Operation and Maintenance Manual For S3X2S, S4X3S and S6X4S Dual Chambered Pumps

(Gravity and Flow Induced versions)

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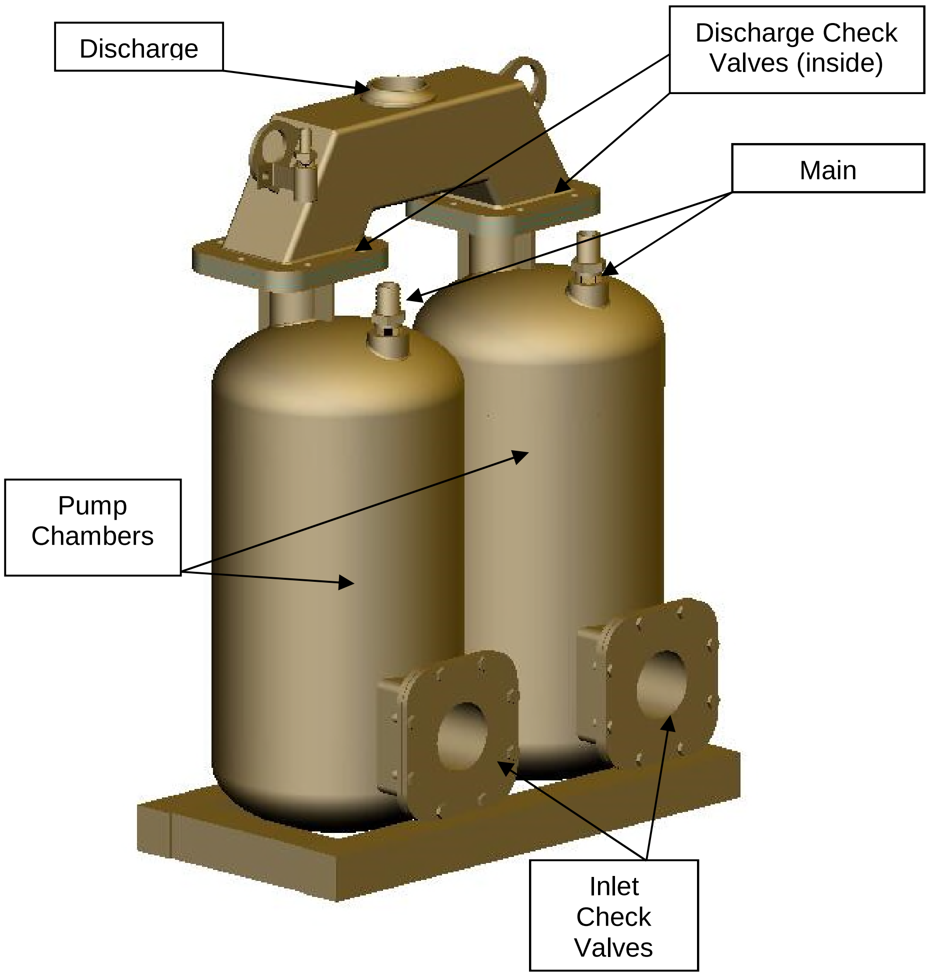
OVERVIEW

The wetted portion of the **PITBULL**® dual chambered pump system is based on two pump chambers, each with two check valves, one to allow fluid into the chamber and one prevent discharged fluid from flowing back in. The chambers are hollow.

Pumping Action: The inlet check swings open to allow fluid in. Air inside the pump chamber exits through the main airline in the top (either pulled out under vacuum or pushed out by liquid filling the chamber; these two modes are described in the next section).



Once the chamber is full, it is pressurized with compressed air and the inlet valve is pushed closed. With the chamber pressurized, the liquid is forced out the discharge check valve. This pressurization occurs for a set number of seconds, enough to clear the pump chamber, and then the chamber is depressurized and the cycle starts over.

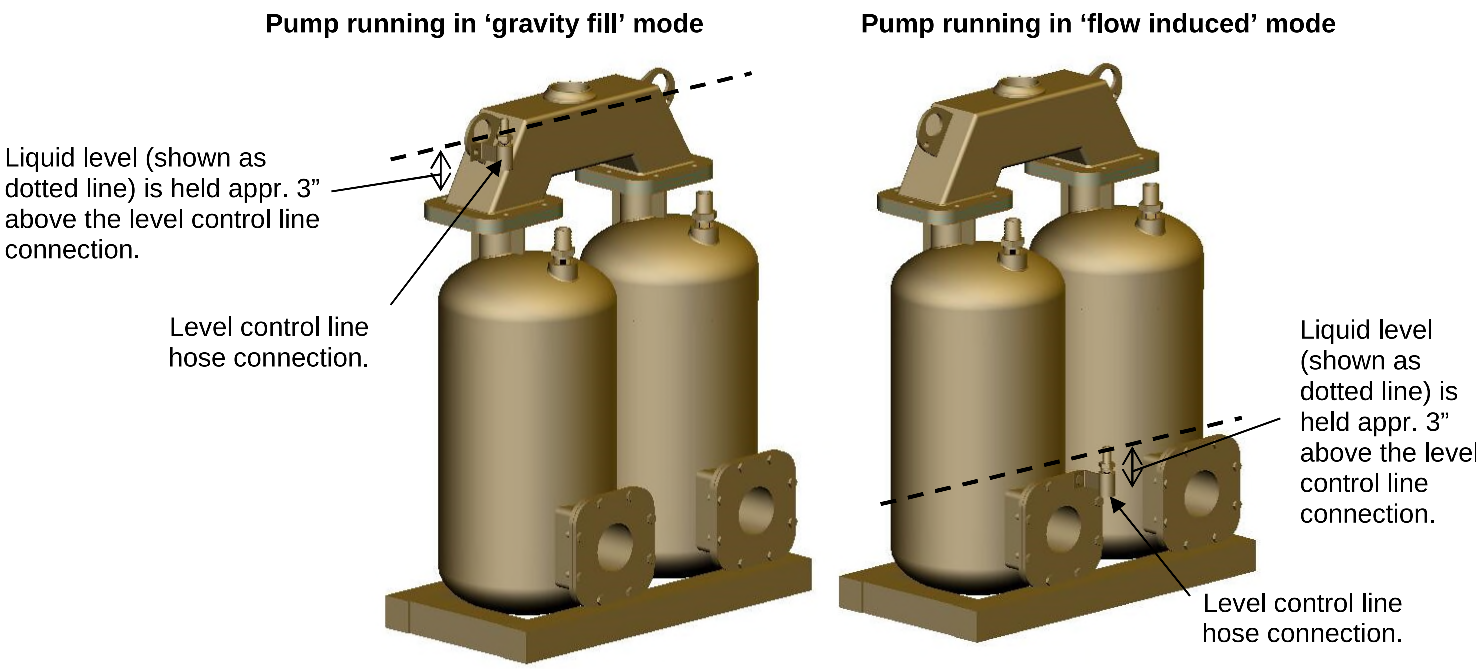
Each chamber runs in the opposite condition of the other; if one is discharging the other is filling and visa versa.

BASIC FUNCTIONING AND COMPONENTS

<u>What the Control Panel Does</u> (panel picture is on next page)

The control panel is what monitors the liquid level in the sump and controls the flow of air/liquids in and out of the pump chambers.

The level control line is an open ended conduit (hose is supplied with the pump for this purpose). The panel will cycle the pump anytime there is appr. 3 inches of liquid over the end of the level control line. Where the end of that control line is placed determines the operating level in the sump. A built-in connection for the control line is provided (see diagrams below). For pumps that fill by gravity (left diagram) the liquid level is held near the top of the assembly. For pumps that are flow induced and are filled using vacuum (see diagram on right) the liquid level is held a few inches above the intake port.

