

Advantage-L

Series 4



Central Vacuum Systems

(Tank Mounted Models)

(Ver. 10/08)

Operating Instructions and Maintenance Manual



DESCRIPTION

The Becker Advantage-D and Advantage-L central vacuum systems are available as either tank mounted simplex or duplex, or as vertically expandable/modular duplex through sextuplex models. All include automatic electrical controls to maintain vacuum levels between pre-set points; ASME coded receivers; inlet filters;

check valves; isolation valves; vibration isolators; flexible connectors; and vacuum gauges.

Advantage-D systems employ Becker 100% oil-less pumps, while Advantage-L systems employ Becker oil flooded models for operation at vacuum levels as high as 29.84"Hg (2 torr).

INSTALLATION

Unloading

Inspect the system carefully for any sign of damage incurred during transit. Becker ships all systems F.O.B., factory; therefore, damage is the responsibility of the carrier, and all claims must be made with them.

Using a fork lift truck, carefully lift the system from the transport vehicle. Using the fork lift truck, place the components in the final location, leaving a minimum of 24" around the package for service and ventilation. (see: COMPONENT ASSEMBLY below for instructions regarding systems assembly).

Location

Certain considerations should be given to the placement of the system. The package may be installed in any location that is level and will support its weight. Adequate ventilation is required since the pumps are air-cooled. The ambient temperature should be between 35°F and 100°F. The system should be located as

When selecting the installation location for the system, leave a minimum of 24" on all sides to permit routine servicing (i.e., changing filters) and ventilation.

close as possible to the point of usage to prevent excessive loss of operating pressure due to pressure drop.

Component Assembly

The system is shipped as separate units to facilitate installation. Most bases are designed to fit through a standard 36" doorway, though some receiver modules may need to be tipped slightly, and the top module of some systems stacked three high may need to be removed (see Caution, below).

CAUTION:

On vertically stacked systems, the pump modules may be top-heavy. Do not tip when moving.

Next, connect the inlet piping on the pump module to the inlet manifold. This may be accomplished by reconnecting the pipe union attached to the flexible connector.

Electrical Requirements

BE SURE THAT ALL POWER IS TURNED OFF PRIOR TO PERFORMING ANY WORK ON THIS ELECTRICAL PANEL!

The electrical controls for the system were wired at the factory and were fully tested.

NOTE: It may be necessary to switch two of the main power leads when performing start-up, if the pump rotation is in the wrong direction.

Attach the main power line to the main power terminal block and ground line to the ground lug in the control panel.

Vacuum Piping Connection

Before connecting any piping to the receiver, the plastic thread protector installed in the main receiver connection port must be removed. The main vacuum line to

the receiver must never be reduced below that provided on the receiver. Long piping runs may need to be increased in size to minimize pressure drop. Improper line

sizing may result in a loss of capacity. Ideally, piping should be constructed using long elbows and a minimum of turns. Contact the factory for assistance in determining proper line size and piping layouts.

All secondary lines should be taken from the top or side of the main lines to prevent any accumulated moisture from draining towards the pumps. All lines should slope away from the pumps. Any low points should be equipped with pipe drains or drip legs to remove accumulated moisture. If the vacuum systems remains under vacuum, a three valve setup may be required in order to drain the piping. Contact the factory for assistance.

START-UP

Oil

Systems are shipped from the factory with oil in the pumps. Should it be necessary to add oil, it must be added to the pump through the oil fill port located at the top of the top of the exhaust box. An exhaust pressure gauge is installed in the oil fill cap on all pumps; care must be taken not to damage the gauge when removing and replacing the cap. Add sufficient oil to bring the oil level to the fill level as noted on the exhaust box casting. Non-detergent oil should always be used to prevent foaming and possible plugging exhaust filter elements.

**NEVER ADD OIL THROUGH THE INLET
OR EXHAUST PORTS OF THE PUMP.**

Pump Rotation

Prior to actual operation, the pumps must be checked for correct rotation.

Using the Manual-Off-Auto switch on the door of the control panel, jog the motor of the specific pump that is to be checked by momentarily turning the switch to "manual" and back to "Off". By observing the cooling fan of the motor you can determine the rotation of the pump. U 4.20-U 4.250 pumps rotate in a counter clockwise direction when viewed from the fan end of the motor.

If the pumps are rotating in the wrong direction, rotation can be reversed by switching any two main incoming power leads. Correct rotation should be confirmed in the previous manner.

