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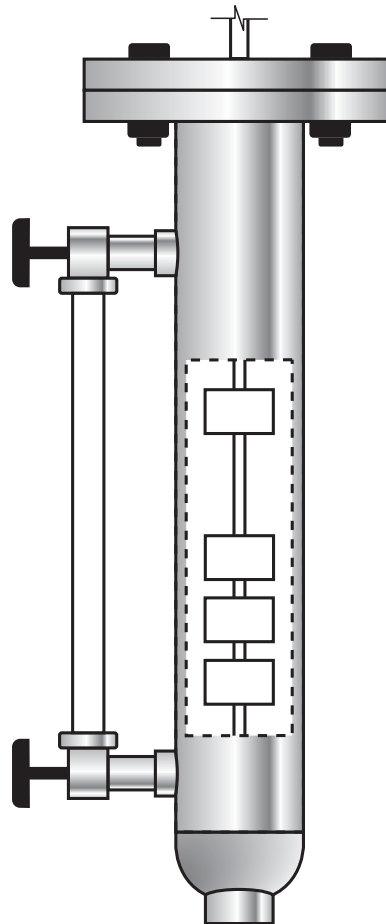
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# Installation, Operation, and Maintenance Manual

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## CEMLINE CORPORATION®

### Stainless Steel Level Controller



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## About the Unit

The CEMLINE CORPORATION Stainless Steel Level Controller is designed to regulate the feed water level within a steam generating system. Its three (3) or four (4) float and reed switch design allows for the integration within the system in a variety of configurations. Depending on the components within your system, and the method in which the level controller will be wired into your system, it can control: a feed water solenoid or pump; control valve shut-off solenoid; pressure control valve; etc., or any combination of these components.

Figure 1 illustrates a typical electro-mechanical high water cut off wiring diagram for the CEMLINE® Stainless Steel Level Controller within a steam generating system.

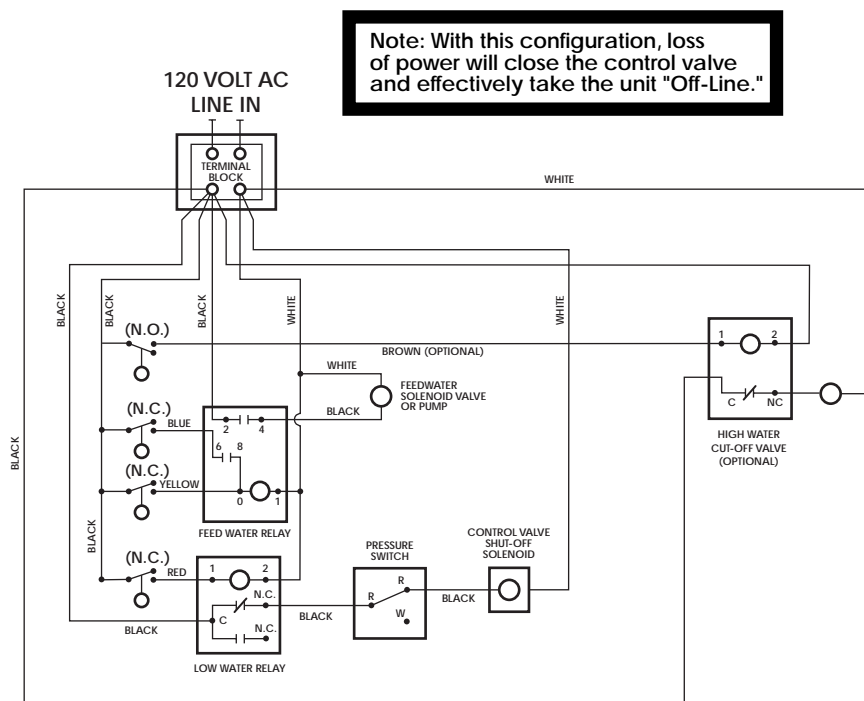


Figure 1: Wiring Diagram of a Typical Application of the CEMLINE Stainless Steel Level Controller-Electromechanical Wiring

The Stainless Steel Level Controller may also be connected to the Cemline Solid State Control Module (SSCM). Figure 2 illustrates a typical wiring connection to the SSCM. See SSCM IO&M for operation of the SSCM.

