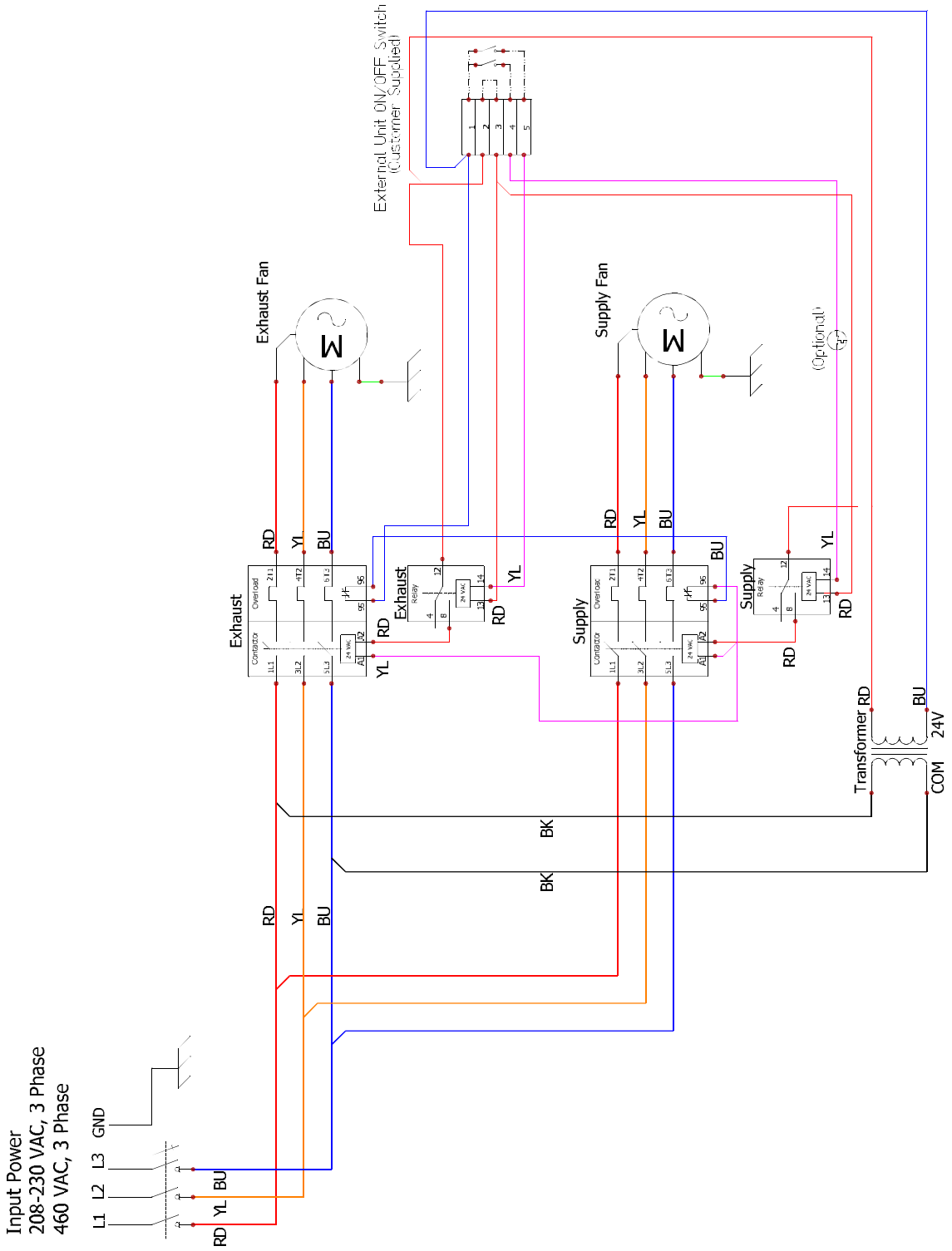
TRC1600 P3 THREE PHASE UNIT

WIRING SCHEMATICS



INSTALLATION

INSTALLATION INSTRUCTION

LOW VOLTAGE CONTROL SYSTEM

This ERV is provided with a Class II 24VAC power supply system that operates the unit's contactors. The ERV's 24VAC Power Supply can also be used to power the externally-installed controls system: up to 8VA of power is available.

