

BULLETPROOF AC

BUILT TO PERFORM. PROVEN TO LAST.

R-454B AIR HANDLER



INSTALLATION & SERVICE 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 warnings in this document are identified by warning triangles. The keyword at the beginning of the warning indicates the type and severity of the risk if no measures are taken to prevent it.

The following keywords are defined and used in this document:

-  **DANGER:** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
-  **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 important information that is not related to personal injury.

Important Information



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

1.2 SAFETY

Read this section before proceeding.

WARNING



- The unit must be installed by qualified personnel trained and certified to handle A2L refrigerants, including R-454B, as required by applicable codes.
- This equipment is not intended for use by individuals with reduced physical, sensory, or mental capabilities unless supervised by a responsible person.
- Install this unit in accordance with the NEC and all applicable state and local electrical codes.
- Children should be supervised to ensure that they do not play with the unit.
- Maintain a minimum clearance of 12 in. (300 mm) from combustible materials, including curtains and blinds.
- This unit is equipped with a leak detection system. Leave power to the unit on at all times except during service.
- Disconnect all power sources before accessing the wiring terminals.
- Read these instructions carefully before installing or operating this unit. Failure to follow these instructions may result in incorrect installation, adjustment, repair, or maintenance, leading to fire, electric shock, property damage, personal injury, or death.
- Installation, service, maintenance, and repair of this unit must be performed by a qualified HVAC technician.
- Service this unit only as recommended by the manufacturer.
- Unit removal and refrigerant recovery/disposal must be performed by a qualified technician.
- Keep all required ventilation openings clear and unobstructed.
- Store the unit in a well-ventilated space that meets the minimum room-area requirements for installation and operation.
- Store the unit in a room free of continuous ignition sources, such as open flames, gas appliances, or electric heaters.

SAFETY

QUALIFICATIONS OF SERVICE PERSONNEL

Installation and service of this equipment must be performed only by qualified, experienced technicians. Qualified installation and service personnel should be trained and experienced in the following:

- Electric heat kit installation
- Opening of sealed components
- Opening of ventilated enclosures
- Commissioning and troubleshooting
- Inspecting the electrical control components and wiring
- Breaking into the refrigerant circuit and charging



This document is the property of the owner/customer and should be kept with the equipment. These instructions do not cover every system configuration or every installation condition that may be encountered in the field.



The manufacturer recommends installing only approved matched indoor/outdoor systems. Split-system AHRI ratings apply only to factory-approved matched indoor and outdoor combinations using a TXV-equipped indoor coil. Approved matched indoor and outdoor systems provide maximum efficiency, optimum performance, and improved overall system reliability.

WARNING: FIRE, ELECTRIC SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH



- The installation must comply with all applicable national, state, and local codes.
- Dispose of this product in accordance with all applicable federal, state, and local regulations. This unit contains flammable refrigerant.
- Risk of fire. This unit uses a flammable refrigerant. Follow handling instructions carefully in compliance with national regulations.



WARNING: RISK OF ELECTRIC SHOCK

Can cause injury or death. Disconnect all remote electric power supplies before servicing. More than one disconnect switch may be required to cut off all power to the equipment. Dangerous voltage can cause serious personal injury or death.



WARNING: ELECTRIC SHOCK

If the fan assembly must be removed, de-energize and lock out all power sources so the field wiring can be safely disconnected. Failure to do so could result in electric shock, personal injury, or death.

WARNING: FIRE, ELECTRIC SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH



- Flammable refrigerant used. Consult repair manual/owner's guide before attempting to service this product. All safety precautions must be followed.
- To avoid equipment damage, personal injury, or death, installation, service, and maintenance must be performed by trained, qualified personnel. Homeowners should only inspect, clean, or replace the air filter. Do not operate the equipment with the access panel removed.

WARNING:



- Do not use any methods to accelerate defrosting or clean the unit except those specifically recommended by the manufacturer.
- Store the unit in a room free of continuous ignition sources, such as open flames, gas appliances, or electric heaters.
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odor.

	WARNING	This symbol indicates that this unit uses a flammable refrigerant. If refrigerant leaks and is exposed to an ignition source, a fire could result.
	CAUTION	This symbol indicates the installation instructions should be read carefully.
	CAUTION	This symbol indicates that service personnel should handle this equipment in accordance with the installation manual.
	CAUTION	This symbol indicates information is available such as the operating manual or installation manual.



WARNING: This product may expose you to chemicals including lead and lead components, For more information, visit www.P65Warnings.ca.gov.



WARNING: ELECTRIC SHOCK

The unit must be permanently grounded. Failure to properly ground the unit could result in electric shock, personal injury, or death.

NOTE: RISK OF FIRE

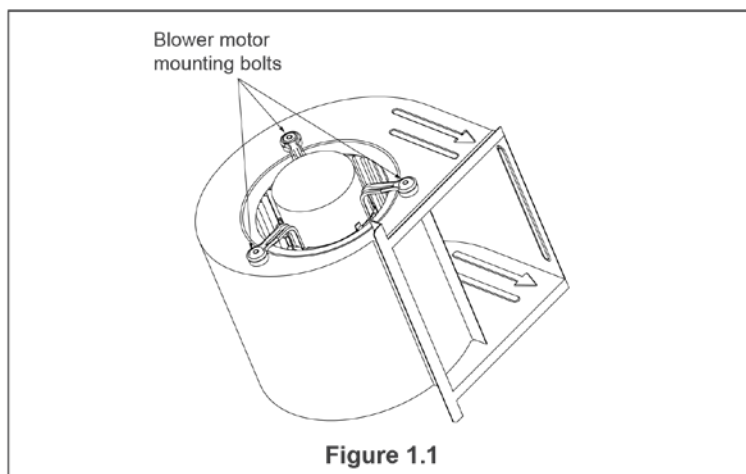


- This product is intended for use in one- or two-family residential applications only.
- Materials used in the air distribution system and related piping shall comply with the latest edition of NFPA 90B.

SAFETY



NOTE: Ensure the fan bracket is secured with the three motor mounting bolts (Figure 1.1). Then, before operating the unit, verify that the blower wheel is securely fastened to the motor shaft.



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 a room without continuously operating ignition sources (for example, open flames, an operating gas appliance, or an operating electric heater).
- 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 only by qualified personnel. This includes opening sealed components, opening ventilated enclosures, and working on the refrigerant circuit.

Area 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

Perform all service work using procedures that minimize the release of flammable refrigerant vapor.

Work Area Safety Checks

Before servicing any system containing flammable refrigerant, inspect the area to confirm that ignition risks have been minimized. Use appropriate leak-detection equipment rated for the refrigerant in use. Avoid working in confined spaces unless adequate ventilation is provided.

Checking for Refrigerant Leaks

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technicians can detect potentially hazardous refrigerant concentrations. Ensure that the leak detection equipment is suitable for use with the refrigerant in this system and is rated for use in flammable refrigerant applications.

Fire Protection

If hot work is required, keep an approved dry chemical or CO2 fire extinguisher within reach of the work area.

Ignition Sources

Do not use ignition sources near exposed refrigerant piping or while refrigerant may be released during installation, service, removal, or disposal. Post “No Smoking” signs as required.

Ventilation

Ensure the area is adequately ventilated before opening the system or performing hot work. Ventilation must continue while work is in progress to safely disperse any released refrigerant.

Checks on the Refrigeration Equipment

Replacement electrical components must be suitable for the application and match the required specifications. 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 that the refrigerant charge does not exceed the allowable charge for the room area in which the refrigerant-containing components are installed.
- The ventilation equipment and air openings are operating properly and are not obstructed.
- “If an indirect refrigerant circuit is 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 are 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

Checks on Electrical Components

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 and operation must continue, 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.

Repairs 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. Also consider the effects of aging and continuous vibration from components such as compressors and fans.

Detection of Flammable Refrigerants

Do not use any source of ignition when searching for refrigerant leaks or performing leak detection. 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 recalibration. (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 leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shutoff valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to the **'Removal and evacuation'** section below.

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. Follow this procedure:

- Safely remove refrigerant following local and national regulations;
- Evacuate;
- Purge the circuit with inert gas;
- Evacuate;
- 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 appliances containing flammable refrigerants, purging shall be performed using oxygen-free nitrogen (OFN) 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.

Purging for appliances containing flammable refrigerants shall be performed by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant remains in the system (optional for A2L applications). 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 that the refrigeration system is grounded before charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Use extreme care not to overcharge the 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 installation location.

Decommissioning

Before performing this procedure, the technician must be fully familiar with the equipment and all related details. As a best practice, recover all refrigerant safely before performing this procedure. Prior to the task being carried out, take an oil and refrigerant sample before starting work if the recovered refrigerant may need to be analyzed before reuse. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate the system electrically.
3. 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.
4. Pump down the refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure the cylinder is placed on the scale before recovery begins.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not fill the cylinder beyond 80% of its liquid capacity.
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, promptly remove the cylinders and recovery equipment from the installation site and close all isolation valves on the equipment.
11. Recovered refrigerant shall not be charged into another refrigeration 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 appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

Recovery

As a best practice, recover all refrigerant 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 that is at hand 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.

Dispose of recovered refrigerant in accordance with all applicable federal, state, and local requirements. 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.

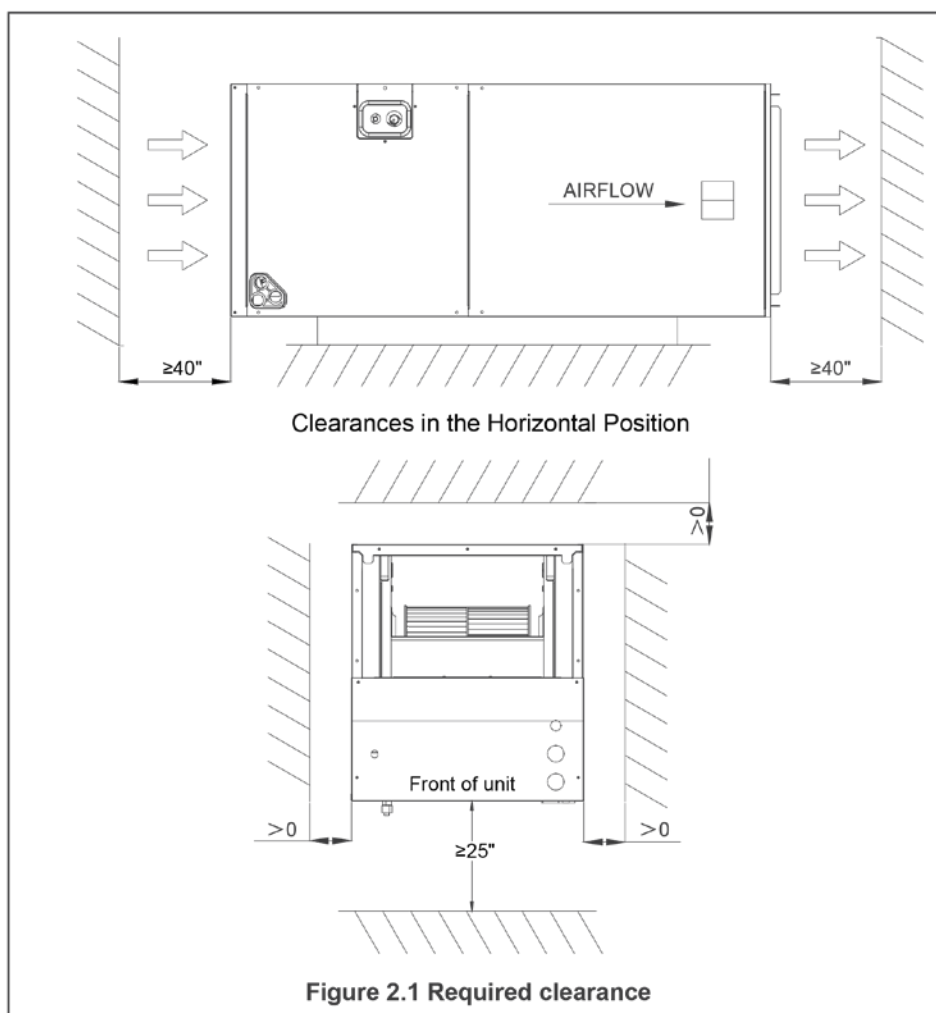
GENERAL

2. GENERAL

This unit may be installed in the upflow, downflow, or horizontal position using the appropriate return-air opening for each configuration.

