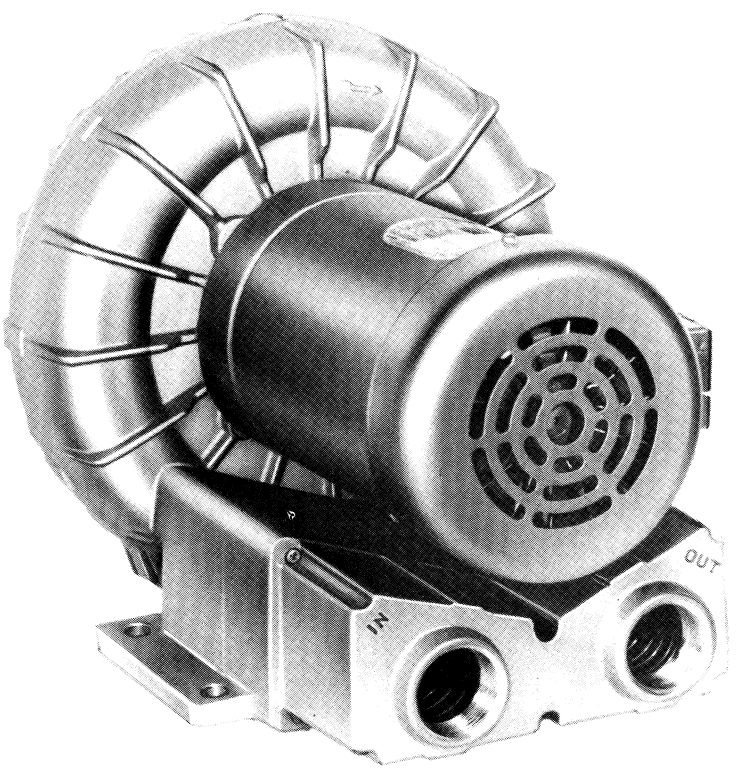
VACU-MAID™

CR-1500 SERIES
INSTRUCTION MANUAL



Lindsay Built-In Vacuum Systems

SAFETY INSTRUCTIONS

This is the safety alert symbol. When you see this symbol, personal injury is possible. The degree of injury is shown by the following signal words:

DANGER: Severe injury or death will occur if hazard is ignored.
WARNING: Severe injury or death can occur if hazard is ignored.
CAUTION: Minor injury or property damage can occur if hazard is ignored.
Review the following information carefully before operating or continuing with installation.

General Information

DANGER: Do not pump flammable or explosive gases or operate in an atmosphere containing them. Ambient temperature for normal operation should not exceed 40 degrees C (105 degrees F). For higher ambient operation, consult the factory. Blower performance is reduced by the lower atmospheric pressure of high altitudes. If it applies to this unit, consult an LMI distributor or the factory for details.

Installation

WARNING: Electric shock can result from bad wiring. Wiring must conform to all required safety codes and be installed by a qualified person.
Grounding is required.
The LMI blower can be installed in any position. The flow of cooling air over the blower and motor must not be blocked.
Plumbing - The tubing ports are designed as connection ports only and will not support the plumbing. Be sure to use the same or larger size tubing and fittings to prevent air flow restrictions and over-heating of the blower. Care should be taken so dirt and chips, often found in new plumbing, will not be allowed to enter the blower.
Noise - To reduce noise and vibration, the unit should be mounted on a solid surface that will not increase sound. The use of shock mounts or vibration isolation materials is recommended. If needed, inlet or discharge noise can be reduced by attaching muffler assemblies (see accessories).
Rotation - The blower should only rotate clockwise as viewed from the electric motor side. This is marked with an arrow in the casting. Proper rotation can be confirmed by checking air flow at the IN and OUT ports. On blowers powered by a three phase motor, rotation is reversed by changing any two of the three power wires.

Operation

WARNING: Solid or liquid material exiting the blower or piping can cause eye damage or skin cuts. Keep away from air stream.
CAUTION: Attach blower to solid surface before starting to prevent injury or damage from unit movement. Air containing solid particles or liquid must pass through a filter before entering the blower (see accessories list for filter suggestions). Blowers must have mufflers, filters, other accessories and all tubing attached before starting. Any foreign material passing through the blower may cause internal damage.
CAUTION: Outlet tubing can burn skin. Guard or limit access.
Mark "CAUTION Hot Surface - Can cause burns."
Air temperature increases when passing through the blower. Three to five feet of metal tubing is required from the exhaust of the unit.
The blower must not be operated above the limits for continuous duty. Do not close off inlet (for vacuum) to reduce extra air flow. This could cause added heat and motor load.
ACCESSORIES - The LMI pressure/vacuum relief valve, DRV-330, will limit the operating duty by admitting or relieving air. The relief valve also allows full flow through the blower when the relief valve closes.

Servicing

WARNING: Disconnect electric power before servicing. Be sure rotating parts have stopped. Electric shock or severe cuts can result. Inlet and exhaust filters need occasional cleaning or replacement of the elements. Failure to do so will result in more pressure drop, reduced air flow and hotter operation. The outside of the unit requires cleaning of dust and dirt. The inside of the blower may also need cleaning to remove material coating the impeller and housing. If not done, the buildup can cause vibration, hotter operation and reduced flow. Noise absorbing foam in the mufflers may need replacement. KEEP THIS INFORMATION WITH THE BLOWER. REFER TO IT FOR SAFE INSTALLATION, OPERATION OR SERVICE.

INSTALLATION

The CR-1500 Series units are shipped in three main cartons. One carton contains the primary dirt separator/collector (dirt canister), while the other cartons contain the motor and pump assembly and the secondary dirt separator/ collector. Also shipped with the unit is the starter/remote control box and the DRV-330 Relief Valve. Upon receipt you should carefully unpack all three units and inspect them for any shipping damage. After verifying that there has been no shipping damage the next step is to determine where and how the power unit and dirt canisters are to be mounted.

