Operation and Maintenance Manual
For All Variations of:
AP300G2–G8, AP300F2L–F8L
& Dual Pump Systems

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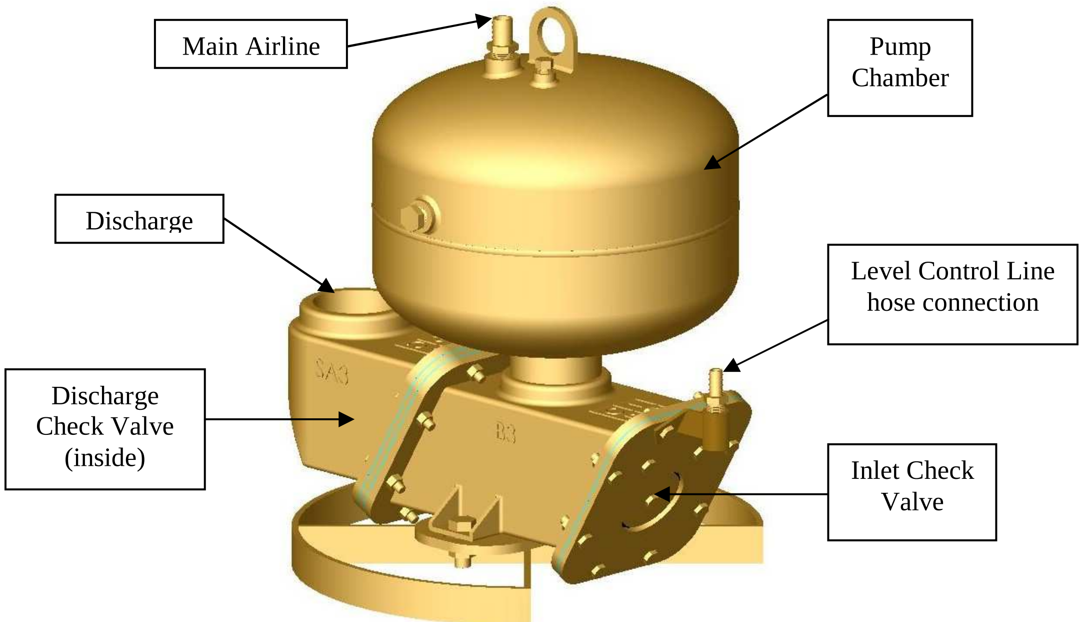
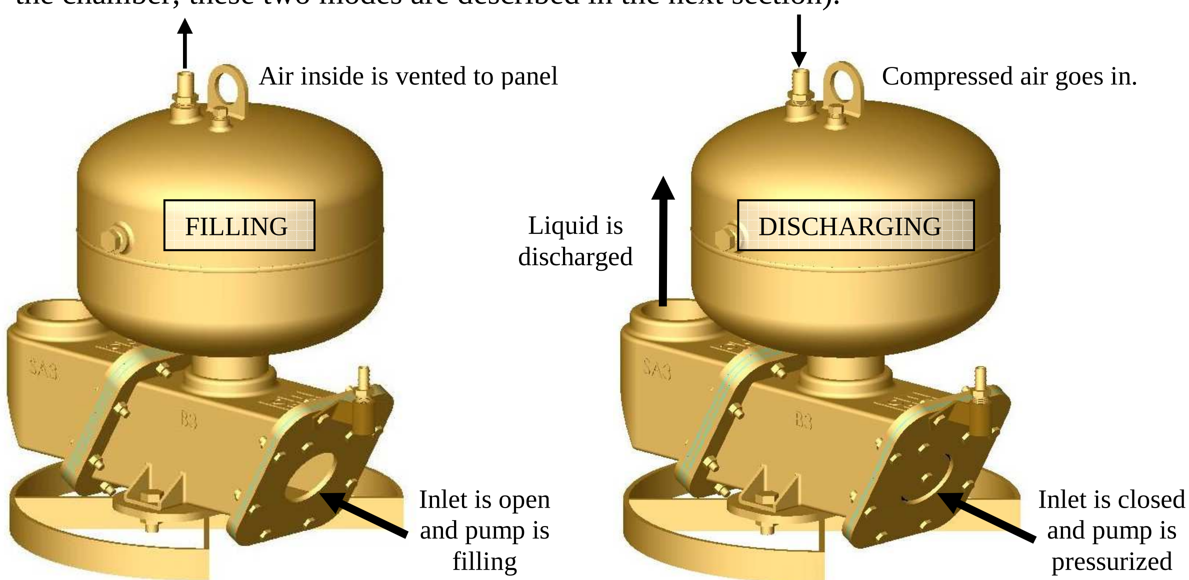
OVERVIEW

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.



<u>Pumping Action:</u> 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.

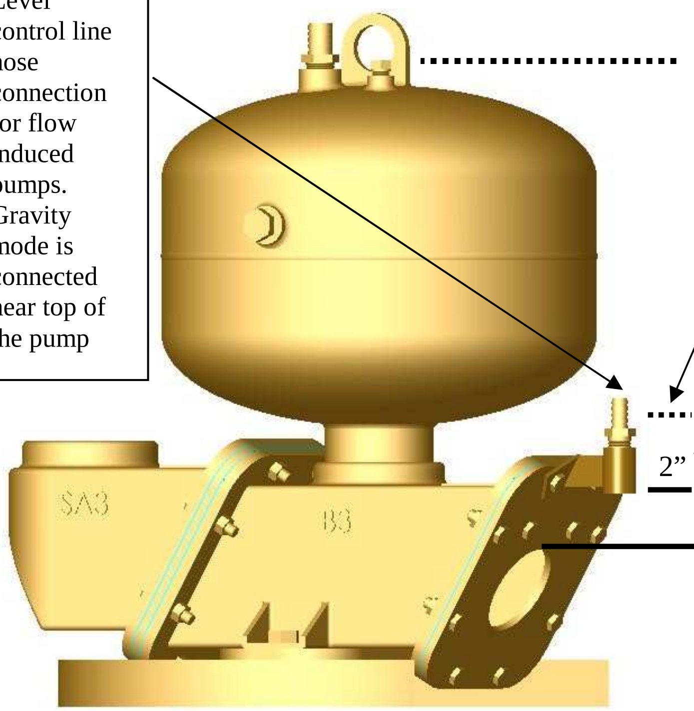
BASIC FUNCTIONING AND COMPONENTS

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 air line connected to the panel (hose is supplied with the pump for this purpose). The panel will cycle the pump anytime there is 2+ 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”-6” pumps; run hard-pipe to the proper sump elevation on larger/other pumps.

Level control line hose connection for flow induced pumps. Gravity mode is connected near top of the pump



NOTE! IMPORTANT!
THERE ARE TWO MODES OF OPERATION

1) GRAVITY FED- liquid runs into the pump on its own. Level control operates at this upper level.

-or-

2) FLOW INDUCED- liquid is sucked into the pump. Level control operates at this lower level.

This is the 2” level of liquid over the control line required to initiate the pump cycling. Below this level the pump/panel will be idle.
IF THE PUMP IS TO RUN IN THE GRAVITY FILL MODE…then the end of the level control line should be at the same elevation as the top of the pump chamber

Note (on the flow induced unit as shown) that the control level is just above the top of the inlet check valve port. ****If you intend to run a separate hard pipe as the level control line, you must make sure that it ends no lower than the top of the inlet