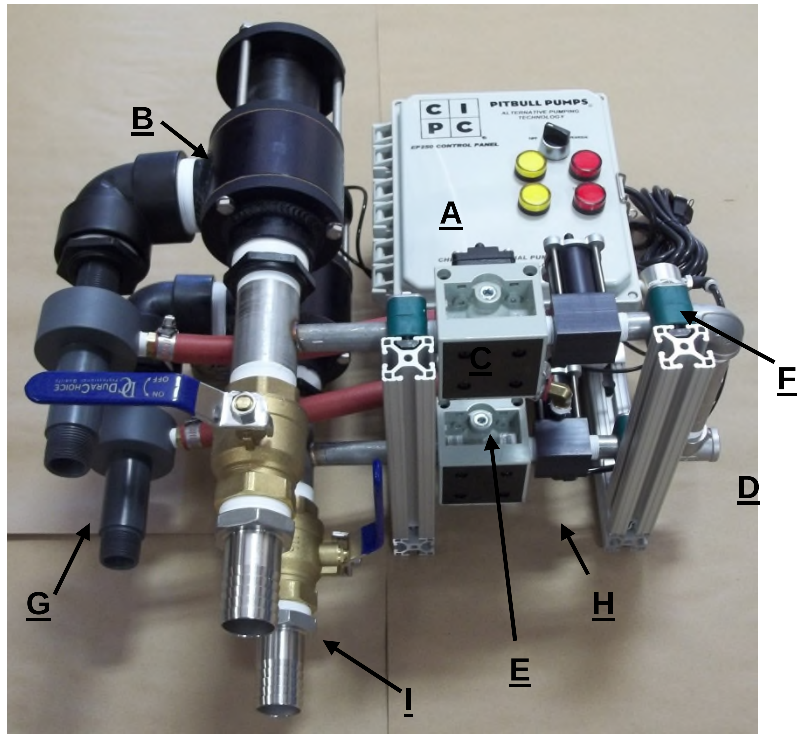


When the 3 inch liquid level (over the end of the control line) has been reached in the sump, the control panel will begin a fill stroke followed by a discharge stroke for each of the two chambers. This makes for one complete 'cycle'. After one complete cycle, the panel checks for the presence of liquid; if there is liquid it will immediately cycle again, if there isn't the panel will wait indefinitely for enough liquid to enter the sump and reach the 3 inch level.

**This means your pump will cycle steadily when the inflow exceeds the pump capacity and cycle intermittently when flow falls below capacity.

PANEL COMPONENTS
'EP250F4L(4X3)- Dual' shown

A- Control box
B- Exhaust valve *(EXV200) shown)*
C- REP50 discharge pressure regulator
D- Main airline connection
E- Level control line connection *(blocked from view behind C)*
F- Pilot air supply filter
G- Flow inducer *(F4L shown)*
H- FV200 supply valve to flow inducer
I- Isolation valve on main airline to pump



The control panel senses backpressure (3-4 inches of water column to initiate) in the control line. It then begins the fill stroke by opening the exhaust valve *and if the pump is equipped with a flow inducer* option, the panel also supplies the flow inducer* with compressed air.*

**** the flow inducer*** is a form of vacuum pump that uses compressed air to generate vacuum. Its purpose is to suck air out of the pump chamber, which pulls liquid in.

Once the fill stroke is complete (usually in the 3-6 second range; see page 9 start-up chart for factory settings) the panel switches to the discharge stroke by closing the exhaust valve to trap pressure in the pump (also by cutting off air to the flow inducer if so equipped) and opening the discharge pressure regulator. This process feeds regulated, compressed air down the main airline and into the pump to push its contents downstream.

The exhaust and vacuum generator valves are operated by small, piloting solenoid valves located inside the control panel enclosure. The discharge piloted regulator is controlled by another piloting solenoid valve but with its' own adjustable regulator to control the pressure of the discharge regulator output to the pump.
** A manual override is located on the door to force cycling, defeating the level control.

INSTALLING THE PUMP

Pump Installation

The pump should be placed on the bottom of the sump, as near level as reasonable and tilted no greater than 10 degrees.

Keep approximately **2X** the pump's piping diameter of open space in front of the inlet to allow full liquid and solids flow into the port (example: 3" submersible should have 6" of open space in front of the inlet port).

Keep 2(x) of the pump piping diameter open in front of the inlet

Discharge Piping

Try to match the discharge piping to the size of the outlet port. Avoid reducing more than one pipe size unless imperative. The reasons and trade-offs are as follows,

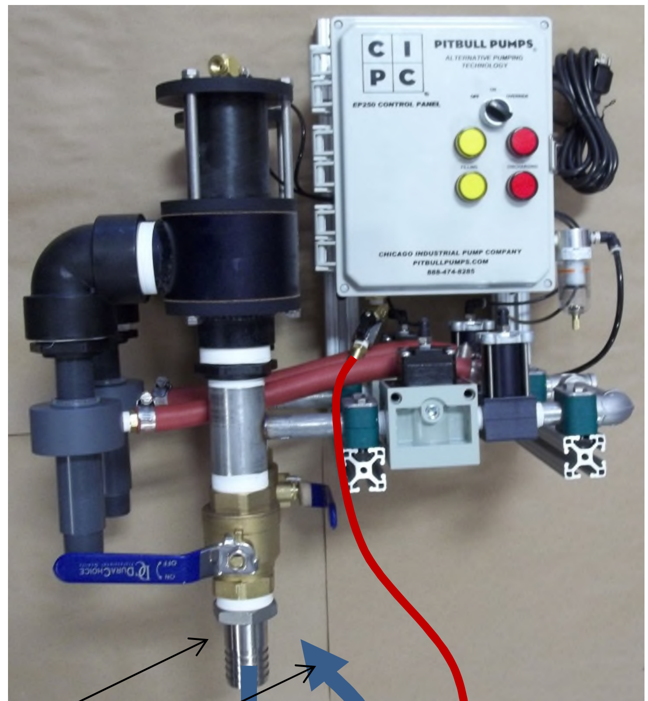
1- Efficiency will be less with reduced piping due to the increase in friction loss and the required pressure to overcome it. Unlike centrifugal pumps the **PITBULL**® can raise its' output pressure to compensate without losing flow rate (within reason) but the penalty is increased air consumption.
2- The **PITBULL**® will pass large solids. Watch out for pumping bigger stuff than your piping can take, particularly when it comes to rigid solids like coal chunks.

CONTROL PANEL INSTALLATION

Mount the panel using the (4) holes on the top and bottom tabs of the box. Locate the panel away from falling debris, drips and leaks and in a spot where it can be adjusted or serviced.

Supply 110vac power to the power cord provided. If connecting with conduit, wire carefully to the exact locations as the cord.

Bring a 60-100 psi, **unlubricated** air supply to the filter/autodrain (right side, not shown in picture). Include a shut-off valve and union or other break in the line so the panel can be pulled for emergency repair. Please use the following air supply line recommendations.

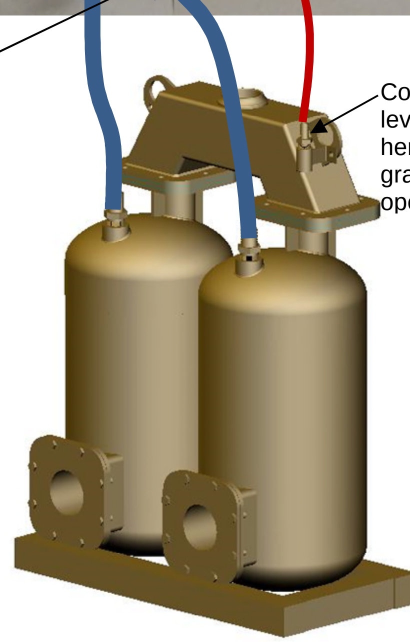


3X2" pump – 3/4" pipe supply
4X3" pump – 1" pipe supply
6X4" pump – 1-1/2" pipe supply

Connecting the Panel to the Pump

There are two connections to make, the (2) main airlines and (1) level control airline. Airlines are provided with your system and come as 15' lengths standard.

1) Run the (2) main airlines from the hose barb on the panel under the exhaust valve/isolation valve to the hose barb on the top of the tank.
2) Run the level control airline from the ¼" ball valve with a 1/2" hose barb on the underside side of the panel to the level control airline hose barb on the pump.



Panel valve sets are labeled 'A' (in front) and 'B' (in back). It doesn't matter which chamber goes to which valve set but make sure you identify which when troubleshooting

Connect level control here for gravity operation.

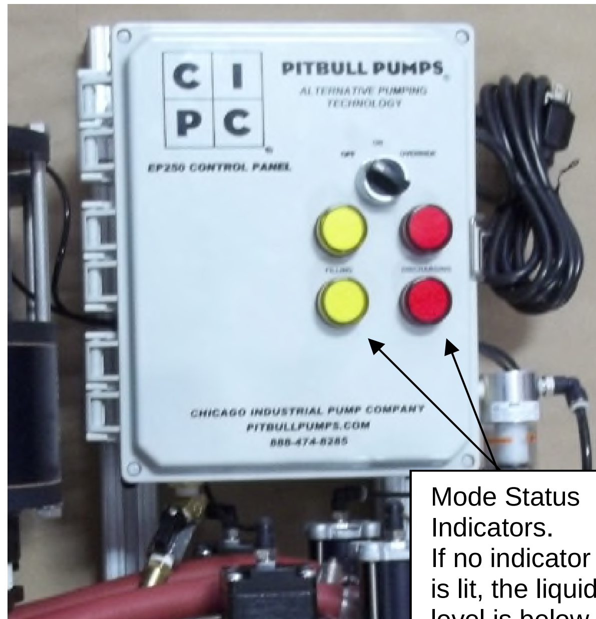
** if you intend to hard pipe the two lines instead of using the hoses, substitute 1/2" pipe or 5/8" tubing (larger OK/better) for the 1/2" control line hose. For the main airline, use pipe or tubing with an ID as big or bigger than the ID of the hose provided.