MOUNTING

When determining where you are going to mount the power unit and dirt canisters, several factors should be taken into account. First, make certain you are choosing a location that is easily accessible for routine maintenance. Be certain that electrical power can be brought to the pump easily. It is recommended that these units be exhausted outdoors, so we would suggest mounting on or near an outside wall. The exhaust should be low to the ground to prevent radiation of noise. Once you have done this, choose which of the two suggested mounting formats shown below as figures 1 and 2, best suits your needs. **NOTE:** If mounting on the wall make sure support can handle unit weight.

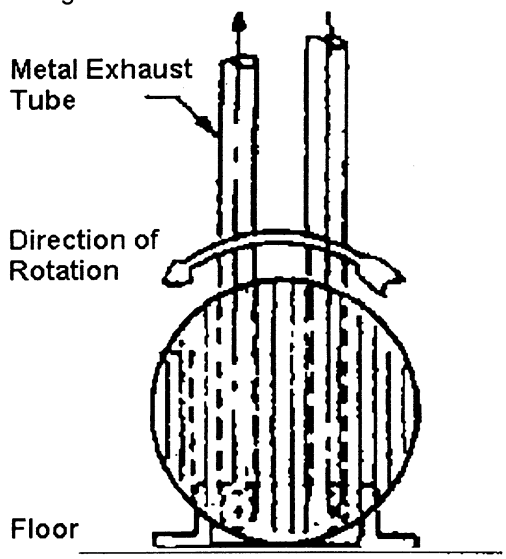


FIGURE 1
Motor/Pump mounted on floor

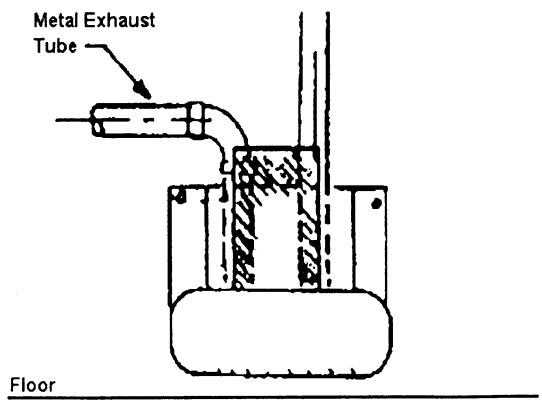


FIGURE 2
Motor/Pump mounted on wall

Once the motor/pump assembly and dirt canisters have been mounted connect 3" plastic/metal tubing between the outlet port of the dirt canister and the inlet port of the motor/pump assembly. When connecting the tubing to the motor/pump assembly be certain that the tubing enters the end of the housing approximately 3/4" and is then glued in place. Next vent the exhaust port of the motor/pump assembly, using 3" aluminum or steel tubing for the first five feet then continuing with tubing, to either the outside wall or through the roof making certain that the outside vent is turned in such a manner so that no rain can enter the tubing (see figure 3).

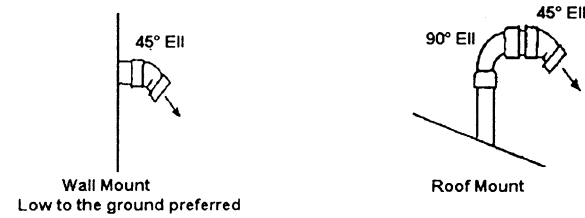


FIGURE 3

WIRING

The next step in installation is to connect the power leads of the motor/pump assembly to the starter/ remote control box. Wire the motor for the proper voltage (208,230, or 460 volts) as shown on the nameplate on the motor. Run the three motor/pump lines to the starter/remote control box and connect at T1, T2 and T3 on the contacter as shown on page 8. Please note the wiring should be done by a certified electrician.

Three Phase:

Connect your incoming power leads as follows. **Note:** connections are made at the overload relay which connects to L1, L2, and L3 of the contacter. Connect your ground lead to a convenient location inside the remote control box. Once you have made these connections it is necessary to check the pump motor for correct rotation.

Start the motor and watch the direction of the shaft. The shaft should rotate in the direction of the arrow located on the motor housing (clockwise when facing the intake and exhaust ports). If it does not rotate in the proper direction let the motor come to a complete stop and then simply change any two of the three leads you have just connected (for example interchange the L-2 and L-3 connections). **<THE MOTOR MUST COME TO A COMPLETE STOP BEFORE YOU CHANGE THE LEADS AND RESTART>** After doing this briefly start the motor again and check the shaft rotation. The shaft should now rotate in the correct direction. If it does not contact your distributor or Lindsay Manufacturing for further instructions. **UNDER NO CIRCUMSTANCES SHOULD YOU LET THE MOTOR RUN IN REVERSE FOR AN EXTENDED PERIOD OF TIME.** Once the shaft is rotating in the correct direction, connect the remote control wires as shown at the bottom of the remote control box (see figure 6).

To complete the installation connect the vacuum inlet on the primary dirt canister (lower connection) to the incoming 3" tubing. Make certain that the tubing enters the inlet housing at least 3/4" and then glue in place. Next, connect the outlet (top connection) of the primary dirt canister to the secondary canister (top connection) then from the outlet of the secondary canister (bottom connection) to the vacuum pump intake port (left hand side viewed from motor end). Then run five feet of metal tubing from the exhaust port (right hand side) before using PVC tubing to exhaust to outside. Once this is completed the unit is ready for operation.

