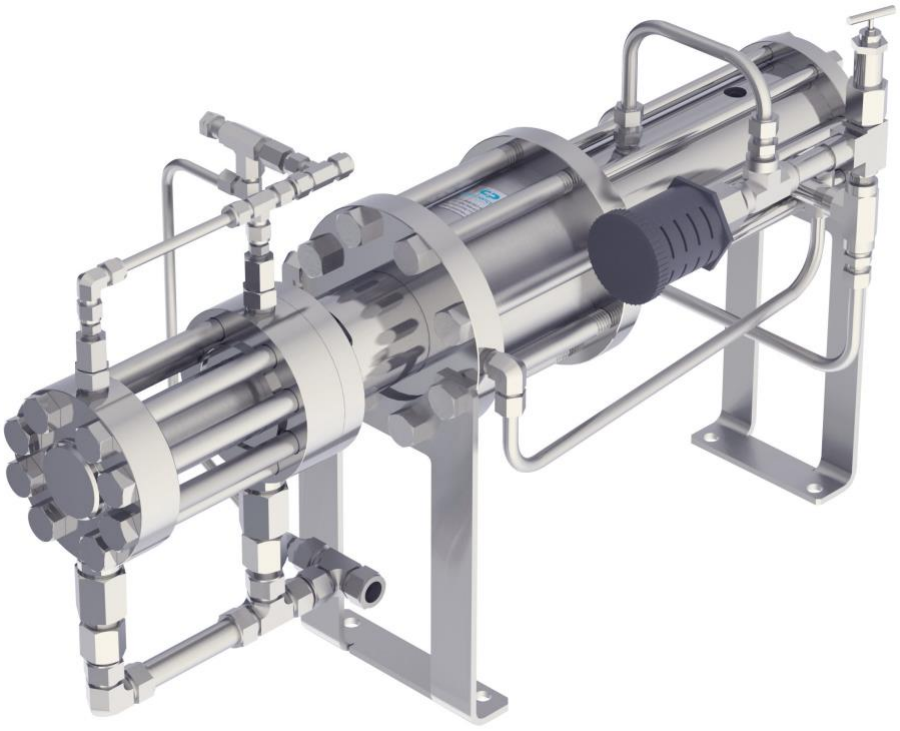
Series 5400 & 8400
Pneumatic Chemical Injection Pump
Operating Manual



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Congratulations! You have chosen the finest, most versatile chemical injection pump made; designed to exacting specifications for long life, reliable performance, and low maintenance. To ensure proper operation and to maximize the Series 5400/8400's durability, please read and follow this guide. Failure to correctly install and maintain the pump is a primary cause for future service problems and may void certain warranty provisions.

NOTE:	This Guide applies to all CheckPoint Chemical Injectors, Part Numbers P54xxxxx and P84xxxxx.

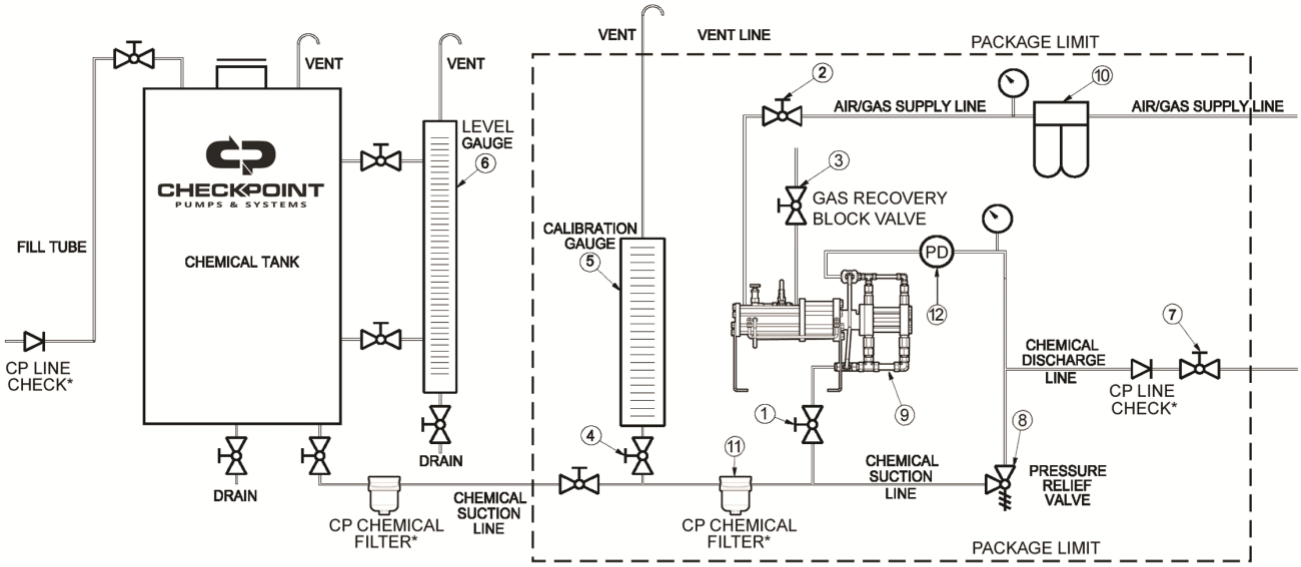
NOTE:	Important illustrations, graphs, and charts are located throughout this Guide, with cutaway drawings of the pump in the back.