Connect level control here for flow induced operation.

PANEL BASICS

Mode of Operation

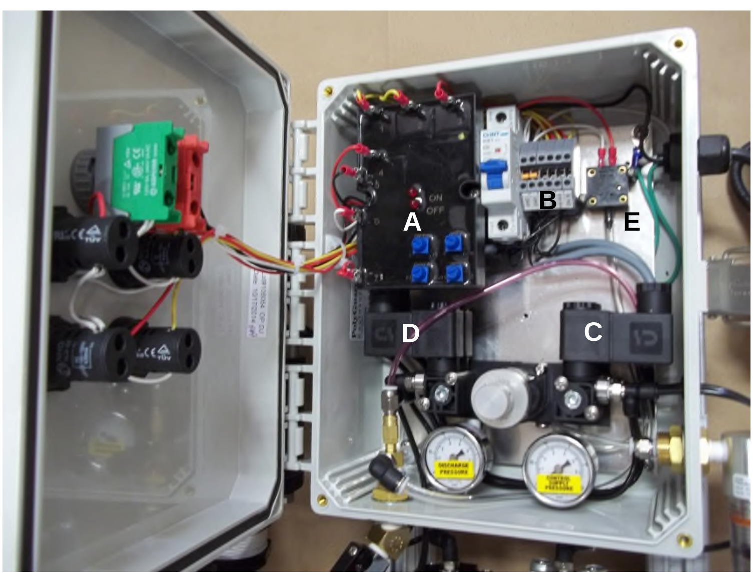
The adjacent picture shows the control panel enclosure. The switch on the front shows the operational modes of the pump. This is a three-position switch, with ‘off’ to the left.



Mode Status Indicators.
If no indicator is lit, the liquid level is below the operational ‘on’ point.

<u>**‘ON’ (automatic level controlled mode)**</u>
This mode cycles the pump when liquid is present and keeps it off when none is available. There is little reason not to run the pump in this mode.

<u>**MANUAL OVERRIDE**- mode is for emergency and manual situations.</u> This mode bypasses the level control function and keeps the panel cycling regardless of whether there is liquid to pump – the pump will run dry in this mode (no damage, just wasted compressed air). Use the bypass mode temporarily if there has been a failure/plugging/disconnection of the level control line or if you need to keep the last few inches of liquid as
low as possible in the sump.



Inner Panel Details

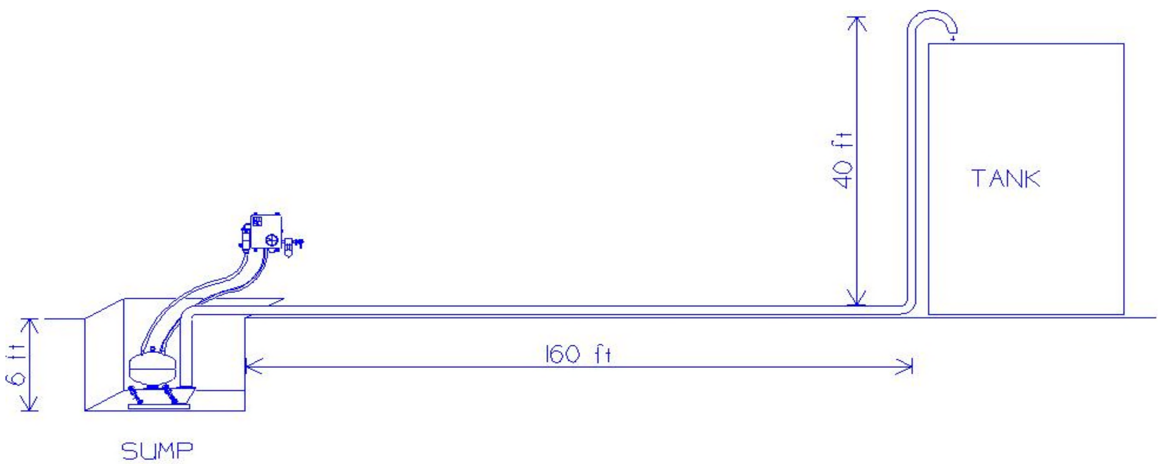
The inner panel should only be opened temporarily for discharge pressure and stroke adjustments, initial power wiring or repairs. Otherwise, please leave it closed and latched tightly to engage the door seal and keep components protected.
(A) Logic module with stroke adjustments.
(B) The terminal strip provides connections for power, solenoid valves and indicators.
(C) Pilot valves for exhaust valves (closing) and flow inducer valves (opening).
(D) Pilot valves with pressure control for piloted discharge regulators.
(E) Level control switch

START-UP SETTINGS

The control panel is preset for cycle times. The discharge pressure is preset for 40 psi. <u>When initially starting up the pump, do not change the cycle times</u> and only adjust the discharge pressure if needed.

<u>Setting the pressure.</u> Try to determine the total dynamic head required for the application. In simple terms, take the vertical height that the pump must push the liquid and convert it to psi (there are 2.31 ft per 1 psi), and then add in your calculated or 'guesstimated' friction loss (guess high if the liquid is viscous) in psi, and finally add 15 psi for a safety margin. This total should be enough to push the liquid out of the pump at a good flow rate. Note: by using too little pressure little/nothing will leave the pump (the pump is essentially deadheaded), too much pressure and you waste compressed air and put extra wear on your check valves.

Example: The pump is in a sump 6' deep, and must pump to an elevated tank 40' above grade, through 200' of 2" pipe at an average flow rate of 80 gpm.



The elevation difference is 6' + 40' = 46' and 46/2.31= 20 psi.

TIP: If your discharge piping size is the same as the **PITBULL**®, the velocity will be so low that friction loss is negligible on shorter runs with watery fluids.

Finally, from a friction loss chart you find that the loss for 80 gpm of water flowing through 200' of 2" pipe is 25 ft, or about 11 psi. So set the discharge regulator for 20 (static) + 11 (friction) + 15 (safety margin) = 46 psi.

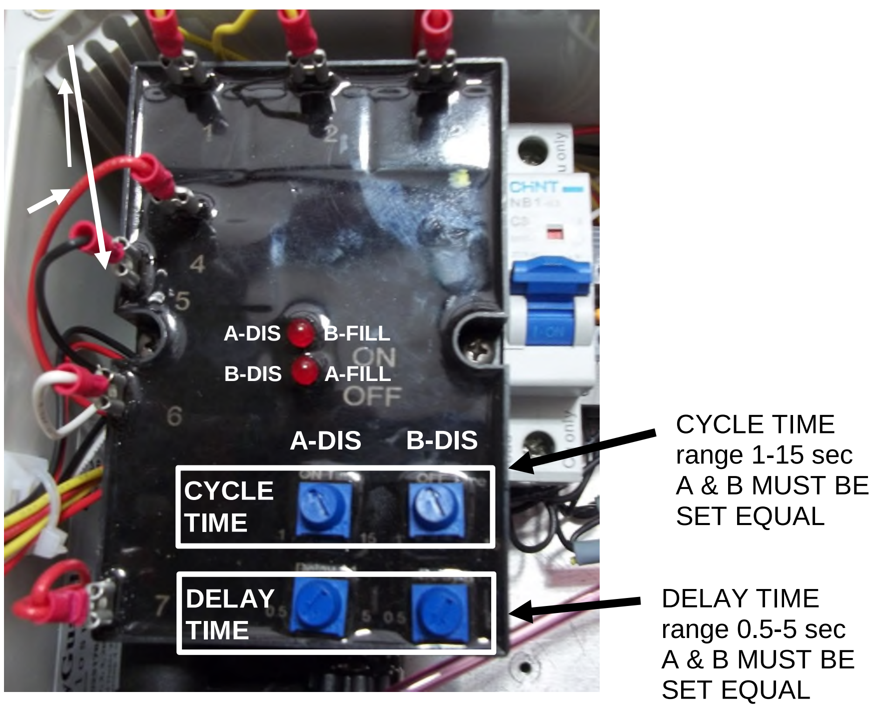
After running the pump a while it may be possible to start lowering the discharge pressure incrementally to reduce the 'safety margin' a few psi and save some compressed air use. Don't do this until you know the pump is maintaining the flow required under the worst case condition of material viscosity (maximum friction loss)

FACTORY SET STROKE ADJUSTMENTS

Pump Model	Cycle Time	Delay Time *(Min/Max)*
S3X2S Dual	4.0 seconds	0.5/1.5 seconds
S4X3S Dual	5.5 seconds	0.5/1.5 seconds
S6X4S Dual	5.5 seconds	0.5/1.5 seconds
Custom	See sticker inside door of control panel; pump specific. Or call factory with serial number for support.	