Refer to the airflow performance table in Section 5 and the wiring diagram for DIP switch settings used to select the required airflow. Refer to Section 4 for high- and low-voltage wiring requirements.

Install the unit on a firm, level surface. Maintain the clearances shown in Figure 2.1 to allow proper installation, service access, and airflow.





NOTE: As shown in Figure 2.1, the installed unit must have the required clearance. Failure to follow these instructions may result in equipment damage and/or premature equipment failure.

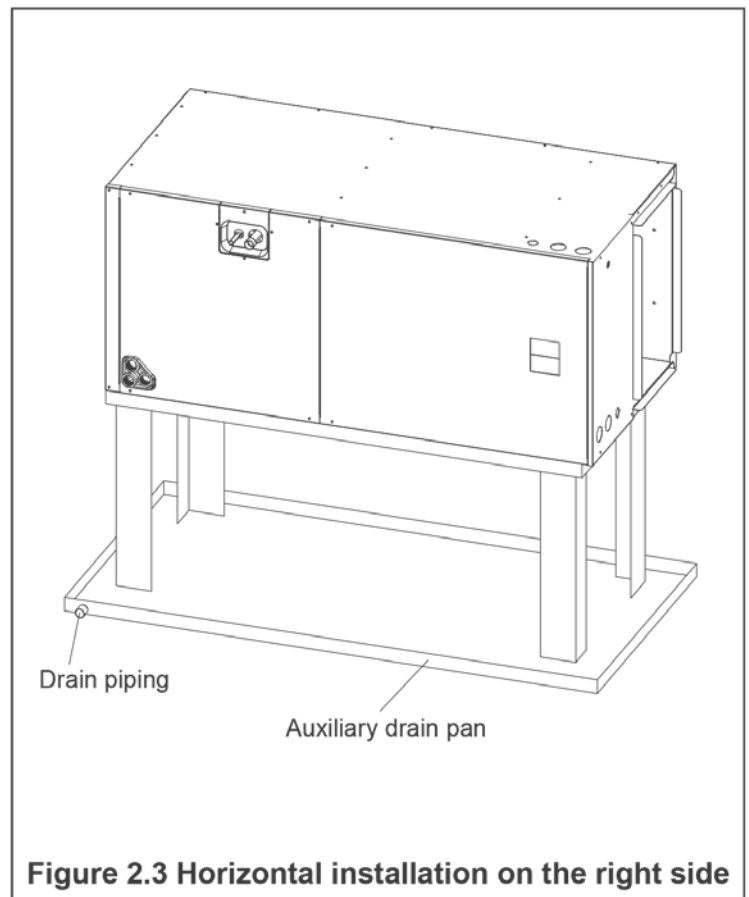
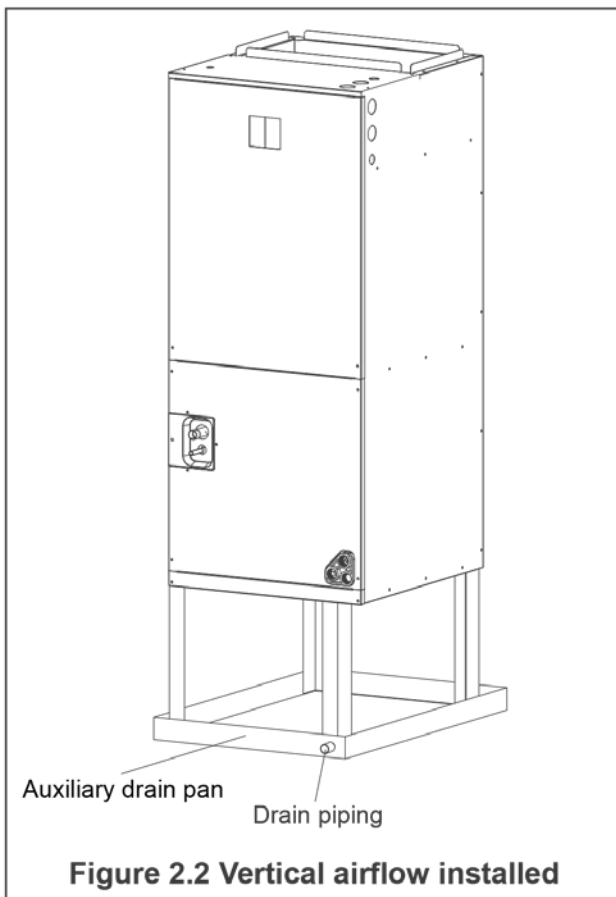


WARNING: FIRE RISK

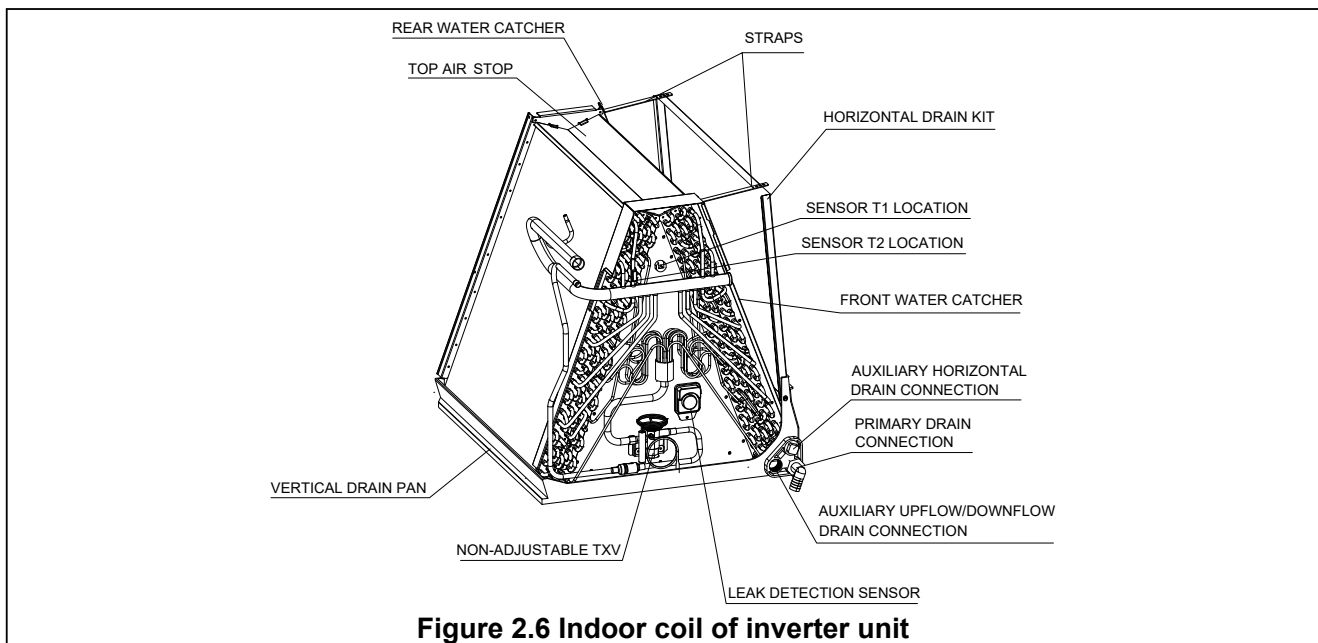
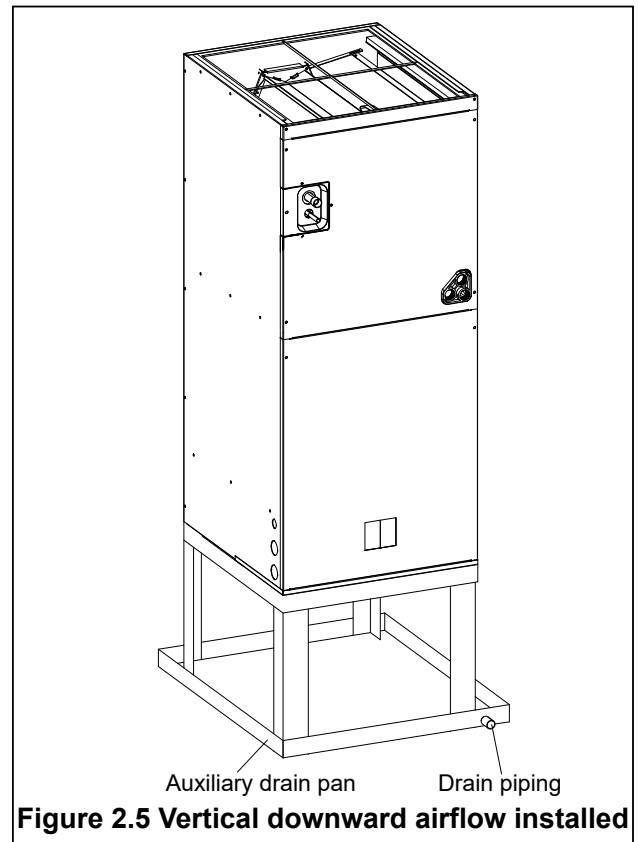
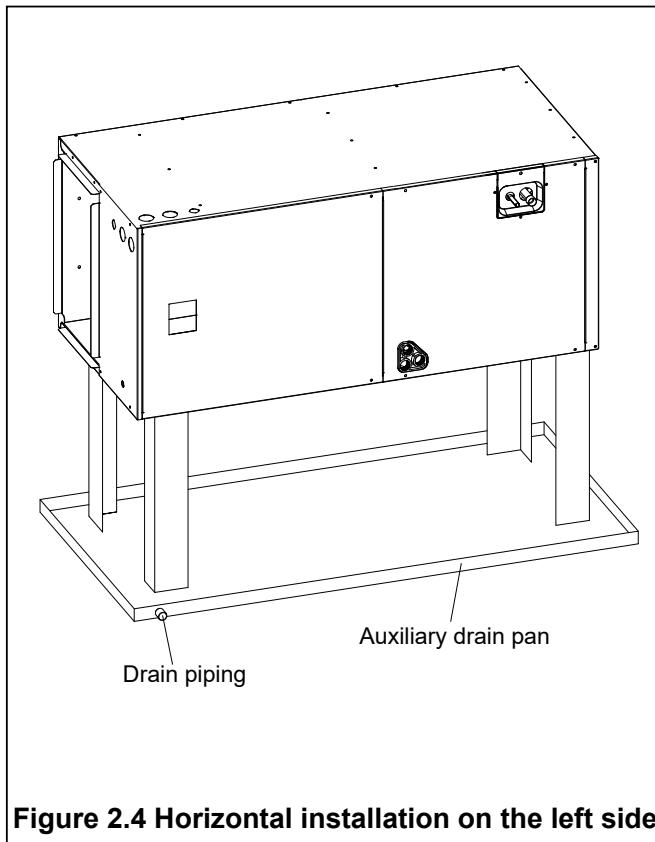
Keep flammable materials and vapors, such as gasoline, away from the air handler. Failure to follow these instructions may result in death, explosion or fire.



