DA/ CFF SERIES HEAT PUMP

INSTALLATION, OPERATION AND MAINTENCE MANUAL







READER SHOULD PAY PARTICULAR ATTENTION TO THE WORDS: **DANGER, CAUTION,** AND **WARNING.** NOTES ARE INTENDED TO CLARIFY OR MAKE THE INSTALLATION AND SERVICE EASIER AND SAFER. CAUTIONS ARE GIVEN TO PREVENT EQUIPMENT DAMAGE AND OR PERSONAL INJURY. WARNINGS ARE GIVEN TO ALERT READER THAT PERSONAL INJURY AND/OR EQUIPMENT DAMAGE MAY RESULT IF INSTALLATION AND/OR SERVICE ARE NOT HANDLED PROPERLY. IT IS IMPORTANT TO READ THIS MANUAL BEFORE INSTALLING AND SERVICING. THERE ARE MANY WARNINGS AS THIS UNIT CONTAINS FLAMMABLE GAS .**THIS UNIT IS NOT TO BE INSTALLED OR REPAIRED WITHOUT AN A2L TRAINED TECHNICIAN.**

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1. Description

1.1 General

The DA/ CFF Series water source heat pump is a self-contained heating and cooling unit designed for **indoor installation only**. Each unit consists of a high-efficiency compressor, air-to-refrigerant evaporator coil, water-to-refrigerant condenser coil, expansion valve, reversing valve, centrifugal blower with high-efficiency motor, a control panel, protective devices and safety controls.



Horizontal unit



Vertical unit

Units are designed to operate with entering water temperatures between 50 °F (10 °C) and 100 °F for standard cooling tower/boiler loop applications. An extended-range option allows operation down to 25 °F (–4 °C) entering water (for geothermal applications), provided an appropriate anti-freeze solution is used to prevent freezing of the heat exchanger and water piping.

In cooling mode, heat is rejected from the refrigerant into the source water loop. A cooling tower or ground loop dissipates this heat, maintaining proper loop temperature. (For open cooling tower systems, proper water treatment is required to prevent corrosion.) In heating mode, heat is absorbed from the source water into the refrigerant circuit through the heat exchanger.

IMPORTANT: For groundwater applications (wells, lakes, etc.), entering water temperature should not be below 50 °F (10 °C). Water flow rate must meet the specifications for the unit to ensure proper operation.

NOTICE: In any application where entering water may approach freezing temperatures, a sufficient concentration of anti-freeze must be used to avoid freezing of the heat exchanger and water lines. Damage due to freezing is not covered under warranty.

Each unit’s maximum allowable refrigerant pressure is marked on the nameplate for both high-pressure and low-pressure sides. Do not expose the refrigerant circuit to pressures beyond these values.

The unit’s enclosure has an ingress protection rating of **IPX0** (no special protection against water ingress). The heat pump is intended for indoor use only in a protected environment.

1.2 Feature Overview

Key design and convenience features of the DA/ CFF Series include:

- **Centrifugal Blower Discharge:** Quiet, efficient forward-curved blower for optimal air distribution.
- **Easy Slide-Out Filter Access:** Filters are accessible from the side of the unit for easy replacement.

- **Insulated Stainless Steel Cabinet:** Durable, corrosion-resistant cabinet with full insulation for sound attenuation.
- **Insulated Stainless Steel Drain Pan (with FPT Connection):** Corrosion-resistant drain pan with a threaded connection for condensate drainage.
- **Factory-Provided Water Connections (FPT):** Threaded water inlet and outlet connections for easy hook-up.
- **Accessible Components:** Convenient access panels to blower, evaporator coil, drain pan, expansion valve, electrical box, compressor, and refrigeration circuit for servicing.
- **Pre-Punched Wire Inlets:** Dedicated openings for power and control wiring entry, simplifying installation.
- **Optional Factory Disconnect:** Units can be equipped with an optional integrated disconnect switch for local power isolation (if provided).

1.3 Safety

Key to Symbols

⚠ **DANGER: Danger** indicates a situation that, if not avoided, will result in death or serious injury.

⚠ **WARNING: Warning** indicated a situation that, if not avoided could result in death in minor to moderate injury.

⚠ **CAUTION: Caution** indicates a situation that, if not avoided, could result in minor to moderate injury.

NOTICE: Notice is used to address practices nor related to personal injury.

This equipment contains a **flammable A2L refrigerant (R-454B)**. Installation, service, and maintenance must be performed by a licensed HVAC installer or service technician who is A2L-trained and certified in handling flammable refrigerants. Improper handling poses risks of fire, explosion, or asphyxiation. Read all safety warnings below and throughout this manual before installing or servicing the unit.

⚠ **DANGER: Flammable Refrigerant (A2L) – Risk of Fire or Explosion.** This equipment uses a flammable refrigerant. Do not use any potential ignition source (open flame, glowing or sparking device) to search for refrigerant leaks. No smoking or open flames should be present when handling refrigerant or servicing the unit. “No Smoking” signs should be posted during service as needed.

DANGER: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

DANGER: Proper Installation Required. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury, or loss of life. Follow all instructions in this manual exactly. A qualified installer or service agency must perform the installation and service of this equipment.

DANGER: Electrical Shock Hazard. This unit may be connected to multiple power sources. Ensure all power supplies to the unit are turned **OFF** at the disconnect switches or breakers before performing any service or maintenance. Lock out and tag out the disconnect(s) to prevent accidental energizing.

WARNING: This unit may be equipped with electrically powered safety devices (e.g. refrigerant leak detection). To be effective, the unit must remain powered at all times after installation, except when it is being serviced. Do not disable power to the unit except for maintenance.

WARNING: The appliance should be stored and transported in a way that prevents mechanical damage. Store in a well-ventilated area, away from open flames, sparks, or continuously operating ignition sources (e.g. running boilers, heaters). Follow the minimum floor area guidelines in the Installation section for the room where the unit is stored or installed.

WARNING: Ventilation and Air Circulation. Install this appliance only in a space that is well ventilated. **Continuous air circulation is required** during operation to prevent the accumulation of leaked refrigerant. An unventilated or confined space where this unit is installed shall be constructed so that any leaked refrigerant will not stagnate and create a fire or explosion hazard.

WARNING: Refrigerant Leak Precautions. In case of refrigerant leakage, immediately ventilate the area. Excessive refrigerant concentrations can lead to oxygen deficiency in enclosed spaces. If a leak is suspected, extinguish all naked flames or ignition sources and evacuate personnel from the area until it is fully ventilated.

WARNING: Fire Extinguisher Requirement. If any hot work (such as brazing or soldering) is to be performed on the refrigerant system or connected parts, have an appropriate fire extinguisher (dry powder or CO_2 type) nearby and ready for use.

WARNING: Qualified Service Personnel Only. Installation and repairs must be performed only by trained service personnel knowledgeable in handling A2L refrigerants. Do not puncture or damage refrigerant tubing. Unauthorized or unqualified personnel should not attempt to service this product.



WARNING: Purging and Brazing. Before using any open flame on the refrigerant circuit, purge the system with oxygen-free nitrogen to expel any refrigerant. **Never use compressed air or oxygen for purging refrigerant lines**, as this can create a flammable mixture. If brazing is required and refrigerant is present, recover all refrigerant or isolate it by closing service valves remote from the brazing point.



WARNING: Leak Detection. Use only electronic or ultrasonic leak detectors that are rated as non-sparking and suitable for R-454B (flammable A2L) refrigerant. Halide torches or any flame-based leak detector must NOT be used. Ensure leak detectors are calibrated per the refrigerant manufacturer's instructions (sensitivity set to detect 25% LFL or lower) and periodically re-calibrated as needed. If using a soap-bubble solution for leak detection, use a non-chlorine, non-corrosive agent to avoid reacting with the refrigerant.



WARNING: Auxiliary Devices in Ductwork. For appliances using A2L refrigerants connected to an air distribution duct system, do not install any auxiliary devices (such as UV air purifiers, humidifiers, electric heaters, etc.) in the ductwork unless they are specifically approved for use with this flammable refrigerant. Only use auxiliary devices that have been determined to be non-ignition sources in the presence of R-454B (consult the manufacturer for a list of approved devices, if any).



WARNING: Unit Power Supply and Disconnect. This stationary appliance is not supplied with a power cord. A properly rated disconnect switch providing full isolation of all supply conductors (all poles) must be installed in the fixed wiring in accordance with the National Electrical Code and local codes. The disconnect must be readily accessible and must disconnect all ungrounded conductors simultaneously. Ensure the unit is properly grounded (earth) as required by applicable codes.



WARNING: Personal Safety and Protective Gear. Always wear appropriate personal protective equipment (gloves, safety glasses, etc.) when handling, installing, or servicing this equipment. Sheet metal parts, moving fan blades, and pressurized refrigerant can pose hazards. Disconnect all electrical power before servicing to prevent shock or sudden startup of moving parts.



WARNING: Pressurized System. The refrigeration system is under high pressure. Do not puncture or open any part of the refrigerant circuit without following proper recovery procedures. If the system must be opened, recover the refrigerant first, then cut or braze lines as required. Opening a pressurized system without proper recovery can result in injury.