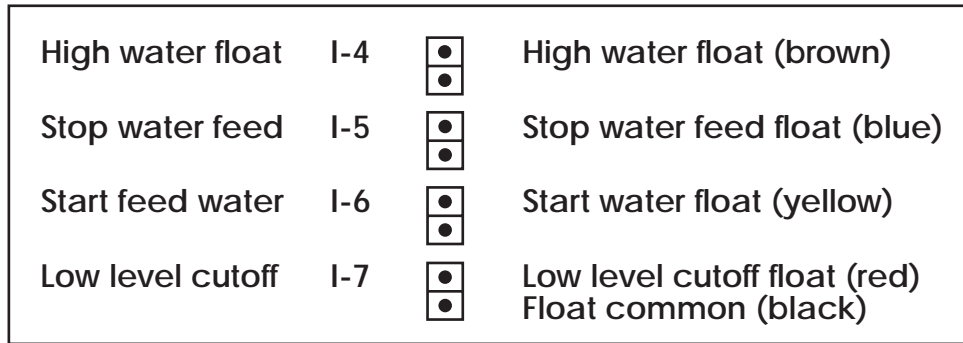


Figure 2: Wiring Diagram of a Typical CEMLINE Stainless Steel Level Controller-SSCM 2001 Control Module

If you are replacing an existing CEMLINE Stainless Steel Level Controller with a new unit, consult the Submittal Sheet and C.A.D. drawing supplied with the original unit for specifications and exact wiring diagram. If you are replacing another manufacturer's level controller with a new CEMLINE Stainless Steel Level Controller, consult the documentation supplied with the unit. If additional information or assistance is needed, contact:

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or your local CEMLINE Sales Representative.

For typical installation procedures, consult Steps 5 through 19 of the Reassembly Procedures later in this manual.

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## Adjustment and Maintenance

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The CEMLINE CORPORATION Stainless Steel Level Controller has been preset at the factory to control the feed water level within the unit according to design specifications. However, it is possible for the preset float position to become incorrect due to rough handling during shipping. If the level controller is not functioning properly after installation (i.e.: incorrect feed water level within the tank), follow the procedures detailed below to verify the float positions and to reset the floats if necessary.

- ▼ Clean steam and energy source steam, boiler water, or high temperature water present situations that can be **very dangerous** because of the high temperatures and pressures. To avoid possible injury or death, use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures.
- ▼ The combination of electricity, steam, and water can pose a **very dangerous situation**. Turn off / disconnect all electric power before attempting any maintenance procedures.

## Removal and Dismantling Procedures

*Note: The following procedures are based upon the assumption that the Stainless Steel Level Controller is being installed in a CEMLINE Unfired Steam Generator. If it is being installed in a system made by a different manufacturer, follow that manufacturer's shutdown and startup procedures.*

1. Close all valves in the energy source inlet line (steam, boiler water, or high temperature water).
2. Turn off all power to the electric controls, if so equipped.
3. Turn off the pneumatic (instrument air) source.
4. Where possible, relieve the pressure from the energy source line (steam, boiler water, or high temperature water), between the shutoff valve and the unit.
5. Close all remaining valves in the system in this order:
  - the clean steam outlet line;
  - the feed water inlet line; and
  - the condensate return line (or boiler / high temperature water return line).
6. Relieve the pressure within the unit by means of the pressure relief valve and vent system.

7. After the system has cooled, drain the unit by opening the tank drain valve and holding the pressure relief valve in the open position. This will prevent the formation of a vacuum and increase the drainage flow.
8. Assure that the energy source, condensate / water return line, feed water inlet, and clean steam outlet have been shut off; that the pressure has been bled from both the clean steam and energy source systems; that the tank has been completely drained; and that the steam, water, all components, and surfaces have cooled.
9. If equipped, slowly open the tricocks located on the body of the level controller. Follow accepted practices in opening the tricocks. If not completely drained and bled, steam or boiling water may exit the tricocks.
10. Remove cap from conduit tee on the top of the level controller. There are four or five wires inside with quick connect fittings. Disconnect the quick connect fittings. Note the wires are color-coded, red, blue, yellow, brown, and black. Remove flexible conduit fitting from end of conduit tee and pull flexible conduit and wire free of conduit tee.

**Notes:** *If only the float assembly is to be removed / replaced / repaired, go to step 15 below. If the body and float assembly are to be removed / replaced, go to step 11 below.*

**Throughout the removal and installation process, care should be taken to assure that the water column gauge glass is not damaged or broken.**

11. Carefully break the joint at the top of the level controller and the top of the tank.
12. With the level controller secured or held in place by an assistant, carefully break the joint at the bottom of the level controller.

