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# APPLICATION, INSTALLATION, AND MAINTENANCE MANUAL

## C2XRT, C3XRT, C4XRT



### **⚠ 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 system 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 system 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. Electrical equipment connected to this unit must be properly 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. This unit must be properly ducted to the outdoors. Outside air inlets must not be located where air may be contaminated, for example by vehicle or appliance exhausts.

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## CRT Series Operation

The CRT-Series cabinets have one basic purpose: to transfer heating or cooling energy from an exhaust airstream to a fresh airstream.

The CRT-Series cabinets operate with no moving parts. The cores in the modules will transfer energy between the two airstreams as long as the two system blowers are moving air through the module. (These blowers are separate from the cabinets).

## Application Guidelines

### Purpose of CRT-Series Cabinets

The CRT-Series cabinets are modular cases with 2, 3, or 4 energy-recovery cores.

A variety of duct connection configurations are possible. Disposable filters are provided; they are of a common size and can easily be replaced.

### General Layout

The CRT-Series Cabinet(s) are used to transfer energy from exhaust air leaving a building, into fresh air being brought in from the outside for ventilation. By recovering energy from the exhaust airstream, the benefits of ventilation can be enjoyed without the full energy cost to condition the outside air.

The CRT-Series Cabinet(s) do not contain blowers. Therefore, two blowers must be installed as part of the system. Several ducts must also be installed.

## Service Access

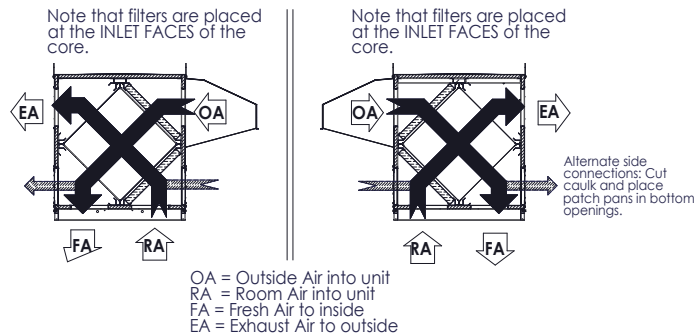
### Service Access

Install the CRT where you can open the door for cleaning the core and filter. Although there is no electrical connection to the Cabinet(s), there should be a nearby system Disconnect Switch, so service people can shut off the blowers connected to the system when changing filters.

### Connection to the HVAC System

In most cases, one or two ducts connect the CRT-Series Cabinet to the building's ducted HVAC system. A variety of connection approaches are possible, depending on the number of CRT-series Cabinets in the installation, purpose of the system, and available space.

The filters must cover the INLET FACES of the cores. Filter racks are provided at each face to handle all possible airflow configurations.



Note that airstreams cross in energy exchange core. Hood mounting viewed from door side.

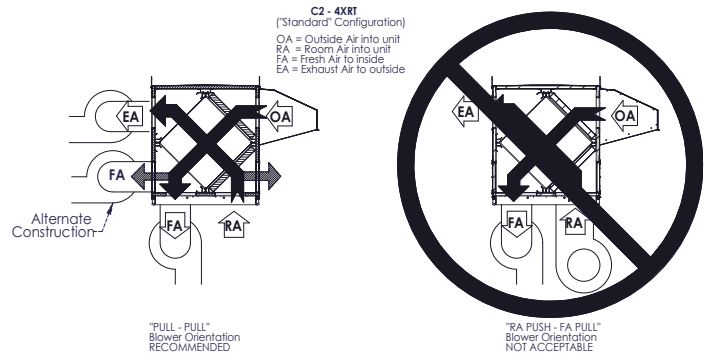
## Blower Orientation

Two blowers will be required: one for the air to be exhausted from the building, another for the fresh air to be brought into the building. See diagram for proper and improper blower locations.

## CAUTION

### Maximum Differential Pressure

The maximum pressure differential between the two airstreams should not exceed 4 inches (h20).



### Pull-Pull -- RECOMMENDED

This is the recommended blower orientations for virtually every application. In "Pull-Pull" applications, both pull from the Cabinet(s).

With Pull-Pull blower orientation, there is generally no need to review the static pressure differences between the two airstreams.

An "RA Push-FA Pull" blower orientation is unacceptable.

## CAUTION

Refer to the Installation Manual Supplement "Designing for High Static Pressure Applications" for help in designing the system to account for bypass airflow.

