

BULLETPROOF AC

BUILT TO PERFORM. PROVEN TO LAST.

R-454B CONDENSER

INSTALLATION MANUAL

MODEL SIZES: 2, 3, 4, AND 5 TONS



FL LOCAL INVENTORY
AND SUPPORT



PROVEN RELIABLE
PERFORMANCE



CONTRACTOR-FRIENDLY
DESIGN

WWW.BULLETPROOFAC.COM
941-599-8999



A MESSAGE FROM

BULLETPROOF AC

BUILT TO PERFORM. PROVEN TO LAST.

At BulletProof AC, we're not just another HVAC brand — we're Florida born and Florida built. For over 25 years, our team has lived and worked in the same heat, humidity, and unpredictable weather that challenge your systems every day. That's why we engineer every product with one goal in mind: to outperform and outlast in the toughest conditions.

We take pride in crafting top-of-the-line HVAC equipment that combines durability, performance, and efficiency. Each unit is designed, tested, and refined right here in Florida to meet the highest standards of quality and reliability. Because when it comes to comfort, we know there's no room for compromise.

At the end of the day, we care about the people behind the systems — the technicians, contractors, and homeowners who rely on us to keep Florida cool. From our family to yours, thank you for trusting BulletProof AC to deliver HVAC products that truly live up to their name.

Sincerely,

The BulletProof AC Team

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SYMBOL & KEY

1.1 SYMBOL KEYWORDS



WARNING:

The safety warnings in this document are identified by warning triangles. The signal word at the beginning of each warning indicates the severity of the hazard if the instructions are not followed.

The following keywords are defined and used in this document:

-  **DANGER:** Indicates a hazardous situation that will result in death or serious injury if not avoided.
-  **WARNING:** Indicates a hazardous situation, which may lead to death or serious injury if not avoided.
-  **CAUTION:** Indicates a hazardous situation, which may cause mild to moderate injury if not avoided.
-  **NOTE:** Indicates information related to installation, operation, or maintenance that is not associated with personal injury.

Important Information



This symbol represents important information that is not harmful to people or property.

1.2 SAFETY

Read this manual completely before proceeding with installation or service.



WARNING:

- ▶ Failure to observe this warning may result in property damage, serious personal injury or death.
- ▶ After disconnecting power, wait at least 3 minutes for the capacitors to discharge before servicing electrical components.
- ▶ This manual must be left with the equipment owner after installation.



NOTICE:

- ▶ These instructions do not cover every installation variation or every condition that may be encountered in the field.
- ▶ If additional information is required, or if special installation conditions are encountered that are not covered in these instructions, contact your installing contractor or local distributor.



Installing a matched indoor and outdoor split system provides maximum efficiency, optimal performance, and improved system reliability.



This document contains wiring diagrams and maintenance information. This manual must be left with the equipment owner and retained for future reference.

WARNING:



- This unit must be installed by a qualified HVAC technician certified to handle refrigerants in accordance with applicable regulations.
- Installation, service, maintenance, and repair must be performed by qualified HVAC service personnel. Refrigerant handling must be performed by technicians certified as required by applicable regulations.
- Servicing shall be performed only as recommended by the manufacturer.
- Product removal and recycling must be performed by a certified technician.
- This unit is designed for outdoor installation. If installed indoors, the unit must be located in a room without continuous ignition sources (such as open flames, gas-fired appliances, or electric heaters).
- This unit is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the unit by a person responsible for their safety.

SAFETY

- Install the unit in accordance with the National Electrical Code (NEC) and all applicable state and local codes.
- Children should be supervised to ensure that they do not play with the unit.
- Before accessing the connection terminals, all power circuits must be disconnected.
- These instructions are intended for qualified personnel with adequate electrical and mechanical experience. Attempting to repair central air conditioning products may result in personal injury and/or property damage.



WARNING: DANGEROUS VOLTAGE

- Failure to observe this warning may result in property damage, serious personal injury or death.
- Can cause injury or death. Disconnect all remote electric power supplies before servicing. Follow proper locking/tagging procedures to ensure that the power supply will not be energized accidentally.



WARNING: REFRIGERANT OIL

Servicing air-conditioning equipment without proper training may result in property damage, serious injury, or death. This unit uses R-454B refrigerant, which operates at pressures approximately 50% to 70% higher than an R-22 system. Use only service tools and equipment rated for use with R-454B refrigerant. R-454B cylinders are color-coded and labeled. Some cylinders may include a dip tube to allow liquid refrigerant to be charged into the system. These systems use POE oil (VG74, VG75 or equivalent), which can easily absorb moisture from the atmosphere. To minimize moisture absorption, keep the system sealed whenever possible. If the system remains open to the atmosphere for an extended period, replace the compressor oil and filter drier. Do not break the vacuum with air. Always replace the filter drier when you open the system for component replacement.



WARNING: HOT SURFACE

Hot surface. Contact may cause burns. Failure to follow this warning may result in personal injury. Do not touch the top of the compressor.



CAUTION: CONTAINS REFRIGERANT

Failure to follow proper procedures may result in personal injury or equipment damage. The system contains high-pressure oil and refrigerant. Before opening the sealed system, recover the refrigerant and verify that the system is at 0 PSIG.



NOTE:

The manufacturer recommends installing only approved matched indoor and outdoor systems. AHRI ratings apply only when this unit is matched with an approved TXV equipped indoor unit. Matched indoor and outdoor systems are required to achieve rated capacity, efficiency, and system reliability.

**NOTE: GROUNDING REQUIRED**

Failure to check or use the correct maintenance tools may result in equipment damage or personal injury. Reconnect all grounding conductors and grounding hardware. All parts of this product that can conduct current are grounded. If the grounding wire, screw, strap, clip, nut or washer used to complete the grounding path is removed during maintenance, it must be put back in place and properly fixed.

**WARNING: SERVICE VALVE**

Failure to follow this warning may cause sudden release of system pressure, which may result in personal injury and/or property damage. When opening the liquid line service valve, be extra careful. Turn the valve stem counterclockwise until it fully back-seats against the internal stop.

**NOTE: INDOOR UNIT REQUIRED**

The indoor unit must be matched with a properly sized TXV-equipped indoor coil or air handler. The TXV must be properly matched to system capacity.

**WARNING: BRAZING REQUIRED**

Failure to verify wiring connections or use proper service tools may result in equipment damage or personal injury. If using existing refrigerant lines, make sure that all joints are brazed, not soldered.

**WARNING: ELECTRICAL SHOCK HAZARD**

Failure to observe this warning may result in property damage, serious personal injury or death. The unit must be properly grounded before power is connected.

**WARNING: CALIFORNIA PROPOSITION 65**

This product may expose you to chemicals including lead and lead components, which are known to cause cancer, birth defects or other reproductive harm in California. For more information, please visit www.P65Warnings.ca.gov.

**WARNING: FLAMMABLE REFRIGERANT**

- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- This unit is designed for outdoor installation only. If the unit is stored or installed indoors, it must be located in a space free of continuously operating ignition sources, such as open flames, gas-fired appliances, or electric heaters.
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odor.

SAFETY

	WARNING	This symbol indicates that the unit uses a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire.
	CAUTION	This symbol indicates that the operation manual should be read carefully.
	CAUTION	This symbol indicates the equipment must be serviced by qualified personnel following the installation manual.
	CAUTION	This symbol indicates that additional information is provided in the operating or installation manual.

1.3 SAFETY PRECAUTIONS FOR R454B REFRIGERANT

WARNING

- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- The unit shall be stored in an area free of continuously operating ignition sources, such as open flames, gas-fired appliances, or electric heaters.
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odor.

Qualified Personnel

All maintenance, service, and repair procedures that affect safety must be performed by qualified personnel, including work involving the refrigerant circuit, sealed components, or ventilated enclosures.

Area Safety Checks

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized.

Work Procedure

Work must be performed using a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

General Work Area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

Checking for Presence of Refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the

technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

Presence of Fire Extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire-extinguishing equipment must be readily available. Keep a dry chemical or CO₂ fire extinguisher nearby when servicing refrigerant systems.

No Ignition Sources

Anyone performing work that exposes refrigerant piping must keep all ignition sources away from the work area. Smoking must be prohibited in the installation, service, removal, and disposal area, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Ventilated Area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Equipment Checks

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

- Verify the refrigerant charge is appropriate for the installation space in accordance with applicable safety codes.
- The ventilation machinery and outlets are operating adequately and are not obstructed;
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant
- Equipment markings must remain visible and legible. Markings and signs that are illegible shall be corrected;
- Refrigerant piping and components must be installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

SAFETY

Electrical Component Checks

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised. Initial safety checks shall include:

- That capacitors are discharged: this shall be done in a safe manner to avoid the possibility of sparking;
- That no live electrical components and wiring are exposed while charging, recovering or purging the system;
- Verify continuity of the equipment grounding path

Repairs to Sealed Components

Sealed electrical components shall be replaced.

Repair to Intrinsically Safe Components

Intrinsically safe components must be replaced.

Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Detection of Flammable Refrigerants

Under no circumstances may ignition sources be used when searching for or detecting refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper tubing.

If a leak is suspected, all naked flames shall be removed/extinguished.

If a refrigerant leak is found and brazing is required, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Recover refrigerant using the procedure in the Removal and Evacuation section.

Removal and Evacuation

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- Safely remove refrigerant following local and national regulations;
- Evacuate;
- Purge the circuit with inert gas (optional for A2L);
- Evacuate (optional for A2L);
- Continuously flush or purge with inert gas when using flame to open circuit; and
- Open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For units containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the unit safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For units containing flammable refrigerants, purge the system with oxygen-free nitrogen and continue charging with nitrogen until the required pressure is reached, then vent the nitrogen to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging Procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure the system is grounded before charging.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

SAFETY

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details. It is recommended that all refrigerant be recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- A) Become familiar with the equipment and its operation.
- B) Isolate the system electrically.
- C) Before attempting the procedure, ensure that:
 - Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - All personal protective equipment is available and being used correctly;
 - The recovery process is supervised at all times by a competent person;
 - Recovery equipment and cylinders conform to the appropriate standards.
- D) Pump down the refrigerant system, if possible.
- E) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- F) Make sure the recovery cylinder is placed on the scale before recovery begins.
- G) Start the recovery machine and operate in accordance with instructions.
- H) Do not overfill cylinders (no more than 80 % volume liquid charge).
- I) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- J) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- K) Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Labeling

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For units containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerants.

Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment available on site and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant required waste-handling documentation arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

UNIT LOCATION

2.1 UNIT SIZE

TABLE 2.1 OUTDOOR OPERATING TEMPERATURE

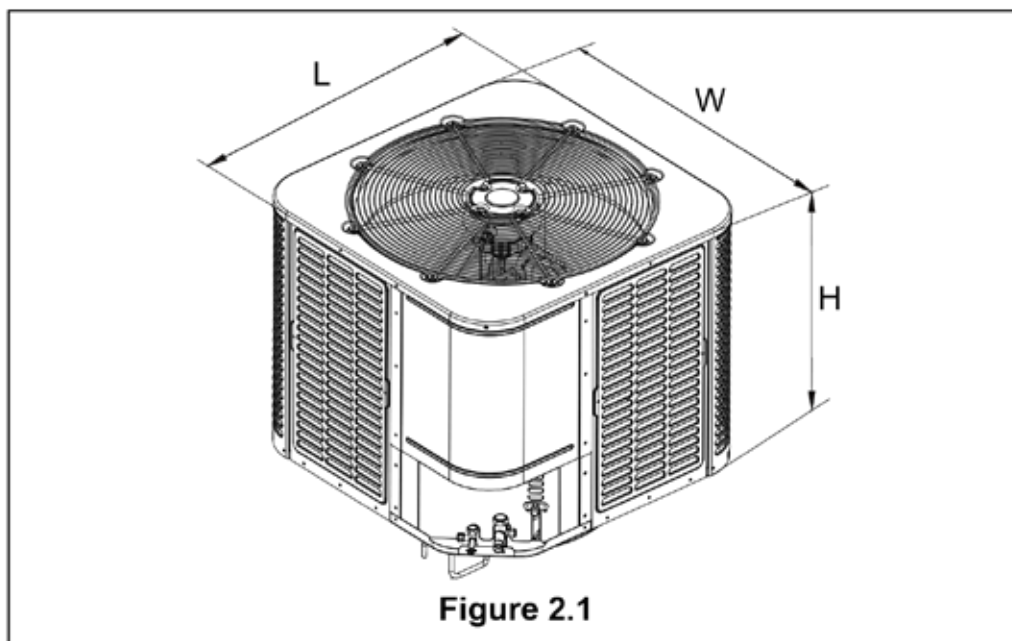
Model	Temperature
Cooling	5°F to 125°F
Heating	-4°F to 86°F

TABLE 2.2 UNIT SIZE

Model	H x W x L (inches)
24/36K	25 x 29-1/7 x 29-1/7
48/60K	32-7/8 x 29-1/7 x 29-1/7

The unit weight is listed on the carton label.

When installing the outdoor unit on the roof, make sure that the roof can support the weight of the outdoor unit. Use appropriate vibration isolation to prevent sound and vibration transmission to the building structure.



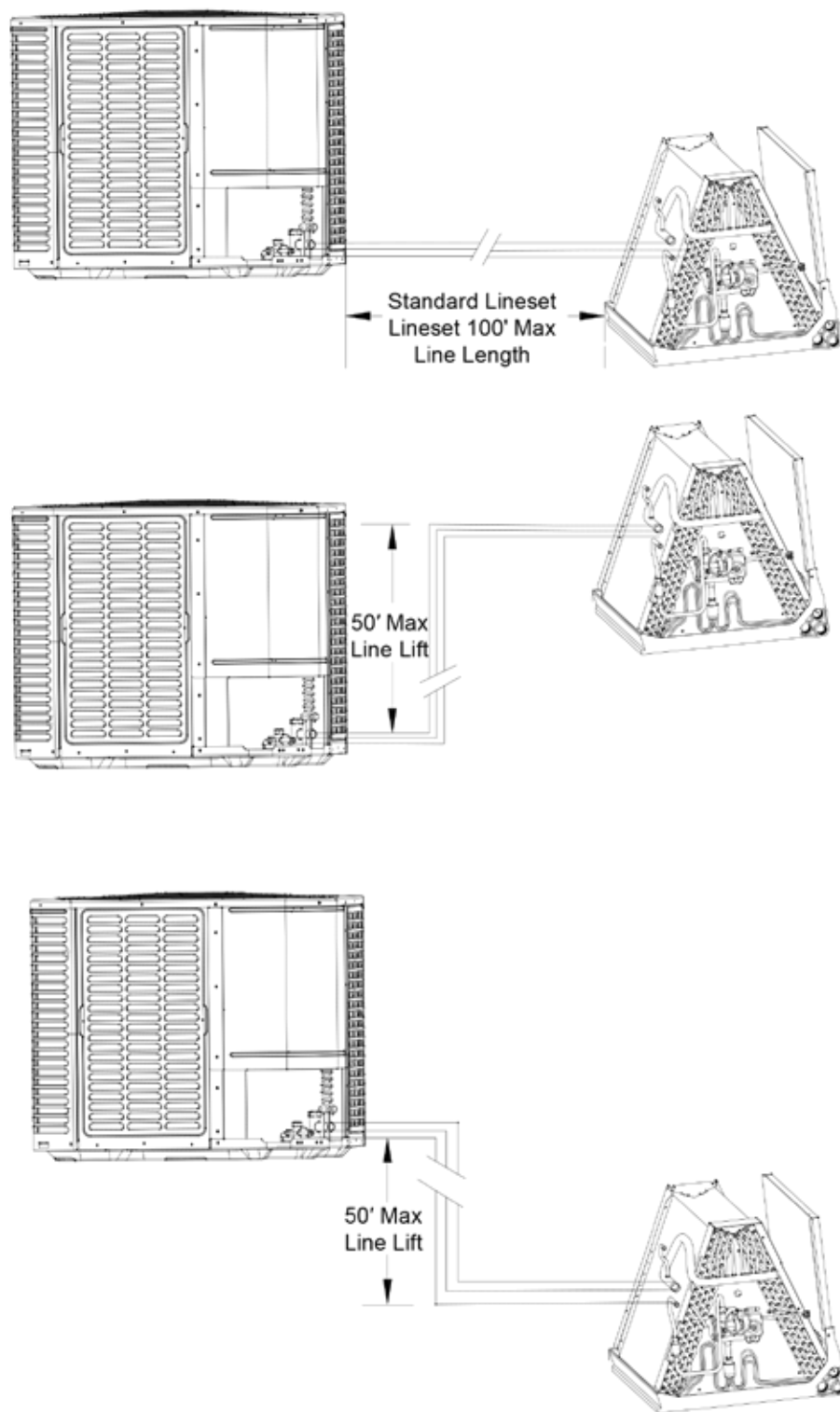
2.2 REFRIGERANT LINE LIMITATIONS

Refrigerant line		Capacity (kBtu/h)			
		24K	36K	48K	60K
Liquid Suction	Inches	3/8-3/4	3/8-3/4	3/8-7/8	3/8-7/8
Max. Refrigerant	Ft.	100			
Line Length*					
Max. Elevation*	Ft.	50			
Vertical Lift**					

*Use the standard refrigerant line sizes listed; Refrigerant charge: see Section 14.