1. PUMP INSTALLATION

1.1 Process Design & Setup

1.1.1 Prior to installing your injector, please inspect the pump carefully for any possible in-transit damage. If the pump appears damaged, call your authorized CheckPoint distributor or call CheckPoint customer service directly at (800) 847-7867 or (504) 340-0770 to confirm damaged condition. If we determine that damage has occurred in transit, you will need to file a claim with the carrier.

FIGURE 1: TYPICAL INSTALLATION SCHEMATIC



CheckPoint packages are available for the 5400/8400 that contain all necessary components as indicated within the Package Limit line. We can supply packages that contain ALL the components, including the tank, mounted on a single skid with or without full leak containment.

1. Suction line block valve	*4. Calibration gauge block valve*	*7. Discharge line block valve*	*10. Regulator/Lubricator/Filter*
2. Air/Gas supply block valve	*5. CP Calibration gauge**	*8. PRV - discharge line*	*11. CP Chemical Filter**
3. Gas recovery block valve	*6. Tank gauge*	*9. CP 5400/8400 Chemical pump**	*12. Pulsation Dampener*

All items in Figure 1. can be purchased from CheckPoint. Call today for our latest prices on pumps, gauges, packages and other components.
**CheckPoint OEM products*

1.1.2 Referring to Figure 1 above, ensure that all necessary components are present in your injection system and in good working order. All the components shown above are recommended by CheckPoint to maximize productivity and life of the pump in typical field or plant use. CheckPoint is available to answer your process questions or to help design and build a skid system utilizing components appropriate for your application.

NOTE:	In Figure 1, the secondary chemical filter, vent line, and pressure regulator are optional under certain conditions but are highly recommended.

1.1.3 CheckPoint recommends horizontal mounting for the Series 5400/8400 model pumps where possible. This allows the suction check valve to have gravity assistance in closing. However, you may also mount the pump in other orientations, subject to the condition that the chemical head should be no higher than level with the motor. If mounting will be other than horizontally, you must use spring-loaded suction checks, which can be requested at time of order or sent to you in the field.

NOTE:	Under no conditions should the pump be oriented so the suction check valve is above the centerline of the motor. Doing so may cause chemical leakage to collect on the motor, eventually to breach the motor seals, and be atomized into the environment.

1.1.4 CheckPoint recommends use of a calibration gauge for your assurance of proper pump function and chemical delivery rate. Please read the section in this Guide entitled *3.2.1 Setting Pump Speed Using a Calibration Gauge* on page 8 for more information. The proper position of the calibration gauge (labeled #5) is shown in Figure 1.

NOTE:	It is necessary to attach a vent tube to the top of all calibration gauges, chemical tanks, and tank level gauges. The height of the top of each vent tube should always be greater than the highest possible liquid level in the system, and the tube should have means to prevent water entry, such as a 180 degree bend.

1.1.5 The Series 5400/8400 does not require flooded suction or positive chemical pressure to prime, and can therefore be mounted above the chemical container. For a chemical with average viscosity, the pump will pull air out of the chemical line and prime from up to twelve feet above the liquid level in the tank. This feature is dependent upon proper packing adjustment and adherence to all points made in Paragraph 1.1.6 below.

1.1.6 ALL VALVES, FITTINGS, AND PIPING BETWEEN THE SOURCE OF CHEMICAL AND THE PUMP'S SUCTION CHECK VALVE MUST BE 100% BUBBLE-TIGHT AND FULLY COMPATIBLE WITH THE CHEMICAL BEING DELIVERED AND WITH EACH OTHER. FAILURE TO ADHERE STRICTLY TO THIS RULE WILL LEAD TO GAS BUILD-UP IN THE CHEMICAL HEAD AND LOST PRIME. SPECIFICALLY:

1.1.6.1 Any fitting or screw-on joint without Teflon™ tape or other acceptable sealant may allow air at atmospheric pressure to enter the suction tubing, even if no chemical leakage is visible.