### Advantages:

Both blowers are on the "outside" of the cabinets, taking advantage of the acoustic attenuation offered by the cabinets. If outside airstream bypass airflow occurs, it additionally insures no exhaust contaminants leak past seals into the fresh air.

### Disadvantages:

The blowers must be sized to provide the additional bypass air, which in most cases is a needless waste of energy. (Note that this bypass air volume is lower than in most competing technologies, such as heat wheels, and even some other plate-type exchangers).

The higher overall static pressures tend to increase duct leakage.

## Blower Sizing

Most "low airflow" problems in the field are caused by under-sized blowers. Systems can under-perform if the designer does not make sufficient allowance for duct leakage, variations in duct layout from ideal design, less-than-ideal blower outlet conditions, dirty filters, and the like.

In general, ventilation systems with energy-recovery components tend to need blowers with relatively high static pressure curves. In addition, parts of the duct system may be operating at higher static pressures than usual, and greater duct leakage may result. While these effects may be small, they may consume a large portion of the "safety factor" that a designer conventionally adds in every blower selection exercise.

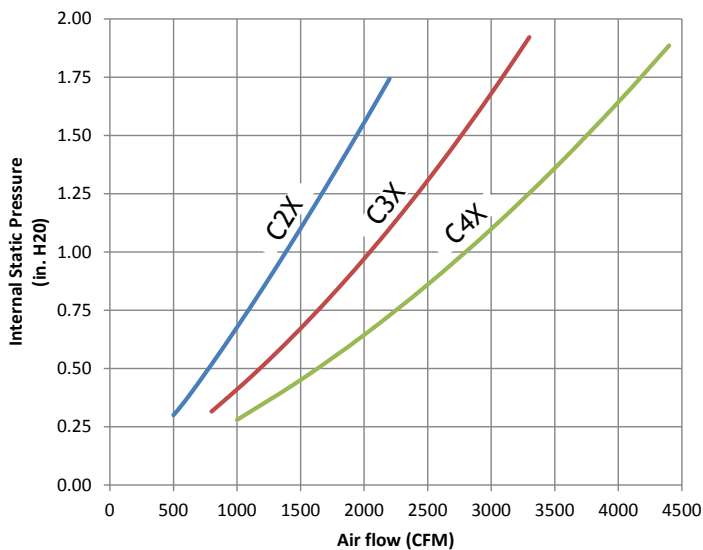
Given all these concerns, it is prudent to select blowers and motors that can be operated at higher RPMs than required by the nominal design.

## Static Pressure Drop Through the Cabinet

The following chart is to be used when considering a Pull-Pull orientation of the blowers.

The chart represents clean filters. It will be necessary to add an additional drop to allow for the buildup of dirt on the filters.

### Rated Pressure Drop through Cabinet



## Placement of the C2-4XRT

The C2-4XRT is designed for installation on a roof or other outside location.

Select a location that is central to the inside duct runs, and close to any other air handler that might be part of the system.

### ⚠ WARNING

The unit's outside 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 outside air inlet where vehicles may be serviced or left idling. Never locate the unit inside a structure.

### ⚠ WARNING

Danger of damage or severe injury if high winds move this unit. Secure unit to structure. Observe local code requirements at a minimum.

## CAUTION

*It is the installer's responsibility to make sure that the screws or bolts used for securing the units are properly selected for the loads and substrates involved. Secure the C2-4XRT so that it cannot fall or tip in the event of accident, structural failure or earthquake. See Rigging Information for unit weight.*

Soler & Palau strongly recommends that you secure rooftop units properly to the building structure. Strong winds, tornados, and hurricanes can and do displace or remove rooftop equipment from rails or curbs. When this happens, the equipment, adjacent roof structure, and even vehicles parked near the building can be damaged, and rain typically enters the building. The equipment is put out of service and the collateral damage can be very expensive.