The unit's power supply system includes isolation relays so you can use external controls whose contact ratings are as low as 50mA (1.2VA). Also, it is possible to operate the isolation relays with 24VAC power from an external source (with proper wiring connections).

A built-in circuit-breaker prevents damage to the transformer and other low-voltage components in the event of a short-circuit or overload. In extreme cases, the transformer itself is designed to fail safely.

SPECIFICATIONS

- Nominal Output Voltage under load: 24VAC
- Typical Output Voltage at no load: 29-31V
- Minimum contact rating for connected control device: 50mA (1.2VA)
- Circuit Breaker Trip Point: 3A

CAUTION

1. Connect only to components intended for use with 24VAC power.
2. Do not undersize the low-voltage wires connected to this device. Observe the wire length and gauge limits indicated in this manual.
3. Do not overload this unit's 24VAC power supply system. Confirm that the power requirements of devices you connect to this power supply system do not exceed 8VA in total.
4. If an external source of 24VAC power is used to control the unit, consult the wiring schematics and connect the external power only to the specified terminals in order to avoid damaging the unit or external controls. Connect only CLASS II power to the control terminals of this unit.
5. Unit is not equipped to receive analog signals (such as 1-10vdc or 4-20mA).
6. Unit is not equipped to communicate directly with Building Management Systems (such as BACNET, LONWORKS, etc.). However, the unit can be controlled by powered or non-powered contacts operated by any kind of control system.

INSTALLATION NOTES

If primary-side voltage is 230VAC, move black primary-side lead from transformer's "208V" terminal to the transformer's terminal marked "240V" ("230V" in some units).

Do not move the black primary-side lead that is connected to the transformer's "COM" terminal.

HOW TO RESET THE 24VAC CIRCUIT BREAKER

If the transformer is subjected to an excessive load or a short circuit, the circuit breaker will trip to prevent the failure of the transformer. When it trips the circuit breaker's button pops up. Shut off the primary-side power to the unit, and remove the excessive load or the short. The circuit breaker can be reset about fifteen seconds after it trips by pressing in the button.

LIMITS OF POWER OUTPUT

If limits on wire gauge and length are observed, you may connect control devices that draw up to 8VA to the blue and red wires. More than one device can be connected as long as total steady-state load does not exceed 8VA.

OBSERVE THESE LIMITS TO WIRE LENGTH AND GAUGE
in order to ensure reliable operation of the control system.

Wire Gauge	#22	#20	#18	#16	#14	#12
Circuit Length	100'	150'	250'	400'	700'	1000'

"Circuit Length" is distance from ERV to Control Device.

INSTALLATION

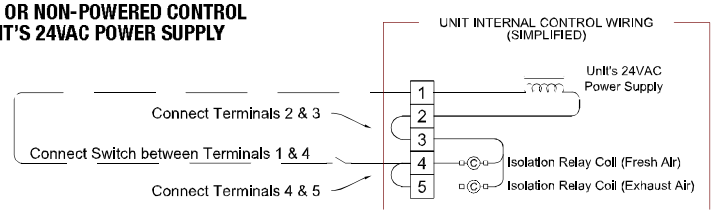
CONTROL WIRING SCHEMATICS

NOTE: The simplified schematics below show only the relevant portions of the low-voltage control circuit in the ERV unit and representational external control approaches. See the complete unit wiring schematics elsewhere in this manual.

CONTROL WIRING EXAMPLES BY TYPE OF APPLICATION

A. Single 2-wire Control, unpowered: Use schematic below if the control requires no power from the unit to operate and acts like a simple on/off switch. The control must not supply any power to the ERV unit. Install jumper (provided) between terminals 2 & 3. Connect the control's contacts to terminals 1 & 4 to operate the ERV's Isolation Relay for OA/FA Blower. Install jumper between terminals 4 & 5 to operate the ERV's Isolation Relay for the RA/EA Blower.

A **A SWITCH OR NON-POWERED CONTROL USING UNIT'S 24VAC POWER SUPPLY**



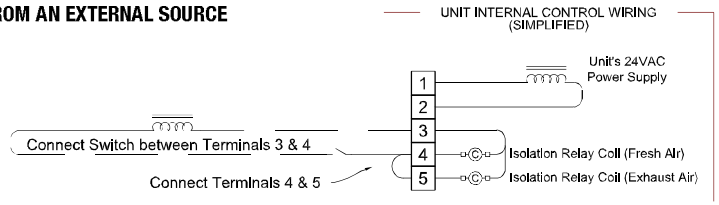
CAUTION

Make sure the control provides no voltage or current at its output terminals.