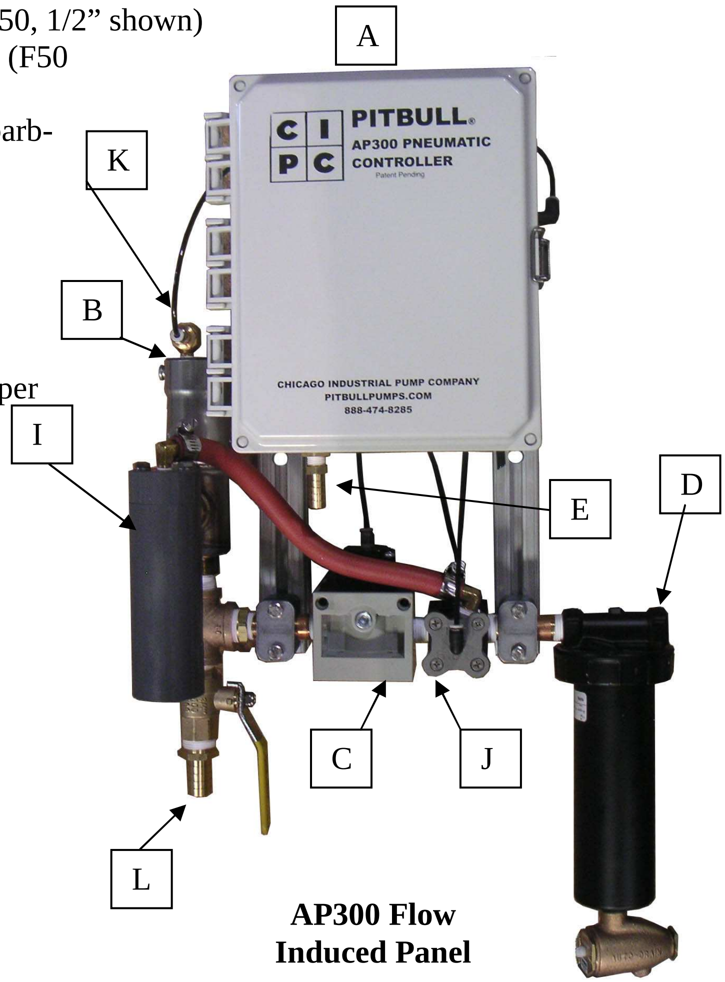
When the level control line is submerged in 2” of water, the control panel will begin a fill stroke followed by a discharge stroke. This makes for one complete pumping cycle. After one complete cycle, the panel checks for the presence of liquid; if there is liquid it will immediately cycle again, if there isn’t the panel will wait however long it takes for enough liquid to enter the sump and reach the 2” level again.
**This means your pump may not cycle steadily. It will cycle to 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.

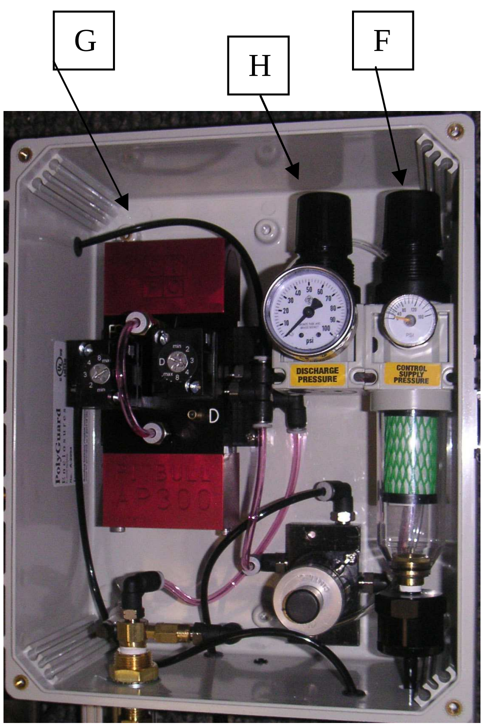
PANEL LAYOUT

<u>Important:</u> All variations of the AP300 control panels share the same control box/logic and vary by the size and capacity of the air valves/filtration/flow inducers mounted below the box. <u>The function of each component is identical, only the size and capacity vary.</u>

A- Control box (common to all)
B- Exhaust valve (EXVS75, 3/4” shown)
C- Piloted discharge pressure regulator (REP50, 1/2” shown)
D- Main airline connection to filter/autodrain (F50 1/2” shown)
E- Level control line connection (1/2” hose barb- all panels)
F- Pilot air supply filter and control pressure regulator (open box pic below)
G- Control logic
H- Discharge pressure regulator
I- Flow inducer
J- FV200 supply valve to flow inducer (one per flow inducer)
K- Piloting quick exhaust valve
L- Airline and isolation valve going to pump



AP300 Flow Induced Panel



AP300 Control Box (all panels)

PANEL FUNCTIONING IN MORE DETAIL

The control panel senses backpressure (approximately 2" inches of water column to initiate) in the level control line. When it sees enough backpressure (enough liquid) to cycle the pump it then begins the fill stroke by opening the exhaust valve *and if the pump is equipped with a flow inducer (vacuum fill 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 pg.14 start-up chart for factory settings) the panel switches to the discharge stroke by closing the exhaust valve (to trap pressure in the pump) and also cuts off air to the flow inducer while opening the discharge pressure regulator. This discharge stroke 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 piloting air valves in the control logic located inside the control panel enclosure.

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 OVERRIDE' mode. The MANUAL OVERRIDE forces the panel to cycle even if it is out of liquid.

The cycling of the pump is relatively slow; anywhere from zero to 10 times per minute so don't expect the pump to 'hammer away'. If it is cycling rapidly, it is probably has had the stroke settings messed up and is putting out less flow than it should.

MANUAL OVERRIDE MODE

This ball valve on the underside of the control panel is used to put the control panel **"MANUAL OVERRIDE MODE"**
Open is Normal operation
Closed is Manual

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 2” above the end of the level control line (2” water column 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 show on pg 4 with the addition of duplicates of the REP50 discharge regulator, EXVS75 exhaust valve, flow inducer, and FV200 flow inducer supply valve.

A- EXVS75exhaust valves
B- Flow inducers
C- FV200 flow inducer supply valves
D- REP50 discharge regulator

NOTE! Additional ball valves may be installed in this location on each pump to further throttle (slow) the discharge of the pump in order for it to match up with the fill stroke of the opposite pump.

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.

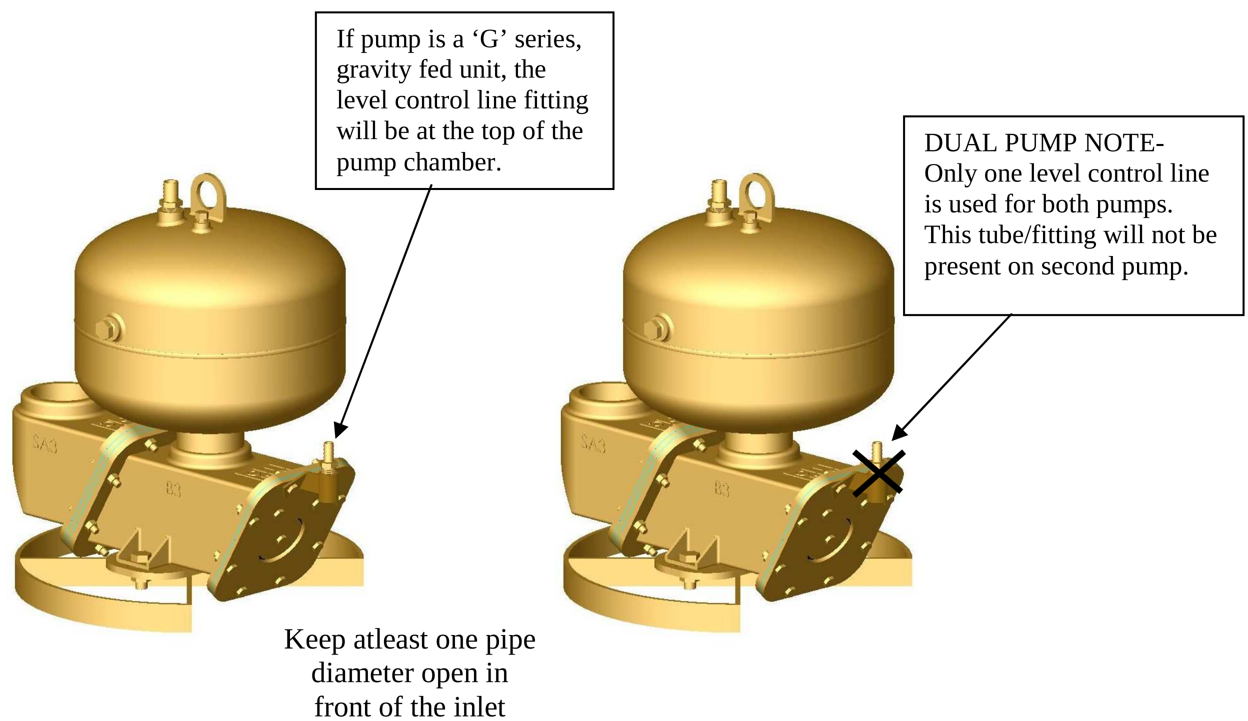
Try to keep approximately 2X the pump's piping diameter of open space in front of the inlet to allow full liquid and solids flow into the port (example: 3" submersible should have 6" of open space in front of the inlet port).

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 averaged flow 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.