General Operation

All Becker central vacuum systems are operated by a programmable logic controller. Pump alternation is based on total pump running hours, the pump with the lowest hours will be started first, and the pump with the highest hours will be started last. The pump with the highest hours will be the first to turn off after high vacuum set point has been reached and the minimum run timer has been satisfied. When the system has reached its high vacuum set point and the minimum run timers have been satisfied the PLC will turn the pump with most hours off first and the second pump 20 seconds later.

If the next pump in rotation is unavailable due to the motor starter being tripped or the HOA switch being in the off position, the program will skip this pump and select the other pump. At this time the PLC will activate the All Pumps Running Alarm.

If the system vacuum level remains between the low and high set points with one pump meeting the demand, when this pump reaches its maximum run time it will shut off. When the vacuum level drops below the low set point the pump with least hours will turn on.

On cold start up the low vacuum alarm is inoperative until the low vacuum alarm and low vacuum set points have been exceeded. If the low vacuum set point has not been reached in 20 seconds the PLC will start the second pump.

On a Hospital System, press enter on the magelis to cancel the Alarm Test on start up/ reboot.

Low Vacuum and All Pumps Running Alarms will remain active until canceled even after the alarm condition has been corrected or is no longer present. To cancel alarm push the alarm silence button and then the enter button on the display screen.

On the *initial* system start-up, when the system is below the set point for the minimum vacuum level, one pump will operate. To prevent excessively high inrush currents upon initial start-up, the PLC will start the second pump in the system in a pre-established time increment, unless the minimum vacuum level has been reached first.

Occasionally, the lead pump does not have enough capacity on its own to raise the vacuum level to the maximum vacuum level set point. Under this condition, the pump will run continuously. To prevent the pump from accumulating significantly more hours than the other pumps, a timed alternation method is included in the PLC program that will alternate the lead/lag functions of the pumps on a timed basis. The standard period of alternation is four hours, but may be modified if the application requires. If the system does not alternate every 4 hours, contact the factory to determine the actual period of alternation.

Minimum run timers are programmed into the PLC to prevent motor damage due to heat from too many starts per hour. We use a ten minute minimum run timer. Should the upper vacuum level set-point be reached, and the timer on the PLC not be finished timing out, the pump will keep running until the timer is satisfied, at which time it will stop, unless the vacuum level has dropped below the lower vacuum level set-point.

MAINTENANCE

Pumps

Each pump in the system is a Becker U series model, which is an oil-flooded rotary vane vacuum pump. A separate operating manual is enclosed with this system.

It is recommended to change the oil every 500 hours as determined by the oil meters on the door of the enclosure. See: Start-up; Oil on page 3.

Exhaust Pressure Gauge

Each oil lubricated pump is equipped with an exhaust pressure gauge to indicate the condition of the exhaust filters that are located within the exhaust box, as back pressure. These filters are vital to the efficient separation of the oil aerosols that present in the discharge airstream. The exhaust pressure gauge should be checked periodically.

NOTE: The exhaust pressure gauge must be read when the pump is operating at open flow (no vacuum).

The following procedure is suggested:

- Turn the pump H-O-A switch to the “Off” Position.
- Close the pump isolation valve.
- Open the inlet bleed valve.
- Remove the inlet filter cover.
- Turn the pump H-O-A switch to “Hand” position.
- Read the pressure on the exhaust pressure gauge.

If the pressure is at or beyond the red zone, the exhaust filter must be changed.

Reverse the procedure to put the pump back on-line.

Inlet Filters

Each pump is equipped with a 5 micron inlet filter. It can be serviced by following these steps: first, close the isolation valve adjacent to the vertical manifold; second, open the vent valve located at the pipe elbow near the pump inlet (this vents the filter housing to atmospheric pressure); third, release the three clamps in the filter housing, and remove the filter cartridge. It is recommended that the filter be checked every week, initially. After experience is gained, the period for inspection may be altered.

The filter element may be cleaned by blowing with compressed air from the inside. Care must be taken not to use too much pressure, which could damage the element.

ELECTRICAL CONTROL PANEL

Description

The Becker electrical control panel is designed to control two vacuum pumps. It includes a programmable controller; low voltage control transformer (115 volt secondary) with fused primary and secondary; an emergency stop button; a back-up pump alarm; a pressure transducer with a panel mounted operator interface that has digital pressure indication, and running time indicator; and the following for each pump: Hand-Off-Auto switch with pump run light, and motor starter with disconnect. All components are enclosed in a NEMA 4X enclosure.

