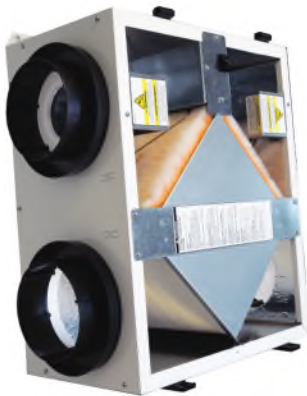




INSTALLATION AND OPERATION MANUAL

90-Series



TR90:
Painted Case
Low Voltage Controls
Line Cord



TR90G:
Galvanized Case
Line Voltage
No Line Cord



Before You Begin

Read all instructions before installing the unit. Also review supplemental instructions included with any controls that will be installed. Carefully unpack and inspect the unit for shipping damage. Open the access door and inspect inside the unit. Attach the four duct collars to the unit with the screws provided in the plastic small-parts bag.

⚠ CAUTION

1. To avoid motor bearing damage and noisy and/or unbalanced impellers, keep drywall spray, construction dust, etc., out of the unit.
2. Do not connect power to the units external control terminals: this will damage the unit. The external terminals are for use only with un-powered controls designed for low-voltage operation.

⚠ WARNING

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

1. Before servicing or cleaning the unit, unplug the unit line cord or shut off power at service switch or circuit breaker. Make sure unit is not running before opening its door.
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. Connect this unit only to a 120VAC grounded circuit protected by a 15 amp circuit breaker.
6. Do not install unit or controls where they can be reached from a tub or shower.
7. This unit must be properly ducted to the outdoors.
8. Outside air inlet for this unit must be located away from sources of hazardous air such as auto exhausts.
9. 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.
10. 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.
11. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.
12. Use the unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

Location of the Unit

Select a location so that:

- The fresh air intake vent from the outside is placed a minimum of ten feet from any other exhaust vent, and is at least 30" long.
- The two ducts to the outside are as short and straight as possible for the best performance from the system. Shorter duct runs help assure the system is balanced: the amount of air brought in is equal to the amount of air exhausted.
- The door can be opened to allow cleaning the core and filters. **Provide clearance at front of unit for service access to the blowers, filters and energy exchange core. (24" recommended/12" minimum.)**
- 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 duct should be about the same length as the fresh air duct.
- The exhaust outlet should not dump air into an enclosed space or into any other structure.
- Do not install the exhaust outlet and fresh air inlet through the roof or roof soffit. If these are the only available options call S&P technical support for help.

The preferred mounting location for the unit is on a concrete foundation wall because the foundation wall isolates any blower vibration.

If a basement area is not available or practical, use other mechanical room space such as a closet, garage, storage, or accessible attic or crawl space.

NOTE: If you wish to install the unit in an attic or other unconditioned space, you must insulate all of the unit's ductwork that is located in the attic. Use at least R-6 insulation.

RA: Room Air EA: Exhaust Air
 OA: Outside Air SA: Supply Air (furnace)
 FA: Fresh Air

Inside Ductwork System

For houses without ducted heating or cooling systems - see **Schematic (B):**

In most houses one or two fresh air grilles in a central part of the house provide effective distribution of the fresh air into the home, particularly when the stale exhaust air is picked up at several points. Because the fresh air is usually somewhat cooler than the household air, the fresh air supply grilles should be located in a traffic area like a hallway or stairway rather than in a sitting area. If you want to get fresh air into specific rooms with high occupancy, you can split up the fresh air supply.

For houses with forced-air heating and cooling systems - see **Schematics (A), (C) and (D):**

Most units are installed with the fresh air duct connected directly to a return duct for the main heating and cooling system. Be careful to connect the fresh air duct at least three feet from the return plenum to minimize suction from the furnace blower. A connection closer to the furnace may result in unbalanced flow and associated problems.

