used on the outdoor unit.

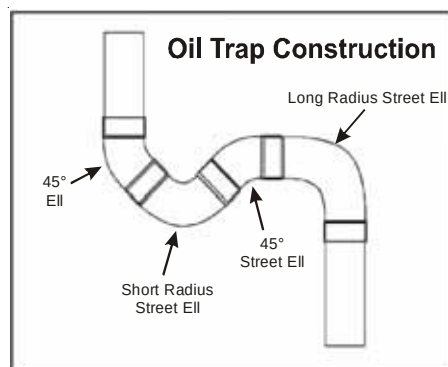
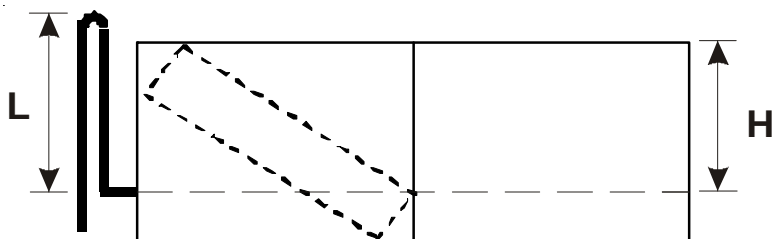


Figure 3-1. Oil Trap

SECTION 4. OUTDOOR UNIT IS BELOW THE INDOOR UNIT

Accessory	Air Conditioner (AC)	Heat Pump (HP)
Crankcase Heater (40 watts minimum)	Yes	Yes
Hard Start Assist	Yes (See manual for each product)	Yes (See manual for each product)
TXV (Indoor)	Yes	Yes
Liquid Line Solenoid at Outdoor (Kit # LSK02*)	Yes	Yes *See Note 5
Inverted Refrigerant Trap at Indoor	Yes	Yes
Oil Trap at Indoor	No	No

1. The maximum elevation (vertical) difference between the outdoor unit and the indoor unit is 80 feet (24.4 m).
2. Suction line must be installed in a manner to prevent liquid migration to the outdoor unit from the indoor unit (see following note 3).
3. An inverted suction line trap must be installed on the suction line just before the inlet to the indoor unit (see Figure 4-1). The top of the inverted loop must be slightly above the top of the indoor unit coil and can be created simply by brazing two 90° long radius elbows together if a bending tool is unavailable. Properly support and secure the inverted loop to the nearest point on the indoor unit or adjacent structure.
4. An accumulator is required to be added (external to the outdoor unit, within 2 linear feet (61 linear centimeters) of the outdoor unit) for air conditioning installations. See Table 4-1 for accumulator selection. Adapter fittings at the accumulator connection may be required. Do NOT install an accumulator in the suction line set in heat pump applications.
5. Liquid Line Solenoid not required if non-bleed TXV is used on the outdoor unit.



L = Length of trap must be more than Indoor Unit Height (H)

Figure 4-1. Indoor Unit with Inverted Suction

Total System Refrigerant Charge			Goodman Accumulator			
			Preferred		Minimum	
oz.	lb.	kg.	Part Number	Connection	Part Number	Connection
112	7	3.2	0151R00004P	3/4"	0151R00004P	3/4"
144	9	4.1	B1226206	3/4"	0151R00004P	3/4"
176	11	5.0	B1226207	7/8"	B1226206	3/4"
208	13	5.9	0151L00008	7/8"	B1226206	3/4"
240	15	6.8	0151L00009	7/8"	B1226207	7/8"
288	18	8.2	0151L00001	1 1/8"	0151L00008	7/8"
352	22	10.0	0151L00010	7/8"	0151L00001	1 1/8"
480	30	13.6	0151L00010	7/8"	0151L00010	7/8"

Table 4-1. Accumulator Size

SECTION 5. CALCULATIONS - TUBING EQUIVALENT LENGTH, TUBE SIZE AND REFRIGERANT

1. In long line applications the “equivalent line length” is the sum of the straight length portions of the suction line plus losses (in equivalent length) from 45 and 90 degree bends. Add the total straight (lineal) length of tubing to the equivalent length of elbows and bends to get total equivalent length.

$$\text{Equivalent length} = \text{Length}_{\text{Horizontal}} + \text{Length}_{\text{Vertical}} + \text{Losses from bends (see Table 5-1)}$$

2. Table 5-1 lists the equivalent length gained from adding bends to the suction line. Properly size the suction line to minimize capacity loss.