1.1.6.2 Dissimilar metals, when joined together in the suction pipe work may react with each other, creating gas bubbles that will end up being carried into the pump head. CheckPoint generally recommends all suction components, including all tubing, piping, fittings, and valves, be of similar material, preferably stainless steel or other chemically resistant metal.

1.1.6.3 Incompatibilities between the chemical and the metallic elements in the suction pipe work can also create such gas bubbles. In particular, some acids require Hastelloy™ or PVC fittings and tubing, while other chemicals may only require 316 SS.

1.1.7 The pump may be clamped to a skid or other surface in a number of ways, however, clamping around the outside of the pump reduces accessibility during maintenance and troubleshooting and is therefore not recommended.

1.1.8 Always check to ensure that all process block valves (labeled as nos. 2, 3 & 7 in Figure 1) are closed prior to disconnecting or re-installing any chemical injection pump. There should always be a block valve placed between a properly installed pump and the process flow, the gas supply, the chemical supply, and, in the case of Gas Recovery models, the gas recovery outlet. Conversely, while the pump is running, all such block valves should always be open.

1.1.9 The pump suction line should be sized appropriately to the flow rate to avoid cavitatation. A general rule of thumb is to size the suction line such that instantaneous flow velocity through the line does not exceed 2 feet per second at any point. For multiple pump installations, for extremely viscous chemicals, and for chemicals with low vapor pressures, additional allowances may be needed. Contact CheckPoint or your authorized CheckPoint distributor for design assistance.

1.1.10 To avoid over-pressuring chemical discharge lines, a pressure relief valve must be placed between the discharge check valve of the pump and the process flow. The pressure relief valve discharge must be run to a tee upstream of the pump's chemical suction check valve.

CAUTION:	**When using a pressure relief valve, chemical tank or vessel MUST BE properly vented to atmosphere to avoid the possibility of over-pressurizing the tank if the pressure relief valve actuates.**

1.1.11 Pulsation dampeners may be required in your installation depending on a variety of factors. Consult with CheckPoint if you have any concerns about pulsation.

1.2 Connecting The Chemical Supply

1.2.1 Clean suction lines and check chemical containers to ensure that they are free of all foreign matter, sand, sludge, or chemical buildup.

NOTE:	Removing foreign debris from suction lines and chemical containers will substantially extend the life of the packing and other components of the pump. Even a new chemical tank can contain debris that can be carried into the pump and damage it.

NOTE:	CheckPoint recommends using filtration to ensure a maximum particulate size of 140 microns. Multiple stages of filtration should be considered, depending upon the initial cleanliness level of the fluid media being pumped, to prevent cavitation and an increase in maintenance.

NOTE:	If premature scoring of the pump plunger or early packing failure is observed during operation, a likely cause is abrasive particles carried into the pump through the suction plumbing. Use of a pre-suction in-line chemical filter such as the CheckPoint Series FSTS and/or a ceramic or Hastelloy™ plunger is recommended if symptoms continue. Call CheckPoint for appropriate filter element sizing criteria.

CAUTION:	**Substantial scoring of the plunger can lead to severe leakage of chemical into the surrounding environment.**

1.2.2 Connect the chemical suction line (3/4 or 1") to the suction check valve on the pump head. The suction line is underneath the pump and will be a ¾ or 1" SS compression tubing connection (see illustrations in the Parts List Manual).

NOTE:	Always apply Teflon™ tape or other appropriate thread sealant to the check valve threads prior to attachment to prevent leakage.

NOTE:	Never re-locate the suction or discharge check valves away from the chemical head. To operate properly, check valves must remain directly attached to the chemical head. If desired, a secondary discharge line check may be placed downstream of the pump discharge.

1.2.3 Connect your discharge line to the pump discharge. This is normally a 3/8 autoclave or 1/2" SS compression tubing connection (see illustrations in the Parts List Manual).

1.2.4 Check that the packing nut is properly adjusted. In a new pump, proper adjustment is finger-tight, plus 1/8 of a turn. Use a packing adjustment tool (available from CheckPoint at no charge) for best results. IMPORTANT: PLEASE REVIEW *Section 4.1: Packing Adjustment* on page 11.

NOTE:	DO NOT OVER-TIGHTEN THE PACKING NUT. Applying excess torque to the packing nut will decrease the life of the packing.