DRV-330 Air Relief Valve

One DRV-330 Air Relief Valve comes with the CR-1500 Series pump and is preset at the factory. The DRV-330 (see figure 4) air relief valve needs to be set at 90" H_20 to bleed approximately 150 CFM into the system to help cool the regenerative blower. **NOTE: if less than 150 CFM is bled into the system damage may occur to the blower.**

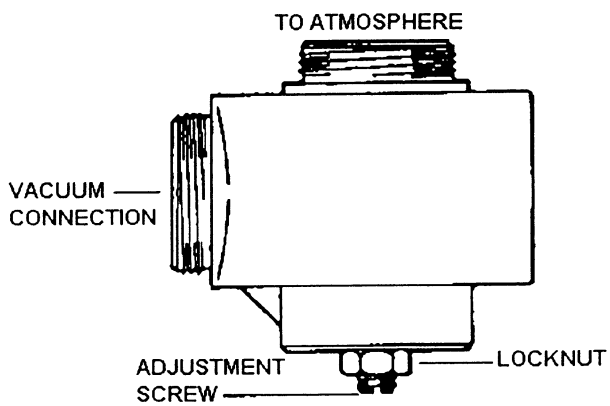


FIGURE 4

If adjustment is required please follow these adjustment steps.

The DRV-330 air relief valve is adjustable from 30 to 160" H_20.

The adjusting of the relief valve is accomplished by loosening the lock nut on the adjusting screw and turning the adjusting screw with the blade of a screwdriver. Turning the adjusting screw clockwise will increase the relief valve setting while turning the relief valve counterclockwise will decrease the setting. Hold the screwdriver in place when retightening the lock nut. The use of the vacuum gauge (VG-160) will provide an accurate setting.

When installing the DRV-330 be sure to place the air relief valve between the unit and the secondary DC-1603 dirt canister (see figure 5) and install the intake air safety screen fitting (RS330A).

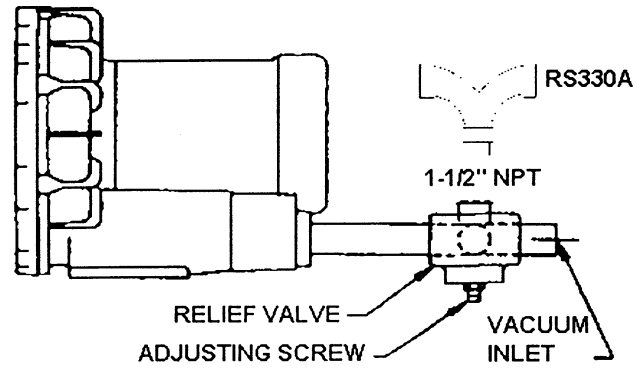
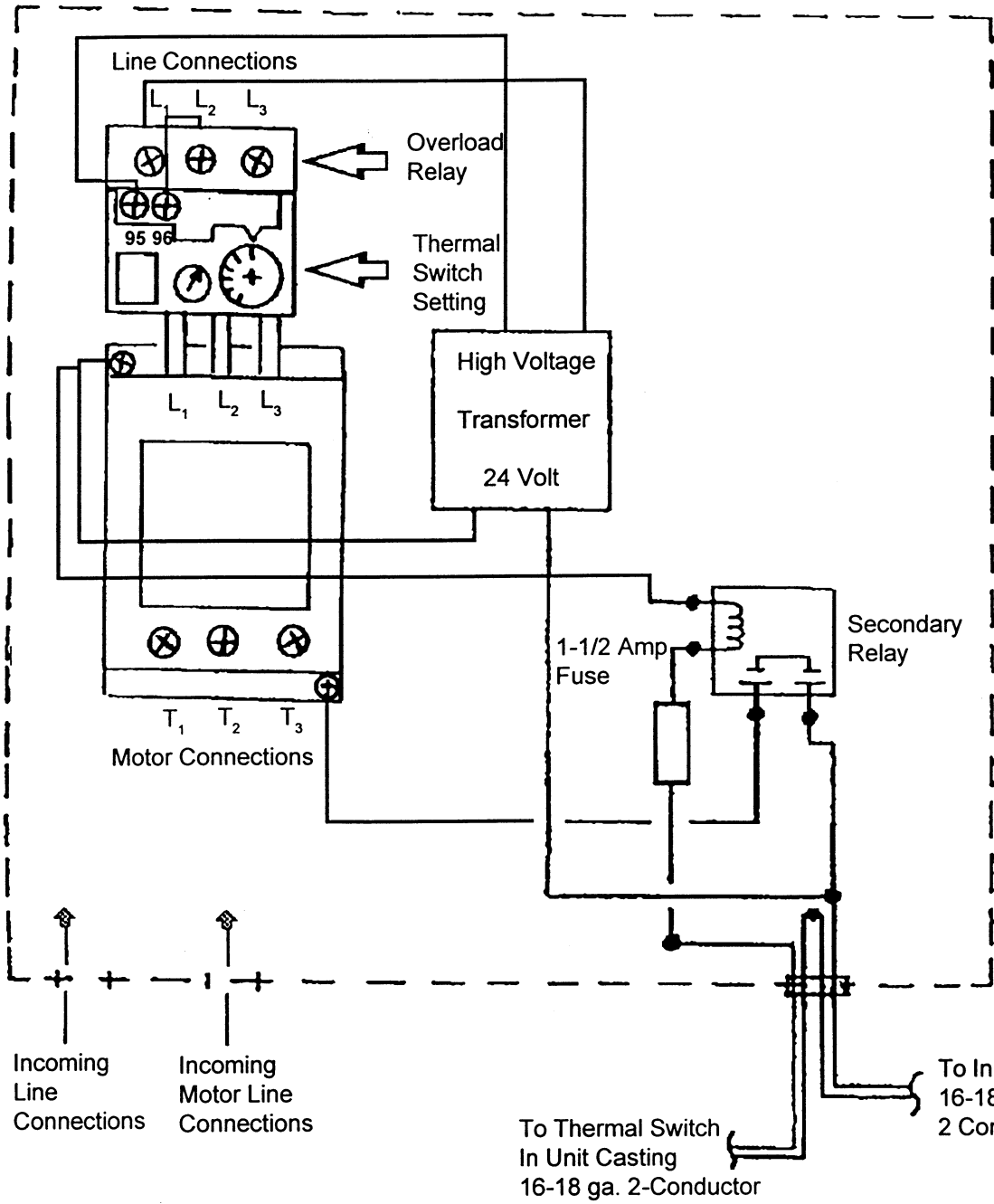
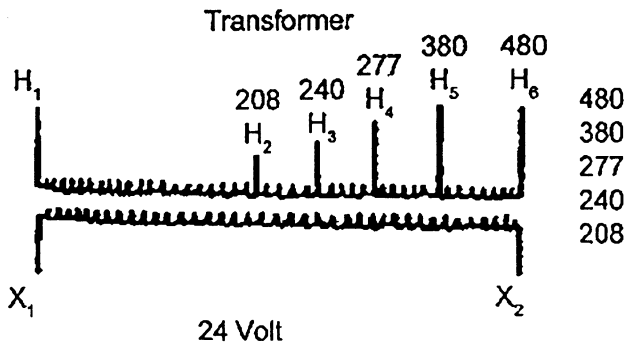