WARNING: Open Flames and Flammable Vapors. Do not use or store gasoline or other flammable liquids/vapors in the vicinity of this unit or any other appliance. Vapors can be ignited by electric or gas-burning devices and cause a fire or explosion.



WARNING: This appliance 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 by a responsible person. Children should be supervised to ensure they do not play with the appliance. **Do not allow children to clean or maintain the unit without supervision.**



WARNING: Do not use means to accelerate the defrosting process or to clean the appliance, other than those recommended by the manufacturer.



WARNING: Do not pierce any part of the refrigerant circuit or burn the appliance. Refrigerant under pressure is flammable and can ignite if released and exposed to flame.



WARNING: Be aware that refrigerants may not contain an odor, even if a leak occurs.



CAUTION: Hot Surface Hazard. Some models may have hot water or steam coils. Hot water can circulate even when the power is off. Before servicing equipment that may contain hot fluids or steam, disconnect all power, close water supply valves, and allow all components to cool to a safe temperature. Wear protective gloves/clothing to avoid burns.



CAUTION: Moving Parts Hazard. The blower fan and other moving parts may start automatically. Disconnect all power before servicing motors or fans to prevent injury from moving parts.



CAUTION: Handling and Disposal. Always recover the refrigerant into appropriate recovery cylinders before opening any part of the sealed refrigerant system. **DO NOT vent refrigerant to the atmosphere.** Dispose of refrigerant and the appliance in accordance with all federal, state, and local regulations. Flammable refrigerant must be handled and disposed of properly to prevent fire risk.



NOTICE: Unit Labels. Do not remove or deface any safety or warning labels on the unit. Ensure all labels (including the flammable refrigerant hazard diamond and the “Refer to Owner’s Manual” symbol) remain intact and visible. If any labels are missing or illegible, contact the factory for replacements. These labels are required for safety compliance.

2. Delivery

2.1 Receipt & Inspection

All shipments are FOB factory. It is the responsibility of the receiving party to inspect the equipment upon arrival. **Do not discard the packaging until inspection is complete.** Any damage or missing items must be noted on the delivery receipt before signing and accepting the shipment. Do not refuse a shipment unless the damage is total.

Upon receipt:

- Verify that the shipment matches the Bill of Lading and packing list. Ensure all items, including any loose-shipped accessories (e.g. thermostat, remote controls), are present. (Loose items may be packed inside the unit's cabinet for security—check inside the unit if applicable.)
- Inspect the unit and any components for visible damage **before the carrier leaves**. If damage is found or parts are missing:
    - Note the damage or missing items in detail on the Bill of Lading or delivery receipt immediately.
    - Take photographs of any damage from multiple angles.
    - Do not remove or discard any packaging material from the damaged unit.
    - Notify the carrier immediately to initiate a freight claim and request an inspection by the carrier.
    - Contact the factory to inform us of the issue and to get guidance on repair or replacement (Phone: 1-888-205-7866). Obtain quotes for replacement parts or units as necessary.
- If repairs on-site are authorized, ensure that doing so will not void the warranty. **Unauthorized repairs or alterations without manufacturer consent may void the warranty.** Consult the manufacturer's warranty department if in doubt.

2.2 Storage

If the unit will not be installed immediately, store it in a dry, indoor location. This equipment is **not suitable for outdoor storage.** Do not expose it to rain, snow, direct sunlight, high humidity, corrosive environments, or extreme temperatures.

For prolonged storage:

- Keep the unit in its proper upright orientation as marked on the packaging. Never stack units unless expressly allowed (stacking can damage the unit).
- Store in a conditioned, well-protected area away from construction traffic or activities that might damage the unit.
- Ensure all internal packing materials remain in place to protect components.
- If the unit contains water (for example, test water in coils), and it will be in an environment subject to freezing, drain the water or add antifreeze. Units are not automatically winterized (unless the optional factory winterization has been provided). Freezing of any internal water will damage the unit.
- Secure any loose-shipped items separately to avoid loss.
- Do not remove protective covers or plugs from pipe connections or wiring entry points until installation, to prevent dirt or moisture ingress.

3. Installation and Repairs

3.1 General



WARNING: Installation or repair of this unit must be performed by qualified HVAC technicians familiar with A2L refrigerant systems. The unit must be installed in accordance with these instructions and in compliance with all applicable codes and regulations. **Improper installation may create hazards and will void the warranty.**

Plan the installation in advance to ensure the site and utilities (electrical supply, water loop, ductwork, etc.) are prepared. Ensure the unit model and capacity are suitable for the application.

Provide sufficient clearance around the unit for service and maintenance (see detailed clearance requirements below). Do not block access panels or service points. Position the unit so that filters can be replaced and major components (compressor, blower, controls) can be accessed for future service.

Follow safe handling practices. Use gloves and protective eyewear when connecting water piping (to prevent injury from slipping tools or pipe debris). Use proper tools and get assistance to lift or move the unit to avoid dropping or damage.

3.2 Codes and Ordinances

Installation must conform to all applicable local building, electrical, and plumbing codes. In the absence of local codes, comply with the current national standards and regulations.

- In the United States: **ANSI/NFPA 70 – National Electrical Code (NEC)**, **UL 60335-2-40** safety standards, and any applicable mechanical and plumbing codes (e.g. IMC, IPC).
- In Canada: **CSA C22.1 – Canadian Electrical Code Part I**, **CSA C22.2 No. 236** (Heating and Cooling Equipment), and **CSA B52 – Mechanical Refrigeration Code**.

The system should be sized and selected in accordance with industry guidelines such as ACCA Manual S and Manual J, or ASHRAE guidelines for HVAC design. The installing contractor is responsible for ensuring the installation meets all regulations and the manufacturer's instructions. Failure to do so could result in unsafe operation or voided warranty.

3.3 Safety Checklist



WARNING: It is the installer's responsibility to comply with all codes, ordinances, and installation instructions. Failure to do so may result in personal injury or equipment damage.

WARNING: Work Procedure – Work shall be undertaken under a controlled procedure to minimize the risk of a flammable gas or vapor being present while the work is being performed.

WARNING: General Working 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.

WARNING: Fire Extinguisher Requirement – If any hot work (such as brazing or soldering) is to be performed on the refrigerant system or connected parts, have an appropriate fire extinguisher (dry powder or CO_2) nearby and ready for use.

DANGER: Flammable Refrigerant (A2L) – Risk of Fire or Explosion. This equipment uses a flammable refrigerant. Do not use any potential ignition source (open flame, glowing or sparking device) to search for refrigerant leaks. No smoking or open flames should be present when handling refrigerant or servicing the unit. "No Smoking" signs should be posted during service as needed.

WARNING: 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.

WARNING: Checks to the equipment – 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**:

- The actual **refrigerant charge** is in accordance with the room size within which the refrigerant-containing parts are installed (see Section 3.5 for minimum room area requirements).
- 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 (to ensure no cross-contamination).
- Markings on the equipment (labels and signs) remain visible and legible. Any markings or signs that are illegible must be replaced or corrected.
- Refrigerant piping or 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 inherently resistant to corrosion or are suitably protected.

Checks to electrical devices: Repair and maintenance of 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 addressed. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used and 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.
- That there is continuity of earth (ground) bonding.

Repairs to sealed components:



WARNING: During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.



WARNING: Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This includes ensuring no damage to cables, not adding excessive numbers of connections, using terminals of original specification, maintaining proper seals, correctly refitting glands, etc.

NOTICE: Ensure that the apparatus is mounted securely after any repair.

NOTICE: Ensure that seals or sealing materials have not degraded to the point that they no longer prevent the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

Repair to intrinsically safe components: (For units with any intrinsically safe circuits)

- Do not apply any permanent inductive or capacitive loads to an intrinsically safe circuit without ensuring this will not exceed the permissible voltage and current for the equipment in use.
- Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or other adverse environmental effects. This includes considering the effects of aging or continual vibration from sources such as compressors or fans.

Detection of flammable refrigerants: Under no circumstances shall potential sources of ignition be used in searching for or detecting refrigerant leaks. **Do NOT use a halide torch or**

any detector that uses a flame to search for leaks. The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks, but for flammable refrigerants, ensure the detector itself is not a potential ignition source and is suitable for the refrigerant used. (Leak detection equipment shall be calibrated in a refrigerant-free area.) Set the detector to a sensitivity of no more than 25% of the LFL of the refrigerant, and calibrate it to the appropriate refrigerant.
- Leak detection fluids (soap bubble solutions) are also suitable for use with most refrigerants. Avoid detergents containing chlorine, as chlorine can react with refrigerant and corrode copper pipe-work. (Examples of acceptable leak detection fluids include bubble solutions or fluorescent dye methods.)
- If a leak is suspected, **remove or extinguish all naked flames** in the area.
- If a refrigerant leak is found that requires brazing to repair, recover all refrigerant from the system (or isolate it via shut-off valves) before starting hot work. Follow all Removal and Evacuation guidelines (see below) when removing refrigerant.