## CAUTION

### Provide Adequate Service Access for Maintenance

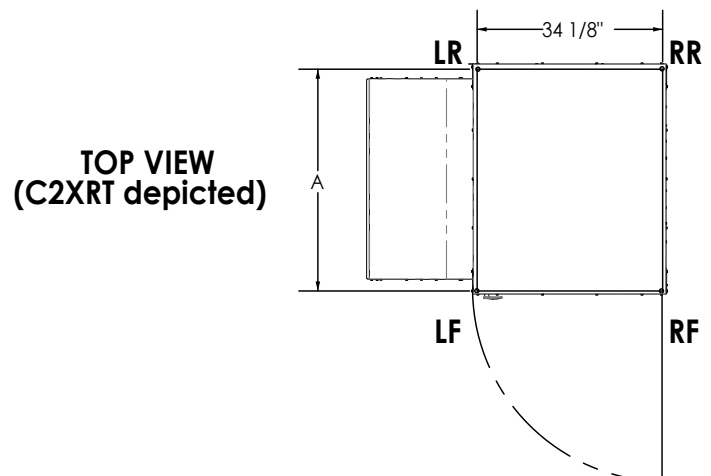
The C2-4XRT will require regular filter and core inspections. Install the C2-4XRT where you can remove the doors for cleaning the core and replacing the filters, and where you can get at the wiring for installation and service.

The C2-4XRT is available from the factory in one configuration where room air enters the bottom of the unit and fresh air exits the bottom of the unit. The relocatable patch pans allow different duct connection configurations.

## Rigging Information

There are lifting lugs at each upper corner of the unit. Use slings or shackles at all four corners. Spreader bars are recommended in order to avoid damage to the unit.

C2-4XRT Unit and corner weights (LBS)						
Model	Weight	Dim "A"	LF	LR	RR	RF
C2XRT	250	39 3/8"	71	69	54	56
C3XRT	377	59 1/4"	107	104	81	85
C4XRT	462	79"	131	128	99	104



## Mounting the C2-4XRT

### On Roof Curbs:

The base of the C2-4XRT Units are designed for installation on our optional Roof Curb. See Curb portion on Dimension Drawings.

Before installing C2-4XRT, apply roofing and counterflashing to Roof Curb as per standard practice.

Install appropriate gasket on top of Roof Curb.

Set C2-4XRT in place. We recommend bolting through sides of unit base into the Roof Curb to secure the unit against high winds.

### On Equipment Rails:

Review drawing of Roof Curb and specify Equipment Rail to fit.

Before installing C2-4XRT, apply roofing and counterflashing to Equipment Rails as per standard practice.

Set C2-4XRT in place. We recommend bolting through sides of unit base into the Equipment Rails to secure the unit against high winds.

**NOTE:** OA Hood provided, can be mounted on either side of the cabinet over the upper cabinet openings. See Duct Connection locations below depending on which side of the cabinet the OA hood is installed.

## Ducting

Before unit is installed on Curb.

### Basic Requirements

- Always connect an RA and an FA duct to each Rooftop unit.
- The RA and FA ducts can be interchanged depending on where you install the OA hood.
- With standard configuration units, both ducts are inside the building. In other unit, that utilize the optional configuration openings, at least one of the ducts is outside and must be weatherized.
- Any weatherized duct must be thermally insulated to prevent condensation on the inside or outside of the duct. The duct lining must be vapor-sealed, and the duct exterior must be rain tight.

Duct(s) connected to the bottom of the C2-4XRT are generally installed at this time. Install (2) ducts with C2-4XRT standard configuration.

Drop duct(s) into openings in top of roof curb.

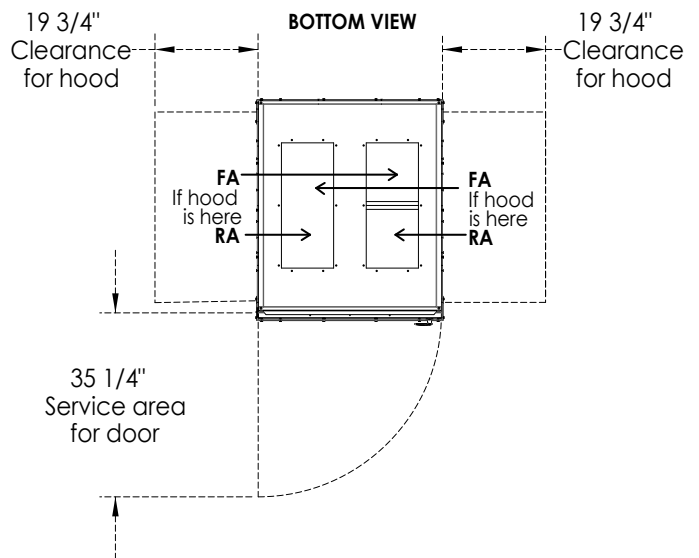
Install appropriate gasket on top of Roof Curb and edges of ducts.

