

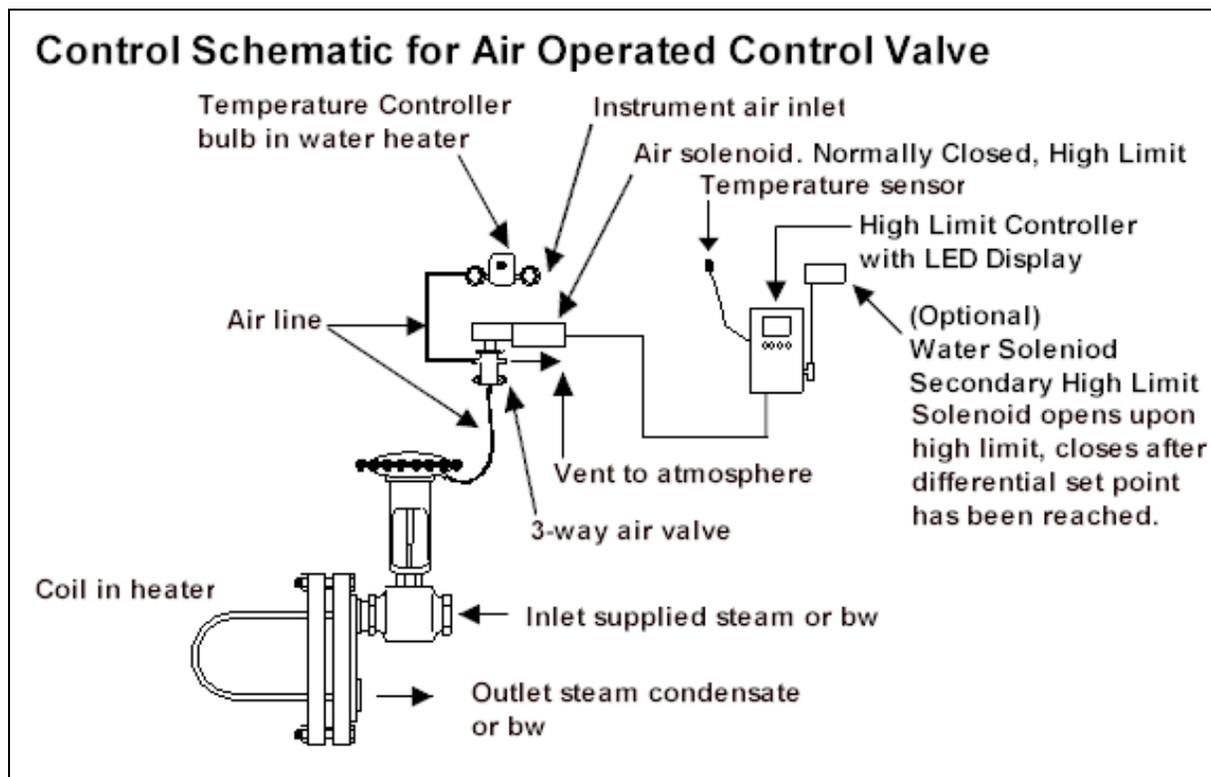
TECHNICAL PAPER: Proper operation of a pneumatically operated control valve with an air operated temperature controller and the electronic high limit control when used with Cemline water heaters.

The operation of the air operated temperature controller and the high limit controller works as follows. The air operated temperature controller has a temperature-sensing bulb submerged in the heated water. As demand for hot water changes, the air operated temperature controller sends more or less of an air signal to the control valve opening or closing the control valve. When the control valve opens more steam or boiler water is able to pass through the control valve and when the control valve closes less steam or boiler water is able to pass through the control valve. Cemline has placed a 3-way air solenoid valve into the air line that runs from the air operated temperature controller to the control valve. The air solenoid prevents the supply of

air from the air operated temperature controller to the control valve if there is no power to the unit and/or if the temperature in the tank rises above the set point on the high limit controller.

One of the more frequently occurring problems is the water heater operating from the high limit and not the air-operated controller. This occurs when the high limit controller is set at a lower temperature than the air-operated controller.

Example: The air operated temperature controller is set at 150 °F and the high limit controller is set at 140 °F. When the temperature of the heated water goes to 140 °F, the high limit control closes the air solenoid cutting off the supply of air from the air operated temperature controller to the control valve, thus closing the pneumatic control valve. Even though the control valve is closed, the air operated temperature controller is still calling for heat





from the control valve. The air operated temperature controller does this by continuing to supply air through the air line to the solenoid. When the temperature in the tank cools, the high limit temperature controller opens the air solenoid allowing air to pass to the control valve causing the control valve to open completely. With the control valve wide open, a large influx of steam or boiler water enters the coil. Immediately, the water in the tank heats up and the water in the tank may rise to above 140 °F and then this cycle repeats itself. To prevent this situation from occurring, be sure to set the high limit temperature at least 10 °F higher than the operating temperature.

How to set the control valve and high limit for proper operation.

When setting the control valve and the high limit for operation, the first step is to temporarily set the high limit at a temperature 30 °F above the desired operating temperature. Note: to set the high limit, see the IOM manual for the T775A electronic temperature controller. By setting the high limit 30 °F higher than the desired operating temperature, the high limit will not interfere or hinder the setting of the pilot control.

The air operated temperature control sets the operating temperature of the water heater by sending an air signal to a pneumatically operated control valve supplied with the heater. To set the operating temperature, turn the temperature controller to the desired set point. After the heater has stabilized check the temperature on the LED display of the high limit controller. Re-adjustment of the temperature controller may be necessary if the desired temperature is not being shown on the digital thermometer.

To set the high limit.

The limit control is set with the electronic high limit controller. (See the IOM manual for the setting the high limit temperature controller). For proper operation, the air operated temperature controller should be set at the desired operating temperature and the high limit $A_{cut\ out}$ temperature should be set 10 °F above the operating temperature. If the unit was supplied with an optional secondary water solenoid the secondary high limit is normally set 20 °F higher than the operating temperature. For example if the heater is to be operated at 140 °F the pilot operated temperature controller should be set at 140 °F, the high limit temperature should be set at 150 °F, and the secondary high limit should be set at 160 °F. This will allow for normal operation of the water heater.