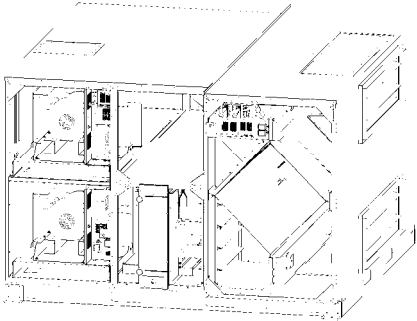


RD4XIN INSTALLATION AND OPERATION MANUAL

BOOK 3

MECHANICAL



ABOUT BOOK 3:

This book covers the mechanical installation of the RD4XIN.

See Book 1 for an overview of the RD4X and system design considerations.

See Book 2 for product and performance specifications.

See Book 4 for basic electrical connections and wiring schematics.

See Book 5 for control system connections, VFD adjustment, Start-Up, Commissioning or Maintenance.

This book does not cover overall system design or system integration issues. Some of these issues are discussed in Books 1 and 5, but in general, specification documents provided by a qualified specifying engineer are to be considered the Basis of System Design.

Following these instructions does not necessarily assure compliance with local codes and standards, which must always be observed.

UNPACKING INSPECTION

Place the RD4X at its installation location and remove packaging. Inspect the unit for visual signs of damage.

Table of Contents

BOOK 1: Overview	
Product Features	2
De-Coupled and DOAS System Overview	3
RD4X Psychrometrics	4
System Integration	6
Critical Warnings	7
Checklist for Specifying Engineer	8
BOOK 2: Specifications	
Product Features	2
Available Features	3
Descriptive Drawings	4
Configuration Codes	6
Condensed Specifications	8
Dimensions	10
Airflow and Power Ratings	12
Coil Performance Ratings	13
Modes of Operation	20
Unit Controls and Operating Sequences	21
Connections to External Equipment	23
Guide Specifications	24
BOOK 3: Mechanical Installation	
Product Features	2
Order of Installation	3
Critical Dimensions	4
How to Reconfigure the Unit (opt.)	5
How to Move Dampers to Remote Locations (opt.)	7
Tie-down of Unit	8
Duct Location, Construction & Termination	9
Coils and Drain Connections	12
How to Install Field-Supplied Coil (opt.)	13
BOOK 4: Electrical Installation	
Product Features	2
Power Connections	3
Disconnect Switch Ratings	5
On-Board Transformer	6
Control Connections	7
Electrical Installation Checklists	8
Schematics	10
Ladder Schematics	17
BOOK 5: Start-Up, Commissioning and Maintenance	
Product Features	2
Initial Checks	3
Balance Air Flow	4
Review / Adjust On-Board Controls (opt.)	6
VFD Parameters	8
Control Connection Examples: On/Off and 3-speed	11
Analog Control of the VFDs -- General	16
Scaling to VFD Response to Analog Inputs	17
Control Connection Examples: Analog Controllers	22
Control Connection Examples: Analog and On/Off	35
To Reset VFD Parameters	38
Service Parts	39
Warranty Information	47
Records	48

BOOK 3: MECHANICAL

PRODUCT FEATURES

The RD4X is an Energy Recovery Ventilator with available features designed for Dedicated Outdoor Air Systems.

Standard features include:

- Energy recovery by fixed-plate enthalpic energy exchanger
- Enthalpy- and temperature-controlled bypass of energy recovery
- Isolation dampers that shut down when ventilation is not needed
- Variable-Frequency Drive (VFD)-controlled direct-drive fresh air and exhaust air blowers
- Integrated disconnect switch
- Airflow measurement stations

Available features include:

- Heating and/or cooling coils for post-treatment of fresh air
- Double-wall construction

PRINCIPLE OF OPERATION

The RD4X can operate in up to four modes depending on options installed:

- Energy Recovery mode: the unit transfers heating or cooling energy from the exhaust air to the fresh air.
- Recovery Bypass mode: the unit takes advantage of free cooling from the outside air and doesn't transfer energy between air streams.
- Dehumidification mode: the unit conditions the fresh air to 53°F.
- Heating mode: the unit tempers the fresh air to 75°F.

The RD4X operates automatically. The unit receives an external call for ventilation. Its isolation dampers open and turn on the variable frequency drives and blowers. The unit determines the operating mode by continuously monitoring the air streams for temperature and enthalpy.

The RD4X does not include a condensing unit, chiller, heat pump or boiler. When a coil for dehumidification or cooling is part of the RD4X unit, the condensing unit, chiller, heat pump or boiler is separately installed to meet the needs of the complete system. RD4X units equipped with coils include connection points to call for operation of the separate heating or cooling equipment. **However, no fluid or refrigerant flow control valve (TX valve) is provided, and must be specified by the designer of the overall system for separate sourcing.**

OPERATING CONTROLS

A wide variety of low voltage (24VAC) control schemes may be selected to meet the ventilation needs of the facility. These may include time clock, occupancy sensor, carbon dioxide sensor, and others. DDC

systems may also control the unit with external control by other. **TX valves are not provided.**

WARNING

RISK OF FIRE, ELECTRIC SHOCK, OR INJURY. OBSERVE ALL CODES AND THE FOLLOWING:

1. Before servicing or cleaning the unit, switch power off at disconnect switch or service panel and lock-out/tag-out to prevent power from being switched on accidentally. More than one disconnect switch may be required to de-energize the equipment for servicing.
2. This installation manual shows the suggested installation method. Additional measures may be required by local codes and standards.
3. Installation work and electrical wiring must be done by qualified professional(s) in accordance with all applicable codes, standards and licensing requirements.
4. Any structural alterations necessary for installation must comply with all applicable building, health, and safety code requirements.
5. This unit must be grounded.
6. Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment that might be installed in the area affected by this equipment. If this unit is exhausting air from a space in which chimney-vented fuel burning equipment is located, take steps to assure that combustion air supply is not affected. Follow the heating equipment manufacturer's requirements and the combustion air supply requirements of applicable codes and standards.
7. Use the unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.
8. This unit is intended for general ventilating only. Do not use to exhaust hazardous or explosive materials and vapors. Do not connect this unit to range hoods, fume hoods or collection systems for toxics.
9. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.