FIGURE 5

CAUTION: The relief valve must be placed in the vertical position with the adjusting screw pointing straight down. Failure to do so could result in incorrect relief valve vacuum settings.

CR-1500 Series
Wiring Instructions for Control Box





NOTE: To reverse rotation on any three phase motor, interchange any two external motor line connections to any two line leads.

Check the thermal relay setting to match the motor amperage.

TROUBLE SHOOTING

The CR-1500 Series units use two protective devices inside the motor/pump assembly. The first is a thermal switch located in the pump housing that will operate when the pump is not moving enough air to cool. This thermal switch prevents the blower from overheating and is set for 212° F. Since the exhaust air can reach temperatures as high as 230° F. the five feet of aluminum or steel tubing allows the heat to radiate away from the pump quicker and also helps prevents the possibility of pump damage due to overheating. If this switch does turn the motor off it will require about two minutes for the thermal switch to reset. The second protective device is a thermal overload in the control box that will operate if the motor exceeds rated amperage. While it is very unusual for this switch to operate, if it does turn the motor off, it will require about 30 minutes for the pump and motor to cool off enough to resume operation. The major cause for this switch operating is low voltage, other things that can cause this switch to operate is a jammed turbine blade, too much lint inside the motor or the intake holes into the motor become blocked with dirt or lint. Since these pumps are designed to move a high volume of cubic feet of air per minute it should not be used in sealed applications where the pump must operate under sealed or low volume conditions. There are relief valves that will need to be installed when these pumps are used in dental operations or restricted air applications. *IF THE BLOWER OVER-HEATS OFTEN, OR IF USAGE AT LOW AIRFLOWS IS ANTICIPATED UPON OCCASSION, CHECK THE RELIEF VALVE FOR PROPER OPERATION TO ALLOW COOLING AIR BETWEEN THE PUMP AND THE DIRT CANISTER.* For additional information see troubleshooting guide below:

TROUBLESHOOTING

Symptom	Possible Diagnosis	Possible Remedy
Excess Vibration	Impeller damaged by foreign material	Replace impeller
	Impeller contaminated by foreign material	Clean Impeller, install adequate filtration
Abnormal Sound	Motor bearing failed	Replace bearings
	Impeller rubbing against housing	Repair blower, check clearances
Increase in Sound	Foreign material can coat or	Replace foam muffler elements,
	destroy muffler foam	trap or filter foreign material.
Blown Fuse	Electrical wiring problem	Have qualified person check fuse capacity and wiring.
Unit very Hot	Running at too high a	
	pressure or vacuum	Install a relief valve
	Relief Valve Stuck	Inspect relief valve for operation

MAINTENANCE

The only maintenance required for the CR-1500 is the emptying of the dirt canisters, periodic cleaning of the upper safety screen and filter bag, inspection and replacement of the FC-750 filter cartridges and, periodic pump bearing lubrication (see chart below). To empty the dirt canisters refer to pages 8 and 9 for dirt can maintenance.

PUMP BEARING LUBRICATION

No Lubrication needed at startup. Bearing lubricated at the factory
Motor is equipped with alemite fitting. Clean tip of fitting
and apply grease gun. Use 1 to 2 strokes of high quality
ball bearing grease equal to the following type:
Consistency: Medium **Type:** Lithium Typical **Grease:** Shell Dolium R

Hours of Service	Suggested Relube Interval
5,000	3-years
Continual Normal Application	1 -year
Seasonal service motor idle	1 -year at beginning
for 6 months or more	season
Continous-high ambients,	
dirty or moist applications	6-months