Refer to local codes for requirements regarding an auxiliary drain pan.



GENERAL



2.2 UNIT DIMENSIONS



Provide 25 in. of front clearance for filter and coil service access.

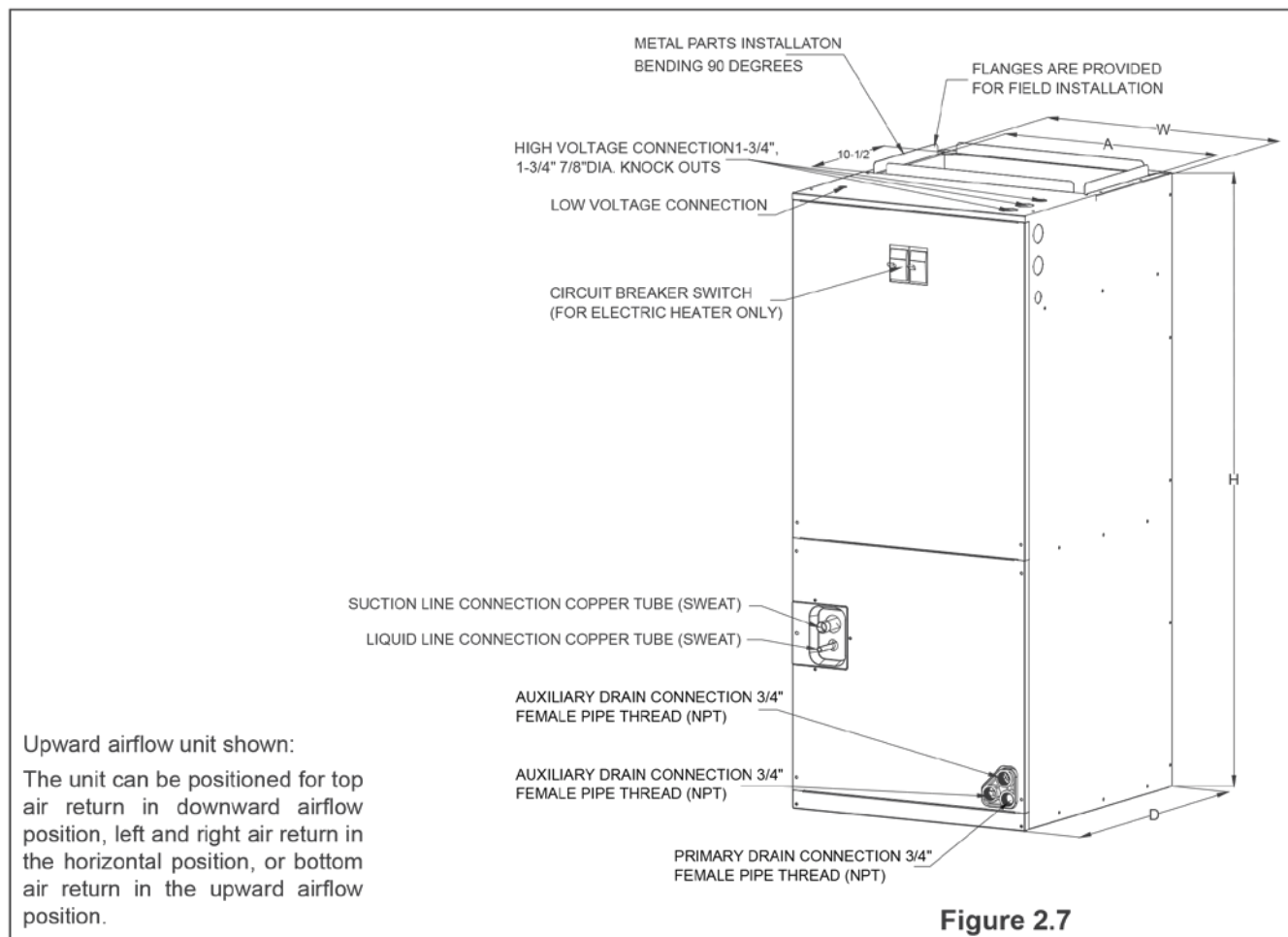


Figure 2.7

TABLE 2.1 UNIT DIMENSIONS

MODEL	Dimensions (inches [mm])				
	Height "H"	Width "W"	Dimension "D"	Air Outlet "A"	Liquid line / Suction Line
24K	45-3/4 [1162]	19-5/8 [500]	22 [560]	17-7/8 [454]	3/8 / 3/4 [9.5] / [19]
36K	45-3/4 [1162]	19-5/8 [500]	22 [560]	17-7/8 [454]	3/8 / 3/4 [9.5] / [19]
48K	53-1/8 [1350]	22 [560]	24-1/2 [623]	19-1/2 [496]	3/8 / 7/8 [9.5] / [22]
60K	53-1/8 [1350]	22 [560]	24-1/2 [623]	19-1/2 [496]	3/8 / 7/8 [9.5] / [22]

APPLICATION

3.1 UPFLOW

- All models are factory-configured for upflow operation. (see Figure 2.7).
- If the return air is to be ducted, the duct should be installed flush with the floor. Use a 1/8- to 1/4-in. approved flexible duct gasket material between the duct, unit, and floor.



Torque applied to the drain connection must not exceed 15 ft-lb. Drain connection dimensions for upflow and horizontal-right installations are shown in Figure 3.1.

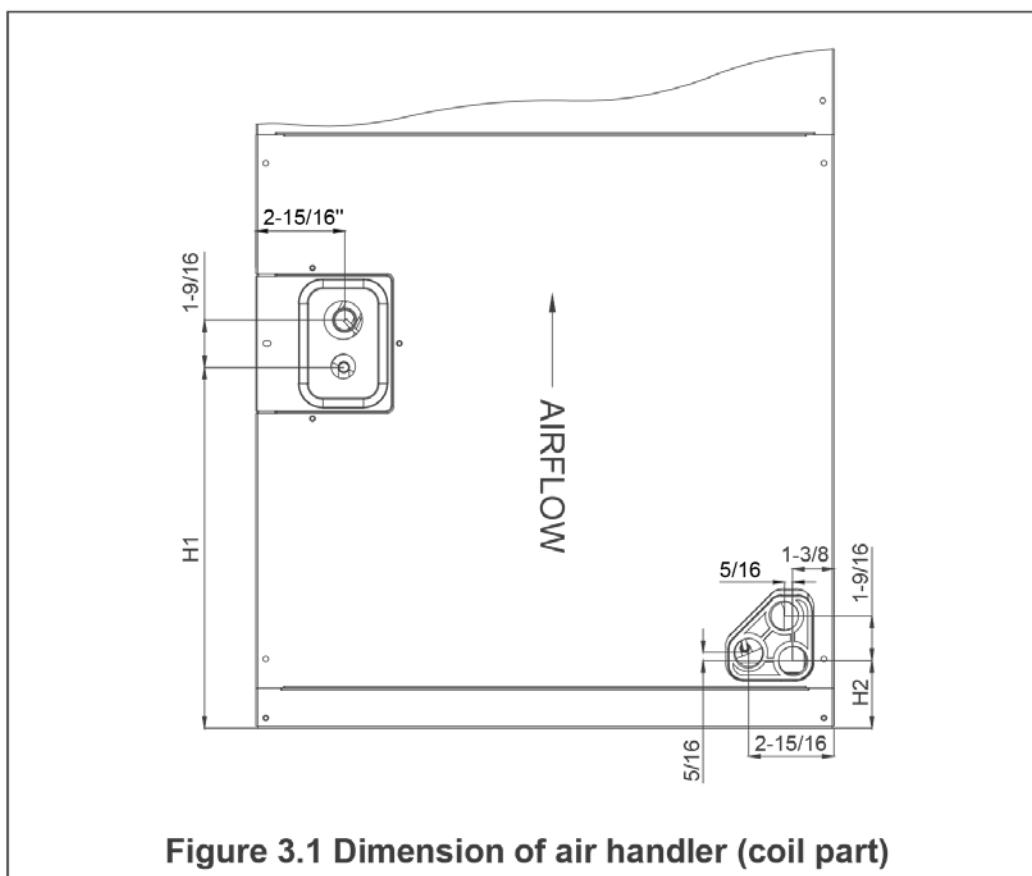


TABLE 3.1

Model	"H1" inch [mm]	"H2" inch [mm]
24K/36K	12-1/4 [311]	2-1/4 [57]
48K/60K	19 [483]	1-25/32 [45]

3.2 VERTICAL DOWNWARD AIRFLOW

Converting to Downflow:

The factory upflow configuration can be converted to downflow. Remove the coil (evaporator) access panel and coil, and reinstall it by rotating 180° from the original position. See Figure 3.2 and 3.4.

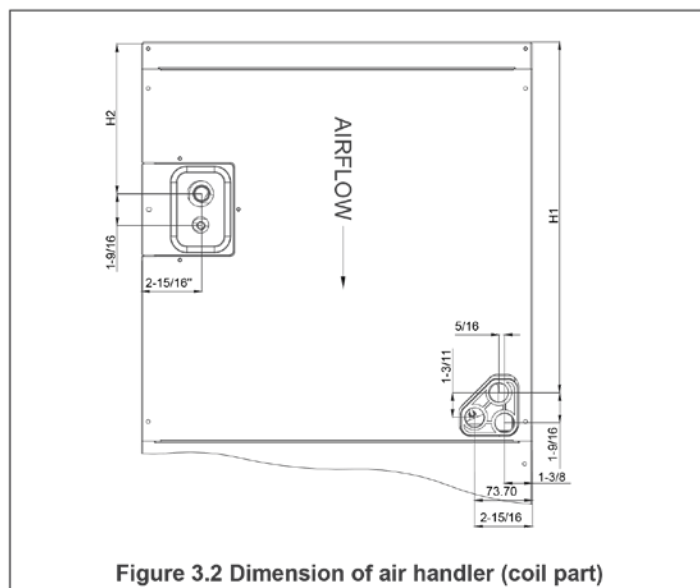


TABLE 3.2

Model	"H1" inch [mm]	"H2" inch [mm]
24K/36K	17-11/16 [449]	7-9/16 [192]
48K/60K	21-11/16 [551]	4-13/32 [112]

