

# D-Series Quad Dual Pump Systems for Continuous Flow and Independent Operation

## Overview

The D-Series Quad Dual Pump system firmware can operate all four pumps independently (A, B, C, D), in one pair and two independently (A-B,C,D), or in pairs of two (A-B, C-D). This system consists of four syringe pumps connected with air valve packages and one controller.

### ☑ Note

The Quad Dual Pump can only be used with the updated controller and the firmware revision must be 1.09 or later. See [TB28 D-Series Syringe Pump Controller Versions](#) for more information.

### ☑ Note

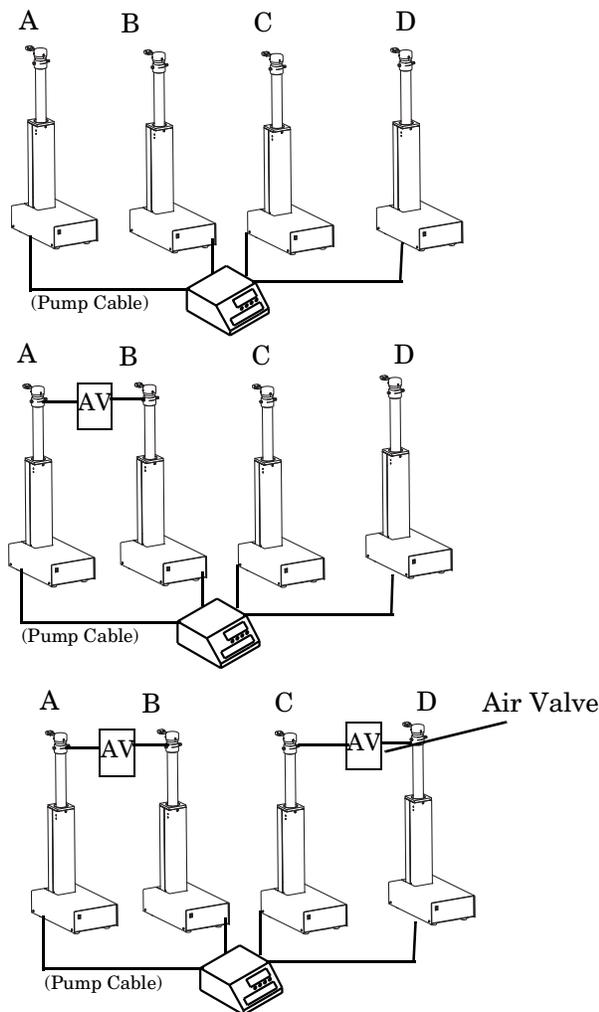
Pump A is always connected to the 'A' port.

## Valve Packages

The valves may be passive (check valves) or active (air). For the steps that follow, refer to Figures 2 and 3.

### ⚠ WARNING

**Risk of injury. The pressure produced could be up to 20,000 psi (1378 bar). Use only the appropriate tubing and connections.**



**Figure 1: Types of pump configurations: Four pumps independently (A,B, C, D), one pair and two independently (A-B, C, D), and in two pairs (A-B, C-D).**

## 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, then tighten the wing-nuts.
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.