1.2.5 Open the process block valve, allowing the process pressure to reach the chemical head. Correct any leakage observed.

CAUTION:	**The Series 5400/8400 chemical head is rated for a maximum working pressure of 10,000 - 20,000 psig. If the discharge line is inadvertantly blocked, certain combinations of air/gas supply pressure and plunger size can generate pressures in excess of 20,000 psig. A relief valve must therefore be placed between the discharge check and the process flow to prevent this condition. To predict the maximum pressure that can be developed by your pump, use the formula: [supply air pressure] x [amplification ratio] = [discharge pressure]. To find the amplification ratio for your pump, please see Figures 2 & 3 on page 7.**

NOTE:	Always open the process block valve (shown as number 7 in Fig 1) prior to operating the pump. Operating the pump with a closed block valve can generate enough pressure to rupture the discharge line, permanently damage the block valve, or reduce the useful life of the pump.

1.3 Connecting The Supply Gas

1.3.1 Gas supply to the pump should be clean compressed air or natural gas at 50 psig minimum, 200 PSIG maximum. "Clean" means free of abrasive dust, sand or other grit that could abrade the seals inside the pump. The pump does not require a pressure regulator when operated within these recommended supply pressures, as long as the supply pressure remains relatively constant (± 5%).

NOTE:	It is not necessary to remove most liquids, such as distillate carryovers, from the supply gas. The pump will not stall no matter how much liquid reaches the air/gas inlet. Certain chemicals can attack seals in the motor, however, so make certain that the supply gas has been specified as part of the ordering process so that CheckPoint can supply the correct seals for your application.

CAUTION:	**Always use a gas pressure regulator if the possibility of supply pressures in excess of 200 psig exists. Allowing higher gas pressures to enter through the air/gas inlet will most probably result in damage to the motor seals. Also, such pressures will translate into excessive discharge pressures, which can rupture chemical discharge tubing.**

1.3.2 Liquids may also be used as a driver fluid, but pump speed will vary widely with the liquid viscosity. Call CheckPoint for performance data for the liquid you intend to use.

1.3.3 Blow the supply gas line clean to remove all foreign matter and debris.

NOTE:	Take care to prevent debris in the supply gas line from entering the main spool housing and switching valves, where it could accelerate seal wear and damage the main switching valve components.

NOTE:	In situations where sand, dirt, and other particulate matter may be carried in with the supply gas, a filter and/or a scrubber is recommended.

1.3.4 Connect the supply gas line to the 1/2" FNPT female connection on the housing. Use a minimum of ¾ tubing. To ensure positive injection, the supply gas pressure should be a minimum of 50 PSIG and a maximum of 200 PSIG, set according to the following formula:

$$\textbf{REQUIRED GAS INLET PRESSURE} = \frac{\text{[DISCHARGE PRESSURE]}}{\text{[AMPLIFICATION RATIO]}} \times 1.3$$

1.3.5 Faster pump speeds can be obtained by increasing the gas inlet pressure from the minimum required by the formula above.

NOTE:	To find the Amplification Ratio for your pump, please see Figures 2 and 3 below.

NOTE:	If the above formula yields a result of < 50 PSIG, use 50 PSIG as your supply pressure.

FIGURE 2: AMPLIFICATION RATIO TABLE, 5400 SERIES

PLUNGER DIAMETER (IN)	AMPLIFICATION RATIO
0.500	100
0.750	44.4
1.000	25
1.750	8.2
2.500	4

FIGURE 3: AMPLIFICATION RATIO TABLE, 8400 SERIES

PLUNGER DIAMETER (IN)	AMPLIFICATION RATIO
0.500	256
0.750	113.8
1.000	64
1.750	20.9
2.500	10.2

2. GAS RECOVERY SYSTEMS - INSTALLATION

2.1.1 The exhaust gas can be exhausted directly to atmosphere, or can be recovered to a lower pressure gas system. If vented directly to atmosphere, CheckPoint supplies the pump with a muffler to reduce exhaust noise.

2.1.2 If recovering the exhaust gas, connect the gas recovery line from the process to the open 1/2" tubing connector on the injector. The pressure in the recovery line ("recovery pressure") must be lower than the supply pressure. To calculate the recovery pressure given your supply pressure in PSIG, use the following formula:

$$\textbf{RECOVERY PRESSURE} = \text{SUPPLY PRESSURE} - \frac{\text{[DISCHARGE PRESSURE]}}{\text{[AMPLIFICATION RATIO]}} - 30 \text{ PSIG}$$

2.1.3 For a GR pump, the maximum recovery pressure, based on a supply pressure of 200 PSIG (the maximum allowable supply pressure) is given by:

$$\textbf{MAXIMUM RECOVERY PRESSURE} = 220 \text{ PSIG} - \frac{\text{[DISCHARGE PRESSURE]}}{\text{[AMPLIFICATION RATIO]}}$$

2.1.4 For more information on how to set up a recovery system for your 5400 or 8400 pump, please contact CheckPoint or an authorized distributor.