3.3 HORIZONTAL

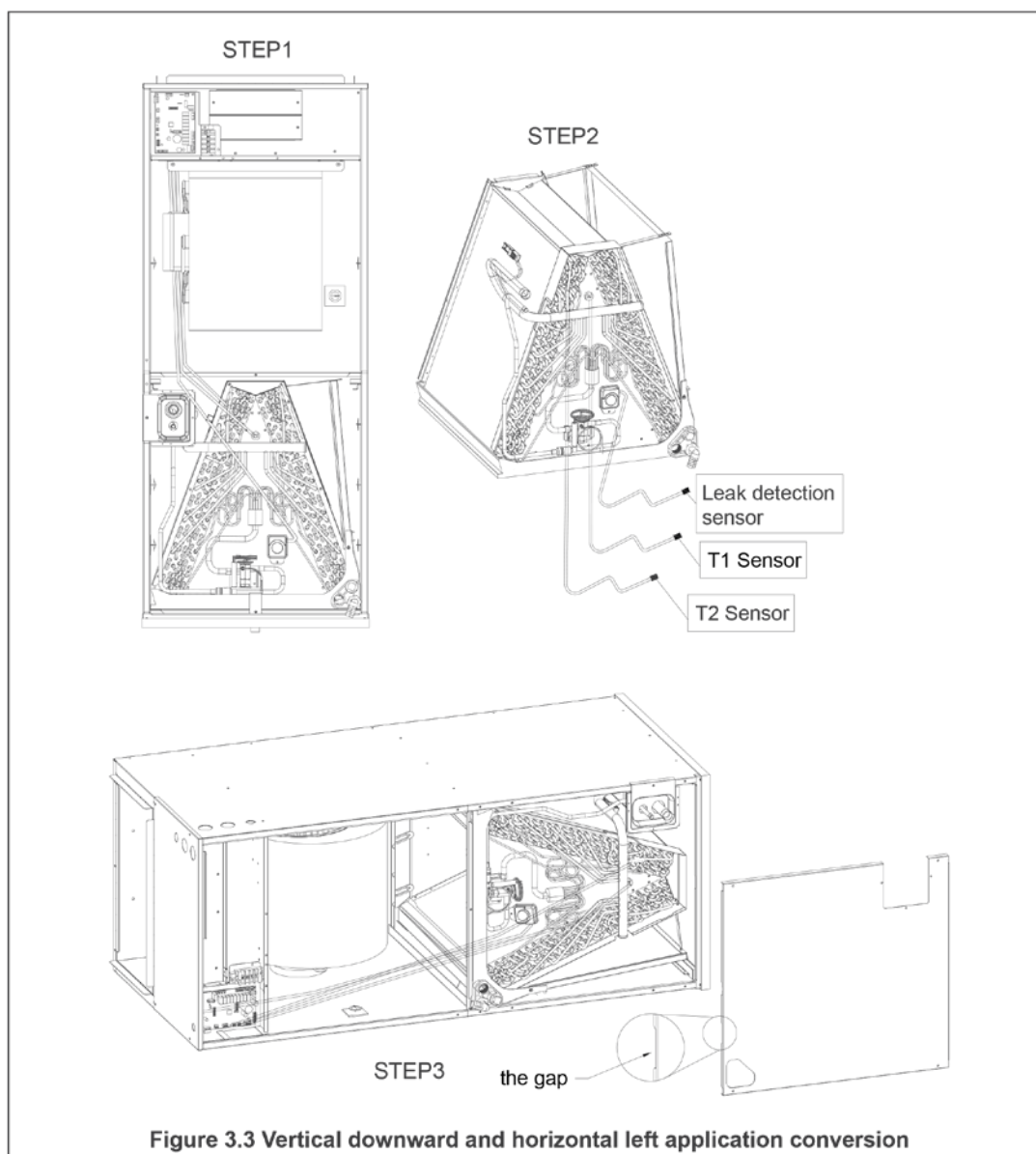
For horizontal applications, the factory default is horizontal-right. To convert to horizontal left installation:

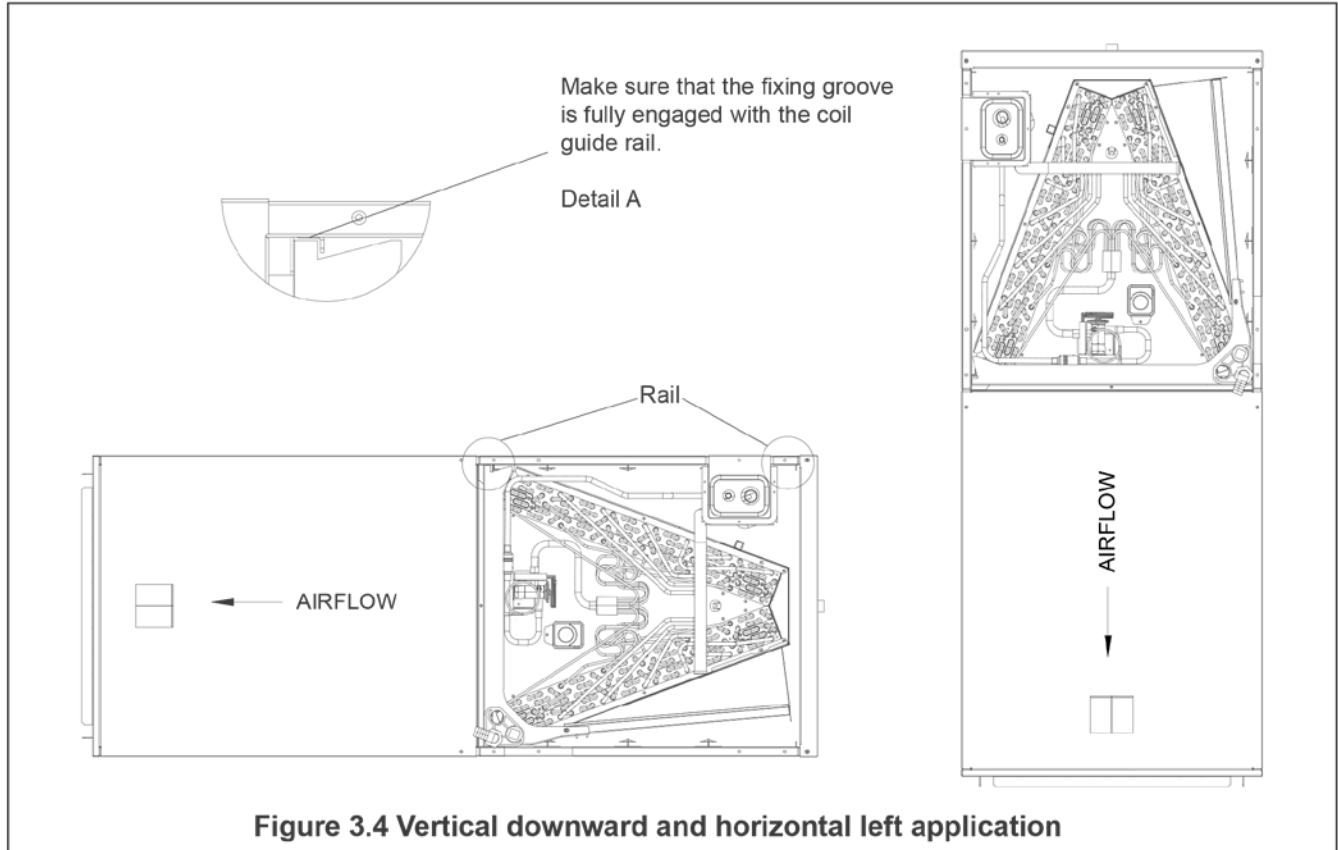
- To convert the unit from upflow to horizontal-left, remove the indoor coil assembly and reinstall it as shown in Figures 3.3 and 3.4.
- Rotate the unit by 90° to the horizontal left position, with the coil segment on the right and the blower segment on the left.
- Reinstall the indoor coil by rotating 180° from the original position. Ensure the mounting slot fully engages the coil guide rail. See Figure 3.4.
- If the unit is installed horizontally above a ceiling or above a finished living area, install an auxiliary drain pan.

APPLICATION

Steps to Convert the Cabinet for Downflow or Horizontal-Left Installation

1. Remove the screws and the front panel, and disconnect the T1, T2, and leak-detection sensor connectors from the control board (Figure 3.3, Step 1).
2. Slide the coil assembly out while leaving the sensor wires connected. Do not disconnect the T1, T2, or leak-detection sensor leads from the coil. (Figure 3.3, Step 2)
3. Install the coil in the correct direction and secure it in place. Route the sensor leads back through the cabinet opening and reconnect them to the control board. (Figure 3.3, Step 3).





NOTE:



- Horizontal units must be configured for either right-hand or left-hand air discharge. The horizontal drain pan must be located under the indoor coil.
- Failure to use the drain pan will result in property damage.

Horizontal Conversion:

Remove the indoor coil and reinstall it after rotating it 180° from its original position. The horizontal right air outlet can be changed to the horizontal left air outlet.

3.4 INSTALL IN UNCONDITIONED SPACE



NOTE: There are two pairs of coil guide rails in the air handler, which are used for upflow and downflow applications. If the air handler is installed in an unconditioned space, two unused coil guide rails should be removed to minimize cabinet condensation. Remove the six mounting screws from both sides of the cabinet and remove the unused coil guide rails.

APPLICATION

3.5 LEAK DETECTION SENSOR REPLACEMENT

General Specifications — Leak Detection Sensor:

MODEL: RGD-02TL11

MINIMUM LIFETIME: 15 YEARS

Replace the sensor only with the same model. Contact the manufacturer if you need assistance.

1. Remove the screws and the front panel, and disconnect the leak-detection sensor connector from the control board. (Figure 3.5, Step 1).
2. Remove the screws and remove the leak-detection sensor and wiring harness. (Figure 3.5, Step 2)
3. Install the new leak-detection sensor and secure it to the triangular mounting plate, reconnect and secure the wires to the control board in the same routing as originally installed. Install the access panels. Ensure all panels are fully seated so refrigerant cannot escape through panel gaps in the event of a leak.