CAUTION

To avoid motor bearing damage and noisy and/or unbalanced impellers, keep drywall spray, construction dust etc, out of unit.

BOOK 3: MECHANICAL

ORDER OF INSTALLATION

ESSENTIAL STEPS

PLAN THE INSTALLATION	this page
MOVE THE UNIT TO THE INSTALLATION LOCATION	this page
RECONFIGURE THE UNIT (if necessary)	page 5
SECURE THE UNIT IN FINAL LOCATION	page 8
CONNECT DUCTS TO UNIT	page 9
CONNECT COILS TO HEATING/COOLING EQUIPMENT (if necessary)	page 12
CONNECT POWER AND CONTROLS TO UNIT	BOOK 4

PLAN THE INSTALLATION

Plan the installation before starting:

- Determine how the unit will be moved to its installation location, and whether available equipment can handle the unit. See "PLACE THE UNIT", below.
- Insure there will be access to the front and rear of the unit for maintenance and service. See "PLACE THE UNIT", below, for more information.
- Determine the ducting layout. If the inlets and outlets need to be re-configured do this prior to installation. See "FIELD RE-CONFIGURATION OF INLETS AND OUTLETS", page 5.
- Know where the line voltage and control wires are connected. See "CRITICAL DIMENSIONS", page 4.
- Confirm routing of pipes connected to coils (if applicable) including the condensate drain line.

MOVE THE UNIT

The RD4XIN is designed for installation in a sheltered location out of the weather. The unit must be on a level surface or slightly pitched from back to front of the unit to allow for proper drainage of the condensate drain pan out the front of the unit. See "SECURE THE UNIT IN FINAL LOCATION", page 8, for additional information about proper installation locations.

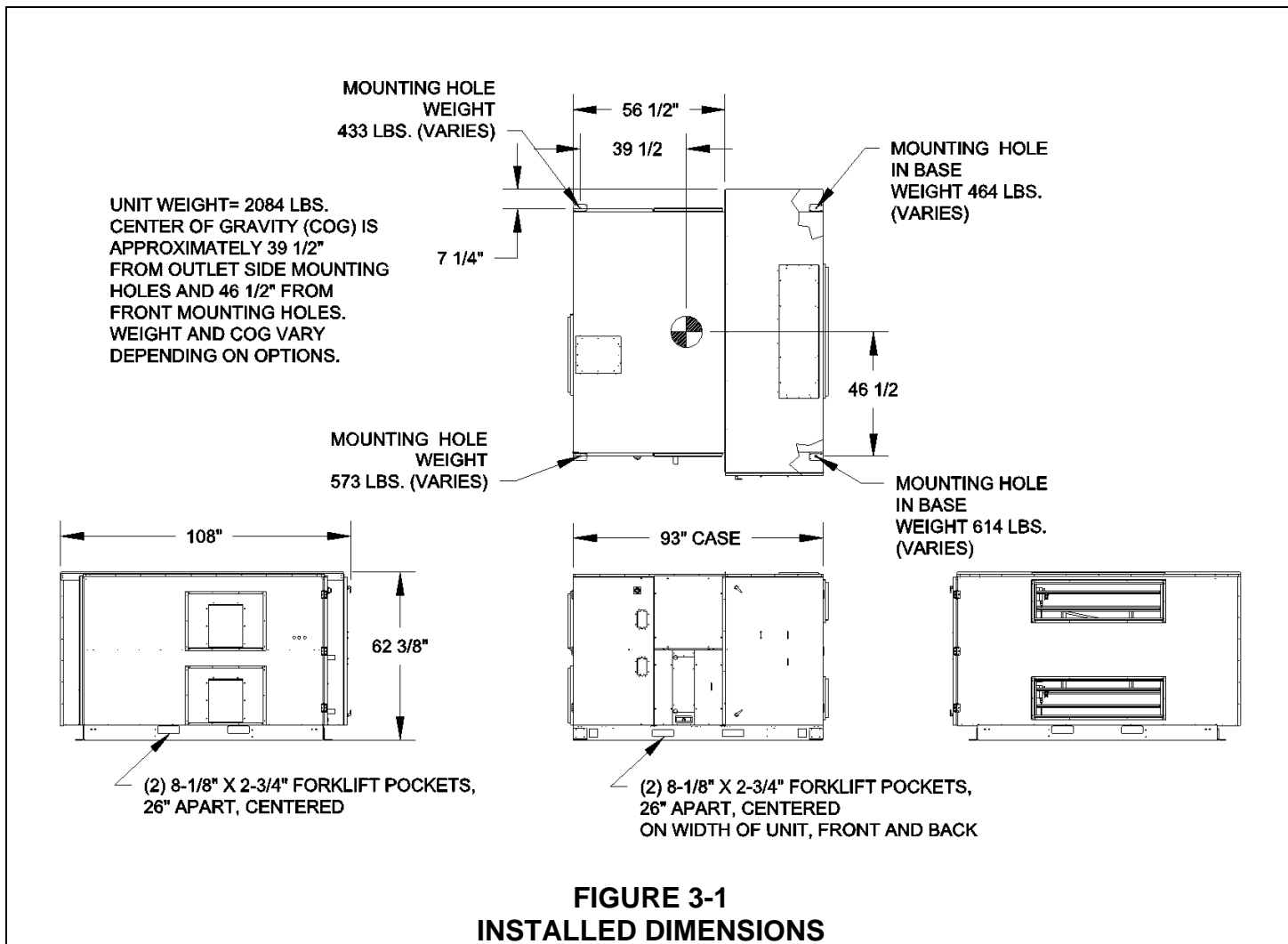
See next page for illustrations of critical dimensions and weights for moving the unit, and for final location of the unit.