- ▶ **Maximum equivalent refrigerant line length: 100 feet**
- ▶ **Maximum vertical equivalent length = 50 feet.**
- ▶ **Use only the refrigerant line sizes shown in the applicable sizing table.**
- ▶ **If the suction line exceeds 65 feet, do not use a larger suction line than recommended.**

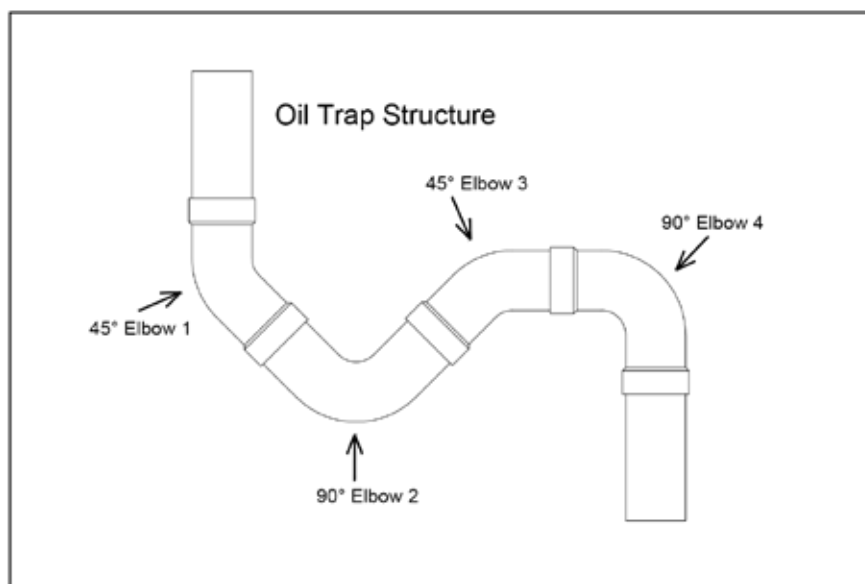
UNIT LOCATION



2.3 LONG LINE INSTALLATION PRECAUTIONS

- Note that the refrigerant line set between the outdoor unit and indoor unit cannot exceed 100 ft.
- If the line set is routed horizontally, no additional measures are required.
- If the line set includes vertical rise, install oil traps as required below:
 - For vertical lift up to 16.5 ft, no oil trap is required.
 - If the vertical lift is greater than 16.5 ft and up to 33 ft, install one oil trap at the midpoint.
 - If the vertical lift is greater than 33 ft and up to 50 ft, install two evenly spaced oil traps.

NOTE: The vertical height difference between the outdoor unit and the indoor unit cannot exceed 50 feet. Install the oil trap as shown below.

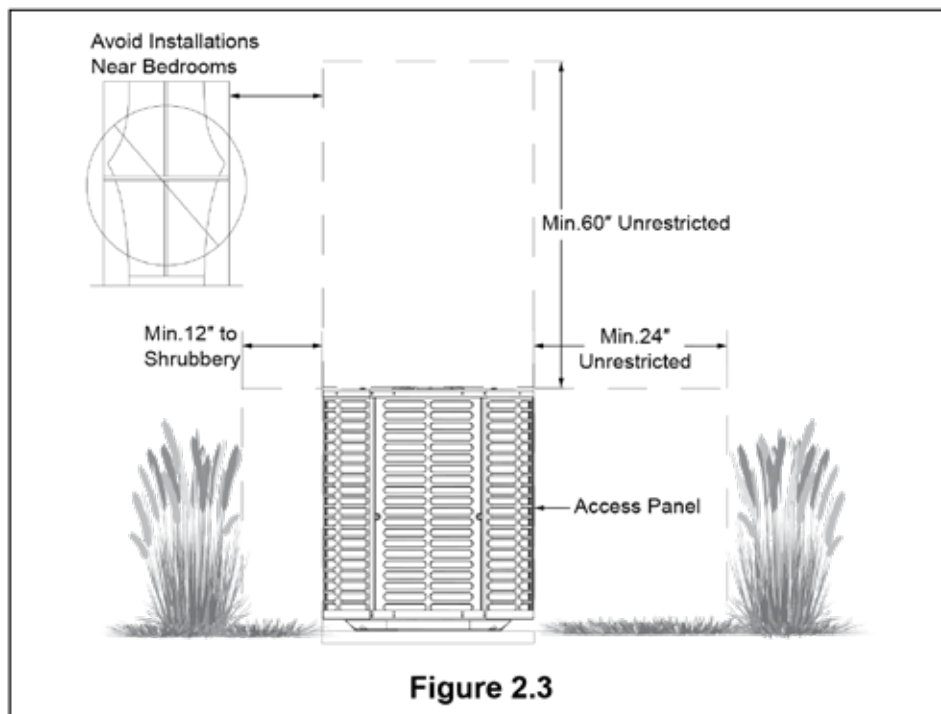


2.4 INSTALLATION CLEARANCES

- Make sure there is at least 60 inches of unobstructed clearance above the top of the unit.
- Position the outdoor unit to allow adequate airflow, refrigerant line routing, wiring access, and service clearance.

UNIT LOCATION

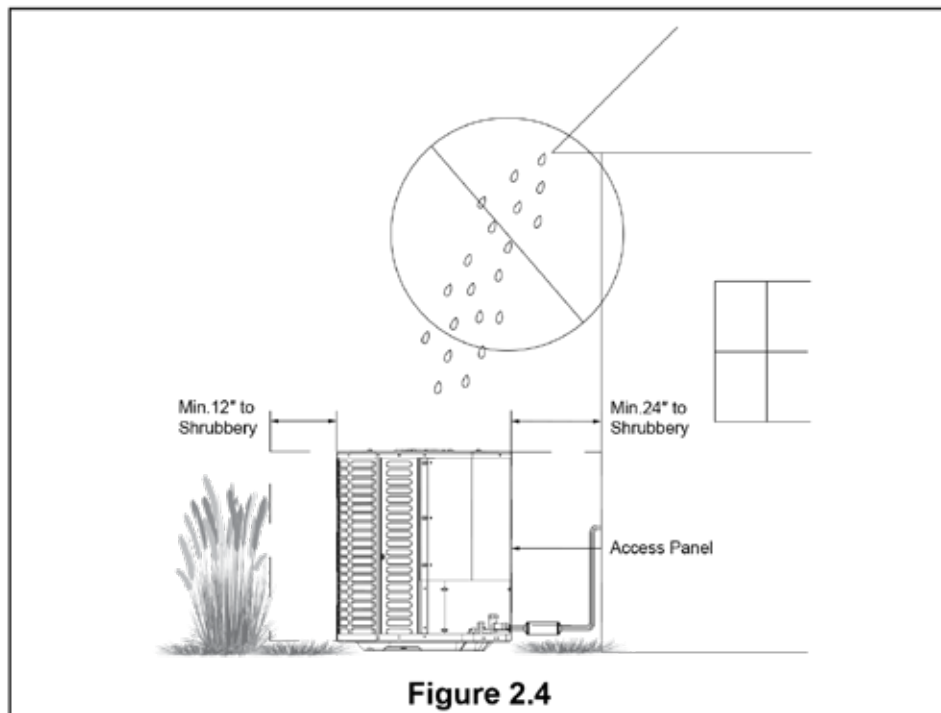
- Provide a minimum clearance of 12 inches on the control-panel side and 24 inches on the adjacent side.
- Maintain at least 24 inches of clearance between adjacent units.
- Install the unit where water, snow or ice cannot fall directly on the unit from the roof or overhangs.
- See figures 2.3 and 2.4.



Corrosive Environment

Exposure to corrosive environments may shorten the service life of the unit. Corrosive exposure can corrode metal parts and negatively affect unit performance. Corrosive elements include but are not limited to: sodium chloride, sodium hydroxide, sodium sulfate and other compounds commonly found in seawater, sulfur, chlorine, fluorine, fertilizers and various chemical pollutants from industrial/manufacturing plants. If the unit is installed in a corrosive environment, special attention must be given to placement and maintenance.

- Do not allow lawn sprinklers, hoses, or wastewater to spray directly on the unit cabinet for extended periods.
- Fences or shrubs can provide some shielding protection for the unit, but the minimum unit clearance must still be kept.
- Clean outdoor coil and exposed surfaces every three months in corrosive environments.



Cold-Climate Precautions (Heat Pump Only, Below-Freezing Conditions)



Precautions must be taken for units installed in areas with snow and long-term temperatures below freezing.

- Depending on the local weather conditions, the unit should be raised by 3 to 12 inches. This added height allows melted water from the defrost cycle to drain before it can refreeze. Make sure the drain hole in the base pan is not blocked. Otherwise, defrost water may not drain properly. (Figure 2.5).
- If possible, avoid places that are prone to snow. If this is not feasible, a snow barrier should be installed around the unit to prevent snow accumulation on the side of the unit.

UNIT SETTINGS

4.1 PAD INSTALLATION

When installing the unit on a support pad (such as a concrete slab), observe the following requirements:

- All sides of the pad must be at least 1 to 2 inches larger than the unit.
- The pad must be separated from any structure.
- The pad must be level.
- The pad must be high enough above the ground for drainage.
- The location of the pad must comply with all applicable national, state and local codes.



These instructions provide a general method for securing the unit to a concrete pad in high-wind areas. Verify tie-down requirements with all applicable local codes and wind-load regulations.

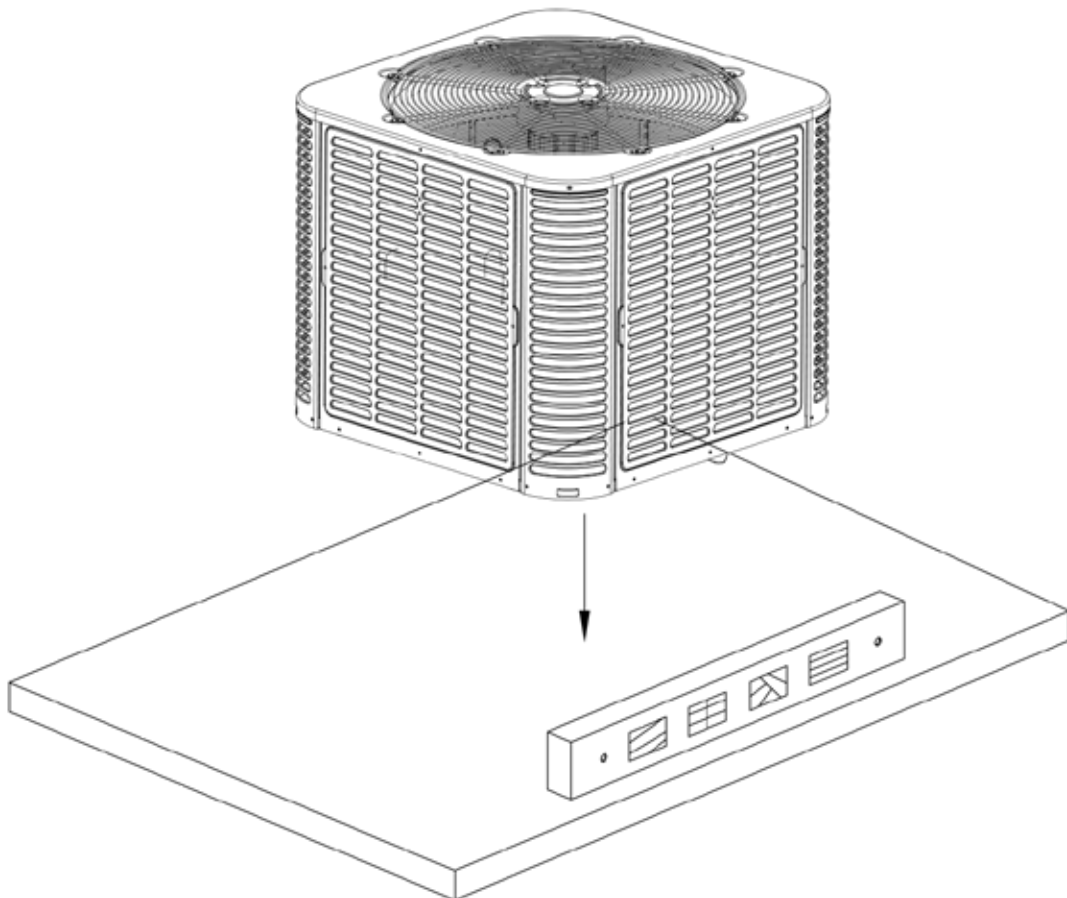


Figure 4.1

LINE SET PRECAUTIONS

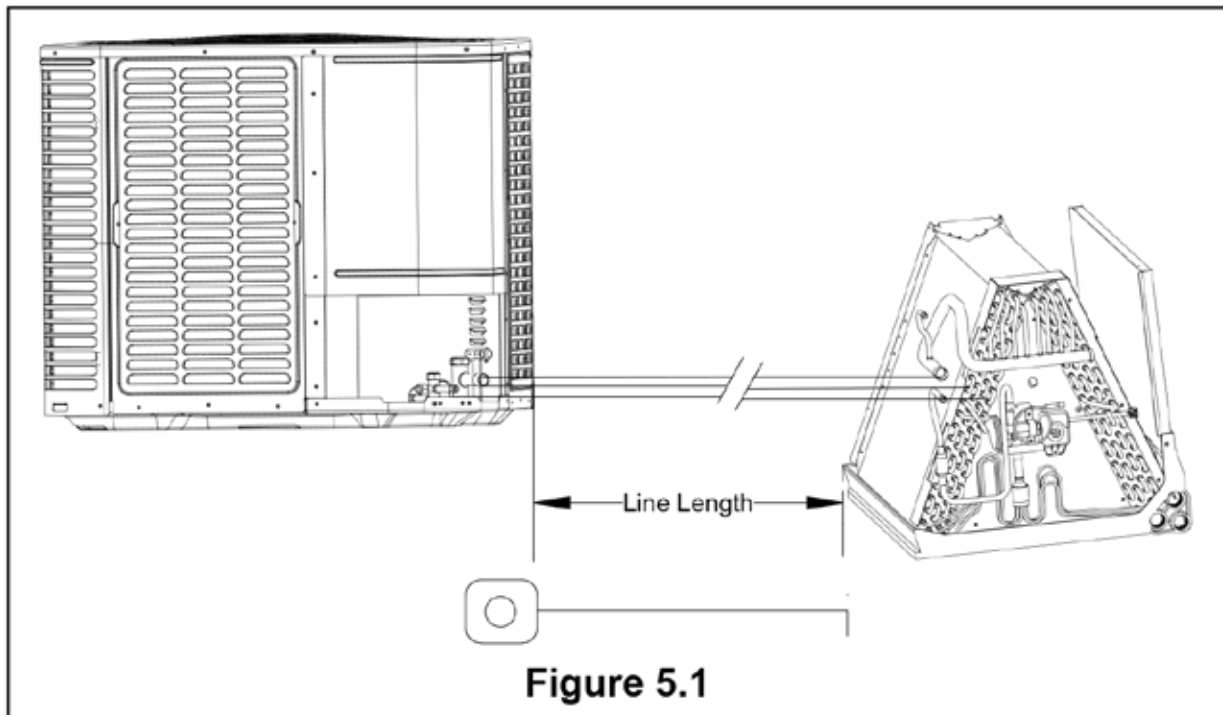
5.1 REFRIGERANT LINE AND SERVICE VALVE CONNECTION SIZES

TABLE 5.1

MODEL	Suction Line	Liquid Line	Suction Line Connection	Liquid Line Connection
	All line sizes are shown in inches.			
24K/36K	3/4	3/8	3/4	3/8
48K/60K	7/8	3/8	7/8	3/8

5.2 REQUIRED REFRIGERANT LINE LENGTH

Determine the required refrigerant line length (see Figure 5.1 and Table 2.2).

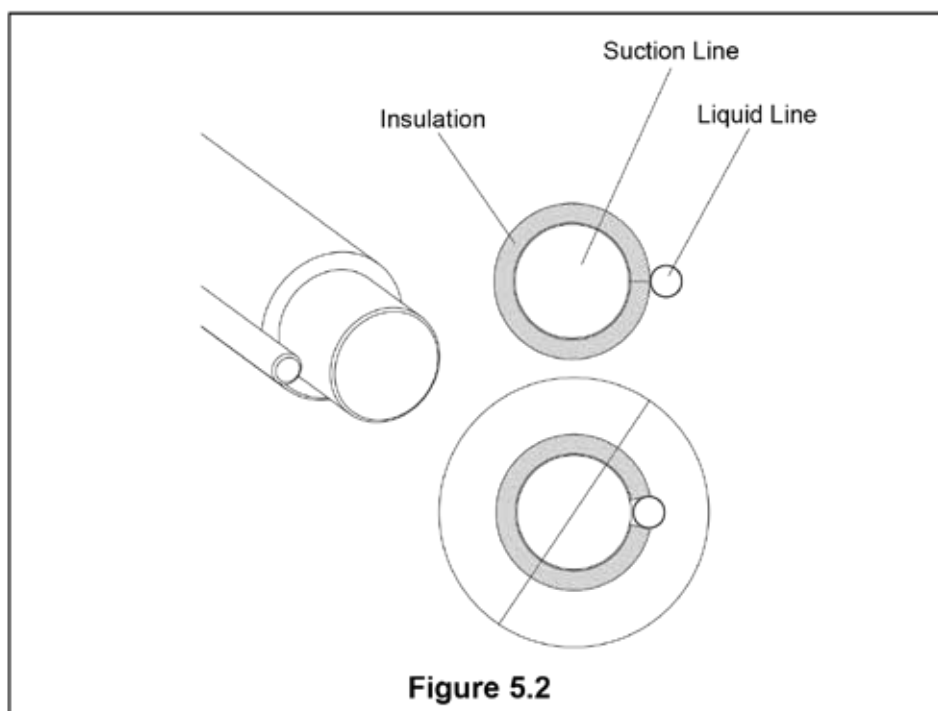


LINE SET PRECAUTIONS

5.3 REFRIGERANT PIPE INSULATION



Insulate the suction line. Where required by local conditions, insulate the liquid line separately.



