

Multiple Pump Systems for Continuous Flow or Independent Modes

Basic Configurations, Setup, and Operation

Overview

Multiple pump systems can be used in either constant pressure or constant flow mode, and can operate in tandem (2 pumps), or independently (up to 3 pumps), regulated by a single controller. The D Series dual pump system consists of two syringe pumps connected with an air or electric, or check valve package, and one controller.

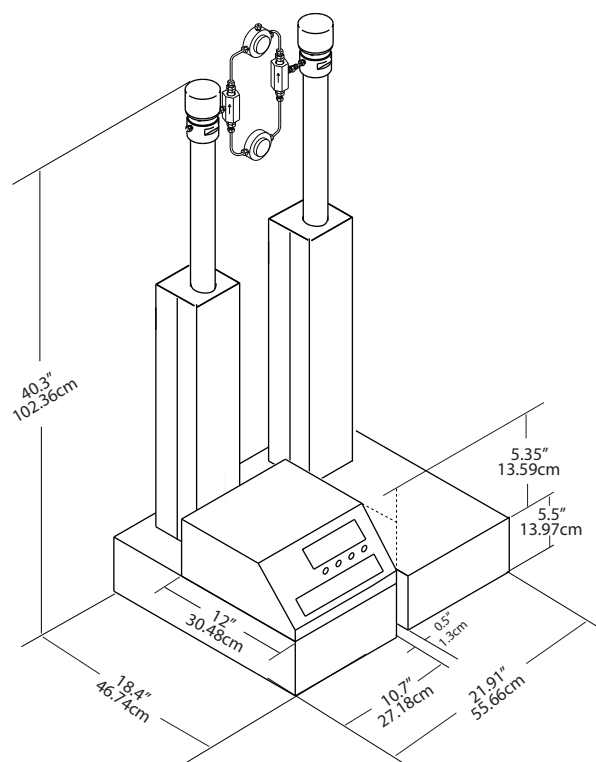


Figure 1: Dual pump system dimensions

Power Requirements	100 ±10VAC, Pump A max 1.5A; Pump B max 1.5A
	117 ± 12VAC, Pump A max 1.5A; Pump B max 1.5A
	234 ± 23VAC, Pump A max 0.75A; Pump B max 0.75A
Line Frequency	50 or 60 Hz

Valve Packages

The valves may be passive (check valves) or active (air or electric). Electric valves are recommended for the following applications:

- Liquefied gases
- Heated viscous fluids delivered at low pressure from a pressure pot
- Viscous fluids requiring a forced valve closure

For the steps that follow, refer to Figures 2 and 3.

WARNING

Risk of injury. The pressure produced could be up to 10,000psi (700 bar). Use only the appropriate tubing and connections.

Valve Package Installation

1. Position the pump bases 1.3 cm apart.
2. Use the plugs to close the ports that will not be connected.
3. Loosely attach the tubing lengths from the valve assembly to the pumps.
4. Allow the bracket to hang vertically and place the straps around the pressure transducer caps. Tighten the wingnuts.
5. Install the four bracket panhead screws on the bottom of the bracket.