CAUTION

Do not stand on the unit. Do not stack or store items on the unit when installed.

BOOK 3: MECHANICAL

CRITICAL DIMENSIONS

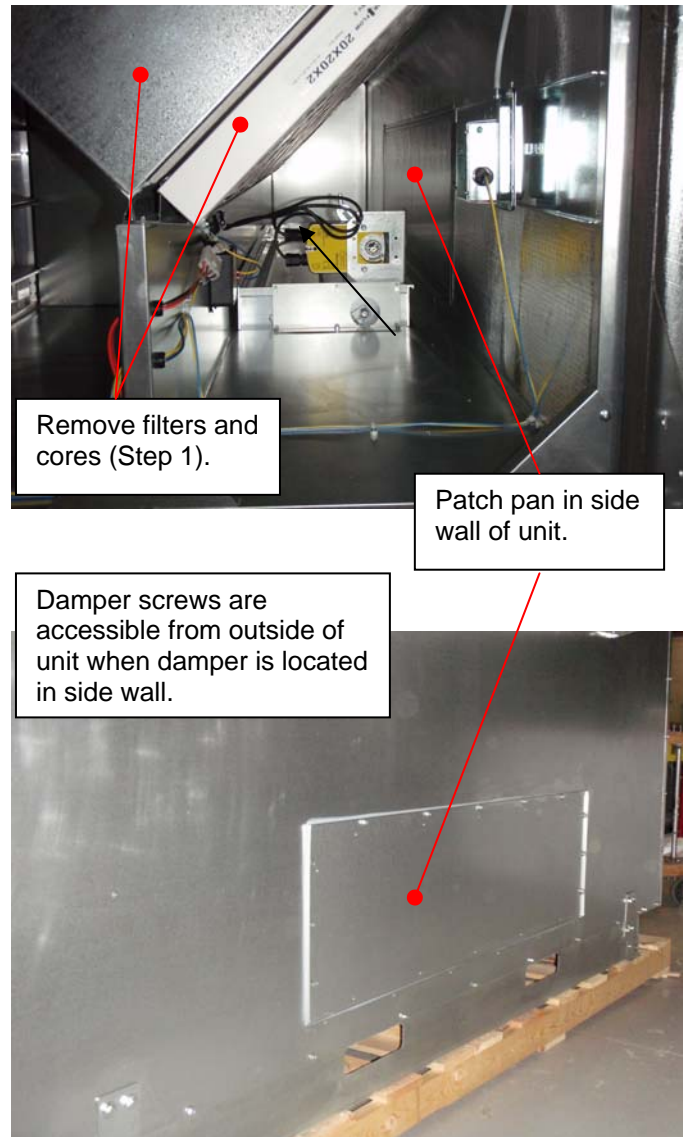


Unit Installed Weight: 2084 lbs
(varies with options installed)

The RD4X is delivered with the inlets and outlets configured as ordered. In the event you need to reconfigure the inlet and/or outlet the RD4X provides that versatility. Follow the steps below.

TO RECONFIGURE INLETS

1. Remove the filters and cores from the unit so they are not damaged during reconfiguration.
2. Remove the patch panel from the desired opening. Save the patch panel and associated hardware.
3. Loosen the isolation damper from the opening by removing the screws. Save the associated hardware. If the damper is located in the floor remove the brackets from the damper. They are not needed when the damper is re-located to the side wall.
4. Remove the duct flange from the side wall opening, if present.
5. Re-locate the isolation damper into the desired opening.
6. Attach the damper with the screws. Brackets need to be fabricated if the damper is re-locating from the side wall to the floor.
7. Place the patch panel in the unused opening and attach with the saved hardware.
8. When using the side opening or roof opening place the duct flange around the opening and attach with screws.
9. Caulk around the perimeter of the duct flange to provide an air tight seal.
10. Replace the cores and filters.



**FIGURE 3-2
RECONFIGURING RA INLET**

BOOK 3: MECHANICAL

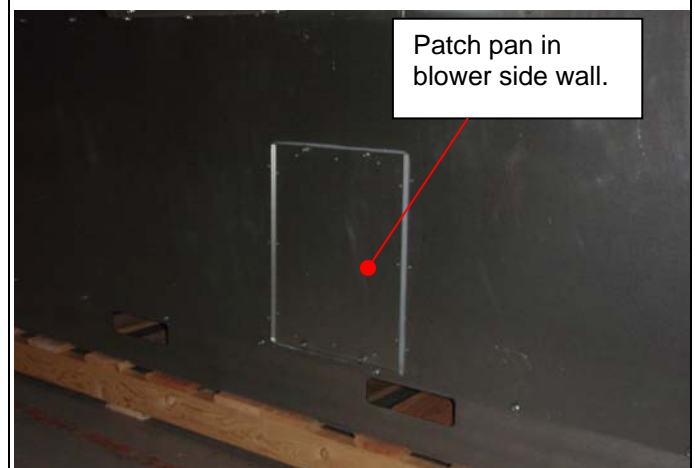
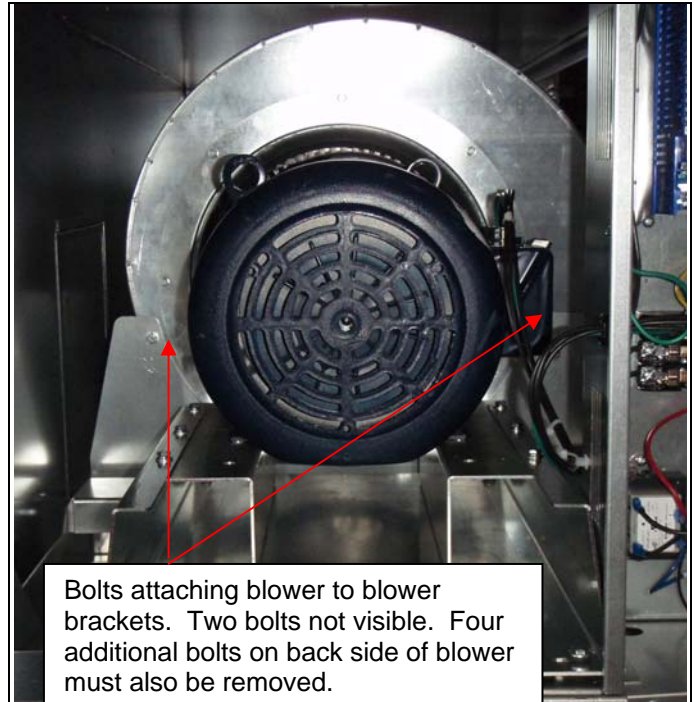
HOW TO RECONFIGURE THE UNIT (OPTIONAL)