MODIFICATION: The above cycle times are conservative, meaning that they are not as rapid as the pumps are capable of. If the pump is overwhelmed but an additional 10-20% flow capacity would allow it to keep up, there is a potential 0.5-1.0 seconds that can be removed from the cycle time by carefully and incrementally reducing the cycle time and observing if the pump continues to fully refill each time. Please call the factory with your pump model and conditions to receive recommendations and detailed discussion of how to know when the absolute maximum is reached.

<u>To re-set the discharge time.</u>*(Most submersed pumps will not require adjustment, and are factory pre-set)* After turning the cover switch into the 'BYPASS' setting use a very small blade screw driver in the slot adjustment knob or your fingers to make changes in the fill and discharge strokes. *USE YOUR WATCH WHEN FINE TUNING THE CYCLE. Clockwise is longer, CCW is shorter, the entire range is .5-15 seconds.*
**Keep the adjustment arrows parallel, pointing to the same position, same time.*



SETTINGS AND ADJUSTMENTS CONTINUED

WHEN TO ADJUST….
Most slurries and trash applications will flow into the pump at very close to the same rate, requiring no change in the CYCLE TIME.

To adjust,

CYCLE TIME: Exceptions are sludges, muds, heavier oils etc where the viscosity is enough higher to affect the chamber filling time required. If the pump is still filling (air still blowing from the exhaust on a gravity fill pump, or no change in exhaust tone on a flow induced pump) then add full second to the CYCLE TIME on both pots. Observe the exhaust, and repeat if necessary. **a small increase is all that is required for the few cases that require any increase at all.

DELAY TIME: When the discharge line is short, or large diameter, and the pump can discharge its contents quicker than normal, you will add time to the DELAY setting. What this does is decrease the actual time the pump chamber is pressurized during a discharge stroke. Situations when the liquid can be pushed from the pump very quickly, the time of pressurization needs to be shortened to avoid over-stroking the pump and getting air into the discharge. *This is not a problem for the pump, but does use more compressed air than needed for the same flow/pressure.

Using a watch, increase the DELAY TIME about 0.5 sec and then evaluate if compressed air is still getting into the discharge. Common observations are vibration in the piping, of feeling the turbulence by placing your hand on the pipe at an elbow and feeling the transition from the smooth fluid flow to the mixed fluid/air turbulence. *Also, if your pump is discharging too quickly, lower the discharge pressure to slow down the excess discharge rate.

If the discharge pipe run is long or restricted/reduced in size, it is likely you will not need any discharge delay. *You may also need to increase the discharge pressure under those conditions.

SETTINGS AND ADJUSTMENTS CONTINUED

Fine tuning pressure and discharge strokes *<u>(typically not needed):</u>* The settings most likely to need adjustment are the pressure and discharge stroke duration. If inadequate pressure is used for the conditions, then the pump will push little if any liquid downstream during the discharge stroke.

Things to observe

1) Vibration from flow in the piping; place a hand, preferably on an elbow in the discharge line and feel the turbulence of flow. If you can't tell the difference between when the pump is cycling or not cycling, then there is probably little or no flow. Look for closed valves, deadheading or too low of a discharge pressure.
2) Same thing, vibration, this time feeling for the difference in steady flow and the turbulence when the flow contains entrained compressed air. The difference is usually quite detectable (caused by too much discharge pressure or not enough DELAY TIME).
3) Observe the outfall of the pump if possible. The surge of the discharge stroke should appear approximately the same as the listed volume of the pump chamber.
4) Observe the exhaust/vent air. This can be the most informative of all but take care with these steps; a) when the discharge stroke ends the compressed air in the pump is released very rapidly out the exhaust port- keep you hand away during the blast of de-pressurization air, typically less than one second. b) after the blast there should be a 'wind' as liquid fills in the pump and pushes air out the exhaust. c) if the wind stops well short of the recommended fill stroke setting, then the pump probably was not discharged fully and only needs to refill half (for example) of the pump instead of the full volume.
5) If a short fill time is observed (and we're talking about the 'wind'/venting duration, not the adjustment on the potentiometer) then one or both of the following actions should be taken. 1- increase the discharge pressure, particularly if you cannot feel the liquid flowing in the discharge piping, or 2- increase the discharge stroke time using the adjustment potentiometer. Keep incrementally increasing the time (try 0.5 second increments, with 1 second usually being the maximum adjustment needed) and see if the change lengthens the fill/'wind' duration. This corresponds to more liquid being pumped out and it will take more time to refill. Once the fill/'wind' duration doesn't increase correspondingly, you should be finished. *Also if the stroke is adjusted long enough that some air is pushed into the discharge piping you should be easily able to feel the vibration as the pipe switches between smoother fluid flow to the turbulence from compressed air and liquid.
6) Another method is if there is a drain or flush valve on the discharge piping that can be cracked open, you will be able to see when the discharge switches over from liquid to compressed air. Start by lengthening the stroke until you get compressed air after the liquid and then shorten the discharge stroke until the air just goes away or is minimal. This will give you one full pump stroke volume per cycle.

TROUBLESHOOTING THE PUMP

THE MOST COMMON PROBLEMS DURING START-UP

If you are having difficulty with the operation of your pump please review the following list of pump problems. This list contains the most common problems we get calls on and also represents a group of avoidable conditions

1) Rust, scale, water slugs in the air supply fouling the filter-autodrain/valving because of not blowing down the air supply until clear, prior to connection. For excessively wet conditions or corroded piping, a knock-out pot (air receiver or other tank near the panel will help immensely).
2) Exhaust splatter and fouling due to the pump being deadheaded or close to it.
3) Cycling problems due to improper layout of the airlines, with crimps, undersized airlines substituted for the hoses supplied, restrictive quick couplings and fittings or excessive lengths.
4) Erratic cycling due to a small diameter air supply that can't deliver the volume while maintaining pressure. 'Control' pressure gauge falls below 40 psi during discharge stroke.
5) Pump fails to fill up and discharges a low volume per stroke because of a restriction in the exhaust path (muffler, looped line etc.).
6) Poor setting of the discharge pressure and/or discharge time for the conditions. Stroke and/or pressure are way off, usually from being played with unnecessarily. These conditions are all covered in the installation and start-up of the pump. If you are having one of these problems, and particularly if you have recently installed the pump, please review the earlier portions of the manual for correcting the condition.

Given that the preceding section does not address your pump's condition, we suggest the following process of test/evaluation/elimination to arrive at the source of the problem with the least amount of servicing.

COMMON CHECK VALVE AND PIPING PROBLEMS

<u>Inlet check valve:</u>

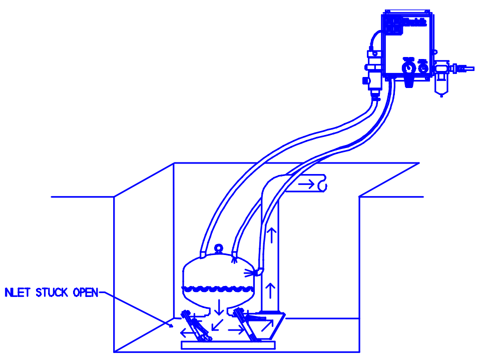
If the inlet check valve is blinded, blocked or stuck closed, the pump will cycle but put out little or no fluid per stroke but lots of air.

If the inlet check valve is stuck open, the pump will appear to cycle normally, but the discharge flow rate will be reduced or non-existent. You will commonly see turbulence at the inlet (from liquid and possibly air being expelled from the intake).

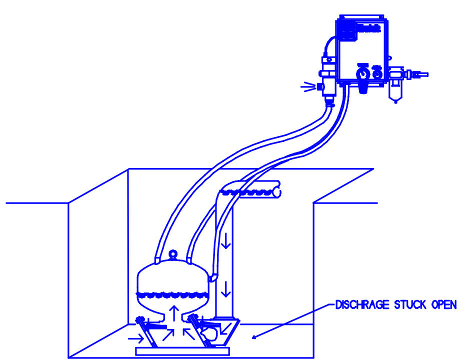
<u>Discharge check valve:</u>

If the discharge check is plugged or stuck closed, the pump is deadheaded. Because no liquid is leaving the pump, you may also get liquid spraying from the exhaust because the pump is completely full of liquid.

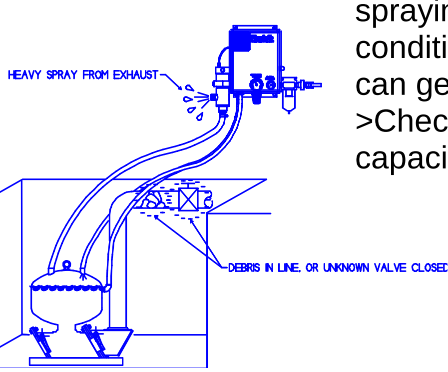
If the discharge check is stuck open, the pump will cycle normally, but flow will be much less as liquid runs back into the pump from the discharge piping. You may get spray out of the exhaust when the pump ‘overfills’ as one pump force fills the other..