5.4 REUSE THE EXISTING REFRIGERANT LINES



CAUTION: BURN HAZARD

If using existing refrigerant lines, make sure that all joints are brazed, not soldered.

For retrofit applications that reuse existing refrigerant lines, observe the following precautions:

- Make sure the refrigerant line size is correct. Refer to Table 2.2 on page 12.
- Ensure the refrigerant lines are free of leaks, acid contamination, or residual mineral oil.



The manufacturer recommends that only approved matched indoor and outdoor systems be installed. AHRI ratings apply only when this outdoor unit is matched with an approved TXV equipped indoor unit. The benefits of installing an approved indoor and outdoor split system are maximum efficiency, best performance and best overall system reliability.

LINE SET ROUTING

6.1 VIBRATION ISOLATION MEASURES

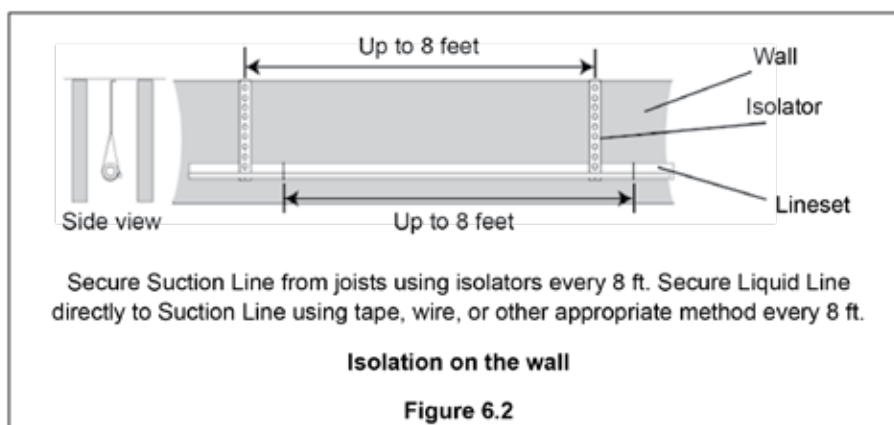
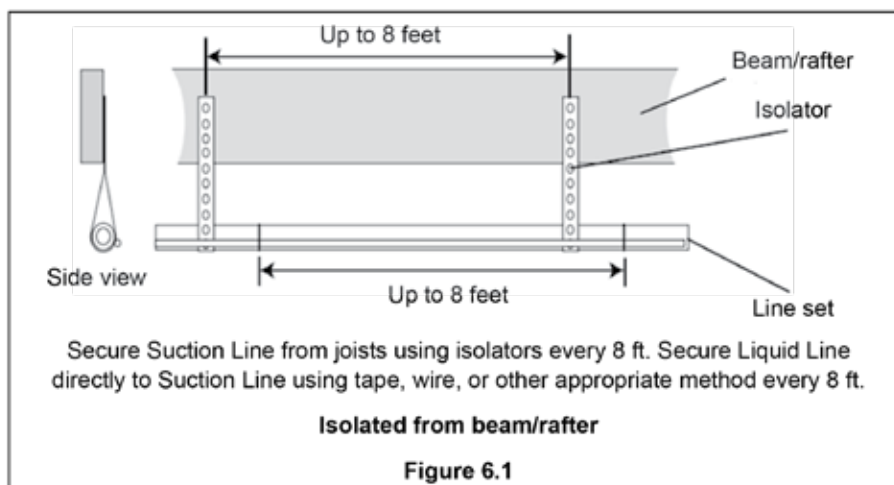


Prevent vibration from refrigerant piping from transmitting noise through the building structure. To reduce vibration and noise:

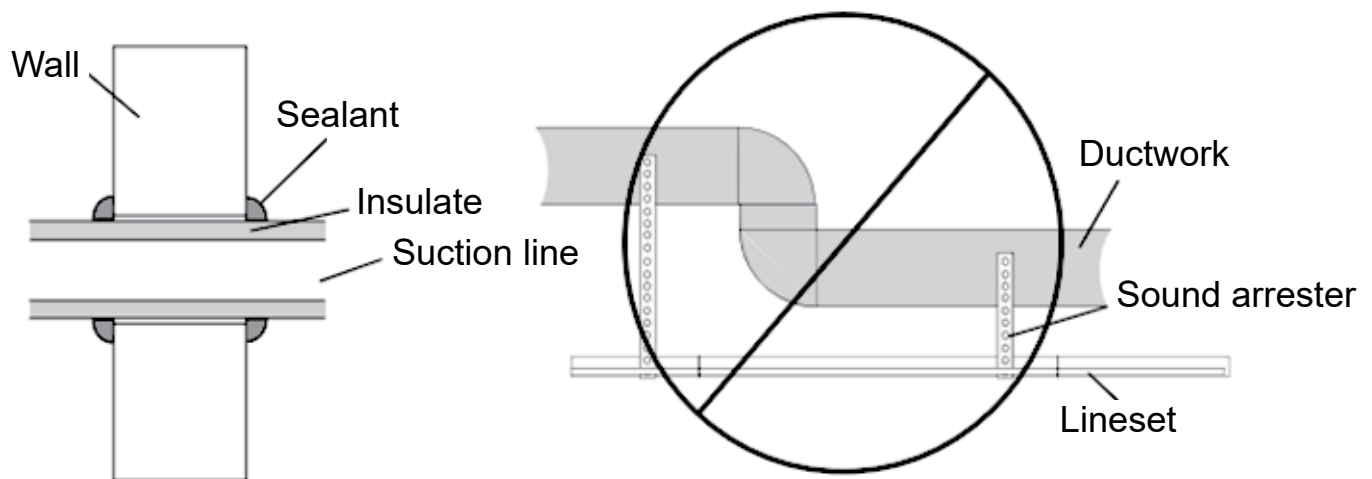
- Use vibration-isolating hangers when securing refrigerant lines to floor joists or structural framing.
- Use isolators when routing lines through ceiling cavities or wall spaces.
- Insulate refrigerant lines where they pass through walls or structural members.
- Avoid attaching refrigerant lines directly to ductwork.



Comply with national, state and local regulations when isolating the line set from joists, rafters, walls, and other structural members.



LINE SET ROUTING



Wall isolation

Do not hang the lineset on the duct work.

Figure 6.3

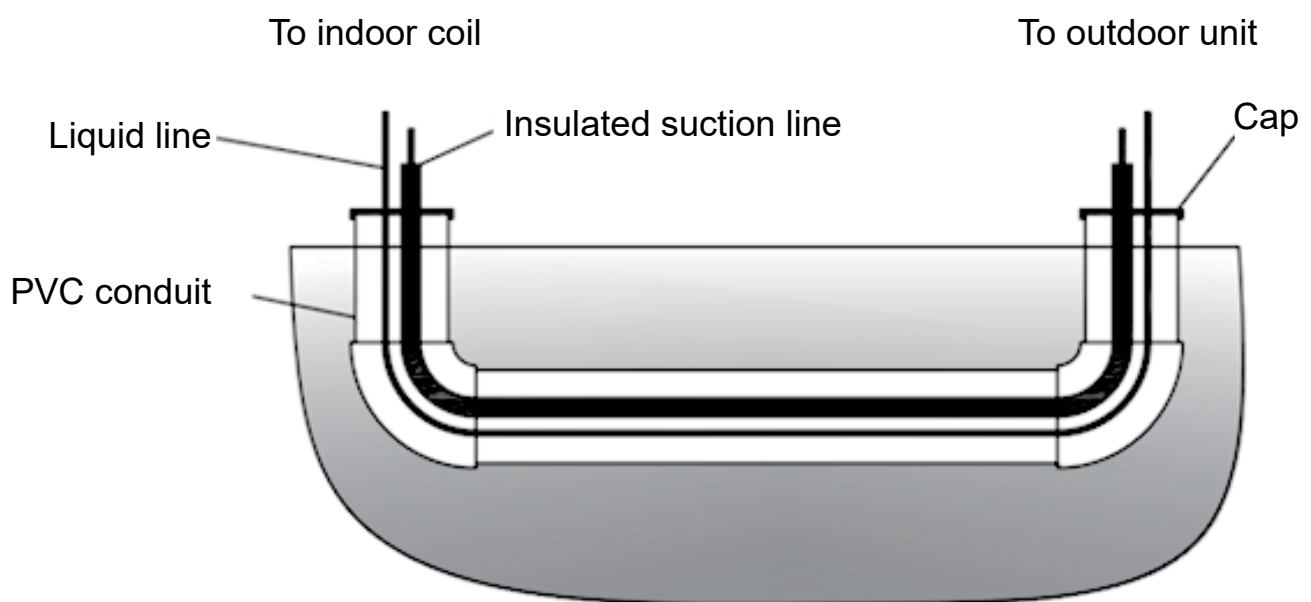
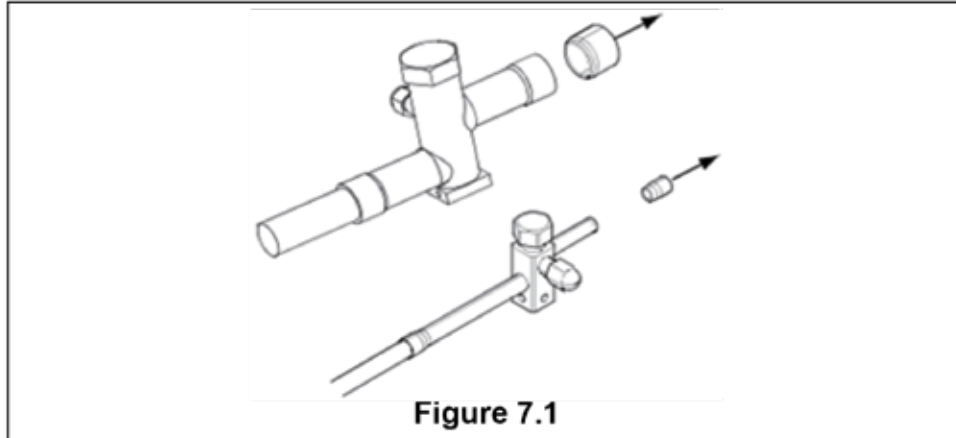


Figure 6.4

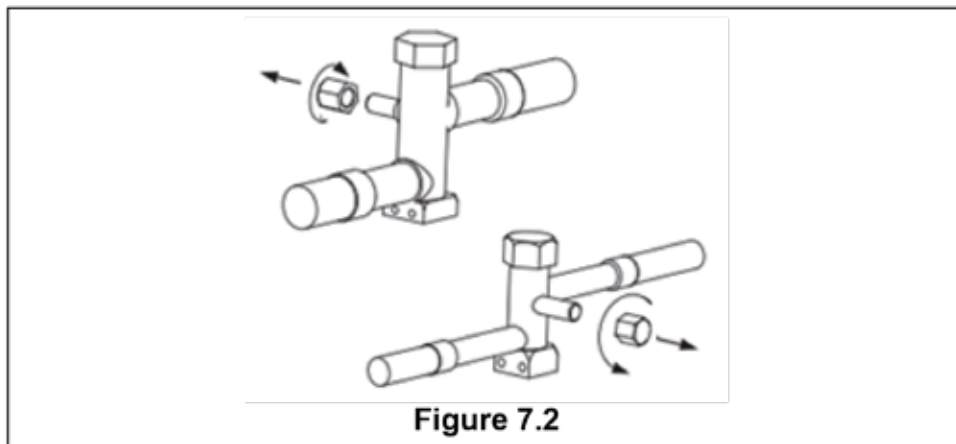
LINE BRAZING

7.1 BRAZING REFRIGERANT LINES

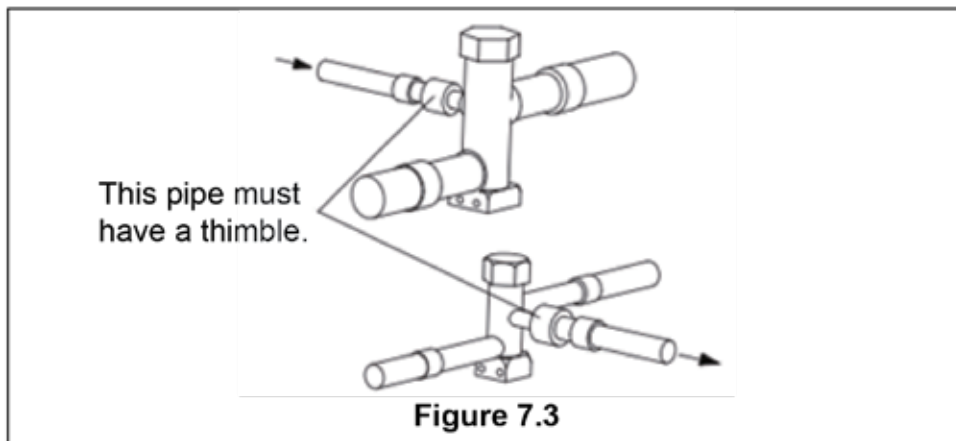
1. Remove the protective cap or shipping plug from the refrigerant line connection. Use the deburring tool to deburr the line end. Clean the inside and outside surfaces of the tubing using emery cloth.



2. Remove the service-port caps from both service valves.



3. Purge refrigerant lines and indoor coils with dry nitrogen.



LINE BRAZING

4. Wrap the valve body with a wet rag to avoid thermal damage, and continue purging with dry nitrogen (Figure 7.4).

Braze the refrigerant line to the service valve.

Braze the filter drier to the liquid line.

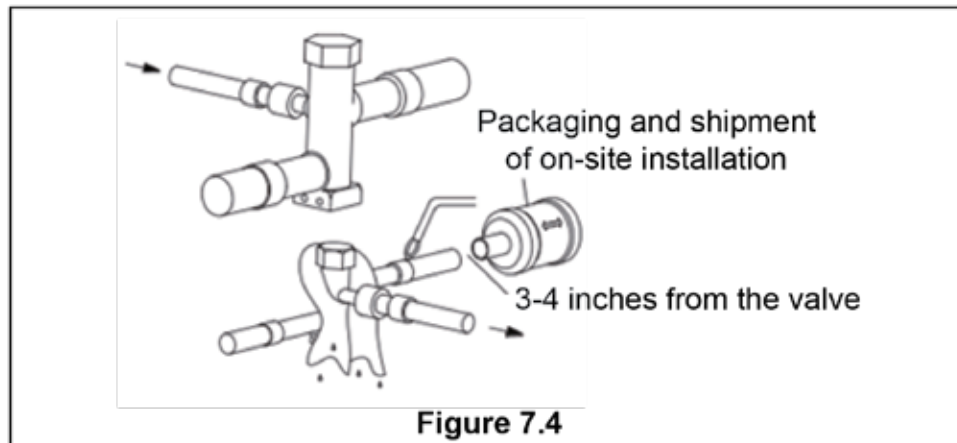


Install a bi-flow filter-drier in the liquid line. Braze the filter drier to the liquid line. Do not force the tubing against the internal stop of the filter drier, as this may damage the component.

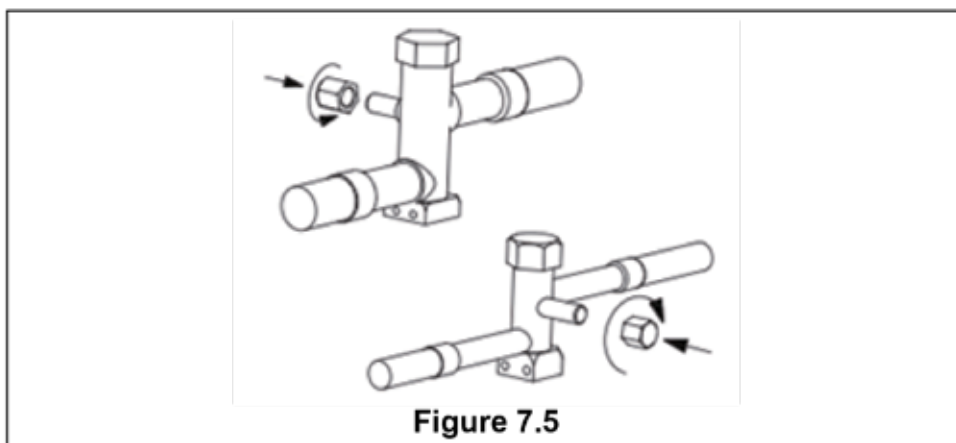
Maintain nitrogen purge during brazing. Do not remove the wet rag until brazing is complete.



