Operation
&
Maintenance
Manual

9100 du Parcours, Anjou, Qc, H1J 2Z1
Tel : (514) 354-7776 • Fax : (514) 354-2830

Terms, Conditions and Warranty

TERMS: Terms of payment are subject at all times to the approval of Ventrol's Credit Department.

ACKNOWLEDGEMENT AND ACCEPTANCE OF CUSTOMERS' PURCHASE ORDERS: Ventrol's failure to object to provisions contained in customer's purchase orders or other communications shall not be deemed a waiver of the following conditions of sales nor acceptance of such provisions. No representations of guarantees other that the following shall be binding upon Ventrol unless made in writing and signed by an officer of Ventrol for the express purpose of modifying our standard terms, conditions and warranty.

CLAIMS: The responsibility of Ventrol ceases upon delivery of goods in good order to the carrier. Claims for factory storage will not be considered unless in writing to Ventrol within ten days after receipt of the goods and accompanied by reference to our bill of lading and factory order numbers. As all goods are shipped at customer's risk, any claims for damages or shortage in transit must be filed by customer against the Transportation company. No claim for Freon loss will be accepted.

TAXES: Prices quoted do not include any State, local, sales use or Federal Excise Tax, **All** taxes imposed on items involved herein, if payable by Ventrol will be added to the price shown.

CANCELLATIONS: Our best efforts will be put forth to make shipment within the time estimated by failure to do so will not be considered sufficient cause for cancellation. Cancellation of orders will not be accepted after material has been purchased and manufacturing has been started except upon an agreement of the buyer to make payment for the material and work that has been done.

DELAYS: Ventrol shall not be liable for any delays caused by riots, strikes, fires, floods, lack of transportation, accident or any other contingency beyond it's control.

PRODUCT CHANGES: In the interest of continuous product improvement, Ventrol reserves the right to change specifications and/or design without incurring obligation.

RETURNED GOODS: Goods may not be returned except by permission of authorized officials of Ventrol at Anjou (Quebec), and when so returned will be subject to a handling charge and transportation costs.

LIMITED WARRANTY: Ventrol warrants its products to be free of defects in material and workmanship for a period of 18 months from receipt of units or one year from unit start-up, which ever comes first, assuming proper installation, proper maintenance, normal operating conditions and competent supervision. Ventrol's obligation under this warranty shall be limited to repairing or replacing at its factory any part or parts thereof which shall be returned to its factory with transportation to its factory charge prepaid, and which upon examination shall appear to Ventrol's satisfaction to have been defective. Ventrol reserves the right at its sole discretion to dispatch qualified employees to witness product installation at the jobsite or to verify warranty claims without prejudice to its rights under the present limited warranty. Correction of such defects by repair or replacement shall constitute fulfillment of all obligations to purchaser under this warranty. ***THERE IS NO OTHER EXPRESS WARRANTY****:* The duration of any implied warranty is limited to the duration of the express warranty specified above. Some states do not allow limitation on how long an implied warranty lasts, so the above limitations may not be applicable to you. ***VENTROL SHALL NOT BE LIABLE FOR INCIDENTAL. CONSEQUENTIAL OR SPECIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH PRODUCT USE OR PERFORMANCE.*** Some states do not allow the exclusion of incidental or consequential damages, so the above limitation may not apply to you. Ventrol assumes no liability for expenses of repairs made outside of its factory except by express written contract. No liability whatsoever shall attach to Ventrol until said products whatsoever with respect to Freon. This warranty gives you specified legal rights, and you may also have other legal rights which vary from state to state. This warranty supersedes all prior warranties.

FINALLY: The above terms, conditions and warranty supersede and are in lieu of all other terms, conditions and warranties expressed or implied, and no other person, agent or dealer is authorized to give any other on behalf of Ventrol nor to assume for Ventrol any other liability in connection with any of Ventrol's product.

9100, rue du Parcours, Anjou (Quebec) H1J 2Z1
(514) 354-7776 (telephone), (514) 354-2110 (fax)

OUTDOOR-MOUNTED AIR HANDLING UNITS

Installation, "Start-up", Maintenance and Inspections Instructions

(A) INSTALLATION

(1) Equipment is purchased F.O.B. Factory and is the responsibility of the receiving party to inspect unit upon arrival at the destination before unloading or moving unit to its permanent location; inspect closely for damage that may have been caused in transit. Report damage to delivering carrier promptly (list damage or shortage on freight bill if possible). If damage is noted or discrepancies found, the local Ventrol Inc. Sales Representative should be notified immediately so that corrective action may be instigated. Where local repairs or alterations are required, the representative should be fully informed by the contractor as to the extent and expected cost of work required. ***UNAUTHORIZED BACK-CHARGES WILL NOT BE RECOGNIZED BY VENTROL AIR HANDLING SYSTEMS INC.***

(2) An experienced, reliable rigger should be selected to handle the unloading and final placement of the equipment. Handle equipment with care during installation to avoid damage due to twisting, bouncing or tilting. Rigger should be advised that the unit contains delicate components and is to be handled in upright position only. Avoid excessive stress to fans, shafts, bearings, coil fin and tubes, dampers, isolators, filter accessories, humidifiers, piping, electrical, motors, drives, access doors and insulation. This will save time and expense during "start-up" and initial service warranty period. Should storage of unit be required caution to set unit relatively level and in clean locations or cover unit to protect motor, bearings, coils, filters and etc. from dust and elements. Also avoid storage in location where children play and/or public access. ***AIR HANDLING UNITS SHOULD NOT BE USED AS ON SITE STORAGE FOR OTHER MECHANICAL TRADES***. If units are to be stored for an extended period of time the following maintenance procedures must be performed:

a) Fan wheels should be rotated by hand every 30 days.
b) Each month bearings should be purged with new grease to remove condensation.
c) Before start-up, new grease must be added to the bearings.
d) Belts should be removed, then prior to start-up, inspect and replace, if necessary, reinstall belt.
e) All openings and access doors must remain sealed during storage.
f) Dampers must be cleaned and lubricated prior to start-up.

(3) Lifting brackets are provided on the sides of the unit and equal tension of cables at each bracket is essential for weight distribution and safety. Rigging cables should be as long as the longest unit piece dimension at corners to prevent stress on assembly.

(4) Roof-curbs (where required) must be installed square and level. Curb should be field welded or bolted to roof joists or deck field flashing and unit mounting to secure in place. Apply curd gasket material (furnished by others) to top of curb before unit mounting. Foundation for curb must be adequate to support weight of unit without deflection to maintain spirit level of unit after installation.

(5) Steam coils are drainable if unit is level. Water coils are also drainable except for special circuiting. When special circuitry has been furnished coil must be protected from freeze damage by means of anti-freeze liquids or heaters.

(6) Condensate drain lines inside or to roof from pan must be pitched and include a water seal or trap to prevent the passage of air into or out of the unit via the drain in the field by the contractor. Intermediate pans for coils more than one high include downspouts to main pan. A minimum of 2-inch trap is required in the condensate line to prevent back up (more trap is required for units with SP higher than 1 ½" wg).

(7) Multi-section units if furnished have sealing plates to be screwed along the modules splits, with gaskets, caulking and screws furnished. Additional bolting inside is required on some units. Attachment bolts shall be provided by others.

(8) Observe all pertinent local ordinances and codes covering installation and operation of air handling equipment. Adequate clearance for the service and removal of components should be provided (Do Not install unit in a tight space or dangerously close to roof edge especially on access side).

B) "START-UP" SERVICE

(1) After unit is permanently positioned, fan isolation shipping lock-downs (tagged) should be removed. If load points are not on same plane after supports are removed readjust isolators or shim until elevation of load points are uniform.

(2) Access door to piping compartment is provided if pipe chase is furnished. All plumbing in field should be done through chase (Do Not puncture casing). Use back-up wrenches on stubouts and swing joint piping or flex piping to avoid damage to headers and tubes. If, for any reason, it is necessary to cut a hole in the unit casing, this hole should be cut through a side panel (not through any access door) and then carefully sealed. If vestibule is furnished all piping should be run inside the vestibule and plumbed through the chase hole cover plate. Access door to vestibule or chase compartment should be closed and latched securely to avoid plumbing freeze up.