Plumbing Connections

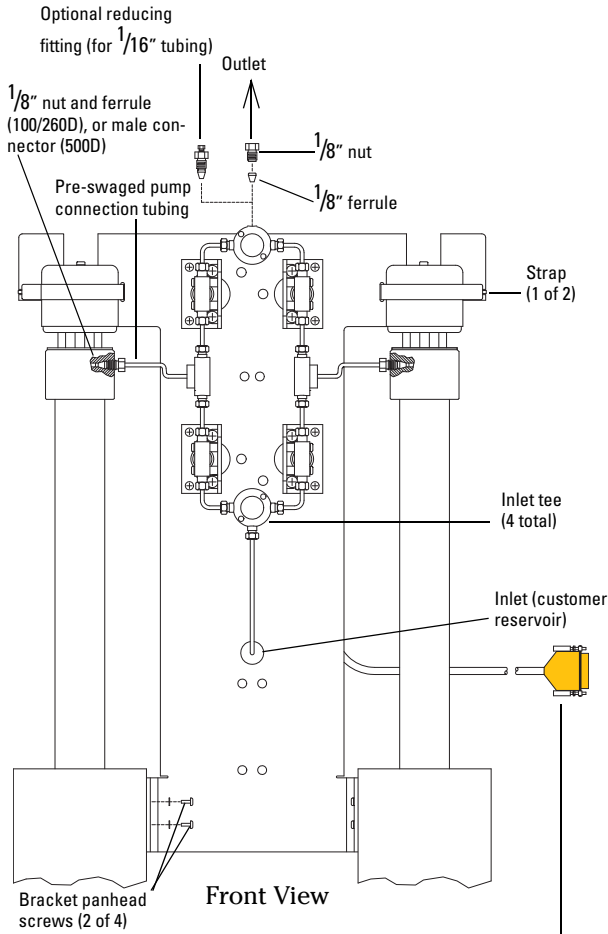
1. Tighten the tubing nuts.
2. Connect the inlet tube to the supply reservoir.
3. Connect the outlet tee to your apparatus.

Electrical Connections

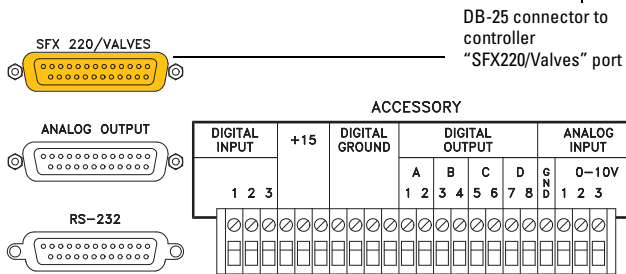
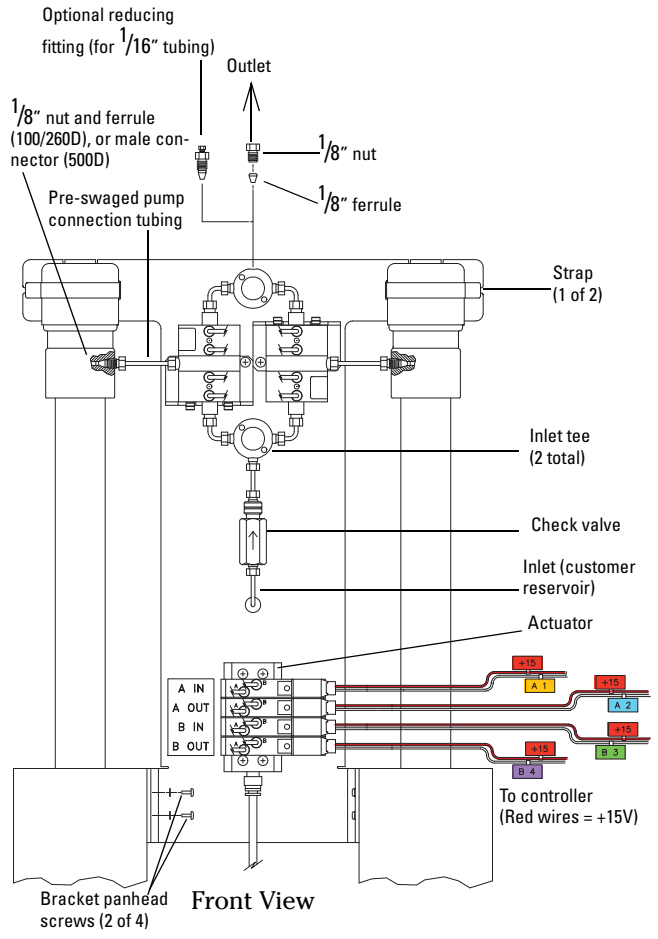
Electric Valve Package – The actively controlled electric valve package requires a special interface board mounted inside the controller. Connect the DB-25 cable to the controller rear panel “SFX 220/VALVES” connector, as shown in Figure 2.