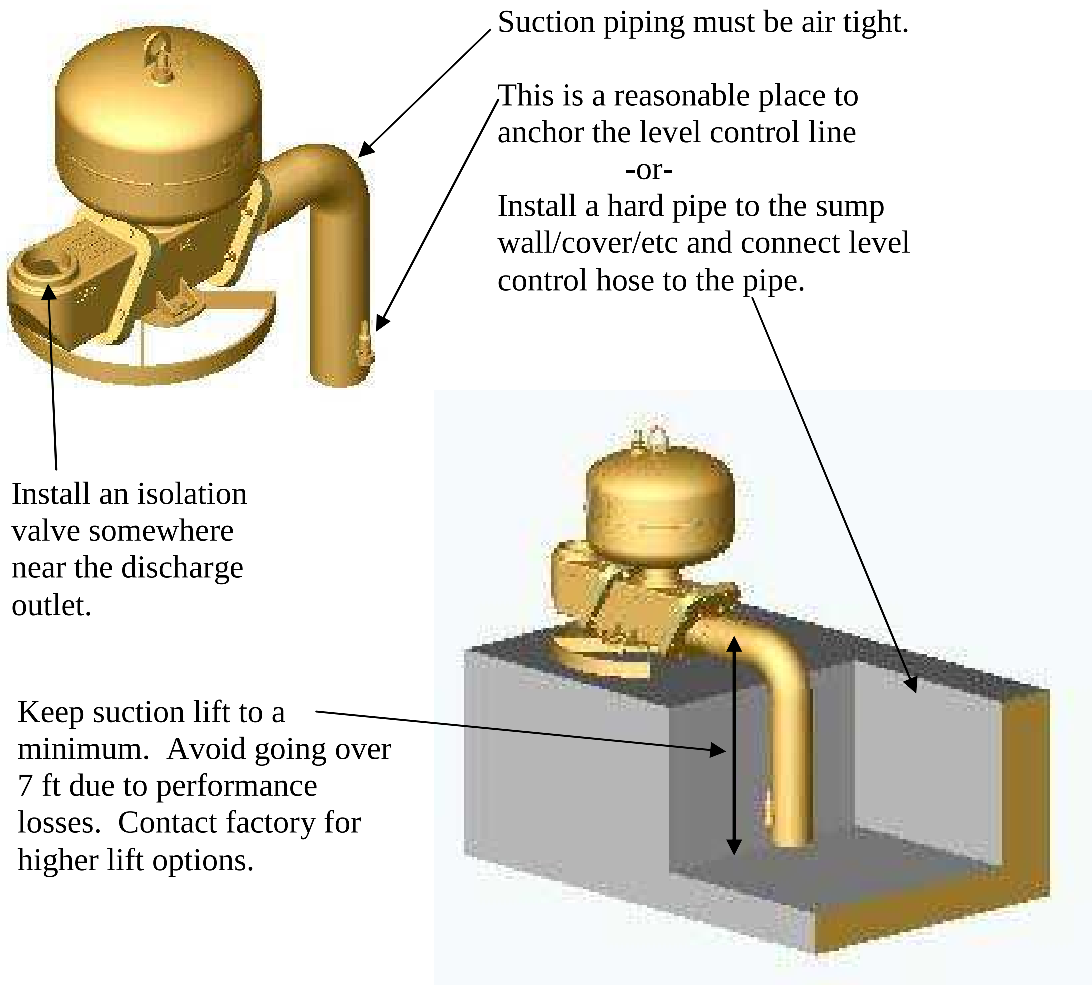


For dual pump configurations it is important to place both pumps on the same surface/elevation so that each pump has the same 'fill' stroke hydraulics.

INSTALLATION OF SELF-PRIMING CONFIGURATION

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

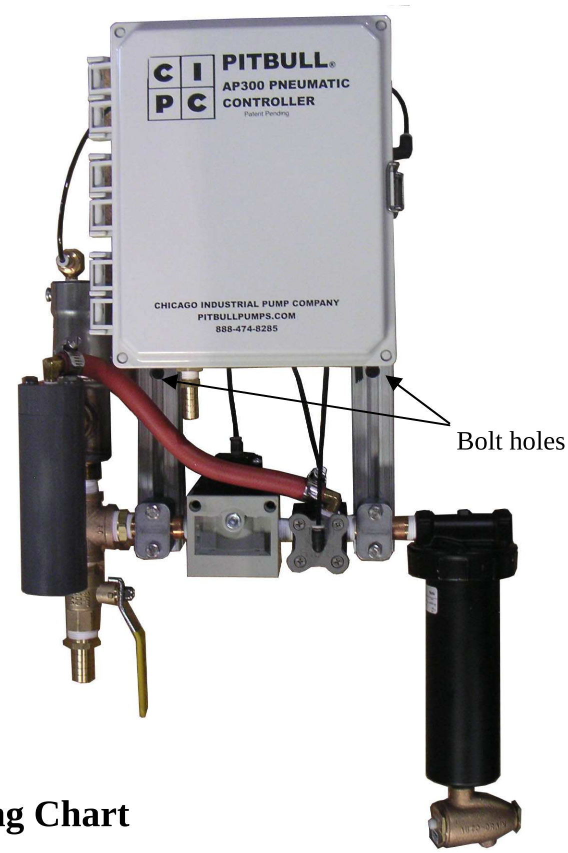
1) The level control line does not anchor to the pump because the pump is not in the sump. Instead, the level control line must end in the sump at the liquid level you wish the pump to hold. *TIP- ¾" <u>or larger pipe</u> is often used as the submersed end of the level control line and the level control 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 <u>any</u> 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 into the discharge mode; 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.



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.

Bring an unregulated, 70-100 psi, **unlubricated** air supply to the filter/autodrain on the right side of the panel valve package. 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.



<u>Mounting Dimensions for all AP300 Panel Frames</u>
Bolt pattern *(see overall dimensions on next page)*:
7.5" width (between centers)
11" height (between centers)
Bolt hole: ½" diameter (through 1.5" thick frame)

Air Supply Line Sizing Chart

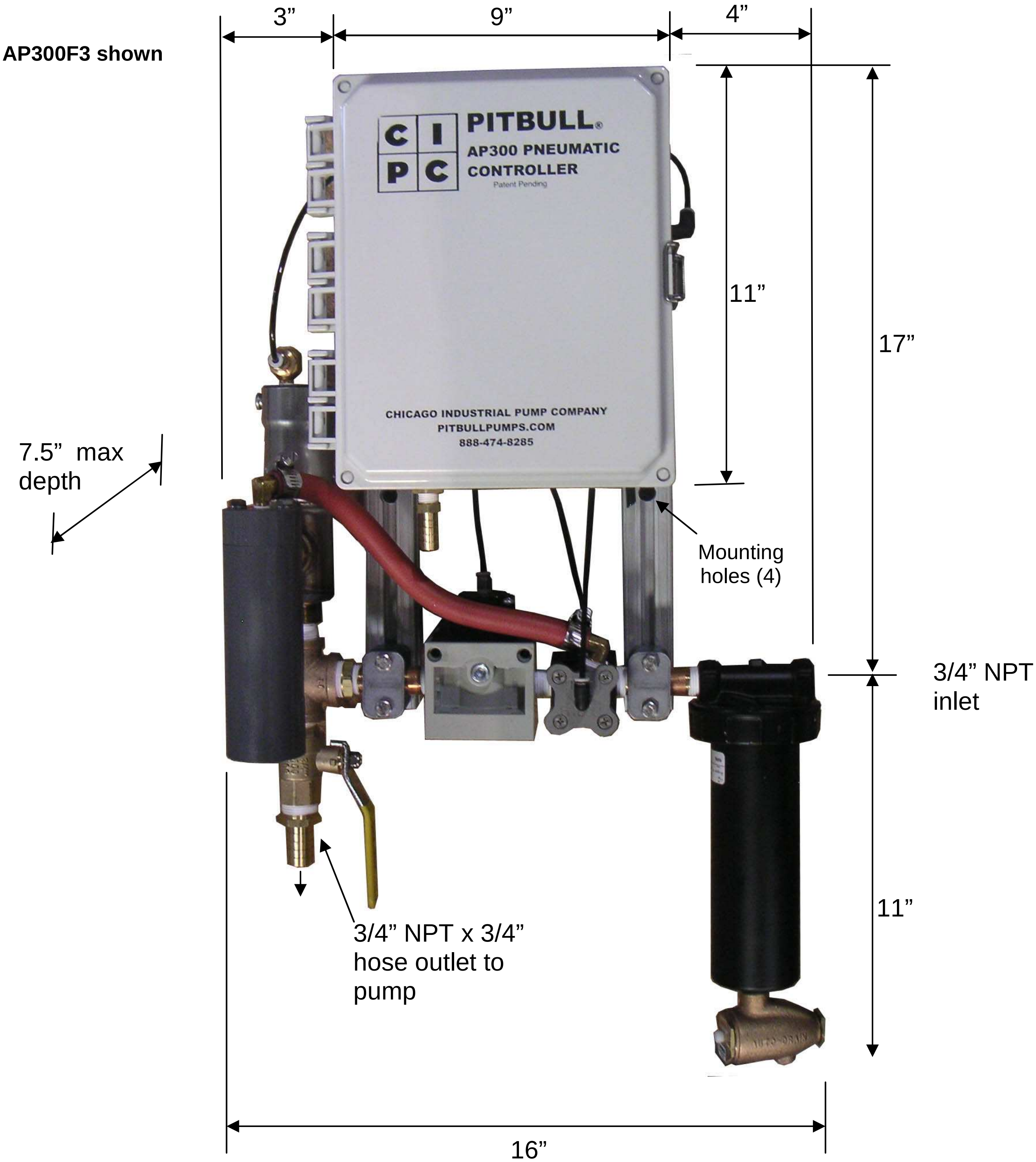
Pump Discharge Size	Panel Supply Port	Supply line <100 ft	Supply line>100 ft
2" and 3" Pumps	3/4" NPT	3/4" pipe, 3/4" hose	3/4" pipe, 3/4" hose
4" Pumps	3/4" NPT	3/4" pipe, 3/4" hose	1" pipe, 1" hose
4" (SH4), 6"x4" Pumps	1" NPT	1" pipe, 1" hose	1" to 1-1/4" pipe, 1-1/4" to 1-1/2" hose
6", 8" Pumps	1-1/2" NPT	1-1/2" pipe	1-1/2" to 2" pipe