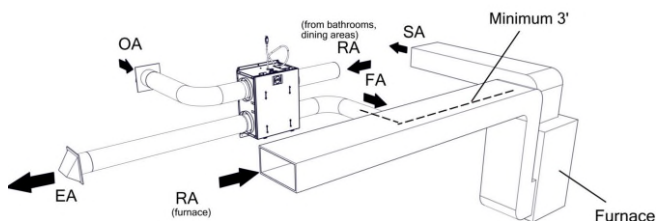
For installations that collect stale air from specific rooms in the home - for example, **Schematics (A) and (B):**

Locate stale air return grilles (RA) in rooms where moisture and odors are generated: bathrooms, the kitchen, and perhaps other areas where contaminants are generated such as in the home workshop. Return grilles in these other areas may be dampered so that they can be shut off when not in use. A central location such as a hallway is also acceptable but won't clear humidity and odors from baths and kitchens as rapidly. Locate stale air return grilles (RA) near the ceiling on inside walls. Stale air returns are usually easiest to install in interior partitions.

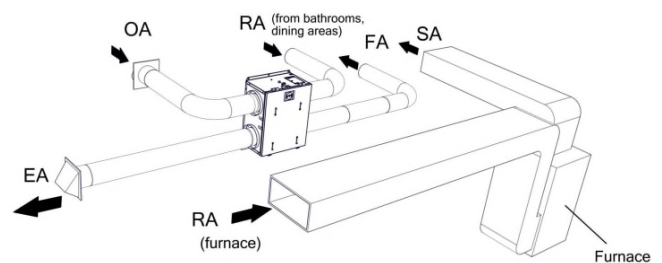
Stale Air Return Grille Sizes

Bathroom	4" X 10" or 6" X 10" - 40 to 60 sq. in.
Kitchen	6" X 10" or 60 sq. in.

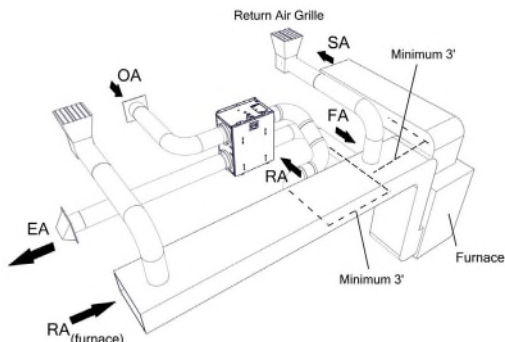
**(A) Separate Room Air Pick-up -
Fresh Air to Furnace Return Air Trunkline**



(B) Separate Return Air and Fresh Air Supply

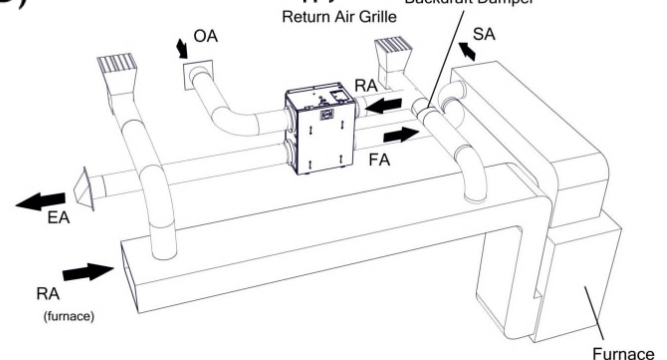


(C) Furnace Return Air Back into Return Air



*TR90 only

(D) Furnace Return Air Back into Supply Air



Exhaust & Outside Air Ducts

The Exhaust Air Duct and the Outside Air Duct connect the unit to the outside. Flexible insulated duct is typically used. See Table under “Duct Sizes” below.

⚠ WARNING

DO NOT PLACE ANY STALE AIR RETURNS IN GARAGES.

Can an ERV be used to ventilate bathrooms?

A S&P ERV can be used as a central exhaust system in place of bathroom exhaust fans. Tie a grill in each bathroom directly back to the ERV - see Schematic (A). A successful installation should provide at least 50 CFM of exhaust per moisture producing bathroom. When used for bathroom exhaust, the TR90 should be used for only one bathroom. Install a control in the bathroom ventilated by the ERV (see Secondary Operating Controls, below).

For houses where radon is a concern:

The first line of defense against radon should always be techniques that prevent the entry of radon into the home, such as under-slab suction, vented perimeter drainage, and crack sealing. However, if moderate levels of radon continue to be present, it is important that the unit slightly pressurize the basement, not de-pressurize the basement.