Inlet check stuck open. Pump continues to cycle but output is low. You may see turbulence and vigorous bubbling near the inlet (if sump level is low)

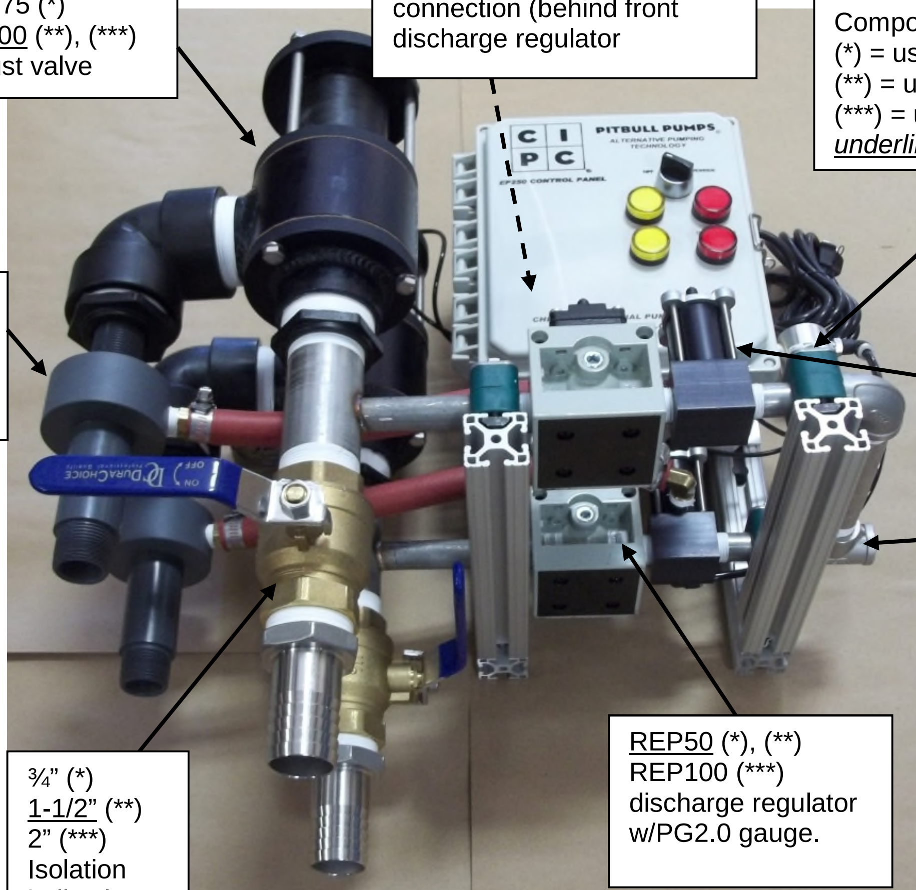


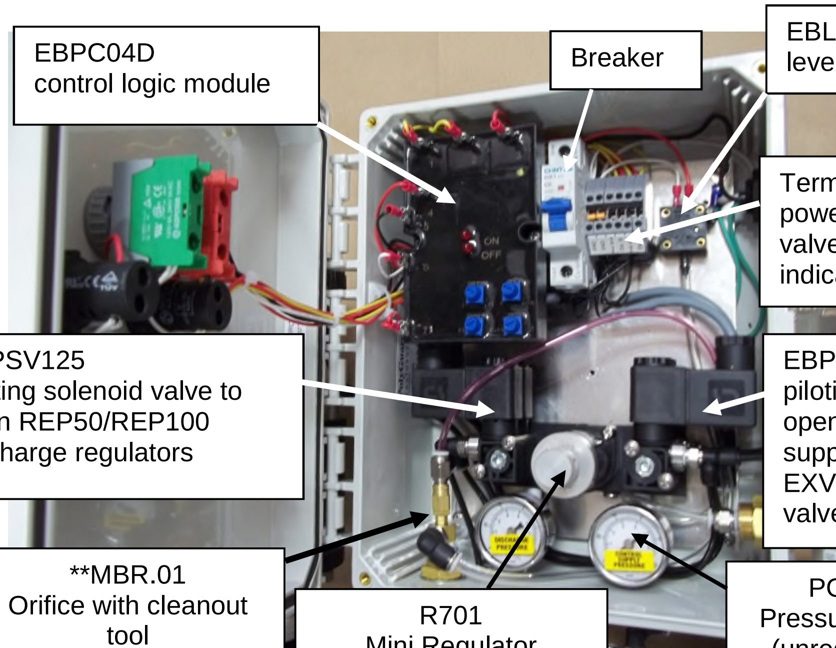
Discharge check stuck open. Pump continues to cycle but output is low. The pump is ‘re-pumping’ the same liquid over and over. It will often overfill under this condition and have fluid exiting the exhaust port.



Deadheaded pump. The discharge line is blocked or greatly restricted. The pump will cycle, little fluid will go down stream, and the pump will constantly overfill, spraying fluid from the exhaust port. Under this condition the exhaust valve, flow inducer and airline can get clogged and need to be cleared.
>Check these items if the pump does not pump at capacity once the discharge line is cleared.

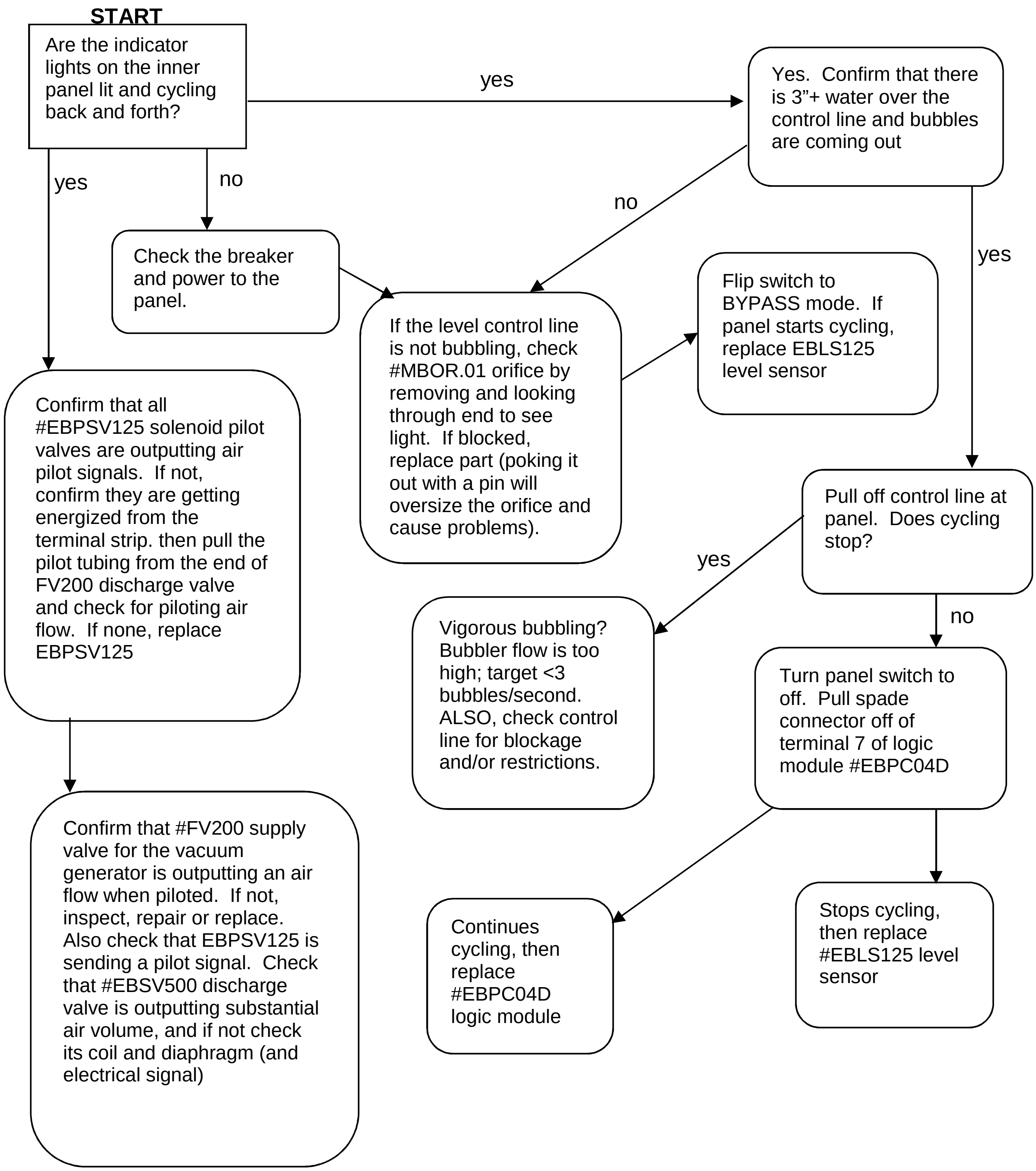
CONTROL PANEL COMPONENT IDENTIFICATION





CONTROL PANEL TROUBLESHOOTING

Start this section only after you have evaluated the pump using pages 11 to 12. This logic sequence only makes sense if you have already eliminated the standard problems like deadheading, low air pressure, plugged inlet already discussed. Without doing that first you may well be wasting your time.



