Operation and Maintenance Manual For All Variations of: EP250G2–G8, EP250F2L–F8L & Dual Pump Systems

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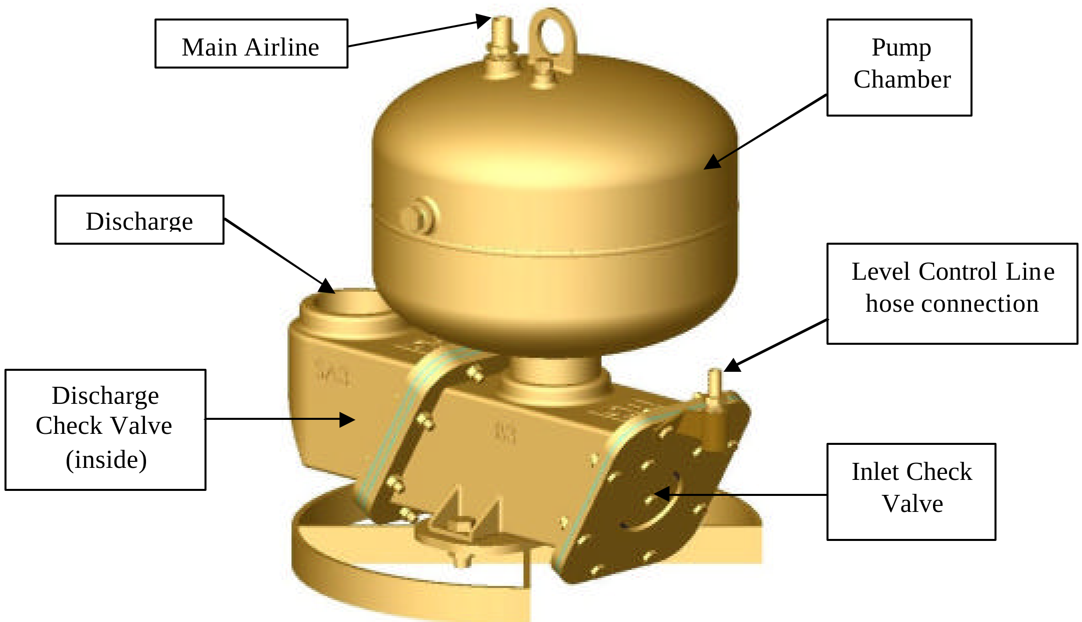
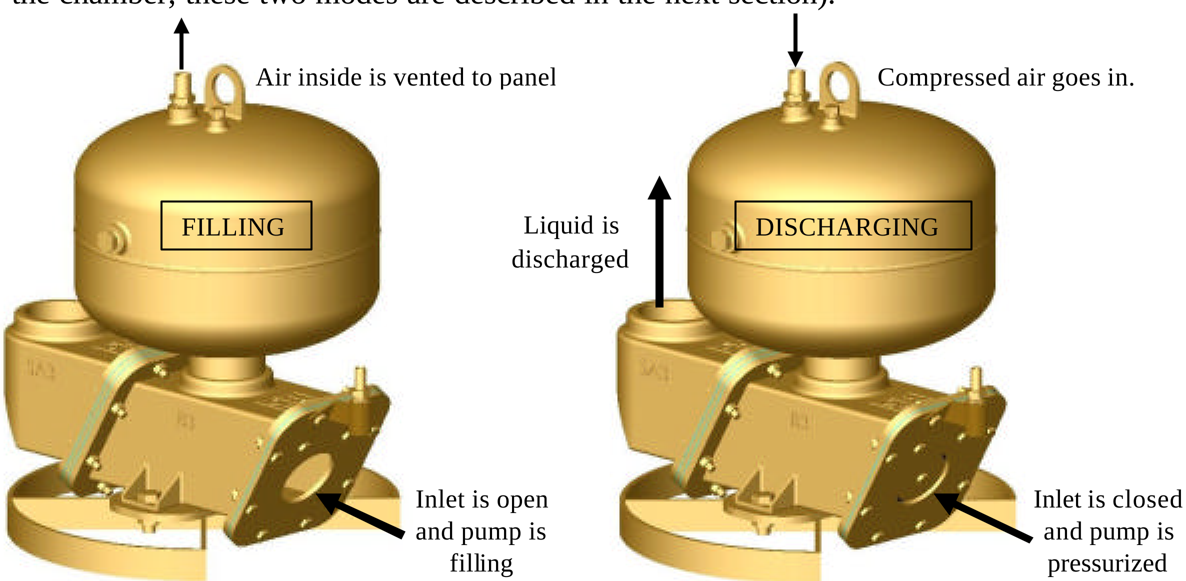
OVERVIEW

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



Pumping Action: The inlet check swings open to allow fluid in. Air inside the pump chamber exits through an 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).



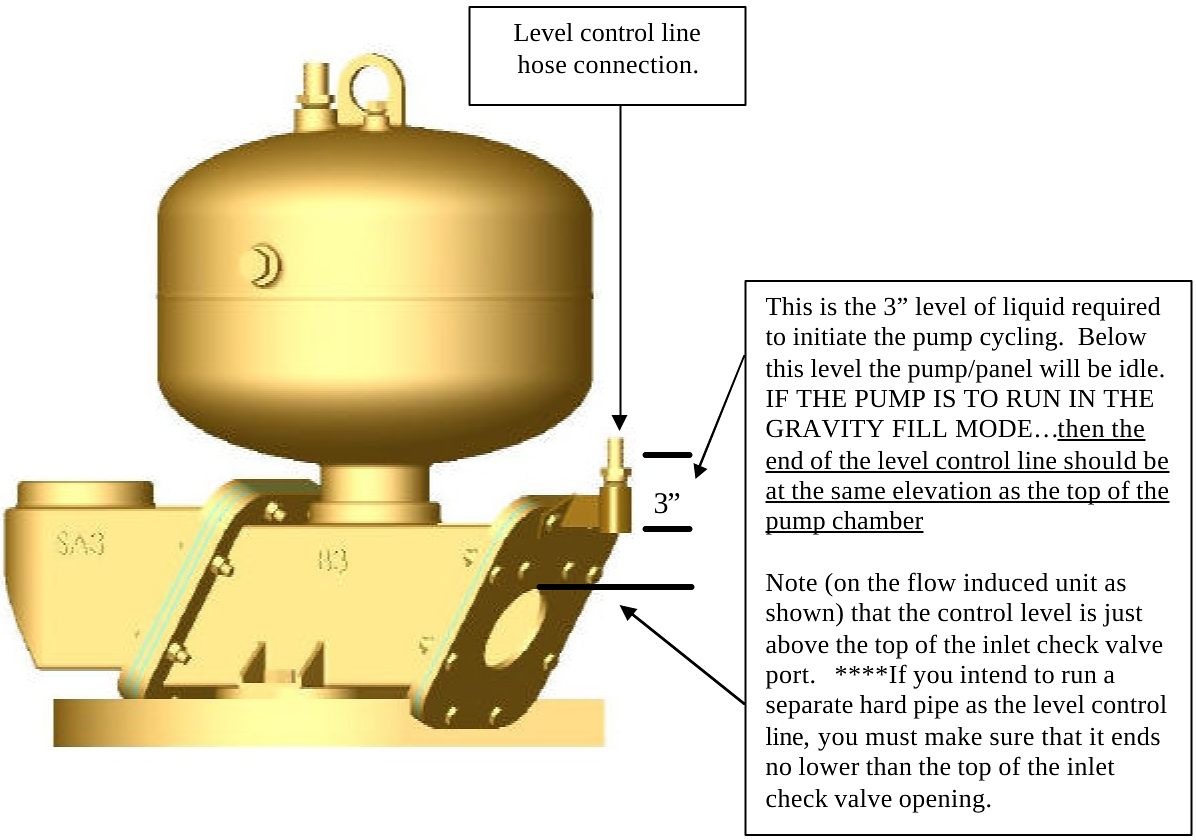
Once the chamber is full, it is pressurized with compressed air and the inlet valve is pushed closed. With the chamber pressurized, the liquid is forced out the discharge check valve. This pressurization occurs for a set number of seconds, enough to clear the pump chamber, and then the chamber is depressurized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

BASIC FUNCTIONING AND COMPONENTS

The Function of the Control Panel (panel picture is on next page)

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

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 3-6 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 on 2”-4” pumps; run hard-pipe to the proper sump elevation on larger/other pumps.