## CAUTION

Tape both inner and outer vapor barriers of insulated duct to collars on duct adapters. This is critical to prevent migration of moisture into insulation. Build-up of moisture can result in failure of the duct system and/or frost in the insulation. Make sure any tears in the inner and outer vapor barriers are sealed.

### Ducting Information

OA Inlet hood may be placed in two different locations



## Inside Ductwork System

### Follow Engineer's Ductwork Design

Ductwork should be designed by an engineer to allow the unit to provide the required airflow.

### Duct Transition

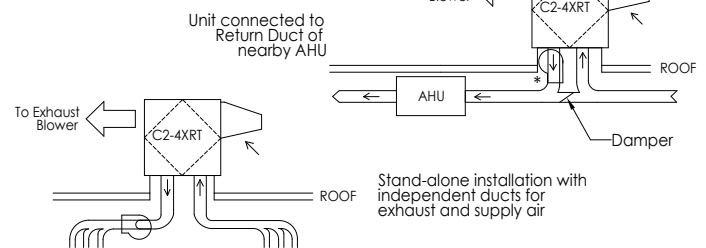
Ducts should enter and exit the unit through smooth gradual transitions.

### Duct Insulation

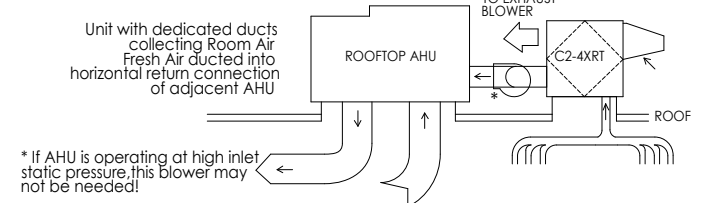
If the inside ducts run through un-conditioned spaces, they must be insulated, with a sealed vapor barrier on both inside and outside of insulation.

See drawings below for examples of some common installation approaches.

