



DISINFECTING THE SOLUTION DELIVERY SYSTEM (SDS) USING OZONE

WARNING:

No dialysis equipment may be connected to the SDS during disinfection procedure. Verify that all distribution points of use are disconnected and all patient treatments have been terminated.

WARNING:

During the disinfection process, **do not open the Bicarb Mix Tank lid to see if ozone is being produced.** To determine if ozone is being produced, rely on the ozone generator monitoring and the chlorine colorimeter. If testing shows insufficient ozone production, refer to Chapter 5, "Troubleshooting" in the O&M manual for the SDS.

WARNING:

The use of this equipment will cause ozone to be released into the air in the room. The room containing ozone-generating equipment must be well ventilated. At the first sign of discomfort (nose and throat irritation, headache, chest pain, nausea) move out of doors or to another room where ozone is not in the air and do not return to the work area until the symptoms subside. Individuals with existing respiratory conditions should not work in an ozone environment.

NOTE:

There is evidence that pregnant or lactating women may experience an increased sensitivity to ambient ozone. Women with these conditions should pay special attention to any discomfort and seek fresh air. There is no evidence of any effects on the human reproductive system.

NOTE:

It is the responsibility of the operating facility to determine the culturing and disinfection frequency. Mar Cor Purification recommends disinfecting the SDS daily for one month after installation. This should ensure that bacteria levels in the fluid paths will be controlled. Sample the water from the SDS before each disinfection. After one month of 'no growth' samples, the interval between disinfecting can be increased.

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BY: 

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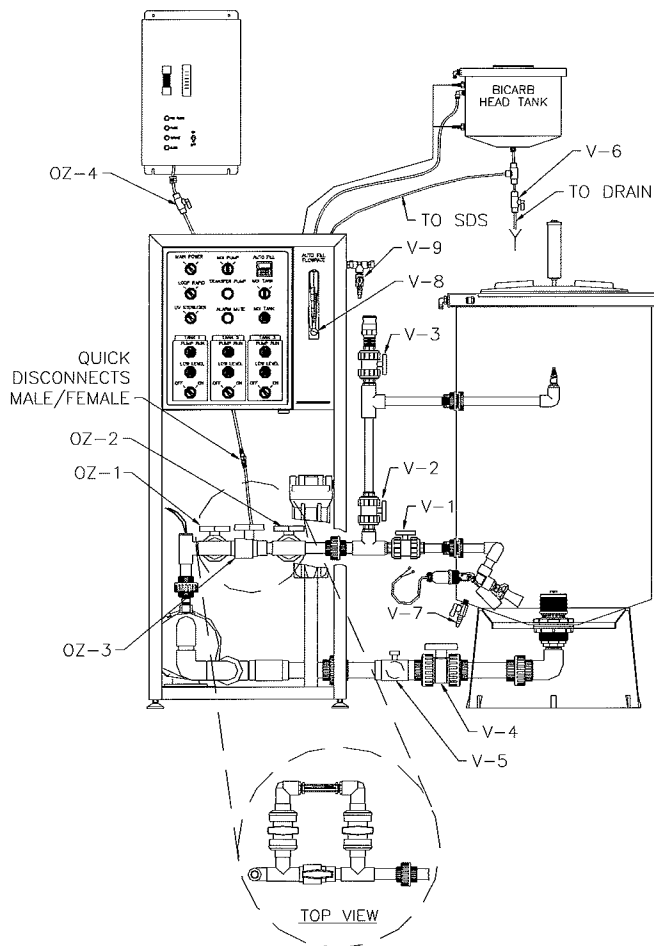


NOTE:

This procedure assumes that the SDS unit has an Auto Fill Mode Timer. If your unit does not have the automatic timer, when the procedure references the Auto Fill Timer, fill the Mix Tank using your facility's protocol.

WARNING:

Label all the wall dispenser stations and the SDS system with warning signs that state **"DO NOT USE, CONTAINS DISINFECTANT"**.



OZ-1	Injector Inlet Valve
OZ-2	Injector Outlet Valve
OZ-3	Injector Bypass Valve
OZ-4	OTT Throttle Valve
V-1	Mix Pump Discharge Valve
V-2	Spray Head Supply Valve
V-3	Inlet Water Valve
V-4	Mix Pump Suction Valve
V-5	Mix Tank Drain Valve
V-6	Bicarb Head Tank Drain Valve
V-7	Mix Tank Sample Valve
V-8	Flow Meter Needle Valve
V-9	Loop Drain Sample Valve

NOTE:

This procedure assumes that the SDS is installed and operating correctly and that the O₃Z Ozone System has been correctly attached and is operating correctly.