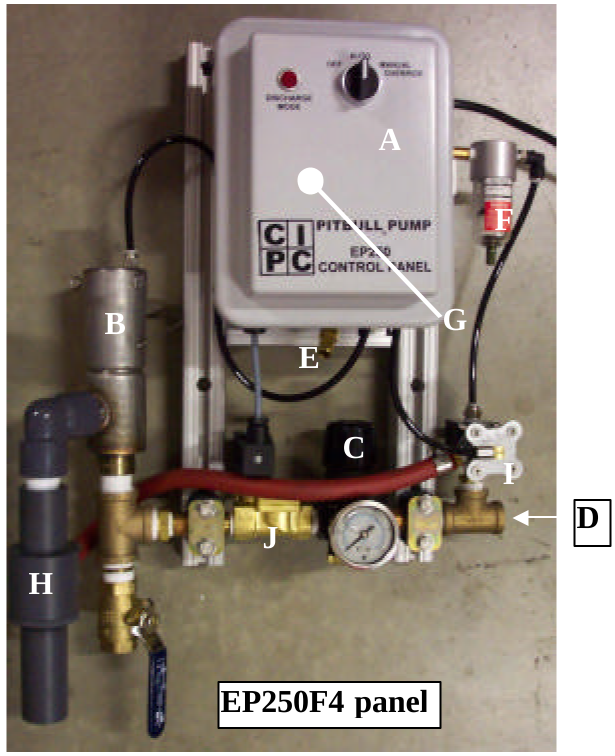
When the 3 inch liquid level (over the end of the control line) has been reached in the sump, the control panel will begin a fill stroke followed by a discharge stroke; which makes for one complete cycle. After one complete cycle, the panel checks for the presence of liquid; if there is liquid it will 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 may not cycle steadily. It will match the inflow feeding the sump.

Dual pumping systems run exactly as described above except a second pump is filling when the first is discharging and visa versa.

PANEL COMPONENTS

A- Control box
B- Exhaust valve (EXVS75 shown)
C- RE50 discharge pressure regulator
D- Main airline connection
E- Level control line connection
F- Pilot air supply filter
G- (2) Piloting solenoid valves (inside box)
H- Flow inducer
I- FV200 supply valve to flow inducer
J- EBSV500 Discharge solenoid valve



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 3-6 seconds; see page 12 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. **On the EP250H panel (only) the piloting valve feeding the discharge pressure regulator has its supply pressure controlled by a small regulator inside the panel which is adjustable in order to set the pump discharge pressure.*

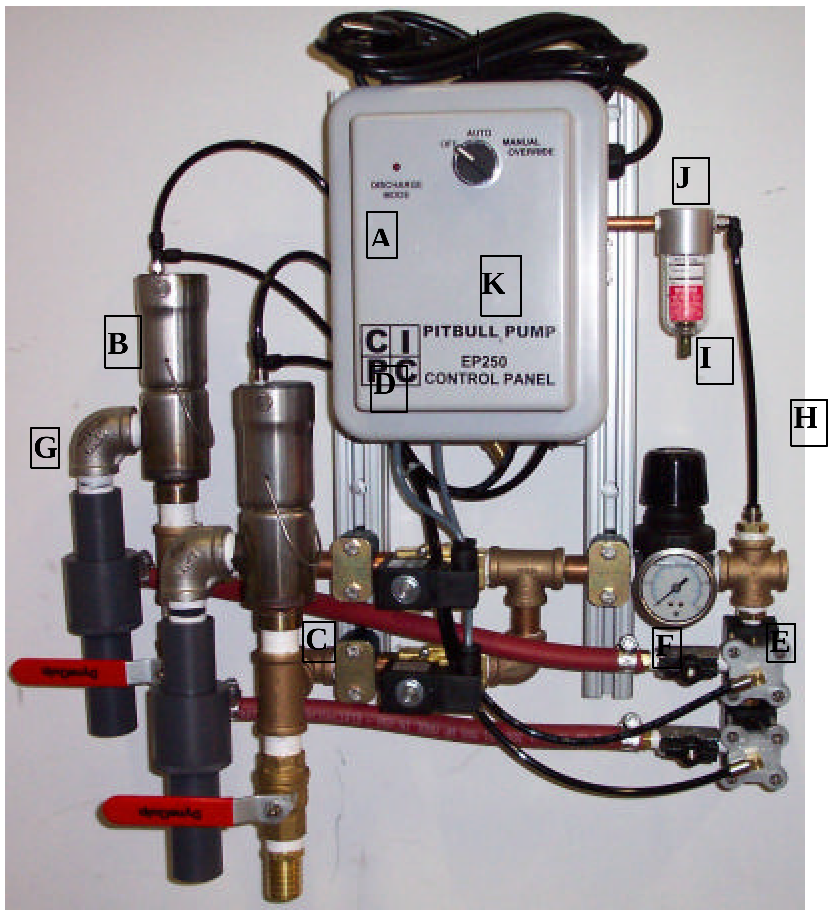
***A couple of important notes; the cycling will only occur when there is enough liquid to fill the pump chamber- the pump will not cycle (run dry) if no liquid is present unless in the 'MANUAL OVERIDE' mode. The cycling of the pump is relatively slow; anywhere from zero to 10 times per minute.

DUAL PUMP CONFIGURATION

PITBULL® dual pump systems function exactly as single pump systems; the same fill and discharge strokes with the exception that the two pumps work opposite each other. When one pump fills, the other discharges and visa versa. Once the liquid level has been sensed to be about 3” above the end of the level control line (3” WC of pressure) the panel will perform a complete pumping cycle on both pumps.

Component Identification
The dual control panel uses the same components as the single control panel with the addition of air valving to run a second, identical pump.

- A- Control box
- B- Exhaust valves
- C- Pump isolation isolation ball valves
- D- EBSV500 discharge solenoid valves
- E- FV200 flow inducer supply valves
- F- FV200 isolation valves
- G- Flow inducers
- H- Main airline connection
- I- RE50 Discharge pressure regulator
- J- F125 Control air filter
- K- (2) Piloting solenoid valves (inside)



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.

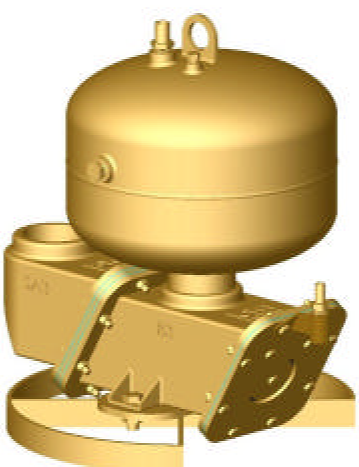
Keep approximately 2X the pump's piping diameter of open space in front of the inlet to allow full liquid and solids flow into the port (example: 3" submersible should have 6" of open space in front of the inlet port).