3. PUMP OPERATION

3.1 Setting The Pump Stroke Rate

3.1.1 Setting Pump Speed Using a Calibration Gauge

The following directions are for setting the pump speed using a calibration gauge. There are a variety of calibration gauges available, including a complete line of appropriately-sized CheckPoint gauges for every CheckPoint pump. To ensure that your pump is working as is should and that chemical is being delivered at the rate you need, it is important to use a calibration gauge.

3.1.1.1 Most calibration gauges are designed to read properly when one full minute of pumping has taken place. However, if the liquid level drops too fast to allow for a full minute, shorter periods are acceptable. Try to size the gauge so that at least a 30 second test can be made, however, or a loss of accuracy will result.

3.1.1.2 Proper gauge placement and plumbing is important. Please refer to Figure 1 for appropriate valving and placement, and for reference numbers as used in this section. The calibration gauge is labeled as number 5.

3.1.1.3 With the pump either running or stopped, open the Gauge Fill Valve (shown as #4 in Figure 1). The gauge (shown as #5 in Figure 1) should begin to fill. Continue filling until the chemical level is at or near the top markings on the gauge, then close the Gauge Fill Valve.

3.1.1.4 Now ensure that the CheckPoint pump is running. Take note of the level of chemical in the gauge using the appropriate scale for the volume units you want to measure the pump's output in. Usually the gauge will show liters on one scale and quarts or gallons on the other. It is best to write down the number so that you can calculate flow accurately.

3.1.1.5 Open the Gauge Fill Valve (#4), and simultaneously close the Chemical Supply Valve (shown as #1 in Figure 1). This isolates the pump and gauge so that the pump is being supplied its entire chemical directly from the gauge.

3.1.1.6 The level in the gauge should begin to fall. (If it does not, or if the level seems to go down and then back up with each stroke, refer to troubleshooting in *Section 5.1 on page 12*). When the liquid level in the gauge gets near the bottom of the gauge, or when one minute has expired (whichever comes first), stop timing, note the ending level on the gauge, and reopen the Chemical Supply Valve.

3.1.1.7 Write down the amount of time in seconds and the final gauge reading, then close the Gauge Fill Valve.

NOTE:	Failure to reopen the Chemical Supply Valve will result in the pump quickly depleting the remaining chemical in the gauge and running on air, necessitating pump re-priming.

NOTE:	In cases where the chemical flow rate is extremely low, you may need to time for longer than one minute to allow an adequate amount of chemical to move out of the gauge.

3.1.1.8 The pumping volume (in the units specified on the gauge scale) will be given by the following equation:

$$\textbf{PUMPING VOLUME} = \frac{[\text{END READING}] - [\text{BEGINNING READING}]}{[\text{DURATION OF READING IN SECONDS}]} \times 60$$

NOTE:	To ensure accurate stroke rate measurement, allow sufficient measurement duration. Where possible, allow at least thirty seconds of gauge drawdown.

NOTE:	At extremely slow stroke rates, only a small turn of the speed control valve is required to alter the stroke rate, so if readjusting the rate of the pump, it is helpful to turn the valve only a small increment (a couple of angular degrees) at a time.

3.1.2 Calculation of Stroke Rate

It is possible to calculate your pump's minimum required cycle rate. To do so, you have to look up a volume factor, then multiply it by your desired chemical flowrate requirement. The instructions below will detail this process. This is most helpful when determining if a particular plunger or pump size will output a required volume. Note that these formulas calculate cycle rates assuming zero discharge pressure. Allowances will then need to be made for liquid compressibility for discharge pressures greater than zero.

NOTE:	This procedure should not be used as the sole means of setting the pump's speed in the field. Without checking pump output with a calibration gauge, you cannot be assured that the pump is delivering the correct liquid flow rate. For example, if the suction check valve is stuck due to trash or thickened chemical, chemical would not be injected even if the cycle rate has been properly set.