Air Valve Package – The actively controlled pneumatic valve package requires a pressurized air source of 80-115psi (552-793KPa). As shown in Figure 3, connect the two positive (red) wires to any two of the 15VDC terminals on the rear of the controller. Connect the black wire from solenoid #1 (IN) to DIGITAL OUTPUT 1. Connect the black wire from solenoid #2 (OUT) to DIGITAL OUTPUT 2.

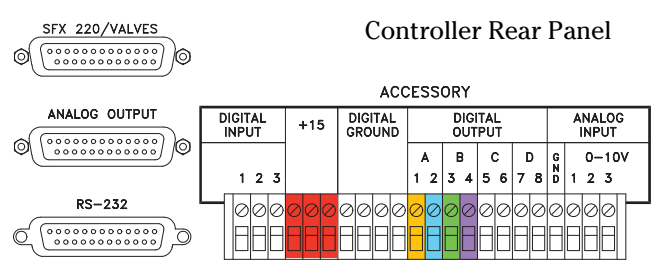
Electric Valve Package



Air Valve Package



Controller Rear Panel



Controller Rear Panel

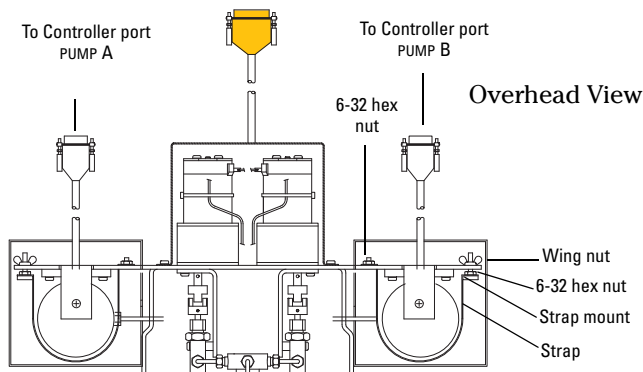


Figure 2: Electric valve installation

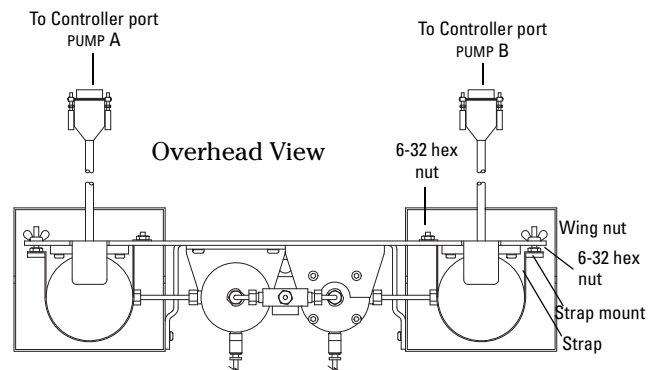


Figure 3: Air valve installation Requires pressurized air source @ 80-115 psi (5.5 - 7.93 bar)

Setting Up Continuous Flow

Both pumps must be operated manually during initial setup, *i.e.* refill and purging of air. Active (air or electric) valves are switched using the ACC CTRL key. Lights on the air switches indicate which valves are open. Once the valve package is installed and you have ensured that fluid connections are leak free, you are ready to program the system. Press the keys on the controller front panel in the order shown for the desired mode.

Defining Operation

SELECT PUMP – This menu allows you to select any pump to display its run screen (program and operation data) and to make program changes.

Valve specification – To prevent pressure fluctuation at switchover, you must specify the type of valve package you are using.