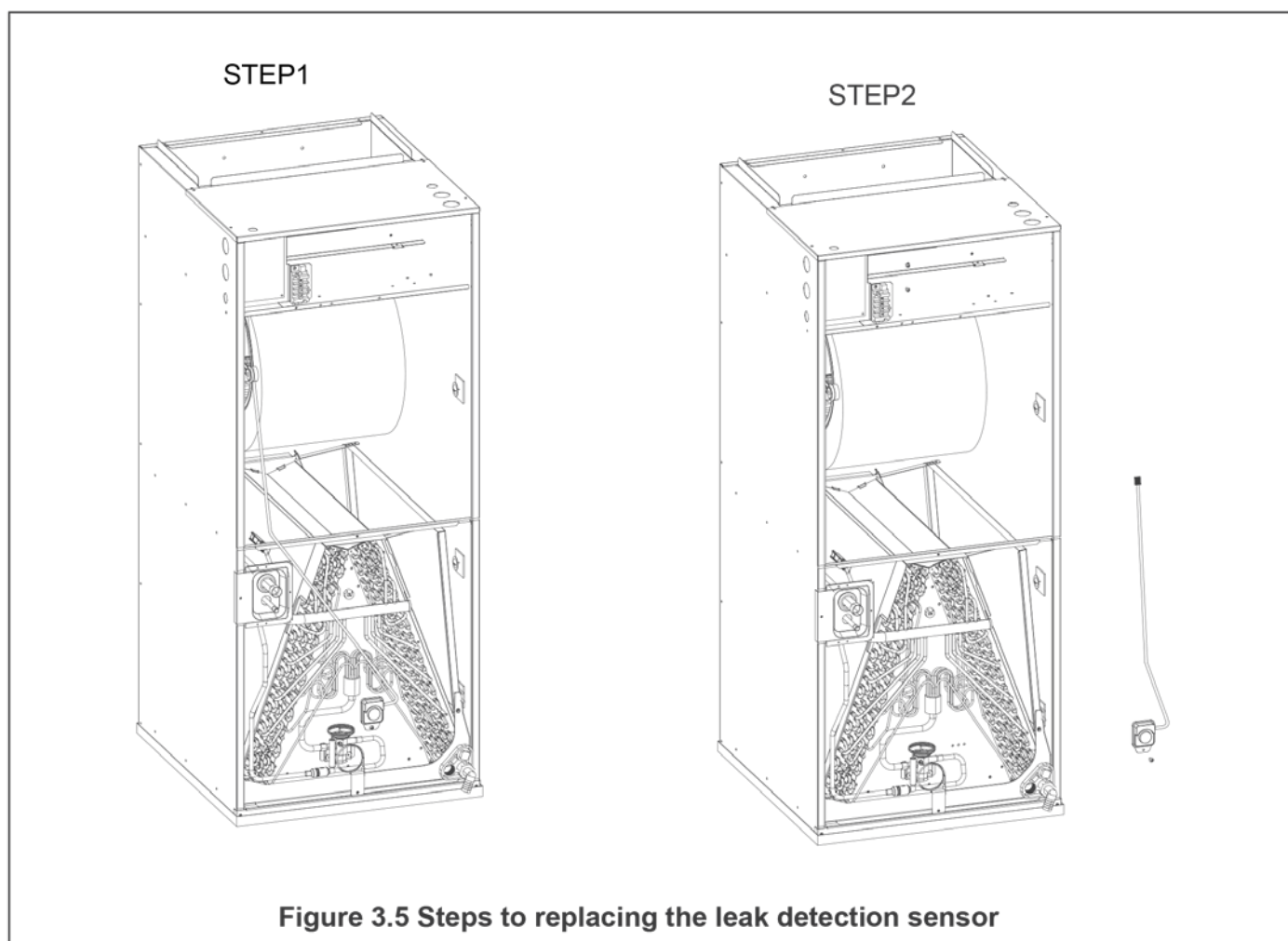
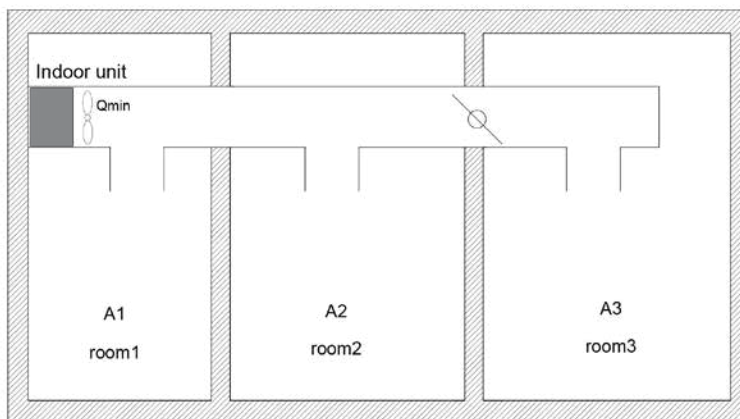


Figure 3.5 Steps to replacing the leak detection sensor

3.7 INSTALLATION ROOM SIZE RULES

Minimum room height: 7.2 ft (2.2 m) (if applicable)

Minimum room area for operation or storage: 215.91 ft² (20.06 m²).



Ensure that the total connected room area (TA) is greater than the minimum required room area (TA min (m²))

TABLE 3.3

24K/36K			
Piping length (m/ft)	Refrigerant charge (kg/oz)	TA min (m ²) (m ²)	TA min (m ²) (ft ²)
7.6/25.0	3.30/116.40	9.90	106.57
15.2/50.0	3.68/129.84	11.04	118.87
22.9/75.0	4.06/143.28	12.19	131.18
30.5/100.0	4.44/156.71	13.33	143.48
48K/60K			
Piping length (m/ft)	Refrigerant charge (kg/oz)	TA min (m ²) (m ²)	TA min (m ²) (ft ²)
7.6/25.0	4.40/155.20	13.20	142.10
15.2/50.0	4.78/168.64	14.34	154.40
22.9/75.0	5.54/195.51	16.63	179.00
30.5/100.0	6.69/235.83	20.06	215.91

TA equals the sum of the connected room areas served by the system. If a duct damper is installed, include all connected room areas when the damper is open. If the damper is closed, include only the room areas upstream of the damper. Verify that the total connected room area is not less than the minimum required room area shown in Table 3.3.

Example: A 36K unit with 25 ft of connected piping and a refrigerant charge of 116.4 oz requires a minimum installation room area of 106.57 ft².

APPLICATION

TABLE 3.4

MODEL	Qmin, CFM [m ³ /h]	QminA, SCFM [m ³ /h]
24K	450(265)	439.6(258.7)
36K	666(392)	439.6(258.7)
48K/60K	1361(801)	662.4(389.9)

Note: Qmin refers to the minimum airflow of the air handler (see Table 5.1 for details), which is not less than Qmin_A.

ELECTRICAL WIRING

4.1 POWER SUPPLY WIRING



WARNING: ELECTRIC SHOCK

Disconnect and lock out all power sources before installation or service. More than one disconnect switch may be required to disconnect power to the equipment. Dangerous voltage can cause serious personal injury or death.



When an electric heat kit is installed, the unit will include one 30 to 60 A circuit breakers. These circuit breakers protect internal lines and act as disconnecting units when a short circuit occurs. The factory-installed circuit breaker does not provide branch-circuit overcurrent protection for the field power wiring, so its size may be larger than that of the branch circuit protection.

Verify that the power supply matches the unit nameplate requirements before connecting power. For additional requirements, refer to the unit rating label, wiring diagram, and electrical data in these installation instructions.

- Install a properly sized branch-circuit disconnect within sight of the unit, if required.
- Use copper conductors rated for a minimum of 221°F (105°C). For current carrying capacity, wire size and overcurrent protection requirements, please refer to electrical data in this section. The power supply protection device may be a fuse or HACR-type circuit breaker.
- Route high-voltage conductors through the knockouts on the right side, left side, or top of the cabinet.
- Three knockouts sized 7/8 in., 1-3/8 in., and 1-3/4 in. are provided for high-voltage wiring entry.
- Connect the high-voltage supply conductors to the red and black leads in the control compartment.

4.2 CONTROL WIRING



Do not run low-voltage control wiring in the same conduit as high-voltage wiring. Maintain the required separation between low-voltage and line-voltage wiring in accordance with local codes.

- For control wiring runs under 100 ft, use 18 AWG low-voltage conductors.
- See Figure 2.7 for the connection position of low-voltage wires.
- For wiring details, refer to the wiring diagram on the back of the blower access panel.
- After installation, make sure that the low-voltage and high-voltage wiring are kept separate.

ELECTRICAL WIRING

4.3 GROUNDING



DANGER: ELECTRIC SHOCK

The unit must be permanently grounded. Failure to properly ground the unit could result in electric shock, personal injury, or death.

- Ground the unit in accordance with the NEC and local codes, using an approved equipment grounding conductor.
- Connect the equipment grounding conductor to the grounding lug provided in the unit.
- When multiple power supply circuits are used, each power circuit must be grounded separately.
- The grounding lug is located at the upper right of the cabinet.

4.4 ELECTRICAL DATA

TABLE 4.1 ELECTRICAL DATA

Model	Voltage	Hz	HP	Fan Speed	Circuit AMPS	MCA(A)	MOP(A)
24K	208/230	60	1/3	5	1.1	4	15
36K	208/230	60	1/2	5	2.0	5	15
48K	208/230	60	3/4	5	3.5	7	15
60K	208/230	60	3/4	5	4.3	7	15

4.5 MCA/MOP DATA OF ELECTRIC HEAT KIT

TABLE 4.2 APPLICABLE HEAT KITS FOR AHU MULTI-POSITION INSTALLATION

Heat Kit Model	AHU Model	Electric Heat (kW) 208/230 VAC	Current (A) 208/230VAC	MCA (A) 208/230VAC	MAX. Fuse or Breaker (HACR) Ampacity		Fan Speed				
					208 VAC	230 VAC	1	2	3	4	5
21-4444-01	24K	3.8/5	19.66/21.74	25/29	30	35	●	●	●	●	●
21-4444-02		5.6/7.5	29.50/32.61	37/43	40	45	X	X	●	●	●
21-4444-03		7.5/10	39.32/43.48	50/57	55	60	X	X	X	●	●
21-4444-01	36K	3.8/5	19.66/21.74	25/29	30	35	●	●	●	●	●
21-4444-02		5.6/7.5	29.50/32.61	37/43	40	45	X	●	●	●	●
21-4444-03		7.5/10	39.32/43.48	50/57	55	60	X	X	●	●	●
21-4444-04		5.6+5.6/7.5+7.5	29.50+29.50/32.61+32.61	37+37/43+43	40/40	45/45	X	X	X	●	●
21-4444-01	48K	3.8/5	19.66/21.74	25/29	30	35	●	●	●	●	●
21-4444-02		5.6/7.5	29.50/32.61	37/43	40	45	●	●	●	●	●
21-4444-03		7.5/10	39.32/43.48	50/57	55	60	X	●	●	●	●
21-4444-04		5.6+5.6/7.5+7.5	29.50+29.50/32.61+32.61	37+37/43+43	40/40	45/45	X	X	●	●	●
21-4444-05		7.5+7.5/10+10	39.32+39.32/43.48+43.48	50+50/57+57	55/55	60/60	X	X	X	●	●
21-4444-01	60K	3.8/5	19.66/21.74	25/29	30	35	●	●	●	●	●
21-4444-02		5.6/7.5	29.50/32.61	37/43	40	45	●	●	●	●	●
21-4444-03		7.5/10	39.32/43.48	50/57	55	60	X	●	●	●	●
21-4444-04		5.6+5.6/7.5+7.5	29.50+29.50/32.61+32.61	37+37/43+43	40/40	45/45	X	X	●	●	●
21-4444-05		7.5+7.5/10+10	39.32+39.32/43.48+43.48	50+50/57+57	55/55	60/60	X	X	X	●	●

- These heat kits are approved for use with the AHU in all four installation positions.
- MCA and fuse/circuit breaker values include the blower motor load.
- The heat pump system requires the specified airflow range. Required airflow is 350 to 450 CFM per ton of cooling, with 400 CFM per ton as the nominal setting.

ELECTRICAL WIRING

TABLE 4.3 HEATER KIT ACCESSORIES

Model	Description	24	36	48	60
21-4444-01	5 kW heating kit, single-pole circuit breaker	●	●	●	●
21-4444-02	7.5 kW heating kit, single-pole circuit breaker	●	●	●	●
21-4444-03	10 kW heating kit, single/double-pole circuit breaker	●	●	●	●

● = available; x = not available

WARNING:

- This product uses an A2L refrigerant. The electric heater must comply with UL 60335-2-40 requirements for A2L applications.
- Electric heat kits must be installed by qualified personnel in accordance with NEC and local codes. Install electric heat kits only in locations permitted by applicable codes and regulations.
- 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 appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the unit.
- Install the unit in accordance with the NEC and all applicable state and local codes.



AIRFLOW

5. AIRFLOW PERFORMANCE

Airflow data is based on cooling operation with the indoor coil installed and no filter in place. Use the performance table to select the appropriate model. External static pressure (ESP) should be kept within the minimum and maximum limits shown in the following table to ensure proper operation in cooling, heat pump heating, and electric heat modes.