**Note:** *It may be necessary to break the lines at a second location to allow clearance for the level controller to be removed from the tank. If it is necessary, care should be taken to insure that in-line components are not damaged.*

13. After breaking both the top and bottom joints, continue loosening the connections until the level controller can be removed.
14. After removing the level controller, it should be placed on a firm, level surface, free of dirt or debris, on which dismantling and reassembly procedures can be carried out.
15. Remove the four (4) bolts and nuts securing the top flange to the body of the unit (see Figure 2).
16. Carefully remove the top flange and float assembly from the body of the level controller by breaking the gasket seal and withdrawing it from the body of the level controller.

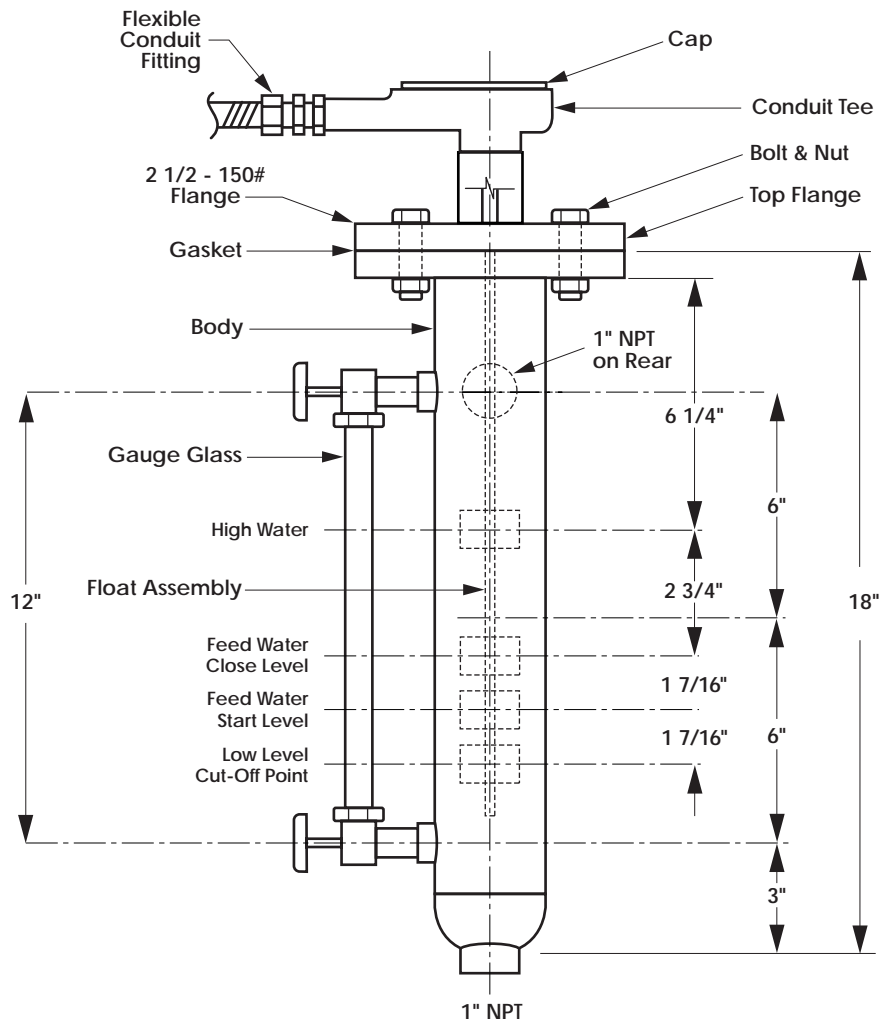


Figure 2: CEMLINE CORPORATION Stainless Steel Level Controller Schematic

## Inspection and Adjustment

After removing the top flange and float assembly from the body of the level controller, examine the floats for signs of physical damage. If no visible damage is detected, check to assure that the floats are still in the factory preset position. Figure 3 illustrates the float assembly and lists the normal float positions.

*Note: If the float settings for the particular unit vary from the normal float positions contained in Figure 3, the proper settings for the unit will be listed in the design specifications and C.A.D. drawing supplied with the unit.*

The upper and lower travel limit of each float is controlled by lock rings set into machine grooves in the stem.