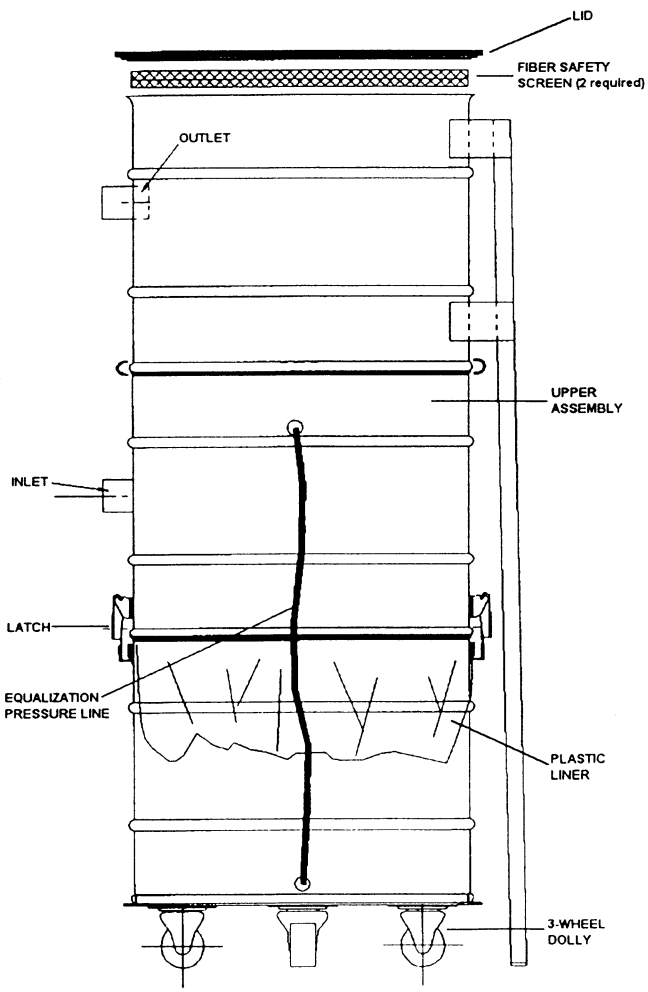
FEATURES

POWER UNIT

There are two major design reasons why the series power unit is so ideally suited for commercial application. The first is the fact that the unit is powered by an induction motor. This means there are no brushes to wear out so the unit has an almost infinite life as compared to a unit powered by a series motor where brushes limit the length of service in a commercial application.

Secondly, the series motor blower systems were designed so that they require approximately only eight horsepower to move a maximum C.F.M. of air flow through a three inch opening. This means that while the motor is designed to operate at greater horsepower, since it is not required to operate at full capacity, the lifetime of the motor is increased.

The model series power units are also protected by a thermal switch in the casting and a thermal overload in the control box for over amperage. For more information on these see Troubleshooting.



DC-2530
FIGURE 7

MOTOR

Motors are designed to run within Class B limits. The stator windings are treated to assure maximum moisture protection while all machined surfaces in the motor are coated with a zinc chromate primer. The bearings in the motor are all prelubricated. Follow the Pump Bearing Lubrication guide after installation (see page 7).

DC-2530 DIRT CANISTER
Comes with the CR-1525 Series

The DC-2530 dirt canister consists three parts. The separator canister (two parts) or top part, is made of heavy gauge steel and is mounted on three legs, while the lower upper canister, which holds the cyclonic separator funnel and gasket, is also made of heavy gauge steel. The bottom canister is mounted on a three wheel dolly so it can be easily moved for emptying (see Figure 7) and also has an equalization pressure line from the bottom canister to the top seperator section. This line helps the 3 mil plastic bag in place. The separator canister is made of heavy gauge steel, and contains a three stage filter to prevent foreign material from entering the rotor blades of the pump.The first stage of the filtering process consists of the cyclonic cone that separates the heavier dirt as it enters the canister. The air then passes into the second stage, the stand pipe, that will let only the cleaner air out while insuring that the heavier dirt has dropped into the bottom canister. From the stand pipe the air passes into the third filter stage, that of the safety screen, or "hogs hair" type filter. This filter then collects those particles that were not heavy enough to be separated earlier, before passing the air into the vacuum pump where it is vented outside.

To service the bottom dirt canister please follow these instructions.

1. Remove the Equalization Pressure Line by pushing down on the release mechanism and pulling out the Equalization pressure Line at the same time.
2. Unlatch bottom 38 Gallon (144 Liter) drum and roll out from under upper separator assembly. Check the attached equalization pressure fittings on the upper assembly and bottom drum. Make sure the fittings are secure. **Caution: do not over tighten.**
3. Make sure the bottom drum fiber screen disk is flat on the inside bottom of the drum and covers the bottom equalization pressure opening. The fiber screen prevents the plastic liner from sealing against the equalization pressure line opening.
4. Place the 38 Gallon (144 Liter) minimum 3 mil plastic liner in the drum so the plastic liner overhangs the outside of the drum approximately 18" (45.7 cm) to 22" (55.9 cm). Remove air trapped between plastic

liner and drum by smoothing out the liner back against the drum. Make sure the upper can gasket is clean before latching the bottom drum to the upper separator assembly. Insert the equalization pressure line back into the fitting until the line sets into the fitting and stops.

5. The 38 Gallon (144 Liter) primary separator has two removable fiber safety screens. Remove the top lid of the separator to remove the fiber safety screens and clean. Clean by shaking or washing any debris that may have collected on it. Check lid gasket to make sure it is clean before replacing the dry fiber safety screens and replacing the lid.

SAFETY SCREEN

The safety, or "hogs hair" filter screen should be cleaned on a regular basis. To do this lift off the top lid of the dirt canister and lift out the filter. After removing the filter clean it by washing, brushing or using compressed air and then put it back in the top of the canister and replace the lid. If the filter is washed be sure to let it completely dry before replacing.

DC-2600 DIRT CANISTER
Comes with the CR-1526 Series

Note: The CR-1526 series and the DC-2600 are for use ONLY for fine dust control. Contact the factory for application information.