(3) Vault type door latches provided on access doors can be adjusted by changing position of bevelled flange or handle on inside. Access door gasketing must not be removed or leakage of air and water could result.

(4) Check motor mounting to make sure all nuts are tight. Confirm that the motor voltage, phase, and HP size are compatible with wiring. Motor nameplate amperage is maximum. All electrical connections should be tight, complete and properly terminated.

(5) Supply and return air duct flanges are provided and should be attached to ducts with flexible connector unless fans are internally isolated. Multi-zone units require field zoning of individual zone segments by use of "W" clips which attach to zone separators.

(6) Fan blower wheel should rotate freely. Check motor and fan sheave for proper alignment and make sure set screws are tight. Check bearing-collar set screws on fan shaft and fan hub set screws for tightness. Loose collars and/or set screws will ruin the shaft quickly. Ball bearings have been lubricated at the factory and do not need further attention at start-up. *Do Not operate fans with imbalance.* During fan (supply and return) start-up observe the rotation and if fan is operation backward, reverse two legs of the supply electrical power, if three phases.

(7) Rotate damper (Face & Bypass, Outside Air, Return Air, Exhaust and Zone Dampers) shafts to test action; rough handling may have caused damper blades to bind. Damper shaft extension (½" shaft) is provided to accept manual or automatic controls. Do Not overdrive damper motors, this will deform dampers and/or linkage.

(8) Outside air inlet hood & exhaust outlets (if not mounted when shipped) have been predrilled for attachment in field. Both the hood and the outlets include bird screen and louvers.

(9) Filters (when furnished by Ventrol Inc.) are often furnished and mounted in the racks or in boxes inside the unit. Check to make sure the filter cartridge count is correct. (Filter count is found on the Data Sheet). If filter count is short, the exact number received should be noted on the freight bill at the time of delivery. Check to make sure that filter media has been installed properly in the rails. Check to be sure that the filters called for are used; failure to use the filters that your Ventrol Inc. Air Handler has been designed for can cause fan motor overload and/or cause the coils to become dirty and restrict airflow. Filter access doors should always be latched firmly to stop air by-pass around filter cartridges.

(10) Check all screws, bolts, nuts and piping connections for tightness.

(11) If unit heaters are provided check thermostat settings to insure freeze protection.

(12) Supply and return fan drives are provided in the mid-speed adjustment range when variable speed sheaves are furnished. The motor sheave pitch diameter is field adjustable for the required airflow. When final adjustments are complete the current draw of the motor should be checked and compared to full load amperage rating of the motor. After supply fan is set, the return fan drives should be adjustable for proper pressurization of the building. Sheaves with two or more grooves should be adjusted by the same number of ½ or full turns from closed position to insure the same pitch diameter so belt bear equal load. DO NOT FORCE BELT OVER THE GROOVES. Hub type fan sheaves are furnished. Sheaves must be tightened securely before drive is operated.

(13) Hinged or slide rail motor mounts are furnished with two adjusting bolts. Bolts must be adjusted equally or so drives maintain proper alignment. Correct belt tension should be acquired by use of belt tension checker tool. Over tightened belts reduce belt and bearing life substantially, yet belts must be tight enough to prevent slippage.

(14) Humidifiers if installed include operator, trap, strainer and manifold mounted or furnished and mounted by contractor. Supply stream connects at top to strainer and return connects at leaving side of trap. Piping to and from humidifier should not be reduced in size with pitch of (½" in 10') length without sag.

(15) After 24 hours operation re-check "Start-up" items.

(16) Set Pre-start and Operation Check Sheet.

C) MAINTENANCE AND INSPECTION SERVICES

(1) **FAN -** check blades for dirt and/or grease build-up especially on concave sides. Check set screws and/or set collars of fan wheel and bearings for tightness. Check bearing mounting bolts and fan housing cut off blade bolts and nuts for tightness. If fans are furnished with housing drains, see that «*weep holes*» in bottom are open. If housing access door is furnished be sure it is properly sealed and latched. Remove all debris from fan section and unit in general.

(2) **BEARINGS AND SHAFT** – ball or roller bearings are greased at the factory and therefore ready to run at "Start-up"; however, routine maintenance and inspection is required there after. Normal operation of bearings are "cool or warm to touch". High bearing temperature accompanied by excessive leakage of grease indicates too much grease. High temperature with no grease showing at the seals, particularly if the bearing seams noisy, indicates too little grease. If running discloses an excessive amount of grease in the bearings the grease fittings should be removed until the excess has escaped. Fan shafts should be coated to prevent corrosion yet check that dirt or debris build-up is not accumulating which could affect balance.

(3) **FAN BEARING LUBRICATION** – lubrication intervals vary with the period of operation and temperature of the air. *Do Not over-lubricate*. The bearing is factory lubricated with Lithium based grease of NGL1#2 consistency, such as Shell Alvania #2, Exxon Unirex #2, Mobil Mobilux #2, Mobil 532, Texaco Premium RB.

PRE-START CHECK	4
UNIT RECEIVED UNDAMAGED	
EQUIPMENT RECEIVED AS ORDERED	
UNIT LOCATED PROPERLY FOR SERVICE	
VIBRATION ISOLATORS USED	
SPRING ISOLATION PROPERLY USED	
RUBBER IN SHEAR ISOLATORS PROPERLY SHIMMED	
CHECK ELECTRICAL SUPPLY VOLTAGE	
CHECK ELECTRICAL CONNECTIONS FOR TIGHTNESS	
CHECK FUSETRON AMPERAGE AGAINST SCHEMATIC	
CHECK FAN WHEEL SET SCREW, DRIVE SHEAVES	
CHECK BEARINGS FOR ALIGNMENT AND LOCKING COLLARS	
ROTATE WHEELS AND MOTORS TO ASSURE FREEDOM OF MOVEMENT	
CHECK CONDENSATE DRAIN TRAPS	
CHECK TO SEE THAT PROPER AIR FILTERS ARE INSTALLED	
OPERATIONAL CHECK	4
MOMENTARILY START FAN MOTOR AND ASSURE CORRECT ROTATION	
CHECK BELTS FOR TIGHTNESS	
CHECK CONDITIONER MOTOR ( ) (VOLTAGE) RPM ( ) AMPS	
CHECK RETURN AIR MOTOR ( ) (VOLTAGE) RPM ( ) AMPS	
CHECK DAMPER OPERATION	
CHECK CABINET FOR AIR LEAKS	
CHECK CABINET FOR POSSIBLE WATER LEAKS	
LATCH/TIGHTEN ALL PANELS	

The following table should be used as a re-lubrication guide:

CONDITIONS

SPEED	TEMPERATURE	CLEANLINESS	GREASE INTERVAL
100 RPM	Up to 120 degrees F	Clean	6 to 12 months
500 RPM	Up to 150 degrees F	Clean	2 to 6 months
1 000 RPM	Up to 180 degrees F	Clean	2 weeks to 2 months
1 500 RPM	Over 210 degrees F	Clean	Weekly
Any speed	Up to 150 degrees F	Dirty	Daily to 2 weeks
Any speed	Over 150 degrees F	Dirty	Daily to 2 weeks
Any speed	Any Temperature	Very Dirty	Daily to 2 weeks
Any speed	Any Temperature	Extreme conditions	Daily to 2 weeks

Add grease slowly with shaft rotating until a slight bead forms at the seals.

(4) **MOTOR AND MOTOR BEARINGS** – check for dirt and debris accumulation on "air travel" opening of open type motors to prevent overheating. Re-lubricate motor bearings every 2,000 hours of operation while it is warm and at a stand still. Remove and clean upper and lower grease plugs. Insert grease fitting into upper hole adding a small amount of clean grease with a low-pressure gun. Run motor 5 minutes before replacing plugs. Excessive grease will overheat the bearings. Use only high-grade mineral grease having a 200 degrees F safe operating temperature. (If special lubrication instructions are shown on the motor nameplate they will supersede all other instructions).