3.1.2.1 Using your desired chemical flow rate, calculate the Minimum Cycle Rate (MCR): ***[MINIMUM CYCLE RATE (MCR) (CYCLES/MIN)] = [FLOWRATE (GAL/HR)] X [VOLUME FACTOR]***. Figure 4 gives the Volume Factor used to determine the MCR. Figure 5 contains basic conversions to assist you.

FIGURE 4: VOLUME FACTOR TABLE, SERIES 5400 & 8400

PLUNGER DIAMETER (IN)	VOLUME FACTOR
0.500	3.477
0.750	0.869
1.000	0.386
1.750	0.217
2.500	0.408

FIGURE 5: GENERAL CONVERSION TABLE

TO CONVERT:	TO:	MULTIPLY BY:
GALLONS	QUARTS	4.00
LITERS	QUARTS	1.058
CUBIC INCHES	QUARTS	0.0173
MINUTES	DAYS	0.000694

NOTE: To ensure accurate stroke rate measurement, allow sufficient measurement duration. Count all exhaust discharges for at least thirty (30) seconds, then convert to a stroke per minute rate. When attempting to control the pump at a frequency lower than 2 cycles per minute, time at least three cycles, then divide by the number of minutes to calculate the cycle rate per minute rate.

4. AIR/GAS CONSUMPTION

If emissions are a concern, refer to Section 2 for details on how to use the gas recovery feature of your CheckPoint pump.

Use the following equation along with the appropriate gas consumption factor from Figure 6 to calculate air/gas consumption.

Gas Consumption [SCFM] @ 68F = Chemical Flow Rate [GPH] * Gas Supply Pressure [PSIA] * English Gas Consumption Factor

Gas Consumption [Nm3/Hr] @ 0C = Chemical Flow Rate [LPH] * Gas Supply Pressure [BARA] * SI Gas Consumption Factor

NOTE: Gas supply pressure value must be absolute pressure, not gauge pressure (Absolute pressure = gauge pressure + atmospheric pressure). For reference, the Earth's atmospheric pressure at sea level is approximately 1 atm or 14.696 psi or 1.0133 bar.

NOTE: This is a theoretical consumption rate that will vary depending on gas density and other actual field conditions. Air/Gas consumption can be minimized by using the minimum supply pressure required to achieve the target application. Please contact CheckPoint for assistance estimating optimal supply pressure and associated consumption rate for a particular application.

FIGURE 6: GAS CONSUMPTION FACTORS

PUMP SERIES	PLUNGER DIAMETER [IN]	GAS CONSUMPTION FACTOR ENGLISH SCFM @ 68F	GAS CONSUMPTION FACTOR SI METRIC NM3/HR @ 0C
5408	1/2	0.0347	3.0690
5412	3/4	0.0100	0.8874
5416	1	0.0055	0.4878
5428	1 3/4	0.0015	0.1362
5440	2 1/2	0.0008	0.0726
8408	1/2	0.0889	7.8566
8412	3/4	0.0257	2.2718
8416	1	0.0141	1.2487
8428	1 3/4	0.0039	0.3488
8440	2 1/2	0.0021	0.1858

5. PUMP MAINTENANCE

CheckPoint's Series 5400 & 8400 are designed to provide trouble-free operation for many years with little adjustment, lubrication, or other routine maintenance. However, like any other device, proper maintenance can extend the life of the product. This can include packing adjustment, periodic cleaning of the gas and chemical inlets, and lubrication.

5.1 Packing Adjustment

Packing adjustment is usually indicated whenever adjustable packing is installed in the pump and leakage can be observed around the packing nut or coming out of the weep hole drilled through the packing nut. In most cases, if there is no leakage, no adjustment is necessary.

5.1.1 Use a CheckPoint T10010 packing adjuster, which is specifically designed for this purpose. If one is not available, you may order one at no charge directly from CheckPoint. In an emergency or if time is short, a 6" length of ¼" OD tubing or metal rod may be used.

5.1.2 Packing should generally be adjusted while pump is running if it is already in service.

5.1.3 To tighten the packing, insert the tool into one of the eight shallow radial holes in the packing nut, and tighten the nut clockwise. Snug the nut until light pressure with one finger on the packing nut tool no longer moves the packing nut.

5.1.4 From this point, TIGHTEN THE NUT 1/8 TURN ONLY (there are eight holes, so each 1/8 turn moves the next hole into the position of the previous one):

5.1.4.1 If adjusting the packing while pump is operating, pause after each 1/8 turn to determine if the leakage has stopped, allowing for enough time to ensure previous leakage has already drained from the nut weep holes and threads. If pump is still leaking, turn packing nut an additional 1/8 turn and check again. Continue turning the nut

1/8 turn at a time as often as necessary to stop the leakage. If the leakage cannot be stopped, or if excessive force is required to stop leakage, it is time to replace the packing.