Bicarb Solution Drain & Rinse

Valve	Description	Open	Closed
OZ-1	Injector Inlet		
OZ-2	Injector Outlet		
OZ-3	Injector Bypass		
OZ-4	OTT Throttle		
V-1	Mix Pump Discharge		
V-2	Spray Head Supply		
V-3	Inlet Water		
V-4	Mix Pump Suction		
V-5	Mix Tank Drain		
V-6	Bicarb Head Tank Drain		
	Indicates current valve position		

1. Place the end of the Bicarb Wand (bicarb loop return) in the Drain port located on the right side of the SDS unit.
2. Close the following valve:
 - a. V-1 (Mix Pump Discharge Valve)
3. Open the following valves:
 - a. V-2 (Spray Head Supply Valve)
 - b. V-3 (Inlet Water Valve)
 - c. V-5 (Mix Tank Drain Valve)
 - d. V-6 (Bicarb Head Tank Drain Valve)
4. Verify that the Mix Tank and Bicarb Head Tank are empty by ensuring that no flow is coming from the drain line. If flow is present, wait until flow has ceased before proceeding.
5. Ensure Mix Tank lid is on tight.
6. Turn the SDS Main Power switch to the ON position.

NOTE:

If clarification is required for SDS operation, refer to the SDS Operation and Maintenance Manual.



7. Calculate the number of minutes required to fill the Mix Tank to 120 liters using the measured flow rate. Set timer to calculated number of minutes for use in future operations. Turn the Mix Tank Auto Fill switch momentarily to the START position. This will open the Inlet Water Solenoid Valve.
 - a. Open the Flow Meter Adjust Valve (V-8) to obtain a flow rate no greater than twenty (20) LPM.

NOTE:

120 liters is sufficient for most facilities. Larger volumes or multiple batches of ozone may be required depending upon facility configuration or bio-loading within the loop. Adjust the batch size (120 liters or greater) depending on facility requirements.

8. Visually confirm water is flowing through the flow meter. After a few seconds, water should flow from the Mix Tank Drain Valve (V-5) to drain.
9. After one (1) minute, turn the Mix Tank Auto Fill switch momentarily to the START position to close the Inlet Water Solenoid Valve and allow the tank to drain.
10. Verify that the Mix Tank is empty by checking that no flow is coming from the drain line. If flow is present from the drain line, wait until the flow has ceased before proceeding.
11. Close Valves:
 - a) V-5 (Mix Tank Drain Valve)
 - b) V-2 (Spray Head Supply Valve)
12. Open Valve V-1 (Mix Pump Discharge Valve)
13. Set fill timer to fill tank with 120L of water. Turn the Mix Tank Auto Fill switch momentarily to the START position. This will open the Inlet Water Solenoid Valve. Allow the mix tank to fill with 120L of water.

NOTE:

Thorough rinse-out of all parts of the system is important as residual bicarb solution, even at very low levels, will inhibit the production of ozone.



14. When fill is complete, turn the mix pump switch to MIX. After 20 seconds, confirm the absence of bicarb from the Mix Tank with the sample drawn from V-7, using a manufacturer's approved test method. Consult your bicarb manufacturer. If the test is positive, open V-5 (Mix Tank Drain Valve), drain all water from the tank then close V-5 (Mix Tank Drain Valve). Repeat steps 13 and 14 until negative residual is achieved. When the negative residual is confirmed, draining of the Mix Tank is not required.
15. Turn off Mix Pump.
16. Set timer to fill the Bicarb Mix Tank with 120 liters (or amount needed for your facility) of water. Turn the Mix Tank Auto Fill switch momentarily to the START position to open the Inlet Water Solenoid Valve and begin filling the Bicarb Mix Tank. Visually confirm the Mix Tank water level at end of time period. Adjust level as required.
17. Turn the Mix Pump switch to the TRANSFER position.
18. Allow head tank to fill until water is observed flowing from the Bicarb Head Tank Drain Valve (V-6) into the drain manifold. If the Bicarb Head Tank does not flow freely, STOP the procedure and reroute tubing to allow the tank to freely flow. Do not proceed until this is completed. Allow the head tank to rinse for a minimum of five (5) minutes. If a longer rinse is desired, it may be necessary to add water to the Mix Tank. If additional water is required, turn the Mix Pump switch to the OFF position, repeat steps 15 and 16. After 5 minutes of flowing to drain, close V-6 (Bicarb Head Tank Drain Valve) to start filling the head tank.

NOTE:

Thorough rinsing of all parts of the system is important as residual Bicarb solution, even at very low levels, will inhibit the production of ozone.