(5) **SHEAVES** – after air balance, require no further adjustment. However, sheave locking devices, wear, alignment and belt tension should be checked on a regular basis.

(6) **DAMPER BLADES AND LINKAGE** – should be inspected regularly for dirt and/or debris build up to insure abnormal wear or damage does not occur. Winterize damper system prior to cold weather to insure that proper sequence of control is being maintained, paying close attention to operation of outside air intake. Outside air damper should be checked closely for minimal leakage when closed.

(7) **OUTSIDE AIR INTAKE HOOD** – should be checked for debris in bird screen and/or obstructions to air flow (such as old boxes, new walls or fences, etc.) around unit. Clean or remove as required.

(8) **WATER COILS** – (Heating and Cooling) if not antifreeze protected or heater protected should be drained as thoroughly as possible and then treated in the following manner:

> Fill each coil independently with an antifreeze solution using a small circulating pump and again drain. Check freezing point of antifreeze before proceeding to next coil. Due to a small amount of water always remaining in each coil, there will be a diluting effect. The small amount of antifreeze solution remaining in coil must always be concentrated enough to prevent freeze-up. Carefully read instruction for mixing antifreeze solution used. Some products will have a higher freezing point in its natural state than when mixed with water.

Failure of controls, outside air dampers and air stratification can cause freeze-up and permanent coil damage if above precautions are not observed. *Do Not allow dirt to accumulate between the fins of coils. Use water, steam or air to remove dirt*.

(9) **STEAM COIL** – Fins should be cleaned in the same manner as Water Coils. Steam lines to and from unit should be checked for pitch, pipe sag and blockage to avoid "Water-hammer". Strainers and traps require annual cleaning minimum.

(10) **CONDENSATE PAN** – should be checked for dirt and debris build-up and cleaned. Trap and drain should also be cleaned especially if blockage is evident.

(11) **FILTER ASSEMBLY** – tracks should be checked for rail seal retention where required and all rails should be cleaned annually to control dirt build-up, filter drag and dust by-pass during change out of media. Dirty filters reduce the air volume handled by the unit, and thereby its capacity. Unit should not be run without proper filters or fan motor overload, dirty coil and restricted airflow will result. Proper media retainers should be used at all times to avoid possible media "blow-out", which can cause blockage of air flow and/or damage rotating fan and motor parts. Do not operate media beyond its rated capacities before change out or "blow-out" damage can result.

(12) **CASING AND ACCESS DOORS** – should be checked for leakage (air and/or water). Door gasket must be in proper alignment and if damaged, should be replaced. Inside access panels must be latched properly to avoid air re-circulation.

(13) **COILS** – can be removed from unit through coil connection side of unit (both ends if mentioned in the submittal). After removing piping and end panels, remove bolts holding coil to structural frame at the air entering side of coil. The coil and casing can then be pulled out.

(14) **WIRING AND COMPONENTS** – should be made and remain in accordance with National, State/Province local codes that apply to this equipment. Check connections of wiring and retighten so danger of a poor connection causing overheating and component failure through inadequate current handling can be avoided. Good practice and safety indicates that before attempting service to components, de-energize the systems and only after workers are clear of rotating and electrical devices can unit be energized again.

(15) **AIR FILTER GAUGE** - "pick-ups" should point against air flow for the best results without restriction. Oil Manometers require split to operate properly (check zero set).

(16) **HUMIDIFIER** – strainer screen in supply line should be cleaned a few days after put in operation and thereafter at least once a season – more often if much dirt is found in the screen. The trap should be inspected at the same time strainer is cleaned.

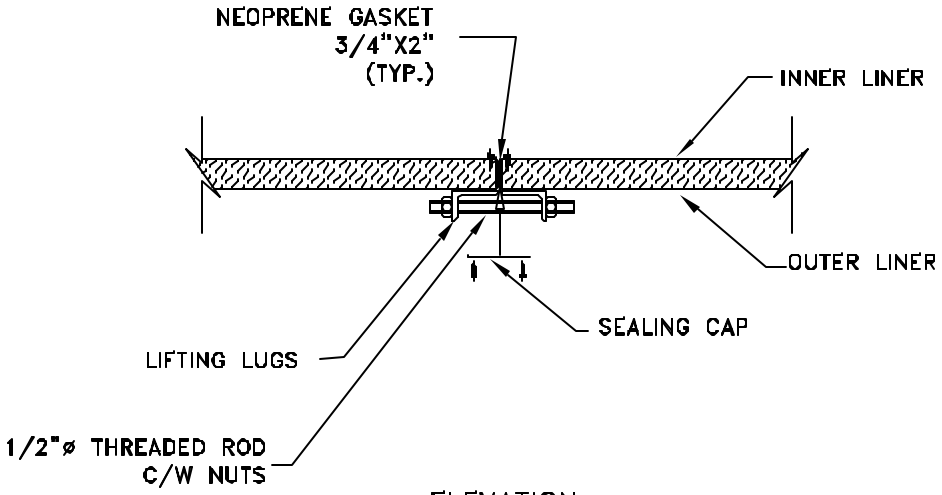
(17) **UNIT HEATER OR ELECTRICAL COIL** – should be checked for dirt on resisters and removed by use of air only. **DO NOT** attempt cleaning without positive shut down.

(18) **PNEUMATIC OPERATORS** – and linkage should be inspected for sequence and travel and vacuum hose leaks especially prior to cold weather usage where furnished.

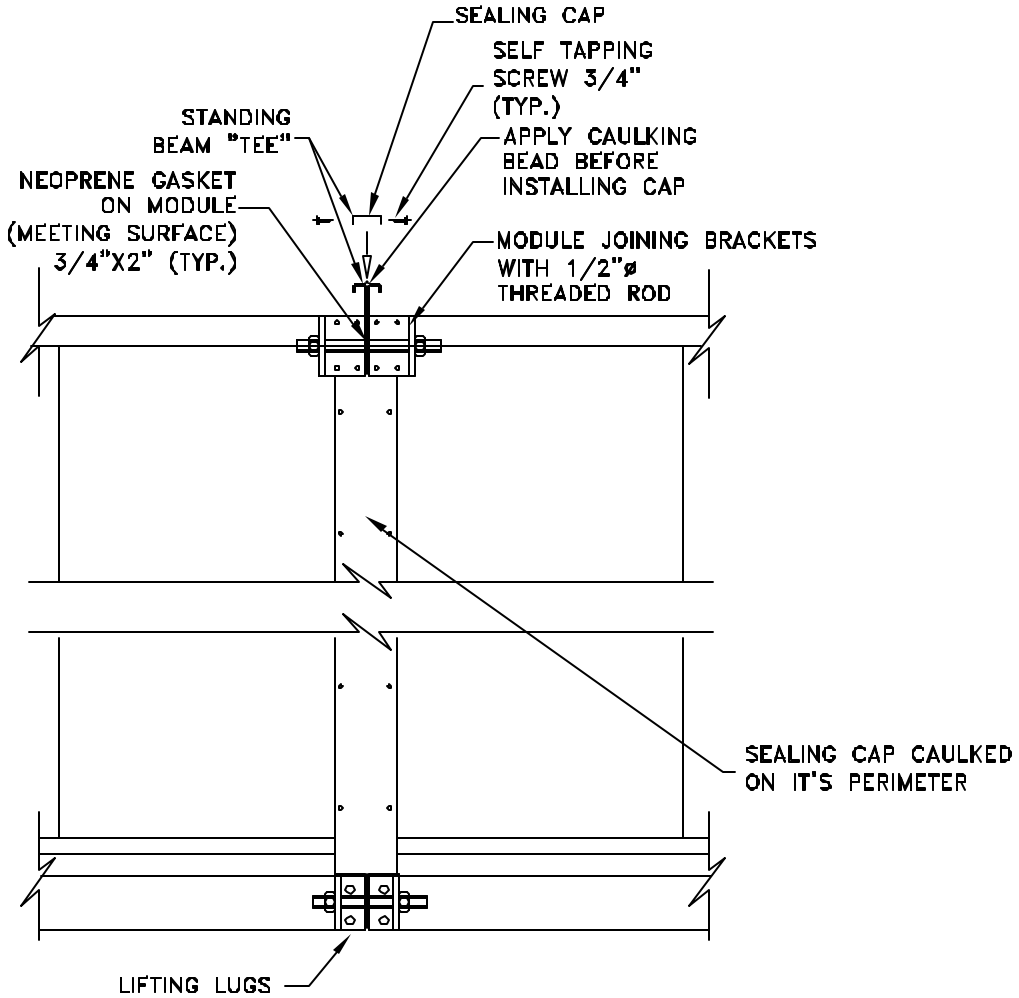
(19) **OTHER COMPONENTS** – not mentioned should be maintained per instructions attached to component.

