CLAIMS

In the claims:

1. A method comprising:

receiving, for a first pipe, a first plurality of pressure values corresponding to a first plurality of valve positions of a first valve coupled to the first pipe;

receiving, for a second pipe routed in parallel with the first pipe, a second plurality of pressure values corresponding to a second plurality of valve positions of a second valve coupled to the second pipe;

generating a model of fluid conductance ratios based on the first plurality of pressure values, the first plurality of valve positions, the second plurality of pressure values, and the second plurality of valve positions;

generating a fluid conductance map based on the model of fluid conductance ratiosfirst plurality of valve positions, the first plurality of pressure values, the second plurality of valve positions, and the second plurality of pressure values; and

causing, by a processing device based on a recipe and the fluid conductance map, the first valve to be in a first valve position and the second valve to be in a second valve position for a process of the recipe.

2. The method of claim 1 further comprising:

receiving, for a third pipe routed in parallel with the first pipe and the second pipe, a third plurality of pressure values corresponding to a third plurality of valve positions of a third valve coupled to the third pipe, wherein the generating of the fluid conductance map is further based on the third plurality of valve positions and the third plurality of pressure values; and

causing, based on the recipe and the fluid conductance map, the third valve to be in a third valve position for the process of the recipe.

3. The method of claim 1, whereinfurther comprising:

determining, based on the first plurality of pressure values, comprises corresponding first sets of pressure values for different inlet flow rates of an inert gas; and

determining, based on the second plurality of pressure values, comprises corresponding second sets of pressure values for the different inlet flow rates; and

determining a plurality of ratio setpoints based on the first plurality of valve positions and the second plurality of valve positions, wherein the generating of the model of fluid conductance ratios is further based on the different inlet flow rates, the plurality of ratio setpoints, the corresponding first sets of pressure values, and the corresponding second sets of pressure values.

4. The method of claim 3 further comprising:

transmitting a first plurality of voltage values to the first valve to cause the first valve to be in the first plurality of valve positions during the different inlet flow rates through the first pipe; and

transmitting a second plurality of voltage values to the second valve to cause the second valve to be in the second plurality of valve positions during the different inlet flow rates through the second pipe.

5. The method of claim ~~3~~1, wherein the generating of the ~~fluid conductance map comprises generating a~~ model of fluid conductance ratios is further based on ~~the different inlet flow rates,~~ a plurality of ratio setpoints, and wherein the plurality of ratio setpoints are based on the first plurality of valve positions and the second plurality of valve positions~~the corresponding first sets of pressure values, and the corresponding second sets of pressure values, and wherein the fluid conductance map is based on the model of fluid conductance ratios~~.

6. The method of claim 1, wherein the causing of the first valve to be in a first valve position and the second valve to be in a second valve position comprises:

determining a first pressure value and a second pressure value from the recipe;

determining, based on the fluid conductance map, a first voltage value corresponding to the first pressure value and a second voltage value corresponding to the second pressure value;

transmitting the first voltage value to the first valve to cause the first valve to be in the first valve position; and

transmitting the second voltage value to the second valve to cause the second valve to be in the second valve position.

7. The method of claim 1, wherein the causing of the first valve to be in the first valve position and the second valve to be in the second valve position is to clear the first pipe and the second pipe of fluid in anticipation of the process of the recipe.

8. The method of claim 1, wherein the causing of the first valve to be in the first valve position and the second valve to be in the second valve position is to preposition the first valve and the second valve for the process of the recipe.

9. The method of claim 1, wherein:

a first displacement sensor of the first valve is outside of a first wetted flow path of the first pipe; and

a second displacement sensor of the second valve is outside of a second wetted flow path of the second pipe.