### C2-4XRT STANDARD CONFIGURATIONS

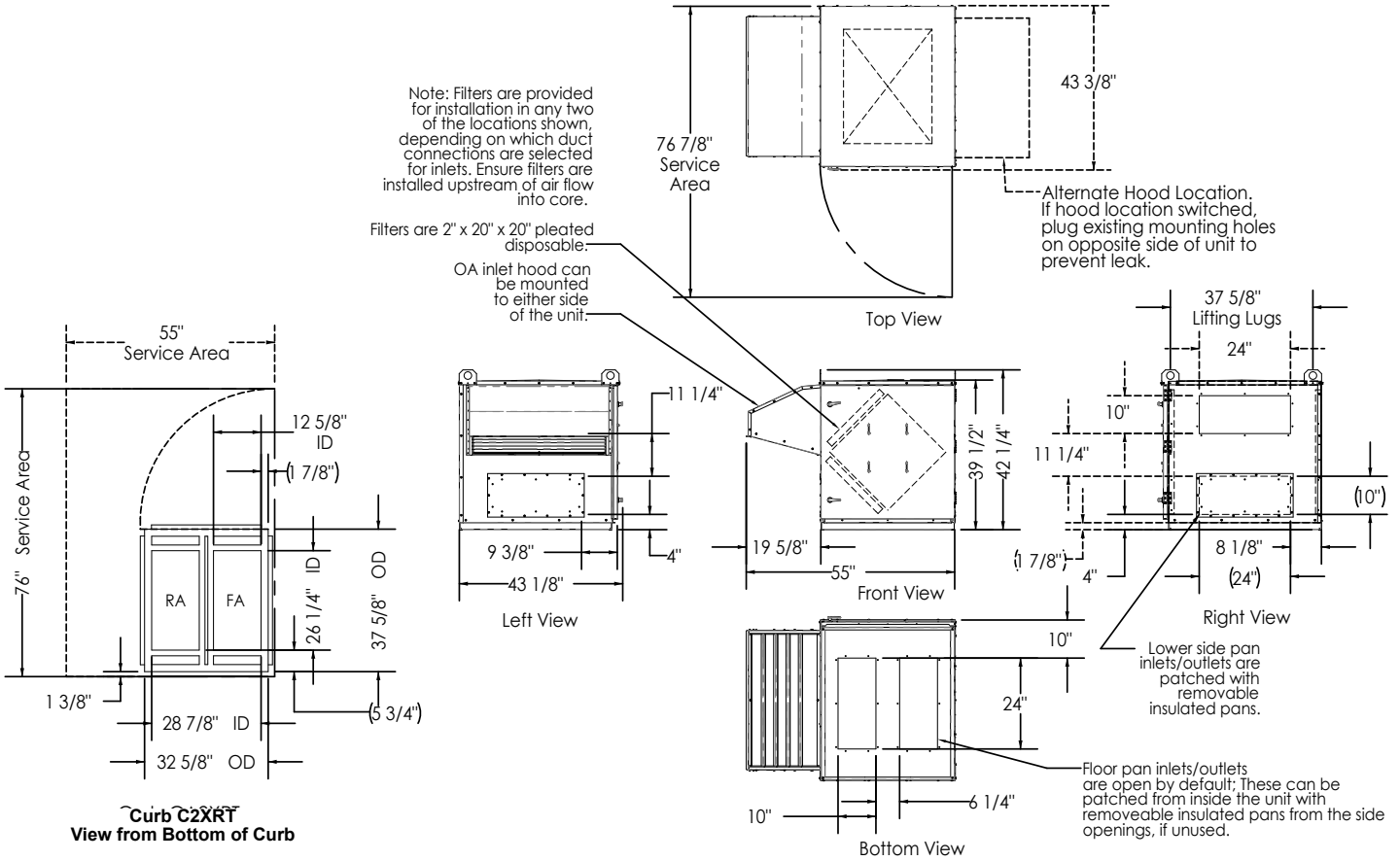


### C2-4XRT OPTIONAL CONFIGURATION