(20) **REPLACEMENT PART** – (if required) orders for service or replacement must include serial number, model number and unit tag of unit as stamped on serial plate, attached to unit. If replacement parts are required, state date of installation of unit, date of start-up and date of failure, along with an explanation of the malfunction and a description of the replacement parts required. Goods may not be returned except by permission of authorized factory officials of Ventrol Air Handling Systems Inc. at Anjou, Quebec and when so returned will be subject to a handling charge and prepaid transportation charges. Following our personal inspection of the returned part and if it is determined that the failure is due to faulty material or workmanship, credit will be issued on customer's purchase order if warranty is still in effect.

PLAN VIEW



ELEVATION



NOTE: DO NOT USE LIFTING LUGS & BOLTS TO BRING MODULE TOGETHER

Ventrol
Air Handling Systems Inc.

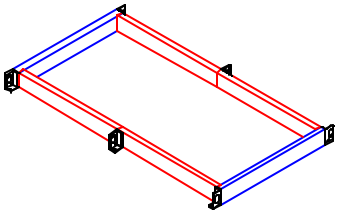
TITLE: MODULES ASSEMBLY (OUTDOOR UNIT)		
SCALE FAC.: NTS	DWG. MAN: C.V.	DWG. NAME: A-0005
DATE: 26/11/2002	LOCALISATION:	

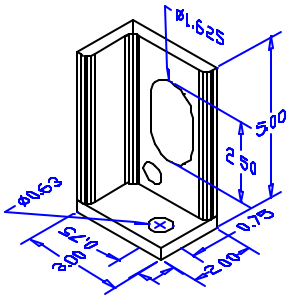
Ventrol Air Handling Systems Inc.

9100, rue du Parcours
Anjou (Québec) H1J 2Z1
: 514.354.7776
: 514.354.2830
info@ventrol.com

RIGGING AND INSTALLATION PROCEDURES

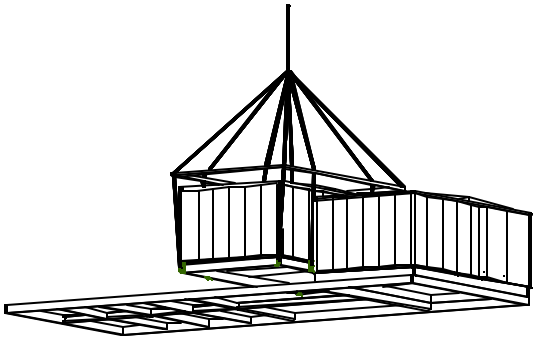
1. Each unit is supplied with a number of lifting lugs, located along the base of the unit. The quantity and location of the lifting lugs are shown on the unit submittal drawing, and varies with unit weight and foot print.

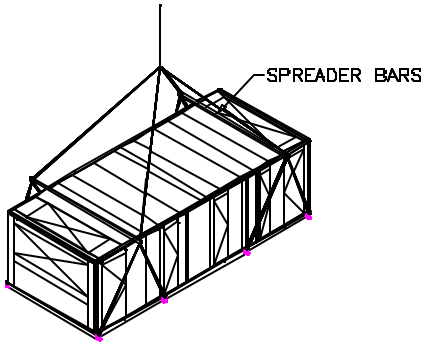




2. When rigging the unit, all lifting lugs **must be used**. Spreader bars must be used to keep the cables parallel to the unit walls, in order to prevent damage to the unit casing.

3. For modular units, place the first module as per a unibase unit. After the first module of the unit is set in place, remove internal bolted lifting lugs (if applicable). Install factory supplied gasket along the elevation transversal perimeter of unit, at the module split. Set second module as close as possible to the first module and remove internal bolted lifting lugs (if applicable).





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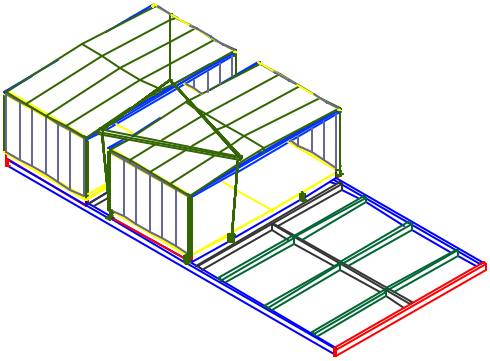
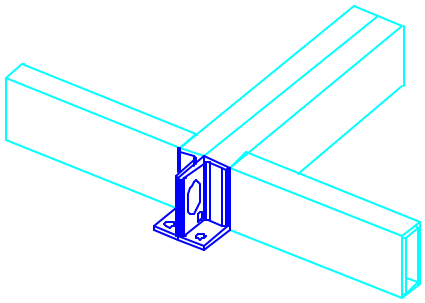
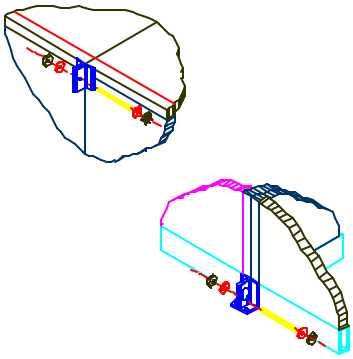
4. Rigging modules into final position with lifting lugs should not be confused with lifting modules into final position. Use a few of the lifting lugs to partially remove weight while positioning one module to the previous module with a rachet hoist. **Do not lift unit from side of section**.



5. Use a ratchet hoist to pull the second module to the first module



6. With two modules pulled together, use two field supplied 3/8" diameter, 12" long threaded rod, to secure each module together at the unit base, using the lifting lugs. If applicable, secure upper casing rail with factory installed flange and field supplied rod.



7. Repeat procedure described above for the remaining modules (if applicable).

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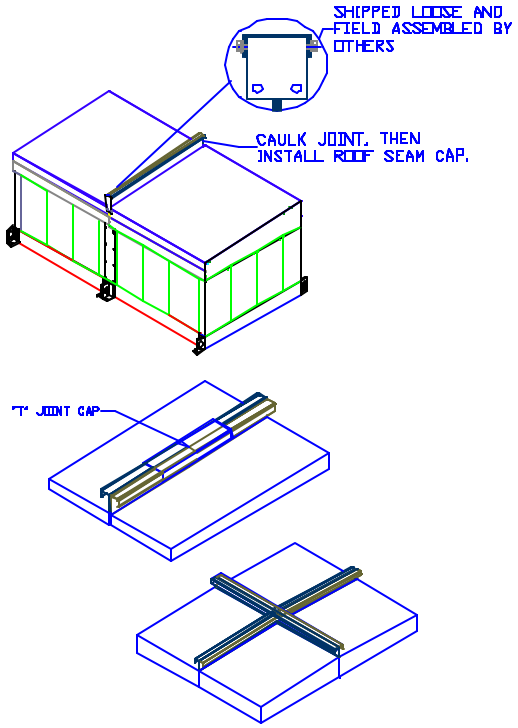
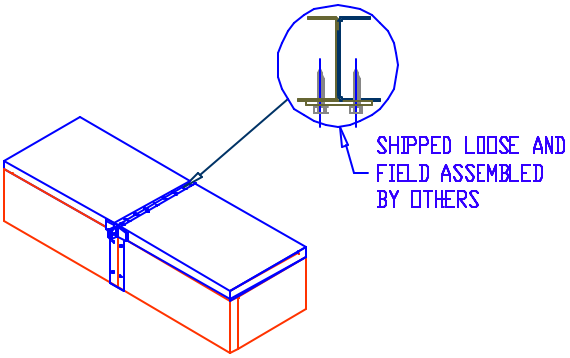
8. With all the modules securely bolted together at the lifting lugs, install factory supplied roof seam cap after caulking roof joint.