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**:

1. Safely **recover** the refrigerant from the system into suitable recovery cylinders (if venting is not allowed by local code).
2. **Purge** the circuit with inert gas (oxygen-free nitrogen)
3. **Evacuate** the system to remove any remaining refrigerant vapor.
4. Purge again with inert gas
5. Open the circuit by cutting or brazing as required.

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

For appliances containing flammable refrigerants, purging is achieved by breaking the vacuum in the system with oxygen-free nitrogen, filling until working pressure is reached, then venting to atmosphere, and finally pulling down to vacuum. This process shall be repeated until no refrigerant remains in the system. When the final oxygen-free nitrogen purge is done, vent the system to atmospheric pressure to enable safe work. **Ensure the outlet of the vacuum pump is not near any ignition sources and that ventilation is available.**

Charging procedures: In addition to conventional charging procedures, observe the following requirements:

- 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 refrigerant they hold.
- Cylinders shall be kept in an appropriate position as instructed (usually upright).
- Ensure that the refrigerating system is properly grounded prior to charging with refrigerant.
- Label the system when charging is complete (if not already labeled with the full charge).
- Extreme care shall be taken not to overfill the refrigerant system.
- Before recharging, pressure-test the system with an inert gas to ensure integrity. After charging and before full commissioning, perform a leak test. A follow-up leak test should be done prior to leaving the site.

Decommissioning: Before decommissioning, it is essential that the technician is completely familiar with the equipment and all details. It is recommended good practice that all refrigerants be recovered safely. Prior to starting, take an oil and refrigerant sample in case analysis is required before reusing recovered refrigerant. **Electrical power must be available** (for recovery machinery) before beginning.

Steps for decommissioning (refrigerant recovery):

a) Become familiar with the equipment and its operation.
b) Electrically isolate the system (power OFF).
c) Before starting, ensure that:
– Mechanical handling equipment is available, if required, for moving refrigerant cylinders.
– All required personal protective equipment (PPE) is available and being used correctly.
– The recovery process is supervised at all times by a competent person.
– Recovery equipment and cylinders conform to appropriate standards (and are suitable for flammable refrigerants, if applicable).
d) Pump down the refrigerant system, if possible (using built-in pump-down if provided).
e) If vacuum pump-down is not possible, set up a manifold to remove refrigerant from various parts of the system.
f) Ensure the recovery cylinder is placed on a scale before recovery so the amount recovered can be monitored.
g) Start the recovery machine and operate it per the manufacturer's instructions.
h) Do not overfill cylinders (fill to no more than 80% of their volume with liquid refrigerant).
i) Do not exceed the cylinder's maximum working pressure at any time.
j) When cylinders have been filled to the correct level and recovery is complete, remove the cylinders and recovery equipment from the site promptly. Close all isolation valves on the equipment.
k) **Recovered refrigerant must not be charged into another system** unless it has been cleaned and checked to specifications.

Labelling: After decommissioning and evacuating the refrigerant, label the equipment clearly to indicate it has been de-commissioned and emptied of refrigerant. The label should be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels stating the equipment contained flammable refrigerant and has been properly evacuated.

Recovery: When removing refrigerant from a system for servicing or decommissioning, always recover all refrigerant safely. When transferring refrigerant into cylinders, use only appropriate refrigerant recovery cylinders. Ensure you have enough cylinders to hold the entire refrigerant charge of the system. All cylinders used must be designated for the specific refrigerant and labeled accordingly (i.e., special recovery cylinders for that refrigerant). Cylinders should have functional pressure-relief devices and shut-off valves. Empty recovery cylinders should be evacuated and, if possible, cooled before recovery.

The recovery equipment must be in good working order and accompanied by its instructions. It must be suitable for all appropriate refrigerants, including flammable refrigerants when applicable. Have a calibrated weighing scale available and in use to monitor refrigerant quantity. Hoses should have self-sealing (leak-free) disconnect couplings and be in good condition. Before using the recovery machine, verify it is in satisfactory working order, properly maintained, and that any electrical components are sealed to prevent ignition in the event of refrigerant release. **Consult the manufacturer if in doubt.**

The recovered refrigerant should be returned to the refrigerant supplier in the correct recovery cylinders, with proper waste transfer documentation. **Do not mix different refrigerants** in recovery units or cylinders.

If compressors or compressor oils are to be removed, ensure they have been evacuated to an acceptable level so that no flammable refrigerant remains dissolved in the oil. The evacuation should be done before shipping compressors. Use only electric heating of the compressor body (if needed) to assist in removing refrigerant from the oil. When oil is drained from the system, it must be done safely (oil may contain refrigerant).

3.4 Handling

Use appropriate lifting and handling equipment to move the unit. Always handle the unit by its base or frame; **do not use piping, coils, or internal components as lift points**. The unit contains delicate components (coils, fans, electronics). Avoid impacts or rough handling that could deform the cabinet or damage internal parts.

When moving the unit through doorways or tight spaces, take care not to bump protruding parts like piping connections or the control box. It may be helpful to leave protective caps or packaging on the connections until final placement to prevent damage.

If the unit is on a pallet or skid, use that for support during positioning. Once in place, remove any shipping skids and ensure the unit is level and supported at all four corners.

CAUTION: When suspending the unit (for ceiling-hung installations), verify that the building structure can support the weight of the unit. Use appropriate anchors and mounting hardware. An improperly supported unit could fall, causing injury or damage.

3.5 Location

Select an indoor location for the heat pump that allows even air distribution throughout the space. The unit should ideally be centrally located relative to the ductwork system to minimize duct lengths and balance airflow.

Ensure the location is protected from freezing conditions. This heat pump is not designed to operate in ambient temperatures at or below 32 °F (0 °C). If installing in an unheated space where freezing could occur, special provisions (such as heater tape on water lines or adding antifreeze to the loop water) are necessary to prevent freeze damage. (Freeze damage is not covered by warranty.)

The unit must be installed level on a solid foundation or platform that can support its weight. Provide adequate space around the unit for installation and service of piping and electrical connections.

Other considerations for location:

- Avoid areas with excessive dust, airborne fibers, or corrosive vapors that could clog the coil or damage components.
- Ensure sufficient clearance for filter removal and for accessing the electrical panel and other service points.
- If noise is a concern, do not install the unit directly under or adjacent to noise-sensitive spaces (like bedrooms). Place it over a utility area or use vibration isolation measures as needed.

Minimum Room Area: ***Install the unit only in a space with a floor area of at least 100 ft² (9.3 m²)*** (with an 8 ft ceiling, equivalent to ~800 ft³ or 22.7 m³ of volume). This minimum room size ensures that any leaked refrigerant will be sufficiently diluted. **Do not install the unit in a smaller enclosed space** without providing additional mechanical ventilation or other mitigation measures as required by UL 60335-2-40 and local codes to prevent refrigerant accumulation.

3.6 Service and Installation Clearance

Before setting the unit in place, ensure that the minimum clearances for service are provided. Key panels and components that require access include: the blower compartment, filters, refrigerant circuit access ports, water connections, and electrical controls.

- Maintain at least **20 inches (51 cm)** of clear space on the side of the unit where the access panels/doors are located. This clearance is needed for removal of panels and replacement of components.
- Provide at least **24 inches (61 cm)** clearance at the front (return air side) of the unit (if applicable, such as for vertical units) to allow filter removal and access to the blower and coil.
- Ensure there is adequate ceiling or overhead space if the unit is ceiling-suspended, so it can be safely hung and serviced.

Failure to provide these clearances can make maintenance impossible and may result in unsafe conditions or the need to remove the unit for servicing.

3.7 Mounting and Suspension

Depending on model configuration, the DA/ CFF heat pump can be floor-mounted (vertical units) or ceiling-suspended (horizontal units):

- **Floor Mounted (Vertical Units):** Set the unit on a level platform or pad. Use rubber isolation pads or strips under the unit to reduce vibration and noise transmission. Ensure the platform height is sufficient to maintain a proper slope on the condensate drain line (a slope of at least 2% is recommended for drainage). Secure the unit to the platform if necessary to prevent shifting.
- **Suspended (Horizontal Units):** Horizontal units are provided with structural mounting brackets or holes at the corners for hanging. Use field-supplied all-thread rods (3/8″ or as specified) to hang the unit. Support the unit from the building structure (e.g., joists or trusses) with suitable hardware. It is recommended to lift the unit into position using the shipping skid or a broad support to distribute weight and prevent bending the cabinet. Once in place, insert the threaded rods through the unit's mounting holes and secure with nuts and lock washers. Adjust the nuts to level the unit. Use vibration isolators if required by the installation.

CAUTION: When suspending the unit, verify that the building structure can support the weight of the unit. Use appropriate anchors and mounting hardware.