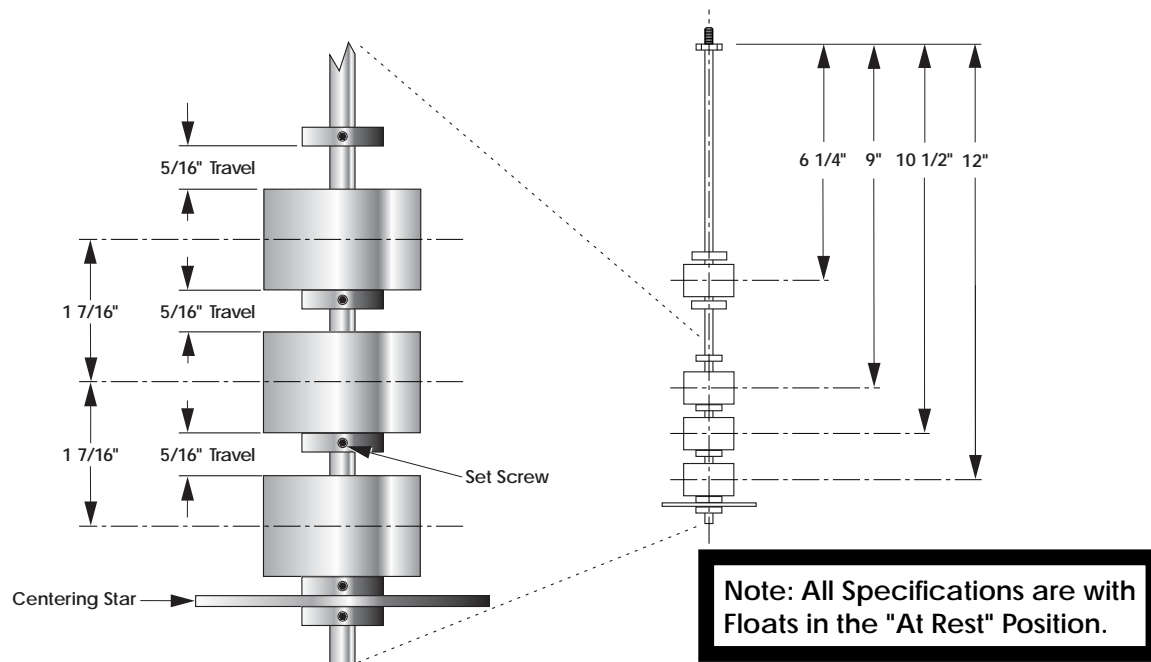


Figure 3: Detail of Typical Float Settings

1. The "At Rest" position for the bottom float (float resting on bottom lock ring - lower travel limit) should be set first. With the top flange and float assembly held vertically, the distance from the bottom of the threads of the float shaft (bottom of the flange) to the center of the float should be 12".
2. The "At Rest" position for the middle float should be set so that the distance between the centers of the bottom and middle floats is 1-7/16".
3. The "At Rest" position for the third float should be set so that the distance between the centers of the middle and top floats is 1-7/16".
4. The "At Rest" position for the top float is 6 1/4" from the bottom of the threads of the float shaft.
5. The position of the top locking ring should be set to give 5/16" travel for the top float.



## Test for Reed Switches

To test the operation of the reed switches in the level controller float assembly, connect an ohmmeter to the black wire and in succession the red, yellow, blue, and if supplied, brown wires. With the bottom float in the “At Rest” position (float resting on the locking ring) and the meter connected to the black and red wires, the meter should read zero (0) ohms (closed circuit). With the float up, so its top touches the locking ring above, the ohmmeter should read infinite ohms (open circuit)

Connect the ohmmeter to the black and yellow wires and repeat the same test for the next to middle float.

Connect the ohmmeter to the black and blue wires and repeat the same test for the next to top float.

If any of the floats do not show closed circuit in the “At Rest” position and open circuit in the raised position (and the float settings have been adjusted), one or more of the reed switches in the float assembly is defective and the float assembly should be replaced.

The top float controls a normally open switch, therefore the ohm readings will be opposite of the bottom three floats. Connect the ohmmeter to the black and brown wires. The ohmmeter should read infinite ohms (open circuit). Raise the top float to the limit of the stop; the reading should be (0) ohms.

- ▼ The reed switches in the float assembly are suitable for no more than 100 VA at 120 volts. Do not connect any load other than the ohmmeter, or the relays supplied with the level controller to these switches.

