PACIFIC LIQUID & AIR SYSTEMS
PUMPS • MOTORS • CONTROLS
a Solaray Company

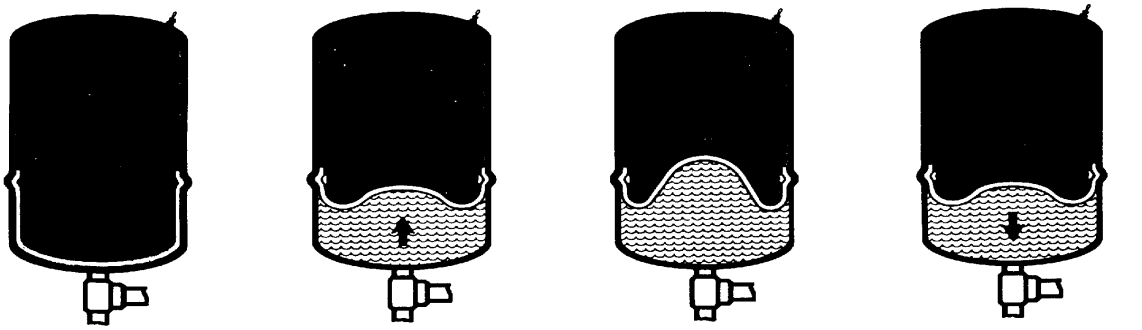
SET UP AND TUNING OF PRESSURE SWITCHES AND HYDROPNEUMATIC TANKS

GENERAL

Pressure systems that are designed to run intermittently will usually incorporate both a pump and a pressure tank. In the past inefficient, *air over water* tanks were used. Today, the modern diaphragm or bladder tank offers an economical and efficient means of providing pressurized water between pump cycles.

HOW HYDROPNEUMATIC TANKS WORK

The bladder or diaphragm tank operates on the principle that, while air is compressible, water is not. Refer to the figure below. Before start up, the upper portion of the tank is precharged with air at a pressure that is slightly below the pump cut in pressure. This precharge presses the diaphragm or compresses the bladder against the bottom of the tank and thus occupies the entire volume of the tank. The first time the pump starts (start-up and fill cycle), water is pumped into the bottom of the tank forcing the diaphragm upward (or expanding the bladder) and compresses the air above. When the pump shuts off (hold cycle) the air pressure above the diaphragm has been compressed to a pressure equal to the water pressure below the diaphragm. When a fixture is opened the compressed air above the diaphragm will expand, forcing water out of the system under pressure (delivery cycle). This delivery, without assistance from the pump, is referred to as *drawdown*. When the water pressure in the tank decreases to the pump cut in pressure, the pump will restart and the fill cycle will begin again. Since the tank precharge is several pounds lower than the pump cut in



Start-Up Cycle
With water chamber empty, diaphragm is pressed against bottom of chamber.

Fill Cycle
As water is pumped into water chamber, diaphragm is forced upward into air chamber

Hold Cycle
When pressure in air chamber reaches pump cut-off point, diaphragm is in uppermost position, water chamber is filled to rated capacity

Delivery Cycle
When water is delivered to system, pump remains shut off. Air pressure in top chamber forces diaphragm downward

pressure, the tank is never entirely drained. This allows an uninterrupted flow of water throughout the delivery and fill cycles.

ADJUSTING THE TANK PRECHARGE

Decide upon the lowest delivery pressure (cut in pressure) desirable. Use a good quality digital tire pressure gauge to measure the air pressure in the tank. Release or add air as required to adjust the precharge pressure to 2 PSI below the pump cut in pressure. It is extremely important that the tank pressure be as close to 2 PSI below pump cut in pressure as possible. If the pressure is less than 2 PSI, water delivery could be interrupted. If it is greater than 2 PSI, efficiency will be reduced. Tank precharge should be checked twice each year to accommodate valve leakage and permeation of the bladder or diaphragm. Some hydropneumatic tanks are precharged with nitrogen which passes through the membrane material more slowly than ordinary air. These should be checked once each year.

ADJUSTING THE PRESSURE SWITCH

WARNING: Disconnect power to the pump during switch adjustments.

Connect power to the pump and allow the tank to fill with water until the pump cuts off. Note the cut out pressure. Open one or more fixtures and allow the tank to drain. Note the cut in pressure of the pump. The difference between cut in and cut out pressure must be at between 15 and 20 PSI. The greater the pressure differential, the greater the tank drawdown.

If cut in pressure is correct you may increase cut out pressure by turning the shorter adjustment screw clockwise. This will increase cut out pressure without affecting cut in pressure. Anticlockwise adjustment will cause the opposite effect.

Turning the taller adjustment screw clockwise will increase both cut in and cut out pressure by approximately the same amount. Anticlockwise adjustment will reduce both in the same manner.

Adjustment of both the taller and shorter screws will affect both cut in and cut out pressure. The following rules apply:

TALLER ADJUSTMENT:	CLOCKWISE -- INCREASE CUT IN AND CUT OUT PRESSURE ANTICLOCKWISE -- DECREASE CUT IN AND CUT OUT PRESSURE
SHORTER ADJUSTMENT:	CLOCKWISE -- INCREASE CUT OUT PRESSURE ANTICLOCKWISE -- DECREASE CUT OUT PRESSURE

Observe several pump cycles for proper operation. If the pump fails to shut off, turn the shorter adjustment screw anticlockwise.

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