Installation of this unit for radon mitigation is beyond the scope of this manual. Consult a radon mitigation professional.

Duct Sizes

Duct Minimum Sizes and Type	
Exhaust Air & Outside Air (EA & OA)	6” round insulated duct 8” round insulated duct may be used to maintain maximum airflow
Fresh Air & Stale Air (FA & RA)	6” round or 8” oval rigid un-insulated
All ducts from unit to house in unconditioned spaces like attics and crawl spaces MUST BE INSULATED.	

Controls

For an installation in which the ERV should run continuously in order to provide the required ventilation rate for the home, no controls are needed. However, in most installations, control over the unit operation is desired and this is best provided by a Proportional Timer.

Proportional timers (SPTL or SFM controls for TR90 or line voltage controls for TR90G) may be located anywhere that is convenient. A typical location for either control is next to the home’s thermostat. Proportional timers operate the ERV to provide regular background ventilation of the home.

TR90 installations that pull stale air from specific rooms, such as bathrooms, should have Push-Button Lighted (SPBL) Controls in those rooms. The secondary operating controls allow the system to be turned on from various locations in the house.

⚠ CAUTION

RISK OF INJURY WHEN LIFTING UNIT AND INSTALLING UNIT OVERHEAD. GET A HELPER AND WEAR EYE PROTECTION.

Mounting the Unit

Unit may be installed in any orientation:

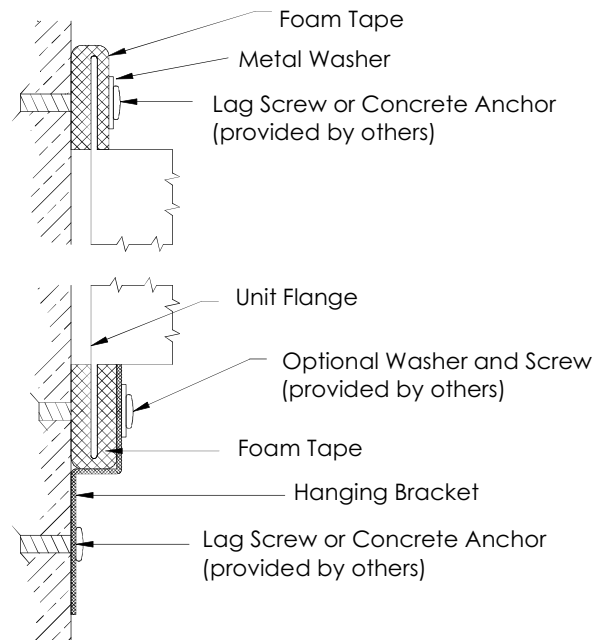
Orient the unit for the simplest duct layout and connections. Note however that the door is equipped with slide-off hinges. For the homeowner’s convenience it is helpful to orient the unit so that the door does not drop off when it is unlatched.

Mounting the TR90 on a concrete foundation wall:

Mount hanging bracket to the wall with appropriate concrete anchors. Use pre-cut foam tape from small parts bag. Remove backing and apply two pieces of foam tape equally spaced along the unit’s mounting flange to be held by the hanging bracket. Apply the other two pieces of foam over two holes that will be used for fastening, on the other flange. The tape should be applied in a “U” shape to cushion both the front and back of the integral flanges. Lift unit and slide unit flange into the hanging bracket. Using metal flat washers, fasten flange opposite hanging bracket to structure. Safety screws should similarly be installed passing through the hanging bracket and flange. Make sure the screws, which you must supply, are properly selected for the loads and substrate involved.

Mounting the TR90 to a stud wall:

Mount unit using supplied hanging bracket kit as described for mounting to concrete foundation wall. Note that the hole layout on the integral mounting flanges and the hanging bracket are spaced for 16” on-center framing patterns.



* TR90 only.

Suspending the TR90 from floor joists or trusses:

The unit may be screwed directly to joists or trusses using the hanging bracket and integral flange. Mount as described for mounting to concrete foundation wall. Note that the hole layout on the hanging bracket is spaced for 16” on-center layouts.