Discharge Piping

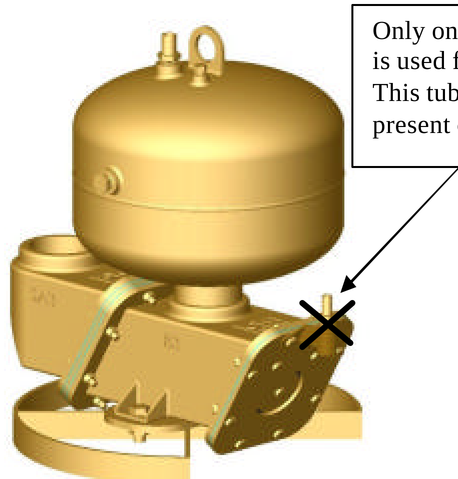
Try to match the discharge piping to the size of the outlet port. Avoid reducing more than one pipe size unless imperative. The reasons and trade-offs are as follows,

1- for an average flow rate of 50 gpm, the **PITBULL®** will be discharging liquid at 100+ gpm in discreet bursts so friction losses need to be based on the burst flow, not the average over time. Our pipe sizes are oversized for the average flow but appropriate for the flow in bursts.
2- The **PITBULL®** will pass large solids. Watch out for pumping bigger stuff than your piping can take.

**Note: If you are reducing the piping and have potential for large solids, consider adding a strainer to the pump inlet. CIPC offers threaded inlet adapter (see parts section for numbers) with big-ported strainers as an option. Or improvise your own.



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



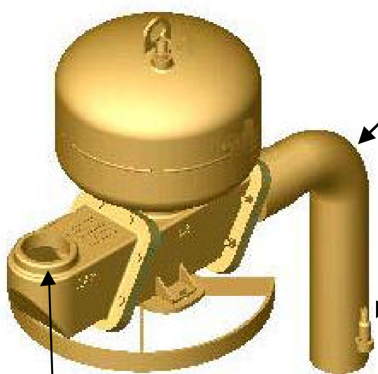
Only one level control line is used for both pumps. This tube/fitting will not be present on second pump.

For dual pump configurations it is important to place both pumps on the same surface/elevation so that each pump has the same 'fill' stroke hydraulics.

INSTALLATION OF SELF-PRIMING CONFIGURATION

All the previous information applies to self-priming installation since there is no difference in the function. The important installation and set-up difference to account for are;

1) The level control line does not anchor to the pump because the pump is not in the sump. Instead, the level control line must end in the sump at the liquid level you wish the pump to hold. *TIP- ¾" or larger pipe is often used as the submersed end of the level control line and the level control hose supplied with the system is connected to the top of the pipe with the other end in the sump at the desired level. If the pipe is clamped, it can be adjusted up or down to change the sump level*.
2) The suction/down-pipe and its connections must be air-tight. NO LEAKS.
3) On the discharge piping there needs to be an isolation valve. The <u>important reason</u> for this is when the piping system is dry, the pump can pull air in through the discharge if any debris is under the discharge check seat. This will waste the vacuum being created and the suction lift is lost. Close the valve until the pump cycles; once liquid is in the piping the check valve will seal well enough to prime.
4) The 'fill' time will be longer depending on the suction lift. See page 11 for fill time settings.



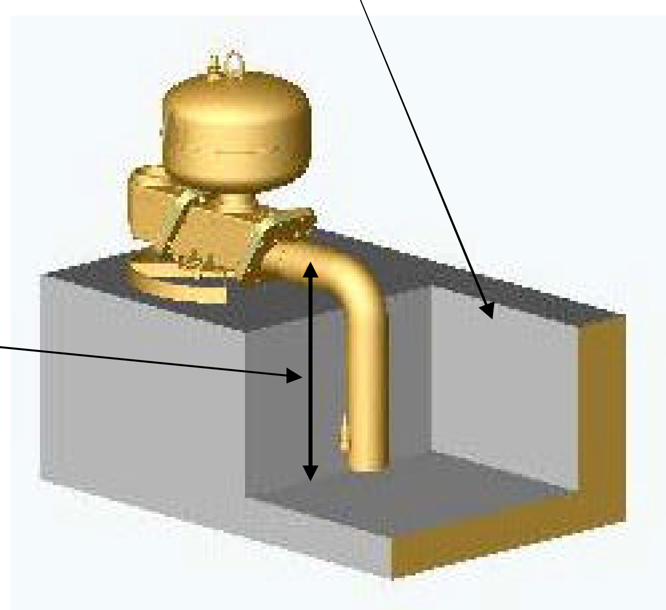
Suction piping must be air tight.

This is a reasonable place to anchor the level control line

-or-

Install a hard pipe to the sump wall/cover/etc and connect level control hose to the pipe.

Install an isolation valve somewhere near the discharge outlet.



Keep suction lift to a minimum. Avoid going over 7 ft due to performance losses. Contact factory for higher lift options.

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. Cord may also be cut and connected with strain relief to a junction box.

Bring an unregulated, 60-100 psi, **unlubricated** air supply to the filter or open 'T' port on the right side of the panel valving. 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 chart as the minimum air supply line requirements.

2" pump – 1/2" pipe supply
3" pump – 1/2" pipe supply
4" pump – 3/4" pipe supply
6"-8" pump –1 1/2" pipe supply
>8" - 2" or larger pipe supply

- if the pipe run is longer than 100' from a larger pipe, it is advisable to increase one size. Just like the liquid discharge piping, the airline is sized for a burst of flow, not the average draw.

Connecting the Panel to the Pump

There are two connections to make, the main airline and the control airline. Both airlines are provided with your system and come as 15' lengths standard.

1) Run the main airline from the hose barb on the panel under the exhaust valve to the hose barb on the top of the tank.
2) Run the level control airline from the bottom right side of the panel to the level control airline hose barb on the side of the pump (or other equal elevation).

Please note that on dual pump systems you will run the level control line to only one of the pumps.
SELF-PRIMING PUMPS- this line runs to the sump (see page 7) **not the pump!**

** if you intend to hard pipe the two lines instead of using the hoses, substitute 1/2" pipe or 5/8" tubing (larger OK) 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.

Avoid sags or low spots that could collect moisture

PANEL BASICS

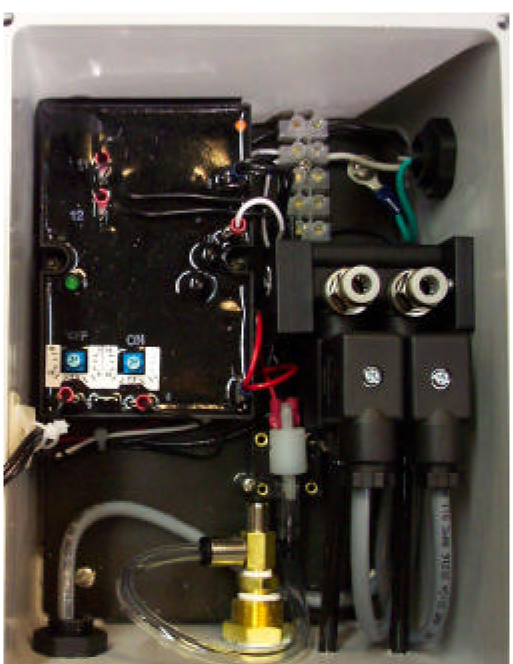
Mode of Operation

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.

AUTO-best operation is in this Level Controlled mode. 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.

MANUAL OVERRIDE- mode is for emergency and manual situations. 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.

?Logic module with stroke adjustments.