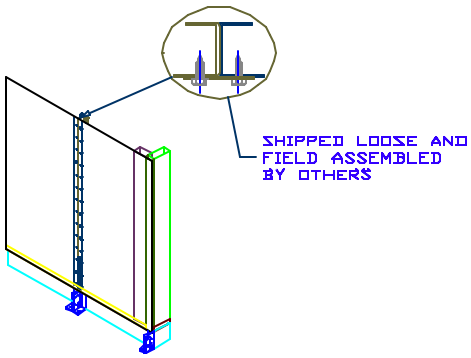
For Outdoor Units (if applicable):



For Indoor Units (if applicable):



9. Install factory supplied exterior side cap over center of seam and screw in place with factory provided screws. Caulk along the perimeter of exterior cap with factory supplied caulking.



10. For painted units, use factory supplied touch up paint where required.

START – UP REPORT

Start – UP Date: _____

Job Name: _____

Unit Serial Number _____

A Start- Up report must be submitted for ~~each unit~~ on the job. For warranty purposes, start – up occurs when the equipment and/or blowers are started for operation regardless of when the building may be ready for operation.

GENERAL

	Initials or ☞
1. Inspect the unit for shipping and installation damage.	
2. Check Bill of Lading against material received	
3. Make sure all packing material has been removed from unit.	
4. Inspect unit demounts for proper re-assembly (if unit shipped in sections)	

PRE-START

1. Remove shipping lock down bolts. See drawing on inside Supply Fan access door	
2. Check fan wheel set screws for tightness and motor and fan sheave for proper alignment	
3. Manually rotate fan wheels and motors to assure freedom of movement	
4. Check main supply voltage	
5. Check electrical connections for tightness	
6. Check main fan amp draw (Refer to motor nameplate)	
7. Check condensate drain traps (Separate traps are required for each drain connection)	
8. Inspect system piping for proper installation	
9. Check to see that proper filters are installed	
10. Clean inside of unit of all construction dirt and debris	
11. Adjust access doors for proper alignment if necessary	

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OPERATIONAL CHECK
Warning ! Do not operate unit if system is not properly balanced.

1. Check damper operation to assure freedom of movement	
2. Momentarily start fan motor and assure correct rotation	
3. Check belts for tightness	
4. If unit is equipped with variable frequency drive, refer to enclosed manufacturers recommended start-up procedures.	
5. Record motor rpm / amp: Supply fan # 1 _____ rpm Supply Fan # 1 _____ amps Supply fan # 2 _____ rpm Supply Fan # 2 _____ amps Return Fan # 1 _____ rpm Return Fan # 1 _____ amps Return Fan # 2 _____ rpm Return Fan # 2 _____ amps	
6. Record unit External Static Pressure (esp.) and Total Static Pressure (tsp). Supply fan # 1 _____ esp Supply Fan # 1 _____ tsp Supply fan # 2 _____ esp Supply Fan # 2 _____ tsp Return fan # 1 _____ esp Return Fan # 1 _____ tsp Return fan # 2 _____ esp Return Fan # 2 _____ tsp	
7. Record Unit Supply and Return CFM: Supply air CFM: _____ Return air CFM: _____	
8. Verify unit is operating at design conditions	
9. While unit is in operation verify no excess standing water in drain pan.	

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Note: After 24 hours of operation re-check set screws on bearing collar and fan hub for proper tightness.

Ball and Roller Bearing Setscrew Tightening Torque			
Dia.	Hex Size Across Flats	Min. Recommended Torque Valuline	
#10 (109)	3/32	in.lbs	ft.lbs
1/4	1/8	22	1.8
5/16	5/32	40	3.3
3/8	3/16	65	5.4
7/16	7/32	130	10.8
1/2	1/4	200	16.7
5/8	5/16	290	24.2
3/4	3/8	470	39.2

The following table should be used as a relubrication guide:

Conditions

SPEED	TEMPERATURE	CLEANLINESS	GREASE INTERVAL
100 RPM	Up to 120 degrees F	Clean	6 to 12 months
500 RPM	Up to 150 degrees F	Clean	2 to 6 months
1000 RPM	Up to 180 degrees F	Clean	2 wks to 2 months
1500 RPM	Over 210 degrees F	Clean	Weekly
Any Speed	Up to 150 degrees F	Dirty	Daily to 2 wks
Any Speed	Over 150 degrees F	Dirty	Daily to 2 wks
Any Speed	Any Temperature	Very Dirty	Daily to 2 wks
Any Speed	Any Temperature	Extreme Cond.	Daily to 2 wks

Add grease slowly with shaft rotating, until a slight bead forms at the seals.

Start – Up performed by: _____ Date: _____

Notes:

_____

_____

_____

_____

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MAINTENANCE

FREQUENCY SCHEDULE

Recommended Maintenance Service for Ventrol Equipment

Type of Service	Start-Up	Monthly	Every 6 Months	Shutdown	Annually
Inspect General Condition of Unit	X	X			
Clean Debris From Unit	X	X		X	
Check and Adjust Fan Belt Tension	X	X			
Check Unit for Unusual Noise or Vibration	X	X			
Check Fan Bearing Locking Collars	X		X		
Check Motor Voltage and Current	X		X		
Lubricate Fan Shaft Bearings	X		See Below	X	
Lubricate Motor Base Adjusting Screws	X		X	X	
Check Fan for Rotation Without Obstruction	X				
Check Fan for Proper Rotation	X				
Inspect Protective Finish					X
Replace Filters		X			
Lubricate Damper Linkage			X		
Check Fans for Unusual Vibration	X				X
Clean Outside of Coils			X	X	

IMPORTANT SAFETY NOTES

Before performing any maintenance or inspection, make certain that all power has been disconnected.

Adequate precautions should be taken to safeguard the equipment and the premises from damage, also the public from possible injury as appropriate for the installation of these products.

The following table should be used as a relubrication guide:

	Conditions		
SPEED	TEMPERATURE	CLEANLINESS	GREASE INTERVAL
100 RPM	Up to 120 degrees F	Clean	6 to 12 months
500 RPM	Up to 150 degrees F	Clean	2 to 6 months
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1500 RPM	Over 210 degrees F	Clean	Weekly
Any Speed	Up to 150 degrees F	Dirty	Daily to 2 wks
Any Speed	Over 150 degrees F	Dirty	Daily to 2 wks
Any Speed	Any Temperature	Very Dirty	Daily to 2 wks
Any Speed	Any Temperature	Extreme Cond.	Daily to 2 wks

Add grease slowly with shaft rotating, until a slight bead forms at the seals.