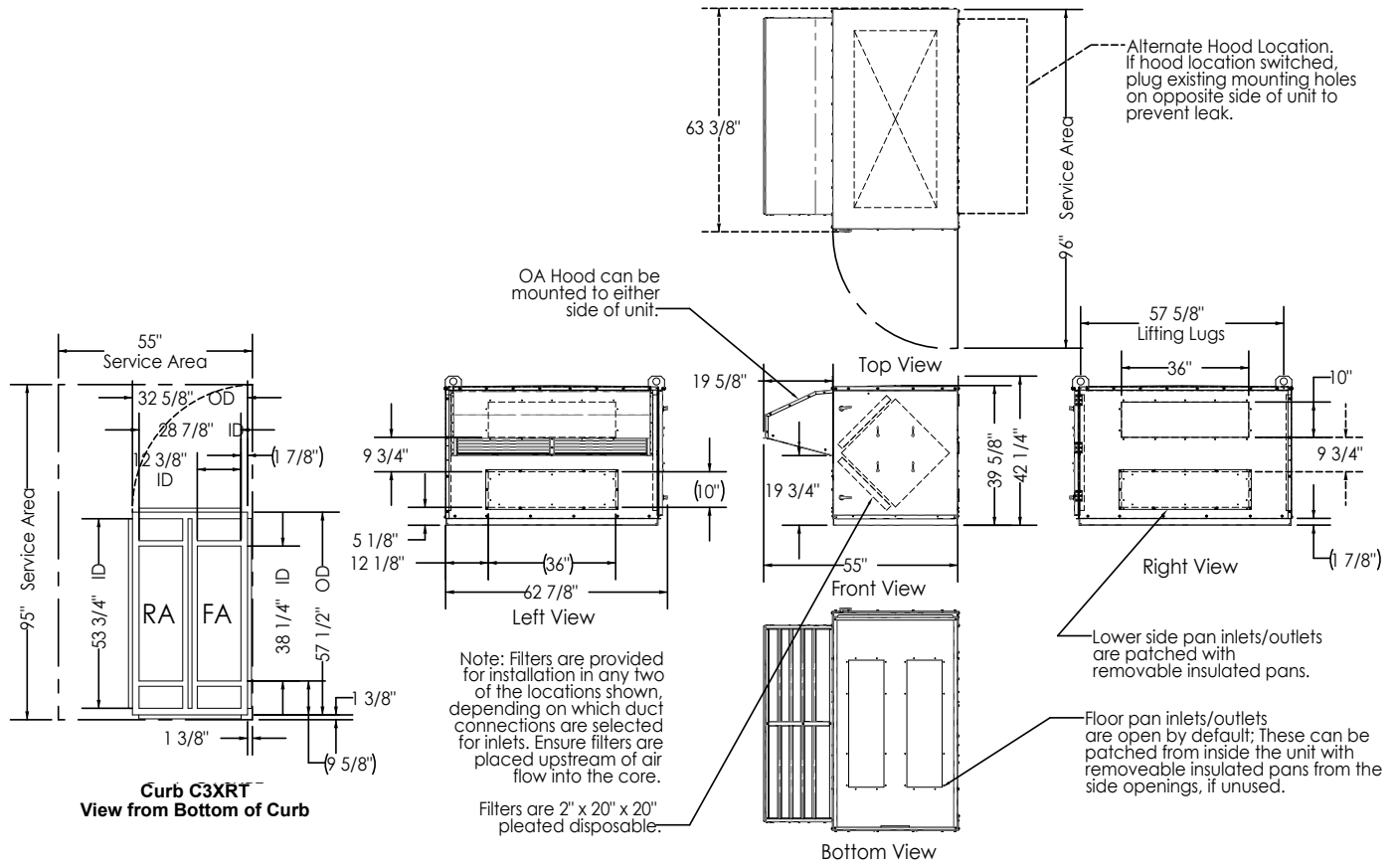


\* If AHU is operating at high inlet static pressure, this blower may not be needed!

