

**OPERATING INSTRUCTIONS**

**SIMPLEX**

# **VACUUM SYSTEMS**

For Advantage D, Advantage X, Advantage L,  
Advantage P, and Advantage C Systems

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**MAKE IT BECKER.**



**IMPORTANT:** Please review all material pertaining to your system **BEFORE** commissioning, to prevent injury or damage to personnel and/or equipment.



IMPORTANT NOTES FOR THE USER OF THE OPERATING INSTRUCTIONS

- We reserve the right to make technical changes and additions to the operating instructions.
- No liability is accepted for the content, in particular for damage caused by existing, non-existing or incorrect information.
- Passing on these operating instructions is not permitted unless expressly authorized.
- Additions / improvements are expressly desired, but require approval.

OPERATING INSTRUCTIONS VALID FOR

|                     |                                                                                    |
|---------------------|------------------------------------------------------------------------------------|
| General Designation | Central Vacuum Systems                                                             |
| Product Type        | Simplex Tank Mounted Central Vacuum Systems                                        |
| Model               | Advantage D, Advantage X, Advantage L, Advantage P, Advantage C Systems            |
| Manufacturer        | <b>Becker Pumps Corporation</b><br>100 East Ascot Lane<br>Cuyahoga Falls, OH 44223 |

BECKER ADVANTAGE SYSTEMS

Becker Central Vacuum Advantage systems are available in three configurations: tank mounted, space saver or expandable. Tank mounted models are offered in two sizes, simplex or duplex. Space saver systems are duplex only, to maximize vacuum capability despite space limitations. Expandable systems range in size from duplex to sextuplex and are designed to be easily expandable from any smaller size option up to the largest size option (sextuplex). Each system includes:

- Automatic electrical controls to maintain vacuum between preset levels
- ASME coded receivers
- Inlet filters
- Check valves
- Isolation valves
- Vibration isolators
- Vacuum gauges

All Becker Advantage systems are given a specific suffix to identify their associated vacuum technology. Reference the table below to identify the vacuum technology associated with your system.

| SYSTEM NAME | VACUUM TECHNOLOGY          |
|-------------|----------------------------|
| Advantage D | Dry Rotary Vane            |
| Advantage X | Dry X-Vane                 |
| Advantage L | Oil-Lubricated Rotary Vane |
| Advantage P | Oil-Lubricated Purge       |
| Advantage C | Hook & Claw                |

# SYSTEM COMMISSIONING

## 1. INSTALLATION

### 1.1 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 the carrier directly. Using a fork lift truck, carefully lift the system from the transport vehicle and 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).

### 1.2 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 as the pumps are air-cooled.
- The ambient temperature should be between 35°F and 100°F.
- The system should be located as close as possible to the point of usage to pre-vent excessive loss of operating pressure due to pressure drop.

### 1.3 COMPONENT ASSEMBLY

The system is shipped as a complete assembly. No further assembly is required beyond connecting the electrical supply and inlet and exhaust (if supplied) piping connections.

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

**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 (see START-UP: PUMP ROTATION for more information).

## 1.5 PLUMBING CONNECTIONS

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 radius elbows and a minimum number 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 line to prevent any accumulated moisture from draining towards the pumps. All lines should slope away from the pumps. Any low points in the piping should be equipped with pipe drains or drip legs to remove accumulated moisture. If the vacuum system remains under vacuum, a three valve setup may be required in order to drain the piping. Contact the factory for assistance.

## 2. START-UP

### 2.1 PUMP IDENTIFICATION

Identify your specific pump type and review the pump specific operating manual enclosed with your order. Prepare each pump in the system for use according to the instructions given. Additionally double check the following:

- Advantage L & P systems ONLY: adequate oil has been added to the pump
- Correct ball valves are open between the pump, air receiver and your application
- Any and all exhaust shipping plugs are removed
- All electrical connections are secure and plumbing is free of major leakages

### 2.2 PUMP ROTATION

Prior to operation, the pump must be checked for correct rotation:

1. Identify the correct direction-of-rotation of the pump by locating the directional arrows cast into the pump frame or by referencing the pump's operating manual.
2. Using the Hand-Off-Auto switch on the door of the control panel, jog the motor of the pump momentarily by turning the switch to "Hand" and back to "Off".
3. Observe the cooling fan of the motor while bumping power to the pump, and note the direction the fan rotates in.

**NOTE:** For three-phase systems, 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 with the procedure above, before beginning normal operation.