3.8 Ductwork

For new installations, design and install the duct system according to current ACCA or ASHRAE guidelines for duct design. Proper duct design will ensure correct airflow, acceptable sound levels, and system efficiency. Key points:

- The supply and return duct connections at the unit should have flexible connectors to reduce vibration transmission to the ductwork.
- Ducts should be appropriately sized for the airflow (CFM) of the unit. Undersized ducts result in high static pressure and reduced performance; oversized ducts may lead to poor air distribution and low air velocity.
- All ducts, especially those running through unconditioned spaces, should be insulated to prevent excessive heat loss/gain and to avoid condensation during cooling operation.
- Seal all duct joints and seams to minimize air leakage.
- If connecting to existing ductwork, inspect it for leaks or damage. Repair any air leaks and ensure the ductwork is clean. Verify the existing duct system can handle the airflow and static pressure of the new unit.
- Provide balancing dampers in branch ducts as needed to balance airflow to different areas of the building.

A well-designed duct system is crucial for the heat pump to deliver its rated capacity efficiently and quietly.

3.9 Sealing

It is very important to prevent unconditioned air from infiltrating the unit cabinet and to prevent conditioned air from escaping. Seal all openings where air could enter or escape:

- **Piping penetrations:** Seal around all water pipes, refrigerant lines, and electrical conduit penetrations with a suitable material (e.g. foam rubber grommets, Armaflex insulation, or silicone sealant).
- **Condensate drain connections:** Seal around the drain pipe connection to the drain pan if there is any gap.
- **Cabinet joints:** Ensure access panels are properly secured (gasketed or screwed down tight). Replace any missing screws. Add weatherstripping or sealant to panel edges if needed to stop air leaks, especially if the unit is installed in an unconditioned attic or crawl space.
- **Duct flange connections:** Use HVAC foil tape or mastic on the flange where the unit connects to ductwork.

Preventing air leakage will improve system performance and prevent issues such as condensation forming on the unit cabinet or in unconditioned spaces.

3.10 Supplementary Cooling/Heating

Some DA/ CFF units may have optional supplementary heating or cooling coils (e.g., hot water heating coil, steam heating coil, or water-side economizer). These options must be installed in accordance with the following guidelines:

Unit with Hot Water Coil: If the unit includes a hot water heating coil, connect the hot water supply and return lines to the coil connections. All water piping must be insulated, properly supported, and routed per local codes. Provide shut-off valves and balancing valves as needed. Air bleed vents should be installed at high points in the piping to purge air. The hot water coil should be controlled such that it only receives hot water flow when heating is needed (typically via a control valve actuated by the thermostat or building management system).

Unit with Steam Coil: If a steam heating coil is provided, the unit **must** be installed high enough to allow a minimum 12-inch (1 ft) condensate drop leg below the coil outlet (or as recommended by the steam trap manufacturer). This is critical for proper condensate drainage and trap operation. Steam supply lines and condensate return lines must be insulated with appropriate high-temperature insulation. Follow local codes for steam piping. Ensure a proper steam trap is installed and functional at the coil outlet, and provide a vacuum breaker if required. Verify that inlet steam pressure and condensate handling meet the coil specifications.

Unit with Water-Side Economizer: This option typically is a water coil that can provide free cooling when loop water temperatures are sufficiently low. Connect the water-side economizer coil in the same manner as a standard water coil: use insulated supply and return water lines, properly valved and trapped (if necessary). The economizer coil should be piped with bypass and control valves as required by the system design so that it can be used to pre-cool without running the compressor. Controls must be integrated to utilize the economizer coil when advantageous (i.e., when cool water is available) and to shut it off when not needed.

For any auxiliary coil installation:

- Ensure flow rates are correct (use balancing valves). Excessively high flow can erode the coil, while too low flow can reduce heating/cooling capacity.
- Install air vents at high points and drains at low points in the piping for maintenance (to bleed air and drain water as needed).
- Follow the coil manufacturer's instructions for any required safety devices (e.g., pressure relief valves on steam coils, mixing valves on hot water systems if needed, etc.).

3.11 Water Line Piping

Connect the building's water loop supply and return to the unit's water inlet and outlet connections. The connections on the unit are typically female pipe thread (FPT). Use appropriate mating fittings and support the external piping so as not to strain the unit connections.

Guidelines for water piping:

- **Flexible hoses:** It is recommended to use short flexible hoses or vibration isolators at the unit connections to reduce vibration transmission and allow for easier servicing.
- **Pipe sizing:** All supply and return lines must be sized to handle the water flow required by the unit, with minimal pressure drop. Undersized piping will cause poor performance and potentially trip safety limits; oversized piping can add unnecessary expense.
- **Materials:** Use copper, CPVC, PEX or other suitable plumbing materials rated for the loop water pressure and temperature. (Galvanized steel pipe is not recommended due to the risk of corrosion and scaling.)
- **Shut-off valves:** Install shut-off/isolation valves on both the supply and return lines near the unit. This will allow the unit to be isolated for maintenance or future removal.
- **Strainer:** An in-line water strainer (mesh filter) is **highly recommended** at the inlet of the unit. This will catch any debris (scale, sediment) and prevent it from clogging the heat exchanger. In systems with known poor water quality, a strainer is imperative.
- **Pressure/flow:** Verify that water flow is within the specified range for the unit (per the unit's engineering data). An external flow control valve or balancing valve may be needed to regulate flow. Check the pressure drop across the unit's heat exchanger to infer flow rate.
- **Water hammer:** If the system uses solenoid valves for water flow control, consider using slow-closing motorized valves to avoid water hammer. If a fast-acting solenoid valve is used, it may be preferable to locate it on the outlet side of the unit to reduce pressure shock on the heat exchanger.

- **Freeze protection:** If the unit is connected to an open loop (e.g., groundwater) or any loop where water temperature can fall below ~50 °F (10 °C), ensure freeze protection measures are in place (such as adding antifreeze to the loop or controlling flow to prevent freezing conditions).
- **Flushing connections:** Provide means for routine flushing and chemical cleaning of the water heat exchanger. For example, install service valves with hose bib ports on the water inlet and outlet so a flushing pump can be connected to circulate cleaning solution through the heat exchanger if needed.

CAUTION: Inadequate water flow or poor water quality can severely damage the heat exchanger and compressor, and such damage may be considered abuse that voids the warranty. Always ensure water flow and water quality meet the specifications.

After connecting piping, purge all air from the water circuit. Air pockets can cause poor performance and corrosion. Use the highest vents in the system to bleed air when filling the loop.

3.12 Condensate Piping

Properly connect and route the condensate drain from the unit's drain pan to an appropriate drain in the building. The unit is equipped with an internal drain pan that has a stub-out or connection for a drain line.

Drain piping guidelines:

- **Use a trap:** Install a U-trap (P-trap) in the condensate line close to the unit. The trap is necessary for proper drainage due to the negative pressure in the drain pan during operation. The vertical drop (depth) of the trap should be at least 2–4 inches to provide a good water seal.
- **Slope:** The condensate line should slope downward at least 1/4 inch per foot (2% grade) in the direction of flow towards the building's drain. Avoid any sags or loops where water can collect and block flow.
- **Pipe size:** Use drain piping that is at least one nominal size larger than the drain connection on the unit (for example, if the unit has a 3/4″ drain outlet, use 1″ drain pipe) to ensure easy flow and reduce chance of clogging.
- **Material:** PVC piping is commonly used for condensate drains. Use PVC primer and cement for any glued joints. Insulate the condensate line if it passes through areas where sweating could cause dripping (e.g., a warm attic space).
- **Vent (if needed):** If the condensate run is long or has multiple turns, consider adding a vent or air break downstream of the trap (if needed) to prevent air lock. Any vent must be installed after the trap (never between the unit and the trap).
- **Safety pan:** In any installation where a water leak could cause damage (such as an attic or above a finished ceiling), place a secondary drain pan under the unit with its own separate drain line for overflow protection. Local codes may require an overflow prevention float switch in the secondary pan to shut off the unit if water accumulates.

- **Clean-out:** Provide an access point for cleaning the condensate trap and line (e.g., a tee with a capped opening at the trap). This allows maintenance personnel to clear algae or debris that could clog the line.

CAUTION: When connecting drain piping, do not overtighten fittings on the unit's drain pan connection. The drain outlet or pan could crack under excessive torque. Hand-tighten plastic connections and then give a slight additional turn if needed to seal.

After installation, pour a few cups of water into the unit's drain pan to fill the trap and verify that water flows freely through the line to the building drain. Check for leaks in all drain line connections.

3.13 Electrical

All field wiring must comply with the National Electrical Code (NEC) in the USA, or the Canadian Electrical Code (CEC) in Canada, and any local electrical codes. Have a licensed electrician perform all fixed wiring connections.

Verify the unit's electrical requirements: Check the unit's data plate (nameplate) for the required electrical supply: voltage, phase, frequency, and minimum circuit ampacity (MCA). Install a properly sized branch circuit breaker or set of fuses for overcurrent protection, as indicated by the unit nameplate (observe the maximum fuse or breaker size on the nameplate).

Disconnect Switch: This stationary appliance does not come with a pre-installed disconnect. The installation **must include** a dedicated disconnect switch (or circuit breaker) in the fixed wiring, within sight of the unit, that disconnects **all poles** of the power supply. This switch is a safety requirement to fully isolate the unit for servicing. The disconnect must have an adequate interrupt rating and be rated for the voltage and current of the unit.