TO RECONFIGURE OUTLETS

1. Remove the duct flange from the opening, if present.
2. Remove the patch panel from the desired opening. Save the patch panel and associated hardware.
3. Loosen the bolts attaching the blower to the blower brackets. There are four bolts on each side of the blower (total 8 to be removed).
4. Rotate the blower 90° to the desired outlet orientation.
5. Place the patch panel in the unused opening and attach with the saved hardware.
6. When using the side opening or roof opening place the duct flange around the opening and attach with screws.
7. Caulk around the perimeter of the duct flange to provide an air tight seal.
8. Attach the blower to the base brackets with bolts.

CAUTION

Motor is heavy. Do not drop. Personal injury or damage to the equipment can occur.



**FIGURE 3-3
RECONFIGURING FA OUTLET**

BOOK 3: MECHANICAL

HOW TO MOVE THE DAMPERS TO REMOTE LOCATIONS (OPTIONAL)

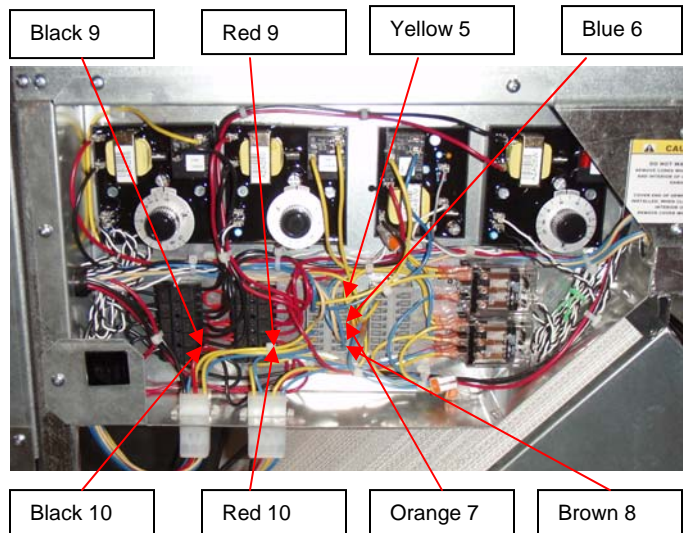
The isolation dampers are secured in the unit inlet openings by six screws. The electrical harness for the damper actuator is connected with a plug and receptacle. Should it be necessary to locate one or both isolation dampers remote from the unit follow the steps below:

1. Disconnect all power to the unit.
2. Disconnect the black, red, yellow, and blue wires from the terminal blocks in the low voltage electrical box in the core module. See Figure 3-4.
3. Remove the strain relief in the center vertical wall in the core module and pull through the four wires for the harness. It is not necessary to disconnect the plug and receptacle from each other. Replace the strain relief.
4. Remove the six screws from the vertical sides of the damper that attach the damper to the unit.
5. Pull the damper out of the opening.
6. Locate the damper at its remote location and secure it into position.
7. Measure the distance for the wire lengths back to the unit from the damper. Minimum wire is 18 gauge.
8. Connect one end of each wire to the wires at the damper using wire nuts or crimp-on connectors.
9. At the unit, thread the other end of the wires through the control wire hole at the top of the core module into the unit. Connect the end of these wires to the terminal blocks in the low voltage electrical box in the core module. See Schematic Section, Book 4.