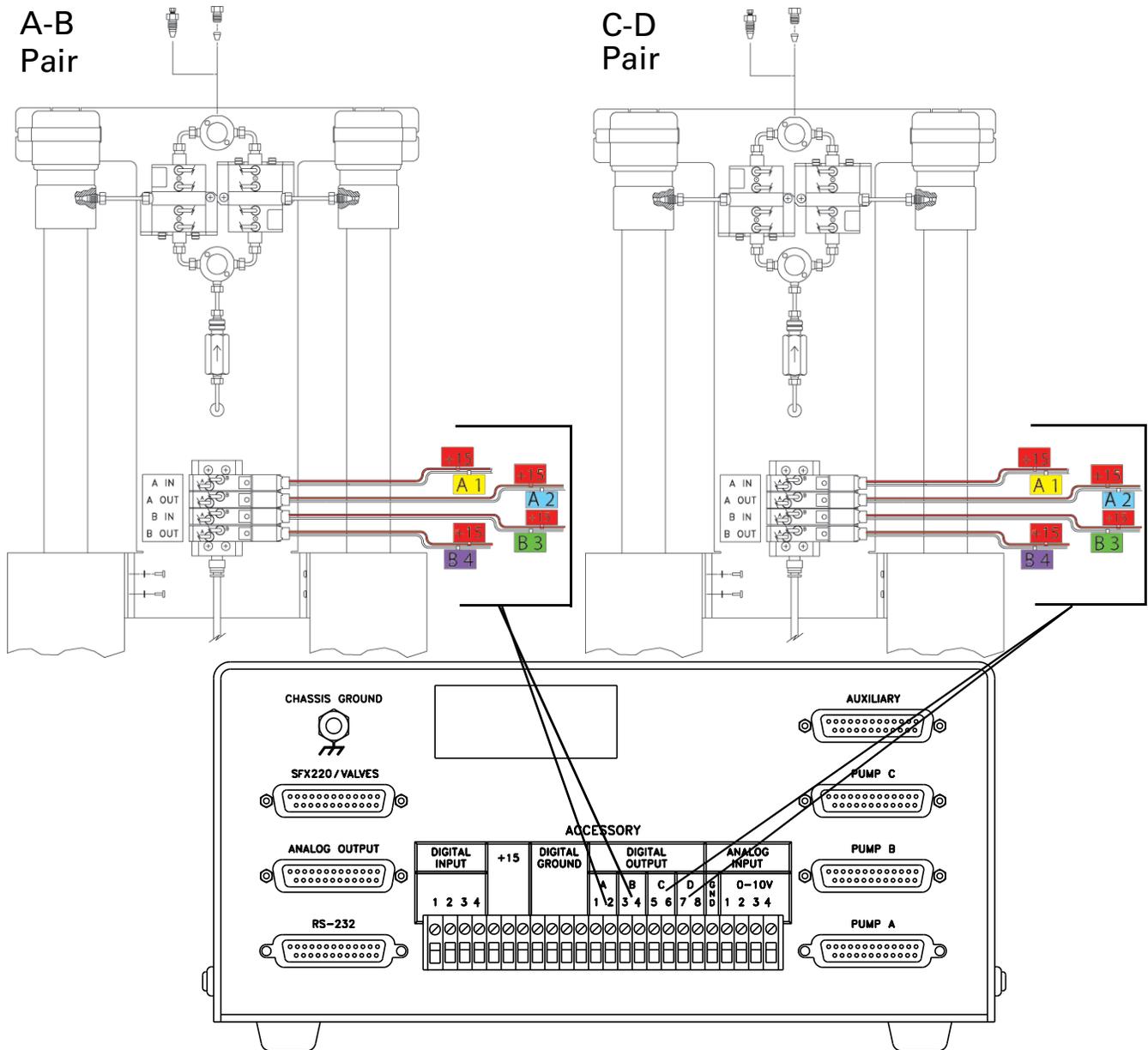
## Electrical Connection

**Air Valve Package** – The actively controlled pneumatic valve package requires a pressurized air source of 80-115psi (552-793KPa). Connect the eight positive (red) wires to any of the three 15VDC terminals on the rear of the controller. You may need to double up wires in the terminals.

For the black wires:

1. Connect the black wire from solenoid A1 (IN) of the A-B pair to DIGITAL OUTPUT 1.
2. Connect the black wire from solenoid (OUT) A2 of the A-B pair to DIGITAL OUTPUT 2.
3. Connect the black wire from solenoid B3 (IN) of the A-B pair to DIGITAL OUTPUT 3.
4. Connect the black wire from solenoid (OUT) B4 of the A-B pair to DIGITAL OUTPUT 4.
5. Connect the black wire from solenoid A1 (IN) of the C-D pair to DIGITAL OUTPUT 5.
6. Connect the black wire from solenoid (OUT) A2 of the C-D pair to DIGITAL OUTPUT 6.

7. Connect the black wire from solenoid B3 (IN) of the C-D pair to DIGITAL OUTPUT 7.
8. Connect the black wire from solenoid (OUT) B4 of the C-D pair to DIGITAL OUTPUT 8.



**Figure 2: Air Valve Installations Rear panel with connections for Pumps A-B (left) and Pumps C-D (right)**

**Table 1: Wire Pair Conversion Table for A-B Pump Pair and C-D Pump Pair**

A-B Pump Wire Pair	Digital Output	+15 Wires		C-D Pump Wire Pair	Digital Output	+15 Wires
A1	A1	+15		A1	C5	+15
A2	A2	+15		A2	C6	+15
B3	B3	+15		B3	D7	+15
B4	B4	+15		B4	D8	+15

**☑ Note**

Wire tags are noted for a two pump operation. To connect the second valve package, use the conversion table in Table 1 and see Figure 2 for more information.