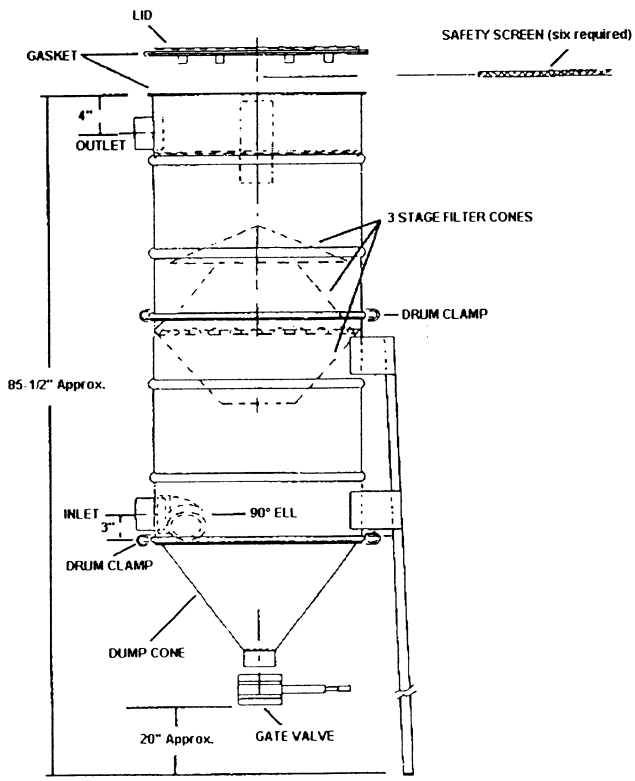


FIGURE 8

The DC-2600 dirt canister consists of two parts. The separator canister, or top part, is made of heavy gauge steel. The bottom canister, which holds the cyclonic separator funnels, dump cone, gate valve and is mounted on three legs, is also made of heavy gauge steel. The gate valve is for easy dumping into a 5 or 10 gallon container. (See figure 8). The separator canister contains three filter cones to prevent foreign material from entering the rotor blades of the pump. The first stage of the filtering process consists of the cyclonic cone that separates the heavier dirt as it enters the canister. The air them passes up through the filter cones to the stand pipe which will let only the cleaner air out insuring that the heavier dirt has dropped into the bottom canister. From the stand pipe the air passes into the final filter stage, that of the safety screen, or "hogs hair" type filters. These filters then collect those particles that were not heavy enough to be separated earlier, before passing the air into the vacuum pump where it is vented outside.

SAFETY SCREEN

The safety, or "hogs hair" filter screens should be cleaned on a regular basis. To do this lift off the top lid of the dirt canister and lift out the filters. After removing the filters clean them by washing, brushing or using compressed air and then put them back in the top of the canister and replace the lid. If the filters are washed be sure to let them completely dry before replacing.

DC-1800
Comes with the CR-1518 Series

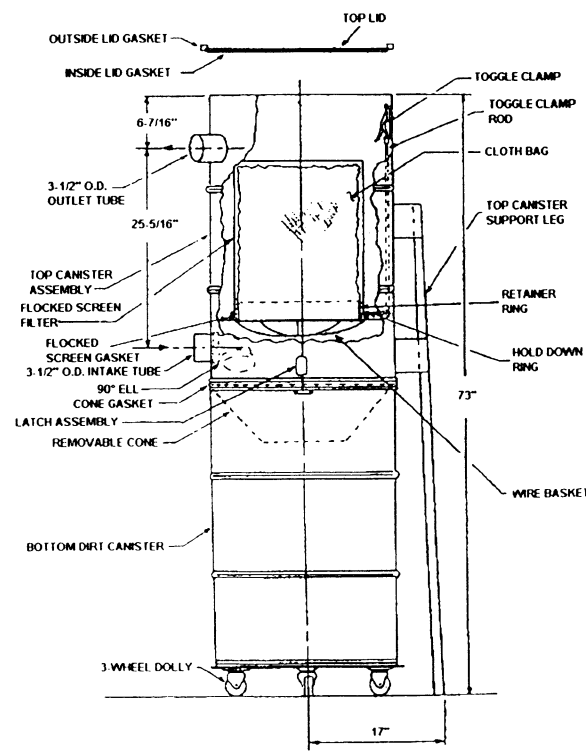


FIGURE 9

This dirt canister is similar in construction to the DC-2530 except that it contains a secondary filter that consists of a heavy cloth bag and a tertiary filter made of a nylon type material. The secondary filter is a tightly woven, heavy cloth bag that is held in place by a steel frame. The tertiary filter is made of nylon material and is held in place by a metal ring (see Figure 9). The heavy dirt is collected in the bottom canister, while the lighter dust accumulates in the filter bag located in the top canister. Because of this the filter bag will need to be cleaned periodically. The frequency of cleaning will depend on usage and the amount of fine dust being picked up by the system. To clean the bag, which is mounted on a wire frame, pull down on the handle of the frame. Then remove the cloth bag from the frame for cleaning. After you dump the bag you should shake it or wash it to remove all the smaller dirt particles. If you wash the bag be sure to let it completely dry before putting it back in the dirt can. To remove the tertiary filter for cleaning you must first remove the top lid from the DC-1800 and then release the three toggle clamps. Lift the filter out and remove the clamp ring to which it is attached. Then clean the filter by washing, brushing or blowing if out with compressed air. Like the cloth bag, if you wash the filter, it must be allowed to completely dry before you place it back in the canister. When you put it back in the canister be sure to reinstall the clamp ring, latch all three toggle clamps and replace the top lid before resuming operation.

SECONDARY DIRT CANISTERS

DC-2000 DIRT CANISTER

In applications where fine dust control is needed the DC-2000 Dirt Canister which works with the DC-2530 or DC-1800 is the perfect solution. The DC-2000, made of heavy gauge steel, contains two high efficiency cartridge filters for fine dust control (see Figure 10).