?The terminal strip provides connections for power, solenoid valves and indicators.

?Pilot valve for exhaust valve (closing).

?Pilot valve for flow inducer supply valve (and for opening exhaust on units with operated ball valves for exhaust valves).

?Level control switch

START-UP SETTINGS

The control panel is preset for fill and discharge strokes. The discharge pressure is preset for 40 psi. When initially starting up the pump, do not change the fill and discharge stroke settings and only adjust the discharge pressure if needed. Please see the section on adjusting settings if you have (1) a very long pipe run, >300' or (2) a reduction of two more pipe sizes in the discharge piping. In those cases you will need to increase the discharge stroke.

Setting the pressure. 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 20 gpm.

The elevation difference is 6' + 40' = 46' and 46/2.31= 20 psi. Now, the flow rate was said to be 20 gpm, but the **PITBULL**® has separate fill and discharge cycles and therefore *to put out a 20 gpm flow rate the pump must take in 40 gpm while no fluid is discharging, and then discharge at 40 gpm while no fluid is filling to pump in order to average the 20 gpm.* So, use 40 gpm to calculate friction loss.

****for Dual Pump Systems** there is no gap between cycles, so size lines directly for the flow rate.

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 40 gpm of water flowing through 200' of 2" pipe is 3.6 ft/100', or a total of 7.2' (3.1psi). So set the discharge regulator for 20 + 3.1 + 15 = 38.1 psi.;40 is close enough. (Note that the friction loss was small)

FACTORY SET STROKE ADJUSTMENTS

(flow induced as standard)

Pump Model	Fill Time	Discharge Time	*(Fill time; self-priming)*
S2C/S2S	3.0 seconds	2.5 seconds	*4.0 seconds*
S3C/S3S	3.5 seconds	3.0 seconds	*5.0 seconds*
S4C/S4S	4.5 seconds	4.0 seconds	*6.0 seconds*
S6C/S6S	6.0 seconds	5.0 seconds	*8 seconds*
S8C/S8S	8.0 seconds	7.0 seconds	*10 seconds*

To re-set the discharge time.*(Most submersed pumps will not require adjustment, and are factory pre-set)* After throwing the cover switch into the 'BYPASS' setting use a very small blade screw driver in the slot adjustment knob to make changes in the fill and discharge strokes. *USE YOUR WATCH WHEN FINE TUNING THE STROKES. Clockwise is longer, CCW is shorter, the entire range is .5-15 seconds.*

Open door to expose module

*this LED will light (along with the door indicator) in the discharge mode

This is the 'fill' stroke adjustment knob

This is the discharge stroke adjustment knob

IT IS VERY UNLIKEY YOUR 'FILL' STROKE NEEDS ADJUSTING. Typically only the discharge stroke needs lengthening for special conditions. The fill stroke (the time it takes to fill up the pump chamber) should be constant unless the liquid is extra thick or the pump is installed in the self-priming configuration with high suction lift.

If you have a thick liquid, you may need to lengthen the discharge stroke too (more time is required to push the liquid downstream) .

If the discharge pipe run is long or restricted/reduced in size, it is likely you will need to add 20-50% more time to the discharge stroke. *You may also need to increase the discharge pressure.

FACTORY SET STROKE ADJUSTMENTS FOR DUAL PUMP SYSTEMS

(flow induced as standard)

Pump Model	Fill Time	Discharge Time
S2C/S2S	2.5 seconds	2.5 seconds
S3C/S3S	3.0 seconds	3.0 seconds
S4C/S4S	4.0 seconds	4.0 seconds
S6C/S6S	5.0 seconds	5.0 seconds
S8C/S8S	7.0 seconds	7.0 seconds

The settings above are based on the dual pump system running in the **flow induced mode** (the liquid is pulled into the pump instead or running in by gravity. This gives a shorter, more consistent fill stroke duration).

There may be cases where the time setting for the discharge stroke may be slightly long, and some compressed air is being blown down the line after the pump is emptied. In this case it is best to throttle back the discharge line (it won't take much) to create enough back pressure to slow the discharge stroke down until no more air goes into the line. *Also check that the discharge pressure setting is not significantly too high (see previous section) which would push the liquid out faster than needed.

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 filling and discharging, then there is probably little or no flow.
2) 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.
3) 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.

If a short fill time is observed (and we're talking about the 'wind' duration, not the adjustment 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 1 second increments) 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.

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.

EP250H High Flow Panel Variation

This version of the EP250 control panel is designed for high flow applications and has the following differences from the EP250 standard;

1) The discharge solenoid valve is replaced by a pilot operated regulator that has much higher flow capacity.
2) The exhaust valve is enlarged to 2” piping, and will be either an EXV200 unit or a double acting operated ball valve as show in the picture below.
3) Inside the control box a mini regulator has been added and an additional piloting solenoid valve. The solenoid valve provides a pressure controlled signal to the pilot operated regulator which then dumps high volume airflow at that pressure into the pump. The mini regulator is the discharge pressure control.

EP250H panel w/o flow inducement

Please note that all basic functioning of the high flow panel is the same as the standard when it comes to level control, stroke settings and troubleshooting.

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.

<u>CHECK VALVE PROBLEMS (see diagrams on next page)</u>

<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.

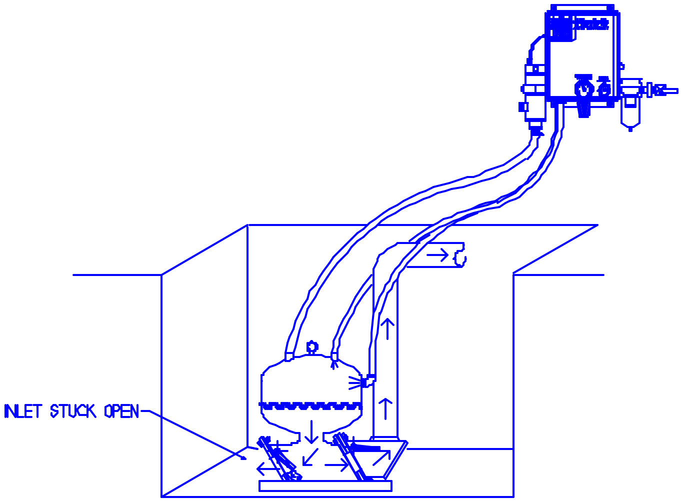
If the inlet check valve is stuck open, the pump will appear to cycle normally, but the discharge flow rate will be reduced or non-existent. On a submersed application you will commonly see turbulence at the inlet (from liquid and possibly air being expelled from the intake). Depending on liquid depth you may be able to detect a lack of a ‘thunk’ as the inlet check doesn't close forcefully at the beginning of the discharge stroke.

<u>Discharge check valve:</u>

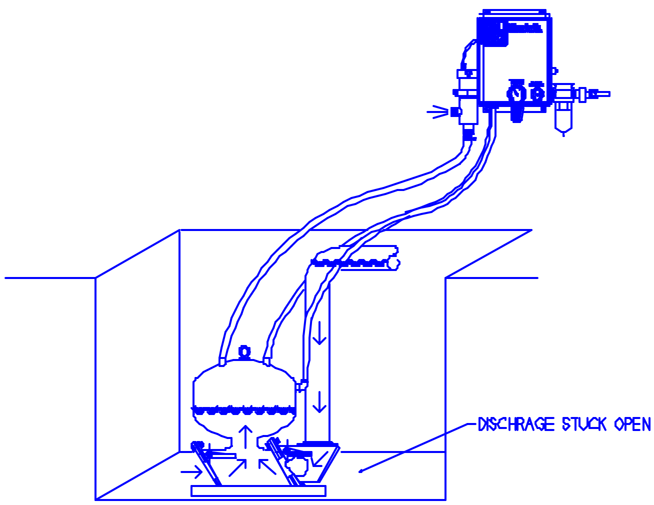
If the discharge check is plugged or stuck closed, the pump is deadheaded. Because no liquid is leaving the pump, you may also get liquid spraying from the exhaust because the pump is completely full of liquid.