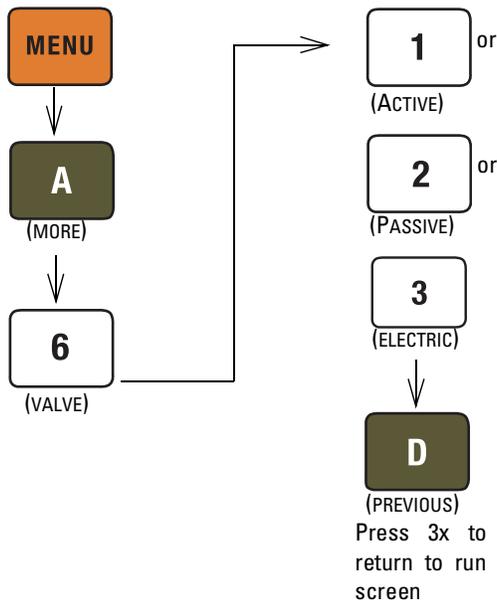
**Setting Up Continuous Flow for Pumps A-B, C-D**

Both pumps must be operated manually during initial setup, *i.e.* refill and purging of air. Active 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 front panel of the controller in the order shown for the desired mode.

**Defining Operation**

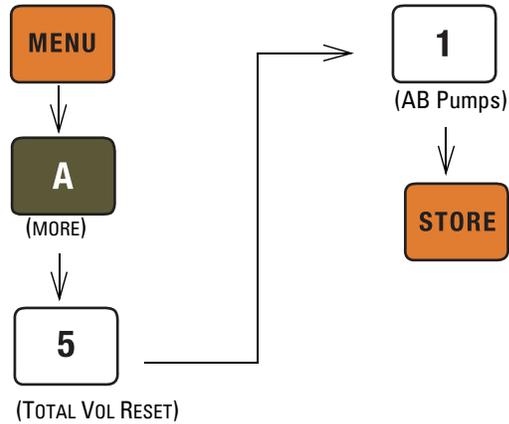
**SELECT PUMP** – This menu allows you to select any pump to display its run screen (program and operation data) and to make program changes.

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



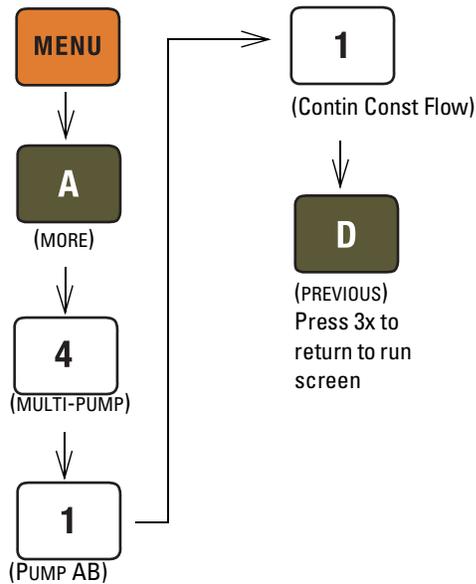
**Figure 3: Keystrokes to specify valve type**

**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



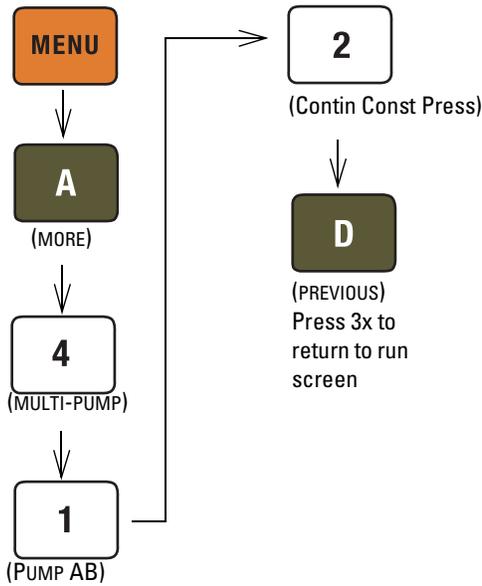
**Figure 4: Keystrokes to reset volume totalizer**