19. Turn the Loop Rapid Distribution Pump switch to the ON position. (The Loop Rapid Distribution Pump will not turn on until the fluid level in the head tank reaches the low-level switch and the one-minute delay has been satisfied.)

DUAL BICARB LOOPS:

If the SDS System includes two (2) bicarb loops, the loops must be rinsed separately. Close one of the Loop Isolation valves to force the water through the OPEN loop. Perform steps 19 through 21. Reverse the Isolation Valve positions, then repeat steps 19 through 21 for the second loop. When complete, verify that the loop isolation valves are open.

20. Once the Loop Rapid Distribution Pump is activated, pump water to drain for ten (10) minutes, and then begin testing to confirm absence of bicarb from the Loop Drain Sample Valve (V-9). If a positive residual exists, continue to rinse the bicarb distribution loop until a negative residual is achieved. If more water is required, add water to the tank by repeating steps 15 and 16.
21. Purge all distribution loop points of use for 15 seconds.
22. Turn the Mix Pump switch from the TRANSFER position to the OFF position.
23. Turn the Loop Rapid Distribution Pump switch to the OFF position. Open V-6 (Bicarb Head Tank Drain Valve) to drain the head tank.

NOTE:
The SDS Bicarb System has been rinsed and is ready for ozone. If water is still in the mix tank, it does not need to be drained.

Ozone Generation

Valve	Description	Open	Closed
OZ-1	Injector Inlet		
OZ-2	Injector Outlet		
OZ-3	Injector Bypass		
OZ-4	OTT Throttle		
V-1	Mix Pump Discharge		
V-2	Spray Head Supply		
V-3	Inlet Water		
V-4	Mix Pump Suction		
V-5	Mix Tank Drain		
V-6	Bicarb Head Tank Drain		
	Indicates current valve position		

24. Ensure the UV lamp is OFF.

NOTE:
Ultraviolet light destroys ozone, so UV lamps must be OFF for ozonation to be effective.

25. Open the following valves:
 - a. OZ-1 (Injector Inlet Valve)
 - b. OZ-2 (Injector Outlet Valve)



26. Connect the OTT in-line quick disconnect valves and turn the ON/OFF switch on the ozone controller to the ON position. Ensure the bicarb return wand is connected to the drain port.
27. Close the following valve:
 - a. OZ-3 (Ozone Bypass Valve)
28. Set the timer to fill the Mix Tank to $\frac{3}{4}$ full (or an appropriate fill level for the facility) of water. There may be water left in the Mix Tank if all was used not to rinse the distribution head tank and loop. Adjust the tank level according to water required to perform the ozone process.
 - a. Turn the Momentary Mix Tank Auto Fill switch once or twice as needed to the START position to reset and open the Inlet Water Solenoid Valve and begin filling the Bicarb Mix Tank.
 - b. Visually confirm the Mix Tank water level. Adjust as necessary.
29. After sufficient water volume is achieved, close the following valve:
 - a. V-3 (Water Inlet Valve)

CAUTION:

The ozone generator is ready to produce ozone.

NOTE:

Chlorine along with other oxidizers will cause the DPD reagent to change color giving a false indication of ozone. Prior to ozonation, test a sample of the water from Sample Valve (V-7) to determine if there is a baseline level of oxidizer present. This baseline reading will help to determine when the Ozone is fully rinsed in later steps.

30. Turn the Mix Pump switch to the MIX position.
31. Adjust Throttle Valve (OZ-4) to achieve an airflow rate between five (5) and six (6) l/min on the flow meter. Verify that the NO Flow indicator (red) has turned off and the Ozone production indicator (white) has illuminated.

NOTE:

Airflow too high or low will cause improper ratios of generated ozone and air, affecting ozone concentration. Increasing the flow of air above six (6) l/min on the meter will actually *reduce* the ability to get ozone into the system. In order for the O₃Z Ozone System to operate optimally, the airflow, as indicated on the meter and adjusted with the Ozone Throttle Valve, must be set between five (5) and six (6) l/min.

WARNING:

During the disinfection process, **do not** open the Bicarb Mix Tank lid to see if ozone is being produced. To determine if ozone is being produced, rely on the ozone generator monitoring and the chlorine colorimeter. If testing shows insufficient ozone production, refer to the “Troubleshooting” chapter in the SDS O&M manual.

32. Continue to operate the mix pump allowing ozone level to build up in the Mix Tank. Wait ten (10) minutes then begin testing to verify ozone concentration in the tank. Continue to test until the required ozone level of 0.7 ppm (“1.03” reading on the colorimeter) is achieved. See Drawing 6-12 in the SDS O&M manual for an Ozone Conversion Chart.