AHU Inspection Reports

Date: _____ Time: _____ Project: _____

AHU Designation: _____ Location on Roof: _____

	Accepted	NOT Accepted
Curb level	☐	☐
Curb Square	☐	☐
Gasket between Sections	☐	☐
Connections between sections	☐	☐
Roof Joiners Connections in place	☐	☐
Roof Joint Crimping	☐	☐
Caulking of Walls between sections	☐	☐
Caulking of Roof between Sections	☐	☐
Side Seal Strips between Joint Section	☐	☐
Final Caulking @ Side Seal Strips	☐	☐
UNIT COMPLETED	☐	☐
Photo's Attached	☐ yes	☐ no

Inspection Team

Ventrol: _____

Rep: _____

Contractor: _____

ROOFTOP CURB
INSPECTION REPORT

Date: _____ Project: _____

Time: _____ Job #: _____

Trade Contractor: _____

AHU Designation: _____

Location of AHU: _____

Check Offs: _____

Cement Curbing: _____

AHU Intermediate and X bracing: _____

Unit Level: _____

Unit Square: _____

Bolting of unit curbs to cement curbs: _____

Grouting of concrete curb to unit curb: _____

NOTES: _____

_____

_____

_____

Inspection Team

Ventrol: _____

Rep: _____

Contractor: _____

Trouble

Shooting

TROUBLE SHOOTING GUIDES
FANS

PROBLEM	PROBABLE CAUSE	SOLUTION
Noise	Impeller hitting inlet ring	a. Impeller not centered in inlet ring. b. Inlet ring damaged c. Crooked or damaged impeller d. Shaft loose in bearing e. Impeller loose on shaft f. Bearing loose in bearing support
	Impeller hitting cutoff	a. Cutoff not secure in housing b. Cutoff damaged c. Cutoff improperly positioned.
	Drive	a. Sheave not tight on shaft (motor and/or fan) b. Belts too loose. Adjust for belt stretching after 48 hours of operation. c. Belts too tight. d. Variable pitch sheaves not adjusted so each groove has same pitch dia. (multi-belt drives). e. Misaligned sheaves f. Belts worn g. Isolation base shipping restraints not removed. h. Belts oily or dirty
	Bearing	a. Defective bearing b. Needs Lubrication c. Loose on bearing supports d. Loose on shaft e. Seals misaligned f. Foreign material inside bearing g. Worn bearing h. Fretting corrosion between inner race and shaft.
	Shaft Seal Squeal	a. Need lubrication b. Misaligned
	Impeller	a. Loose on shaft b. Defective Impeller *Do not run fan - Contact manufacturer.* c. Unbalanced
Noise (Continued)		d. Worn as result of abrasive or corrosive

TROUBLE SHOOTING GUIDES
FANS

PROBLEM	PROBABLE CAUSE	SOLUTION
		material moving through flow passage
	Housing	a. Foreign material in housing b. Cutoff or other part loose (rattling during operation)
	Electrical	a. AC hum in motor or relay b. Starting relay chatter c. Noisy motor bearings d. Single phasing a 3 phase motor
	High Air Velocity	a. Duct work too small for application. b. Fan selection too small for application. c. Registers or grilles too small for application. d. Heating or cooling coil with insufficient face area for application.
	Pulsation or Surge	a. Restricted system causes fan to operate at poor point of rating. b. Fan too large for application c. Ducts vibrate at same frequency as fan pulsations.
	Rattles and/or Rumbles	a. Vibrating duct work b. Vibrating cabinet parts c. Vibrating parts not isolated from building.
CFM Low - Insufficient Air Flow	Fan	a. Mecanical volume control device is improperly set. b. Fan running backwards c. Cutoff missing or improperly installed. d. Dirty fan blades. e. Loose or slipping belts f. Fan speed too slow
	Duct System	a. Actual system is more restrictive (more resistant to flow) b. Dampers closed c. Registers closed d. Leaks in supply ducts e. Insulating duct liner loose.
CFM Low - Insufficient Air Flow (continued)	Filters	a. Dirty or clogged

TROUBLE SHOOTING GUIDES
FANS

PROBLEM	PROBABLE CAUSE	SOLUTION
	Coils	a. Dirty or clogged
	Obstructed Fan Inlets	a. Elbows, cabinet walls or other obstructions restrict air flow. Inlet obstructions cause more restrictive systems but do not cause increased negative pressure readings near the fan inlet(s). Fan speed may be increased to counteract the effect of restricted fan inlet(s)
	No Straight Duct at Fan Outlet	a. Fans which are normally used in duct system are tested with a length of straight duct at fan outlet. If there is no straight duct at the fan outlet, decreased performance will result. If it is not practical to install a straight section of duct at the fan outlet, the fan speed may be increased to overcome this pressure loss.
	Obstructions in High Velocity Air Stream	a. Obstruction near fan outlet b. Sharp elbows near fan outlet c. Improperly designed turning vanes d. Projections, dampers or other obstructions in part of system where air velocity is high
CFM High - Too Much Air Flow	System	a. Oversized duct work b. Access door open c. Registers or grilles not installed d. Damper set to by-pass coils e. Filter(s) none in place f. System resistance much lower than anticipated
	Fan	a. Fan speed too fast
Incorrect Static Pressure	System, Fan or Interpretation of Measurements	General Discussion: ● The velocity pressure at any point of measurement is function of the velocity of the air or gas and its density ● The static pressure measured in a "loose" or oversized system will be less than the static pressure in a "tight" or undersized system for the same air flow rate
Incorrect Static Pressure - Continue -		● In most systems, pressure measurements are indicators of how the installation is operating. These measurements are the result of air flow and as such are

TROUBLE SHOOTING GUIDES
FANS

PROBLEM	PROBABLE CAUSE	SOLUTION
		useful indicators in defining system characteristics ● Field static pressure measurements rarely correspond with laboratory static pressure measurements unless the fan inlet and fan outlet conditions of the installation are exactly the same as the inlet and outlet conditions in the laboratory
Static Pressure Low, CFM High	System	System has less resistance to flow than expected This is a common occurrence. Fan speed may be reduced to obtain desired flow rate. This will reduce HP (operating cost).
	Fan	a. Backward inclined impeller installed backwards. HP will be high b. Fan speed too high
Static Pressure Low, CFM Low	System	a. Fan inlet and/or outlet conditions not same as tested.
Static Pressure High CFM Low	System	a. Obstruction in system b. Dirty filters c. Dirty coils d. System too restricted
HP High	Fan	a. Backward inclined impeller installed backwards b. Fan speed too high c. Too low system resistance for forward curved fan
	System	a. Oversized duct work b. Face and by-pass dampers oriented so coil dampers are open at same time by-pass dampers are open c. Filter(s) - left out d. Access door open
	Fan Selection	a. Fan not operating at efficient point of rating. Fan size or type may not be best for application
Fan Does Not Operate	Electrical or Mechanical	a. Blown fuses b. Broken belts c. Loose pulleys d. Electricity turned off

TROUBLE SHOOTING GUIDES
FANS

PROBLEM	PROBABLE CAUSE	SOLUTION
		e. Impeller touching scroll f. Wrong voltage g. Motor too small and overload protector has broken circuit h. Optional thermostats, firestats, freezestats may lockout fan operation if set incorrectly

TROUBLE SHOOTING GUIDES
ELECTRIC HEATING COILS

PROBLEM	PROBABLE CAUSE	SOLUTION
Electric Heater Not Operating	Electrical or Mechanical	● Disconnect switch or main circuit breaker may be in the "OFF" position. If heater has built-in disconnect switch, door must be closed and switch turned "ON" before heater will operate ● If the fan and heater are interlocked with a fan relay, the fan must be on before the heater will operate. If an air flow switch is used, air pressure in the duct must be sufficient (at least 0.7" W.C.) to close the switch before the heater will operate ● Automatic (or manual) reset thermal cutout may have opened when overheating resulted from insufficient air flow or poor air distribution. Allow heater temperature to return to normal so that automatic thermal cutout may reset or manual reset thermal cutout may be reset. Correct cause of overheating before proceeding. ● Heat limiter(s) may have opened if local "hot spot" developed or if automatic reset thermal cutout failed to open first, when overheating occurred. Correct cause of overheating and replace heat limiter. ● Check main fuses, if open, correct cause of failure before replacing fuses.
Electric Heater Cycles (Will Not Stay On)	Electrical or Mechanical	● Check air inlet and discharge openings for obstructions. See that filters are not clogged, fire dampers are open and air system is balanced ● Check to see that the heater terminal box is tight against duct and heater safety devices are receiving sufficient air flow. Air flow must be distributed evenly over entire face area. ● Look at heater coils in operation (through observation port in duct); any red area is not receiving enough air. (A small amount of redness is permissible inside the coil insulation bushings). Make sure that air flow through every part of the heater is sufficient. *Coils must not glow.* ● If air flow switch is used, contactors may "chatter" if air flow is not sufficient to keep switch fully on. ● If duct has internal insulation, the insulation may be blocking the safety devices.
Improper Temperature	Electrical or Mechanical	● Make sure associated control equipment, such as