After brazing is complete and the valve has cooled sufficiently, remove the wet rag and stop the nitrogen purge.



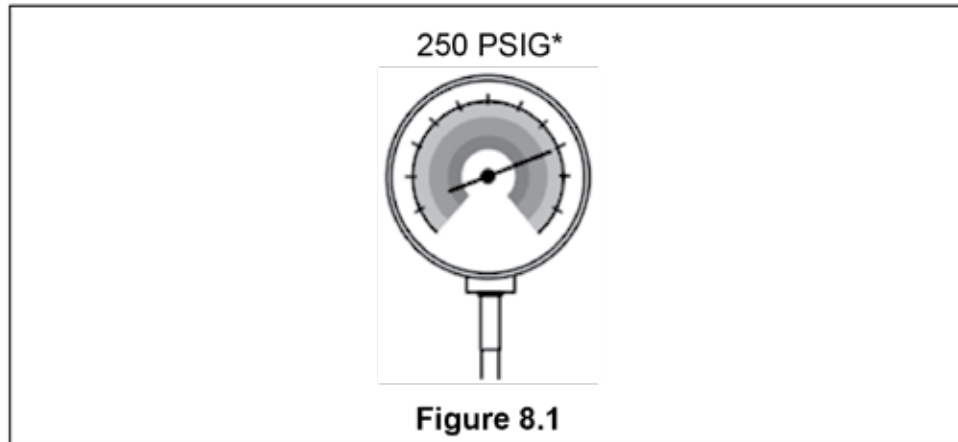
5. Reinstall the pressure tap fitting/cap after the service valve has cooled.



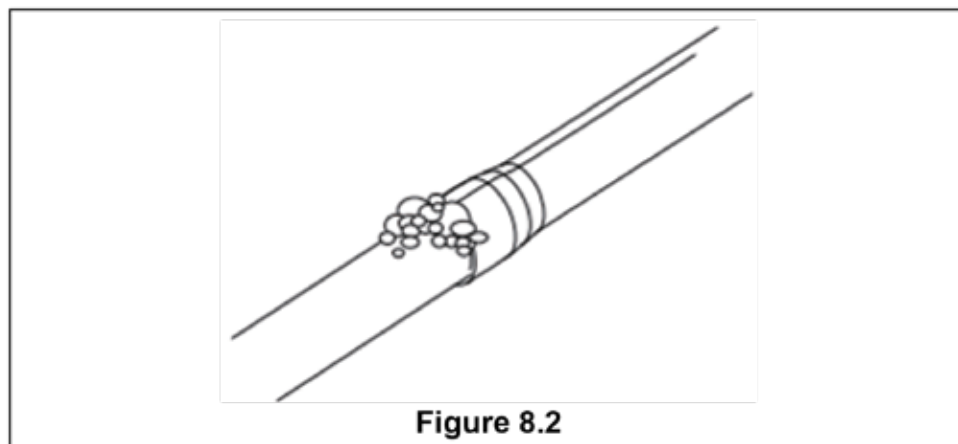
LINE LEAK INSPECTION

8.1 CHECK FOR LEAKS

1. Pressurize the refrigerant line set and indoor coil with dry nitrogen to 250 PSIG and check all joints for leaks.



2. Use an electronic leak detector to check each brazed joint for leaks.



*NOTE: Pressure-test the field-installed refrigerant piping and indoor coil with dry nitrogen to 250 PSIG, or to the unit's low-side design pressure shown on the nameplate, whichever requirement is applicable.

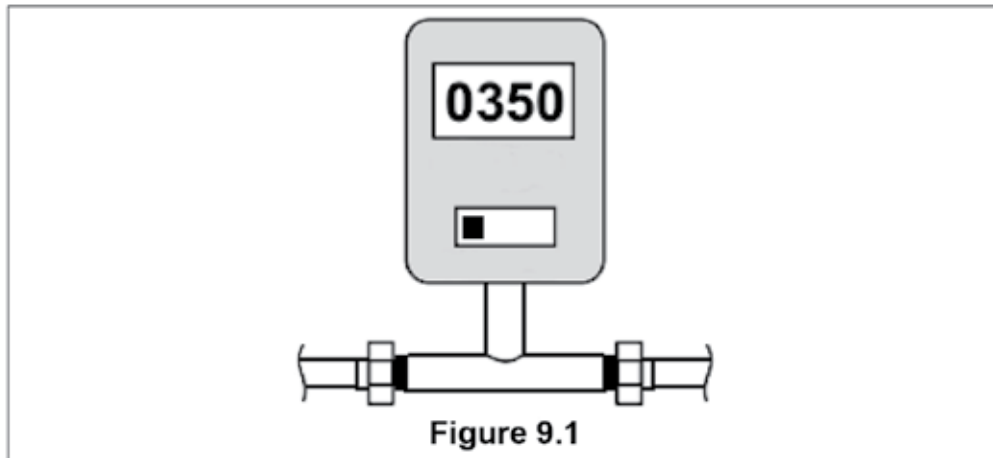
VACUUMING

9.1 EVACUATION PROCEDURE

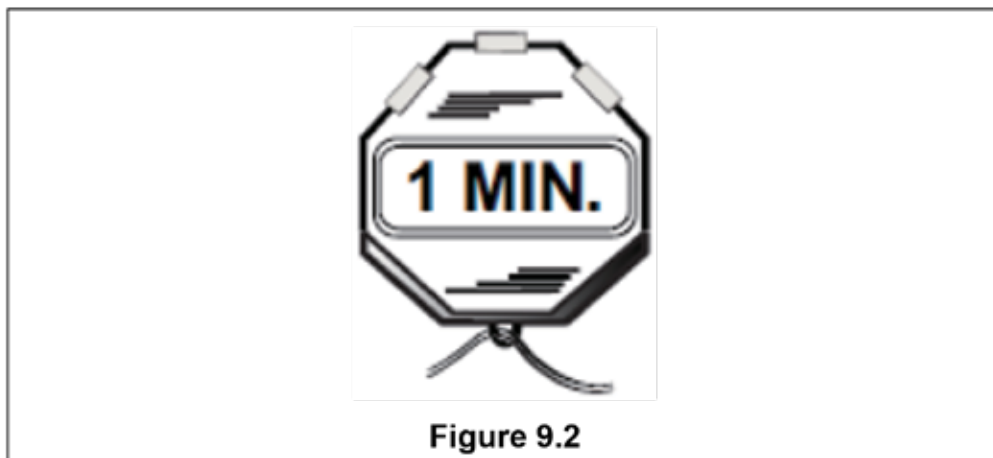


Do not open the service valve until the leak testing and evacuation of refrigerant lines and indoor coils are completed.

1. Evacuate until the micron gauge reads no higher than 350 microns, then close the valve to the vacuum pump.



2. Monitor the micron gauge. If the micron gauge does not rise above 500 microns within one (1) minute, the evacuation is complete. After evacuation is complete, turn off the vacuum pump and micron gauge, and close the valve on the manifold gauge set.



SERVICE VALVE

10.1 OPEN THE SERVICE VALVE



WARNING: BURN HAZARD

When opening the liquid line service valve, be extra careful. Turn counterclockwise until the valve stem seats against the stop. Do not apply additional torque. Failure to follow this warning may result in the sudden release of system pressure, causing personal injury and/or property damage.

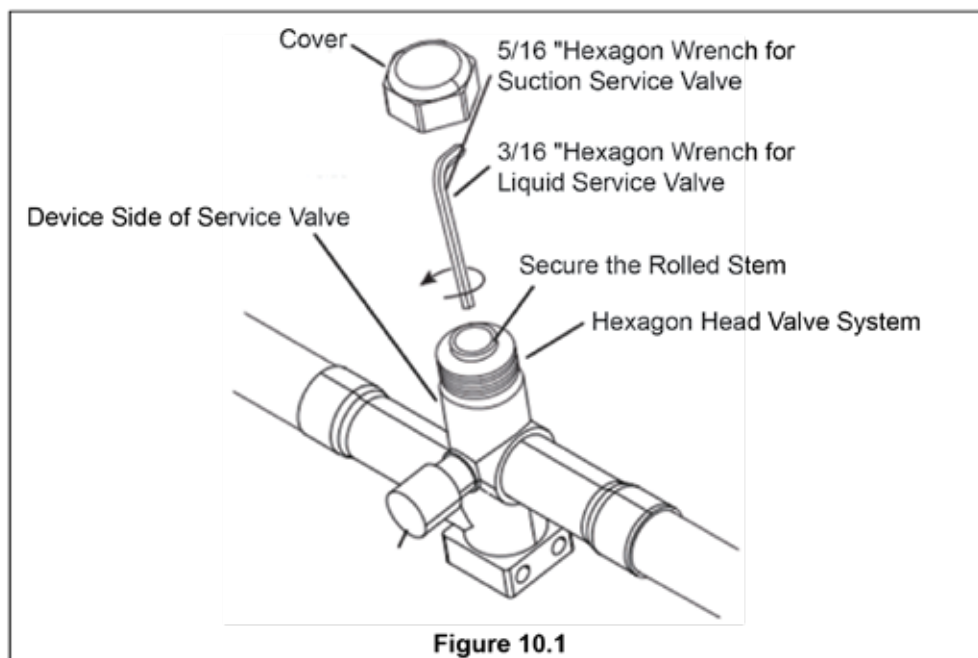


Before opening the service valve, the leak test and evacuation must be completed. Use the service ports on the brazed refrigerant lines for leak testing and evacuation. Do not use a separate suction port if doing so would result in refrigerant loss.



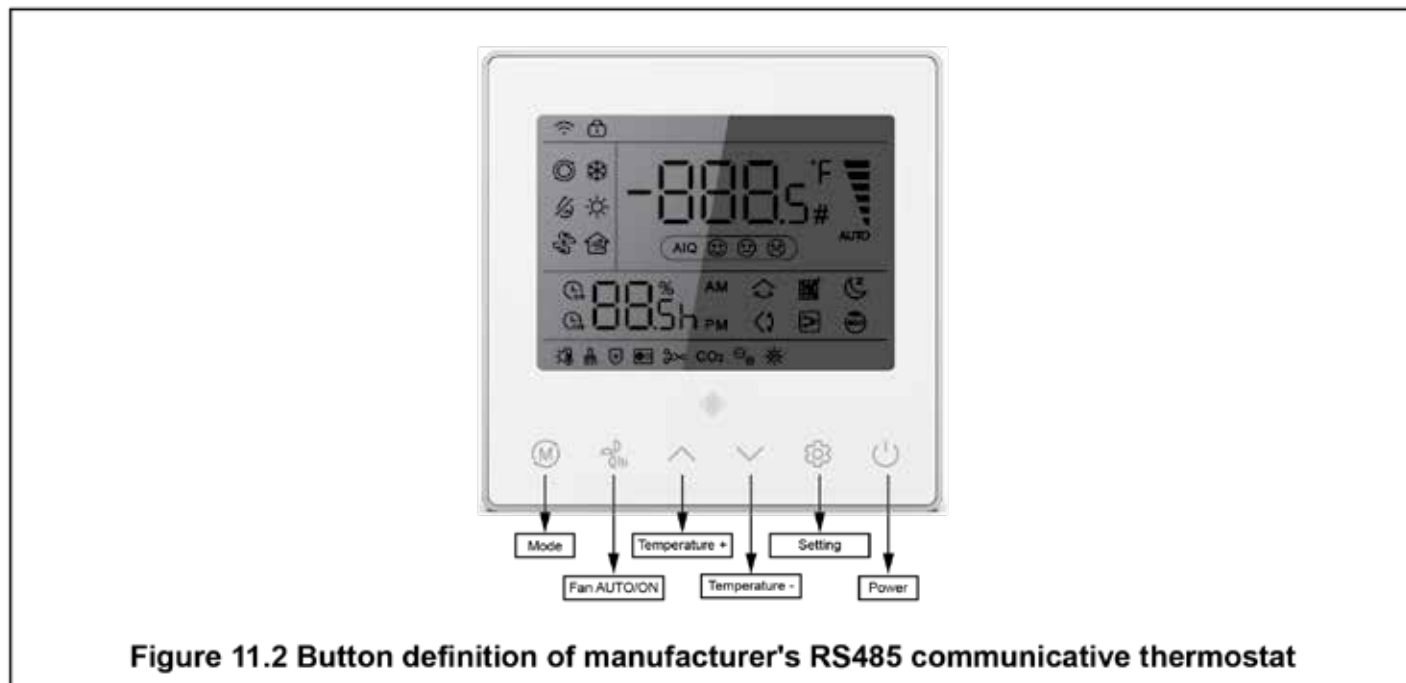
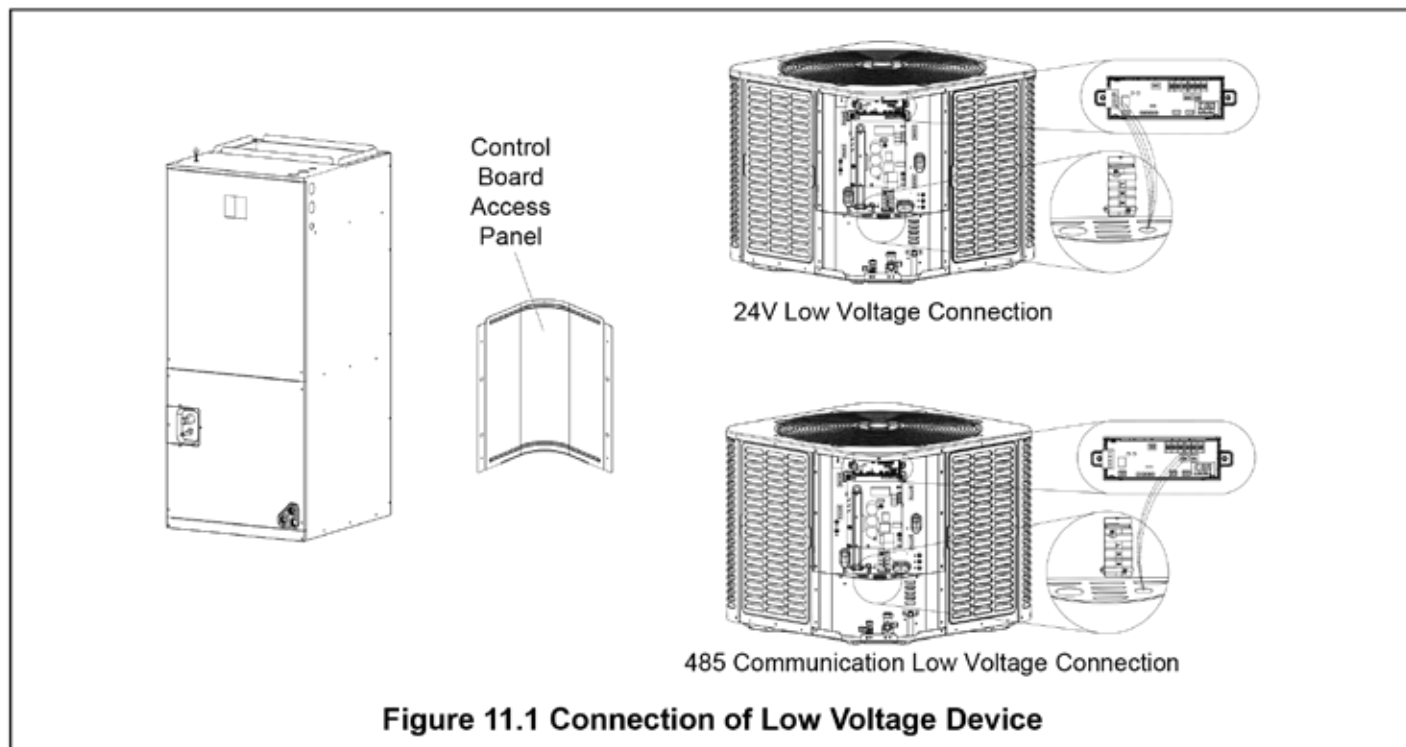
Before opening the liquid service valve, the suction service valve must be opened first.

1. Remove the valve cover (Figure 10.1).
2. Insert the hex wrench into the valve stem completely and turn counterclockwise until the valve stem seats against the stop. Replace the valve stem cap to prevent leakage. Finger-tighten the cap, then tighten it an additional 1/6 turn.
3. Repeat the procedure for the liquid line service valve.



ELECTRICAL

11.1 LOW-VOLTAGE WIRING CONNECTIONS



11.2 THERMOSTAT WIRING DIAGRAMS

- Verify that the power supply matches the unit nameplate ratings.
- Power wiring and grounding must comply with all applicable local codes.
- Use low-voltage wiring with a minimum conductor size of 18 AWG.
- “-----” dashed lines indicate field-installed electric heat connections.
- A 2H thermostat supports single-stage electric auxiliary heat.
- A 3H thermostat supports two-stage electric auxiliary heat.
- W1: The first stage of electric auxiliary heating installed in the indoor unit.
- W2: The second stage of electric auxiliary heating installed in the indoor unit.
- The outdoor unit W terminal energizes electric heat or first-stage auxiliary heat, depending on system configuration.