Programmable Controller

The Programmable Logic Controller (PLC) receives a signal from the pressure transducer and the selector switches and sends a signal to the motor starters. The run lights receive their signal from the auxilliary contacts on the motor starters.

Status Indicators

On the face of the PLC, a number of LED's show the condition of inputs, outputs, and of the controller itself. The input LED's indicate when electrical power is applied to the corresponding input terminal. Inputs are located on the bottom of the controller and are 24 Volts DC

Input LED's numbered:

- I0—Indicate pump 1 running in "AUTO" position.
- I1—Indicate pump 2 running in "AUTO" position.
- I2—Indicates the alarm is silenced.
- I3—Low oil/High temp., pump 1
- I4—Low oil/High temp., pump 2
- I5—Pump 1 running
- I6—Pump 2 running
- I7-I9—Spare
- I10—*Blank*
- I11—Industrial jumper

Output LED's numbered:

- O0—Alarm horn
 - O1—Motor starter 1 energized
 - O2—Motor starter 2 energized
 - O3—Alarm pilot light
 - O4—All pump running
- NOTE: This alarm is intended for industrial use only.
For hospitals, the NFPA 99 (current version) code requirements dictate that the hospital low vacuum alarm be sensed at a point upstream of the main system source (or isolation) valve, which may be independent of this Advantage-D system.
- O5—Low oil/High temp., Pump 1
 - O6—Low oil/High temp., Pump 2
 - O7—*Spare*

Also located on the PLC face near the upper left are controller condition indicating LED's:

- Power
- Run
- Err
- Start

EEPROM Memory Module

The EEPROM memory module contains "read only memory". It is used to store the program for the control sequence. The EEPROM will retain its program even when power to the PLC is turned off.

CAUTION: Turn off power to the processor before removing or installing the EEPROM

PLC Replacement

The control panel is wired to permit the pumps to operate manually when the PLC is removed for service. The H-O-A switch is placed in the "Hand" position; all automatic features are bypassed.

Alarm Relays

There is one alarm relay that is used for remote signaling. It is located just to the left of the starters, and is labeled R1. R1 is an all-pumps-running alarm, also called a reserve-pump-in-use alarm, and has three terminals with numbers 11, 12, and 14. Terminal 11 is the common; terminal 12 is a normally closed contact; and terminal 14 is a normally open contact. Low Vacuum and All Pumps Running Alarms will

remain active until canceled even after the alarm condition has been corrected or is no longer present. To cancel alarm push the alarm silence button and then the enter button on the display screen.

On Hospital systems press Enter on the Magelis to cancel Alarm Test on startup / re-boot.

Changing System Parameters

With the proper password the display screen will allow you to reset the vacuum set points, the minimum run time, hospital (2) or industrial (1) setting, and test (1) or normal (2) operation.

To save changes push Silence Alarm.