Important- when the proper line size is not possible, adding an air reservoir/receiver close to the control panel will dampen the air supply and let the pump put out more flow rate and keep the supply pressure to the panel steadier (for better control function).

The pump consumes air in 'bursts'. Your airline may be able to deliver the averaged out air flow, but can't keep up during the 'burst', which causes the pressure to fall way off while the pump is trying to discharge. A 30-120 gallon receiver (size per pump) is often the low cost cure for this, without requiring an increased supply line.

Mounting Dimensions for all AP300 Panel Frames
Bolt pattern:
7.5" width (between centers)
11" height (between centers)
Bolt hole: ½" diameter (through 1.5" thick frame)

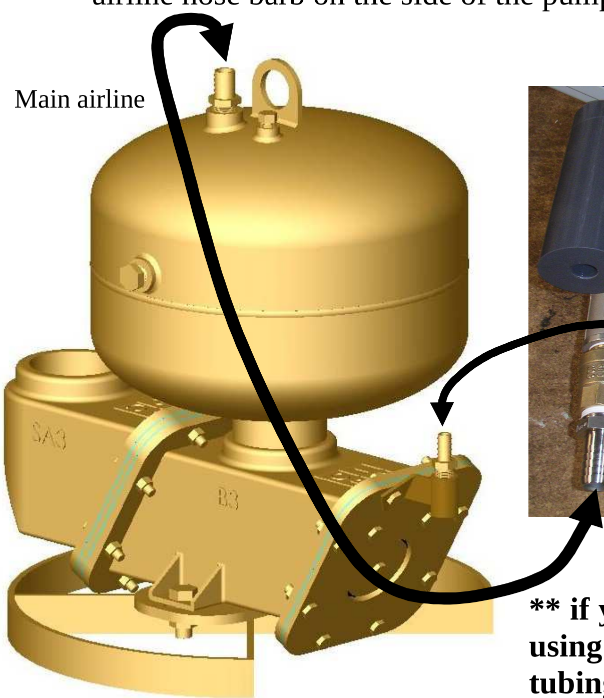
AP300F3 shown

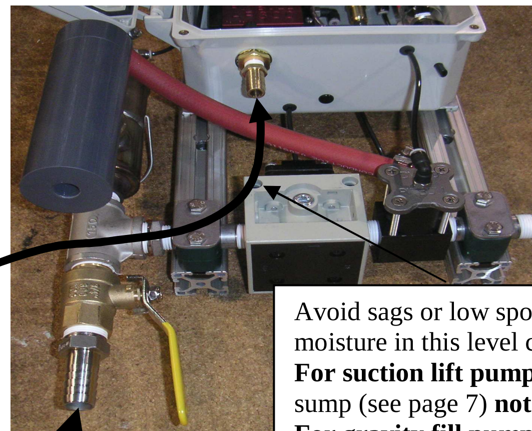


Connecting the Panel to the Pump

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).





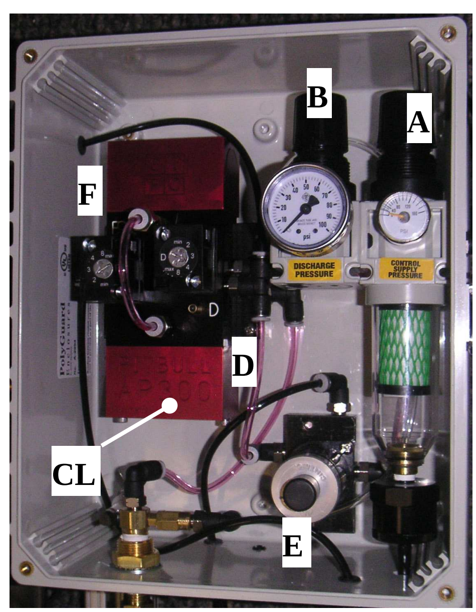
Avoid sags or low spots that could collect moisture in this level control line.
For suction lift pumps this line runs to the sump (see page 7) **not the pump!**
For gravity fill pumps, this line ends near the **<u>top of the chamber</u>.**

**** if you intend to hard pipe the two lines instead of using the hoses, substitute at least 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 <u>as big or bigger than the ID of the hose</u> provided (do not restrict!!!).**

Control Box

A- Control pressure regulator (set at 70 psi) and filter
B- *Discharge pressure regulator adjustment
F- Fill stroke time adjustment and pop-up indicator
D- Discharge stroke time adjustment and pop-up indicator
E- Discharge pilot valve adjustable delay
CL- Control logic module

** Discharge pressure regulator (adjustable to 70 psi max; to go higher than 70psi the control pressure must be raised first. Max is 100 psi, and will shorten maximum stroke time)*

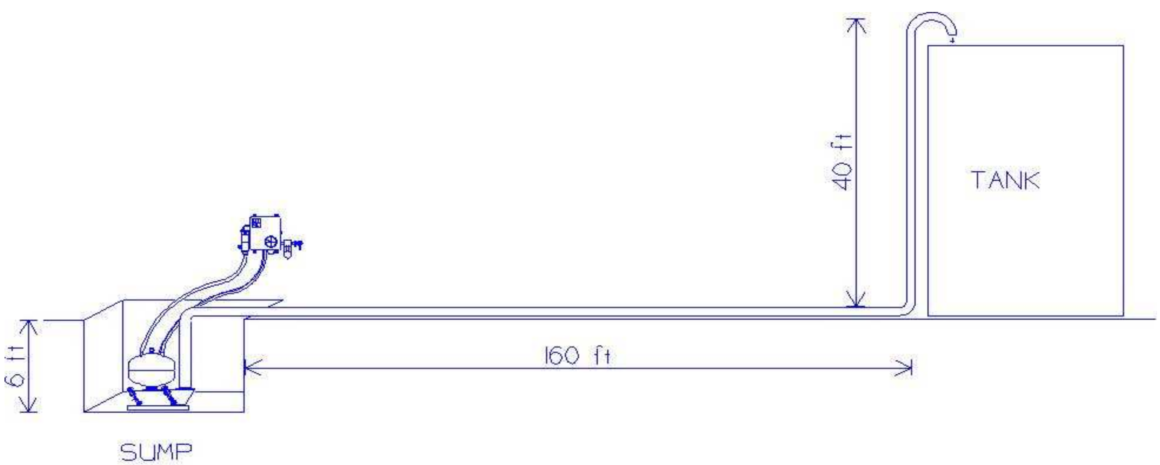


START-UP SETTINGS

The control panel is preset for fill (F) and discharge (D) strokes. The discharge pressure is preset for 40 psi using the discharge pressure adjustment. When initially starting up the pump, do not change the fill (F) and discharge (D) stroke settings and only adjust the discharge pressure (see 'B' in photo above) 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 discharge 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: too little discharge pressure will cause little (or none) fluid to exit the pump (the pump is essentially deadheaded). Too much pressure and compressed air is wasted.