TROUBLE SHOOTING GUIDES
ELECTRIC HEATING COILS

PROBLEM	PROBABLE CAUSE	SOLUTION
Regulation		thermostats, are in the correct location and that all controls are adjusted according to manufacturer's specifications for existing field conditions. ● Check air system balance to see that correct amount of air flow is supplied for proper zone control. ● Automatic thermal cutout may be opening (cycling) before room thermostat is satisfied. (see "Electric Heater Cycles". Insufficient heat may be caused by: 1. Open heat limiter(s) or thermal cutout 2. Incorrect supply voltage 3. Heater too small (in wattage) for application –

TROUBLE SHOOTING GUIDES
Gas Furnace by Reznor

PROBLEM	PROBABLE CAUSE	SOLUTION
Pilot Will Not Light (Match Lit System)	1. Manual valve turned off	1 Open valve
	2. Air in gas line	2 Disconnect pilot line at shut off bleed air from gas supply line
	3. Incorrect lighting procedure	3 Follow instructions on cover of junction box.
	4. Dirt in pilot orifice	4 Remove orifice. Clean with compressed air or solvent (do not ream)
	5. Extremely high or low gas pressure	5 Check line pressure, this should be 3 oz or 5 in. water pressure minimum. 8 oz or 14 in. maximum
	6. Bent or kinked pilot tubing	6 Replace tubing
Pilot Lighted But Magnetic Gas Valve Will Not Open (All Manual Valves Are Open) (Match Lit System)	1. Power not turned on or thermostat not calling for heat.	1 Turn on power, check fuses, turn on thermostat
	2. Circuit to magnetic valve open	2 Check wiring and connections at transformer and thermostat
	3. Faulty transformer	3 Replace transformer
	4. Faulty or dirty thermocouple or safety pilot switch	4 Clean and test with millivolt meter or test kit. Replace defective part.
	5. Faulty thermostat	5 Replace thermostat
	6. Faulty magnetic valve	6 Replace valve or magnetic head
	7. High gas pressure	7 Max. gas pressure 8 oz or 14" W.C.
Venter Motor Will Not Start (RPV Models)	1. No power to unit	1 Turn on power, check supply fuses or circuit breaker
	2. No 24 volt power to venter relay	2 Turn up thermostat, check control transformer output Check for loose or improper wire connections
	3. Venter relay defective	3 Replace
	4. Defective motor or capacito	4 Replace motor or capacitor
Pilot Will Not Light (Spark Ignition System) (Venter Operation on RPV Models)	1. Manual valve not open	1 Open manual valve
	2. Air in gas line	2 Bleed gas line
	3. Dirt in Pilot Orifice	3 Remove and clean with air pressure
	4. Gas pressure too high or too low	4 Set supply pressure at 5" to 8" for natural gas - 11" for propane
	5. Kinked pilot tubing	5 Replace tubing
	6. Pilot valve does not open	6 If 24V available at valve, replace valve
	7. No Spark:	7
	a. Loose wire connection	a. Be certain all wire connections are solid
	b. Transformer failure	b. Be certain 24 volts is available
	c. Incorrect spark gap.	c. Maintain spark gap 7/64"
Pilot Will Not Light Con't	d. Spark cable shorted to	d. Replace worn or grounded spark cable

TROUBLE SHOOTING GUIDES
Gas Furnace by Reznor

PROBLEM	PROBABLE CAUSE	SOLUTION
(Spark Ignition System) (Venter Operation on RPV Models)	ground e. Spark electrode shorted to ground f. Drafts affecting pilot g. G60 control box not grounded h. Faulty G60 8. Optional lockout device interrupting control circuit by above causes 9. Faulty combustion air proving switch	 e. Replace pilot if ceramic spark electrode is cracked or grounded f. Make sure panels are in place and tightly secured to prevent improper or unusual drafts at pilot g. Make certain G60 is grounded to furnace chassis h. If 24V is available to G60 controller and all other causes have been eliminated, replace G60 8 Reset lockout by interrupting control circuit at thermostat 9 Replace combustion air proving switch
Pilot Lights, Main Valve Will Not Open (Spark Ignition System)	1. Manual valve not open. 2. Main valve not operating a. Defective valve b. Loose wire connection 3. G60 does not power main valve a. Loose wire connection b. Flame sensor grounded (Pilot lights - spark continues) c. Gas pressure incorrect d. Cracked ceramic at sensor e. Faulty G60	1 Open manual valve 2 a. Replace if 24V is measured at valve connection and valve remains closed b. Check and tighten all wiring connection 3 a. Check and tighten all wiring connection b. Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required. c. Set supply pressure at 5" to 8" for natural gas - 11" for propane d. Replace sensor e. If all checks indicate no other cause replace G60 DO NOT ATTEMPT TO REPAIR G60 THERE ARE NO FIELD REPLACEMENT COMPONENTS CONTAINED IN THIS DEVICE.
No Heat	1. Dirty Filters	1 Clean or replace filters

TROUBLE SHOOTING GUIDES
Gas Furnace by Reznor

PROBLEM	PROBABLE CAUSE	SOLUTION
(Heater Operating)	2. Incorrect manifold pressure or orifices	2 Check manifold pressure
	3. Cycling on limit control	3 Check air throughput
	4. Improper thermostat or adjustment	4 See thermostat instructions
	5. Belt slipping on blower	5 Adjust belt tension
Cold Air is Delivered on Start-Up, During Operation	1. Fan control heater element improperly wired	1 Connect as per wiring diagram inside junction box cover
	2. Defective fan control	2 Replace fan control
	3. Incorrect manifold pressure	3 Check manifold and line pressure
Motor Will Not Run	1. Circuit open	1 Check wiring and connections
	2. Fan control inoperative	2 Replace fan control
	3. Contactor inoperative	3 Replace contactor
	4. Defective motor	4 Replace motor

TROUBLE SHOOTING GUIDES
HEATING COILS

PROBLEM	PROBABLE CAUSE	SOLUTION
Coil Does Not Operate	Steam valve failure (Steam Coil)	a. Check steam valve. If air operated, check proper air pressure. If electrically operated check for no power or loose connection. If manual valve, check to see if valve is open. If necessary repair or replace valve. b. Defective thermostat or wrong setting
	Steam trap failure (Steam Coil)	Condensate backs up into coil. Check steam trap, repair or replace
	Diverter valve (Hot Water Coil)	a. Check power to valve as above b. Diverter valve piped wrong
Coil Does Not Deliver Adequate Heat	No steam or hot water	Check boiler for proper steam pressure or hot water temperature setting.
	Thermostat	a. Thermostat improperly located, relocate. b. Thermostat defective, replace c. Improper set point, reset d. Defective controls, see above
	Coil undersized	Replace with larger coil
	Insufficient steam pressure	Check boiler controls
	Lack of hot water	Hot water pump undersized or malfunctioning
	Dirty finned tubes	Vacuum or use air hose to gently clean dirt from finned tubes
Coil Leaks	Crack in brazed connection	Repair brazed joint
	Internal corrosion	Replace coil

TROUBLE SHOOTING GUIDES
COOLING COILS

PROBLEM	PROBABLE CAUSE	SOLUTION
Coil Does Not Deliver Adequate Cooling	Lack of chilled water	Chilled water pump undersized or malfunctioning
	Dirty finned tubes	Vacuum or use air hose to gently clean dirt from finned tubes
	Coil undersized	Replace with larger coil
Coil Leaks	Crack in brazed connection	Repair brazed joint
	Internal corrosion	Replace coil
Moisture on Walls Downstream of Cooling Coil	Excess capicity through cooling coil	Check air flow through coil
	Standing water in drain pan	See "Condensate Drain Pan" Section
	V.A.V. unit (Low Volume Air Flow - High Volume Water Flow)	Verify that the air flow and water flow are synchronized

TROUBLE SHOOTING GUIDES
CONDENSATE DRAIN PAN

PROBLEM	PROBABLE CAUSE	SOLUTION
Standing Water in Drain Pan	Unit is not level	Check level of unit, shim if required.
	Drain connection is clogged	Remove dirt or debris from drain pan
	Condensate drain line to drain is not correctly pitched.	Check pitch in line towards floor drain
	Trap is sized incorrectly	● All condensate drain connections and floor drains must be trapped. Failure to properly trap a drain will result in flooding of the drain pan and potential water damage to the air-handling unit and other building facilities.