5.1.4.2 If adjusting the packing prior to new installation or when not currently running, tighten the nut 1/8 turn from the finger tight position.

NOTE:	If the packing is being adjusted while the pump is running, the pump will typically not stall no matter how much the packing nut is tightened. Care must thus be taken not to apply too much pressure when adjusting the packing nut, as this will reduce packing life.

5.2 Lubrication

The CheckPoint Series 5400/8400 motor was designed to run under "stone-dry" internal conditions in the motor end. However, regular lubrication will maximize the life of the pump and thus add value to your investment. In addition to minimizing friction within the pump, lubrication flushes out foreign debris, further reducing wear and tear on the mechanism.

5.2.1 ***Periodic Lubrication*** To lubricate the pump periodically, block off and then disconnect the air/gas supply line by unscrewing the fitting at the pump air/gas inlet. Introduce approximately 1cc of lubricant into the air/gas inlet. Reconnect the air/gas supply line and reintroduce gas pressure. Lubricant will become evenly distributed throughout the motor end of the pump within a few cycles.

5.2.2 ***Continuous Lubrication*** Lubricator bottles can be placed anywhere in the gas supply line prior to the pump's air/gas inlet. Set the lubricator rate as low as possible, one to two drops per minute, unless cold conditions dictate more in order to prevent freezing of the gas supply. CheckPoint offers both a small and a large in-line lubricator; call CheckPoint or your authorized CheckPoint distributor for details.

5.2.3 ***Recommended Lubrication Type*** A light hydraulic oil bearing the designation ISO 3448 viscosity no. 20-32 should be used. If atmospheric or other supply air/gas conditions present exhaust freezing issues, a similar type lubricant with an antifreeze component such as glycol may be used.

6. TROUBLESHOOTING

6.1 Pump runs, but chemical does not discharge at the correct rate

6.1.1 ***One or both suction check valves may be clogged with debris*** To flush, open speed control valve fully, allow pump to cycle at this maximum rate for at least 60 seconds, then return to the original setting. If no improvement is noted after three repetitions, remove the suction check valves from body of pump, blow out with air or water pressure, or rebuild if necessary, and reinstall.

NOTE:	CheckPoint FailSafe$_{TM}$ check valves do not need replacement when they do not check properly. A simple rebuild kit is available to replace the O-rings, which should correct all but the most severe check problems. If corrosion of the valve seat, retainer. and/or poppet is apparent, a different type of check valve material is indicated.

NOTE:	Always replace Teflon™ tape or other appropriate thread sealant on check valve threads during reinstallation to avoid chemical leakage and/or air getting into the chemical head.

6.1.2 ***Pump may have lost prime/become "air locked"*** Check to ensure that there are no leaks in any process lines, particularly upstream of the pump in the chemical suction lines. If the pump is getting any air through the suction side, the pump will possibly lose prime. Please carefully read section 1.1.6 and its subparagraphs for more details. A common source of air in the supply is the block valve ahead of the suction check. Check this valve to make

sure the stem packing is tight and that the materials of construction are compatible with the chemcial being pumped. Check also that the pump's packing nut is adjusted per *Section 4.1* on page 11. Finally, on pumps supplying chemical into gas lines, it is possible that the discharge check may be leaking, allowing gas under pressure to "back into" the chemical head.

6.1.3 ***Check valves may have been re-located away from the chemical head of the pump*** The checks must stay directly attached to the head in order to facilitate chemical movement.

6.1.4 ***Chemical may be obstructed from entering the pump*** Plumbing upstream of the chemical head may have blockage preventing chemical from getting to the suction check valve. A common example is an in-line chemical filter becoming clogged with debris. Solution is to clean out suction plumbing and clean or replace chemical filter.

6.1.5 ***Calibration gauge may reading incorrectly due to clogged air vent*** If the calibration gauge is not reading correctly, the user may be fooled into thinking the chemical is not getting into the process. Check for an obstruction in the gauge or in the air vent atop the gauge.

6.2 Pump does not stroke

6.2.1 ***Pump speed control valve may not be turned on*** Open the speed control valve fully (counterclockwise) until pump actuates. Then set desired stroke rate as described in *Section 3.1.2*.

6.2.2 ***Air/Gas supply pressure may be too low to overcome the chemical discharge pressure*** In many cases, a faulty pressure gauge or regulator is at fault. See *Section 1.3.4* on page 7 to determine the minimum supply pressure for your discharge pressure.