WARNING: Ensure the unit is properly grounded. Connect the ground (earth) wire to the unit's ground lug inside the electrical compartment. A grounding symbol (⏚) on the unit marks the location of the ground connection. An improper ground connection can result in electric shock hazard.

Use copper conductors of the proper gauge for the supply wiring. The wire size must be selected based on the unit MCA (Minimum Circuit Ampacity) and the temperature rating of the wire insulation, in accordance with code requirements.

Route the power supply wires through the designated knockouts or openings in the unit cabinet to the main power terminal block or lugs. Use proper conduit or strain-relief cable clamps to secure the wiring where it passes into the unit. Protect the wiring from sharp edges using grommets or bushings as needed.

Keep high-voltage power wiring separate from low-voltage control wiring to avoid electrical interference. If the unit has a low-voltage control circuit (e.g., 24 V thermostat wires), route those wires through a different opening than the high-voltage wires.

Connect any control circuit wiring per the unit's wiring diagram (typically affixed to the inside of the access panel or inside the control box). Standard units have a 24 V control circuit for the thermostat/controls. Ensure any multi-tap transformer in the unit is set to the proper incoming line voltage tap.

If the unit includes electric resistance heaters or other high-current accessories, ensure the power supply, breakers, and wiring can accommodate the additional loads. Such accessories may require separate power circuits as indicated on the unit's electrical schematic.

After electrical installation:

- Recheck that all field electrical connections and factory connections are tight. (Loose wires can cause overheating or failure.)
- Verify the supply voltage is within ±10% of the unit's rated voltage and that phase rotation is correct for three-phase units (the blower fan should rotate in the correct direction; if not, interchange any two supply phase wires).
- Ensure the unit is properly grounded and that no wiring is resting against refrigerant lines or sharp metal edges.

 **WARNING: Continuous Power Requirement.** This unit may be equipped with safety devices (such as refrigerant leak detectors) that require continuous power. Do not install any device that routinely cuts power to the entire unit (except an emergency disconnect). The unit should remain powered so that safety controls stay active. If power must be removed for servicing, follow proper lockout/tagout procedures.

3.14 Wall Thermostat / Handset

Install the wall-mounted thermostat (or wired remote controller) in a central, neutral location in the conditioned space, about 4.5–5.5 feet (1.4–1.7 m) above the floor. Choose an interior wall, away from direct sunlight, supply air vents, exterior doors, or any heat-generating appliances, to ensure an accurate temperature reading.

Run the thermostat cable (low-voltage 18 AWG, multi-conductor) from the unit's control panel to the thermostat location. Follow the wiring schematic provided with the unit. Typical connections for a heat pump thermostat include:

- R (24 V Hot) and C (24 V Common) – power for the thermostat.
- Y1, Y2 – 1st and 2nd stage compressor contacts (if a two-stage unit).
- G – fan relay/control.
- O/B – reversing valve (O for cooling-active valve, B for heating-active, depending on system type).

- W (AUX) – auxiliary heat (if the unit has electric heat or if using a backup heater).

Some units (e.g., certain DA/ CFF models) may come with a dedicated digital handset or specialized controller. In such cases, use the provided controller and wiring harness, and refer to the specific instructions in the unit's control manual.

After wiring the thermostat, secure it to the wall and restore power to the unit (when ready for startup). Configure the thermostat according to the system type: set it for heat pump operation, set the number of stages of heat/cool, configure O/B for the reversing valve as needed, and any other setup options recommended for this heat pump.

If replacing an existing thermostat, ensure any jumper settings or programming in the new thermostat match the system. For example, some thermostats have an internal setting to select "Heat Pump" mode and whether the reversing valve is energized in cooling (O) or heating (B).

3.15 Filters (Installation)

Each unit is shipped with a clean air filter either installed or provided separately. **Before startup, ensure that the correct filter(s) are in place.**

- **Filter Insertion:** Install the filter into its rack or holding frame with the airflow direction arrow (printed on the filter frame) pointing toward the blower (i.e., in the direction of airflow through the unit). Typically, return air flows through the filter into the coil/blower section.
- **Filter Size:** Use the proper size and type of replacement filter as specified by the manufacturer. The filter should completely cover the return opening without gaps or bypass.
- **Filter Access:** Depending on the unit configuration, filters may slide in from the side (common on horizontal units) or be accessed from the rear or bottom (vertical units). Ensure all access panels or filter doors are securely closed after installing or checking the filter.

Do not operate the unit without a filter or with a dirty/clogged filter. A missing filter will allow dust to accumulate on the coil, significantly reducing performance and potentially damaging the unit. A clogged filter will reduce airflow, which can cause the unit to shut down on low refrigerant pressure or overheat, and will also reduce efficiency.

Advise the end-user on the importance of regular filter checks (see Maintenance section for recommended schedule) to keep the system running properly.

4. Start-Up and Commissioning

4.1 General (Pre-Start Checks)

After installation is complete, **do not immediately start the unit.** First, perform a thorough pre-startup inspection and checkout to ensure the system is ready and safe to operate.

Notice: The heat pump should *not* be used for temporary heating or cooling during construction. Operating the unit in a construction environment with heavy dust (drywall dust, sawdust, etc.) or without proper filtration can damage the system and void the warranty.

Before applying power, verify the following items have been completed:

- **Installation Completion:** All construction work and installation tasks around the unit are finished. There should be no ongoing drywall sanding, sawing, or other activities that could introduce dust or debris into the unit.
- **Refrigerant Charge:** The unit's refrigerant circuit is factory-charged. No field charging is required **unless** the unit was opened to atmosphere or repaired. (If the unit has service valves, ensure they are in the correct open position.)
- **Water Loop:** The water loop is filled, purged of air, and the loop pumps are operational. Check that all water valves to the unit are open and that water flow is established to the unit.
- **Condensate Drain:** The condensate drain line is properly connected, has a trap, and is primed with water. Pour a small amount of water into the unit's drain pan to ensure it flows freely out of the line.
- **Air Filters:** Filters are new, clean, and correctly installed. Remove any temporary filters that may have been used during construction.
- **Airflow:** All duct dampers (both supply and return) are set to their fully open positions. All supply registers and return grilles are installed and open. There are no obstructions in the ductwork.
- **Electrical:** Verify the correct power supply is connected (proper voltage, phase). All electrical panels and covers on the unit are closed. Check that the unit's internal wiring connections (plug connectors, etc.) are secure. **If a crankcase heater is present on the compressor, it should be energized for at least 24 hours prior to startup** (to boil off any liquid refrigerant in the compressor oil).
- **Safety Devices:** Ensure all safety controls (high-pressure switch, low-pressure switch, condensate overflow switch, etc., as applicable) and sensors are properly in place and connected. Do not bypass any safety switches or controls.

4.2 Check-Out (Pre-Start-Up Checklist)

Perform the following additional checks before starting the unit:

- **Mechanical Inspection:** Check that the blower wheel spins freely and that there are no tools, debris, or packaging materials left inside the unit. Remove any shipping brackets (e.g., transit supports on the compressor or blower) that were not removed during installation.
- **Electrical Inspection:** Tighten all field wiring connections and any accessible factory electrical connections in both the high-voltage and low-voltage sections. Verify that all

electrical ratings (voltage, breaker/fuse size) are correct and that the external disconnect is **OFF** before proceeding further.

- **Water Flow:** If possible, measure the water flow (for example, by checking pressure drop across the unit or using a flow meter). Ensure the flow rate meets the unit requirements. Open all water loop isolation or balancing valves. Check for leaks in all the water piping connections now that the system is filled and under pressure.
- **Airflow Path:** Ensure that all supply and return duct dampers are open. If the system includes an economizer or fresh air damper, set it to the appropriate position for startup (usually the minimum ventilation position).
- **Controls:** Set the thermostat system mode switch to **OFF** and the fan switch to **AUTO**. This prevents the unit from immediately energizing when power is applied.
- **Crankcase Heater:** Confirm again that if a crankcase heater is present on the compressor, it has been powered for at least 24 hours if the compressor has been exposed to cold ambient temperatures. This is critical to avoid liquid refrigerant in the compressor at startup.
- **Final Visual Check:** Perform a final visual inspection of the entire installation. Look for any signs of issues, such as loose components, left-over parts, or tools, and ensure everything appears ready for operation.

Once all the above checks are satisfactory, you may proceed to apply power and perform the initial startup.

4.3 Initial Start-Up Procedure

NOTICE: Check-Out Sheet: Fill out the Check-Out Sheet during the following steps and procedures. The manufacturer may require a completed Check-Out Sheet for warranty claims and reserves the right to void the warranty if the sheet is not properly completed and submitted.

Apply Power: Turn on the main power disconnect or circuit breaker supplying the unit. Verify that the unit is energized (control panel receives power). For three-phase units, observe any phase monitor or phase indicator to ensure correct phase sequence (some units have a phase monitor light or alarm that will indicate incorrect phase rotation; if incorrect, shut power and swap two of the incoming phase leads).