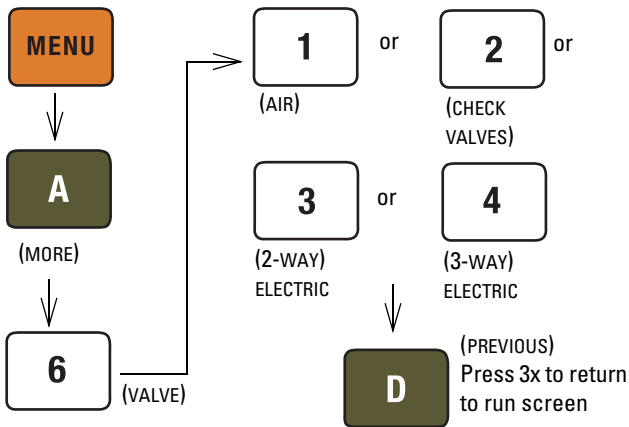


Figure 4: Keystrokes to specify valve type

Note

In older controller versions, only buttons 1 (ACTIVE) and 2 (PASSIVE) are selectable when specifying the valve type being used (Figure 4). *Active* refers to air or electric valves; *Passive* refers to check valves.

Volume totalizer – The total volume delivered is displayed in liters at the top right corner of the screen. Refer to the figure below to reset the volume totalizer to zero.

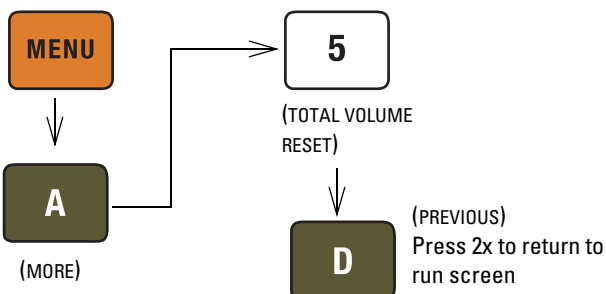


Figure 5: Keystrokes to reset volume totalizer

Constant Flow Mode:

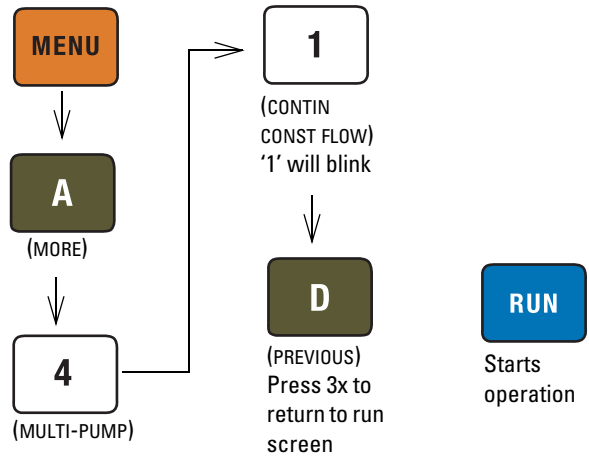


Figure 6: Keystrokes to set up constant flow

Constant Pressure:

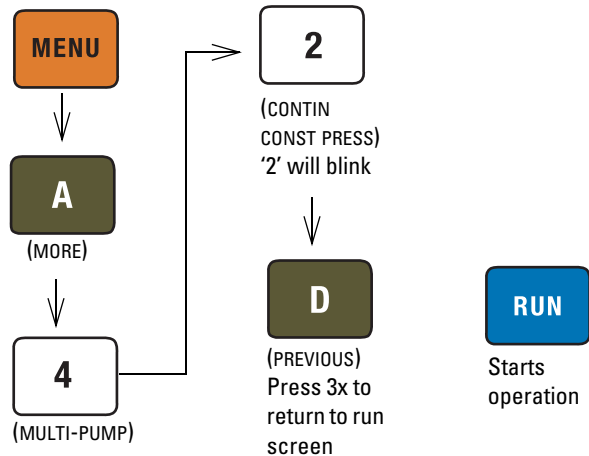


Figure 7: Keystrokes to set up constant pressure

Note

Before pressing RUN, ensure that ON CONT FLOW is displayed on the screen, and that the set flow rate/pressure is correct.