TROUBLESHOOTING CONTINUED

<u>EXVS75 Exhaust valve</u>: (used with EP250G3-Dual and EP250F3L-Dual panels)

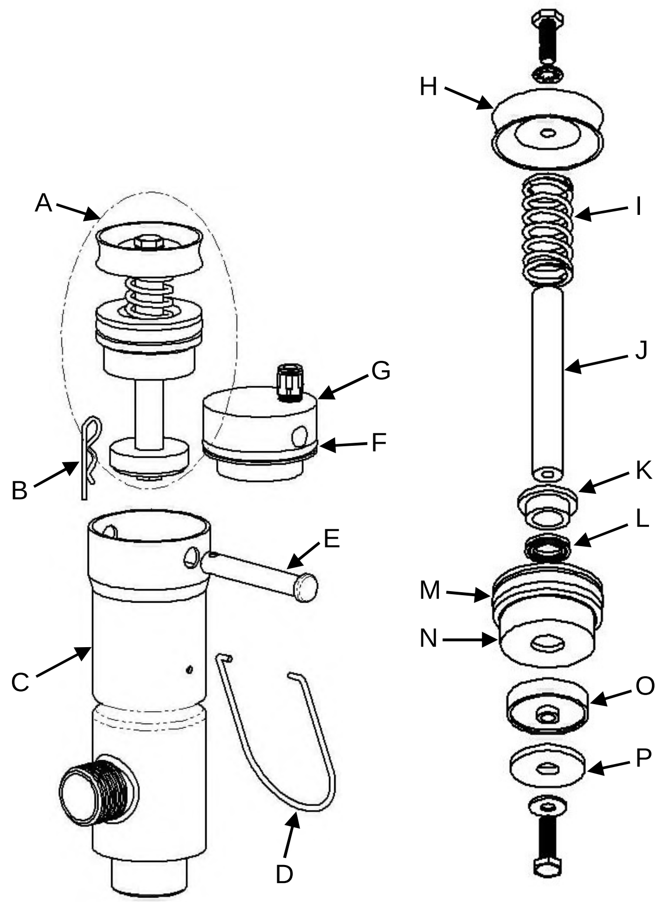
Failed open- will cause a lack of pressure in the pump during discharge, because the discharge air is coming right back up through the exhaust valve. The discharge gauge will drop further than normal, and liquid may spray from the exhaust. Also, the fill cycle will be relatively short like in a deadheaded condition.

Response- Remove retaining ring and pin, and then pull the valve cap 'G' up and out. Pull the exhaust valve internals out (std. pliers on the top shaft bolt work well) and inspect. Look for **1)** debris inside valve, **2)** worn/missing poppet seat, **3)** worn piston seal and **4)** a cut/nicked o-ring on the valve cap.

Failed closed- will cause the pump to slow or stop cycling.

Response- Do the same disassembly/inspection of the exhaust valve as above.

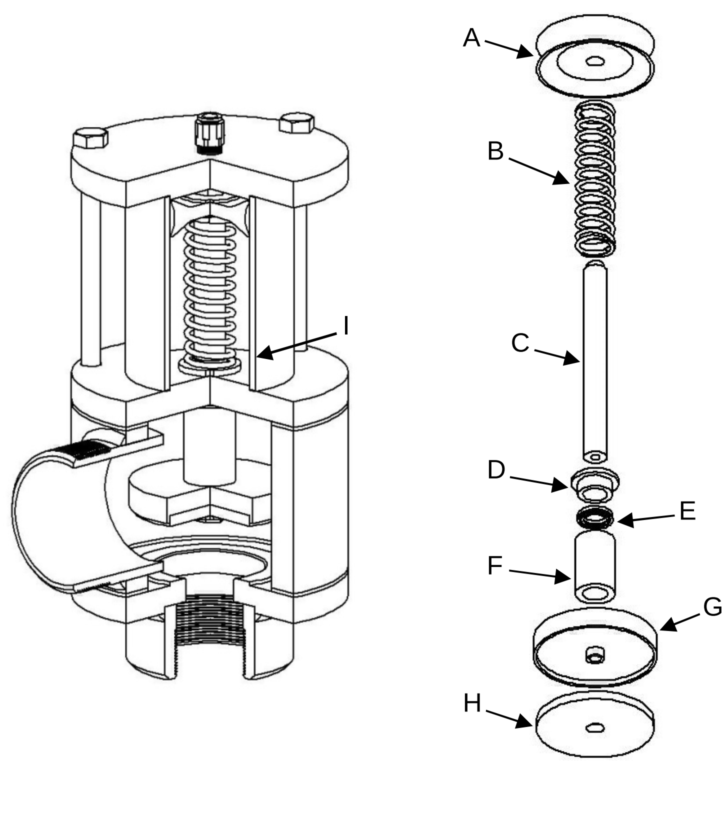
A – Exhaust valve internals
B – Cotter pin
C – Exhaust valve body
D – Spring D-ring
E – Clevis pin
F – Valve cap o-ring
G – Valve cap
H – Piston cup seal
I – Return spring
J – Shaft
K – Guide bushing
L – Wiper shaft seal
M – Seal housing o-ring
N – Shaft seal housing
O – Poppet back
P – Poppet seat



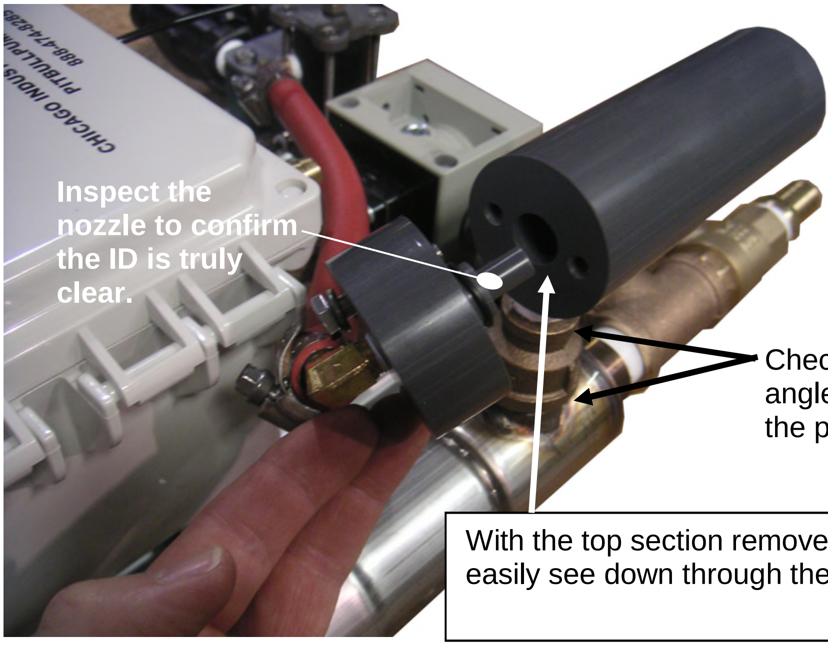
<u>EXV200 Exhaust valve</u> (used with EP250G4(4X3)-Dual, EP250G6-Dual EP250F4L(4X3)-Dual and EP250F6L-Dual panels)

This valve operates with the same in principle as the *EXVS75.* Failure modes will also be the same.