Blower Test: Using the thermostat or controller, set the fan to the **ON** position (continuous fan mode). The blower should start running. Verify that air is moving through the ducts at the registers. If no air is felt, or airflow is weak or accompanied by unusual noise, turn off the fan and investigate (possible issues include incorrect wiring, motor rotation reversed on a three-phase blower, obstructions, etc.). If everything is normal, set the fan back to **AUTO**.

Cooling Mode Test: Set the thermostat to **COOL** mode and lower the cooling setpoint to a value well below the current room temperature (for example, 5 °F below ambient) to initiate a cooling call. The blower will start (if not already running), and after any built-in time delay (~3 minutes on some controls), the compressor should start. (For two-stage units, only the first stage

compressor or compressor stage will engage initially; the second stage may engage after a short delay if the thermostat calls for it.)

Check that **cool air** is blowing from the supply registers after a few minutes of compressor operation. Go to the mechanical room or cooling tower area (if applicable for a shared water loop) and check that the loop water temperature is rising, indicating the unit is rejecting heat to the water loop.

Listen for any unusual noises or vibrations during operation. If abnormal sounds are heard (e.g., loud compressor knocking, squealing, etc.), turn off the system and investigate the cause before continuing.

If accessible and safe, connect refrigerant gauges to the service ports to check operating pressures. Verify the refrigerant pressures are within expected ranges for the current operating conditions (refer to the unit's pressure chart or typical operating pressures).

Heating Mode Test: Change the thermostat to **HEAT** mode and raise the heating setpoint to well above the room temperature (e.g., 5 °F above ambient) to initiate a heating call. The compressor will typically stop briefly (in a heat pump, the reversing valve will shift to heating mode) and then restart after a short compressor off-cycle delay (around 2–3 minutes). In heating mode, verify that **warm air** is blowing from the supply registers after a few minutes.

Confirm that the reversing valve energized/de-energized appropriately when switching modes (you might hear an audible click or change in sound when the valve shifts). Again, check for unusual noises and monitor refrigerant pressures if possible during heating.

Auxiliary Heat (if applicable): If the unit has electric auxiliary heaters or backup heat, test their operation. Many thermostats have an "emergency heat" setting or will automatically energize auxiliary heat if the setpoint is much higher than room temperature or if the heat pump alone cannot reach setpoint. You can force auxiliary heat by setting the thermostat to a very high temperature in heat mode (or selecting emergency heat). Verify that the auxiliary electric heater energizes and that the supply air gets warm (it may take a minute for the coils to heat up).

Operational Checks: Allow the unit to run for at least 15–20 minutes in each mode (cooling and heating) to stabilize. During this time, check the water flow rate and measure entering and leaving water temperatures, as well as entering and leaving air temperatures. These should be within expected ranges (e.g., water temperature rise in cooling or drop in heating of about 10–15 °F, depending on design). Record these values as part of the commissioning log for future reference.

Safety Controls: While the unit is running, verify that safety controls are functioning (without causing a nuisance trip). For example, you might *carefully* reduce water flow (throttle a valve briefly) to see if a low water flow alarm or a low pressure cut-out activates, then immediately restore flow. Or block the return airflow slightly for a short time to see if a low-pressure switch trips and shuts off the compressor (if accessible and safe to test – do not allow the unit to actually freeze or go into deep vacuum). If the unit has a condensate overflow sensor, you can carefully

lift the float (if accessible) to see if it shuts off the compressor. **Perform these tests only if you can do so safely and without damaging the equipment.**

Check all water connections and refrigerant service ports for leaks now that the system is at operating temperature and pressure. Look for any dripping water or signs of refrigerant oil around connections.

If any issue is observed during startup (such as abnormal pressure readings, unexpected noises, or the unit shutting off on a safety limit), **shut the unit off immediately** and investigate the cause. Do not leave the unit running if it is not operating correctly.

Once you are satisfied that the unit is operating normally in both cooling and heating modes, set the thermostat to the desired normal operating settings (typically "AUTO" mode with a reasonable setpoint for comfort).

Finally, explain the system safety measures and operation to the owner and operator. This should include how to use the thermostat or controller, what normal operation looks and sounds like, and the importance of routine maintenance (filter changes, etc.). Ensure the owner has this manual and understands the maintenance schedule.

4.4 Commissioning (Balancing & Optional Equipment)

Commissioning involves verifying and documenting that the system performance meets design specifications and the owner's requirements. For a water source heat pump system, this may include the following:

- **Water Balancing:** If the heat pump is part of a larger shared water loop with multiple units, ensure that water flow is balanced among all units. A qualified technician or balancer should adjust flow balancing valves so that each unit receives its proper design flow. Check each unit's entering and leaving water temperatures and verify they are within expected ranges (typically a 10–15 °F difference between entering and leaving water at full load).
- **Air Balancing:** If not already done, have a professional perform an air balance on the duct system. They will adjust dampers at diffusers and in duct trunks to match design airflow to each zone/room. Proper air balance ensures even temperatures and efficient operation. Verify fan speeds if adjustable to ensure delivered airflow matches specifications.
- **Control Verification:** Test all control modes, safeties, and interlocks. For example, if there is a high-pressure cutout, you might simulate high condensing temperature (e.g., by temporarily restricting water flow or raising loop temperature) to see if it trips at the setpoint, then confirm whether it auto-resets or requires manual reset as designed. Similarly, verify the low-pressure cutout operation (for instance, by temporarily blocking airflow or reducing water temperature to induce a low pressure condition, without causing harm). Ensure any lockout or alarm circuits function properly (if the unit signals an alarm condition to a central controller, verify those communications).

- **Optional Accessories:** If the unit has optional components like an internal secondary pump, water control valve, or energy recovery device, verify their operation. For example, if an internal water flow control valve is installed, ensure it opens when the compressor runs and closes when the compressor stops. If a factory disconnect switch option was provided, test that it indeed disconnects power and that the unit cannot run when it is OFF.
- **Owner Training:** As part of commissioning, provide basic training to the owner or maintenance personnel. Cover how to change or clean filters, what normal operation should look and sound like, what indicators or alarms to watch for (if any), and who to call for service. Make sure they understand the maintenance schedule and any warranty requirements. Provide them with this manual and any other documentation.
- **Documentation:** Record all final operating readings (loop water GPM flow, entering/leaving water temperatures, entering/leaving air temperatures, compressor amps, fan amps, refrigerant pressures if measured, etc.). Also note any adjustments made (valve positions, etc.). This documentation serves as a baseline for future maintenance and troubleshooting, and is useful for warranty purposes.

After successful commissioning, leave the system in the intended normal operating mode. Typically, this means the thermostat is set to maintain a comfortable temperature and left on "Auto" so the unit can heat or cool as needed.

5. Operation and Maintenance

5.1 General

The DA/ CFF Series water source heat pump is designed for reliable operation with minimal user intervention. During normal operation, the primary user maintenance required is regular air **filter replacement/cleaning**. All other maintenance and any repairs should be carried out by a qualified HVAC service technician.

Building owners or maintenance personnel should **not** attempt to open or service internal components of the unit beyond routine filter access. The unit contains high-voltage electrical components and a sealed refrigerant circuit, which require specialized training and tools to service safely.

If the unit is not operating correctly or not providing adequate comfort, contact a licensed service company experienced in water source heat pump systems. Attempting to repair the refrigerant circuit or internal electrical controls without proper training could void the warranty and pose safety hazards.

For any service under warranty, you may be required to provide the unit model and serial number (located on the nameplate) and proof of purchase or installation date. Keep this manual and that information in an accessible place for reference.

5.2 Maintenance Schedule

To ensure efficient and reliable operation, adhere to the following maintenance schedule. *(These are general recommendations; site-specific conditions may necessitate more frequent maintenance.)*

Monthly:

- Inspect the air filter(s). **Clean or replace** if you see a visible accumulation of dust or debris. In environments with high dust or airborne particles (e.g., homes with pets, workshops), filters may require checking more often. A clean filter is crucial for proper airflow and system efficiency.
- Ensure that return air grilles and supply diffusers are not blocked by furniture, rugs, or drapes. Unobstructed airflow is necessary for the unit to function properly.
- Listen for any unusual noises from the unit or the water piping while it's running. Changes in sound (hissing, grinding, etc.) should be investigated by a technician.

Quarterly (Every 3 Months):

- Check the condensate drain pan and condensate drain line. Make sure the pan is draining properly and there is no standing water. If you notice algae growth or buildup in the pan or trap, have the drain line cleaned and flushed.
- Inspect the accessible portion of the evaporator coil for dust or dirt. If the filter maintenance has been adequate, the coil should be mostly clean. Light dust can be vacuumed gently; more significant dirt may require professional coil cleaning.
- If the unit's usage is seasonal, briefly run it in both modes at least once each quarter (e.g., run heating for a short time in early fall, cooling in early spring) to ensure all modes operate and to circulate lubricant in the compressor.
- If gauges are installed on the water loop (for pressure, temperature), check that loop water pressure and temperature are within normal ranges. Significant deviations might indicate a flow issue or a central system problem.
- Observe the unit during operation: verify that the blower fan is running, the compressor cycles appropriately, and that there isn't short-cycling (rapid on/off). Also ensure both the entering and leaving water temperatures are reasonable (not outside design limits).