6.2.3 ***Gas recovery pressure is too high relative to gas supply pressure (Gas Recovery pumps only)*** In pumps where the exhaust gas is being recovered, the pump not only has to overcome the chemical discharge pressure but also the gas recovery pressure. Refer to *Section 2.1.1* on page 8 to determine the appropriate recovery pressure.

6.2.4 ***Pump switching valve may be clogged or "gummed-up" with paraffin or trash*** Disconnect air/gas supply, then pour any type of oil or solvent into the pump air/gas inlet. Re-connect air/gas supply and open speed control valve. Repeat two to three times if necessary. When pump is running normally, reset pump stroking rate as described in *Section 3.1.2* on page 8.

6.2.5 ***Spool may be swollen*** Occasionally, certain types of chemicals that are introduced into the motor through the air/gas inlet may be absorbed by the standard spool material, causing it to swell. If, after removal of the housing with the spool still inside, the spool will not move within the housing, call CheckPoint to order a replacement spool made of a different material.

6.2.6 ***After a repair, alignment screw may have been incorrectly reinstalled*** If care is not taken to replace the alignment screw finger tight prior to tightening by wrench, it may be that it has been screwed into the plastic spool rather than into the alignment slot in the spool. Normally this can be corrected by removal of the alignment screw and replacement after properly repositioning the clock position of the spool inside its housing.

6.2.7 ***Seals may be worn in the motor*** If the pump has been in service for some time, the motor seals may have worn to the point where the pump can no longer switch. If air leakage is constant during stall, worn or damaged seals are indicated. Performing an overhaul on the motor and replacing all seals is required.

6.3 Pump strokes erratically

6.3.1 ***Supply pressure may be fluctuating*** Check supply pressure with an accurate pressure gauge to ensure constant supply pressure. If fluctuations are observed, replace gas pressure regulator, or, if none exists, add a pressure regulator ahead of the air/gas inlet.

6.4 Chemical leakage from packing nut

6.4.1 ***Packing nut may not be tight enough*** Adjust packing nut per *Section 4.1* on page 11.

6.4.2 ***Packing may be worn*** If tightening the packing does not stop leakage, worn or damaged packing is almost certainly indicated. However, prior to replacing the packing, it is important to determine if wear is premature. Common causes of prematurely worn packing are:

6.4.2.1 **Packing nut may have been overtightened** Packing will appear smashed and the elastomer ring will be nearly completely destroyed due to heating and compression.

6.4.2.2 ***Chemical may be attacking packing elastomer material*** The packing will appear swollen or badly damaged once removed from the packing gland if it is being attacked by the chemical. Contact CheckPoint or your authorized CheckPoint distributor. If the chemical has recently been changed or if the pump has just been placed in service, there is a good chance that new packing materials are needed to do the job.

6.4.2.3 ***Chemical may be attacking plunger material*** The plunger will be severely worn, pitted, or corroded when inspected. A different plunger material, such as Hastelloy, 17-4 SS or ceramic is indicated.

6.4.2.4 ***Chemical may have abrasives suspended in it*** The plunger will appear scored and the packing will appear severely worn if trash in the chemical is indicated. To remove such particles prior to entering the pump, CheckPoint an In-Line Chemical Filter available in a range of mesh sizes and inlet/outlet sizes.

6.5 Other problems

If you are experiencing an operating problem not listed above, or if none of the above troubleshooting actions solves your operating problem, please contact your authorized CheckPoint distributor, or call CheckPoint directly at (800) 847-PUMP or (504) 340-0770, to determine appropriate next steps. Once CheckPoint has had the opportunity to help you troubleshoot your problem, please keep in mind the following regarding repairs:

6.5.1 ***CheckPoint offers an exchange program to keep you in service*** We will ship you a rebuilt pump, which you will be able to install prior to sending us your existing pump. When we do receive your pump, we will tear it down, rebuild it, and report back to you any problems we uncovered, charging you for only those repairs you required. If you bought your pump from a distributor, please contact them directly to arrange for this service.

6.5.2 ***Nothing beats factory-direct repairs*** Although the Series 5400/8400 has been designed to be easy to operate and to repair, the best way to ensure continued reliable service is to have your pump repaired at the factory. This is the only way to ensure you always get the quality and reliability you invested in when you purchased the product.

6.5.3 ***Remember that after you repair your CheckPoint pump, it should perform as well as it did when it was new*** If it doesn't, call us to determine what can be done to restore the pump to "like-new" performance.

6.5.4 ***Training sessions are available*** Please call us to set one up.