A – Piston cup seal
B – Return spring
C – Shaft
D – Guide bushing
E – Wiper shaft seal
F – Spacer
G – Poppet back
H – Poppet seat
I – Cylinder

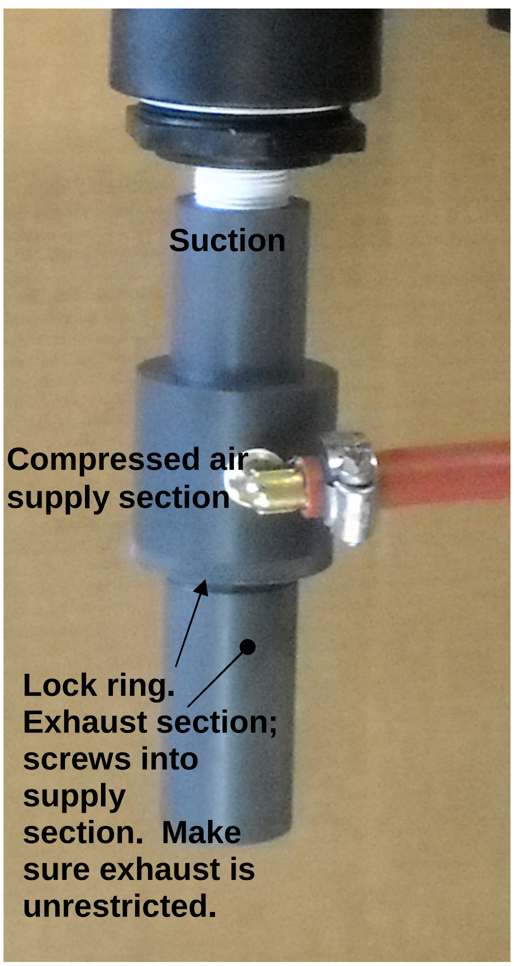


FLOW INDUCER TROUBLESHOOTING AND REPAIR



Flow Inducers with side vacuum port

The bore must be clear/smooth or the vacuum flow will not happen even if the unit sounds like it is working. Remove the top and look through the bore. Clean with water/soap if needed and/or use a plastic bristle cylinder brush.



Flow Inducers with top vacuum port

This style flow inducer has the air supply in the side and pulls vacuum in the top and exhaust out the bottom. There are (3) sections, suction, supply and exhaust.

First inspect the flow path by looking through from the suction out the exhaust. If all clear, then there is either an air supply problem or an adjustment problem (this is assuming there is nothing connected to the exhaust; remove any muffler or tubing before troubleshooting).

Air supply- remove the supply hose from the hose barb and confirm there is plenty of air flow and pressure (need 60 psi or more).

Adjustment- loosen the locking ring and with fingers only, screw the exhaust section up into the fatter supply section until it bottoms. This is ‘0’ degrees; from here start unscrewing. At 270 degrees out from ‘0’ (3/4 of a turn) there will be good flow and suction. Maximum flow and maximum air consumption will occur at 2 full turns out. 1.75 turns is generally the maximum needed.

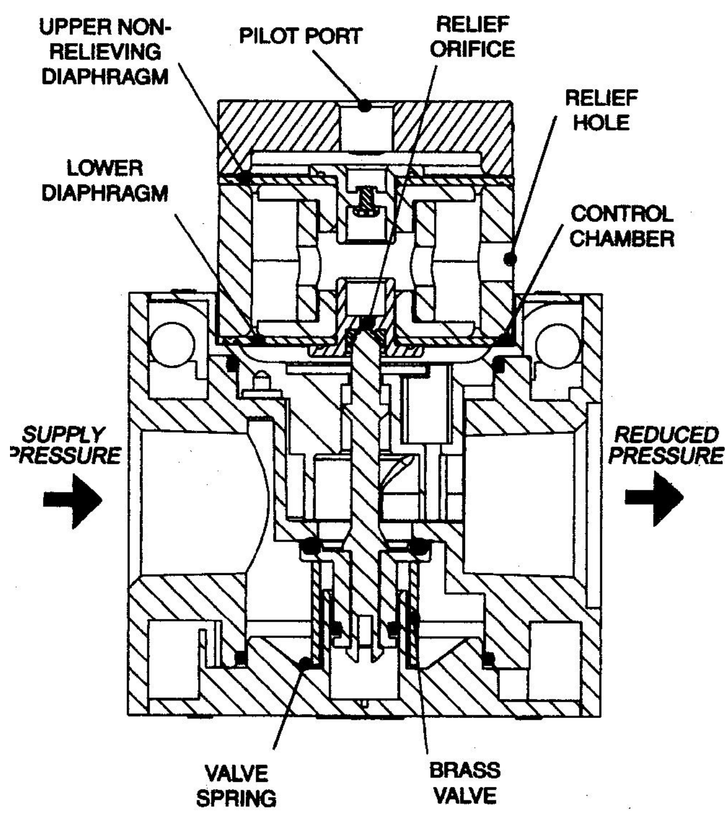
TROUBLESHOOTING CONTINUED

FAILURE CONDITIONS OF CONTROL PANEL COMPONENTS

Discharge regulator: When debris is stuck under the poppet, the regulator will allow excess air pressure by, which it will try to vent out of its bonnet, causing a significant leak (hissing) at the bonnet. When the diaphragms are torn, the similar symptoms will occur: if the top diaphragm is torn, the pilot air signal will blow through making an audible leak and most likely the regulator will not open and pass air downstream. If the lower diaphragm is torn, there will also be an air leak and a chance the regulator won't open. Clean or repair using the appropriate repair kit from the parts list. See cutaway view below.

REP50 and REP100 Discharge Regulators

Piloted discharge regulators: Both regulators have the same design/function and can fail in the same way. When debris is stuck under the poppet, the regulator will continuously allow excess air pressure by.



If the pump is filling, this blow-by air will be added to the pump exhaust air (and if the pump is flow induced, this extra air will defeat the vacuum of the flow inducer causing the pump not to fill). During the discharge mode the leaked air cannot be detected.

The easiest way to determine if the regulator is stuck open is to turn the panel off with the air supply still on (after closing the main airline ball valve which will isolate the pump and force any leaked air to come out the exhaust valve). If you get compressed air exiting the exhaust valve then it is a pretty sure bet that the regulator poppet cannot close. Disassemble and inspect for obvious debris, wear, sticking.

When the diaphragms are torn, different symptoms will occur. If the top diaphragm is torn, the pilot air signal will blow through, making an audible leak and most likely the regulator will not open and pass air downstream. If the lower diaphragm is torn, there will also be an air leak but is likely the regulator will open.
Clean or repair using the appropriate repair kits for the REP50/100K (contains both diaphragms, poppet assembly).

EP250 CONTROL PANEL SPARE PARTS AND COMPONENTS

Note: all panels share the enclosure and internal logic components. The differences are in the size of discharge regulators and exhaust valves. All other parts are interchangeable.

Part #	Description
******	Complete control panel with all valves and filtration
EP250G3-Dual	Electronic-pneumatic control panel complete with 1/2" filter/auto-drain, uses 1” airline size, for S3X2S gravity fill dual pumps.
EP250G(4X3)-Dual	Electronic-pneumatic control panel complete with 1/2" filter/auto-drain, uses 1-1/2” airline size, for S4X3S gravity fill dual pumps.
EP250G6-Dual	Electronic-pneumatic control panel complete with 1" filter/auto-drain, uses 2” airline size, for gravity fill S6X4S pumps.
EP250F3L-Dual	Electronic-pneumatic control panel complete with 1/2" filter/auto-drain, uses 1” airline size with F4L flow inducer for S3X2Sflow induced dual pumps.
EP250F4L(4X3)-Dual	Electronic-pneumatic control panel complete with 1/2" filter/auto-drain, uses 1-1/2” airline size with F4L flow inducer for S4X3S flow induced dual pumps.
EP250F6L-Dual	Electronic-pneumatic control panel complete with 1" filter/auto-drain, uses 2” airline size with F6L flow inducer and 2" relief check for S6X4S flow induced dual pumps.

EBPC04B	Dual logic control module.
EBLS125	Level sensor.
EBPSV125	Piloting 1/8” Solenoid Valve
EXVS75	Complete 3/4" stainless exhaust valve, viton seat, nitrile seal.
EXVS75IN	Complete drop in replacement internal assembly
EXVS75S	3/4" SS exhaust valve seat, and seal rebuild kit
EXV200	2" exhaust valve.
EXV200K	2" exhaust valve rebuild kit
F125	1/8” control filter.
MBR.01	Bubbler orifice
CV1032	Level control line relief valve.
PG2.0	Liquid filled 1-100 psi discharge gauge.
REP50	1/2" piloted discharge regulator.
REP50K	1/2" piloted discharge regulator repair kit.
REP100	1" piloted discharge regulator.
REP100K	1" piloted discharge regulator repair kit.
REP150	1-1/2" piloted discharge regulator.
REP150K	1-1/2" discharge regulator (pilot operated) repair kit.

FLOW INDUCERS

F3L	Flow inducers for S3X2S pumps
F4L	Flow inducers for S4X3S pumps
F6L	Flow inducers for S6X4S pumps

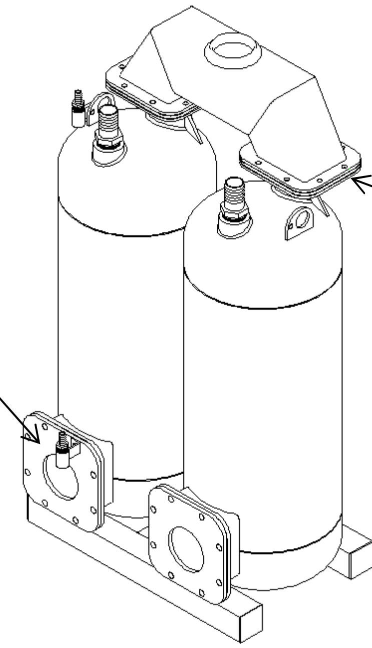
* Flow inducers should be exhausted into large diameter, rubber hose or approved mufflers.