10. A system comprising:

piping comprising an inlet pipe, a first pipe, and a second pipe, wherein a first distal end of the inlet pipe is coupled to a fluid source, wherein a second distal end of the inlet pipe is coupled to the first pipe and the second pipe that are in parallel;

a first valve coupled to the first pipe and configured to control a first flow rate through the first pipe;

a second valve coupled to the second pipe and configured to control a second flow rate through the second pipe; and

a processing device to:

generate a model of fluid conductance ratios based on: a first plurality of pressure values corresponding to a first plurality of valve positions of a first valve coupled to the first pipe; and a second plurality of pressure values corresponding to a second plurality of valve positions of a second valve coupled to the second pipe;

generate a fluid conductance map based on the model of fluid conductance ratios; and

cause, based on a recipe and the fluid conductance map, the first valve to be in a first valve position and the second valve to be in a second valve position for a process of the recipe.

11. The system of claim 10, wherein:

the piping further comprises a third pipe, wherein the second distal end of the inlet pipe is coupled to the third pipe that is in parallel with the first pipe and the second pipe;

the system further comprises a third valve coupled to the third pipe and configured to control a second third flow rate through the third pipe; and

the processing device is to cause, based on the recipe, the third valve to be in a third valve position for the process of the recipe.

12. The system of claim 10 further comprising a fluid manifold configured to control fluid flow rate from the fluid source, wherein the processing device is to cause the fluid manifold to provide a corresponding fluid flow rate.

13. The system of claim 11, wherein the first pipe is fluidly coupled to a first chamber of a substrate processing system, the second pipe is fluidly coupled to a second chamber of the substrate processing system, and the third pipe is fluidly coupled to a third chamber of the substrate processing system.

14. The system of claim 10, wherein the first pipe is fluidly coupled to a first zone in a first chamber and the second pipe is fluidly coupled to a second zone in the first chamber.

15. The system of claim 10, wherein the processing device is further to:

determine, based on the first plurality of pressure values, corresponding first sets of pressure values for different inlet flow rates of an inert gas;

determine, based on the second plurality of pressure values, corresponding second sets of pressure values for the different inlet flow rates; and

determine a plurality of ratio setpoints based on the first plurality of valve positions and the second plurality of valve positions, wherein generating of the model of fluid conductance ratios is further based on the different inlet flow rates, the plurality of ratio setpoints, the corresponding first sets of pressure values, and the corresponding second sets of pressure values generate a fluid conductance map based on a first plurality of valve positions of the first valve, a first plurality of pressure values corresponding to the first plurality of valve positions, a second plurality of valve positions of the second valve, and a second plurality of pressure values corresponding to the second plurality of valve positions, wherein the

processing device is to cause the first valve to be in the first valve position and the second valve to be in the second valve position further based on the fluid conductance map.

16. The system of claim 10, wherein the processing device is to cause the first valve to be in the first valve position and the second valve to be in the second valve position to one or more of:

clear the first pipe and the second pipe of fluid for the process of the recipe; or

preposition the first valve and the second valve for the process of the recipe.

17. A flow ratio controller (FRC) valve comprising:

a displacement device configured to control fluid flow through the FRC valve;

a displacement sensor coupled to the displacement device; and

a processing device to:

receive an input signal indicative of a first setpoint to preposition the displacement device for a process of a recipe;

commence, based on the input signal, adjustment of physical displacement of the displacement device;

determine, based on a feedback signal received from the displacement sensor during the adjustment, whether the physical displacement of the displacement device matches the first setpoint; and

responsive to determining that the physical displacement of the displacement device matches the first setpoint, stop the adjustment of the physical displacement of the displacement device.

18. The FRC valve of claim 17, wherein the displacement device, the displacement sensor, and the processing device are outside of a wetted flow path of the FRC valve.

19. The FRC valve of claim 17, wherein a diaphragm separates the displacement device, the displacement sensor, and the processing device from a wetted flow path of the FRC valve.

20. The FRC valve of claim 17, wherein the displacement device is a piezoelectric material or a solenoid.

21. The FRC valve of claim 17, wherein the displacement sensor is a strain gauge, a capacitance sensor, or an eddy current sensor.

22. The FRC valve of claim 17, wherein the input signal is a first voltage to cause the physical displacement of the displacement device, and wherein a second input signal is a second voltage to cause a second physical displacement of the displacement device.

23. The FRC valve of claim 17, wherein a third input signal is a third voltage to cause a third physical displacement of a second displacement device configured to control the fluid flow through the FRC valve.