B. Single 2-wire Control on separate Power Supply, no power present at Control Output: Wire as shown for the Single 2-wire control (A. above).

C. Control Sending 24VAC "On" Signal (from an external power source) to ERV: Make sure jumper is NOT installed between Terminals 2 & 3. Now you safely can apply 24VAC to the Terminals 3 & 4 to operate the ERV's Isolation Relay for OA/FA Blower. Install jumper (provided) between terminals 4 & 5 to operate the ERV's Isolation Relay for the RA/EA Blower.

C **24VAC FROM AN EXTERNAL SOURCE**



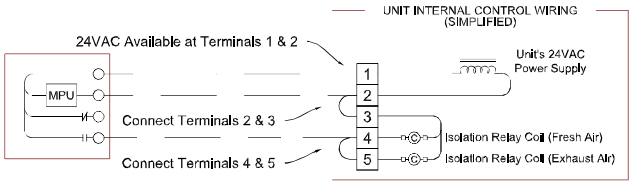
CAUTION

Supply only 24VAC (not VDC) from a Class II Power Source.

D. Control operating on Unit's 24VAC Power Supply: 24VAC power is available at the Terminals 1 & 2.
CAUTION: external control system should not draw more than 8VA. Install jumper (provided) between terminals 2 & 3.

Connect the switched output of the Control to Terminal 4 to operate the ERV's Isolation Relay for OA/FA Blower. Install jumper between terminals 4 & 5 to operate the ERV's Isolation Relay for the RA/EA Blower.

D **AN EXTERNAL CONTROL USING UNIT'S 24VAC POWER SUPPLY**



INSTALLATION

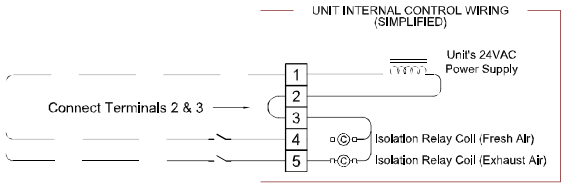
CONTROL WIRING SCHEMATICS

E. Control System with 2 Non-powered Relay Contacts: Use this schematic if the external control system provides no voltage or current at its output contacts. Install jumper (provided) between terminals 2 & 3. Connect one side of each of the output contacts to Terminal 1. Connect the other side of the output contact to control the FA Blower to Terminal 4, and the output contacts to control the EA Blower to Terminal 5.

CAUTION

Make sure the control provides no voltage or current at its output terminals.

E **A SWITCH OR NON-POWERED CONTROL USING UNIT'S 24VAC POWER SUPPLY**

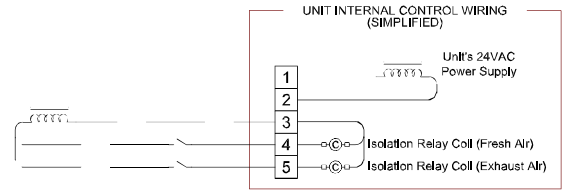


CAUTION

Supply only 24VAC (not VDC) from a Class II Power Source.

F. Control System Sending two 24VAC "On" Signals from an external power source: Make sure the jumper is NOT installed between Terminals 2 & 3. Now you safely can apply one of the 24VAC signals to Terminals 3 & 4 to operate the ERV's isolation relay for the Fresh Air Blower. Apply the second 24VAC signal to Terminals 3 & 5 to operate the ERV's isolation relay for the Exhaust Blower (make sure the polarity of each wire connected to Terminal 3 is the same).

F **TWO EXTERNAL RELAY CONTACTS SUPPLYING 24VAC FROM AN EXTERNAL SOURCE**



G. Control System Operating Isolation Dampers with End Switches: Use Isolation Dampers with electrically separate end switches. The end switches are used to separately control the ERV unit's Isolation Relays. This ensures that each damper is open before the respective blower starts up.