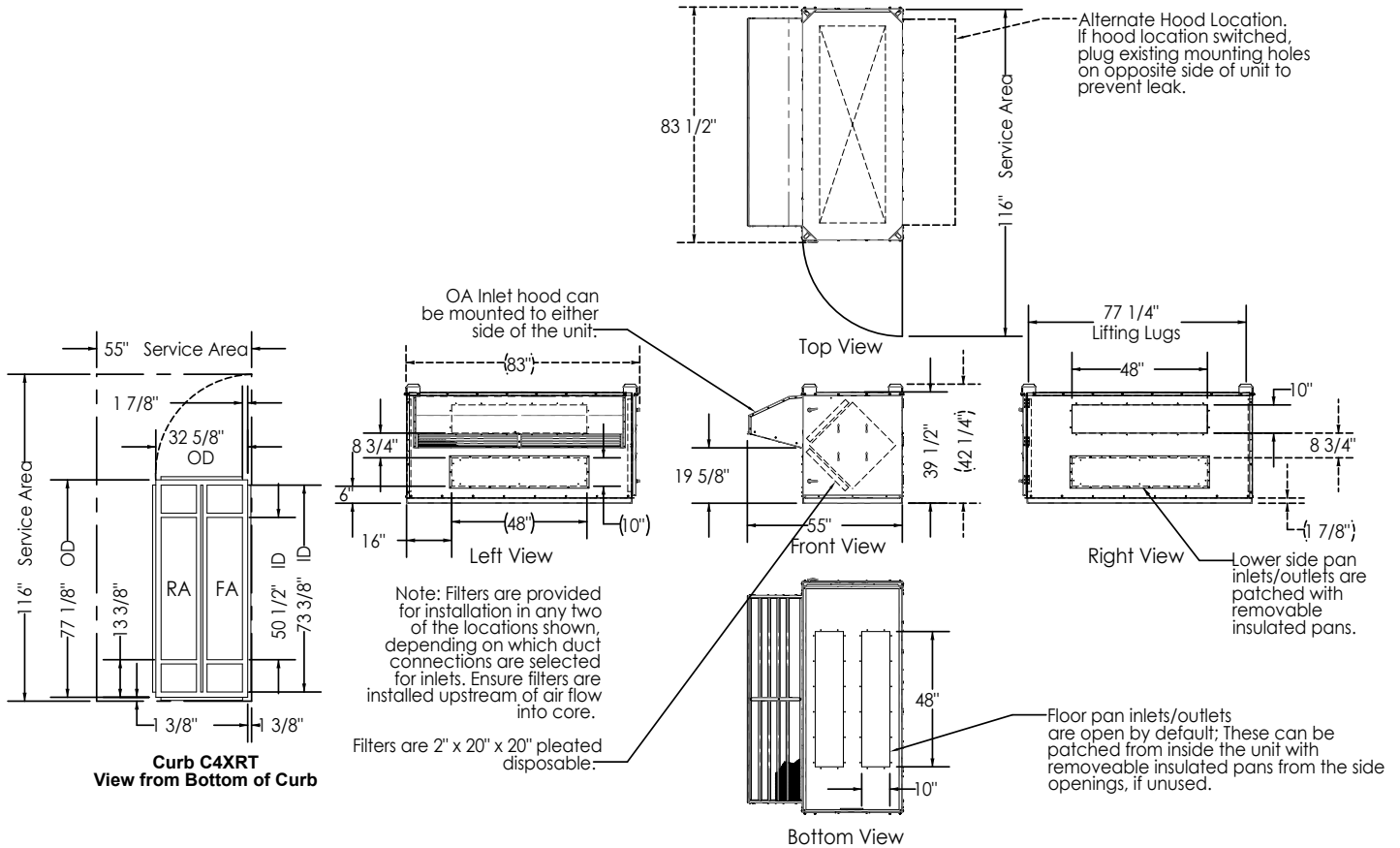
# C2XRT Dimensions



# C3XRT Dimensions



# C4XRT Dimensions



## Operation

### Principal of Operation

The C2-4XRT has one basic purpose: to exhaust air from a structure and bring in fresh air from outside, while transferring heating or cooling energy from the exhaust air to the fresh air.

The C2-4XRT is a very simple device, and will accomplish this purpose as long as the blowers for both airstreams are able to move air through the energy-exchange core.

### Checking that Unit is Operating

#### Air Flow

Airflow should be occurring in both airstreams. Sometimes the easiest place to confirm that air is moving is at the weatherhoods.

If exact airflow is critical, it may be desirable to permanently install flow measuring stations and manometers in the ductwork connected to the unit. These also can be used to determine when filters should be cleaned or changed.

#### Use Static Taps in Doors to Measure Airflow Rates

See "Cross-Core Static Drop" in MEASURING AIRFLOW table. These may be used to directly measure airflow in the unit.

### Energy Exchange

Precise determination of installed sensible energy exchange effectiveness requires careful measurement of temperatures and air flows in all four air streams, and in practice is somewhat difficult.

It is possible to confirm that energy is being exchanged simply by feeling the ducts. If the Fresh Air duct from the unit into the room is closer to room temperature than to the outside temperature, energy is being recovered.

### Continuous Operation

Continuous operation is acceptable in virtually all conditions. Unit will not be damaged by continuous operation as long as air flow occurs. Blower motors may overheat if filters become completely blocked due to lack of maintenance. Motors are thermally protected. With continuous operation, some external frosting may occur in very cold weather (see below).

### Operation in Extreme Cold Weather

Unit is capable of operating at outside temperatures down to -10°F, with indoor humidities below 40%, without any internal frosting. Unit can operate at more severe conditions occasionally with little or no impact on its performance. At lower humidities, it can operate at lower outside temperatures without freezing the energy-exchange core.

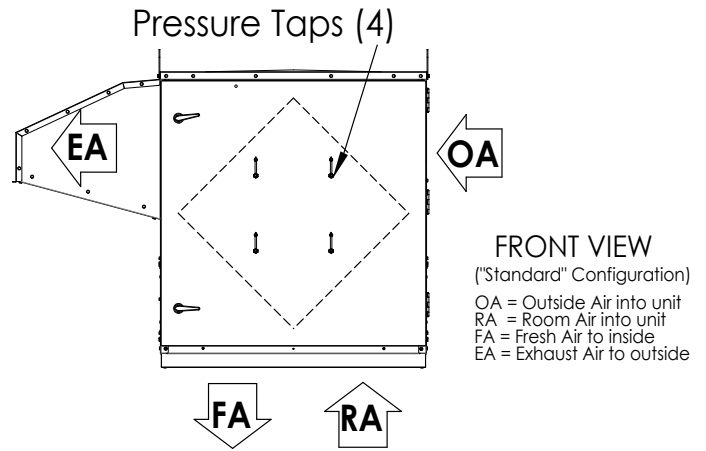
# Measuring Airflow

## Equipment Required

- A magnehelic gauge or other device capable of measuring 0 to 1.5 in. water of differential pressure.
- 2 pieces of natural rubber latex tubing, 1/8" ID, 1/16" Wall works the best. NOTE: Be sure to remove cap from pressure port before inserting tubing. Insure tubing is well seated in pressure ports. NOTE: The tubing should extend in the pressure port approx. 1 inch.