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 as the pump ‘overfills’ by filling from two directions, the inlet and the discharge.

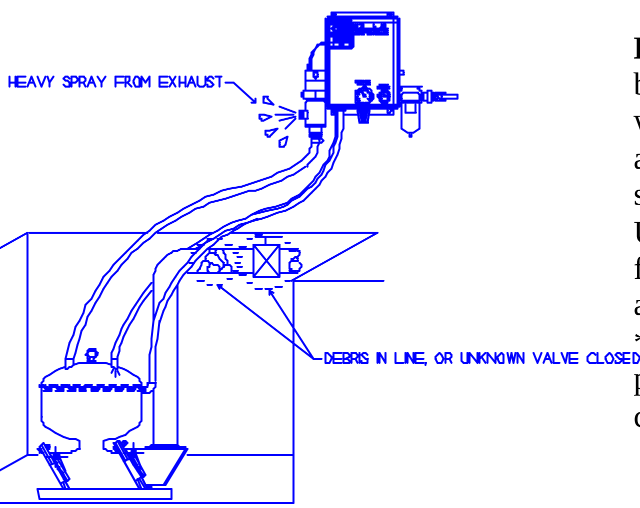
COMMON CHECK VALVE AND PIPING PROBLEMS



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).

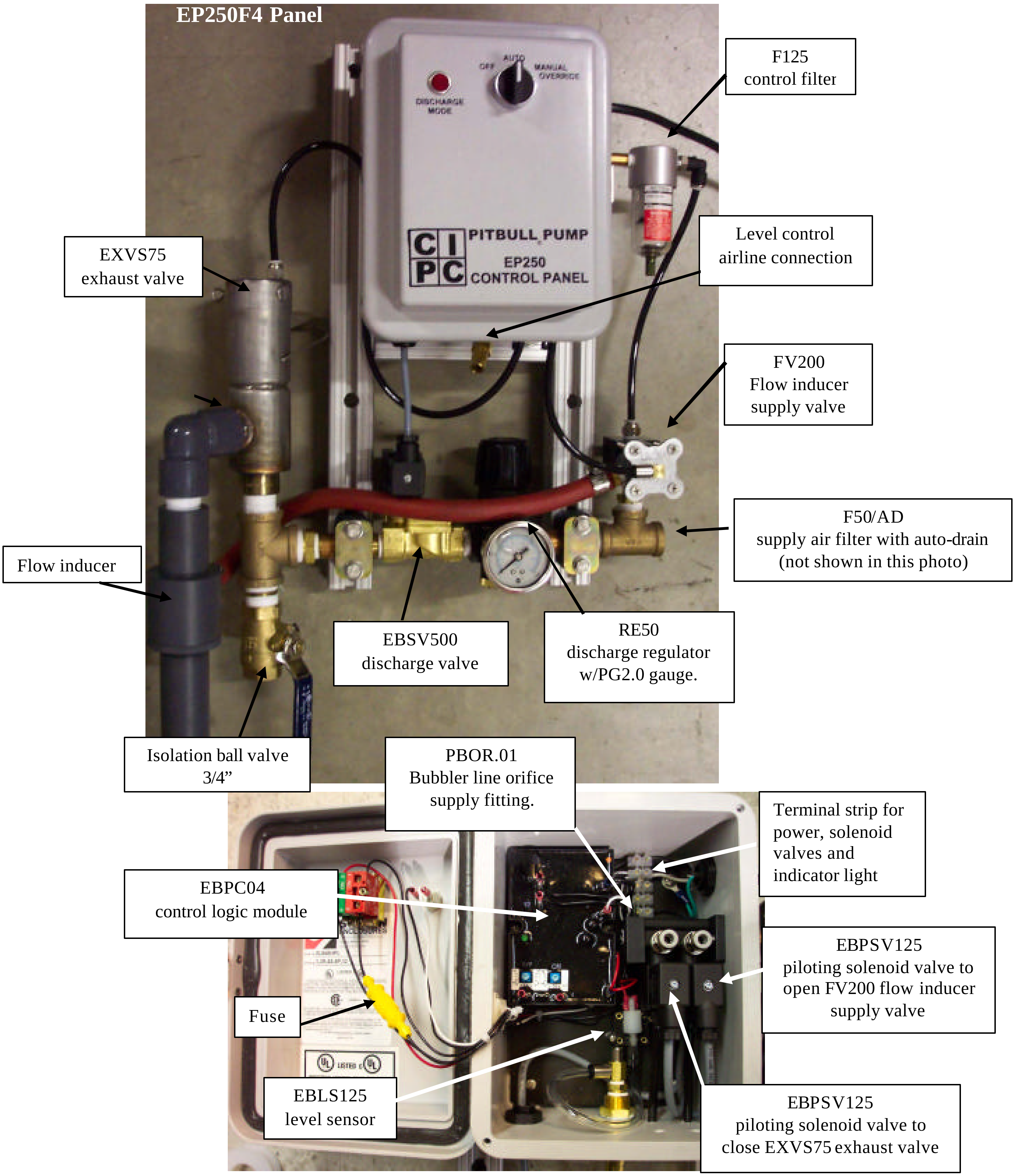


Discharge check stuck open. Pump continues to cycle but output is low. The pump is 're-pumping' the same liquid over and over. It will often overfill under this condition and have fluid exiting the exhaust port.



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.