NOTE: Because the ERV's Motor Starters will only be operating once the Dampers are open, the power draw of the Damper Actuators is allowed to be as much as 35VA while opening (including power draw of the external control system, if any). However, the power draw of the fully-opened (stalled) Actuators (and external control system if any) must be less than 8VA. Most damper actuators have much lower power draws.

PRINCIPAL OF OPERATION

The TRC1600 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 TRC1600 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

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 also can 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. 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 airflows in all four airstreams, 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.

OPERATING CONTROLS

A wide variety of control schemes may be selected by the engineer, installer, or owner to meet the ventilation needs of the facility. These may include timer clocks, occupancy sensors, dehumidistats (for cool-weather operation), carbon dioxide sensors, and others. DDC systems may also control the unit with external control by other. Most control schemes will operate the unit only when needed.

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. With continuous operation, some external frosting may occur in very cold weather (see OPERATION IN EXTREME COLD WEATHER).

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.

Some condensation or even frost may form on the outside or drip off of the case during very cold conditions, particularly if the unit runs continuously. Exterior condensation during extreme conditions can be reduced or prevented by periodically cycling the unit off for several minutes to allow the case to warm up.

START-UP & OPERATION

OPERATION

MOTOR STARTERS

This unit uses IEC-style motor starters to protect the motors against overload.

IEC-style motor starters use Overload Relays to detect excessive current and interrupt the control circuit that engages the motor's contactors.

⚠ WARNING

The Overload Relay output contacts 95 & 96 must remain in series with the low-voltage control circuit! Altering this will create a hazardous situation in which the motor is not protected against overload!

Adhere to applicable local codes when adjusting the dial setting of the overload relays.

Overload Relays are sized to Full Load Amp (FLA) rating of the protected motor. The Overload Relays can be adjusted to trip (interrupt the control circuit) at a specific setting within a range.

Overload Relays should initially be set at the FLA rating of the motor (see Unit Rating Label). If necessary to prevent nuisance tripping at start-up, the Relays can be adjusted to trip no higher than 115% of the motor's FLA rating.

For safest operation, the overload relays should also be used in manual reset mode with trip test capability.

NOTE: As factory-wired, if one blower motor is shut down due to overload by its Motor Starter, the other motor will also be shut down.

NOTE: Terminals 96 & 97 of the Overload Relays and terminals 14 & 13 of the Contactors are normally-open dry contacts that may be used to signal that the contactors are closed and/or that the Overload Relays have tripped.

⚠ WARNING

DANGER OF INJURY OR DAMAGE.

The motors in this unit must not be run at an amperage that exceeds the motor's rated full load amps and overload relays on the motor starters must be set at or below motor full load amps. For safest operation, the overload relays should also be used in hand reset mode with trip test capability.

It is the installer's responsibility to measure the operating amperage of each motor. If the full load amp rating is exceeded, the amp draw must be reduced by substituting a smaller motor pulley or by adjusting the variable sheave. Continue these adjustments until the actual amperage is no more than the motor's faceplate full load amps.

Failure to make this adjustment may result in unsafe motor winding temperatures or tripping of the supplied motor starter's overload relay motor protection devices set at full load amps.

The relay must be set for correct FLA rating depending on the motor horsepower. See Unit Rating Label on motor for HP and FLA specifications.

START-UP & OPERATION

MEASURING AIRFLOW

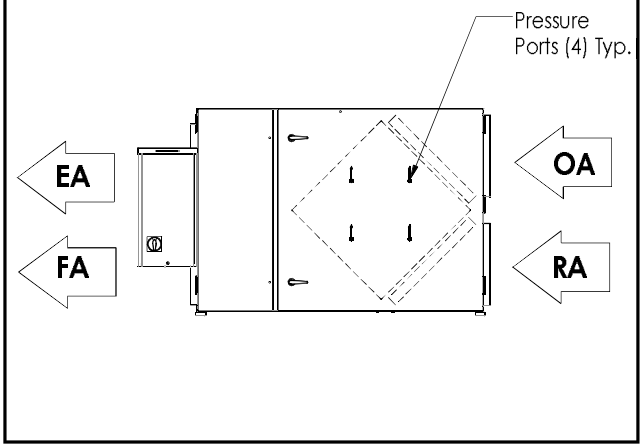
EQUIPMENT REQUIRED

- 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. Ensure 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.