TABLE 5.1 AIRFLOW PERFORMANCE

Air handler model size	Motor Speed		SCFM								
			External Static Pressure-Inch Water Column [kPa]								
			0[0]	0.1[.025]	0.2[.050]	0.3[.075]	0.4[.100]	0.5[.125]	0.6[.150]	0.7[.175]	0.8[.200]
24K	Tap (1)	SCFM	670	572	491	394	270	-	-	-	-
		Watts	41	47	52	57	61	-	-	-	-
	Tap (2)	SCFM	792	709	616	549	474	371	265	-	-
		Watts	59	67	73	77	83	88	93	-	-
	Tap (3)	SCFM	949	887	810	724	672	597	504	410	-
		Watts	96	102	109	115	129	126	132	141	-
	Tap (4)	SCFM	1021	966	887	798	739	698	672	573	490
		Watts	118	127	136	144	150	156	160	167	177
	Tap (5)	SCFM	1115	1059	995	907	842	791	727	707	653
		Watts	148	157	167	178	186	191	198	205	211
36K	Tap (1)	SCFM	955	898	840	739	652	576	512	432	392
		Watts	91	96	102	110	115	121	127	138	140
	Tap (2)	SCFM	1081	1032	977	926	819	744	675	609	547
		Watts	125	131	137	143	153	160	166	173	179
	Tap (3)	SCFM	1182	1138	1089	1043	987	879	811	750	689
		Watts	158	165	172	177	185	197	203	212	221
	Tap (4)	SCFM	1306	1262	1221	1180	1132	1086	984	914	857
		Watts	207	214	221	228	236	244	257	266	273
	Tap (5)	SCFM	1387	1350	1309	1275	1233	1187	1138	1032	970
		Watts	245	253	262	270	277	285	295	309	318
48K	Tap (1)	SCFM	1275	1220	1166	1116	1052	975	914	859	801
		Watts	153	163	173	183	194	203	212	220	231
	Tap (2)	SCFM	1435	1382	1335	1289	1244	1186	1114	1076	1016
		Watts	210	220	232	243	254	266	276	287	297
	Tap (3)	SCFM	1611	1567	1528	1482	1441	1396	1351	1262	1220
		Watts	287	301	313	325	336	355	361	381	391
	Tap (4)	SCFM	1757	1719	1675	1634	1601	1557	1520	1475	1426
		Watts	366	376	392	405	415	431	444	459	472
	Tap (5)	SCFM	1776	1748	1719	1685	1651	1622	1588	1554	1516
		Watts	511	520	530	541	551	563	576	586	599
60K	Tap (1)	SCFM	1275	1220	1166	1116	1052	975	914	859	801
		Watts	153	163	173	183	194	203	212	220	231
	Tap (2)	SCFM	1435	1382	1335	1289	1244	1186	1114	1076	1016
		Watts	210	220	232	243	254	266	276	287	297
	Tap (3)	SCFM	1611	1567	1528	1482	1441	1396	1351	1262	1220
		Watts	287	301	313	325	336	355	361	381	391
	Tap (4)	SCFM	1757	1719	1675	1634	1601	1557	1520	1475	1426
		Watts	366	376	392	405	415	431	444	459	472
	Tap (5)	SCFM	1917	1883	1843	1799	1773	1734	1701	1663	1622
		Watts	467	482	496	512	525	542	553	569	584

The shaded table values identify airflow within the recommended range of 300 to 450 CFM per ton.

AIRFLOW

NOTE:

1. Use the selected operating airflow as the rated airflow for full-load operation.
2. The rated airflow of a system without an electric heater kit requires 300 to 450 CFM per ton. The air distribution system has the greatest effect on airflow. Verify that external static pressure is within the manufacturer's specified range.
3. Design and install the duct system carefully. Poor duct design or installation can significantly reduce system performance.
4. Locate supply outlets to provide even air distribution throughout the conditioned space. Improper location or insufficient airflow may lead to insufficient ventilation or noise in the ductwork.
5. Balance the air distribution system so each room receives proper airflow with acceptable noise levels. Use an anemometer or airflow hood to verify branch duct and system airflow.

5.1 INDOOR FAN FUNCTION

Passive Dehumidification (Optional)

This unit includes a passive dehumidification feature which lowers the fan speed with a DH call from the thermostat. This function requires proper DH wiring from the indoor unit to the thermostat (with a humidistat).



If the DH terminal is not connected, the system will operate normally.

5.1.1. COLD-BLOW PREVENTION & HEATING BLOWER DELAY

1. Anti-Cold Air:

This function utilizes the T1 (indoor room temperature) and T2 (indoor coil temperature) sensors of the indoor unit to determine whether the indoor blower should turn on. This function prevents the unit from delivering cold air during heating operation.

When all of the following conditions are met, the Anti-Cold Air function will be activated:

- A. Heating mode
- B. DIP switch SW1-2 is set to "OFF";
- C. $T2 < 82.4^{\circ}\text{F}$;
- D. Electric heat kit is off;
- E. Y1/Y2 is energized when it is connected with a 24V thermostat OR when a manufacturer-supplied RS485 communicating thermostat is connected, indoor fan blower is activated by thermostat.

When all of the following conditions are met, the Anti-Cold Air function will be deactivated:

- A. $T_2 > 89.6^{\circ}\text{F}$;
- B. Electric heat kit is on;

2. Heating Fan Delay:

When the DIP switch SW1-2 is set to “ON” and the indoor unit is in heating mode, the fan will operate with a 90-second delay each time heating starts. Fan speed is determined by the Y1/Y2 signal from the thermostat.

5.1.2. INDOOR COIL ANTI-FREEZING FUNCTION

This function uses the T_2 indoor coil sensor to determine whether the coil is approaching a freeze condition. This feature prevents operation at excessively low evaporating temperature and low suction superheat.

When all the following conditions are met, the Anti-Freezing Function will activate:

- A. $T_2 < 32^{\circ}\text{F}$
- B. $32 - T_2 \geq 5.4$

When the following conditions are met, the Anti-Freezing Function will deactivate:

- A. $T_2 \geq 42.8^{\circ}\text{F}$

The Anti-Freezing function is active in both 24-V thermostat mode and RS-485 communication mode. When the feature is activated, the compressor will be turned off.

5.1.3. R454B LEAKAGE DETECTION FUNCTION

This function uses an R-454B leak-detection sensor to monitor refrigerant concentration. Terminal F is reserved for connecting buzzer, if needed.

If an R-454B leak is detected at the indoor coil in the indoor coil and the concentration is above 10%, the unit will respond as follows:

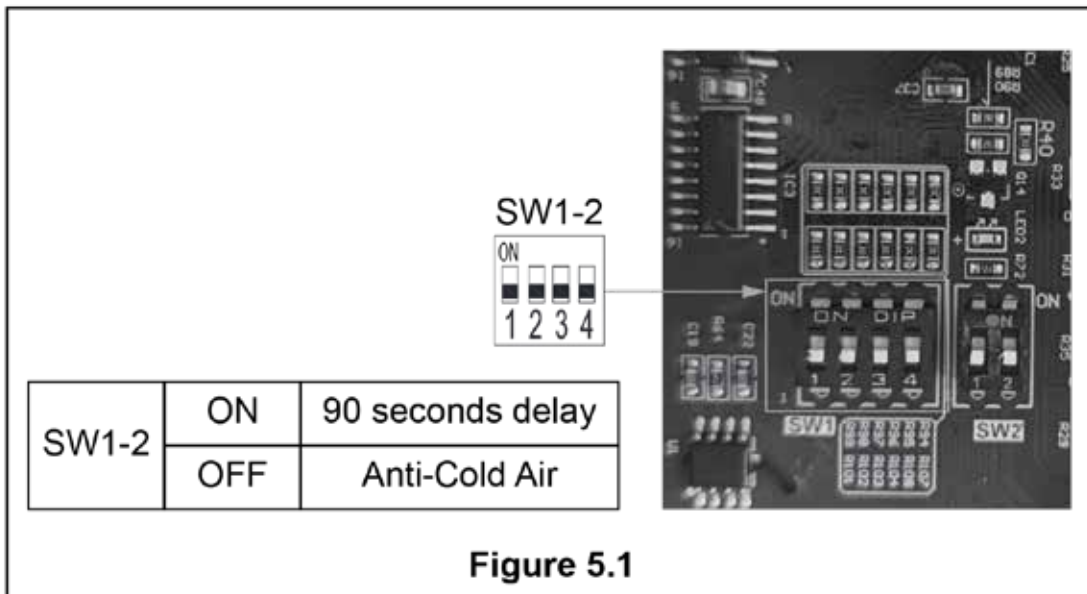
- A. Interrupt the compressor call from the thermostat to stop the compressor.
- B. The electric heat kit will shut off.
- C. Line voltage will be present between terminals F and L2 to energize the optional alarm buzzer.

AIRFLOW

5.1.4. USB PORT SOFTWARE UPDATE FUNCTION

A USB port is provided on the control board to allow the contractor to update software when needed. Follow the manufacturer's instructions.

1. Disconnect the power supply and set the thermostat to OFF mode.
2. Set the DIP switch SW1-4 to "ON".
3. Connect the power supply.
4. Set DIP switch SW1-4 to OFF. The green LED will remain on continuously.
5. Insert a USB flash drive which contains the updated software file into the USB port.
6. Wait until the green light begins flashing slowly.
7. Remove the USB flash drive.



DUCTWORK

6. DUCTWORK

Field-installed ductwork must comply with NFPA 90A, NFPA 90B, and all applicable local codes.



WARNING: FIRE AND CARBON MONOXIDE

Under no circumstances should the return ductwork be connected to any other heat-producing equipment, such as a fireplace, stove, or other heat-producing appliance. Unauthorized use of such equipment may cause fire, carbon monoxide poisoning, explosion, personal injury or property damage.

The metal ductwork operating in the air-conditioned space must be insulated and covered with a vapor barrier. Fiberglass duct systems may be used if they are designed and installed in accordance with applicable SMACNA standards. Duct materials shall comply with UL 181 and all applicable NFPA and local code requirements. Follow local code requirements for duct construction and insulation.

- The duct system must be designed within the external static pressure range of the intended operating range of the unit. Adequate airflow in the system is very important. Ensure that the supply and return ductwork, grilles, filters, accessories, and duct fittings are included in the total external static pressure. Please refer to the airflow performance table in Section 5 of this manual.
- Design the duct system in accordance with ACCA Manual D. The latest version can be obtained from “ACCA” American Air Conditioning Contractors Association, 1513 16th Street NW, Washington, DC, 20036. If the ductwork contains flexible ducts, make sure that the system takes into account the pressure drop information (straight line length plus all turns) shown in “ACCA” manual “D”.
- Connect the ductwork to the unit’s 3/4” flange. Install a flange around the air outlet.
- Use appropriate fasteners suitable for the type of duct used, fix the outlet and return ducts to the flanges of the unit, and connect the ducts to the unit with adhesive tape as needed to prevent air leakage.



If the duct connector has an elbow, its size should not be smaller than that of the flange on the outlet of the unit.



The front flange on the return duct (if connected to the fan casing) must not be screwed into the area where the power wiring is located. Drill bits or sharp screw tips can damage the insulation of the internal wires of the equipment.

SYSTEM CONNECTIONS

7. LINE SET CONNECTION

Keep the indoor coil sealed until the refrigerant line set is ready to be connected. Refer to the outdoor unit installation instructions for approved line sizes, maximum line lengths, and refrigerant charge requirements. Remove the rubber plugs only when ready to braze the line set, and verify that the factory nitrogen holding charge has not been lost before proceeding.