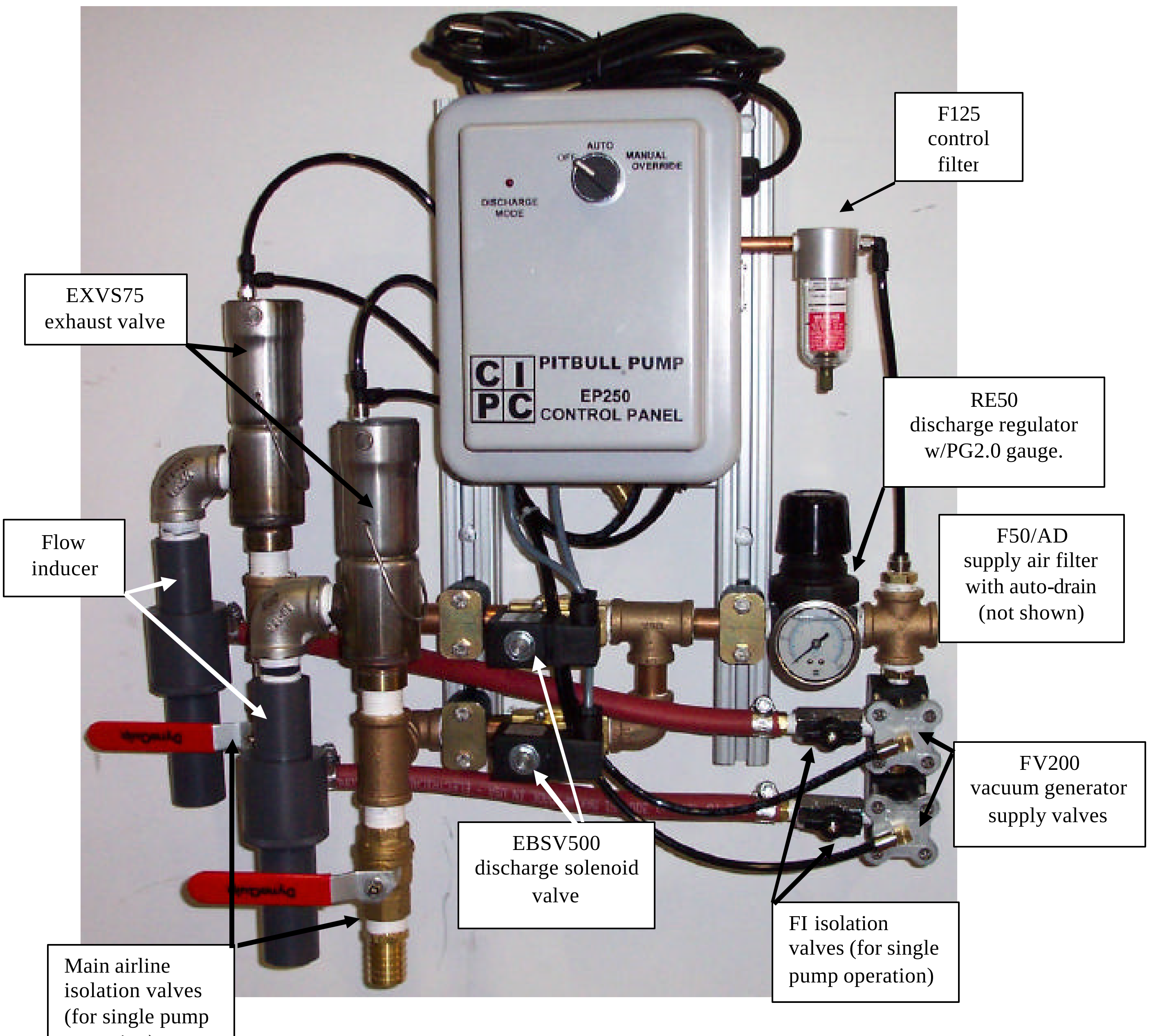
CONTROL PANEL COMPONENT IDENTIFICATION



DUAL PUMP CONTROL PANEL COMPONENT IDENTIFICATION

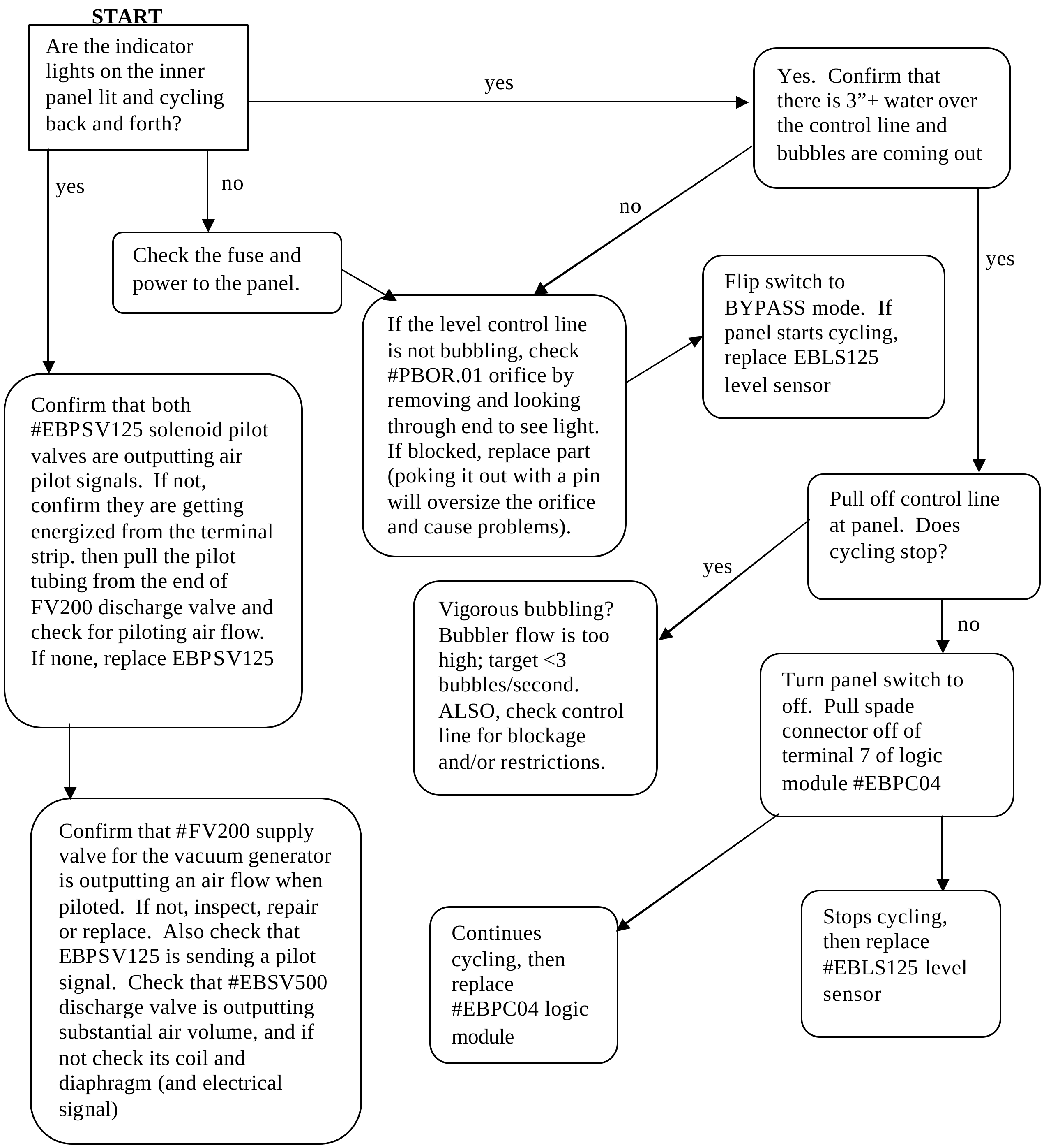
Below is a typical layout for a dual pump control panel. This basic configuration is used for 2" through 4" (discharge) sized pumps. Regardless of the pump size the panels all function the same, including the very largest which just have bigger versions of the same air valving components (but use the standard EP250 control box).

Troubleshooting is the same for dual pump systems as it is for single pump versions. Please the same pages and concepts as outlined in this manual for either system.



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>:

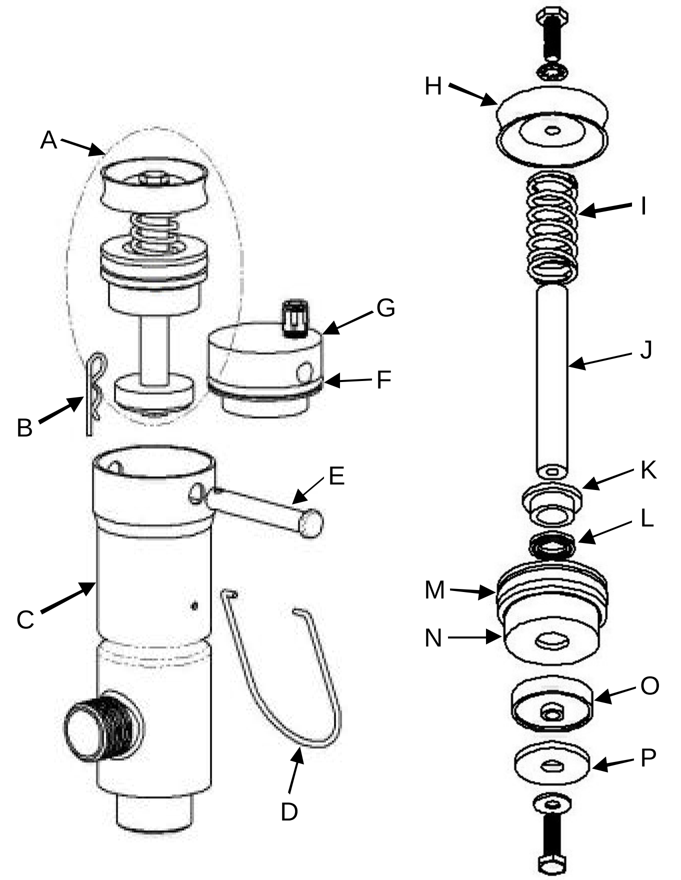
Failed open- will cause a lack of pressure in the pump during discharge, because the discharge air is coming right back up through the exhaust valve. The discharge gauge will drop further than normal, and liquid may spray from the exhaust. Also, the fill cycle will be relatively short like in a deadheaded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