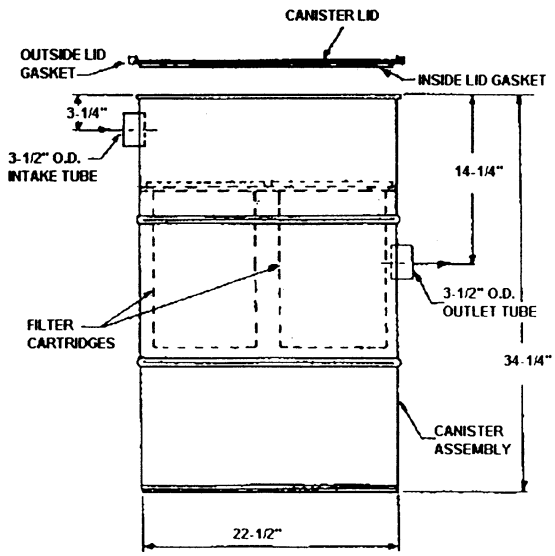
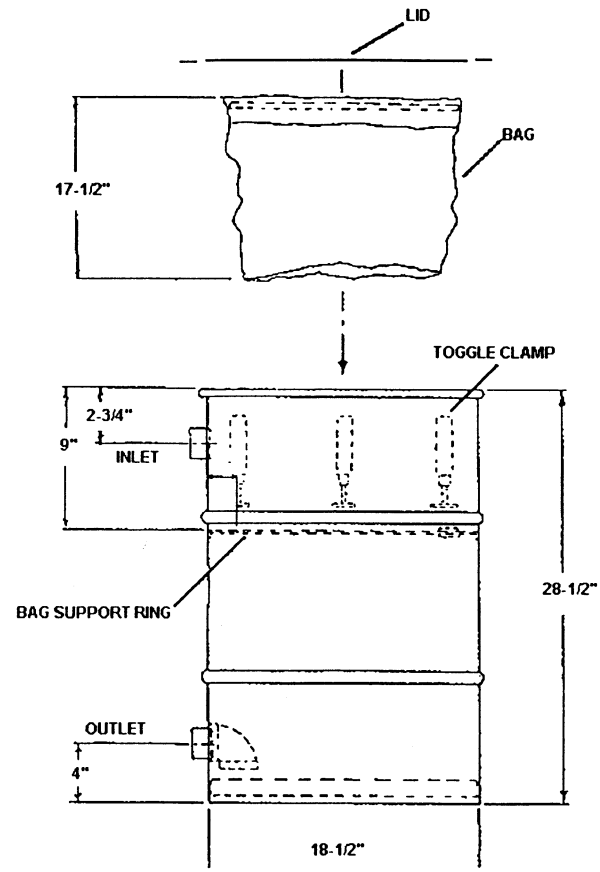


FIGURE 10

The fine dust is captured inside the cartridge filters (part # FC-750, 2-required) which typically have a long life and will hold a large amount of dust. The filters are not reusable and must eventually be disposed of and replaced. Each filter will filter out approximately 99.97% of the dust particles 3 to 5 microns in size that are picked up and each filter has approximately 37 square feet of filtering area for a total of approximately 74 square feet.

DC-1602/1603 DIRT CANISTER



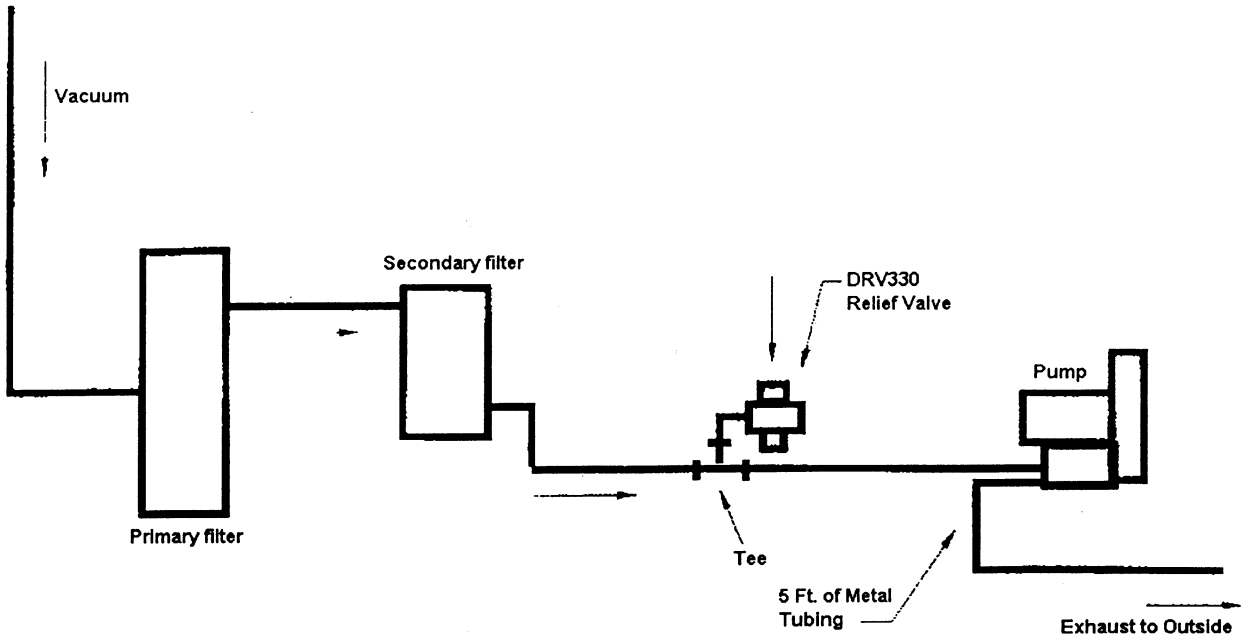
DC-1603 has 3-1/2" O.D. Connections DC-1602 has 2" O.D. Connections