Mounting the TR90G:

The TR90G can be mounted similar to the TR90 however, the TR90G does not come with a hanging bracket. Using flat washers provided install screws through the holes in the flanges of the unit. Make sure the screws, which you must supply, are properly selected for the loads and substrate involved.

Installing Outside Air & Exhaust Air Ducts

Ducts connecting the unit to the outside must be well- insulated. Vapor barrier is required on both inside and outside of the insulation.

Band or tape inner duct liner to inner flange of appropriate collar. Drive a sheet metal screw through liner to secure duct spiral wire to collar. Straighten insulation, and slide outer duct jacket onto the outer flange of the duct collar. Secure with band or tape.

⚠ CAUTION

The vapor barrier should be continuous and sealed against air and moisture leakage! If not, condensation or ice may form in cold weather on the duct surface or in its insulation!

The inlets and outlets should be screened against insects and vermin and shielded from the weather to prevent the entry of rain or snow.

⚠ CAUTION

INSTALL FRESH AIR INLET AWAY FROM SOURCES OF CONTAMINANTS.

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

Installing Return Air (RA) Ducts

All the stale air returns are connected by ducts to the unit. Generally, empty stud cavities are used for returns as is often done with cold air returns for the furnace, using standard duct boots to connect to six inch pipe at the bottom or top of the wall cavity. Always be sure to seal all joints with duct sealant or tape. Some local codes may require metal ducting all the way from the boots to the stale air grilles. Use rigid ducts to allow the air to move freely and easily through the ducts. See chart under System Layout to size your ductwork:

If duct runs are very long (over 30 feet of flex duct for 90 CFM) or have excessive bends or elbows or if maximum air flow rates are required, eight inch insulated flexible duct should be used. The outer flange of the duct collar can be used for both the inner and outer jacket of the flexible duct. Care must be taken to insure that the duct is securely fastened and sealed to the duct collar.

Do not use more flex duct than necessary!

Flex duct is much more resistant to airflow than rigid duct; longer runs of flex duct will reduce the ventilation performance of your system. Stretch flex duct and avoid sharp bends.

⚠ CAUTION

- Do not connect Dryers directly to the unit.
- Do not connect Range Hoods to the unit.

NOTE: Seal all duct collars at unit to minimize air leakage.

⚠ WARNING

DANGER OF ELECTRICAL SHOCK WHEN SERVICING AN INSTALLED UNIT.

ALWAYS UNPLUG UNIT BEFORE CONNECTING OR SERVICING CONTROLS.

Electrical Connections

NOTE: DISCONNECTION MEANS. Most electrical codes require that the unit be disconnected for service. Depending on local codes, an electrical outlet (for TR90) or an on/off switch available for the unit (TR90G) may satisfy this requirement.

Power supply connection to TR90G is made in its electrical box through the hole in the end pan. Pull out the unit electrical box and connect the power wire conductors to the terminal block inside the electrical box. The terminal block inside the electrical box is conveniently marked for connection of field power wiring. After connecting the power wire conductors to the terminal block re-install the electrical box in the unit.

S&P offers the TR90 with a line cord for connection to an electrical outlet. If a TR90 with a line cord is installed and the installer desires to convert to field power wiring, should local codes permit, simply remove the line cord from the terminal block and connect field wiring as described above.

Installing Controls

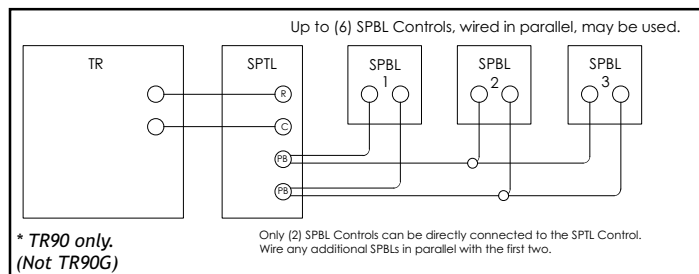
The TR90 is offered with a control board for connection to external controls. The TR90G runs continuously whenever power is supplied to it.