## 2.3 MAINTENANCE

The required routine maintenance points for each system vary depending on the pump technology used. Please refer to your pump specific operation manual, included in your system packet, for information on routine maintenance requirements and correct procedures.

If your system uses external canister filters, in addition to the pump's integrated filters, be sure to regularly empty and check these filter canister and elements so they do not become overloaded. For additional help, please contact the factory. Additional maintenance documents may be available upon request.

## 3. GENERAL OPERATION

On initial start-up of the system in AUTO mode, the pump will run until the high vacuum setpoint has been reached. The pump will remain on until the minimum run timer has expired. During this period, the vacuum level may increase above the high vacuum setpoint (this occurs when the vacuum demand is less than the vacuum output of the system). Once the pump shuts off, it will not restart until the low vacuum setpoint has been reached. At this point the system has entered its normal automatic operation.

If the system vacuum level remains between the low and high setpoints the pump will continue to operate until the vacuum level exceeds the high vacuum setpoint. The pump will then turn off after the minimum run timer has expired.

Minimum run timers are incorporated on all systems to prevent motor damage from excess starts per hour. The minimum run timer begins once the system vacuum level has reached the high vacuum setpoint. Exceeding the high vacuum setpoint will not cause damage to the pumps if they are well maintained and operating correctly; however, caution is advised if the end-user's process cannot tolerate higher vacuum levels. Contact the factory for assistance.

**NOTE:** Setpoint values are indicated on system paperwork.

## 4. ELECTRICAL CONTROL PANEL

### 4.1 DESCRIPTION

The Becker Simplex electrical control panel is designed to control one vacuum pump and includes:

- a low voltage control transformer (115 volt secondary) with fused primary and secondary;
- a pressure transducer;
- a Zelio controller;
- a Hand-Off-Auto switch with pump run light; and
- motor starter with disconnect.

All components are enclosed in a NEMA 3R, 4 & 12 enclosure.

## 4.2 KEY COMPONENTS

Standard equipment furnished with a Becker Simplex control panel have the following components:

1. MOTOR STARTER

The starter provides short circuit and thermal overload protection as well as a lockable branch circuit disconnect for the motor circuit. This starter meets all requirements of UL 508, Category E, for self-protected combination starters. The starter's magnetic coil will be energized when a 115 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.

2. ILLUMINATED HAND / OFF / AUTO SWITCH

The pump is equipped with an illuminated H/O/A switch. The switch lights whenever the pump is 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.

3. CONTROL VOLTAGE TRANSFORMER

All 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.

4. PRESSURE TRANSDUCER

Senses vacuum level in the receiver.

5. ZELIO CONTROLLER

Smart relay technology ideal from simple automation applications. Featuring display screen and selection buttons for easy adjustment of system settings. Contains a total of 12 I/O contacts.

## 6. OPERATION OF ZELIO CONTROLLER

Throughout the duration of the system's operation, it may be determined your setpoints need adjusted or reset. In order to adjust the high and low vacuum setpoints of your system, you will need to access the Zelio controller inside the control panel.

**POWER MUST BE SUPPLIED TO THE PANEL IN ORDER TO ADJUST SETTINGS ON THE ZELIO CONTROLLER, A QUALIFIED ELECTRICIAN MAY BE REQUIRED.**

Switch the system into OFF mode with the Hand/Off/Auto switch on the front of the door.

Once the system is in OFF mode, open the panel and follow the flow chart on the next page to adjust the setpoints in the Zelio controller. Use the pressure reference table on the inside panel door, also located on a page 8 of this manual, to select the correct voltage values for your setpoints.

Please contact the factory for assistance.