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 low enough 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

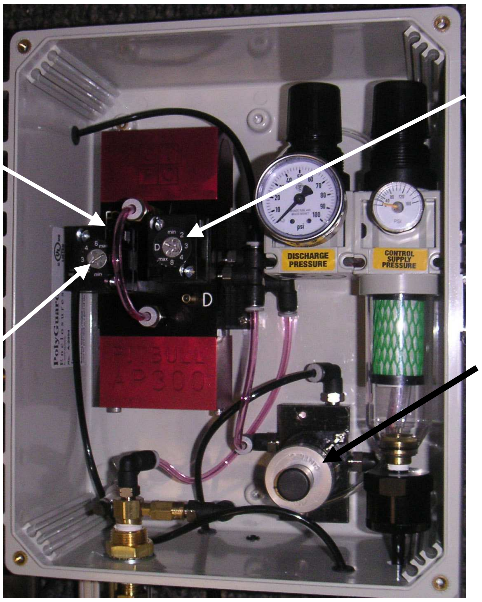
Pump Model	Fill/Discharge *Flow Induced*	Fill/Discharge *Suction lift*	**Fill/Discharge** ***Gravity filled***
S2C/S2S	3.0 sec /2.5 sec	3.5* sec/2.5 sec	**4.0 sec/2.5 sec**
S3C/S3S	3.5 sec /3.0 sec	4.5* sec/3.0 sec	**5.0 sec/3.0 sec**
S4C/S4S	4.5 sec /4.0 sec	6* sec/4.0 sec	**6.0 sec/4.0 sec**
SH4C/SH4S	7.0 sec /5.0 sec	8* sec/5.0 sec	**8.0 sec/5.0 sec**
S6x4C/S6x4S	5.5 sec /5.0 sec	7* sec/5.0 sec	**7.0 sec/5.0 sec**
S6C/S6S	8.0 sec /6.0 sec	9* sec/6.0 sec	**9.0 sec /6.0 sec**
S8C/S8S	9.0 sec /7.0 sec	10* sec/7.0 sec	**10.0 sec/7.0 sec**

*suction lift times will likely go longer for lifts greater than 4 ft.

To re-set the discharge time.*(Most submersed pumps will not require adjustment, and are factory pre-set)* With the pump cycling (level control line flooded) use a 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 .5-8 seconds.*

Pop-up indicator (above adjuster) pops out during the fill stroke

Fill stroke adjustment; align arrow with approximate time number. *Time with a watch to set accurately- these are not clocks and the numbers are not accurate.



Discharge stroke adjustment- align arrow with approximate time number. *time and set with a watch to set accurately- these are not clocks and the numbers are not accurate.
Pop-up indicator (below adjuster) pops out during the discharge stroke.

This piloting valve has an adjustment under the cap. For 4" and larger pumps there is a 1 second delay adjusted in. To eliminate delay, turn screw slot counter clockwise (2) turns.
NOTE- for a NET discharge stroke of 4 sec the stroke adjustment needs to be set to 5 sec due to the delay.

IT IS VERY UNLIKEY THE 'FILL' STROKE NEEDS ADJUSTING ON A SUBMERSED PUMP. 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
SH4C/SH4S	7.0 seconds	7.0 seconds
S6x4C/S6x4S	5.5 seconds	5.5 seconds
S6C/S6S	8.0 seconds	8.0 seconds
S8C/S8S	9.0 seconds	9.0 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).

The time setting for the discharge stroke may be slightly long, and some compressed air is 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. If that is not an option **consult the factory for additional air throttling valves to slow the discharge rate**. *Also check that the discharge pressure setting is not too high (see previous section) which would push the liquid out faster than needed.

Fine tuning pressure and discharge strokes ***(typically not needed):*** 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.

Complete Reset of Both Fill and Discharge Strokes

This method works most simply for a single pump but if you have a dual pump system the same concepts will apply.

Step One- Establish the fill time under your field conditions.
Set the discharge stroke to an excessive time. Check the chart on pg 13 for your pump and then add another 3 seconds to the discharge setting. This excess time will insure you are starting with an empty pump on each fill stroke.

Step Two- Find the amount of time needed to refill an empty pump.
Start the fill stroke off at least 1 second short of the recommended fill time (pg 13 again). You can hear the tone of the flow inducer change once the pump is full (goes up in pitch). Incrementally increase the fill stroke until you hear this pitch change, or, until liquid starts coming out the exhaust. At this point the fill time is barely too long; shorten it by about ½ second until the spray goes away and/or the tone doesn't change. Now the pump is getting full but not over filled and you can go on to step three.

Step Three- Correct the discharge stroke to match the full fill stroke.
From the previous step the pump is now full at the beginning of each discharge stroke, but we still have the discharge set intentionally too long. Start shortening the discharge stroke a little at a time until the same flow inducer tone change and/or exhaust spray occur. At this point the stroke length is too short to push out all of the liquid but the fill stroke allows for refilling all of the liquid, so the pump overfills. Lengthen the stroke about ½ second to just make these symptoms go away.

The pump strokes are now correctly set!

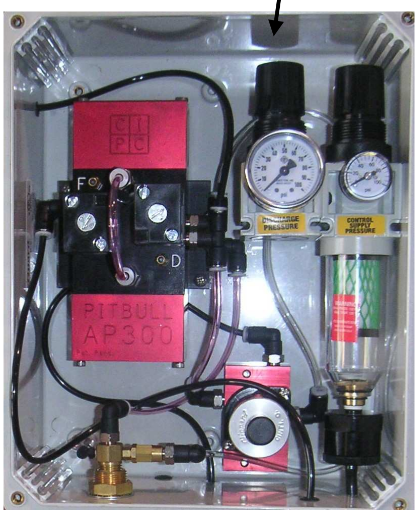
AP300XH High Flow Panel Variation

This version of the AP300 control panel is designed for very high flow applications and has the following differences from the AP300 standard;

1) The piloted discharge regulator is replaced by a 1-1/2” or larger pilot operated regulator that has much higher flow capacity.
2) The exhaust valve is enlarged to >2” piping, and a double acting operated ball valve or butterfly valve replaces the EXV200.
3) Inside the control box, NRE125 regulator provides the discharge pressure control.

Use this knob to adjust the discharge pressure

AP300XH panel shown without flow inducement



A 2-1/2” or larger exhaust valve (operated ball valve shown in this picture) replaces the EXV200

Pilot operated discharge regulator REP150, 1-1/2” size or larger is used.

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.

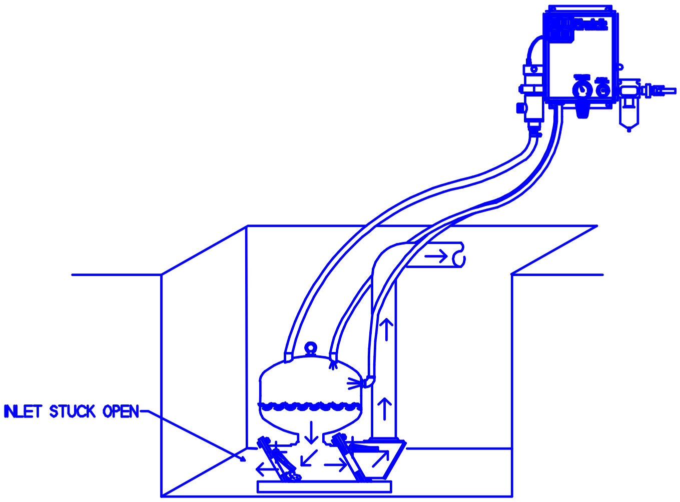
If the inlet check valve is stuck open, the pump will appear to cycle normally, but the discharge flow rate will be reduced or non-existent. On a submersed application you will commonly see turbulence at the inlet (from liquid and possibly air being expelled from the intake). Depending on liquid depth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

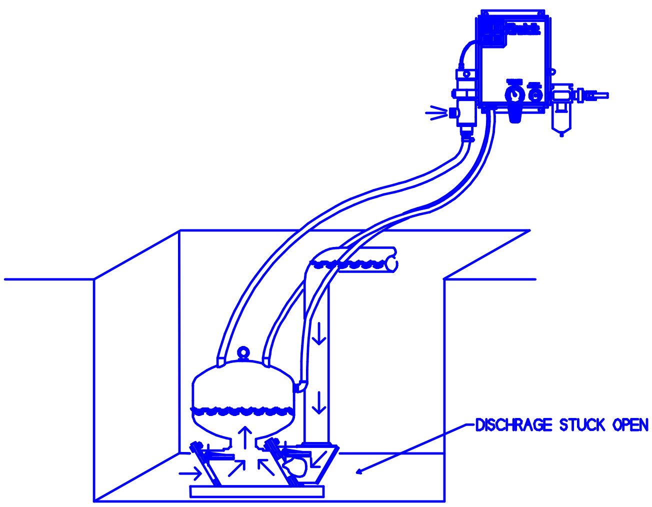
If the discharge check is plugged or stuck closed, the pump is deadheaded. Because no liquid is leaving the pump, you may also get liquid spraying from the exhaust because the pump is completely full of liquid.