Optional Controls:

S&P offers a variety of controls specifically designed to work with the TR90. These include: SPTL (a two wire proportional timer), SFM (a six wire proportional timer that interconnects to the furnace blower), and SPBL (point of use push button control). Other controls that throw an unpowered switch may also be used. The TR90G is a line voltage unit that may be controlled with any line voltage control switch.

Typical Control Schematic:

Various wiring designs can be used to properly control the unit and meet safety and code concerns. Consult your electrician for an electrical design to meet your needs. The schematic below shows a typical control system: a SPTL proportional timer plus two SPBL push-button controls.



See installation manuals for the control(s) you select for wiring diagrams and specific instructions.

If NOT connecting controls to the TR90:

Make a jumper out of a short piece of wire. Connect the jumper wire to the screw connections of the terminal strip on the outside of the unit. ERV runs full-time once its power cord is plugged in.

Starting Up the Unit

- Inspect your installation to be sure all duct work is correctly installed and sealed, that filters are in place, and controls (if any) are connected.
- Shut and latch the door to the unit.
- Provide 120 VAC power to the unit. It may start immediately.
- Use control, if any, to turn on the unit. Check operation of the control(s).
- Check that the unit's safety interlock switch turns off the unit when the door is opened.

Verifying Unit Performance

Airflow

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

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

Use Static Taps to Measure Airflow Rates

See "Cross Core Static Drop" in MEASURING AIRFLOW table on Page 6.

Use Damper to Balance Air Flow to Desired Rates, If Necessary

The ERV's blower motor are well suited for volume control by dampers on the inlet of the units. One balancing damper is provided in the units parts tray. **NOTE:** The unit is considered balanced if the difference between the two airflows is not more than 10 CFM.

After measuring the airflow of the units, the balancing damper may be used to balance airflow if desired. Place the damper between the duct collar and the unit for the outlet of the airstream recording higher flow. **NOTE:** Install the damper so that it slides in the space between the duct collars for the TR90 and the TR90G.

Slowly move the damper further into the duct until the desired airflow is recorded. Secure the damper in place using 1/8" tek screws (provided). **NOTE:** Drilling through the case while the unit is running may cause metal shards to be drawn into the unit.