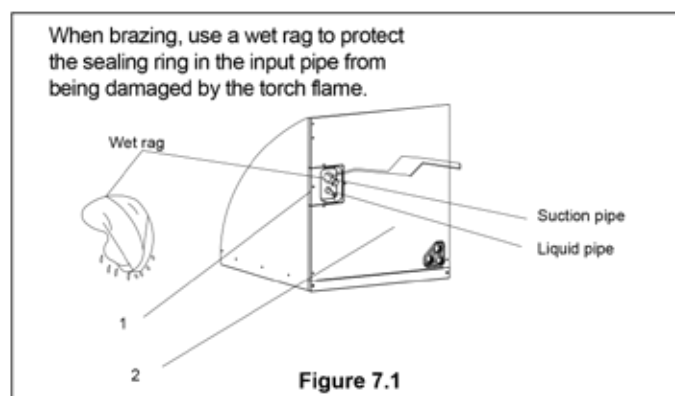
WARNING: PERSONAL INJURY HAZARD

- Failure to follow this warning could result in personal injury.
- Wear eye protection.

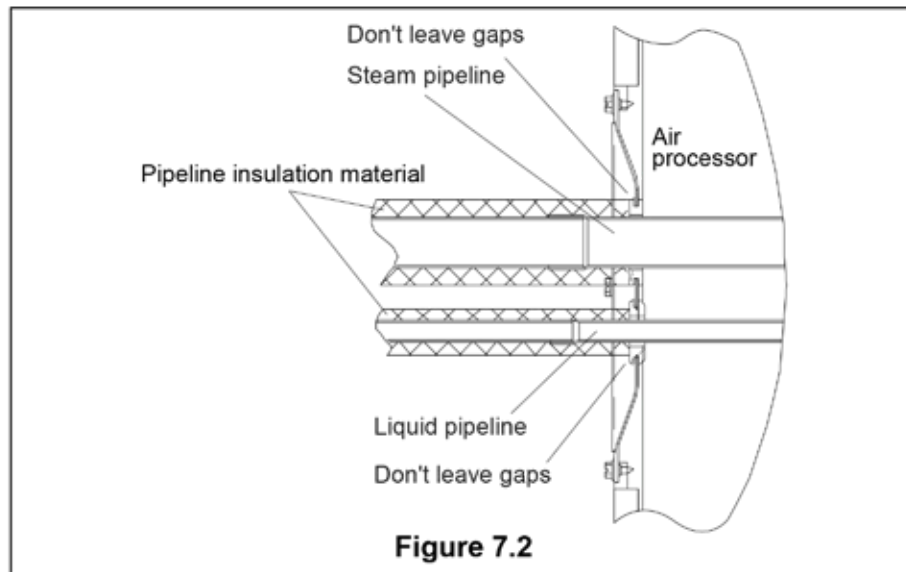


NOTE: Factory nitrogen charge may escape past rubber plugs during storage. This does not indicate a leaking coil.

- Care should be taken to connect the refrigerant line set so that it will not obstruct the service clearance area in front of the equipment.
- Before brazing, remove metal pieces 1 and 2. See Figure 7.1.
- Pull the evaporator coil out approximately 6 in. to expose enough refrigerant tubing for brazing and for placement of a wet rag.
- During brazing, nitrogen should flow through the refrigerant line set.
- Use a brazing shield to protect the paint of the cabinet, and use a wet rag to protect the rubber grommet and adjacent refrigerant tubing from torch heat. During the brazing process, protect the TXV sensing bulb with a wet cloth or approved heat-blocking paste. See Figure 7.1.
- Field-made refrigerant joints indoors shall be leak-tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0.25 times the MAXIMUM ALLOWABLE PRESSURE. No leak shall be detected.
- After completion of field piping for split systems, the field pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging. The minimum test pressure for the system shall be the low side design pressure (See nameplate for detail).
- After brazing, slide the evaporator coil back into position and reinstall metal pieces 1 and 2 on the cabinet.
- After the refrigerant line set connection is completed, seal surrounding openings with approved pressure-sensitive sealing material.



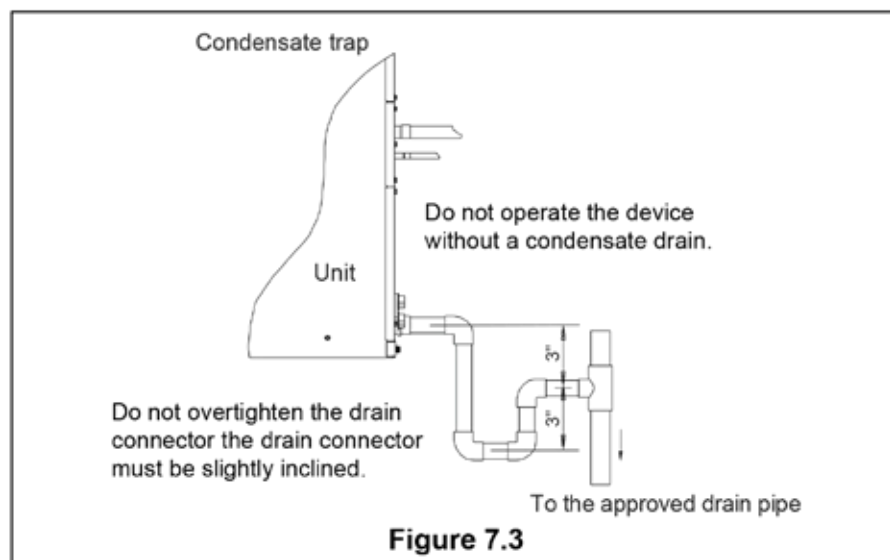
After brazing, verify that there are no refrigerant leaks. After confirming there are no refrigerant leaks, insulate the refrigerant lines as shown in Figure 7.2.



7.1 CONDENSATE DRAIN CONNECTION

For specific requirements, refer to local codes.

For the required condensate trap installation, refer to Figure 7.3 and the following information.



SYSTEM CONNECTIONS



1. When connecting the drain connector to the drain pan, apply a thin layer of PTFE paste, silicone sealant, or PTFE tape and hand-tighten the fitting.
2. When connecting the drain connector to the drain pan, do not overtighten the fitting. Tight fittings will crack the pipe connection on the drain pan.

- Make sure that the condensate drain line will not block the inlet in front of the unit. The minimum front clearance for filter, coil, or blower service is 25 in.
- Ensure that the unit is level, or pitched slightly toward the main drain outlet, so that water can be completely drained from the unit.
- Do not reduce the drain pipe size to less than the connection size provided on the condensate drain pan.
- All horizontal condensate drain lines must be inclined downward at a slope of at least 1/8 inch per foot to ensure proper drainage.
- Do not connect the condensate drain line directly to a sewer. Use an approved air gap or indirect drain. Route condensate to an approved open drain or to a suitable outdoor discharge location.
- Insulate the drain line as needed to prevent condensation from forming on the outside of the pipe.
- If necessary, be prepared to disconnect and clean the main condensate drain line. Install a 3-inch trap (using elbows) on the main condensate drain line as close as possible to the unit. Make sure that the top of the trap is below the drain pan outlet connection to allow the drain pan to drain completely (see Figure 7.3).
- Route the auxiliary drain line to a conspicuous location where discharge will be readily visible. If the condensate drain line starts to flow out from the auxiliary drain pipe, visible discharge from the auxiliary drain indicates a drainage problem that requires service.
- Plug the unused drain connector with the plug in the parts package provided with the equipment. Use a thin layer of PTFE paste, silicone sealant, or PTFE tape to form a waterproof seal.
- After installation, test the condensate drain pan and drain pipe. Pour enough water into the drain pan to fill the drain traps and piping. Check to ensure that the drain pan completely drains water, no leakage is found in the drain pipe fittings, and water is discharged from the main drain pipe terminal.

AIR FILTER

8. AIR FILTER (NOT FACTORY INSTALLED)

The filter is not factory installed and must be field supplied.

The size and type of the field-supplied filter must be selected so face velocity does not exceed 300 ft/min and airflow requirements are maintained.

Filter selection and placement are critical to system airflow and performance. Reduced airflow can shorten the service life of major system components, including motors, relays, evaporator coils, and compressors. Therefore, we recommend that the return air duct system has only one filter position. For systems without return air filter grids, multiple filter grids can be installed at each return air opening.

If a high-efficiency filter or electronic air cleaner is used, verify that system airflow remains within the required range. If the air flow decreases, system performance and efficiency will decrease.. Have a qualified HVAC contractor verify that any high-efficiency filter or electronic air cleaner does not reduce airflow below the required range.



Do not install multiple filters in the return-air path, and do not install filters in the supply duct system. Either condition will restrict airflow and reduce performance.

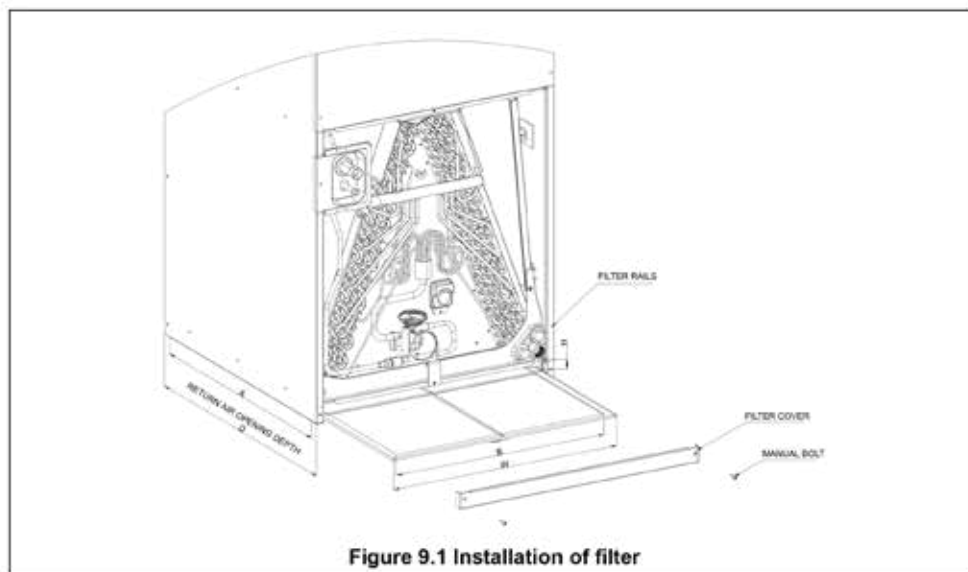
WARNING: FIRE RISK



Do not operate the system without a filter. Airborne dust may accumulate in the duct system and at supply outlets. Airborne dust may contact hot electric heat elements and burn, which can stain ceilings, walls, drapes, carpets, and other household surfaces. When candles, oil lamps, or other ignition sources burn, soot may be drawn into the system.

FILTER SIZE

9. FILTER DIMENSIONS



When installing the indoor unit, regardless of the installation method, make sure that the filter is installed as shown in Figure 9.1.