WARNING

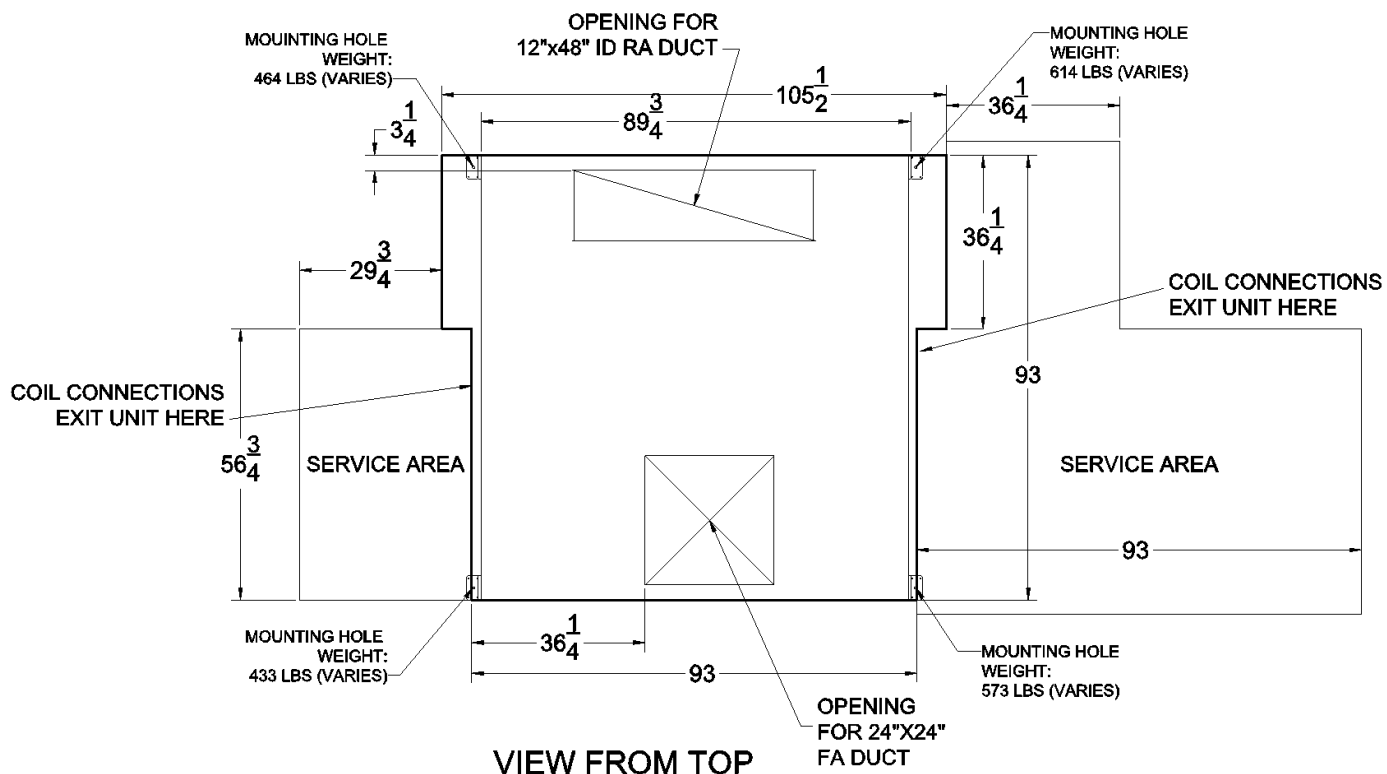
Danger of Electrical Shock when servicing unit. ALWAYS DISCONNECT POWER SOURCE BEFORE SERVICING! More than one disconnect switch may be required. Proper wiring size selection and wiring installation are the responsibility of the electrical contractor.

For OA damper, disconnect black wire at terminal block location 9, red wire at terminal block location 9, yellow wire at terminal block location 5, and blue wire at terminal block location 6.



For RA damper, disconnect black wire at terminal block location 10, red wire at terminal block location 10, orange wire at terminal block location 7, and brown wire at terminal block location 8.

FIGURE 3-4
Damper Actuator Wire Locations



**FIGURE 3-5
DIMENSIONS OF UNIT IN POSITION WITH MOUNTING BRACKET HOLE LOCATIONS**

SECURE THE UNIT IN FINAL LOCATION

Confirm selected unit location allows for proper connection of the ducts, electrical power and control wires, coil and condensate pipes, and provides necessary service access. See Figure 3-5, this page. The RD4XIN is designed for installation in a sheltered location out of the weather.

The unit must be on a level surface or slightly pitched from back to front of the unit to allow for proper drainage of the condensate drain pan out the front of the unit.

Unit should be bolted to a secure surface. The mounting brackets of the RD4XIN can be bolted to vibration isolators that have a 1/2" diameter adjustment bolt.

WARNING

DO NOT SUSPEND OR HANG UNIT. Secure the unit to meet applicable seismic requirements.

BOOK 3: MECHANICAL

DUCT LOCATION, CONSTRUCTION AND TERMINATION

DUCT CONSTRUCTION

GENERAL:

- Follow SMACNA guidelines for duct construction and airtightness.
- Follow duct design specified in construction documents in order to achieve design system airflows.

DUCTS CARRYING AIR AT DIFFERENT TEMPERATURE THAN SURROUNDINGS:

At least two of the ducts connected to the RD4X unit will be carrying air at a substantially different temperature and humidity than the surrounding air. Care must be taken to avoid condensation on or in the ducts.

- If RD4X is installed in a conditioned space, then the Outside Air and Exhaust Air ducts must be insulated, with a sealed vapor barrier on both inside and outside of the insulation.
- If RD4X is installed in an un-conditioned space, then the Room Air and Fresh Air ducts must be insulated, with a sealed vapor barrier on both inside and outside of the insulation.
- Whenever a dehumidification coil is part of the RD4X unit, the Fresh Air duct must be insulated, with a sealed vapor barrier at least on the outside of the insulation.



CAUTION

Danger of condensation and resultant equipment damage or biological growth if ducts are not properly installed, sealed and insulated. Observe guidelines above as well as all applicable codes.

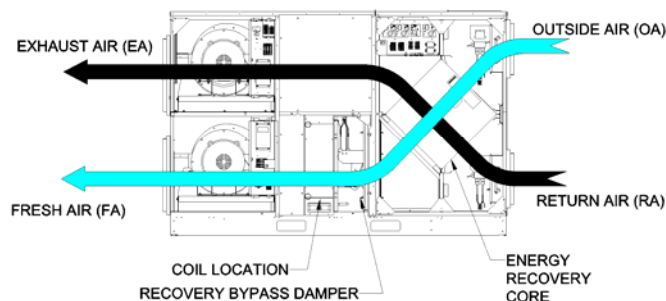


Figure 3-6
AIRFLOW PATHS IN UNIT

DESCRIPTION OF AIRFLOWS

The RD4X is designed for **Outside Air (OA)** to enter the top right hand compartment of the unit. It passes through the energy exchange core or the bypass passage. The **Fresh Air (FA)** then flows through the coil, (if present) and exits the blower and unit at the bottom left hand compartment. The **Return Air (RA)** inside the building enters the bottom right hand compartment of the unit and flows through the energy exchange core. The **Exhaust Air (EA)** then exits the blower and unit at the top left hand compartment. See Figure 3-6.