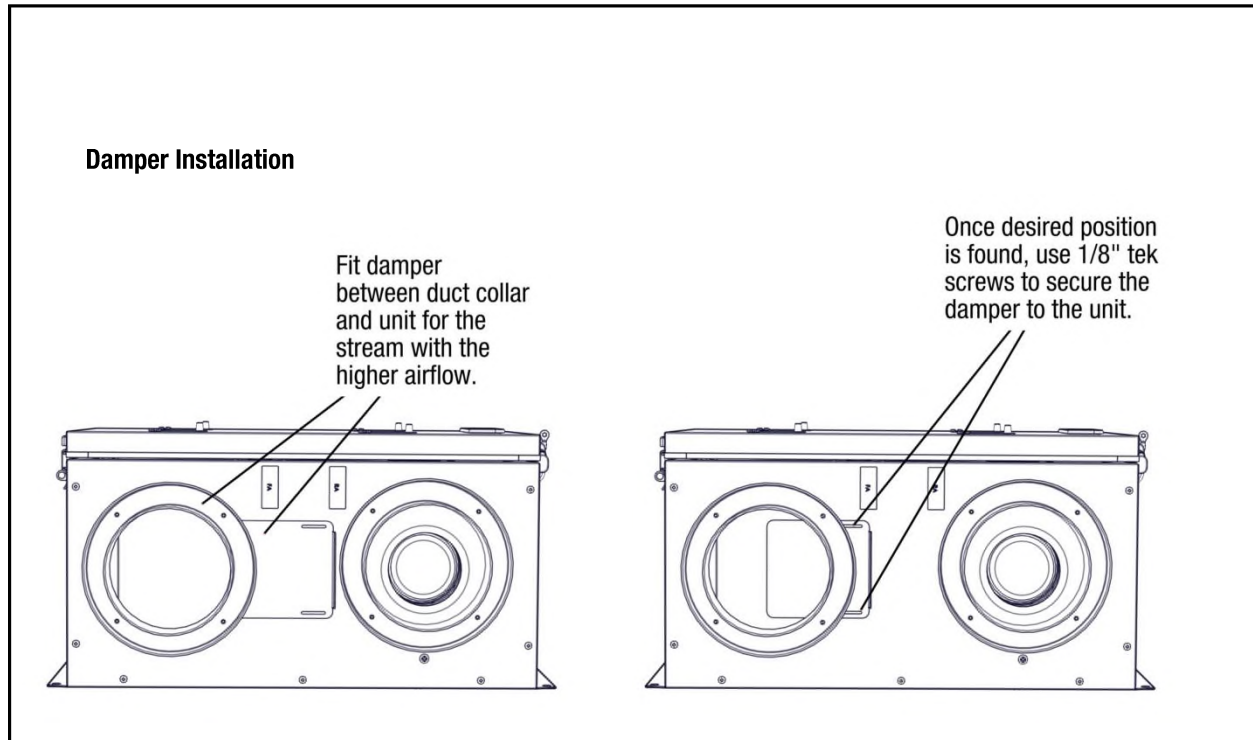
Measuring Airflow

Equipment Required

- A magnahelic gauge or other device capable of measuring 0 to 1.0 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. Ensure tubing is well seated in pressure ports.

NOTE: The tubing should extend into the pressure port approximately 1 inch.



Cross Core Static Pressure Measurement Instructions

The individual differential static pressures (DP) are measured using the installed pressure ports located in the front of the units core access doors.

NOTE: These ports are carefully located on the unit to give the most accurate airflow measurement. **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.
- If gauge drops below zero, reverse tubing connections.
- 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 airflow measuring is completed.

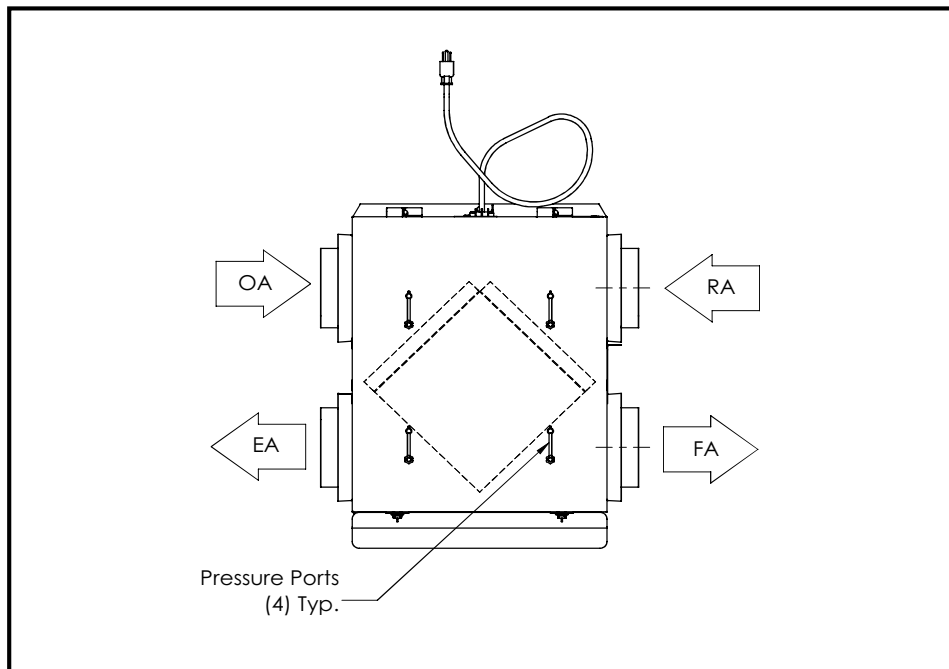
NOTE: For best performance the airflow rate for both the Fresh Air and the Exhaust Air should be roughly equal (“balanced”). In some facilities a slight positive or negative pressure in the building is desired. TR energy recovery ventilators can generally operate with a flow imbalance of up to 20% without significant loss in energy recovery efficiency.