FIGURE 11

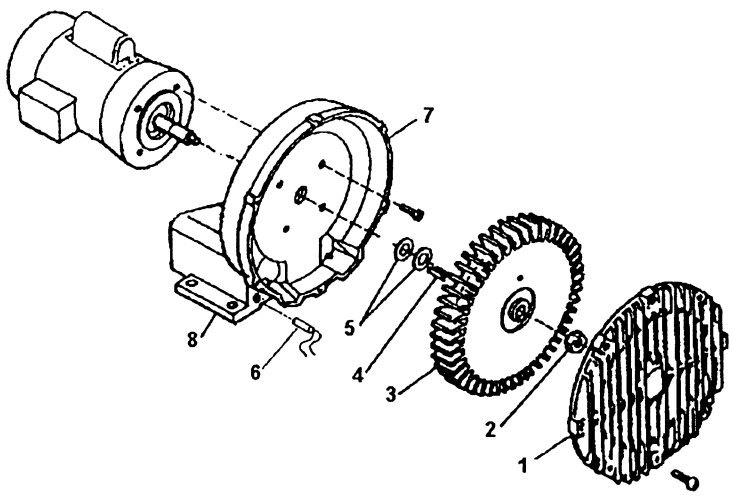
In applications where fine dust control is needed the DC- 1602/1603 Dirt Canister, which work with the DC-2530, DC-1800 or DC-2600, is the perfect solution. The DC1602/1603, made of heavy gauge steel, contains a four layer high efficiency bag filter for fine dust control (see Figure 11).

The fine dust is captured inside the filter bag. The filter bag has a long life and will hold a large amount of dust before cleaning is required. The filter bag will filter out down to 3 to 5 microns and has about 8 square feet of filtering area. Since the filter bag is cleanable, it is reusable. To remove and clean the filter bag simply release three toggle clamps, from the bag ring, then remove the filter bag.

TYPICAL HOOKUP



CR-1500 PARTS BREAKDOWN



ITEM	DESCRIPTION	QTY.	PART NUMBER
1.	Front Cover	1	CR1500-1
2.	Lock Nut	1	CR1500-2
3.	Impeller	1	CR1500-3
4.	Key	1	CR1500-4
5.	Shim .010"		CR1500-5A
	Shim .005"		CR1500-5B
6.	Thermal Switch	1	TB210
7.	Housing	1	CR1500-6
8.	Muffler Box	1	
9.	Muffler Spring	2	CR1500-8
10.	Muffler Foam	4	CR1500-9
11.	Motor 3-Phase	1	CR1510-A

COMMERCIAL / INDUSTRIAL LIMITED WARRANTY

This Warranty (valid in the United States only) gives you specific legal rights, you may also have other rights which vary from State to State.

ITEMS COVERED

The commercial pump of your LMI Vacuum System is hereby warranted against defects in material and workmanship, to the original owner, for one (1) year following installation. This Warranty is effective upon date of installation until the original purchaser ceases to own the system or the system is removed.

ITEMS NOT COVERED

This Warranty does not cover such conditions as normal wear or from damage caused by accidents, negligence, misuse, or improper alteration, or from damage by fire, flood, or other acts of God. Muffler wear is normal and is not considered to be a defect in material or workmanship. Further, this Warranty does not apply to flexible hoses, wands and cleaning tools, or to the act of installing the LMI Commercial/Industrial Vacuum System.

HOW TO INVOKE THIS WARRANTY

If it should ever become necessary to invoke the rights and privileges of this Warranty the original purchaser should contact the installer or distributor. The distributor shall repair or replace, at Lindsay Manufacturing's sole option, such parts that may be found to be defective. Such labor charges that are deemed necessary and proper shall be the responsibility of the owner if repairs are necessary. Only repairs carried out using authentic Lindsay replacement parts and by an authorized LMI distributor shall be covered. If the LMI distributor-installer has not solved your problem within a reasonable time (but in all events within 45 days of when you became aware of a defect), write or call Lindsay Manufacturing, Inc., to obtain a return authorization number and delivery instructions for warranty service. All freight and/or removal charges incurred as a result of a return to the factory shall be the responsibility of the consumer. Proof of purchase is required for all warranty claims.

DISCLAIMER OF OTHER WARRANTIES

LINDSAY MANUFACTURING, INC., HEREBY DISCLAIMS ALL LIABILITY WHATSOEVER FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH OCCUR AS A RESULT OF DEFECTS IN MATERIAL AND WORKMANSHIP IN THE PRODUCT. LINDSAY MANUFACTURING, INC., ALSO HEREBY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. TO THE EXTENT THAT ANY LAW PROHIBITS, IN WHOLE OR PART, THE LIMITATION OF IMPLIED WARRANTIES, ANY IMPLIED WARRANTY APPLICABLE TO THE PRODUCT SHALL NOT EXCEED ONE (1) YEAR IN COMMERCIAL OR INDUSTRIAL APPLICATIONS.

This warranty is exclusive and is in lieu of all other expressed warranties, and in lieu of all other obligations or liabilities on the part of Lindsay Manufacturing, Inc., for damage to person or property. We do not authorize any person, including any dealer, agent, supplier, or representative of Lindsay Manufacturing, Inc., to make any other warranty or guarantee on our behalf, or assume for us any liability on the LMI Commercial/Industrial Vacuum System other than that contained herein. No oral representations regarding warranty shall be binding upon Lindsay Manufacturing, Inc., whether extended before or after sale of that product.

LINDSAY MANUFACTURING, INC. / P.O. BOX 1708 / 580-762-2457 / PONCA CITY, OK 74602-1708