BULK CIRCULATING SYSTEM OPERATION

There are three primary components to an ink circulation system, 1. pump, 2. relief valve, and 3. back pressure valve. Below please find details pertaining to these three components and how they operate in the circulating system.

PUMP

The pump is in most cases a positive displacement, electrically driven, gear type pump. The pump has a built in relief with the capability to generate 150 PSI of discharge pressure (175 PSI Relief Spring).

RELIEF VALVE

The next component to determine is the pressure relief valve. The pressure relief valve is the valve located after the outlet (discharge) of the pump. This valve will relieve either into the return line, or directly into the ink storage tank. The purpose of this valve is to relieve any excess pressure that might build in the system. This valve will relieve instead of the relief on the pump activating. The spring range for this devise should be 70 - 150 PSI.

BACK PRESSURE VALVE

The back pressure valve is located on the return portion of the system, after the last printing unit supplied, and ideally as close to the storage tank as possible. This is the devise that is used to set the pressure on the pumping system. The spring range on this devise should be 30 - 80 PSI.

SYSTEM SET UP

Listed below is a step by step description of how to set up a circulating system, assuming all the components are as detailed above.

1. Insure that the relief set screw on the pump by-pass is all the way in. This will maximize the discharge pressure capability of the pump, and reduce the risk of ink by-passing in the pump. If ink does by-pass in the pump, the pump will heat up and potentially damage the pump. If the pump is hot to the point that it cannot be touched there is something wrong. This indicates there is no flow, and must be corrected immediately or the pump will fail.

2. The back pressure valve and the relief valve should be set to their minimum setting, (set screw all the way out). The back pressure valve and relief valve should have manual by-pass valves at each devise. These manual valves should be in the open position.

3. With the pump set at its maximum discharge capability, and minimum resistance in the system, you can now start the pump. The discharge pressure will be very low due to the minimal amount of resistance currently in the system.

IMPORTANT NOTE: The discharge pressure of a pump is determined by the resistance it is pumping against. Even though this pump has the capability to deliver 150 PSI, the discharge pressure will only be 50 PSI, if 50 PSI is the total resistance. Also, regardless of the resistance in the system, the volume per revolution of the pump will always be the same. As resistance and pressure increase or decrease, the volume of the pump will not change. The only way to change the volume of the pump is to change the speed of the pump.

4. The next adjustment will be at the relief valve location. Close the manual valve. This will direct flow through the relief valve. We now have ink flowing through the relief valve and the main header. The next goal is to direct all flow to the main header. Begin to close down the relief valve. As you turn the set screw the discharge pressure on the pump should increase. This is because more ink is now traveling a greater distance. Continue to increase the resistance in the relief valve until the pressure builds to 150 PSI, or stabilizes at a lower pressure. The amount of resistance in the system will dictate the discharge pressure at the pump outlet. The ideal scenario would be to have the manual relief valve closed, the relief set screw all the way in, and a discharge pressure at the pump less than 150 PSI.

5. You now have achieved full volume delivery through the ink pumping system. Now you must determine your pressure setting at the back pressure station, and set the system accordingly. The pressure settings at the back pressure station vary. The most common range that I see in the field is somewhere between 50 to 60 PSI. For this example we will use the 50 PSI pressure setting. Close the manual valve at the back pressure valve station. Turn in the set screw on the back pressure valve until the pressure gauge at the back pressure station reads your desired setting. As you increase the resistance at the back pressure station you will increase the discharge pressure at the pump. The total resistance of the system has been increased because of the resistance created by the back pressure valve. Be sure that the discharge pressure of the pump does not exceed 150 PSI, or the system will stall and the pump will overheat. After the back pressure is set and if the pump discharge pressure is still less than 150 PSI you are in good shape.

6. The last step is to set the relief on the system. Go back to the pressure relief station. Take note of the discharge pressure at the pump outlet. If the pump is reading 135 PSI, then that is the operational pressure of the system. Now slowly turn the set screw on the relief valve out, keeping an eye on the discharge pressure at the pump. When the pressure begins to drop at the pump, then stop. Now turn the set screw back in until you achieve the operation pressure setting

and turn the set screw an additional 1/2 to 3/4 turn. Now if there is any pressure spikes in the system the excess pressure will relieve at the pressure relief station and not at the pump.

The exception to all of this is if a system cannot handle the full delivery of the pump. In a situation like that the excess pressure will have to be relieved at the relief valve. The primary objective is to have full flow through the pump or as much flow to the main header as possible.