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.

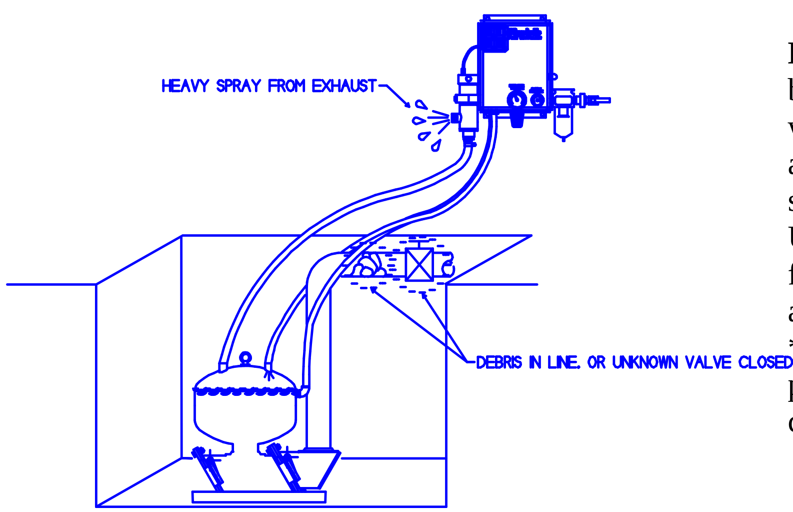
COMMON CHECK VALVE AND PIPING PROBLEMS



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).



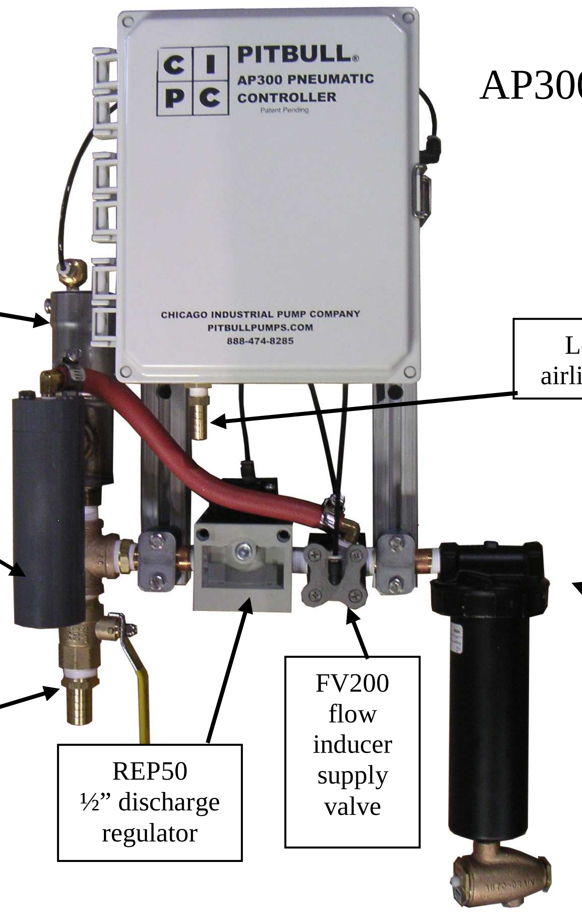
Discharge check stuck open. Pump continues to cycle but output is low. The pump is 're-pumping' the same liquid over and over. It will often overfill under this condition and have fluid exiting the exhaust port.



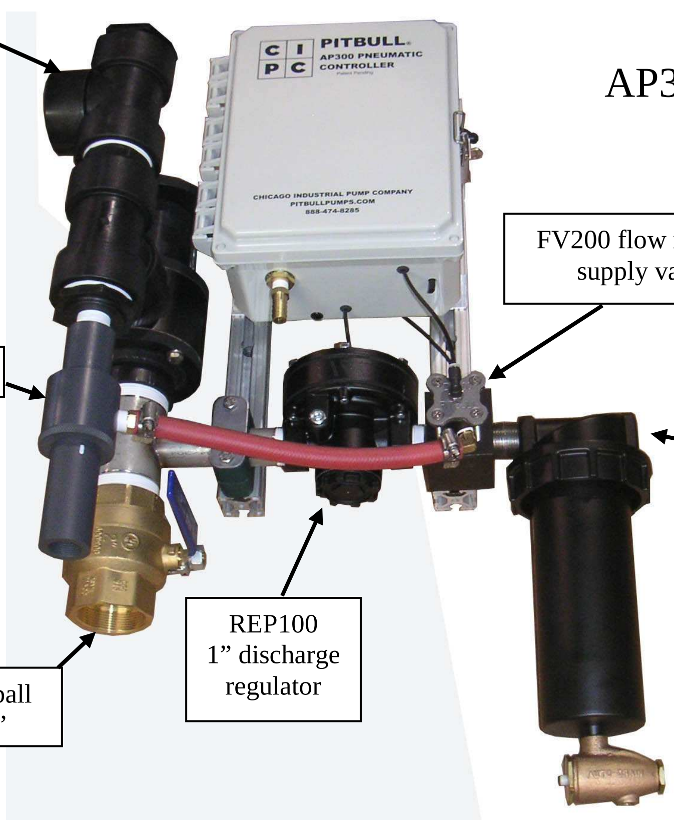
Deadheaded pump. The discharge line is blocked or greatly restricted. The pump will cycle, little fluid will go down stream, and the pump will constantly overfill, spraying fluid from the exhaust port. Under this condition the exhaust valve, flow inducer and airline can get clogged and need to be cleared.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