⚠ CAUTION

- The proper airflow range for the models are 40-110CFM

⚠ CAUTION

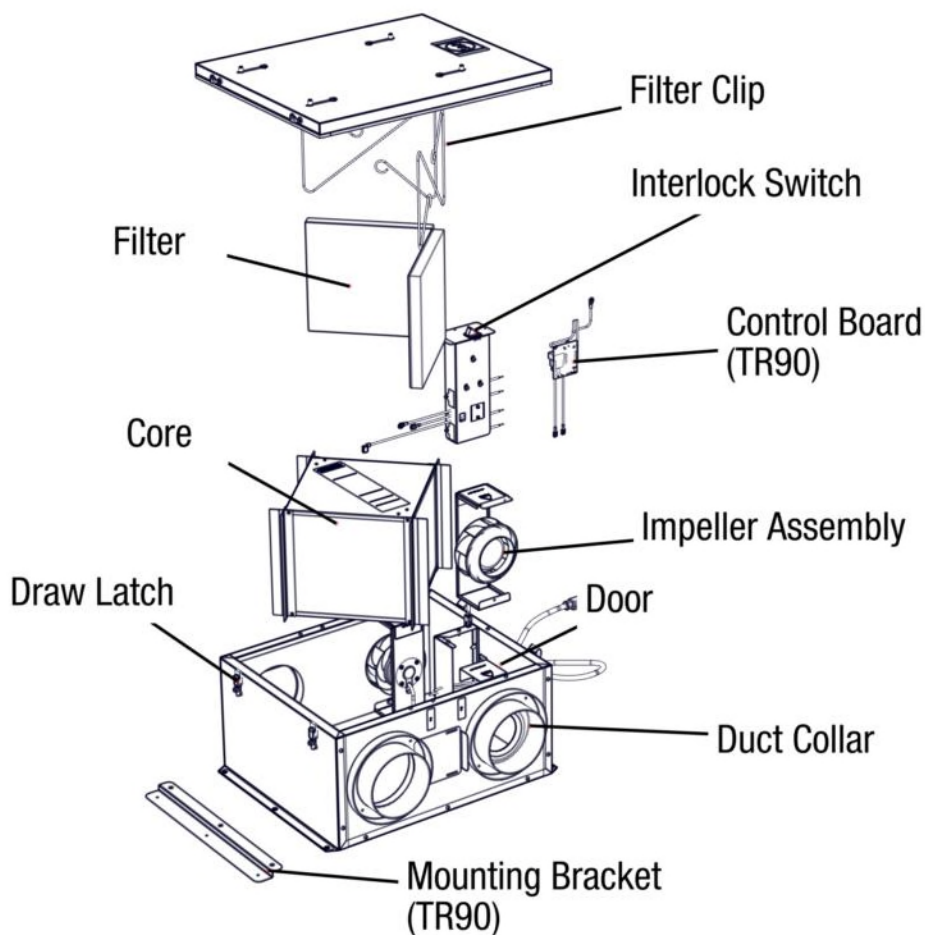
- Make sure clean filters are installed before balancing air flow. Dirty or clogged filters reduce airflow through the unit.



DIFFERENTIAL STATIC ACROSS CORE DSP VS. CFM

TR90, TR90G		DSP	0.10	0.20	0.30
	Fresh Air (FA)	CFM	42	84	127
	Room Air (RA)	CFM	42	84	127

Service Parts



Maintenance Requirements

Keep your ERV performing at its best by cleaning it as described below:

⚠ WARNING

RISK OF ELECTRIC SHOCK OR INJURY.

- Before servicing or cleaning the unit, unplug the unit line cord.
- Make sure unit is not running before opening its door. Blower wheels are sharp and can cut.
- Do not disable the interlock switch: it is there for your safety.

Service filters regularly:

Service filters every three months when the unit is in regular use or as needed to keep them reasonably clean.

1. Release cam latches and carefully swing access door open. Remove the door by sliding to one side.
2. Remove filter clips and pull out the filters.
3. Vacuum core and filters with a hose attachment.
4. Re-install filters and filter clips, (see above).
5. Re-install door, and fasten cam latches.