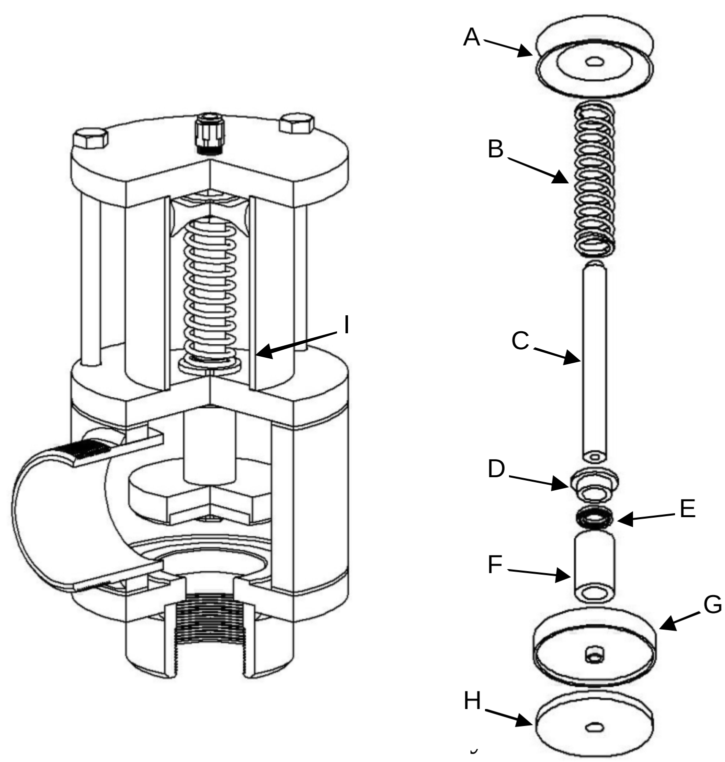
A – Exhaust valve internals
B – Cotter pin
C – Exhaust valve body
D – Spring D-ring
E – Clevis pin
F – Valve cap o-ring
G – Valve cap
H – Piston cup seal
I – Return spring
J – Shaft
K – Guide bushing
L – Wiper shaft seal
M – Seal housing o-ring
N – Shaft seal housing
O – Poppet back
P – Poppet seat



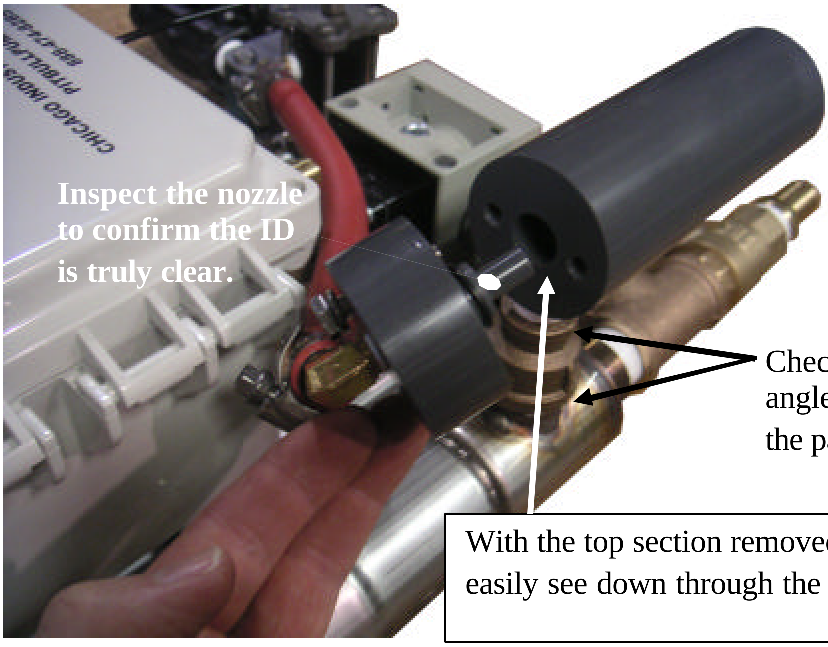
<u>EXV200 Exhaust valve</u>

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

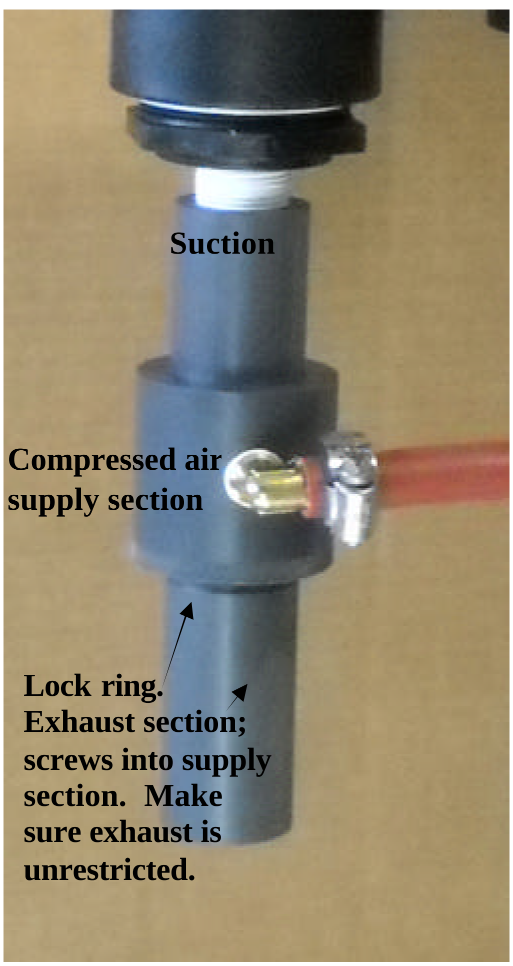


FLOW INDUCER TROUBLESHOOTING AND REPAIR



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.