Always verify the valve settings before running a program. If a controller is reset or moved to a different power source, it will revert back to default settings (Passive).

Tips for Running Continuous Flow

Liquids Checklist:

1. Degas liquids if appropriate.
2. Purge air from the system:
 - a. Fill both pumps completely by pressing REFILL and selecting each pump to fill.
 - b. Route the outlet (see Figures 2 and 3) to waste or reservoir and press RUN. Press STOP when fluid comes out of the outlet.
 - c. Open the valves to atmosphere by pressing ACC CTRL, then selecting each valve to open.
 - d. Zero the pressure in each pump by pressing ZERO PRESS and selecting each pump to zero.
 - e. Connect the outlet tubing and fill each pump once more.
3. Reset total volume (see Figure 5).

Equilibration – When the pumps begin running, the system will go through an equilibration phase, during which both pumps must be full and delivering fluid.

Liquefied Gases Checklist:

1. Open the valves to atmosphere by pressing ACC CTRL, then selecting each valve to open.
2. Zero the pressure in each pump by pressing ZERO PRESS and selecting each pump to zero.
3. Fill both pumps completely by pressing REFILL and selecting each pump to fill.
4. Pressurize both pumps by pressing RAPID PRESS. Maximum flow rate and target pressure value will be displayed. Press D to continue pressurization.
5. Reset total volume (see Figure 5).

Additional guidelines – Please become familiar with the following guidelines provided by our research laboratory:

- Pressure limits for constant flow mode are set by the limits of pump A.
- Temperature changes can cause pressure fluctuations, especially if a restrictor is being used for backpressure. For available temperature control options, contact Teledyne Isco.
- For correct overpressure response, shutdown must be set to ON under PUMP LIMIT options.
- Enter the same refill rate separately for pumps A and B.
The refill rate should always be at least twice the flow rate setpoint to allow time for refill and repressurization before the next switchover.

Independent Control

One controller can run up to three syringe pumps independently of each other in either constant pressure or constant flow mode, or any combination of the two. Each pump will operate at its defined limit and rate. Programming steps are shown in Figure 8.

HOLD PRESS – After a pump in constant pressure mode runs empty, if outlet pressure exceeds the setpoint, this feature causes the pump to restart, returning the system to setpoint pressure.

NORMAL – This feature shuts off any pump that runs empty in constant pressure mode.

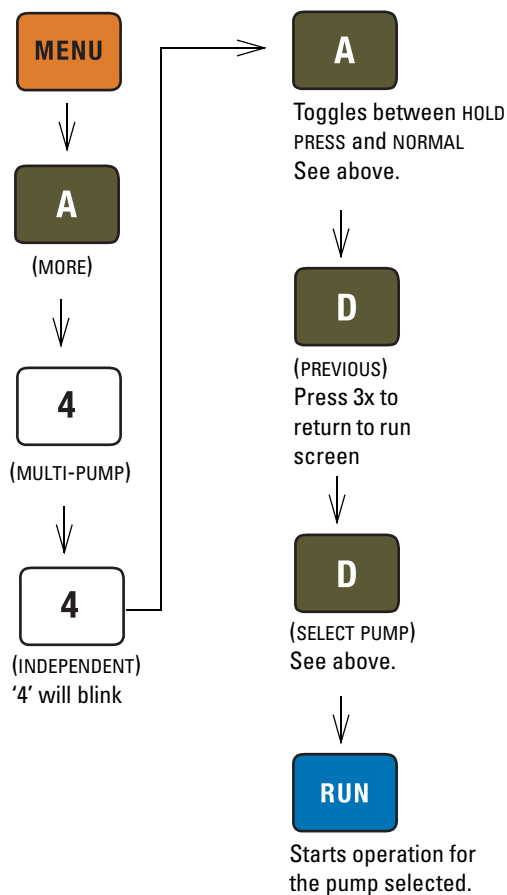


Figure 8: Keystrokes to set up independent pumps

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