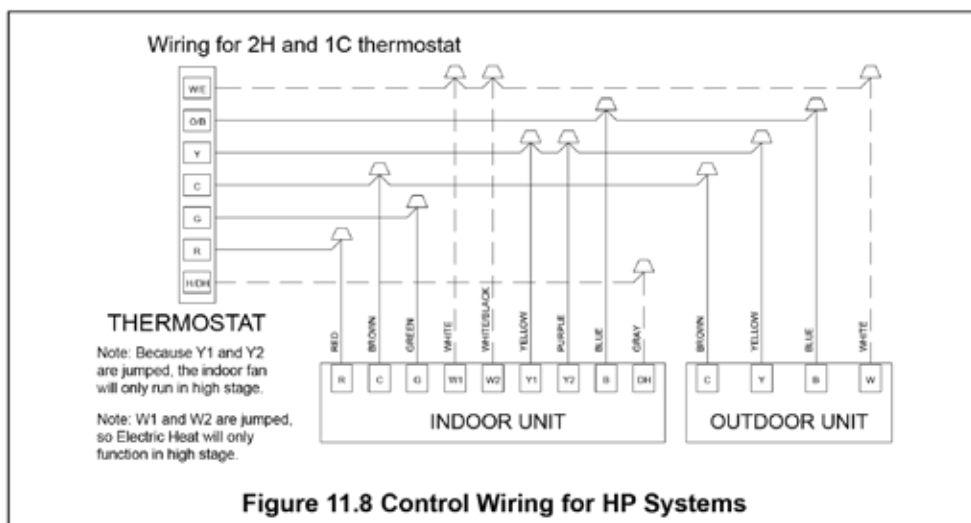
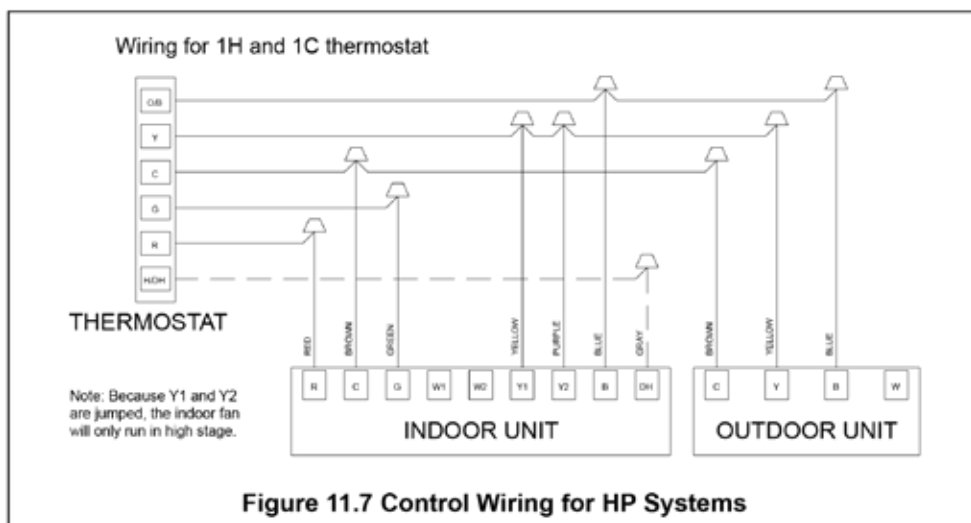


The dotted line in the following thermostat wiring diagram indicates optional wiring (wiring for passive dehumidification and/or electric heating). For the wiring of the thermostat, refer to the thermostat installation instructions.



The reversing valve is factory-configured for B operation: energized in heating and de-energized in cooling. Verify thermostat O/B configuration before startup. SW2-4 reverses the O/B logic.

ELECTRICAL



12.1 HIGH VOLTAGE POWER SUPPLY



WARNING: LIVE ELECTRICAL PARTS!

During the installation, testing, maintenance and troubleshooting of this product, it may be necessary to use live electrical parts. Failure to observe all electrical safety precautions when exposed to live electrical parts may result in death or serious injury.

The high-voltage power supply must match the nameplate of the unit (208/230 VAC, 1 phase, 60 Hz).

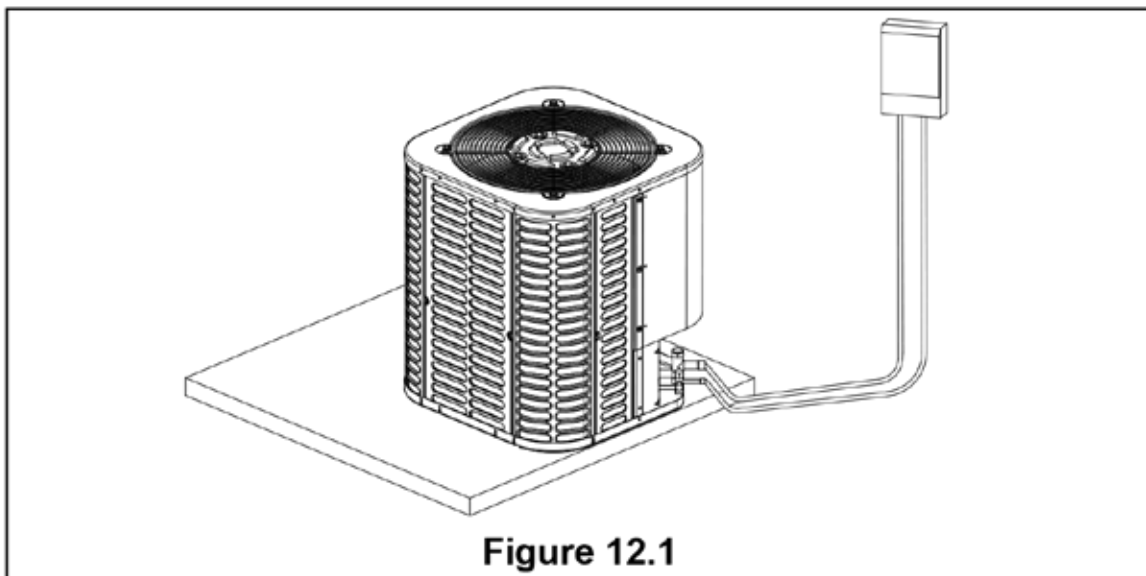


Power supply wiring must comply with all applicable national, state, and local codes.

Follow the instructions of the unit wiring diagram located on the back of the control box access panel, and refer to the wiring diagram in this installation manual.

12.2 HIGH VOLTAGE DISCONNECT SWITCH

Install a separate disconnect switch on the outdoor unit. Use field-supplied flexible conduit for high-voltage wiring.



ELECTRICAL

12.3 HIGH VOLTAGE GROUNDING

Ground the outdoor unit according to the requirements of national, state and local regulations.

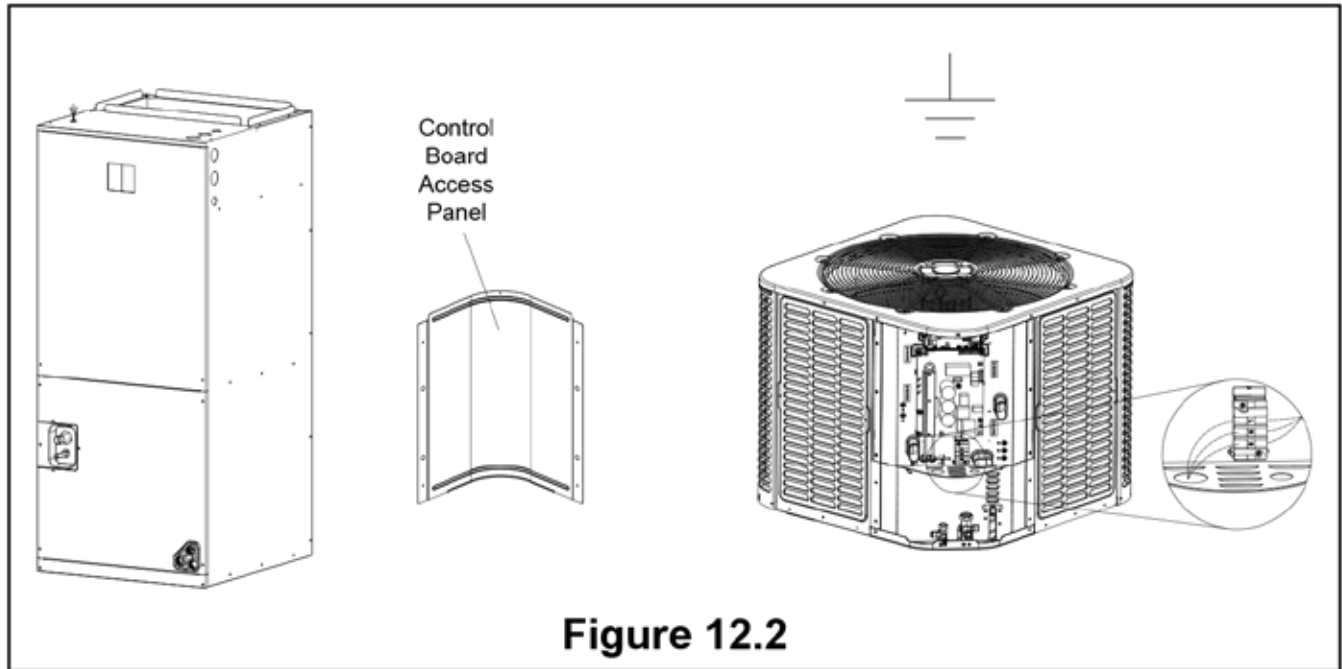


TABLE 12.1 - HIGH-VOLTAGE WIRE SIZE REQUIREMENTS

Capacity (BTU/h)			24K	36K	48K	60K
Power		Stage	Single			
		Voltage/Frequency	208/230VAC, 60 Hz			
Wire gauge	Indoor unit power wiring	Line quantity	3	3	3	3
		Wire diameter (AWG)	16	16	16	16
	Outdoor unit power wiring	Line quantity	3	3	3	3
		Wire diameter (AWG)	14	12	10	10

START

13.1 SYSTEM STARTUP

1. Verify that all installation steps have been completed before starting the system.
2. Set the thermostat to OFF.



Figure 13.1

3. Turn on the disconnect and energize both the indoor and outdoor units.



Figure 13.2

4. On initial startup, if the outdoor temperature is below 70°F, energize the system for at least 1 hour before operation so the crankcase heater can warm the compressor.. When starting the unit for the first time and in heating mode and the outdoor temperature is below 23°F, the system will automatically enter a 1-hour preheat cycle, “PRH” will appear on the display.



Figure 13.3

5. Set the system thermostat to ON.



Figure 13.4

REFRIGERANT CHARGING

14.1 REFRIGERANT CHARGING: WEIGH-IN METHOD

Use the weigh-in method during initial installation, or anytime a system charge is being replaced. Weigh-in method can also be used when power is not available to the equipment site or operating conditions (indoor/outdoor temperatures) are not in range to verify with the subcooling charging method.



The factory charge is sufficient for a standard 25-ft line set. Add 0.54 oz of refrigerant for each additional foot of line set beyond 25 ft.

Use the table below to determine the required additional charge based on total line-set length.

TABLE 14.1 ADDITIONAL REFRIGERANT GUIDELINES

Piping length (m/ft)	Additional charge (kg/oz)
7.6/25.0	0.0/0.0
15.2/50.0	0.4/13.5
22.9/75.0	0.8/27.0
30.5/100.0	1.1/40.5

① = kg (oz)

② = kg (oz)

① + ② = kg (oz)

1. Factory charge in the outdoor unit
2. Refrigerant charge added during installation

REFRIGERANT CHARGING

New Installations — Calculating additional charge for line set greater than 25 ft (7.62 m).

1. Total length of line (m/ft) = _____ (a)
2. Standard line set length = 25 ft (7.62 m)
3. (a) minus (b) = _____ (c)
4. Refrigerant multiplier = 0.54 oz/ft (50 g/m) (d)
5. Additional refrigerant quantity (c*d) = _____ (e) *

If the line set is less than 25 ft (7.62 m), e = 0.

Sealed-System Repairs — Calculating total system charge.

1. Total length of line (ft) = _____ (a)
2. Standard line set length = 25 ft
3. (a) minus (b) = _____ (c)
4. Refrigerant multiplier = 0.54 oz/ft (50 g/m)
5. Additional refrigerant quantity (c*d) = _____ (e) *
6. Factory filling quantity (nameplate) = _____ (f)
7. Total system charge (e + f) = _____

If the line set is less than 25 ft (7.62 m), e = 0.



The only approved mode for verifying system charge is forced cooling mode. The outdoor temperature must be between 68°F and 113°F, and the indoor temperature should be between 68°F and 89°F.

14.2 SUBCOOLING CHARGING AND REFRIGERANT ADJUSTMENT IN COOLING MODE

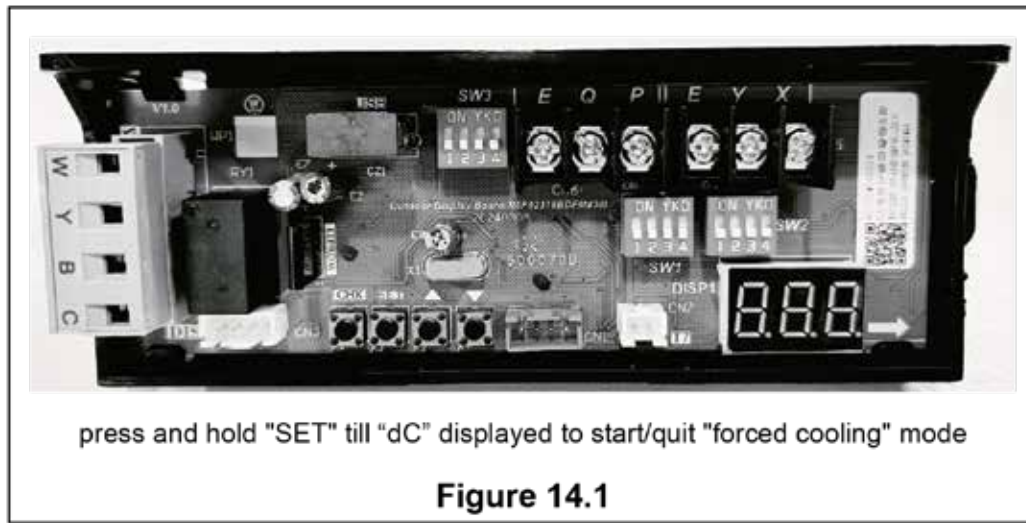
1. Check the outdoor ambient temperature. Subcooling (cooling mode) is the only recommended charging method when the outdoor ambient temperature is higher than 68°F. For outdoor ambient temperature below 68°F, use the weigh-in charging method.



When the outdoor ambient temperature is lower than 68°F, return during warmer weather to verify the system charge in cooling mode.

Subcooling Method

1. Check the ambient temperature. Use the subcooling method only when outdoor ambient temperature is between 68°F and 113°F and indoor temperature is between 68°F and 89°F. If the temperature is outside this range, use the weigh-in method.



2. Start forced cooling mode. Press and hold the SET button until "dC" appears on the display. Once the unit enters forced cooling mode, dC and the current operating frequency will alternate on the display. Forced cooling mode will automatically exit after 60 minutes or press and hold SET to quit forced cooling mode manually.
3. Wait until the system is stable. Wait 20 minutes after forced cooling mode starts. The compressor will maintain a specific frequency in forced cooling mode.
4. Calculate subcooling value. Calculate subcooling value with measured liquid line temperature and pressure according to Table 14.2. If calculated subcooling value is lower than the design subcooling value of Table 14.3, refrigerant should be added. If calculated subcooling value is higher than the value of Table 14.3, refrigerant should be recovered.
5. Adjust refrigerant. Connect service gauges to the unit and adjust the refrigerant charge based on the results from Step 4.
6. Allow the system to stabilize. Wait for 5 minutes and repeat steps 4 through 5 until the subcooling value matches the design subcooling value mentioned in Table 14.3.
7. Return the unit to normal operation. Remove service tools, press and hold SET button to quit forced cooling mode. Symbol "dC" should disappear when forced cooling mode ends.

REFRIGERANT CHARGING

Subcooling (°F)		Ambient Temperature (°F)				
		68-77	77-86	86-95	95-104	104-113
Model	24K	10±2	8±2	8±2	6±2	6±2
	36K	10±2	8±2	8±2	6±2	6±2
	48K	8±2	8±2	8±2	6±2	6±2
	60K	8±2	8±2	8±2	6±2	6±2

Liquid Line Temp (°F)	Subcooling Value (°F)							
	6	7	8	9	10	11	12	13
	Liquid Gauge Pressure (PSI)							
55	164	167	170	172	175	178	181	184
60	178	181	184	187	191	194	197	200
65	194	197	200	203	206	210	213	217
70	210	213	217	220	223	227	230	234
75	227	230	234	238	241	245	249	252
80	245	249	252	256	260	264	268	272
85	264	268	272	276	280	284	288	292
90	284	288	292	297	301	305	309	314
95	305	309	314	318	323	327	332	336
100	327	332	336	341	346	351	355	360
105	351	355	360	365	370	375	380	385
110	375	380	385	390	396	401	406	412
115	401	406	412	417	422	428	433	439
120	428	433	439	445	450	456	462	468
125	456	462	468	474	480	486	492	498

15.1 CONTROL LOGIC DESCRIPTION

- The inverter system uses the same 24 VAC control wiring as a conventional heat pump.
- The compressor's speed is controlled based on coil pressures monitored by the unit's pressure transducer. To ensure stable and adequate capacity, the compressor speed will modulate relative to evaporating pressure in cooling mode and condensing pressure in heating mode.