NOTE: The filters should be replaced after they have been cleaned several times. The primary contact for replacement filters for your S&P unit is the installing contractor. As an alternative, you may wish to produce your own filters.

Filters may be cut from a sheet or roll of ¼" - 1" firm, spun polyester filter media or material, similar to the existing filter in the residential unit.

The size of each filter (2 required per unit) is as follows:
90-Series - 9 ½" x 10 ½"

NOTE: Filters must be used or the face of the energy exchange core will become blocked by dust. The filters supplied in the unit are usually able to keep the energy exchange core clear for many months. Finer filters can be used but must be cleaned more often.

Clean the face of the energy exchange core yearly:

1. Remove the filters (see above).
2. Vacuum the exposed faces of the energy exchange core with a soft brush attachment.
3. After servicing the filters, re-install them (see above).
4. Vacuum out dust from the rest of the unit case.

Dust collects only on the entering faces of the energy exchange core. The interior of the energy exchange core stays clean even if the core faces are dust covered.

⚠ CAUTION

DO NOT WASH THE ENERGY EXCHANGE CORE.

Clean only as described above. The energy exchange core can be replaced but is expensive.

Maintenance Requirements

The blower/motor package needs no lubrication:

Vacuum clean the blower wheels at the same time you clean the face of the energy exchange core.

Purpose of an Energy Recovery Ventilation (ERV) System

Many modern homes are built air-tight for energy efficiency and comfort. The result is that natural air infiltration rates are often too low to provide acceptable indoor air quality. The solution is to use an ERV to remove gaseous pollutants such as odors, winter-time excess humidity, formaldehyde, smoke, radon, vapors from cleaning products, and other chemicals. Removal of dust and other small particles from your home is not the function of an ERV.

When should you use your ERV?

Use the ERV when windows are closed and ventilation is needed. When the outdoor air is warmer or cooler than comfortable, the ERV allows a quieter, more secure home with the windows closed and also saves energy.

Using an ERV with air-conditioning:

An ERV works very well with air-conditioning because its “enthalpy-transfer” energy-exchange core reduces the amount of moisture in the outside air that is brought in. ERVs are the preferred way to ventilate while air-conditioning because it brings in less moisture than any other ventilation method.

Controlling excess humidity during cold weather:

When the ERV is first turned on at the beginning of the heating season (or when first installed), it will have to run full-time for several days to reduce indoor humidity levels. A properly set dehumidistat will do this automatically. If your control is the proportional timer type (SPTL or SFM), it should be set to “100%” for several days whenever you have a problem with excess humidity during cold weather.

How much ventilation is right for you?

Always reference applicable codes and standards for ventilation rate. Different households require different rates of ventilation, depending on the pollutants found in each home. Most people use one of two methods to control the operation of their ventilation systems:

1. Provide a daily average of 0.35 Air changes per hour (ACH) for your entire home. A proportional timer is the primary operating control that allows you to reliably achieve this ventilation rate. According to the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), this ventilation rate will provide good air quality in most homes for most people.

At this rate, you will be changing the air in your home over eight times per day. Most ERV systems are generally designed to provide at least this ventilation rate.

Be sure to provide at least 15 CFM per person in the home. In small homes this may mean more than nine air changes per day.

2. Ventilate enough in the winter to keep indoor humidity low. Run the unit more to lower humidity.

In the winter, water vapor inside your home mostly comes from people -breathing, showering, and cooking. When the outside air is 40 degrees F or less, an ERV will reduce indoor humidity. This helps to prevent condensation on windows.

High wintertime humidity generally means you need more ventilation to control other indoor-air pollutants, like cooking odors.

Use your judgment:

These guidelines are a starting point. As long as the pollutants you are concerned with are detectable (like water vapor or odors) your nose can be a good guide, and you may find that fewer hours of operation will be sufficient.

For households with smokers:

Smokers will need at least double the usual ventilation rate to satisfy non-smokers in the same household.

WARNING

There is no known safe level of cigarette smoke. Any ventilation system may provide noticeable improvement in spaces where cigarettes are smoked, but it cannot be expected to protect against the severe long-term health hazards of exposure to cigarette smoke.