Annually: *(Preferably perform these before the cooling season, and again before the heating season for best results.)*

- **Air Filter:** Replace with a new filter of the correct size (if a disposable type). Even if the filter still looks serviceable, an annual replacement ensures optimal performance and indoor air quality.
- **Evaporator Coil:** Have the indoor coil (evaporator) inspected and cleaned by a professional if there is any buildup of dirt. Typically this involves using a non-corrosive coil cleaner. Clean coils ensure proper airflow and heat exchange.
- **Blower Wheel and Motor:** Inspect and clean the blower assembly. Dust can collect on the blower blades, causing imbalance and noise, and can accumulate on the motor. With

power off, a technician should remove the blower assembly if necessary to clean it. Lubricate the blower motor if it has oil ports (many blower motors are permanently lubricated and do not require oil). Also check that the blower wheel is securely attached to the motor shaft (set-screws tight).

- **Water Heat Exchanger:** Check the water-to-refrigerant heat exchanger (coaxial coil) for any performance issues. If the loop water quality is known to cause scaling, consider having a contractor flush the heat exchanger with a descaling solution. Ensure the water flow rate is correct by measuring pressure drop if possible.
- **Refrigerant Charge and Pressures:** Have a licensed technician connect gauges to verify the refrigerant pressures and temperatures are within spec. They should check superheat and subcooling to ensure the unit has the correct charge and there are no indications of a slow leak or other refrigeration issue. *(This is not typically a user task, but part of an annual professional maintenance.)*
- **Electrical Components:** Inspect internal electrical components such as contactors, relays, and wiring for signs of wear, pitting, or overheating. Tighten any loose electrical connections. Have the technician test capacitors (for the compressor and fan) because a weak capacitor can lead to hard starting or reduced efficiency.
- **Safety Controls:** Test the operation of safety features. For example, slowly close a water service valve to see if a low water flow or low refrigerant pressure switch trips (and immediately reopen it to avoid sustained fault). Also test any float switches on the condensate pan by lifting them to simulate a high water condition (the unit should shut off). These tests should be done carefully by a technician to avoid damage.
- **Cleaning:** Clean the interior of the unit's cabinet. Remove dust from electrical panels with dry compressed air (while unit is powered off). Wipe down surfaces to discourage corrosion. Clean out the condensate pan to prevent algae buildup (a little bleach or pan treatment tablet can be used to inhibit growth, if recommended by manufacturer).
- **Loop Fluid:** If the water loop contains antifreeze (glycol solution), have the fluid concentration tested annually and adjusted if needed to maintain freeze protection and corrosion inhibitors.
- **Documentation:** Log the date of maintenance, what was done, and any observations or measurements (like refrigerant pressures, amp draws, water temperatures). Keeping a record helps track the unit's performance over time and is useful for warranty support.

5.3 Filters (Maintenance)

The air filter is one of the most important maintenance items for this heat pump. A dirty filter reduces airflow and can significantly impair system performance and longevity. The frequency of filter changes depends on usage and air quality conditions. **As a rule of thumb, check the filter monthly and replace (or clean, if reusable) at least every 3 months** – more frequently if the environment is dusty or contains allergens.

Always use the correct size and type of replacement filter specified for the unit. Using an undersized filter or not properly sealing the filter in its rack will allow dust to bypass the filter and clog the coil. Using an overly restrictive filter that is not designed for this unit (for example, some aftermarket high-MERV filters) can reduce airflow if the unit is not designed for them.

When replacing or cleaning the filter:

1. Turn off the unit or ensure the blower fan is not running (this prevents drawing unfiltered air into the unit while the filter is out).
2. Remove the old filter carefully to avoid knocking dust off of it into the unit or duct.
3. If reusable, clean the filter per the manufacturer's instructions (vacuum or rinse). If disposable, discard the dirty filter in a sealed bag — it will contain dust and possibly allergens.
4. Wipe out or vacuum any dust from the filter housing/rack before inserting the new filter.
5. Insert the new (or cleaned) filter with the correct orientation (airflow arrow pointing toward the unit's blower). Ensure it fits snugly with no gaps.
6. Restore power and set the blower back to its normal operation mode.

5.4 Blower Assembly

The blower motor and wheel should be kept clean and properly secured. Over time, dust can accumulate on the blower wheel blades, which can unbalance the wheel and reduce efficiency. If the blower becomes noisy or vibrates, it may need cleaning or servicing.

Blower maintenance steps (to be performed by a technician with power disconnected):

- Remove the access panel to expose the blower assembly (typically in the return air section).
- Inspect the blower wheel (squirrel-cage fan) for dust buildup. A thin layer of dust can be carefully brushed off and vacuumed. Heavy buildup may require removing the blower wheel for thorough cleaning.
- Check that the blower wheel's set-screws are tight on the motor shaft. A loose blower wheel can slip or wobble.
- If the blower is belt-driven (uncommon in these unit sizes, most are direct-drive), check the belt condition and tension. Replace any frayed or cracked belts and adjust tension to manufacturer specs.
- If the blower motor has oil ports (usually small capped openings on the end of the motor), add a few drops of the recommended motor oil to each port **annually**. Many modern motors are sealed and do not require oil. Do not over-oil.
- After any maintenance, spin the blower wheel by hand to ensure it moves freely without rubbing on the housing.
- When restoring power, observe the blower startup. It should ramp up smoothly to full speed. Listen for any wobble or scraping noises – if present, shut down and re-inspect (this could indicate misalignment or motor bearing issues).

5.5 Indoor Coils

The evaporator coil (the indoor air coil) should be inspected at least once a year and cleaned if needed. A dirty evaporator coil reduces heat transfer and can lead to icing during cooling operation or insufficient heating.

To clean the evaporator coil:

- Remove or open the access panel to the evaporator coil section (often the same as the blower section on many units).
- If the coil surface is only slightly dusty, you can gently brush along the fins with a soft nylon brush and use a vacuum to remove loose debris. Always brush in line with the fins (up-and-down) to avoid bending them.
- For more substantial dirt or any greasy film, use an HVAC-approved foaming coil cleaner. Follow the product instructions: usually you spray it on the coil, let it soak for the recommended time to dissolve grime, then gently rinse it off with low-pressure water or wipe with a damp cloth. **Be sure to have a drain pan or towels in place** to catch the runoff, and avoid getting water on electrical components.
- Straighten any bent fins with a fin comb (a special tool) to maintain airflow through the coil.
- Ensure the condensate drain pan and drain line are clean and flowing (since you're already in there, it's a good time to flush the drain).
- Reinstall all access covers securely when finished to ensure proper airflow and cabinet sealing.

Note: The evaporator coil may have a factory-applied protective coating or be constructed of copper tubes with aluminum fins. Use only coil cleaners that are compatible with these metals (non-acidic cleaners are preferred to avoid corrosion).

5.6 Water Heat Exchanger

The water-to-refrigerant heat exchanger (also known as the coaxial coil or water coil) transfers heat between the refrigerant and the water loop. For efficient operation, the inside of this heat exchanger must remain free of scale and fouling.

Maintaining the water heat exchanger primarily involves maintaining **water quality** in the loop:

- **Strainer Cleaning:** If a strainer is installed on the water inlet to the unit, check and clean it as needed (at least annually, more often for an open-loop system). A clogged strainer will reduce water flow and thus unit performance. In an open loop (e.g., well water) this could need very frequent checks; in a closed treated loop, it may rarely get dirty.
- **Scale Prevention:** In a closed-loop system with properly treated water, scaling inside the heat exchanger should be minimal. However, in an open loop system (using groundwater) or if using glycol, periodic flushing might be required. A qualified technician can perform a **descaling flush** by pumping a mild acid solution (like a phosphoric acid-based descaler) through the heat exchanger, then flushing with clean water. This should be done if a significant reduction in performance is detected and scale is suspected.
- **Water Quality:** Each year, test the loop water or antifreeze solution. Maintain proper corrosion inhibitor levels and glycol concentration (if used). Poor water quality (incorrect pH, hardness, or lack of inhibitors) can cause scale or corrosion in the heat exchanger, which will reduce performance and could eventually cause leaks.

- **Flow Rate:** Ensure the water flow rate is within design specifications. Symptoms of fouling or flow restriction in the heat exchanger can include a larger-than-normal temperature difference between entering and leaving water, and/or higher compressor head pressures in cooling mode. If these symptoms are observed, the heat exchanger may need to be cleaned.

If the heat exchanger becomes severely fouled, professional cleaning or replacement might be necessary. Proactive maintenance of water quality and keeping filters/strainers clean will prevent most heat exchanger issues.

5.7 Service Assistance

If the heat pump requires service beyond routine maintenance, contact a qualified HVAC professional. **Before calling for service**, note the model and serial number of the unit (from the nameplate) and be prepared to describe the issue and what has been observed. Many problems can be more quickly resolved if the technician has detailed information.

The manufacturer's customer service/warranty department can be reached at **1-888-205-7866** (phone) for technical assistance. Warranty service must be performed by an authorized service provider. Always have the installation date and maintenance records available when making a warranty claim.