OUTSIDE DUCT TERMINATION LOCATIONS

The exhaust outlet and fresh air inlet on the outside of the building should be at least ten feet apart to avoid cross-contamination. The exhaust outlet should not dump air into an enclosed space or any other structure, nor onto a walkway. The inlets and outlets should be screened against insects and vermin; screen openings shall be between ¼" and ½". Inlets and outlets shall be shielded from the weather to prevent the entry of rain or snow (see below).



WARNING

The fresh air inlet should be at least 10' away from any exhaust, such as dryer vents, chimneys, furnace and water heater exhausts, or other sources of contamination or carbon monoxide. Do not locate the fresh air inlet where vehicles may be serviced or left idling. Never locate the fresh air inlet inside a structure.

INLET TERMINATION CONSTRUCTION

BOOK 3: MECHANICAL

DUCT LOCATION, CONSTRUCTION AND TERMINATION

INLET CONSTRUCTION: To prevent the entry of rain through the outside air inlet duct, use either:

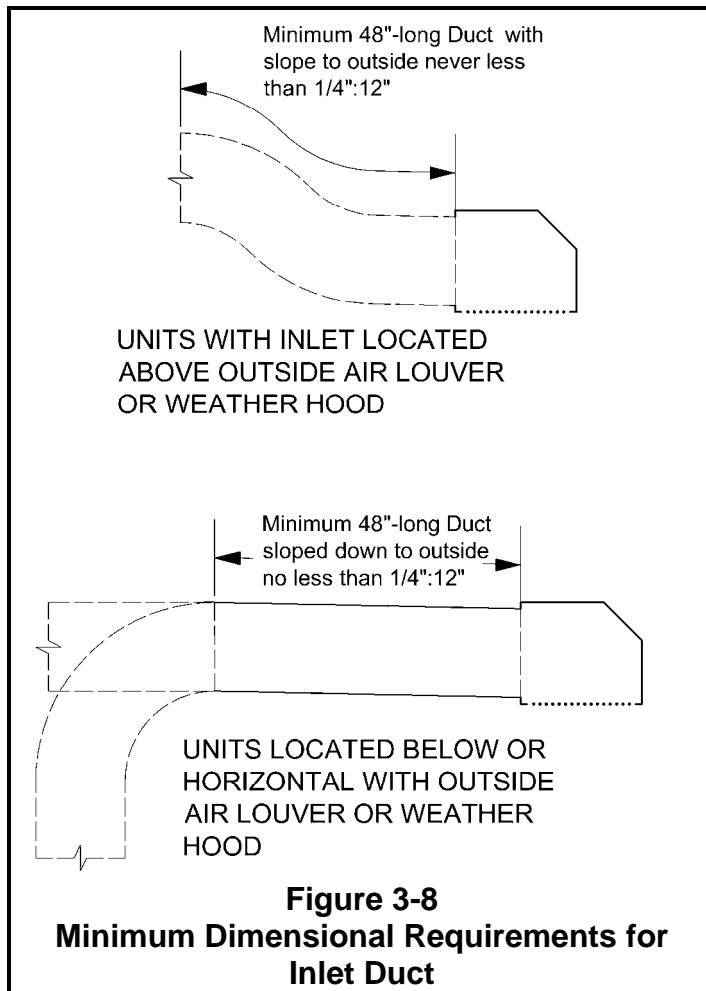
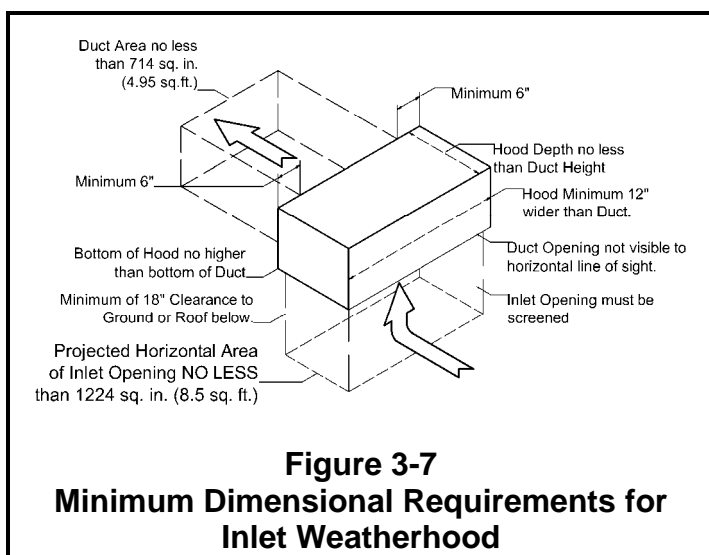
1. An AMCA-certified weather-resistant rain louver with a rated beginning point of water penetration above the free air velocity that would occur with the louver operating at 4250 CFM;

OR

2. An AMCA-certified wind-driven rain louver with a 29mph wind velocity rating of Class C or better at the free air velocity that would occur with the louver operating at 4250 CFM;