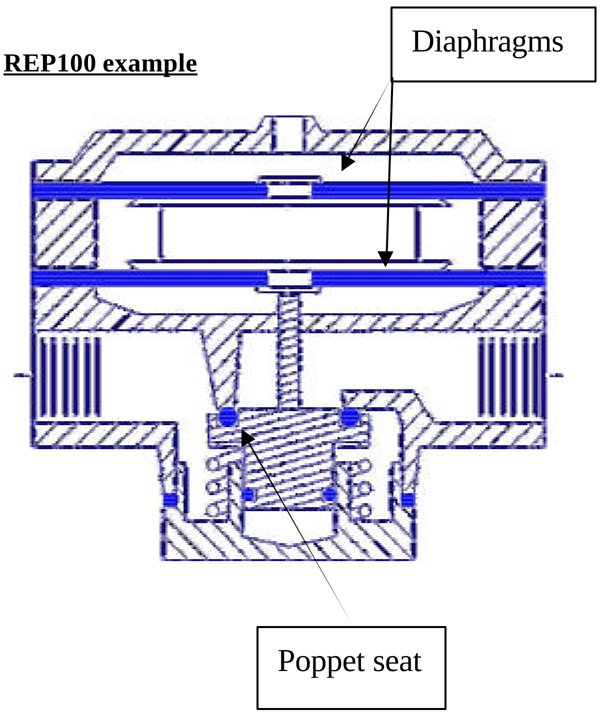
REP50, REP100 and REP150 Regulators

Piloted discharge regulators: All (3) regulators regardless of size function and fail in the same way. 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. Also you may hear the leaking air escaping out the exhaust valve.

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 thru150K (contains both diaphragms, poppet assembly).

REP100 example



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 valving and filtration (All Models: EP250G2–G8, and EP250F2L–F8L)
CV1032	Level control line relief valve.
EBSV500	Discharge solenoid valve, 1/2” npt.
EBPC04	Control logic module.
EBLS125	Level sensor.
EBPSV125	Piloting 1/8” Solenoid Valve
EBSV500	1/2” 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.
PBOR.01	Bubbler orifice
PG2.0	Liquid filled 1-100 psi discharge gauge.
RE50	1/2" discharge regulator.
RE50K	1/2" discharge regulator repair kit
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

F2L	Flow inducers for 2" pumps
F3L	Flow inducers for 3" pumps
F4L	Flow inducers for 4" pumps
F6L	Flow inducers for SH4, 6x4 and 6” pumps
F8L	Flow inducers for 8” and larger 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

INLET TRANSFER ADAPTERS

2CTAD	2" carbon steel adapter *(Fig 14A & 14B)*
2SSTA	2" 316SS adapter *(Fig 14A & 14B)*
3CTAD	3" carbon steel adapter *(Fig 14A & 14B)*
3SSTA	3" 316SS adapter *(Fig 14A & 14B)*
4CTAD	4" carbon steel adapter *(Fig 14A & 14B)*
4SSTA	4" 316SS adapter *(Fig 14A & 14B)*

Adder for threaded inlet adapter plate (same adapter as on inlet of transfer pumps).
Includes: plate with male threaded end, valve plate gasket, extra length bolts for check valve flapper posts(sealing bolts). Pump is capable of dry-piping inlet with this adapter. Note size and construction of pump.

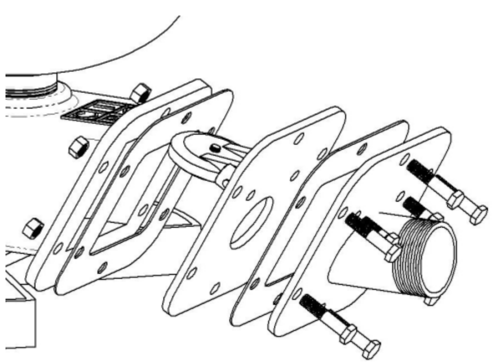


Fig 14A

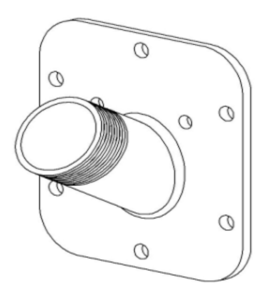


Fig 14B

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.

Part #	Size	Description
2CVP/C(_)	**2"**	**CIPC steel swing check, plate style, full port, complete assembly for S2C pumps.** *(Fig 20A)*
2CVP/S(_)	**2"**	**CIPC 316SS swing check, plate style, full port, complete assembly for S2S pumps.** *(Fig 20A)*
2CVF/(_)	**2"**	**Flapper (316SS)** *(Fig 20B, 20D exploded)*

Seat adders for check valve flappers

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

(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)*

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

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

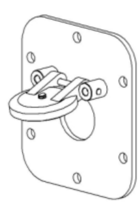


Fig 20A

Fig 20B

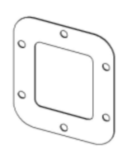


Fig20C

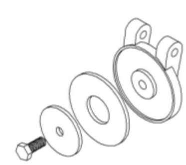


Fig20D

Seat Material Selection Properties:

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 Best 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.

CIPC CHECK VALVES CONTINUED

3CVP/C(_)	**3"**	**CIPC steel swing check, plate style, full port, complete assembly for S3C pumps.** *(Fig 20A)*
3CVP/S(_)	**3"**	**CIPC 316SS swing check, plate style, full port, complete assembly for S3S pumps.** *(Fig 20A)*
3CVF/(_)	**3"**	**Flapper (316SS)** *(Fig 20B, 20D exploded)*

Seat adders for check valve flappers

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

(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)*

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

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

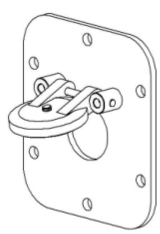


Fig 20A


Fig 20B

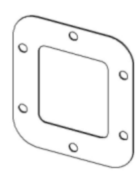


Fig20C

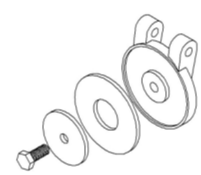


Fig20D

Seat Material Selection Properties:

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 — Best 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.

CIPC CHECK VALVES CONTINUED

4CVP/C(_)	**4"**	**CIPC steel swing check, plate style, full port, complete assembly for S4C pumps.** *(Fig 20A)*
4CVP/S(_)	**4"**	**CIPC 316SS swing check, plate style, full port, complete assembly for S4S pumps.** *(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*.

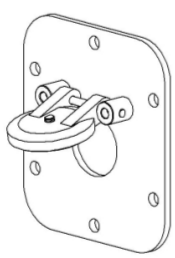


Fig 20A


Fig 20B

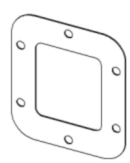


Fig20C

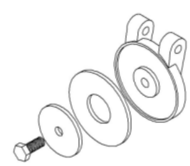


Fig20D

Seat Material Selection Properties:

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 — Best 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.

CIPC SIDE INLET CHECK VALVE ASSEMBLIES

4SICV	**4"**	CIPC side inlet internal swing check, stainless steel, for 4" high flow side inlet pumps
4SICV-DT	**4"**	CIPC side inlet internal swing check, stainless steel, with low level downtube, for 4" high flow side inlet pumps
6SICV	**6"**	CIPC side inlet internal swing check, stainless steel, for 6x4, 6" side inlet pumps
6SICV-DT	**6"**	CIPC side inlet internal swing check, stainless steel, with low level downtube, for 6x4, 6" side inlet pumps
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

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

CIPC WAFER CHECK VALVES

4WCV	**4"**	CIPC stainless steel wafer swing check, full port, for 4" high flow and 6x4 pumps
6WCV	**6"**	CIPC stainless steel wafer swing check, full port, for 6" pumps
8WCV	**8"**	CIPC stainless steel wafer swing check, full port, for 8" pumps

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

ALL RUBBER FLAPPER CHECK VALVES

For 2", 3", and 4" pumps

These all rubber hinged designed check valve flappers are used in place of our standard plate style flapper. Designed to be used on stringy or irregular shaped products they may build up around our standard check valve flapper. Designed only for specific qualifying applications.

Contact **CIPC** with your specific pumping application.

NON-METALLIC CHECK VALVES FOR VINYLESTER PUMPS

Contact **CIPC** with your pump serial number for current available products for your pump.