CONTROL PANEL COMPONENT IDENTIFICATION

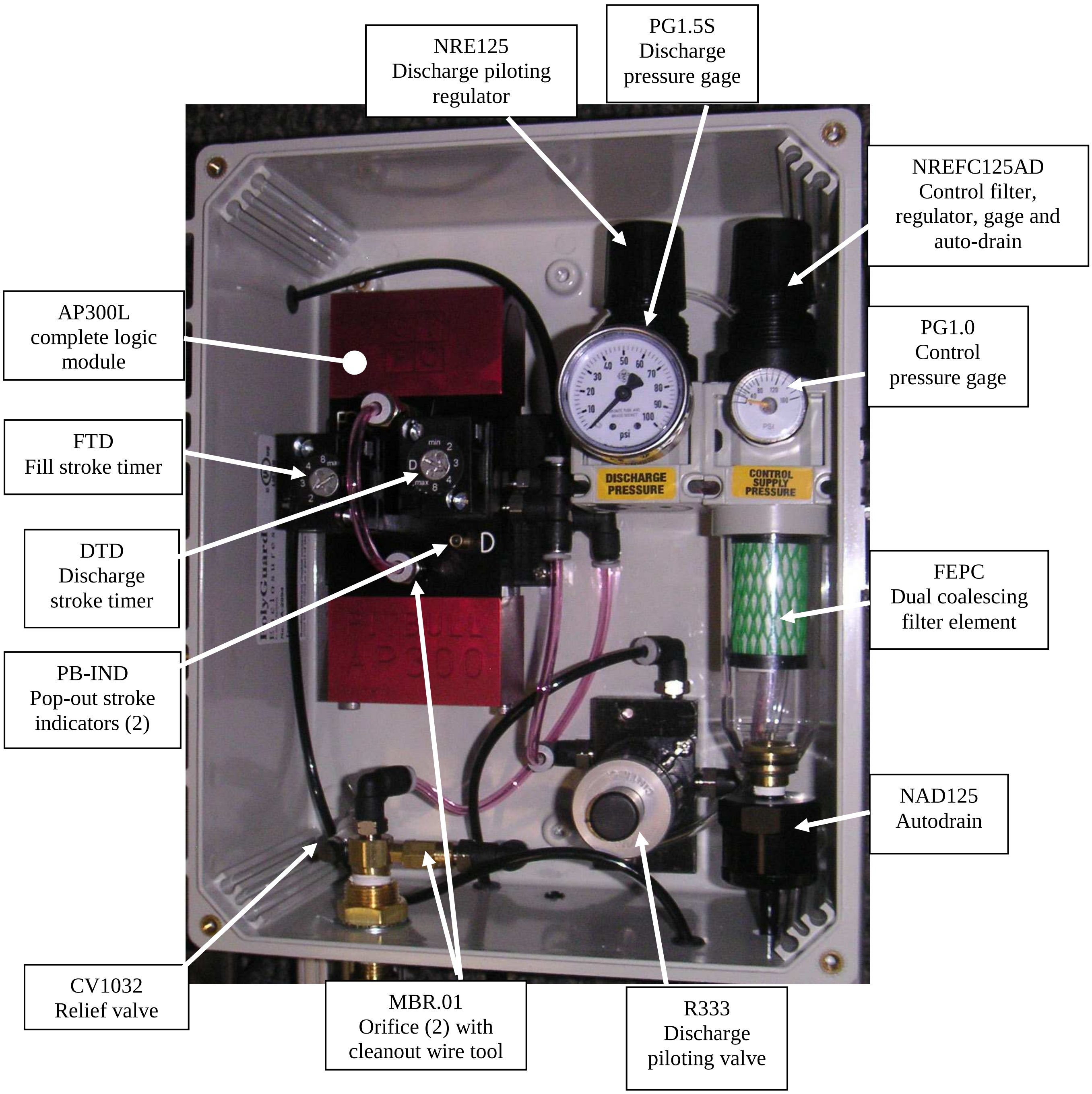
AP300 Flow Induced Panel



AP300F6 panel

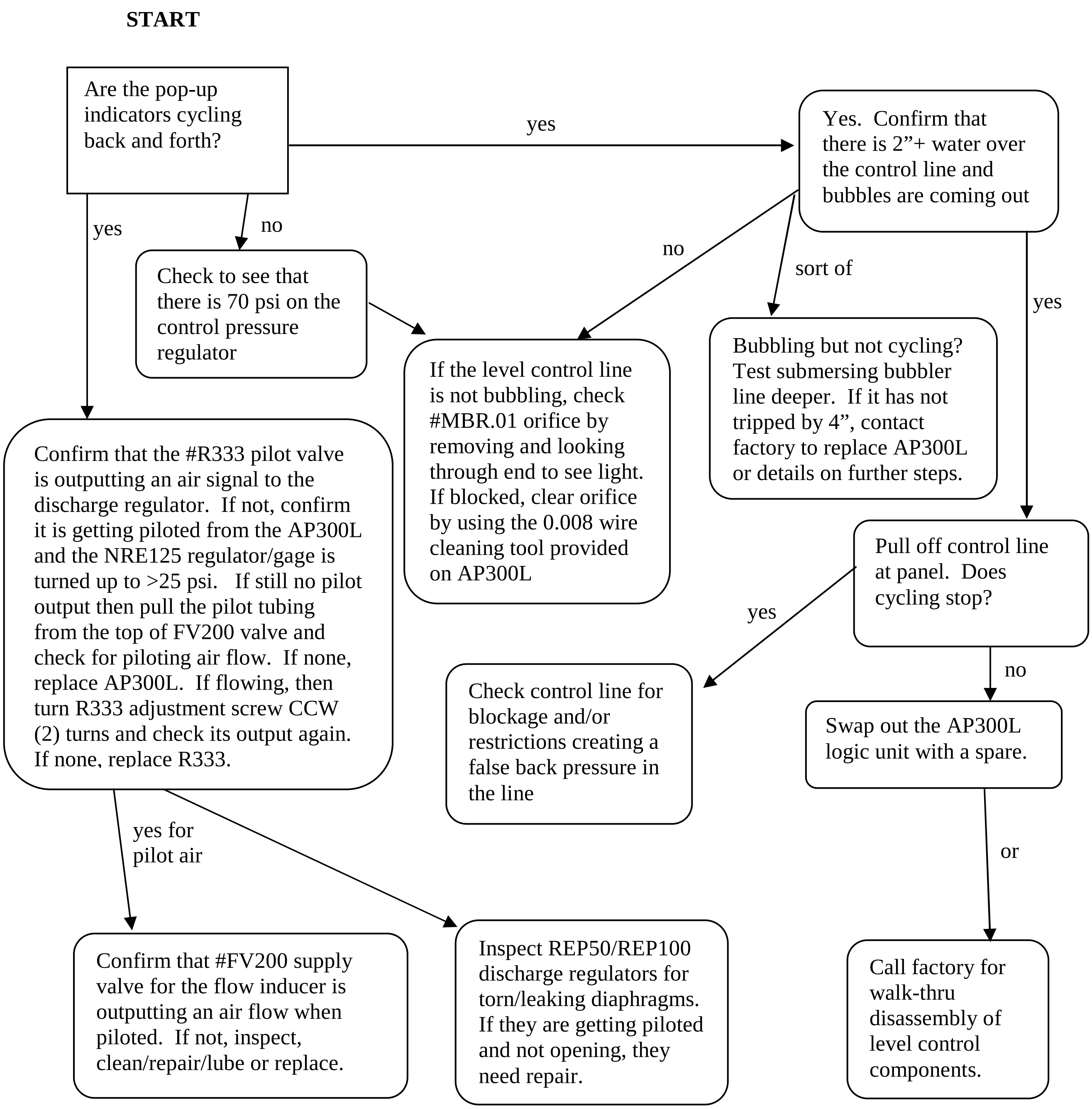


INNER CONTROL PANEL COMPONENT IDENTIFICATION



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

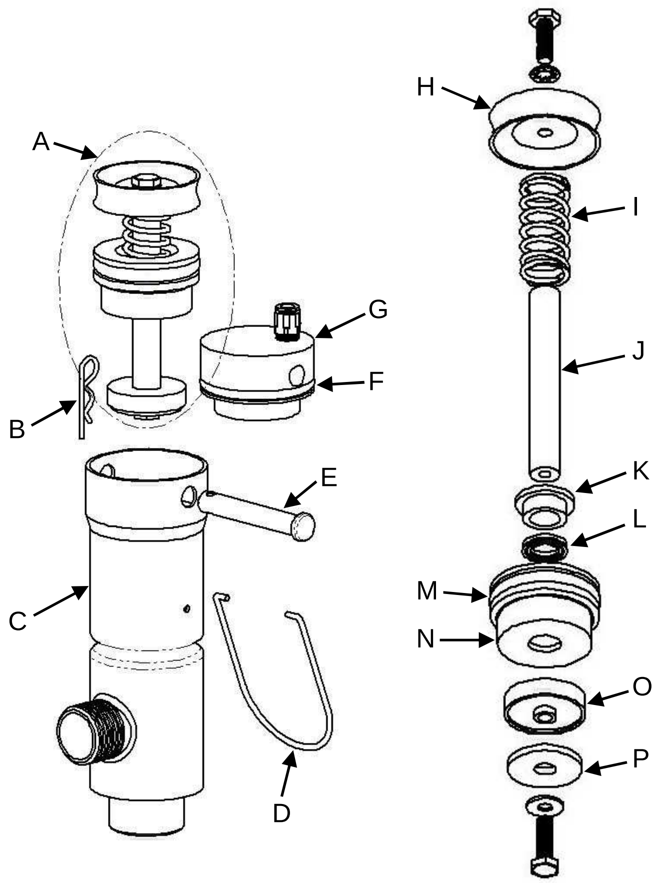
EXVS75 Exhaust valve:

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.

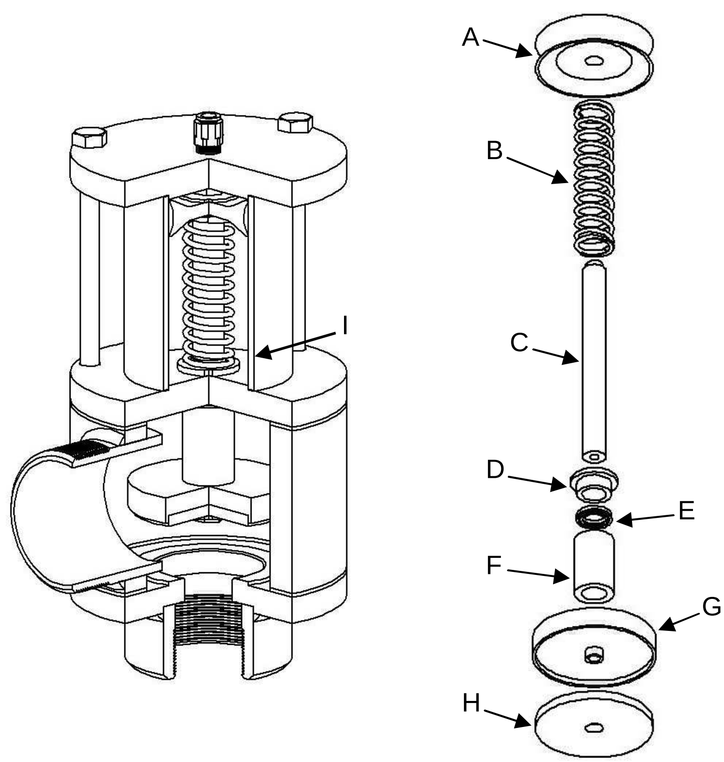
Response- Do the same disassembly/inspection of the exhaust valve as above.