## Cross Core Static Pressure Measurement Instructions

- The individual differential static pressures (DSP) can be measured using the installed pressure ports located in the front of the units core access doors. NOTE: These ports have been carefully located on the unit as to give you the most accurate airflow measurement. NOTE: Do not relocate pressure ports.
- To read SCFM of Fresh Air (FA) install the "high" pressure side (+) of your measuring device to the Outside Air (OA) port and the "low" pressure side (-) to the Fresh Air (FA) port.
- To read SCFM of Room Air (RA) install the "high" pressure side (+) of your measuring device to the Room Air (RA) port and the "low" pressure side (-) to the Exhaust Air (EA) port.
- Use the reading displayed on your measurement device to cross reference the CFM output using the conversion chart. NOTE: Be sure to replace cap into pressure port when air flow measuring is completed.



Proper Operating Airflow Range	
Model	CFM
C2XRT	500-2200
C3XRT	750-3300
C4XRT	1000-4400

Differential Static Across Core DSP vs. CFM														
		DSP	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75
C2X	Fresh Air (FA)	CFM	529	662	794	926	1058	1191	1323	1455	1588	1720	1852	1985
	Room Air (EA)		567	709	851	993	1134	1276	1418	1560	1701	1843	1985	2127
C3X	Fresh Air (FA)		818	1023	1227	1432	1636	1841	2045	2250	2454	2659	2863	3068
	Room Air (EA)		732	915	1098	1281	1464	1647	1830	2013	2196	2379	2562	2745
C4X	Fresh Air (FA)		1221	1526	1832	2137	2442	2747	3053	3358	3663	3969	4274	4579
	Room Air (EA)		1130	1412	1695	1977	2260	2542	2825	3107	3390	3672	3955	4237

## Maintenance

### SUMMARY MAINTENANCE REQUIREMENTS

Change Filters  
General Cleaning and Inspection  
Clean Energy Exchange Cores

### CHANGING THE FILTERS

Inspect and/or replace filters every two or three months when the unit is in regular use, or as needed.

- Turn off unit completely! Lock-out and tag-out the system disconnect switch.
- Open the Door. The door is secured with turn-type latches
- Remove and dispose of all filters. Replace all filters. NOTE: See chart for information on the initial resistance of the filters originally supplied with this unit. If replacement filters have higher resistance, the airflow of the system will be lower.
- Close door.

### GENERAL CLEANING AND INSPECTION

Perform general cleaning and inspection when changing filters.

- Remove paper, leaves, etc. from inlet and outlet screens.
- Inspect for insect nests.

### TO CLEAN THE ENERGY EXCHANGE CORE

Clean the core annually.

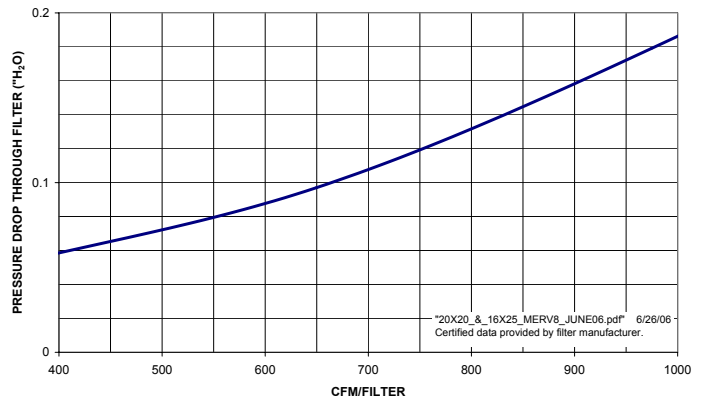
- Remove the filters.
- Vacuum the exposed faces of the energy exchange core with a soft brush.
- Vacuum out dust from the rest of the unit case.
- Install new filters.

## ⚠ WARNING

Danger of injury if unit starts unexpectedly. Switch power off at service disconnect. Lock-out/tag-out the disconnect.

Initial Resistance of Filters supplied with this unit:

INITIAL PRESSURE DROP 20" x 20" MERV 8 FILTERS  
RENEWAIRE SERVICE PART NUMBER 990083



### Filter Specifications:

20" x 20" x 2" (nominal) pleated filters

Actual size: 19.5" x 19.5" x 1.75"

Unit shipped with MERV-8 Filters

Minimum recommended effectiveness: MERV-6

## CAUTION

Filters must be used or the energy exchange core will become blocked by dust and the unit will not do its job. In extreme cases components may be damaged.

## CAUTION

**DO NOT WASH THE ENERGY EXCHANGE CORE.**  
Keep it away from water or fire to avoid damaging it. Always handle the core carefully.