TROUBLE SHOOTING GUIDES
ELECTRIC MOTORS

PROBLEM	PROBABLE CAUSE	SOLUTION
Motor Fails to Start	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker
	Overload trips	Check and reset overload
	Improper line connections	Check connections with diagram supplied with motor
	Open circuit in winding or starting switch. Evidence by humming sound from motor when switch is closed	Check inside motor to determine if switch is closed. Check for loose connections.
	Improper current supplied	Check to determine that power supply agrees with motor nameplate specifications.
	Mechanical failure	Determine that motor and drive turn freely. Check bearings and lubrication
	Short circuited stator	Indicated by blown fuses. Motors must be rewound
	Poor stator coil connection	Remove end bells and locate with a test lamp.
	Defective rotor	Look for broken bars or end rings. Replace rotor
	Motor overloaded	Reduce load or replace unit with larger motor
	With a 3 phase power source one phase may be open	Check line for open phase
	Defective capacitor	Replace capacitor
Motor Stalls	Wrong application	Change type or replace unit with a larger motor, consult factory
	Overloaded motor	Reduce load or replace unit with a larger motor.
	Low line voltage	Check across AC line and correct if possible
Motor Runs and Then	Partial loss of line voltage	Check for loose connections. Determine adequacy

TROUBLE SHOOTING GUIDES
ELECTRIC MOTORS

PROBLEM	PROBABLE CAUSE	SOLUTION
Dies Down		of main power supply
	Stator shorts when motor warms up.	Replace stator
Motor Does Not Come Up to Speed	Motor under designed for application	Replace with a larger motor
	Voltage too low at motor terminals	Check across AC line and correct if possible
	Line wiring to motor too small	Install larger line wiring
	Broken rotor bars	Look for broken bars or end rings, replace motor.
	60 cycle motor connected to 50 cycle line supply	Replace unit with a 50 cycle motor.
Motor Takes Too Long to Accelerate	Excessive load	Replace with larger motor
	Loose connection(s)	Check connections and tighten where necessary
Wrong Rotation (3 Phase)	Improperly wired to AC line (Wrong sequence of phases)	Check wiring diagram on motor nameplate and correct. Reverse any two motor leads at line connection
Motor Overheats (Temperature Rise Above Ambient Greater Than Nameplate Specifications)	Motor overloaded	Replace with larger motor.
	Motor fan may be clogged with dirt preventing proper ventilation	Remove fan cover and clean, replace fan cover
	Motor (3 phase) may have one phase open	Check to insure that all connections are tight
	Partially shorted stator coil	Must be rewound
	Line voltage too high	Check across AC line and correct. Step-down transformer may be required
Motor Overheats -Continue-	Line voltage too low	Check across AC line. Consult power company. Step-up transformer may be required

TROUBLE SHOOTING GUIDES
ELECTRIC MOTORS

PROBLEM	PROBABLE CAUSE	SOLUTION
(Temperature Rise Above Ambient Greater Than Nameplate Specifications)	Rotor rubs stator bore	Check motor bearings and replace
	Worn bearings	Replace bearings and seals
Motor Vibrates When Connected to Driven Equipment	Motor mounting bolts loose	Tighten mounting bolts
	Rigid type coupling used to connect motor to driven equipment	Replace coupling with a proper coupling
	Driven equipment unbalanced	Balance driven equipment
	Worn motor bearings	Replace bearings and seals
	Motor (3 phase) running on single phase	Check for open circuit and correct
	Bent motor shaft	Replace shaft or rotor
Rapid Motor Bearing Wear	Excessive overhung load due to over tensioned drive	Check overhung load, retension drive.
	Excessive overhung load due to a smaller diameter sheave than recommended minimum used on motor shaft	Check "NEMA Sheave Selection Guide" in the Browning Catalog. Replace sheave with one of size equal to or greater than listing

TROUBLE SHOOTING GUIDES
VARIABLE SPEED DRIVES

PROBLEM	PROBABLE CAUSE	SOLUTION
Short Belt Life	Spin burns from belt slipping on drive under stalled load conditions or when starting	Tension belts
	Gouges or extreme cover wear caused by belts on drive guard or other objects	Eliminate obstruction or realign drive to provide clearance
	High ambient temperature	a. Use Gripnotch Belts b. Provide ventilation c. Shield belts
	Grease or oil on belts	a. Check for leaky bearings b. Clean belts and sheaves
	Worn sheaves	Replace sheaves
	Center distance shorter than recommended minimum when using standard sheave as a companion sheave	Increase center distance by using longer belts. Replace standard driven sheave with a companion sheave
	Belt misalignment	Realign drive with sheave set at mean pitch diameter
Belts Turn Over in Grooves	Damaged cord section in belts. Frayed or gouged belts.	Replace belts
	Excessive vibration	Tension belts, replace belts if damaged.
	Flat idler pulley misaligned	Realign idler
	Worn sheaves	Realign drive
Belt Squeal	Excessive overload. High starting load. Belts not tensioned properly.	Tension drive or redesign and replace drive.
	Insufficient arc of contact	Increase center distance or use Gripnotch Belts
Belt Breakage	Foreign material in drive	Provide drive guard

TROUBLE SHOOTING GUIDES
VARIABLE SPEED DRIVES

PROBLEM	PROBABLE CAUSE	SOLUTION
	Belts damaged during installation	Replace belts
	Shock or extreme overload	Eliminate overload cause or redesign drive.
Belt Stretch Beyond Take-up	Worn sheaves	Replace Sheaves
	Under designed drive	Redesign and replace drive
	Take-up slippage	Reposition take-up
	Drive excessively tensioned	Properly tension drive
	Damaged cord section during installation	Replace belts and properly install
Excessive Vibration	Damaged belt cord section	Replace belts
	Loose belts	Tension drive
	Belts improperly tensioned	Tension drive with slack of each belt on the same side of the drive
Belts too Long at Installation	Insufficient take-up	Use shorter belts
	Drive improperly set up	Recheck driver and driven machine set up
	Wrong size belts	Use correct size belts
Belts too Short at Installation	Insufficient take-up	Use longer belts
	Drive improperly set up	Recheck driver and driven machine set up
	Wrong size belts	Use correct size belts
Belts Mismatched at Installation	Belts matched by code number only	Replace belts with Machine Matched Belts
Belts Mismatched at Installation	Old belts and new belts used together on the same drive	Replace with new belts

TROUBLE SHOOTING GUIDES
VARIABLE SPEED DRIVES

PROBLEM	PROBABLE CAUSE	SOLUTION
- Continue -		
	Different brand name belts used on same drive	Replace with a set of Machine Matched Belts
	Driver and driven shaft shifted	Realign drive
	Worn sheaves	Replace sheaves
Belts Mismatched After Service	Belts improperly tensioned, causing more stretch of some belts than others	Replace belts and tension drive with slack of each belt on the same side of the drive
	Old belts and new belts used together on the same drive	Replace with new belts
	Different brand name belts used on same drive	Replace with a set of Machine Matched Belts.
	Driver and driven shafts shifted from parallel	Realign drive
	Belt cord section damaged during installation	Replace belts and install properly
Drive Fails to Adjust	Fretting corrosion (drive allowed to operate at one speed over a period of time).	Sheave must be disassembled, cleaned and lubricated, then reassembled.