15.2 SENSORS AND VALVES

T3: Outdoor Coil Temperature

- High temperature protection
- Outdoor fan control (Cooling mode)
- Defrost control (Heating mode)

T4: Outdoor Ambient Temperature

- Maximum compressor frequency limitation
- Defrosting condition (Heating mode)
- Outdoor fan control (Heating mode)

T5: Compressor Discharge Temperature

- High discharge temperature / Low superheat protection
- Electronic Expansion Valve (EEV) control

T7: Control board Heat Pipe Temperature

- Control board anti-condensation protection

Tfin: IPM Radiator Temperature

- High IPM temperature protection

PT: Pressure Transducer

- Detect evaporating pressure in cooling mode and condensing pressure in heating mode.
- Compressor frequency control
- Electronic Expansion Valve (EEV) control
- High pressure protection (heating mode)
- Low pressure protection (cooling mode)

Pressure Equalizer Valve (PEV)

- Balances system pressure before compressor startup.

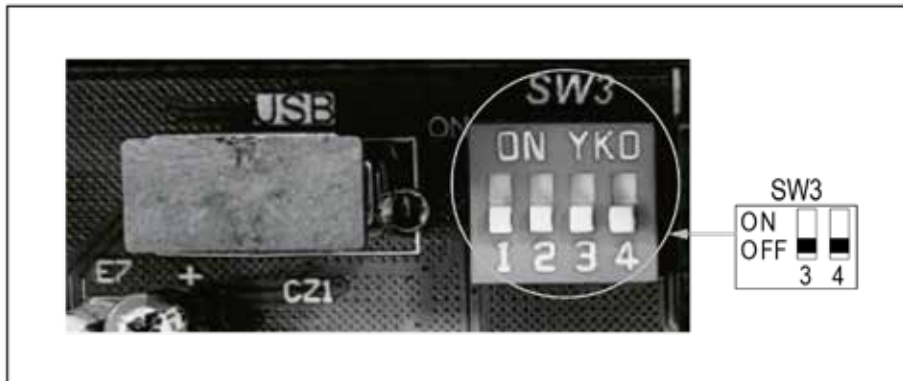
Reversing valve

- Used to switch the refrigerant flow direction between cooling and heating mode

TROUBLESHOOTING

15.3 ACCELERATED COOLING/HEATING

The dip switch SW3-3 and SW3-4 are set to OFF position by default. If dip switch SW3-3 is set to ON, the target coil temperature will be reduced in cooling mode. If dip switch SW3-4 is set to ON, the target coil temperature will increase in heating mode. The accelerated cooling/heating function improves dehumidification in cooling mode and increases system capacity.



15.4 DEFROST DESCRIPTION

Automatic Defrost Control Function

The function monitors outdoor coil temperature (T3) and the ambient temperature (T4) to determine whether a defrost cycle is required.

One of the following conditions should be met to run a defrost cycle:

1. The difference between the outdoor ambient temperature(T4) and the outdoor coil temperature (T3) is called Delta T. When $T4 \geq 19^{\circ}\text{F}$, the compressor has run for 60 minutes or under PI control for 15 minutes, and $T3 < 30^{\circ}\text{F}$, as well as $\Delta T < 46^{\circ}\text{F}$ lasts for 3 minutes, the unit will run a defrost cycle automatically.
2. When the compressor has run for 120 minutes under the low ambient temperature between 14°F and 19°F , and $T3 < 5^{\circ}\text{F}$ or $T3$ decreases by more than 5°F , the unit will run a defrost cycle automatically.
3. When $T4 \leq 14^{\circ}\text{F}$:
 - A) the compressor has run for 90 minutes and $T3 \leq -13^{\circ}\text{F}$, or
 - B) the compressor has run for 90 minutes and $T3$ has decreased by more than 5°F , or
 - C) the compressor has run for 360 minutes, the unit will run a defrost cycle automatically.

Minimum Run Time (MRT) Defrost.

The MRT Defrost function is based on outdoor ambient temperature(T4). This function applies when T3 does not accurately reflect actual coil conditions. One of the following conditions should be met to run a defrost cycle:

- A) $\text{MRT} \geq 3.5$ hours and $T4 < 23^{\circ}\text{F}$
- B) $\text{MRT} \geq 2$ hours and $23^{\circ}\text{F} \leq T4 < 42^{\circ}\text{F}$
- C) $\text{MRT} \geq 50$ minutes and the last defrost time ≥ 7 minutes

Low Saturated Discharge Pressure (SDP) Defrost

This function applies if T3 is misread or does not accurately reflect coil conditions. When the unit has run for 20 minutes under the ambient condition: $14^{\circ}\text{F} \leq T4 < 28^{\circ}\text{F}$, use Saturated Discharge Pressure (displayed as equivalent saturated temperature) to determine whether a defrost cycle is required when the value drops below 82°F .

Fixed Time Defrost

When the dip switch SW2-1 is set to ON, the Fixed Time Defrost Mode is activated. For different geographical and ambient conditions, set dip switch SW2-2 to select the fixed defrost interval. SW2-1 and SW2-2 are set to OFF by default.

Accelerated Defrost

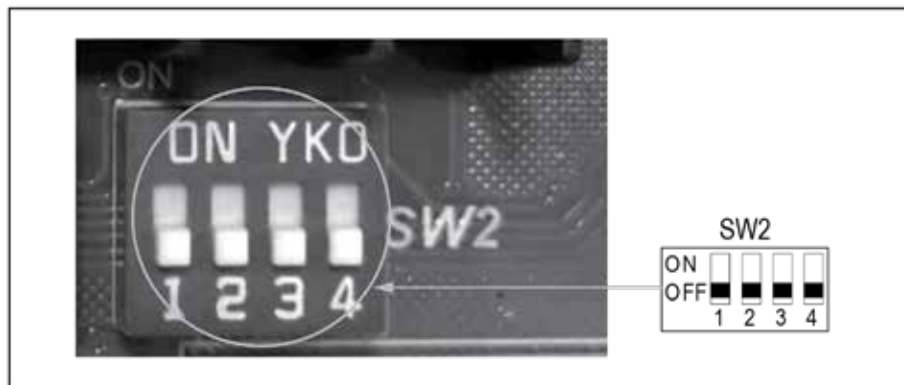
Heating operating time is reduced by 10% and Defrost time is extended for 60 seconds. Valid only for Fixed Time Defrost and Minimum Run Time Defrost.

Manual Defrost

Press and hold the defrost button on the display board until 'dF' appears on the display ("dF" and the compressor frequency will be displayed alternately). The unit must have been operating in heating mode for at least 5 minutes. Defrost will terminate automatically, after which the display board will show the compressor speed (Hz).

O/B Signal

If the thermostat uses an O/B signal, verify the factory default O/B setting before startup. The dip switch SW2-4 is factory-set to OFF, which requires a B signal call from the thermostat in heating mode. When SW2-4 is ON, the system uses O logic and the reversing valve energizes in cooling. Defrost will terminate once the outdoor coil temperature (T3) reaches 64°F for a period of 1 minute or defrost time has exceeded 8 minutes.



15.5 COMPRESSOR CRANKCASE HEATER CONTROL FUNCTION

The crankcase heater starts when one of the following conditions is met:

- Discharge temperature $T5 < 73^{\circ}\text{F}$ and defrost is turned on
- Discharge temperature $T5 < 73^{\circ}\text{F}$ when powered on for the first time.
- The power off time is longer than 3 hours or more than 2 hours when powered on for the first time.

Under those conditions, if T4 is below 50°F and T5 is below 73°F , the crankcase heater will energize.

Exit conditions:

- Discharge temperature $T5 \geq 82.4^{\circ}\text{F}$.

TROUBLESHOOTING

15.6 OPERATION OF REVERSING VALVE



The reversing valve is energized in heating mode and de-energized in cooling mode.



On the first call for heating, the unit may briefly operate in cooling mode for about 1 minute to build differential pressure before shifting the reversing valve.

15.7 PROTECTIVE FUNCTIONS

- Temperature protection of outdoor coil in cooling mode (T3)
 1. If $T3 > \text{Maximum set temperature}$, the system stops for protection.
 2. If $T3 < \text{the set recovery temperature value}$, the system restarts.

Note: Refer to factory service data or contact technical support for the programmed threshold values.

- Exhaust temperature protection (T5)
 1. In cooling or heating mode, if the temperature is higher than the set maximum value, the system will stop for protection.
 2. In cooling or heating mode, if the temperature is lower than the set recovery temperature, the system will restart.

Note: Please consult the supplier for maximum temperature and recovery temperature.

- IPM module (inverter) protection (TF)
 1. $TF \geq \text{the upper protection threshold}$. If the outdoor fan does not reach the highest level at this time, the fan speed will be increased one by one. At this time, the compressor frequency is not limited. If the outdoor fan is the highest fan speed, the current frequency is the highest allowable operating frequency.
 2. $TF \geq \text{the highest judgment value B}$, the compressor reduces the frequency successively.
 3. $TF \geq \text{the highest judgment value A}$, the compressor shuts down on protection.
 4. $TF \leq \text{the upper protection threshold D}$, the system restarts.

Note: The highest judgment value A/B/C/D are all parameters set in the program. Please consult the supplier for specific values.

TABLE 15.1

Code	Failure and Protection
E1	Communication error (indoor unit)
E2	T1 sensor error
E3	T2 sensor error
E4	R-454B sensor error
E6	Refrigerant leakage error
E7	EEPROM failure (indoor unit)
E8	Fan motor error (indoor unit)
E9	Communication fault of wire control
F0	Communication failure (outdoor unit)
F4	T4 outdoor ambient temp sensor error
F5	T5 exhaust temp sensor error
F6	T3 outdoor coil temperature sensor error
F7	T7 temp sensor error
F8	T7 temp sensor error in detecting condensate risks
F9	AC overvoltage/undervoltage protection
FA	EEPROM failure (outdoor unit)
FB	EEPROM failure of driver chip
FC	IPM module sensor error
FD	HLP pressure sensor failure
FE	T3 or T5 sensor disconnect error
FF	High-pressure switch open/disconnected
P1	High pressure switch error
P2	Low pressure protection
P3	Inverter overcurrent protection
P4	T5 exhaust temp sensor high temp protection
P5	T3 outdoor coil high-temperature protection (cooling mode)
P6	IPM protection
P7	T2 freeze protection
P8	IPM high temperature protection (Tf)
P9	DC fan motor error
PC	Condensate Protection Fault
PD	High pressure abnormal error (In heating mode)

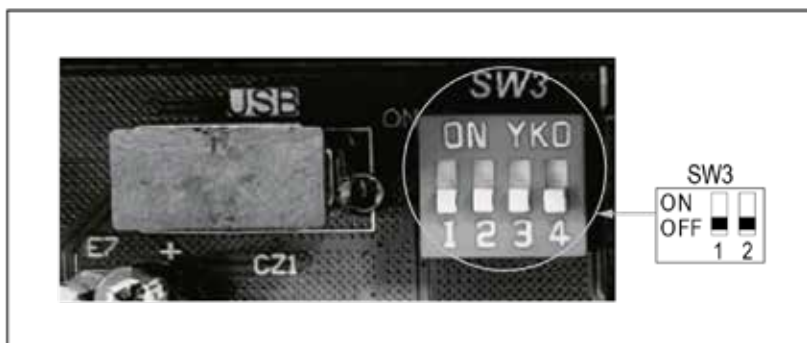
TROUBLESHOOTING

H0	Communication fault of master board and driver chip
H1	T3 sensor high temperature error (In cooling mode) (3 times P5 error within 180 minutes)
H2	High pressure switch error (3 times P1 error within 150 minutes)
H3	High pressure abnormal in heating mode (3 times PD error within 180 minutes)
H4	IPM module high-temperature error (3 times P8 within 120 minutes)
H5	Low pressure error (5 times P2 within 240 minutes)
H6	Discharge temperature abnormal error (3 times P4 within 100 minutes)
H7	Condensate Overflow Protection (3 times PC within 200 minutes)
H8	T3 condenser sensor disconnect error (3 times FE within 120 minutes)
HC	Discharge temp sensor disconnect error (3 times FE within 180 minutes)
HE	Condensate error (3 times F8 within 60 minutes)
L0	DC cable bus low voltage protection
L1	DC cable bus high voltage protection
LA	Frequency limitation by voltage
LB	Frequency limitation or decline by high pressure
LC	Frequency limitation by condenser temp
LD	Frequency limitation by discharge temp
LE	Frequency limitation due to high IPM module temperature
LF	Frequency limitation by current
d0	Oil return
df	Defrost
dC	Forced cooling
ATL	Over temperature protection
PRH	Crankcase heater preheating; compressor start is inhibited

15.8 CAPACITY MODEL SELECTION

The control board reads the performance settings based on the DIP switch selection. The DIP should be set according to the matched indoor unit (IDU).

Mode	SW3-1	SW3-2	Remark
2 Ton	OFF	ON	
3 Ton	OFF	OFF	Factory default
4 Ton	ON	OFF	
5 Ton	ON	ON	Factory default



15.9 SW1 DIP SWITCH DESCRIPTION

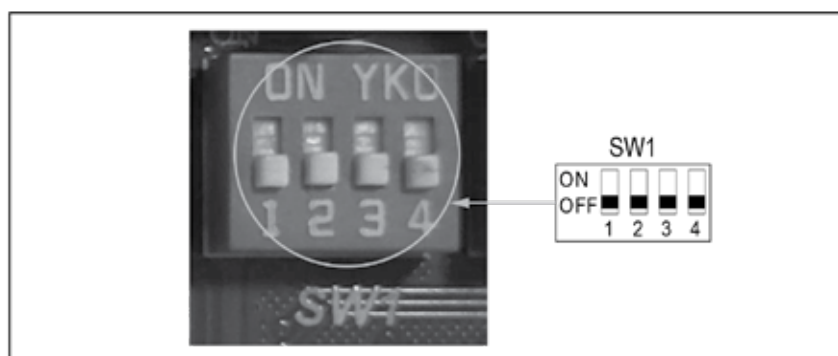
The dip switch SW1-1 is set to OFF, the unit should be controlled by a 24 V thermostat. For RS-485 communication mode, set SW1-1 to ON. RS-485 communication mode is available only with an approved matched indoor unit, this outdoor unit, and an optional manufacturer-supplied RS-485 communicating thermostat. The benefits of RS-485 communication mode include:

- Modulates compressor speed based on indoor temperature to improve comfort and energy efficiency.
- Error code display on thermostat
- Allows the end user to remotely control the system through the manufacturer's app.

The dip switch SW1-2 is for selection of display temperature and pressure units. The dip switch SW1-3 is for switching between Cool Only (AC) and Heat Pump (HP). USB Port Software Update. Dip switch SW1-4 enables the USB software update function.

First turn off the power supply, then set SW1-4 to ON position and insert the USB flash drive, then turn on the power supply. The LED display will show "1," then "2," then "3." When the update is complete, the display will briefly show "8.8.8." and then return to normal operation.

	SW1-1	SW1-2	SW1-3	SW1-4
ON	RS-485	°C & MPa	AC	USB Port Software Update
OFF	24V thermostat (Factory default)	°F & PSI (Factory default)	HP (Factory default)	Software Update (Factory default)



TROUBLESHOOTING

15.10 PARAMETER POINT CHECK TABLE

- To display system parameters, press the “CHK” (K4) button to run through the series of parameters available. The first time you press the “CHK” button, it will display the parameter number, and after 1 second it will display the value of the parameter. Press CHK again to advance to the next parameter number. (Refer to Table 15.2).
- Refer to the picture below for check button location on the display board.