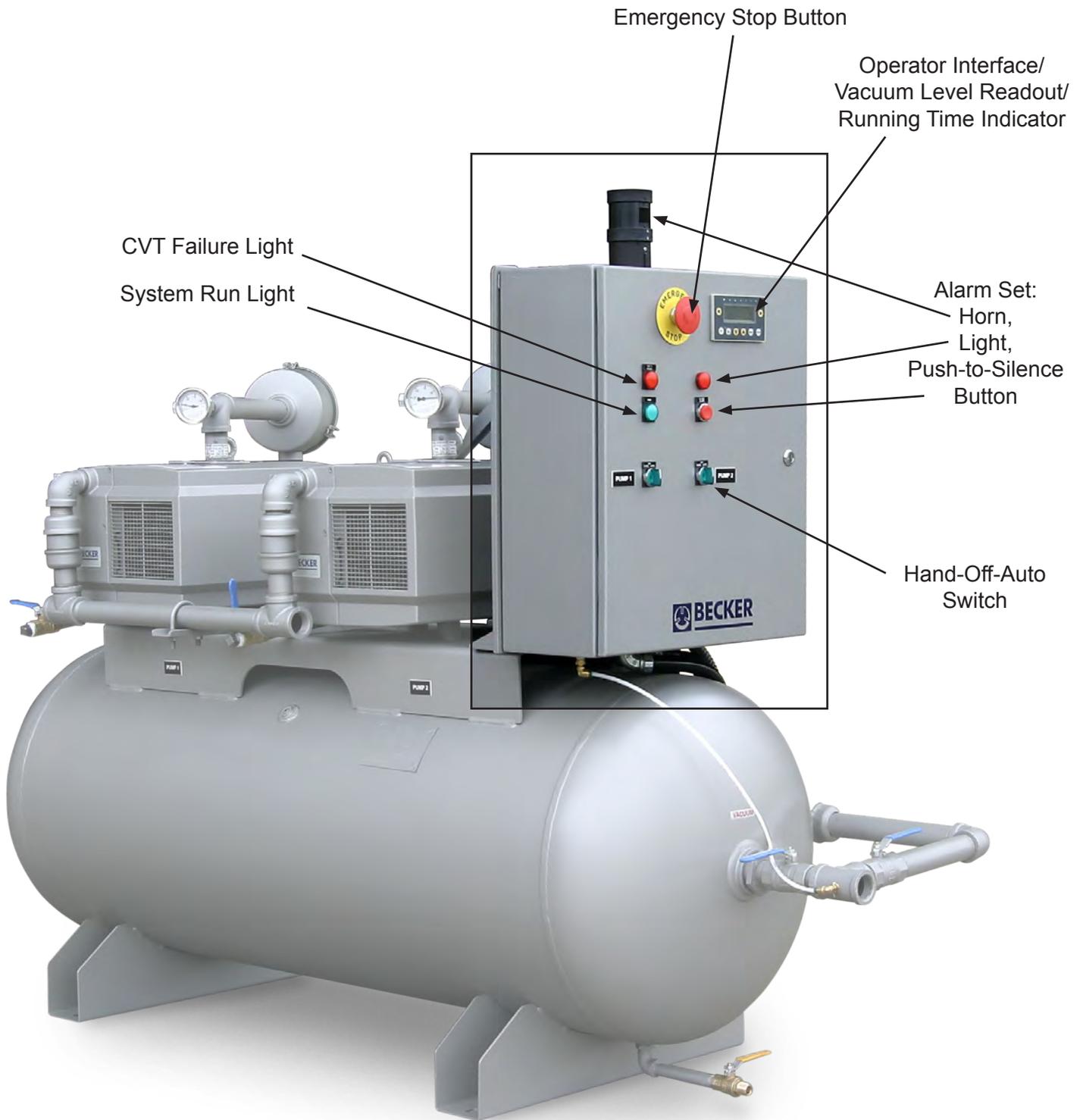
Starter

The starter's magnetic coil will be energized when a 24 volt current passes through A1 and A2 terminals. When the starter coil is energized, the contacts between L1 to T1, L2 to T2 and L3 to T3 close.

