WHAT IS CLAIMED IS:

1. A substrate processing apparatus, comprising:

a process chamber configured to process a substrate;

an exhaust line including a second pressure regulation valve;

a bypass line including a first pressure regulation valve; and

a pressure control controller configured to control the first pressure regulation valve and the second pressure regulation valve,

wherein the pressure control controller is configured to:

~~adjust an opening degree of~~fully open the first pressure regulation valve to reduce a pressure in the process chamber from an atmospheric pressure to a second predetermined pressure;

adjust ~~the~~ an opening degree of the first pressure regulation valve to maintain the second predetermined pressure;

~~adjust the opening degree of~~fully open the first pressure regulation valve to reduce the pressure in the process chamber to a first predetermined pressure that is lower than the second predetermined pressure;

detect the pressure in the process chamber in a state in which at least the first pressure regulation valve and the second pressure regulation valve are closed for a first predetermined time when the first predetermined pressure is reached;

~~adjust an opening degree of~~fully open the second pressure regulation valve to reduce the pressure in the process chamber to a third predetermined pressure that is lower than the second predetermined pressure; and

adjust ~~the~~ an opening degree of the second pressure regulation valve to maintain a processing pressure at which the substrate is processed.

2. The substrate processing apparatus of Claim 1, wherein the pressure control controller is

configured to make the processing pressure to be higher than the first predetermined pressure and the third predetermined pressure and to be lower than the second predetermined pressure.

3. The substrate processing apparatus of Claim 1, wherein the pressure control controller is configured to, after the processing pressure is maintained for a second predetermined time, increase the pressure in the process chamber to the atmospheric pressure or higher in a state in which the first pressure regulation valve and the second pressure regulation valve are closed.

4. The substrate processing apparatus of Claim 1, wherein if it is determined that a leak has occurred as a result of detecting the pressure in the process chamber in the state in which at least the first pressure regulation valve and the second pressure regulation valve are closed for the first predetermined time when the first predetermined pressure is reached, the pressure control controller is configured to bring the pressure in the process chamber to the first predetermined pressure again and to check the leak in the process chamber in the state in which the first pressure regulation valve and the second pressure regulation valve are closed.

5. The substrate processing apparatus of Claim 1, further comprising:

a temperature control controller configured to control a temperature in the process chamber,

wherein the temperature control controller is configured to increase the temperature in the process chamber to a processing temperature at which the substrate is processed for a predetermined time during which the second predetermined pressure is maintained.

6. The substrate processing apparatus of Claim 1, wherein a diameter of a pipe of the exhaust line where the second pressure regulation valve is installed is set to be larger than a diameter of a pipe of the bypass line where the first pressure regulation valve is installed.

7. The substrate processing apparatus of Claim 1, wherein a diameter of a pipe of the bypass line where the first pressure regulation valve is installed is set such that exhaust can be performed at a predetermined fixed rate ~~according to the opening degree of~~when the first pressure regulation valve is fully opened.

8. The substrate processing apparatus of Claim 1, wherein the pressure control controller is configured to:

adjust ~~the~~ opening degrees of the first pressure regulation valve and the second pressure regulation valve; and

reduce the pressure in the process chamber at a constant rate from the atmospheric pressure to the second predetermined pressure and/or from the second predetermined pressure to the first predetermined pressure that is lower than the second predetermined pressure.

9. A method of manufacturing a semiconductor device, comprising:

reducing a pressure in a process chamber from an atmospheric pressure to a second predetermined pressure;

maintaining the second predetermined pressure;

reducing the pressure in the process chamber to a first predetermined pressure that is lower than the second predetermined pressure;

detecting the pressure in the process chamber in a state in which at least a first pressure regulation valve and a second pressure regulation valve are closed for a first predetermined time when the first predetermined pressure is reached;

reducing the pressure in the process chamber to a third predetermined pressure that is lower than the second predetermined pressure; and

maintaining a processing pressure at which a substrate is processed.

10. The method of Claim 9, further comprising:

controlling a temperature in the process chamber to a processing temperature in a state in which the pressure in the process chamber is the second predetermined pressure;

controlling the pressure in the process chamber to a processing pressure that is lower than the second predetermined pressure while maintaining the processing temperature; and

processing the substrate by supplying a processing gas to the process chamber while maintaining the processing temperature and the processing pressure.

11. A program that causes, by a computer, a substrate processing apparatus to perform a process comprising:

reducing a pressure in a process chamber from an atmospheric pressure to a second predetermined pressure;

maintaining the second predetermined pressure;

reducing the pressure in the process chamber to a first predetermined pressure that is lower than the second predetermined pressure;

detecting the pressure in the process chamber in a state in which at least a first pressure regulation valve and a second pressure regulation valve are closed for a first predetermined time when the first predetermined pressure is reached;

reducing the pressure in the process chamber to a third predetermined pressure that is lower than the second predetermined pressure; and

maintaining a processing pressure at which a substrate is processed.