▲ : Check button and set the parameter “+”

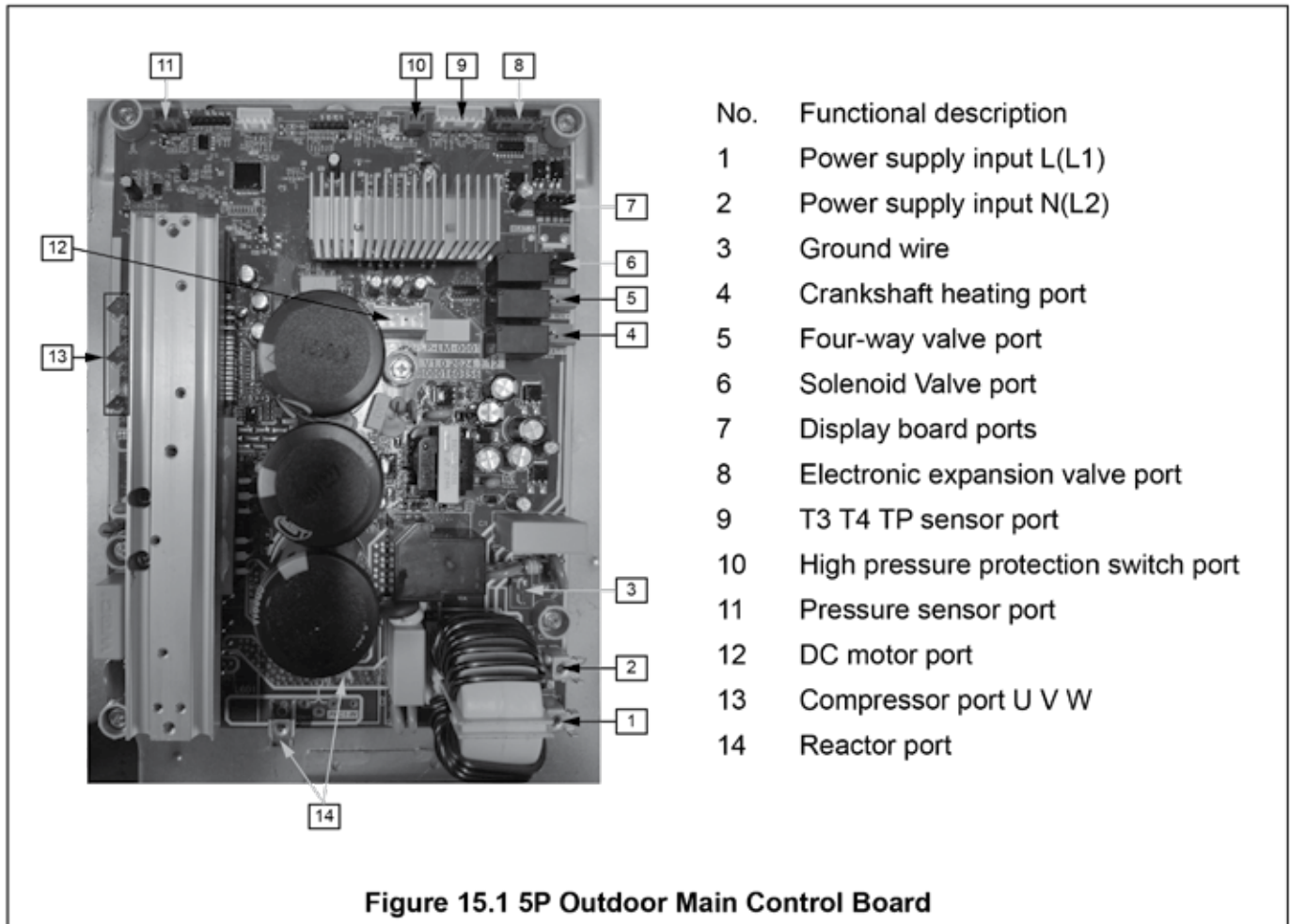
▼ : Check button and set the parameter “-”

TABLE 15.2

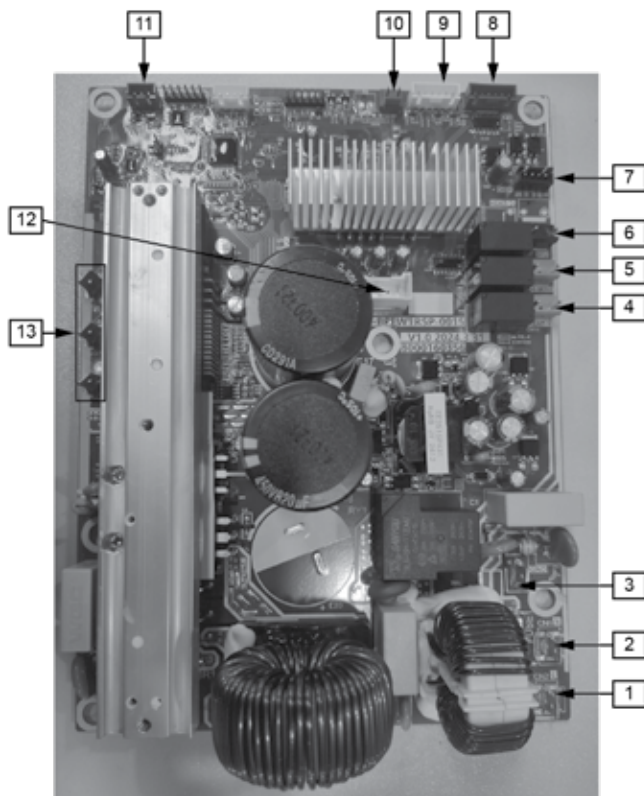
CHECK TABLE			
NUM	Display content		
		20	AC current (A; Actual value)
00	Unit type: 0 = top-discharge unit; 1 = side-discharge unit; 2 = rooftop unit	21	Compressor current
01	Outdoor unit model	22	Oil output (CC; Actual value)
02	Running mode (0: Standby mode; 2: In cooling mode; 3: In heating mode)	23	T1 indoor ambient temp (°F; Actual value)
03	Target frequency (Hz; Actual value)	24	T2 indoor evaporator temp (°F; Actual value)
04	Actual frequency (Hz; Actual value)	25	Concentration value
05	Running frequency (Hz; Actual value)	26	PI control status (0 or 1)
06	T3 condensing temp (°F; Actual value)	27	Enter defrosting type
07	T4 outdoor ambient temp (°F; Actual value)	28	Test mode (1-40; Mode gear)
08	T5 exhaust temp (°F; Actual value)	29	Frequency offset (actual value)
09	Temp transform by pressure sensor (°F; Actual value)	30	△ EV (step; Actual value)
10	IPM module temp Tipm (°F; Actual value)	31	PFC control state
11	Target temp Ttrg (°F; Actual value)	32	Frequency limit item
12	Discharge temp superheat (°F; Actual value)	33	Driving failure code subdivision 1
13	Target superheat (°F; Actual value)	34	Driving failure code subdivision 2
14	Fan speed (Actual value / 10)	35	Last failure or protection code
15	EXV opening degree (step; Actual value)	36	Software version number (1-255)
16	Pressure value (PSI; Actual value)	37	T7 condensing temp (°F; Actual value)
17	Pressure valve transform by T3 (PSI; Actual value)	38	T30 temp (°F; Actual value)
18	AC voltage (VAC; Actual value)	39	Compression ratio
19	DC voltage (VDC; Actual value)		

15.11 OVERVIEW OF MAIN CONTROL BOARD

Outdoor Main Control Board

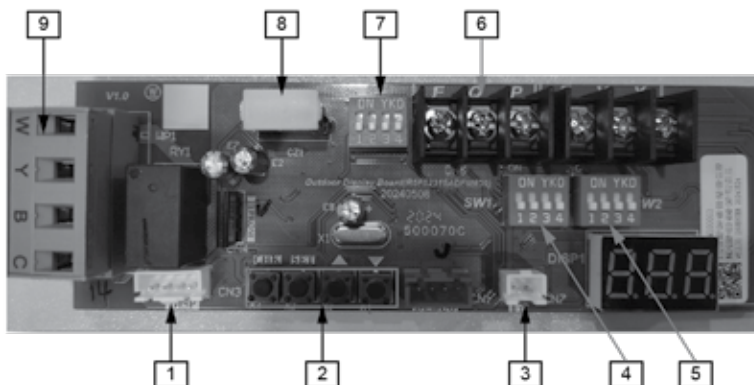


TROUBLESHOOTING



- | No. | Functional description |
|-----|--------------------------------------|
| 1 | Power supply input L(L1) |
| 2 | Power supply input N(L2) |
| 3 | Ground wire |
| 4 | Crankshaft heating port |
| 5 | Four-way valve port |
| 6 | Solenoid Valve port |
| 7 | Display board ports |
| 8 | Electronic expansion valve port |
| 9 | T3 T4 TP sensor port |
| 10 | High pressure protection switch port |
| 11 | Pressure sensor port |
| 12 | DC motor port |
| 13 | Compressor port U V W |

Figure 15.2 3P Outdoor Main Control Board



- | No. | Functional description |
|-----|---------------------------|
| 1 | Display board ports |
| 2 | Switch (K1 K2 K3 K4) |
| 3 | T7 sensor port |
| 4 | Dip switch SW1 |
| 5 | Dip switch SW2 |
| 6 | RS-485 communication port |
| 7 | Dip switch SW3 |
| 8 | USB port |
| 9 | 24V communication port |

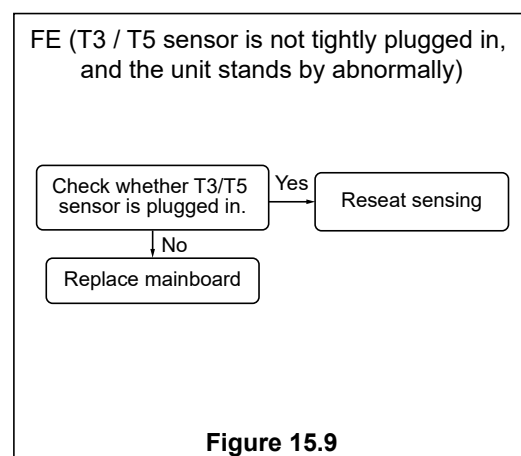
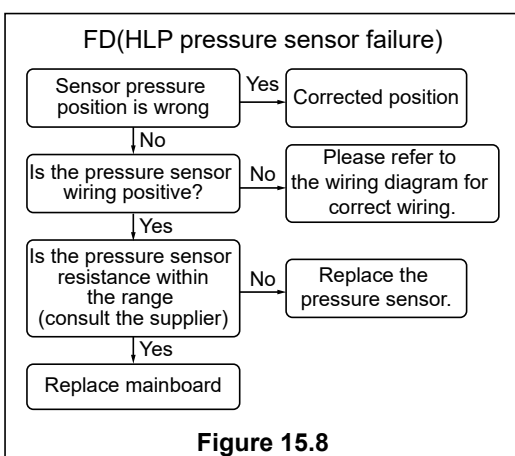
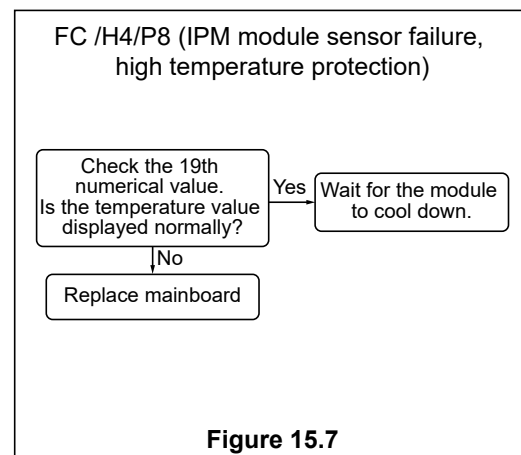
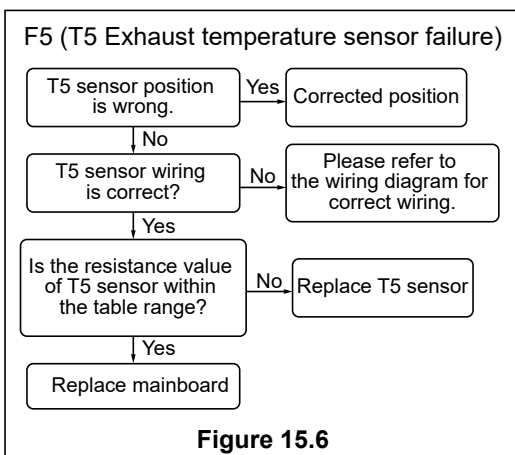
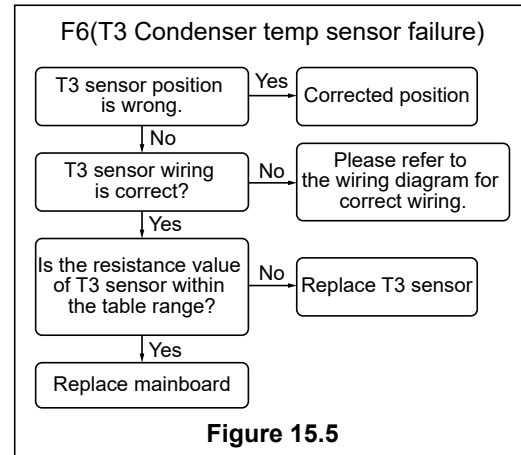
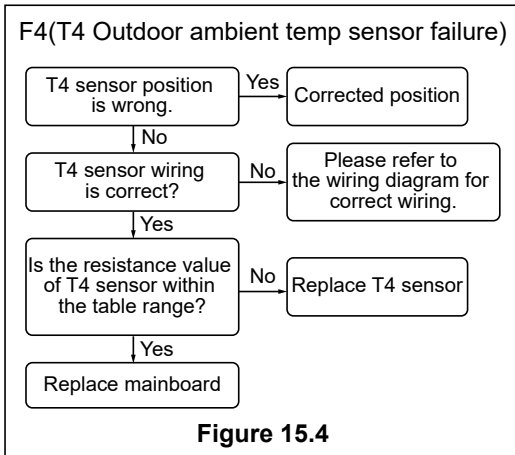
Figure 15.3 Display Board

15.12 TROUBLESHOOTING OF FAULT CODES



WARNING: DANGEROUS VOLTAGE

- When measuring the resistance, make sure that the power of the unit is turned off and wait for 3 minutes before measuring.



TROUBLESHOOTING

F9 (Undervoltage on primary side)

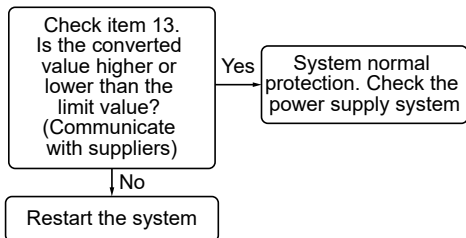


Figure 15.10

FA (Outdoor EEPROM failure)

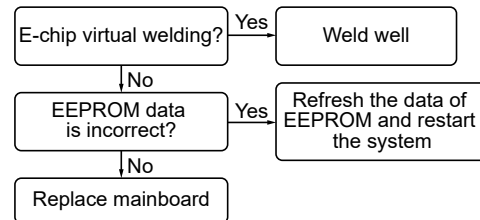


Figure 15.11

H0 (communication failure between main control chip and IPM chip)

Replace mainboard

Figure 15.12

H2/P1 (High pressure switch protection)

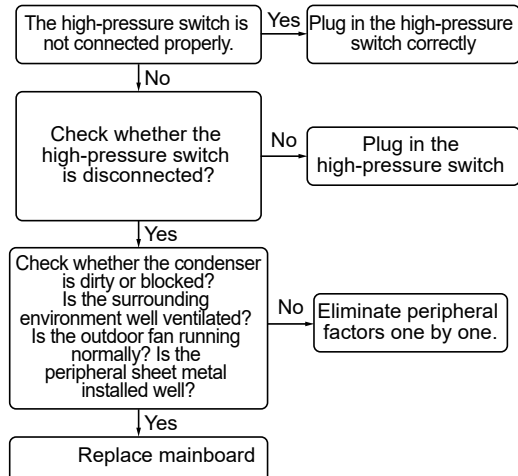


Figure 15.13

H3/PD (High pressure abnormal failure protection in heating mode)

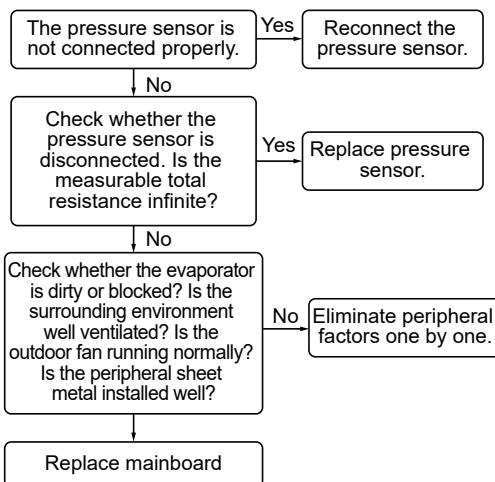


Figure 15.14

H5/P2 (Low pressure abnormal failure protection)