OR

3. An inlet weather hood constructed as shown below (Figure 3-7).



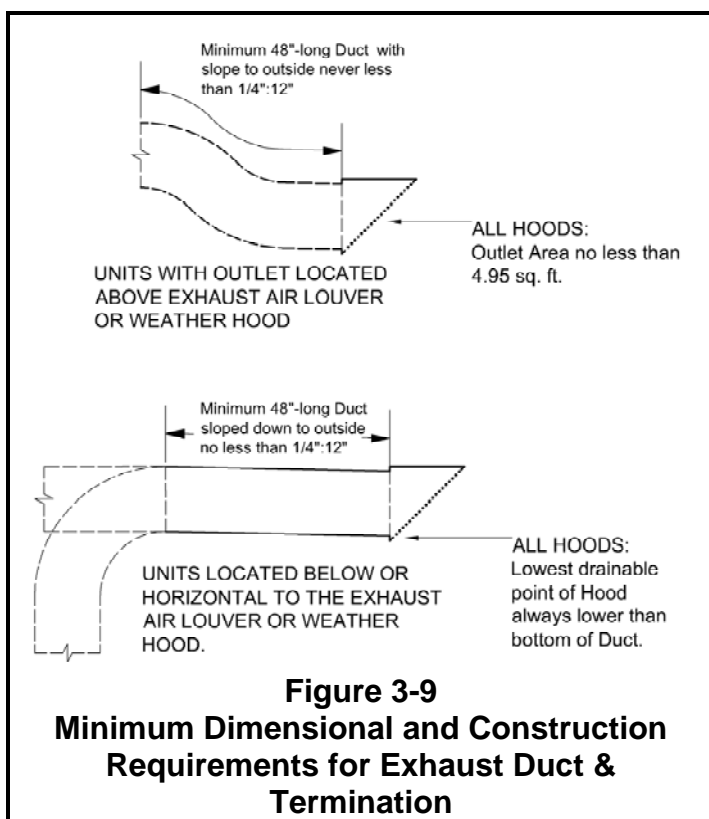
INLET DUCT CRITICAL DIMENSIONS

1. Duct between unit and the inlet hood or louver must have at least 714 in² (4.95ft²) cross-sectional area.
2. Centerline length along duct from weather hood to unit inlet must be at least 48" (Figure 3-8).
3. First 48" of duct connecting to the inlet hood or louver must pitch downward to the outside with a slope of at least 1/4" to the foot (Figure 3-8).

EXHAUST TERMINATION CONSTRUCTION:

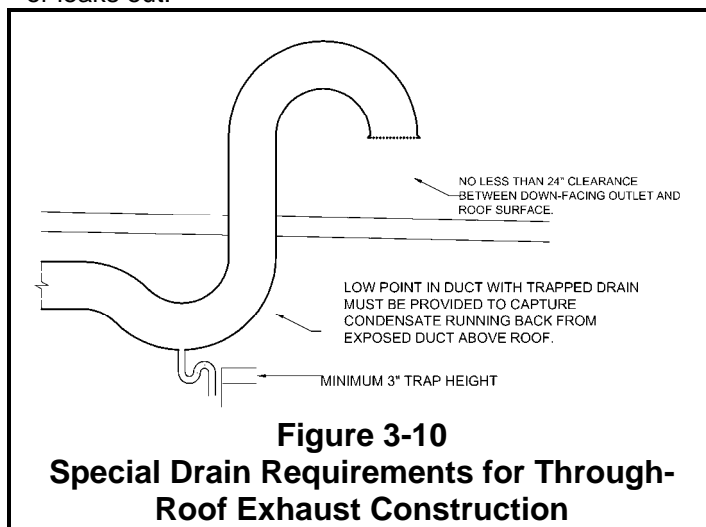
To prevent the entry of rain through the exhaust outlet, use either:

1. An AMCA-certified weather-resistant rain louver with free area no less than 714 in² (4.95ft²);
- OR
2. An AMCA-certified wind-driven rain louver with a 29mph wind velocity rating of Class C or better at a free air velocity of 0 fpm and with free area no less than 714 in² (4.95ft²);
- OR
3. An outlet weatherhood constructed as shown below (Figure 3-9).



THROUGH-ROOF EXHAUST CONSTRUCTION:

When exhaust air is exposed to cool surfaces of a roof exhaust stack, as can occur in cool weather or at night, condensate will be generated. The condensate must be drained out of the exhaust duct before it reaches the unit or leaks out.



CAUTION

Risk of damage to unit or building!
Do not vent exhaust duct up through roof except as shown. Otherwise, condensate will form in cool conditions and run back into unit.

EXHAUST DUCT CRITICAL DIMENSIONS:

1. Duct between unit and the outlet hood or louver must have at least 714 in² (4.95 ft²) cross-sectional area.
2. Centerline length along duct from weather hood to unit outlet must be at least 48" (Figure 3-9).
3. Final 48" of duct at the outlet hood or louver must pitch downward to the outside with a slope of at least 1/4" to the foot (Figure 3-9).

BOOK 3: MECHANICAL

COILS AND DRAIN CONNECTIONS

When dehumidification or heating coils are part of the RD4X unit, the coils must be connected to separate equipment external to the unit. All connecting lines should be supported independently of the unit. Do not rely on the connection to the coil to support the pipes.

DIRECT EXPANSION COIL

The liquid (supply) line should be connected to the middle connection on the leaving air side for counter-flow operation

The suction line should be connected to the lower connection on the entering air side for counter-flow operation. The suction header is equipped with an external equalizer connection.

CHILLED WATER COIL

Connections for the chilled water (CW) coil include supply line and return line. Both connections are soldered copper. The supply line should be connected to the lower connection on the leaving air side for counter flow operation. The coils will vent and drain through the factory-installed vent and drain fittings when mounted level for horizontal flow.

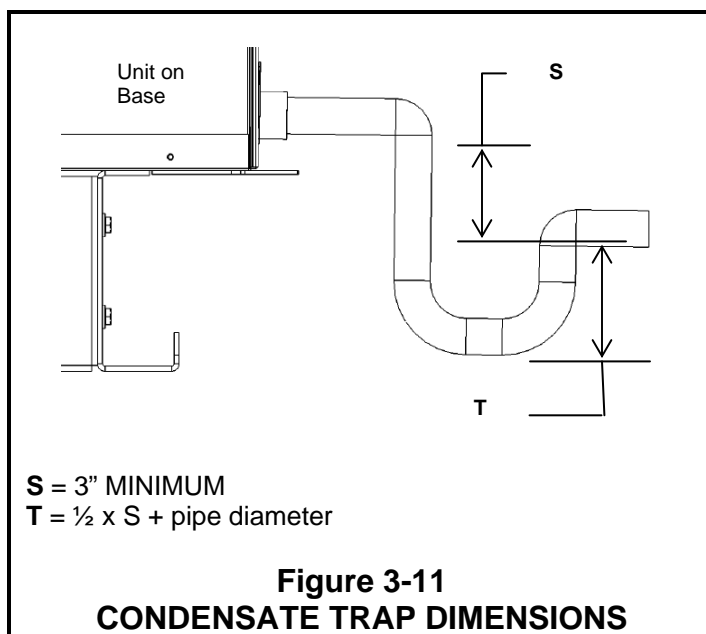
HOT WATER COIL

Both connections are soldered copper.