## Reassembly

1. Remove all traces of the original gasket between the top flanges and install a new gasket. Follow local codes, or accepted contractor practices, as to the use of joint compound or sealer on the gasket and mating surfaces.
2. After all floats have been repositioned, and the new positions verified one last time, the float assembly is ready to be inserted into the body of the level controller.
3. Once the float assembly is repositioned in the body of the level controller, and the correct positioning of the gasket is confirmed, install and tighten the four (4) bolts and nuts that secure the flanges. The bolts should be torqued to 96 ft/lb, using the normal rotational technique.
4. To install the level controller, align the controller with the feed lines and start the fittings. Follow recommendations contained in the manufacturer's

documentation, local codes, or accepted contractor practices as to the use and / or type of joint compound or sealer at the connections.

5. After assuring that the level controller is correctly aligned, tighten the fittings.
6. Reconnect flexible conduit to conduit tee on level controller and reconnect color-coded wires.
7. To bring the unit back on-line, first assure that all manual shutoff valves on clean steam, feed water, energy source, and pneumatic lines are closed.
8. Turn on the power and pneumatic (instrument air) sources to allow the level controller to regulate filling operations.
9. Slowly open the manual shutoff valve on the feed water inlet line, checking to assure that there are no leaks at the valve or any joints. During refilling, hold the pressure relief valve open to allow air to bleed out of the tank. This will speed the filling process.
10. The filling process should stop automatically when the correct water level has been reached. This can be verified via a gauge (level) glass located in the water column of the level controller. The filling process should stop when water is visible in approximately the bottom one-third (1/3) of the gauge glass.

If the filling process stops before water is visible in the gauge glass, before it fills the bottom third of the gauge glass, or does not stop by the time one-half (1/2) of the gauge glass is filled, shut off the feed water control valve, and turn off the power and instrument air sources. Re-examine the level controller to assure that the floats have been correctly repositioned. If it appears that the floats are correctly positioned, contact **CEMLINE CORPORATION** for additional instructions and diagnostic procedures.

If the unit has filled to the correct level, proceed to the next step.

11. Assure that the operating pressure control is set to the desired operating pressure. See the Submittal Sheet and the operating pressure control component manual, included with the unit, for the exact location of the control and detailed adjusting procedures.
12. Assure that the high-pressure limit is set at five to ten pounds per square inch (5 to 10 psi) above the desired operating pressure. See the Submittal Sheet and the high-pressure control manual, included with the unit, for the exact location and detailed adjusting procedures.
13. Open the steam condensate return valve or boiler water / high temperature water return valve.

14. Slowly open the manual shutoff valves on the power source inlet and clean steam outlet lines, and create a load / demand situation of approximately ten to twenty-five percent (10% to 25%) of the system design conditions. As the valves are being opened, check for leaks at all valves and joints. For pneumatically controlled valves, open the instrument air supply valve.

*Note: This procedure is similar for both boiler water or high temperature water energy sources.*

- ▼ Steam, boiler water, or high temperature water present situations that can be **very dangerous** because of the high temperatures and pressures. Use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures, to avoid possible injury or death.
15. If no leaks are found, slowly continue to open the manual shutoff valves on the power source inlet and clean steam outlet.
  16. As the unit is initially heating the water and creating clean steam, carefully reinspect the feed water inlet, clean steam outlet, power source inlet (steam, boiler water, or high temperature water), and condensate return lines and joints for signs of leakage.
  17. As unit approaches the desired operating pressure, check that the pressure within the unit is within the desired range. If necessary, readjust the pressure control valve. See the Submittal sheet and the pressure control valve component manual, included with the unit, for the exact location of the valve and detailed adjusting procedures.
  18. After the unit has reached operating pressure, reinspect all joints for signs of leakage. In addition, check all gauges and controls to verify that the clean steam and energy source pressures are within design specifications.
  19. The unit is now ready for to resume normal operation.

## Parts List

### For Cemline Stainless Steel Level Controller

Part Number	Description	Quantity
28-200-002	Top Flange	1
07-006-262	Bolts, 5/8"-11 x 3"	4
07-006-293	Nuts, 5/8"-11	4
04-005-030	Gasket, Ring	1
28-200-008	LWCO Body	1
28-200-009	LWCO Body with Tricocks	1
02-312-514	Tricock ball valve (if used)	3
02-111-205	Float Assembly (3 Float)	1
02-111-204	Float Assembly (4 Float)	1
02-111-215	Centering Star	1
02-314-015	Gauge Glass Assembly	1