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

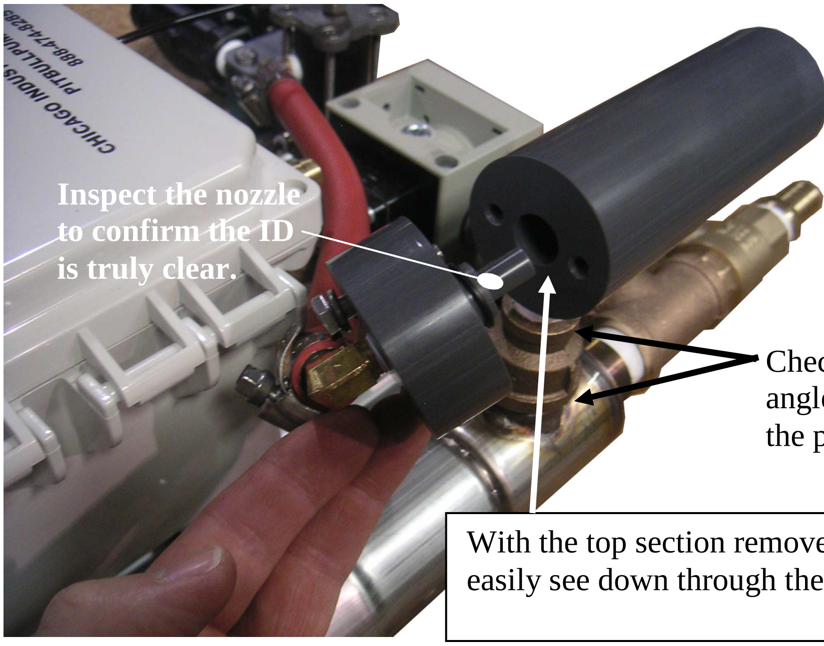
EXV200 Exhaust valve

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



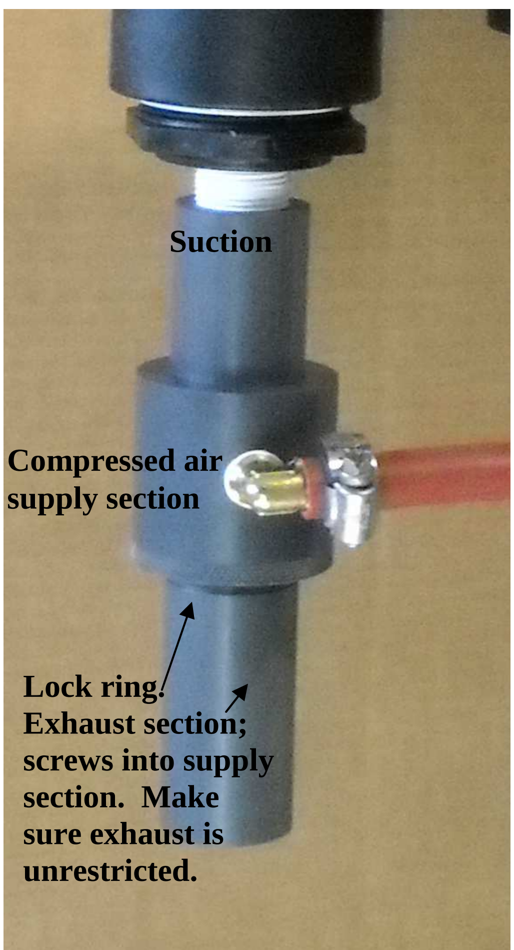
A – Piston cup seal
B – Return spring
C – Shaft
D – Guide bushing
E – Wiper shaft seal
F – Spacer
G – Poppet back
H – Poppet seat
I – Cylinder

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.

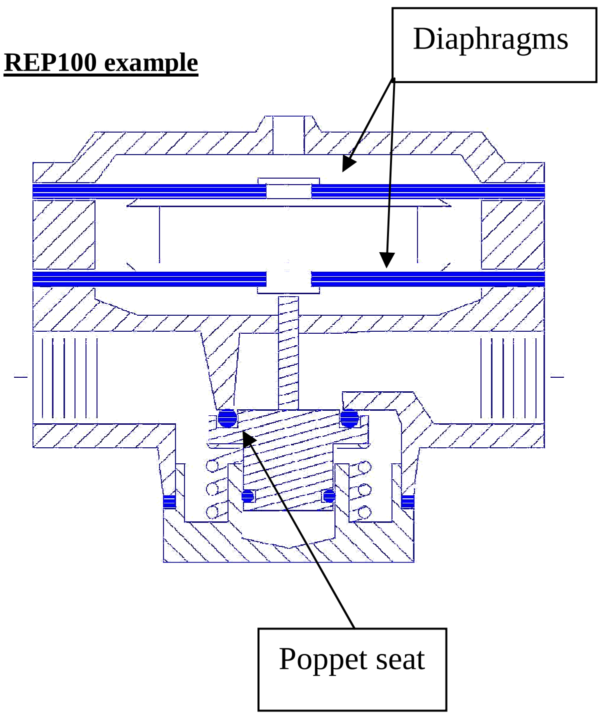
REP50, REP100 and REP150 Regulators

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



AP300 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: AP300G2–G8, and AP300F2L–F8L)
AP300L	Control logic module
MBR.01	Bubbler orifice (orifices (2) and clean-out tool)
NREFC125AD	Combination coalescing control filter, regulator and auto-drain
FEPC	Control filter element, dual particulate and coalescing.
FTD	Fill stroke timer
DTD	Discharge stroke timer.
PB-IND	Pop-out logic indicator (F or D)
NRE125	Discharge piloting regulator
NAD125	Control filter auto-drain.
PG1.5S	Discharge pressure gage.
PG1.0	Control supply pressure gage.
CV1032	Level control line relief valve.
R333	Discharge piloting valve time delay
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
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.

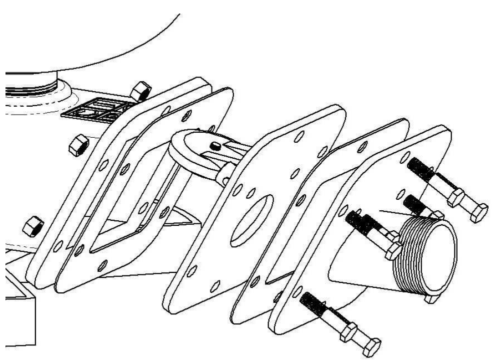


Fig 14A

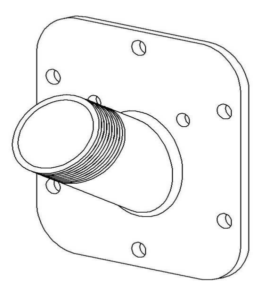


Fig 14B

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.*

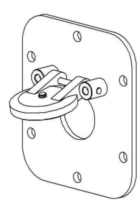


Fig 20A

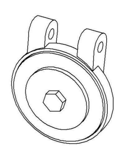


Fig 20B

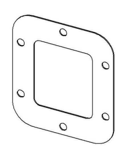


Fig20C

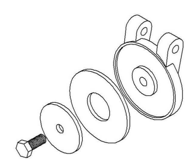


Fig20D

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*.

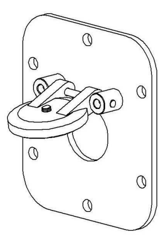


Fig 20A

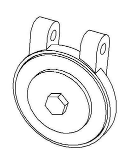


Fig 20B

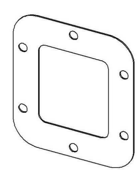


Fig20C

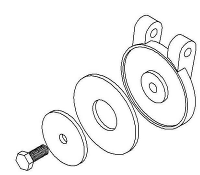


Fig20D

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*.

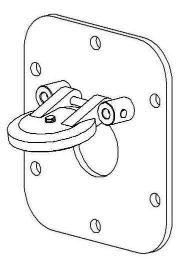


Fig 20A

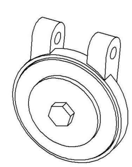


Fig 20B

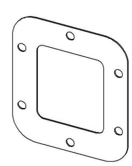


Fig20C

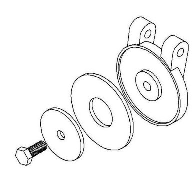


Fig20D

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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.