MUFFLERS

ST-6B	Muffler for F2–F3 flow inducers
ST-12C	Muffler for F4–F8 flow inducers

AIR SUPPLY FILTERS

F50/AD	1/2" filter with high flow autodrain
FE50	40 micron filter element for F50 filter
F100/AD	1" filter with high flow autodrain
FE100	40 micron filter element for F100 filter
F150/AD	1-1/2" filter with high flow autodrain
FE150	40 micron filter element for F150 filter



CIPC CHECK VALVES

CIPC recommends that customer's stock inlet and discharge check valve internals, and in cases of expected high wear such as abrasive slurries we recommend entire spare check valves. Following is a list of **CIPC** check valve part numbers and descriptions.

Seat Material Selection Properties

SEAT MATERIAL	**DESCRIPTION**
Nitrile	Good all-purpose elastomer. Medium chemical, oil and solvent resistance, good strength,temperatures up to 170°F
Viton	Excellent resistance to oxidizers and solvents. Medium strength, temperatures up to 250°F.
Teflon	Best chemical resistance of all. Inert to acid bases and solvents. Lower cycle life, non-elastomeric, temperatures up to 300°F.
Urethane HD	Good resistance to abrasion. Toughest of the elastomers, with mild chemical resistance, temperatures up to 150°F.
EPDM	Good heat and acid/base resistance. Tougher than Viton but poor solvent resistance, temperatures up to 300°F.
PVDF	Excellent chemical and solvent resistance, toughness for abrasion and temperature resistance to 250F.

CIPC SIDE INLET CHECK VALVES CONTINUED

3SICV(_) **3"** CIPC side inlet internal swing check, stainless steel, for 3” side inlet pumps
3CVF/(_) **3"** Flapper (316SS)

Seat adders for check valve flappers

(N)	Nitrile seat for 3" check
(V)	Viton seat for 3" check
(T)	Teflon seat for 3" check
(UHD)	Heavy duty urethane seat for 3” check
(E)	EPDM seat for 3" check
(P)	PVDF seat for 3” check

3CVSK(_) **3"** **Seat kit (2 seats), for 3” checks**

(N)	Nitrile seat for 3" check
(V)	Viton seat for 3" check
(T)	Teflon seat for 3" check
(UHD)	Heavy duty urethane seat for 3” check
(E)	EPDM seat for 3" check
(P)	PVDF seat for 3” check

4SICV(_) **4”** CIPC side inlet internal swing check, stainless steel for 4” side inlet pumps
4CVF/(_) **4"** Flapper (316SS)

Seat adders for check valve flappers

(N)	Nitrile seat for 4" check
(V)	Viton seat for 4" check
(T)	Teflon seat for 4" check
(UHD)	Heavy duty urethane seat for 4" check
(E)	EPDM seat for 4" check
(P)	PVDF seat for 4” check

4CVSK(_) **4"** **Seat kit (2 seats), for 4” checks**

(N)	Nitrile seat for 4" check
(V)	Viton seat for 4" check
(T)	Teflon seat for 4" check
(UHD)	Heavy duty urethane seat for 4” check
(E)	EPDM seat for 4" check
(P)	PVDF seat for 4” check

CIPC SIDE INLET CHECK VALVES CONTINUED

6SICV(_)	**6"**	CIPC side inlet internal swing check, stainless steel, for 6x4 and 6” side inlet pumps
6SICV(_)-DT	**6”**	CIPC side inlet internal swing check, stainless steel, with low level downtube, for 6x4 and 6” side inlet pumps
6CVSK(_)	**6"**	**Seat kit (2 seats), for 6” checks**
(N)		Nitrile seat for 6" check
(V)		Viton seat for 6" check
(T)		Teflon seat for 6" check
(UHD)		Heavy duty urethane seat for 6” check
(E)		EPDM seat for 6" check
(P)		PVDF seat for 6” check
8SICV(_)	**8"**	CIPC side inlet internal swing check, stainless steel, For 8” side inlet pumps
8SICV(_)-DT	**8”**	CIPC side inlet internal swing check, stainless steel, with low level downtube, for 8” side inlet pumps
8CVSK(_)	**8"**	**Seat kit (2 seats), for 8” checks**
(N)		Nitrile seat for 8" check
(V)		Viton seat for 8" check
(T)		Teflon seat for 8" check
(UHD)		Heavy duty urethane seat for 8” check
(E)		EPDM seat for 8" check
(P)		PVDF seat for 8” check

DISCHARGE CHECK VALVES, S6X4S, S4X3S & S3X2S

2CVP/S(_)	**2"**	**CIPC 316SS swing check, plate style, full port, complete assembly.** *(Fig 20A)*
2CVF/(_)	**2"**	**Flapper (316SS)** *(Fig 20B, 20D exploded)*

Seat adders for check valve flappers

(N)	Nitrile seat for 2" check
(V)	Viton seat for 2" check
(T)	Teflon seat for 2" check
(UHD)	Heavy duty urethane seat for 2” check
(E)	EPDM seat for 2" check

2CVSK(_)	**2"**	**Seat kit (2 seats), for 2” checks**

(N)	Nitrile seat for 2" check
(V)	Viton seat for 2" check
(T)	Teflon seat for 2" check
(UHD)	Heavy duty urethane seat for 2” check
(E)	EPDM seat for 2" check

2CVGK	**2"**	**Flange gasket kit (4 gaskets) for 2” check valve** *(Fig 20C)*

3CVP/S(_)	**3"**	**CIPC 316SS swing check, plate style, full port, complete assembly.** *(Fig 20A)*
3CVF/(_)	**3"**	**Flapper (316SS)** *(Fig 20B, 20D exploded)*

Seat adders for check valve flappers

(N)	Nitrile seat for 3" check
(V)	Viton seat for 3" check.
(T)	Teflon seat for 3" check.
(UHD)	Heavy duty urethane seat for 3" check
(E)	EPDM seat for 3" check.

3CVSK(_)	**3"**	**Seat kit (2 seats), for 3” checks**

(N)	Nitrile seat for 3" check
(V)	Viton seat for 3" check.
(T)	Teflon seat for 3" check.
(UHD)	Heavy duty urethane seat for 3” check
(E)	EPDM seat for 3" check

3CVGK	**3"**	**Flange gasket kit (4 gaskets) for 3” check valve** *(Fig 20C)*

*** (2) gaskets required for submersible (2 spares)*

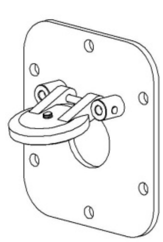


Fig 20A

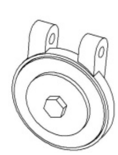


Fig 20B

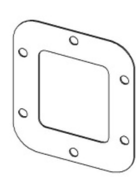


Fig20C

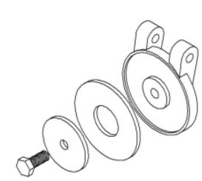


Fig20D

CIPC CHECK VALVES CONTINUED

4CVP/S(_)	**4"**	**CIPC 316SS swing check, plate style, full port, complete assembly.** *(Fig 20A)*
4CVF/(_)	**4"**	**Flapper (316SS)** *(Fig 20B, 20D exploded)*

Seat adders for check valve flappers

** Pumps are built with NITRILE seats as standard **

(N)	Nitrile seat for 4" check
(V)	Viton seat for 4" check.
(T)	Teflon seat for 4" check.
(UHD)	Heavy duty urethane seat for 4" check.
(E)	EPDM seat for 4" check.

4CVSK(_)	**4"**	**Seat kit (2 seats), for 4” checks**

(N)	Nitrile seat for 4" check
(V)	Viton seat for 4" check.
(T)	Teflon seat for 4" check.
(UHD)	Heavy duty urethane seat for 4” check.
(E)	EPDM seat for 4" check

4CVGK	**4"**	**Flange gasket kit (4 gaskets) for 4” check valve** *(Fig 20C)*

** *(3) gaskets required for submersible (1 spare) & (4) required for transfer pumps*

** **CIPC** *strongly recommends that new gaskets be installed whenever reassembling check valves*.

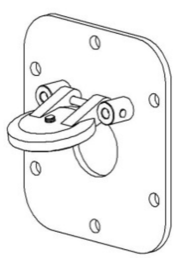


Fig 20A

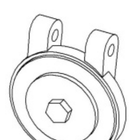


Fig 20B

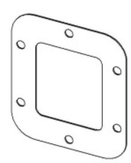


Fig20C

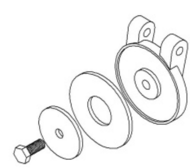


Fig20D

To order, contact **CIPC** with your pump serial number