If the unit is not running at all, check a few basics before calling for service:

- Is the thermostat set correctly (in the proper mode, with a demand for cooling or heating)? If the thermostat has batteries, are they good?
- Are the power disconnect switches turned on and the circuit breakers not tripped? (Verify that any external or internal disconnect is in the ON position and check the building's breaker panel.)
- Is the air filter clean, allowing adequate airflow? A very dirty filter can cause safety switches to shut the unit down.
- Is the water loop pump running and valves open to provide flow through the unit?

If all the above appear normal and the unit still does not run or does not perform correctly, further diagnosis will require a trained technician. **Do not attempt to open sealed refrigeration components or access internal electrical controls** without proper training, as this could be dangerous.

6. Troubleshooting

The following guide lists some common issues, their possible causes, and suggested corrective actions. **Note:** Internal troubleshooting and repairs should be performed by qualified service personnel. This guide can help owners or maintenance staff communicate with a technician or do basic checks.

Problem: Entire unit does not run (no blower, no compressor)

- **Power supply OFF:** Ensure the unit is receiving power. Check that the external disconnect switch is ON and that the building circuit breakers/fuses for the unit are not tripped or blown. If they are off, restore power or replace the fuse/reset the breaker. Verify that the correct size fuses or breaker are installed (per nameplate).
- **Thermostat off or mis-set:** Make sure the thermostat is turned on, set to either heating or cooling mode as appropriate, and the setpoint is calling for the unit to run. If the thermostat is battery-powered, check/replace the batteries.
- **Thermostat wiring issue:** There may be a problem in the low-voltage control circuit. If comfortable doing so, one can jumper R to G at the unit's control board to see if the blower runs (this bypasses the thermostat). If the blower runs with the jumper but not with the thermostat, the thermostat or its wiring may be faulty. Replace or repair the thermostat/wires as needed.
- **Main control board or transformer issue:** If the unit has power (line voltage present) but no 24 V control voltage, the internal control transformer or a fuse on the control board could be bad. This requires a technician to test for 24 V at the transformer secondary and replace components if necessary.

Problem: Blower operates but compressor does not (no cooling or heating, fan only)

- **Thermostat setting or staging:** The thermostat might not be calling for compressor operation. For example, if the fan is set to ON but the system mode isn't calling for heat or cool, the blower will run without the compressor. Verify the thermostat is in the correct mode (heat/cool) and the setpoint requires the compressor to run.
- **High or low pressure safety lockout:** The unit might have tripped a high-pressure or low-pressure safety and locked out the compressor. Many heat pump controls will shut down the compressor (and often light an alarm LED) if a pressure limit is tripped. Check if any alarm indicator is lit on the unit's control board or if the thermostat has a service light. If a high or low pressure switch opened, the unit may require a manual reset depending on design, and the underlying cause (e.g., loss of water flow or airflow) must be fixed.
- **Wiring/relay issue:** There could be a loose wire on the compressor contactor, or the contactor coil might not be energizing. A technician should inspect the compressor contactor and the control circuit to see if the contactor is getting the 24 V signal to close. Repair any loose connections or replace a faulty contactor or relay.
- **Compressor capacitor (single-phase units):** A failed compressor start or run capacitor can prevent the compressor from starting (often accompanied by a humming sound as the compressor tries to start). If the blower runs but the compressor just hums and never starts, a bad capacitor could be the cause. A technician can test and replace the capacitor.
- **Compressor motor failure:** If the compressor is not starting at all (silent or just clicking) and all controls are calling for it, the compressor's internal overload may be open or the compressor motor may have failed (seized or electrically open/grounded). This requires a technician's diagnosis with specialized tools (e.g., measuring winding resistance). Compressor replacement may be necessary if it's failed.

Problem: Unit short cycles (turns on and off rapidly)

- **Thermostat differential too narrow:** Some digital thermostats allow adjustment of cycle rate or temperature differential. If set too aggressively, the unit may cycle very frequently. Adjust the thermostat settings to lengthen the cycle interval (e.g., a wider temperature swing or a lower cycle rate setting like 3 cycles per hour for compressors).
- **Oversized unit:** An over-capacity unit for the space will satisfy the thermostat very quickly and then shut off, leading to short cycles. Solutions may include adjusting airflow (lower blower speed to remove more humidity and slow the cooling) or, in extreme cases, replacing the unit with a properly sized one.
- **Refrigerant charge or flow issue:** Short cycling can occur if a safety is cutting the compressor off. For instance, an overcharged system or lack of water flow can trip the high-pressure cutout quickly, or a low charge or low airflow can trip the low-pressure cutout, and then the unit might restart once pressures equalize. These conditions require a technician to check refrigerant pressures and charge, as well as water/air flow, to correct the underlying issue.
- **Control board lockout/reset:** The unit may be shutting off due to a safety trip and then automatically resetting after a short delay (some controls attempt auto-resets). Identify if a pressure switch or other safety is causing the shutdown and resolve that root cause (such as low water flow, low airflow, etc., as above).
- **Thermostat placement:** If the thermostat is too close to a supply register or in a spot where it gets a quick blast of conditioned air, it will satisfy quickly and shut the unit off prematurely, then the rest of space will warm up and the cycle repeats. Relocating the thermostat or correcting the airflow issue can help.

Problem: Insufficient cooling or heating performance (unit runs but cannot maintain setpoint)

- **Dirty filter or coil:** Reduced airflow from a clogged filter or dirty evaporator coil will diminish the unit's capacity. Check and replace the air filter. Inspect the evaporator coil and clean it if it's dirty. Restoring proper airflow often fixes performance issues.
- **Low refrigerant charge:** If there is a refrigerant leak, the system may still run but with reduced capacity and possibly long runtimes. Signs of low charge can include continuous operation without reaching the set temperature and possibly ice forming on the evaporator coil in cooling mode. A technician will need to find and fix the leak and recharge the system to the correct amount.
- **Water flow issue:** Ensure the water loop pump is running and that the correct water flow is reaching the unit. Low water flow (due to a failing pump or a clogged strainer or closed valve) will reduce both heating and cooling capacity and can cause the compressor to trip on high or low pressure. Check the water circuit for proper flow (valves open, strainer clean, pump operational).
- **Improper loop temperature:** In cooling mode, if the building's water loop (or geothermal loop) temperature is higher than design (for example, cooling tower not effective or undersized), the unit's capacity will drop. Similarly, in heating mode, if the entering water is too cold (below design), capacity suffers. Check loop temperatures; this may be a central system issue (cooling tower or boiler) rather than the unit itself.

- **Duct leaks or losses:** Inspect the ductwork for significant leakage or poor insulation, especially if some rooms are not getting cooled/heated. Leaking or uninsulated ducts in unconditioned spaces can severely reduce delivered capacity. Seal leaks and ensure ducts in attics or crawl spaces are insulated.
- **Compressor issues:** A weak or worn compressor might run but not compress effectively, reducing capacity. If refrigerant pressures are off despite correct charge and good airflow/water flow, the compressor might be failing (e.g., worn valves). This would need a technician to diagnose and possibly replace the compressor.
- **Reversing valve malfunction (heat pump only):** In rare cases, the reversing valve might not fully shift or could leak internally (bypass between high and low sides), causing poor performance in both modes. If other causes are ruled out and heating/cooling is still insufficient, a tech might test the reversing valve operation. A faulty reversing valve would need replacement by a professional.

Problem: Unit is running but building is uncomfortable (too humid, or large temperature swings)

- **Oversizing/Humidity Issues:** If the unit is oversized for the cooling load, it may satisfy the thermostat before adequately dehumidifying, leading to a cool but humid environment. In cooling season, you might notice cool but clammy conditions. Solutions include using a thermostat with humidity control or adjusting the fan speed to a lower setting to improve dehumidification (longer cooling cycles at lower airflow). In severe cases, a separate dehumidifier or a properly sized unit might be needed.
- **Thermostat calibration or location:** Verify the thermostat reads the actual room temperature accurately. An improperly calibrated thermostat or one located in a drafty or isolated spot could cause temperature swings. Replace or recalibrate the thermostat if it's reading incorrectly. Ensure it's in a representative location for the space.
- **Loop temperature swings (in multi-unit systems):** If multiple heat pump units share a common water loop and that loop is not maintained within the design temperature range, individual units might have trouble. For example, if the cooling tower is undersized or not operational, the water loop might get too warm, making all units struggle in cooling. This is a central system issue to be addressed (check cooling tower, fluid cooler, or boiler function).
- **Inadequate building insulation or changed load:** Sometimes the structure itself is the culprit – if insulation is missing or a door/window is left open, the unit might run continuously and still not maintain comfort. Or if new heat loads have been added to the space (additional people or equipment) beyond what the system was designed for, comfort will suffer. Evaluate the building's insulation, weatherstripping, and internal gains.

If none of the above addresses the issue, or for any persistent/complex problems, **contact a professional HVAC service technician.** They can use specialized tools to read system pressures, check for fault codes on the control board, and perform a more detailed diagnosis. Always ensure proper safety procedures are followed when troubleshooting (power off when opening panels, etc.).

7. Insert Checkout Table Here.