F3 AIRFLOW DIAGRAM TRC1600



CAUTION

The proper operating airflow range for this model is 500 - 2200 CFM.

DIFFERENTIAL STATIC ACROSS CORE DSP VS. CFM

		DSP	0.20	0.30	0.40	0.50	0.60	0.70	0.80
TRC1600	Fresh Air (FA)	CFM	570	850	1130	1420	1700	1980	2270
	Room Air (RA)	CFM	540	810	1080	1350	1620	1890	2170

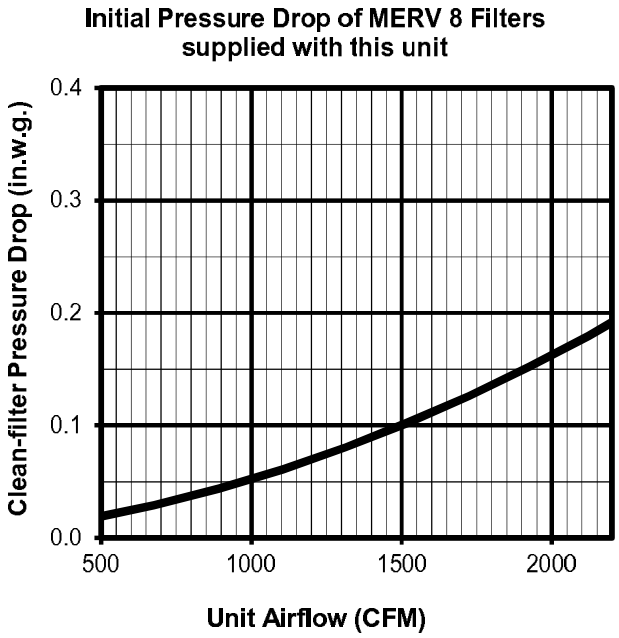
START-UP & OPERATION

MEASURING AIR FLOW

FILTER SPECIFICATIONS

- (4) 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

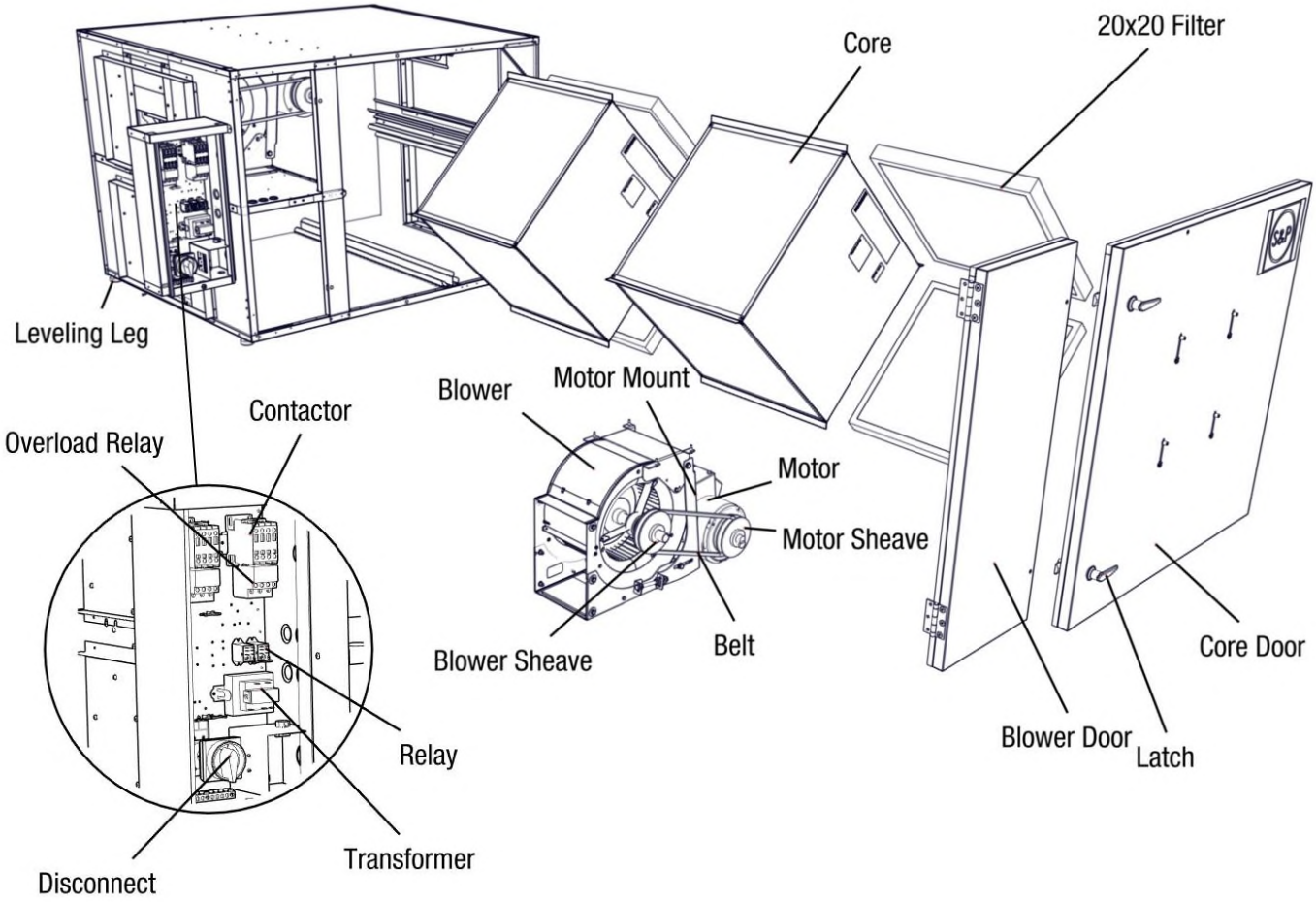
INITIAL PRESSURE DROP OF MERV 8 FILTERS SUPPLIED WITH THIS UNIT