**Continuous Constant Flow Mode**



**Figure 5: Keystrokes to set up continuous constant flow**

### Continuous Constant Pressure



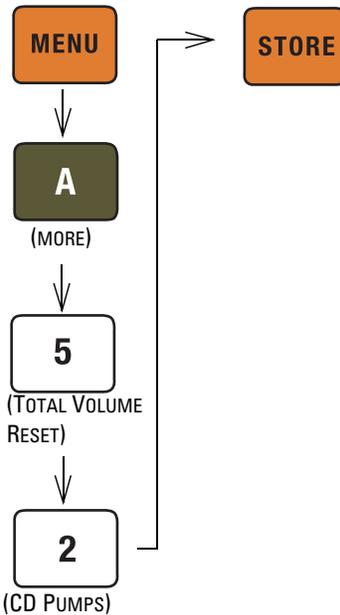
**Figure 6: Keystrokes to set up continuous constant pressure**

### Setting Up Continuous Flow for Pumps C-D

Both pumps must be operated manually during initial setup, *i.e.* refill and purging of air. Active 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.

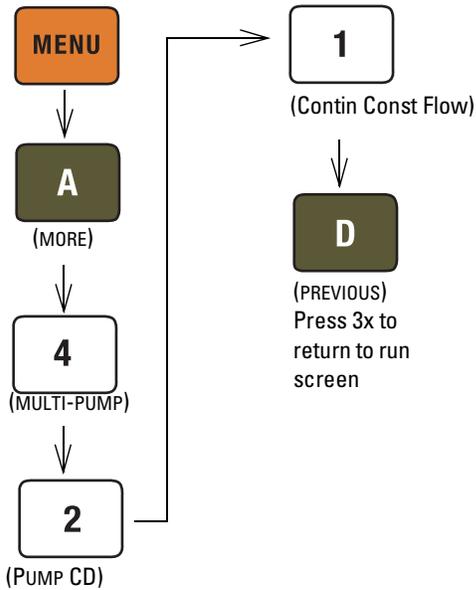
**SELECT PUMP** – This menu allows you to select any pump to display its run screen (program and operation data) and to make program changes.

**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

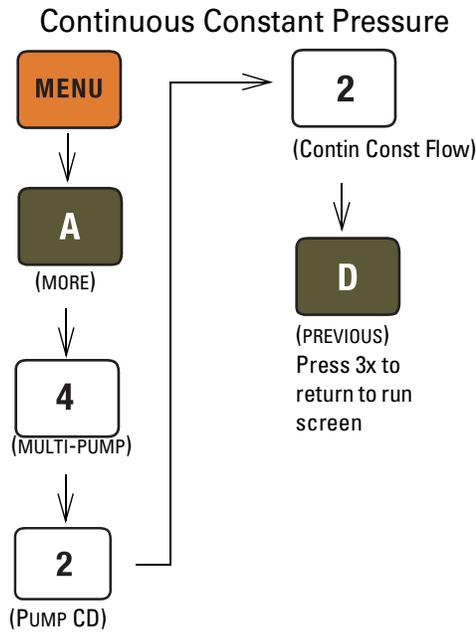


**Figure 7: Keystrokes to reset volume totalizer**

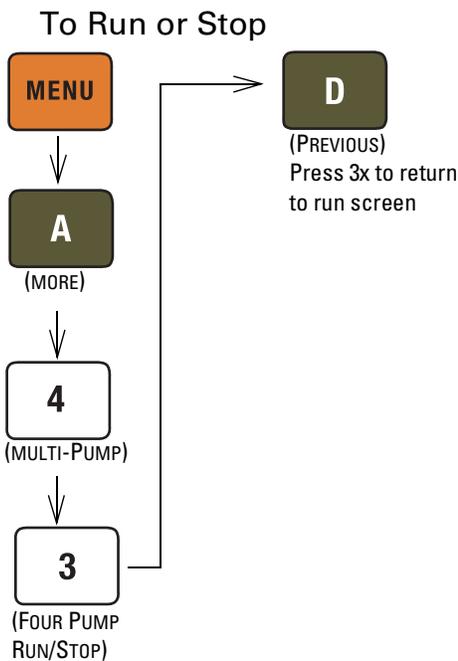
### Continuous Constant Flow Mode



**Figure 8: Keystrokes to set up continuous constant flow**



**Figure 9: Keystrokes to set up continuous constant pressure**



**Figure 10: This menu setting allows the operator to run or stop both pairs of pumps simultaneously.**

## 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 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 4).

**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 4).

**Additional guidelines** – Please become familiar with the following guidelines:

Pressure limits for continuous constant flow mode are set by the limits of pump A for the A-B pair and pump C for the C-D pair.

Temperature changes can cause pressure fluctuations. 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, B, C, and D. The refill rate should always be as high as possible to allow time for refill and repressurization before the next switchover.

## Teledyne Isco

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