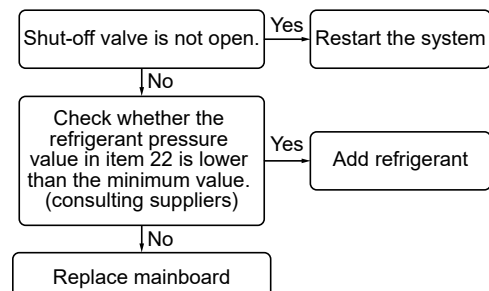
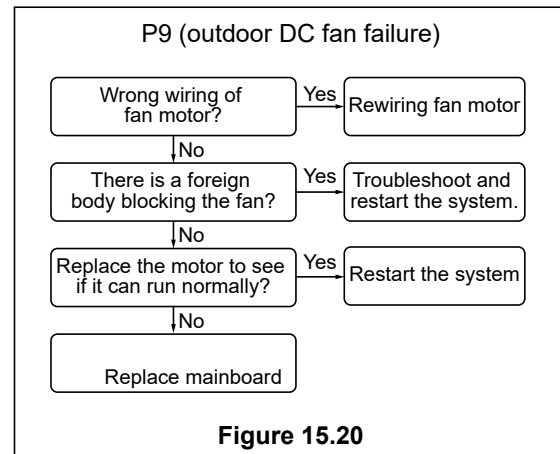
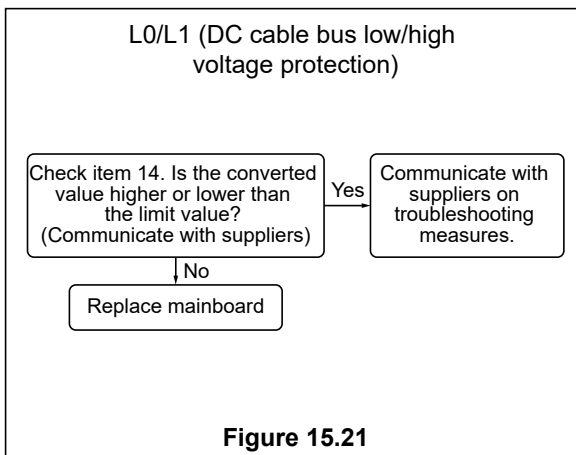
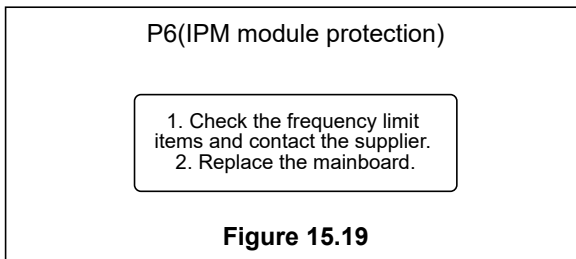
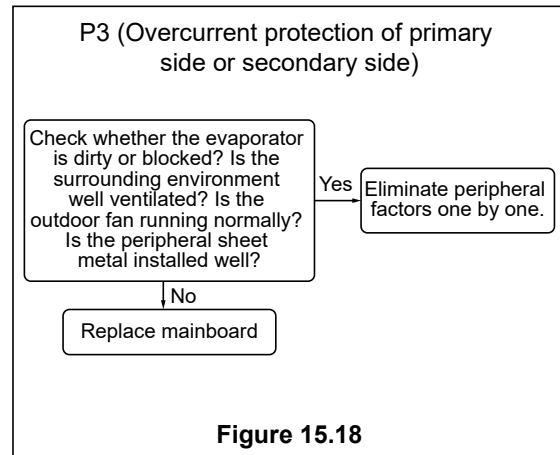
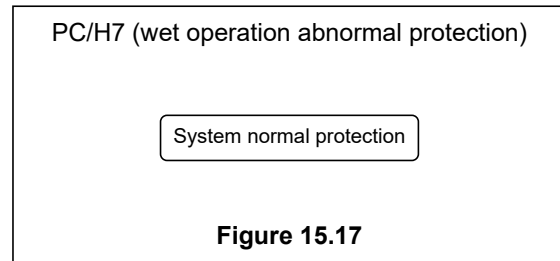
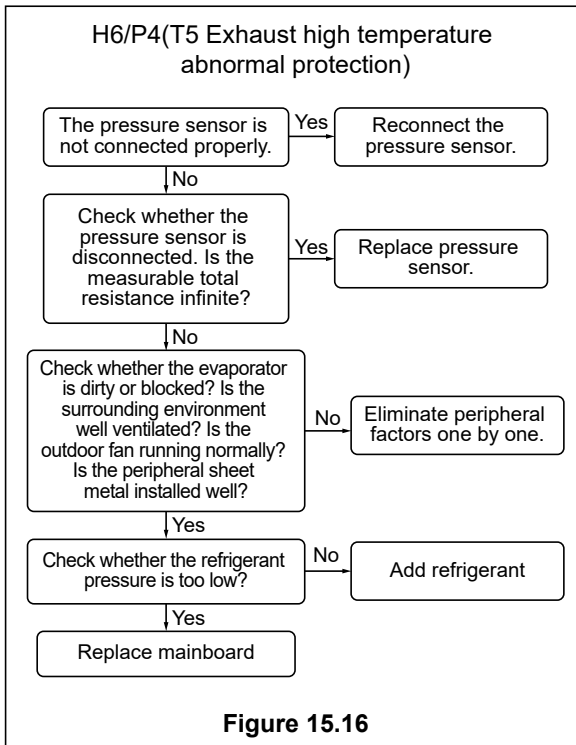


Figure 15.15



TROUBLESHOOTING

15.13 - RESISTANCE VS. TEMPERATURE TABLE (SENSORS)

TABLE 15.3 FOR T3, T4, T7

Temperature F	Temperature C	Electric Resistance kΩ	Volt DC	Temperature F	Temperature C	Electric Resistance kΩ	Volt DC
-5	-20.6	33.367	0.57	90	32.2	3.865	2.63
0	-17.8	29.227	0.64	95	35.0	3.508	2.75
5	-15.0	25.657	0.72	100	37.8	3.187	2.87
10	-12.2	22.595	0.80	105	40.6	2.900	2.99
15	-9.4	19.942	0.89	110	43.3	2.652	3.09
20	-6.7	17.697	0.98	115	46.1	2.421	3.20
25	-3.9	15.673	1.08	120	48.9	2.214	3.30
30	-1.1	13.917	1.18	125	51.7	2.025	3.40
40	4.4	11.060	1.40	130	54.4	1.861	3.49
45	7.2	9.867	1.52	135	57.2	1.706	3.58
50	10.0	8.823	1.64	140	60.0	1.567	3.66
55	12.8	7.884	1.76	145	62.8	1.442	3.74
60	15.6	7.101	1.89	150	65.6	1.327	3.82
65	18.3	6.409	2.01	155	68.3	1.226	3.89
70	21.1	5.767	2.14	160	71.1	1.132	3.96
75	23.9	5.150	2.28	165	73.9	1.046	4.02
80	26.7	4.700	2.39	170	76.7	0.967	4.08
85	29.4	4.266	2.51				

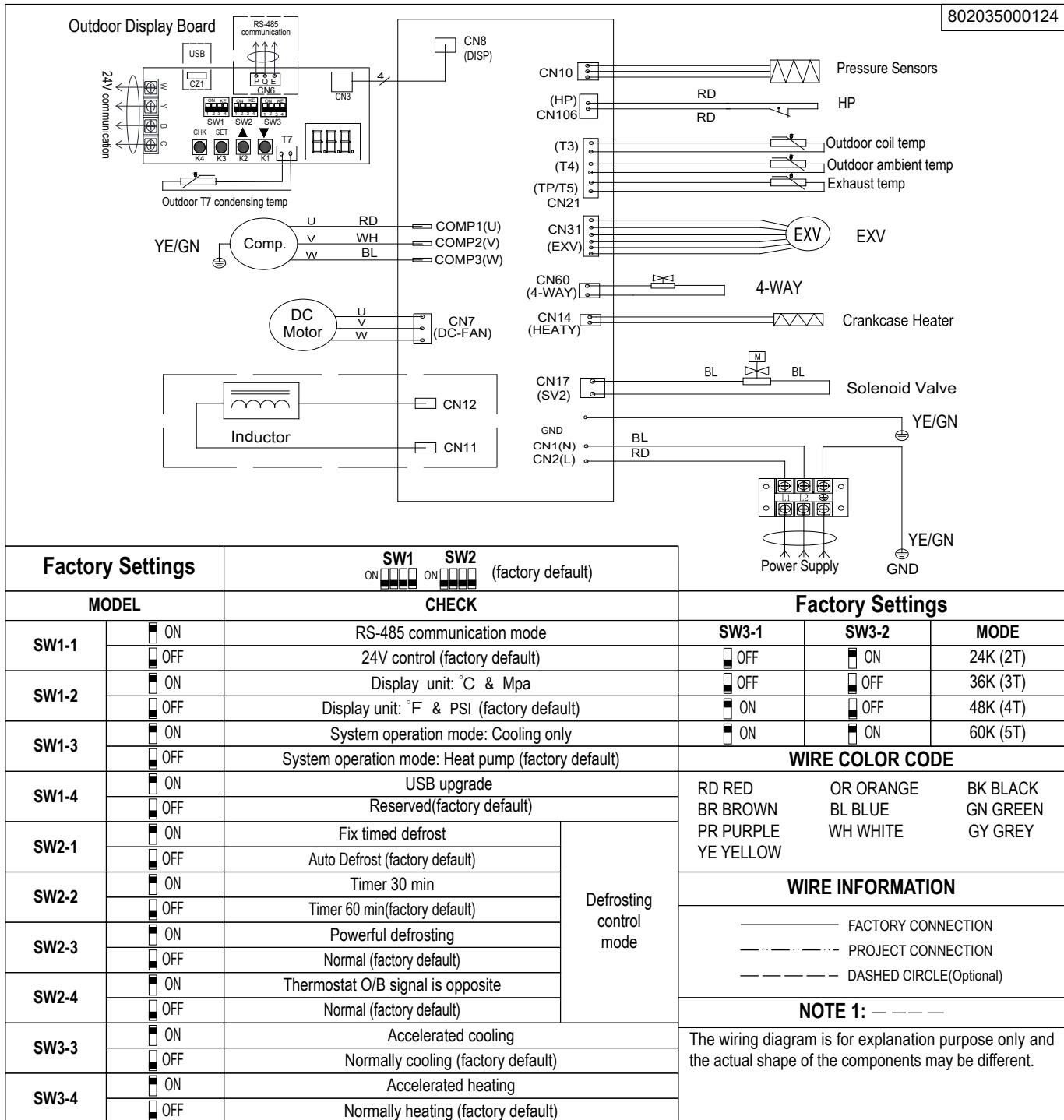
15.14 TEMPERATURE-RESISTANCE RELATIONSHIP TABLE (FOR T5 SENSOR)

TABLE 15.4 FOR T5

Temperature F	Temperature C	Electric Resistance kΩ	Volt DC	Temperature F	Temperature C	Electric Resistance kΩ	Volt DC
-5	-20.6	496.38	0.08	140	60.0	12.348	1.97
0	-17.8	422.97	0.09	145	62.8	11.164	2.10
5	-15.0	361.35	0.11	150	65.6	10.106	2.22
10	-12.2	309.74	0.13	155	68.3	9.193	2.34
15	-9.4	266.152	0.15	160	71.1	8.344	2.46
20	-6.7	230.462	0.17	165	73.9	7.585	2.58
25	-3.9	198.968	0.19	170	76.7	6.904	2.69
30	-1.1	172.231	0.22	175	79.4	6.313	2.80
35	1.7	149.467	0.26	180	82.2	5.761	2.92
40	4.4	130.642	0.29	185	85.0	5.263	3.02
45	7.2	113.87	0.33	190	87.8	4.815	3.13
50	10.0	99.456	0.37	195	90.6	4.410	3.23
55	12.8	87.095	0.42	200	93.3	4.057	3.33
60	15.6	76.425	0.48	205	96.1	3.724	3.42
65	18.3	67.501	0.53	210	98.9	3.423	3.51
70	21.1	59.457	0.60	215	101.7	3.149	3.60
75	23.9	52.489	0.67	220	104.4	2.910	3.67
80	26.7	46.429	0.74	225	107.2	2.689	3.75
85	29.4	41.322	0.82	230	110	2.476	3.82
90	32.2	36.682	0.90	235	112.8	2.288	3.89
95	35.0	32.619	0.99	240	115.6	2.117	3.96
100	37.8	29.068	1.09	245	118.3	1.965	4.02
105	40.6	25.948	1.19	250	121.1	1.821	4.08
110	43.3	23.291	1.29	255	123.9	1.690	4.13
115	46.1	20.855	1.39	260	126.7	1.569	4.19
120	48.9	18.708	1.51	265	129.4	1.462	4.23
125	51.7	16.809	1.62	270	132.2	1.360	4.28
130	54.4	15.184	1.73	275	135.0	1.266	4.32
135	57.2	13.682	1.85	280	137.8	1.180	4.36

WIRING DIAGRAM

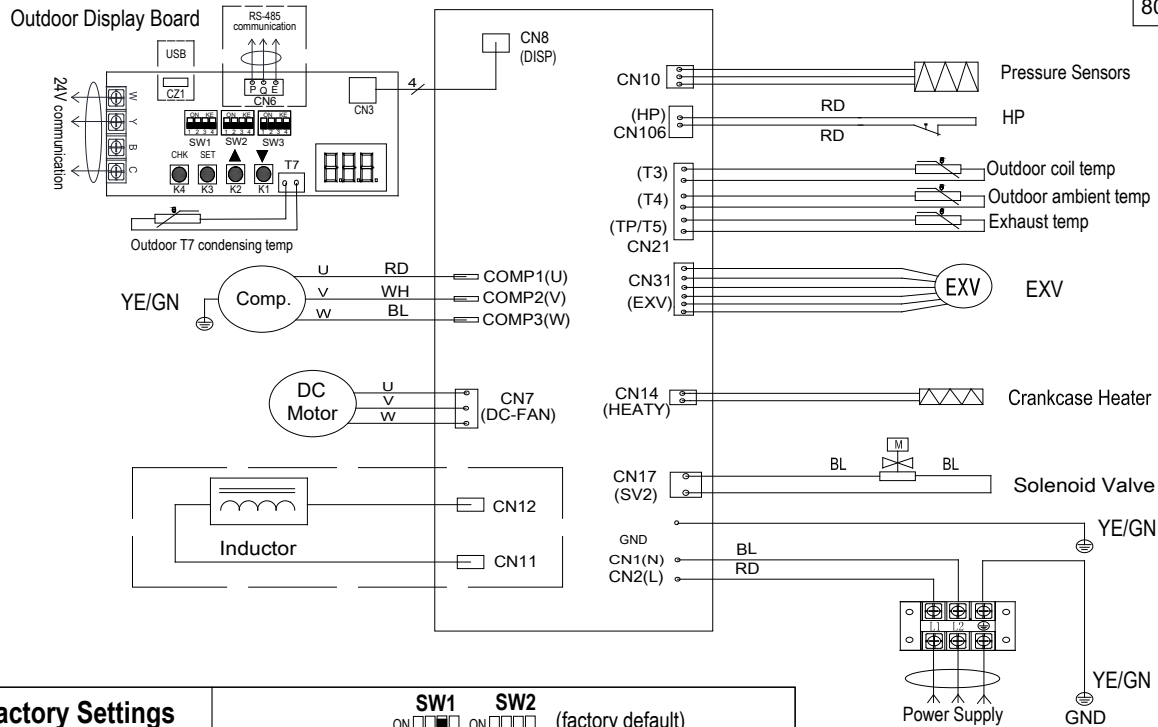
16. WIRING DIAGRAM



NOTE: For reference only, the actual wiring diagram shall prevail.

WIRING DIAGRAM

802035000194



Factory Settings		SW1 SW2 (factory default)	
MODEL		CHECK	
SW1-1	☐ ON	RS-485 communication mode	
	☐ OFF	24V control (factory default)	
SW1-2	☐ ON	Display unit: °C & Mpa	
	☐ OFF	Display unit: °F & PSI (factory default)	
SW1-3	☐ ON	System operation mode: Cooling only (factory default)	
	☐ OFF	System operation mode: Heat pump	
SW1-4	☐ ON	USB upgrade	
	☐ OFF	Reserved(factory default)	
SW2-1	☐ ON	Fix timed defrost	Defrosting control mode
	☐ OFF	Auto Defrost (factory default)	
SW2-2	☐ ON	Timer 30 min	
	☐ OFF	Timer 60 min(factory default)	
SW2-3	☐ ON	Powerful defrosting	
	☐ OFF	Normal (factory default)	
SW2-4	☐ ON	Thermostat O/B signal is opposite	
	☐ OFF	Normal (factory default)	
SW3-3	☐ ON	Accelerated cooling	Factory Settings
	☐ OFF	Normally cooling (factory default)	
SW3-4	☐ ON	Accelerated heating	
	☐ OFF	Normally heating (factory default)	

Factory Settings		
SW3-1	SW3-2	MODE
☐ OFF	☐ ON	24K (2T)
☐ OFF	☐ OFF	36K (3T)
☐ ON	☐ OFF	48K (4T)
☐ ON	☐ ON	60K (5T)

WIRE COLOR CODE		
RD RED	OR ORANGE	BK BLACK
BR BROWN	BL BLUE	GN GREEN
PR PURPLE	WH WHITE	GY GREY
YE YELLOW		

WIRE INFORMATION		
—————	FACTORY CONNECTION	
-----	PROJECT CONNECTION	
-----	DASHED CIRCLE(Optional)	

NOTE 1: — — — —		
The wiring diagram is for explanation purpose only and the actual shape of the components may be different.		

NOTE: For reference only, the actual wiring diagram shall prevail.

17.1 CLEANING PRECAUTIONS



WARNING:

- Maintenance and cleaning of the outdoor unit must be performed by qualified service personnel only.



CAUTION: ELECTRIC SHOCK

Be sure to turn off the unit and disconnect the power supply before cleaning or maintenance.



NOTE:

- Do not use chemicals or chemically treated cloth to clean the unit.
- Do not use benzene, paint thinner, polishing powder or other solvents to clean this unit.

17.2 PRESEASON INSPECTION AND MAINTENANCE

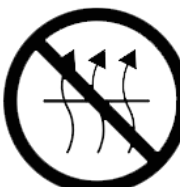
At the start of each heating or cooling season, do the following:



Turn off the unit and disconnect the power supply.



Check for damaged wiring and inspect for refrigerant leaks.



Make sure the unit air inlet and discharge are not blocked.



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