NOTE: pressure drop of standard filter supplied is included in unit airflow performance tables

TRC1600

SERVICE PARTS



MAINTENANCE

REQUIREMENTS

⚠ WARNING

Danger of injury from un-guarded drive belts in unit. Disconnect power to unit before opening door.
Danger of injury if unit starts unexpectedly. Switch power off at service disconnect.
Lock-out/tag-out the disconnect.

CAUTION

DO NOT WASH THE ENERGY EXCHANGE CORE.

Keep it away from water or fire to avoid damaging it. Always handle the core carefully.

Filters must be used or the energy exchange core will become blocked by dust and reduce unit efficacy. In extreme cases components may be damaged.

TO CLEAN THE ENERGY EXCHANGE ELEMENT

Vacuum the face of the energy exchange element yearly. Dust collects only on the entering face of the energy exchange element, right where the filter sits. The interior of the energy exchange element stays clean even if the element faces are dust covered. The core airflow paths are designed to transport the air in a laminar motion. The core flutes move the air in a laminar airflow such that particulate deposition is maintained at virtually nill.

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

INSPECT AND CHANGE THE FILTERS REGULARLY

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

1. Turn off unit completely! Lock-out and tag-out the unit disconnect switch.
2. Open the Door. The door is secured with turn-type latches, plus one Phillips-head securing screw. Keep the securing screw. **NOTE:** Always replace securing screw when reinstalling door for safety reasons.
3. Remove and dispose of all (4) filters. Replace all (4) 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.
4. Close door; reinstall securing screw.

BLOWER INSPECTION

Inspect Blowers every time you change the filters.

1. Confirm bearings are still secure to blower shaft. It should not be possible to move the blower shaft back and forth along its length.
2. Confirm blower wheel is not rubbing against the blower inlet or housing by rotating wheel manually.

CAUTION

Incorrect Belt Tension will damage this blower and bearings.

BLOWER BELT TENSION

Check belt tension every time you change the filters.

1. Inspect belt(s) for cracking or uneven wear.
2. Check that sheaves are properly aligned so that belt runs straight.

Properly tensioned belt will deflect 0.25" when pressed at the center point with the following force:
1.5 BLOWER - 3 pounds

GENERAL CLEANING AND INSPECTION

Perform general cleaning and visual inspection when changing filters.

1. Remove dust from blower wheels periodically.
2. Remove paper, leaves, etc. from inlet and outlet screens.
3. Inspect for insect nests.

MOTOR MAINTENANCE

If the motors used in this ERV are equipped with grease fittings, motors must be lubricated as part of routine maintenance. Use Exxon Polyrex or equivalent at 2500 operating hour intervals.