Type of Elbow Fitting	Inside Diameter (in)		
	3/4	7/8	1 1/8
90° short radius	1.7	2	2.3
90° long radius	1.5	1.7	1.6
45°	0.7	0.8	1

Table 5-1. Losses from suction line elbows (equivalent length, ft.)

Type of Elbow Fitting	Inside Diameter (in)		
	3/4	7/8	1 1/8
90° short radius	0.5	0.6	0.7
90° long radius	0.5	0.5	0.5
45°	0.2	0.2	0.3

Table 5-2. Losses from suction line elbows (equivalent length, m)

Table 5-1. Losses from suction line elbows (equivalent length, ft.)

EXAMPLE: 3/4” suction line using 3/4” elbows

$$150 \text{ feet of straight tubing} + (\text{four short radius elbows} \times 1.7) + (\text{2 long radius elbows} \times 1.5) = 150 + 3.4 + 3 = 156.4 \text{ equivalent feet}$$

3. Table 5-2 lists multiplier values to recalculate system cooling capacity as a function of a system’s equivalent line length (as calculated from the suction line) and the selected suction tube size.

NOTE: Select the proper suction tube size based on equivalent length of the suction line (see Tables 5-1 and 5-2) and recalculated system capacity.

Unit (Btu)	Suction Dia. (in)	Capacity Multiplier for Given Length (ft) ¹									
		25	50	75	100	125	150	175	200	225	250
18000	1/2	0.99	0.97	0.96	0.94	0.94	0.93	0.93	0.92	0.91	0.89
	5/8	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.97	0.97
	3/4	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99
24000	5/8	0.99	0.99	0.98	0.98	0.97	0.97	0.97	0.96	0.95	0.95
	3/4	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.97	0.97
	7/8 ²	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99
30000	5/8	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.94	0.93	0.92
	3/4	1.00	1.00	0.99	0.99	0.99	0.98	0.88	0.98	0.98	0.97
	7/8	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99
36000	5/8	0.99	0.98	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.88
	3/4	1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96
	7/8 ³	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98
42000	3/4	1.00	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.95	0.94
	7/8	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.97
	1 1/8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
48000	3/4	0.99	0.99	0.98	0.97	0.96	0.96	0.95	0.95	0.94	0.93
	7/8	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.97	0.97
	1 1/8 ⁴	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
60000	3/4	0.99	0.98	0.97	0.96	0.94	0.93	0.93	0.91	0.90	0.89
	7/8	1.00	0.99	0.98	0.98	0.97	0.97	0.96	0.94	0.95	0.95
	1 1/8 ⁴	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Table 5-3. Capacity Multipliers (feet)

¹ Equivalent length is to be used for capacity multiplier reduction.

² 7/8" suction line is not approved for 2-ton two stage heat pump applications.

³ 7/8" suction line is not approved for 3-ton two stage heat pump applications over 80 feet.

⁴ 1-1/8 suction line is not approved for 4-ton and 5-ton two stage heat pump applications over 80 feet.