## 7. SIMPLEX SET POINT ADJUSTMENT

| STEP | ACTION                                  | SCREEN VIEW                                                                                                      |
|------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 0    |                                         | Main Screen - LowVac, HighVac, Etc...                                                                            |
| 1    | Press MENU / OK                         | "MONITORING"<br><i>Flashing</i>                                                                                  |
| 2    | Press ↓ twice                           | "RUN / STOP"<br><i>Flashing</i>                                                                                  |
| 3    | Press MENU / OK                         | "STOP PROG."<br>"YES" <i>Flashing</i>                                                                            |
| 4    | Press MENU / OK                         | "BCDE"<br>STOP LD                                                                                                |
| 5    | Press MENU / OK                         | "PROGRAMMING"<br><i>Flashing</i>                                                                                 |
| 6    | Press ↓ Once                            | "PARAMETER"<br><i>Flashing</i>                                                                                   |
| 7    | Press MENU / OK                         | A1 ANALOG - Low Vacuum<br>A <u>1</u> <i>Flashing</i>                                                             |
| 8    | Press ← Once                            | A1 ANALOG - Low Vacuum<br>"R= #.#" <i>Flashing</i>                                                               |
| 9    | Press ↓ ↑                               | Adjust the value<br>(See Inches of Mercury to Voltage Chart)                                                     |
| 10   | Press MENU / OK                         | CONFIRMING CHANGES<br>"YES" <i>Flashing</i>                                                                      |
| 11   | Press MENU / OK                         | A1 ANALOG - Low Vacuum<br>"R= #.#" <i>Flashing</i>                                                               |
| 12   | Press → Once                            | A1 ANALOG - Low Vacuum<br>"A <u>1</u> " <i>Flashing</i>                                                          |
| 13   | Press ↑ Once                            | A2 ANALOG - High Vacuum<br>"A <u>2</u> " <i>Flashing</i>                                                         |
| 14   | Press ← Once                            | A2 ANALOG - High Vacuum<br>"R= #.#" <i>Flashing</i>                                                              |
| 15   | Press ↓ ↑                               | Adjust the value<br>(See Inches of Mercury to Voltage Chart)                                                     |
| 16   | Press MENU / OK                         | CONFIRMING CHANGES<br>"YES" <i>Flashing</i>                                                                      |
| 17   | Press MENU / OK                         | A2 ANALOG - High Vacuum<br>"R= #.#" <i>Flashing</i>                                                              |
| 18   | Press MENU / OK                         | "PARAMETER"<br><i>Flashing</i>                                                                                   |
| 19   | Press ↓ Once                            | "RUN / STOP"<br><i>Flashing</i>                                                                                  |
| 20   | Press MENU / OK                         | "RUN PROG."<br>"WITH NONVOLAT INI" <i>Flashing</i>                                                               |
| 21   | Press MENU / OK                         | Main Screen<br>LowVac, HighVac, Etc...                                                                           |
| 22   | Review the settings on the Zelio Device | A1 = #.# Low vacuum setting (Closer to ambient pressure)<br>A2 = #.# High vacuum setting (Closer to full vacuum) |

## 8. ZELIO VACUUM SETTING | INCHES OF MERCURY TO VOLTS

| IN. OF HG | VOLTS |
|-----------|-------|
| 0.5       | 9.6   |
| 1.0       | 9.5   |
| 1.5       | 9.3   |
| 2.0       | 9.2   |
| 2.5       | 9.0   |
| 3.0       | 8.8   |
| 3.5       | 8.6   |
| 4.0       | 8.5   |
| 4.5       | 8.3   |
| 5.0       | 8.1   |
| 5.5       | 7.9   |
| 6.0       | 7.8   |
| 6.5       | 7.6   |
| 7.0       | 7.4   |
| 7.5       | 7.3   |
| 8.0       | 7.1   |
| 8.5       | 6.9   |
| 9.0       | 6.7   |
| 9.5       | 6.6   |
| 10.0      | 6.4   |
| 10.5      | 6.2   |
| 11.0      | 6.0   |
| 11.5      | 5.9   |
| 12.0      | 5.7   |
| 12.5      | 5.6   |
| 13.0      | 5.4   |
| 13.5      | 5.2   |
| 14.0      | 5.0   |

| IN. OF HG | VOLTS |
|-----------|-------|
| 14.5      | 4.9   |
| 15.0      | 4.7   |
| 15.5      | 4.5   |
| 16.0      | 4.4   |
| 16.5      | 4.2   |
| 17.0      | 4.1   |
| 17.5      | 3.9   |
| 18.0      | 3.7   |
| 18.5      | 3.6   |
| 19.0      | 3.4   |
| 19.5      | 3.3   |
| 20.0      | 3.1   |
| 20.5      | 2.9   |
| 21.0      | 2.8   |
| 21.5      | 2.6   |
| 22.0      | 2.4   |
| 22.5      | 2.2   |
| 23.0      | 2.0   |
| 23.5      | 1.9   |
| 24.0      | 1.8   |
| 24.5      | 1.6   |
| 25.0      | 1.4   |
| 25.5      | 1.2   |
| 26.0      | 1.1   |
| 26.5      | 0.9   |
| 27.0      | 0.8   |
| 27.5      | 0.6   |
| 28.0      | 0.4   |

This table is based on sea level pressure settings. Contact the factory for settings at elevations 2200'+ above sea level.



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