TABLE 9.1 FILTER DIMENSIONS

Model	Filter Size Inches	“W” Inch	“D” Inch	“H” Inch	Return Width “A” Inch	Return Length “B” Inch
24K/36K	18 x 20 x 1	18	21	1	20.8	16.3
48K/60K	20 x 23 x 1	20	23	1	23	18.8

Removal/Installation of Air Filter

- Remove the bolts and the filter cover, as shown in Figure 9.1.
- Grasp the edge of the filter and pull it out.
- Install a new filter so that the Install the filter with the airflow arrow pointing in the direction of airflow..
- If a reusable filter is used, clean it according to the manufacturer’s specifications before reinstalling it.
- The filter must meet the UL 900 standard.

MAINTENANCE

10. MAINTENANCE



The filter is not included in the unit and must be provided at the installation site.

10.1 CLEANING PRECAUTIONS



All maintenance must be performed by qualified service personnel.



Before cleaning or maintenance, be sure to turn off the equipment and disconnect its power supply.



When removing the filter, do not touch the metal parts in the unit. Sharp metal edges can cut you.



- Do not use chemicals or chemically treated cloth to clean the equipment.
- Do not use benzene, paint thinner, abrasive cleaners, or other solvents to clean the unit.
- Do not operate the system without a filter.

10.2 ROUTINE MAINTENANCE

Your equipment must be inspected regularly by qualified service technicians. The annual system inspection should include the following:

1. Check the filter every 30 days, or at any time as needed. If it is dirty or clogged, clean or replace it immediately.
2. Inspection and/or cleaning of blower housing and motor.
3. Check and clean indoor and outdoor coils as needed.
4. Inspect and clean the indoor coil drain pan, main condensate drain line, auxiliary drain pan, and auxiliary drain line as needed.
5. Check all wires and connections. Refer to the wiring diagram and make corrections as needed.

WIRING DIAGRAM

11. WIRING DIAGRAM



WARNING: ELECTRIC SHOCK

Disconnect all power sources before installing or servicing this unit. There may be multiple power sources. Failure to follow these instructions could result in property damage, personal injury, or death.



DANGER: ELECTRIC SHOCK

The unit must be properly grounded and protected by a circuit breaker or fuse.



WARNING: ELECTRIC SHOCK

Wire and install these units in accordance with the NEC and all applicable local codes.

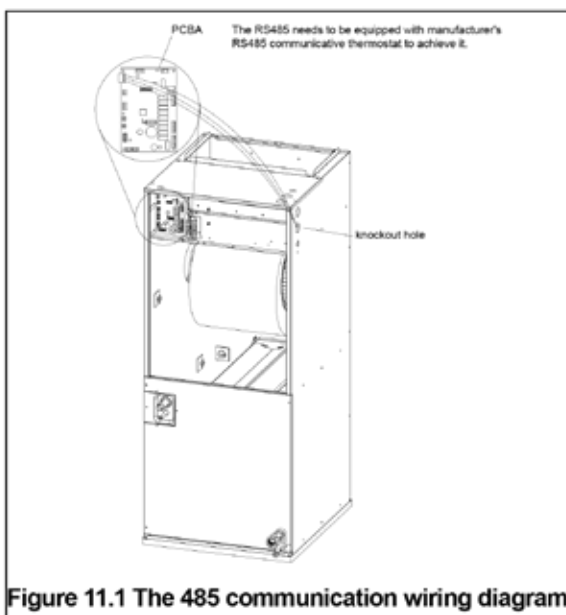


Figure 11.1 The 485 communication wiring diagram

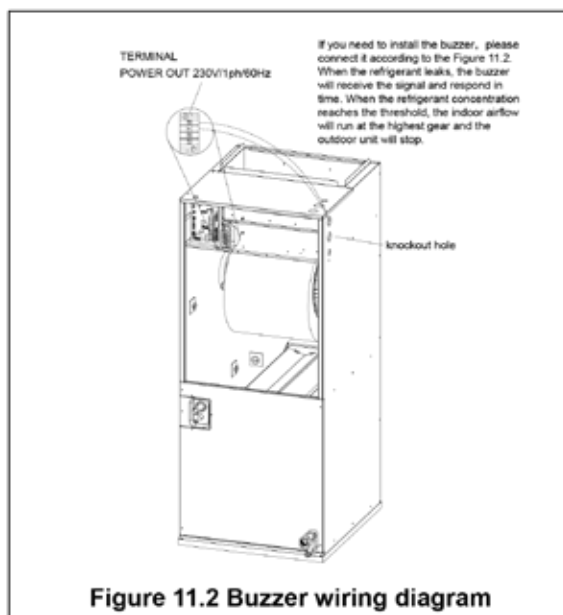


Figure 11.2 Buzzer wiring diagram

To reduce the risk of electric shock:

1. Equipment is properly grounded.
2. Verify that the unit is properly grounded in accordance with the NEC and local codes.
3. Do not pinch, damage, or over-tighten field wiring at cabinet entry points.



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



DH wiring is optional and requires a thermostat or control with a dehumidification output. When the DH input is active, the unit enters passive dehumidification mode and reduces indoor blower speed. If DH wiring is missing, the system will run in the normal operation sequence.

Wiring for 1H and 1C thermostat

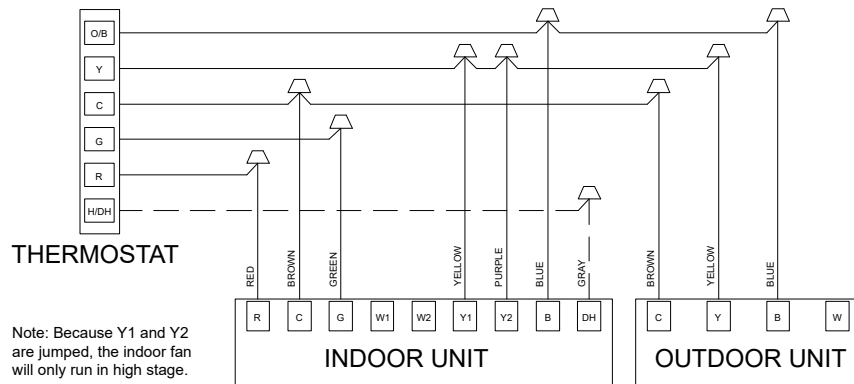


Figure 11.7 Control Wiring For HP Systems

Wiring for 2H and 1C thermostat

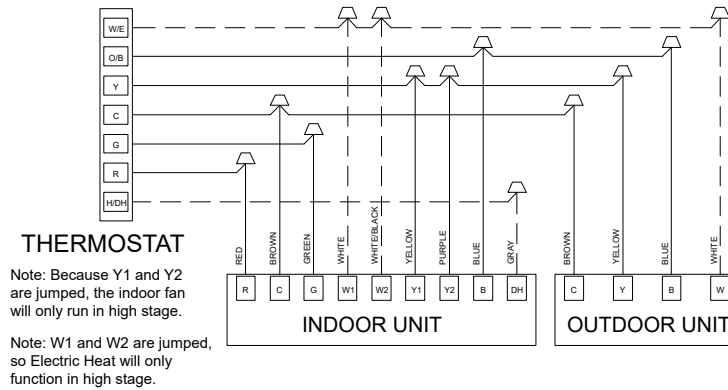
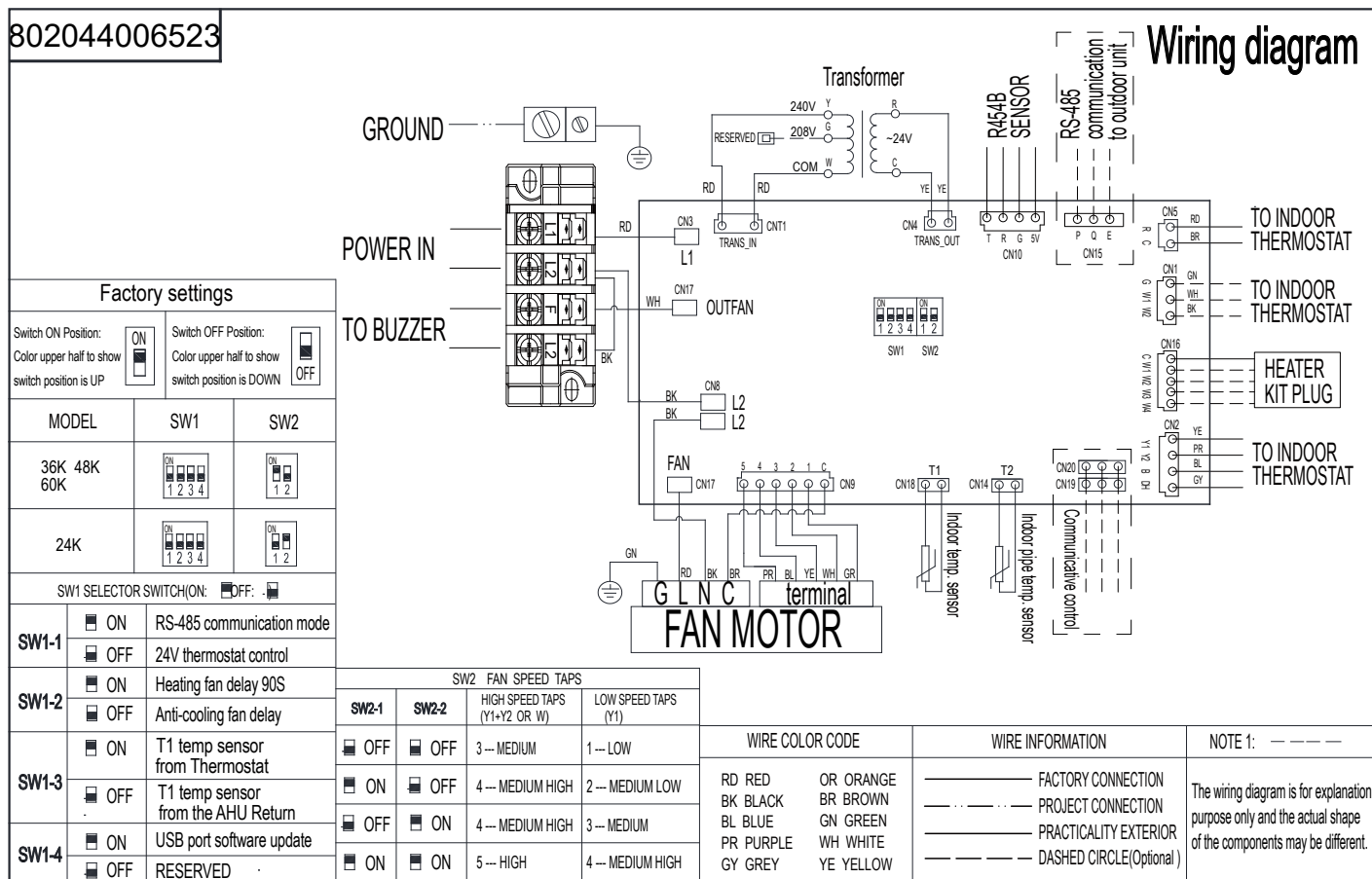


Figure 11.8 Control Wiring For HP Systems

WIRING DIAGRAM

11.1 WIRE GAUGE OF HIGH VOLTAGE SYSTEM

Type (Bty/hour)			24K	36K	48K	60K
Power	Stage	Single				
		Voltage/Frequency				
Wire gauge	Indoor unit power cord	Line quantity	3	3	3	3
		Wire diameter (AWG)	16	16	16	16
	Outdoor unit power cord	Line quantity	3	3	3	3
		Wire diameter (AWG)	14	12	10	10



Applicable to 24K/36K/48K/60K

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



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