CONDENSATE DRAIN

The unit's condensate drain pan is removable for easy cleaning. Keep this in mind when connecting the drain line and trap. The drain line will need to be removed from the drain pan when it is necessary to remove the drain pan for cleaning.

The drain pan has a 3/4" NPT internal threaded connection to allow for drainage of condensation off the coil. The inside of the unit is under negative pressure when operating. A trap needs to be installed to prevent air leakage into the unit during operation. Minimum requirements for condensate drain trap are shown below.



WARNING

Installation work and piping must be done by qualified professional(s) in accordance with all applicable codes, standards, and licensing requirements. Piping should be supported independently.

BOOK 3: MECHANICAL

HOW TO INSTALL FIELD-SUPPLIED COIL (opt.)

The RD4XIN can be ordered without a coil for field installation of a coil provided by others. The coil compartment is designed to accommodate a right hand air flow coil(s). Mounting brackets, drain pans and mounting bolts are provided with the unit for field installed coils.

CRITICAL COIL DIMENSIONS:

Coil including frame and headers may not exceed 77-1/4" width, 24-1/2" height.

Coil frame must be 8" in depth. If two coils are being installed in series they must be bolted together and must have a total depth of 8".

Coil Flange width must be 1".

Coil connections should extend so connections may be made inside the unit. Distributors and distribution lines should be kept within the volume of the maximum dimensions indicated above. See Figure 3-12, page 14.

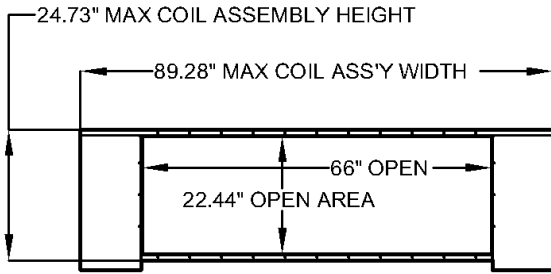
Mounting holes must be provided in the coil frame. Installation steps below assume these holes are placed by the installing contractor.

INSTALLATION STEPS:

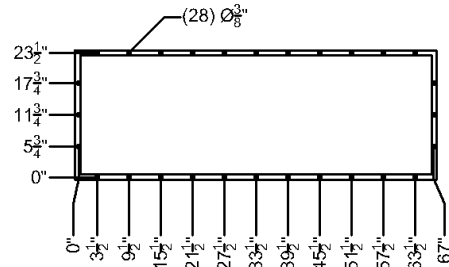
1. Remove the center drain pan – slide it out from the front of the coil section.
2. Remove the panels and pans from the front and back of the coil section to expose the coil area.
3. The side drain pans inside the unit do not need to be removed.
4. Drill (28) 3/8" diameter holes in the coil flanges on the air entering side of the coil (Figure 3-10, below, "VIEW FROM UPSTREAM").
5. Drill (11) 3/8" diameter holes in the top coil flange on the air leaving side of the coil (Figure 3-10, below, "VIEW FROM DOWNSTREAM").
6. Install (39) 1/4"-20 Tinnerman nuts (provided) on the coil flanges.
7. Calculate the distance between the bottom of the coil and the floor of the coil module when the coil will be installed. Place a wooden board or other like material on the floor of the module to support the coil in place when installing it.
8. Gently slide the coil between the opening of the front of the coil module and into position. Be careful not to damage the drain pans.
9. Attach the coil brackets to the coil flanges with (39) 1/4"-20 x 3/4" bolts and lock washers (provided).
10. Remove the wooden board from under the coil.
11. Drill holes in the back pans as needed for the inlet and outlet connections.
12. Install the front and back pans. Make the holes around the connections air tight.

BOOK 3: MECHANICAL

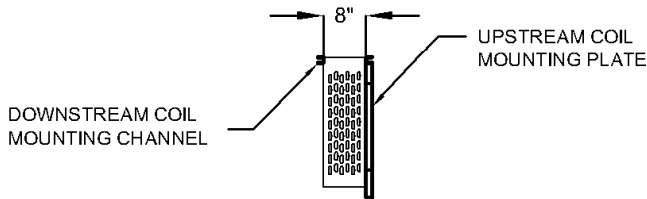
HOW TO INSTALL FIELD-SUPPLIED COIL (opt.)



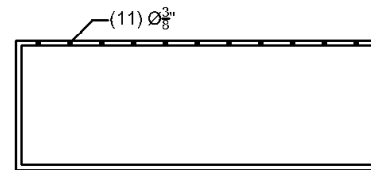
VIEW FROM UPSTREAM:
COIL UPSTREAM MOUNTING PLATE,
SHOWING AVAILABLE COIL FACE AREA
AND MAXIMUM OVERALL COIL SIZE.



VIEW FROM UPSTREAM:
REQUIRED MOUNTING HOLES
IN COIL'S UPSTREAM FRAME.
(28) $\frac{3}{8}$ " \varnothing HOLES AS SHOWN.



VIEW FROM FRONT OF UNIT:
DEPTH OF COIL FRAME MUST BE 8".



VIEW FROM DOWNSTREAM:
REQUIRED MOUNTING HOLES
IN COIL'S DOWNSTREAM FRAME.
(11) $\frac{3}{8}$ " \varnothing HOLES AS SHOWN IN TOP
FLANGE ONLY. THESE HOLES ARE IN-LINE
WITH HOLES IN UPSTREAM FRAME.

Figure 3-12
CRITICAL DIMENSIONAL REQUIREMENTS FOR FIELD-SUPPLIED COIL(S)