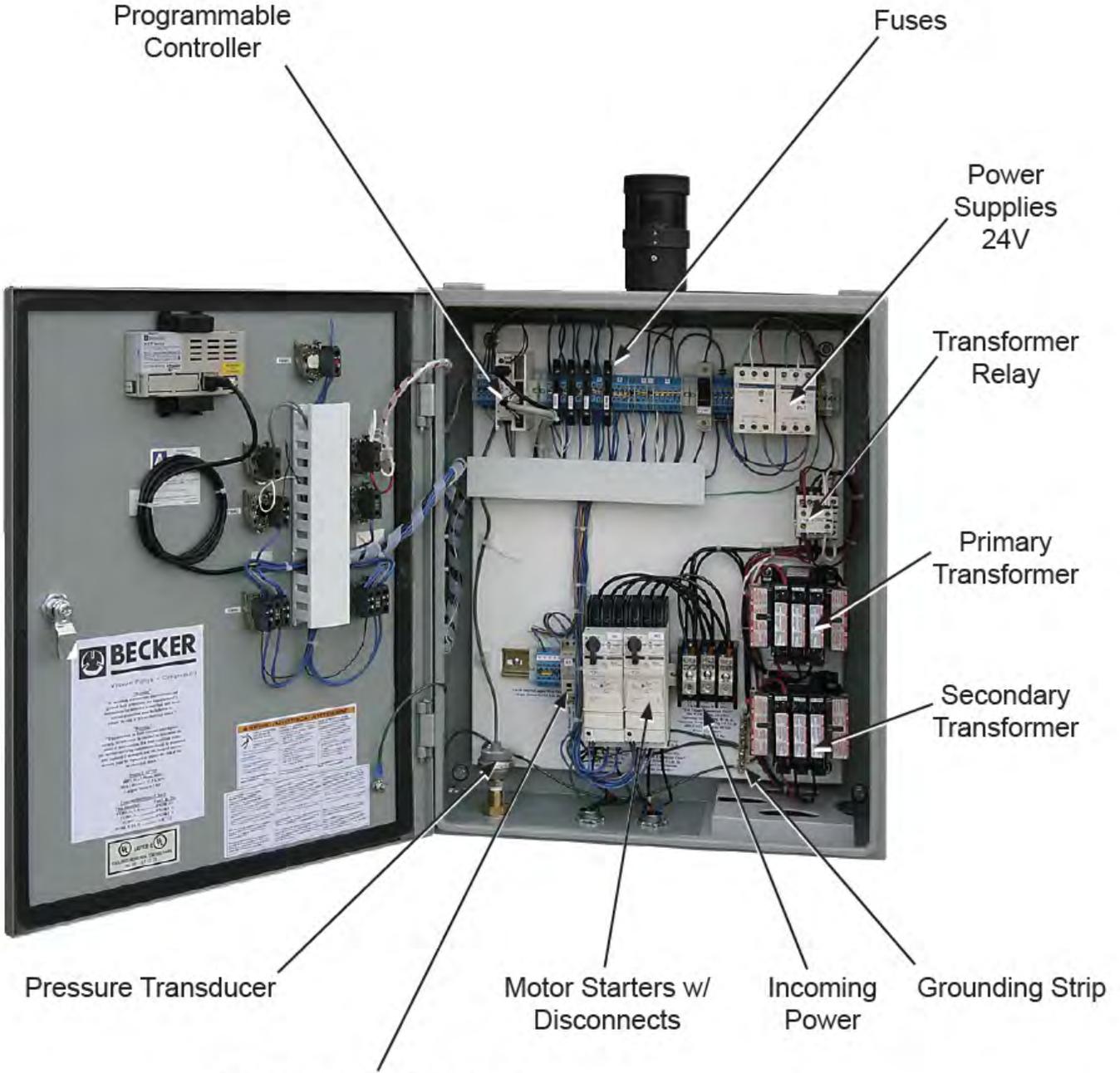
CONTROL PANEL COMPONENT DESCRIPTION

Standard equipment furnished with the Becker non-expandable control panel is as follows:

Emergency Stop Push Button	When depressed, this button interrupts control voltage power to all devices, except transformer(s) and DC power supplies, inside the panel. To reset this button, it must be rotated as shown by the arrows on the button.
System Run Light	Lights to indicate electrical power is present in the control panel.
Alarm Horn	Provides audible warning for alarm conditions.
Silence Alarm Push Button	When an alarm situation exists, both the audible and visual warnings will occur. Depressing the Silence Alarm button will stop the audible warning; the visual warning remains lit until the cause for the warning has been corrected.
Illuminated Hand/Off/Auto Switch	Each pump is equipped with an illuminated H/O/A switch. The switch lights whenever the running. When the switch is in the Hand position, all program logic is bypassed and the pump will run continuously. In the Off position, the pump will not run. In the Auto position, the pump is connected to the system logic and will automatically come on and off as needed.
Control Voltage Transformer(s)	Most controls are operated at 115 volts AC single phase power, which is provided by the CVT. Both primary legs of the voltage as well as the secondary leg are fused. The transformer will accept 208, 230, or 460 volt input. Dual, redundant voltage transformers with transfer relay are provided for hospital systems to meet NFPA 99 requirements. 24 volt DC power is also used for PLC inputs and is provided by a DC power supply mounted in the panel.
Pressure Transducer	Senses vacuum level in the receiver.
Starters	Starters provide short circuit and thermal overload protection as well as lockable branch circuit disconnects for each motor circuit. These starters meet all requirements of UL 508, category E, for self-protected combination starters.
Programmable Controller	<p>The primary function of the controller is to insure that the system operating vacuum level remains in the range between the high and low vacuum limit settings. When the system vacuum level drops below the low set point, one pump is started; if necessary, additional pumps are brought on-line until the low set point is exceeded. Conversely, when the maximum set point is exceeded, one pump is stopped; if necessary, additional pumps are taken off-line until the system level drops below the high set point.</p> <p>Each time a pump is started, a minimum run timer will keep the unit running for a present time interval (10 minutes). This keeps the number of start / stop cycles down in the event of widely fluctuating system requirements, thus preventing possible motor damage.</p> <p>The controller also monitors optional safety devices, such as oil level and temperature control switches. Individual units will be shut down and the alarm will sound with an intermittent sound.</p>
Dry Contacts	A set of dry contacts for remote alarm are provided as an option in all NFPA 99 compliant systems. The contacts may be either normally closed or normally open, depending on the specification at the time of order.



Duplex Control Panel Cover Arrangement



R1= All Pumps Running / Reserve-in-use

Duplex Control Panel Interior Arrangement