Unit (Btu)	Suction Dia. (in)	Capacity Multiplier for Given Length (m) ¹									
		7.6	15.2	22.9	30.5	38.1	45.7	53.3	61.0	68.6	76.2
18000	1/2	0.99	0.97	0.96	0.94	0.94	0.93	0.93	0.92	0.91	0.89
	5/8	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.97	0.97
	3/4	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99
24000	5/8	0.99	0.99	0.98	0.98	0.97	0.97	0.97	0.96	0.95	0.95
	3/4	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.97	0.97
	7/8 ²	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99
30000	5/8	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.94	0.93	0.92
	3/4	1.00	1.00	0.99	0.99	0.99	0.98	0.88	0.98	0.98	0.97
	7/8	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99
36000	5/8	0.99	0.98	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.88
	3/4	1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96
	7/8 ³	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98
42000	3/4	1.00	0.99	0.99	0.98	0.97	0.97	0.96	0.96	0.95	0.94
	7/8	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.97
	1 1/8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
48000	3/4	0.99	0.99	0.98	0.97	0.96	0.96	0.95	0.95	0.94	0.93
	7/8	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.97	0.97
	1 1/8 ⁴	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
60000	3/4	0.99	0.98	0.97	0.96	0.94	0.93	0.93	0.91	0.90	0.89
	7/8	1.00	0.99	0.98	0.98	0.97	0.97	0.96	0.94	0.95	0.95
	1 1/8 ⁴	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Table 5-4. Capacity Multipliers (meters)

4. **Refrigerant Quantity Adjustment.** All residential R-410A outdoor units are factory charged for 15 feet (4.6 m) of line set.

To calculate the initial amount of extra refrigerant (in ounces):

- Subtract 15 feet (4.6 m) from the total linear (not equivalent) length of actual line set
- Multiply that value by 0.6 (oz. per foot) or 17.0 (g per meter) of R-410A refrigerant
- This will be the initial amount of R-410A refrigerant that must be added prior to final charge adjustment.

All systems must have final charge adjustment performed as required in Section 1. In most residential applications a minimal amount of additional refrigerant will be needed to account for the volume in the suction line. For some applications using 1 1/8" suction line and/or over 150 feet of lineal length (45.7 m), approximately 3 pounds (1.4 kg) of additional refrigerant may be needed to account for the suction line.

For a more precise calculation of refrigerant needs use Table 5-3. The additional refrigerant for given line lengths can be found in Table 5-4.

$$R_A (\text{oz.}) = (L_A - 15) \text{ ft.} \times 0.6 \text{ oz./ft.}$$

$$R_A (\text{g}) = (L_A - 4.6) \text{ m.} \times 55.8 \text{ g/m.}$$

Where:

R_A = Initial additional refrigerant needed

L_A = Actual lineal line set length

Line set sizes	Additional Refrigerant (oz. per lineal foot)	Additional Refrigerant (g. per lineal meter)
3/8" liquid only	0.60	55.8
3/8" liquid and 5/8" suction	0.63	58.6
3/8" liquid and 3/4" suction	0.67	62.3
3/8" liquid and 7/8" suction	0.74	68.8
3/8" liquid and 1 1/8" suction	0.78	72.5

Table 5-5 Additional Refrigerant Per Unit Length.

	Additional lineal line length over 15 feet						
	25	50	75	100	125	150	175
	Initial refrigerant addition (oz.)						
3/8" liquid line only	15	30	45	60	75	90	105
3/8" liquid line & 5/8" suction line	16	32	47	63	79	95	110
3/8" liquid line & 3/4" suction line	17	34	50	67	84	101	117
3/8" liquid line & 7/8" suction line	18	35	53	70	88	105	123
3/8" liquid line & 1-1/8" suction line	20	39	59	78	98	117	137

Table 5-6 Initial Refrigerant for Given Line Length (feet)

	Additional lineal length over 4.6 meters						
	7.6	15.2	22.9	30.5	38.1	45.7	53.3
	Initial refrigerant addition (kg)						
3/8" liquid line only	0.4	0.9	1.3	1.7	2.1	2.6	3
3/8" liquid line & 5/8" suction line	0.5	0.9	1.3	1.8	2.2	2.7	3.1
3/8" liquid line & 3/4" suction line	0.5	1	1.4	1.9	2.4	2.9	3.3
3/8" liquid line & 7/8" suction line	0.5	1	1.5	2	2.5	3	3.5
3/8" liquid line & 1-1/8" suction line	0.6	1.1	1.7	2.2	2.8	3.3	3.9

Table 5-7 Initial Refrigerant for Given Line Length (meters)

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NOTE: SPECIFICATIONS AND PERFORMANCE DATA LISTED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE

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