NOTE:

If water temperature is greater than 77°F (25°C) and production/concentration is difficult to achieve, refer to Section 5.15, “Insufficient Ozone Level—Environmental Issues.”

33. Turn the Mix Pump switch to the OFF position.

Disinfection of System

Valve	Description	Open	Closed
OZ-1	Injector Inlet		
OZ-2	Injector Outlet		
OZ-3	Injector Bypass		
OZ-4	OTT Throttle		
V-1	Mix Pump Discharge		
V-2	Spray Head Supply		
V-3	Inlet Water		
V-4	Mix Pump Suction		
V-5	Mix Tank Drain		
V-6	Bicarb Head Tank Drain		
	Indicates current valve position		

34. Close the following valves:
 - a. OZ-1 (Injector Inlet Valve)
 - b. OZ-2 (Injector Outlet Valve)
 - c. OZ-4 (OTT Throttle Valve)
 - d. V-1 (Mix Pump Discharge Valve)

35. Open the following valves:
 - a. OZ-3 (Ozone Bypass Valve)
 - b. V-2 (Spray Head Supply Valve)



36. Disconnect the OTT in-line quick disconnect valves.
37. Turn the ON/OFF switch on the ozone controller to the OFF position.

CAUTION:

The ozone controller must be left plugged into a standard 115 volt outlet at all times, and the “ON/OFF” switch in the OFF position when not being used. No attempt should be made to unplug or disconnect the supply voltage to the ozone controller. The controller is equipped with an internal air drier, which must be allowed to operate continuously. The efficiency of ozone production may be compromised and/or equipment damage may occur if power is disrupted for a significant amount of time.

WARNING:

At this point, always double check and document that the ozone bypass valves have been placed in the proper position for mixing bicarb solutions (see “OZ valves” in Steps 34 and 35, and additional safety controls in steps 36 and 37. Failure to place these valves in the proper positions may result in ozone injection into the solution, with possible patient harm as a result.

38. Turn the Mix Pump switch to the MIX position and operate pump for thirty (30) seconds to rinse tank and lid with ozonated water.
39. After thirty (30) seconds, place the Mix Pump switch to the OFF position and close V-2 (Spray Head Supply Valve).
40. Open valve V-1 (Mix Pump Discharge Valve).
41. Turn the Mix Pump switch to the TRANSFER position to begin rinsing head tank. Allow head tank to fill until water is observed flowing from the Bicarb Head Tank Drain Valve (V-6) to the drain manifold. Allow the head tank to flow to rinse for a minimum of 1 minute.
42. Close Head Tank Drain Valve (V-6) and allow Head Tank to continue to fill.
43. Turn the Loop Rapid Distribution Pump ON. (The Loop Rapid Distribution Pump will not turn on until the fluid level in the head tank reaches the low-level switch and the one-minute delay has been satisfied.)
44. After the Loop Rapid Distribution Pump has been running a minimum of 3 minutes, flush each point of use in the distribution loop a minimum of 5 seconds.



45. Allow the Loop Rapid Distribution Pump to run while measuring ozone concentration from the Loop Drain Sample Port (V-9). Continue to monitor until the ozone concentration reaches 0.3 ppm ("0.44" reading on colorimeter).

DUAL BICARB LOOPS:

If the SDS System includes two (2) bicarb loops, the loops must be filled/verified for the presence of ozone. OPEN both Loop Isolation Valves before proceeding to Step 46. Ensure that all loop returns are open after testing.

NOTE:

During the disinfection process, the ozone concentration in the Mix Tank may be significantly depleted, making it difficult to achieve the desired ozone levels or the water level in the Mix Tank may fall below the Mix Tank float switch. If the ozone concentration needs to be increased or water added to the Mix Tank, proceed to step 25.

46. Move the Bicarb Wand from the Drain port on the SDS manifold to the Tank port on the Mix Tank and circulate for a minimum of 15 minutes.
47. Open the bicarb connection at each point of use for 5 seconds; then test for the presence of ozone. Then close connection. If the distribution loop contains any inline valves, cycle each valve to flush around the ball of the valve.
48. Turn OFF the Loop Rapid Distribution Pump.
49. Turn the MIX PUMP Switch to the OFF position.

Rinse Procedure

WARNING:

RO water must be used to make up the bicarbonate solution. Residual water from the disinfection process should be dumped to drain and the tank and plumbing rinsed and tested for a zero (0) residual (or pre-determined baseline) level of Ozone before use.

Valve	Description	Open	Closed
OZ-1	Injector Inlet		
OZ-2	Injector Outlet		
OZ-3	Injector Bypass		
OZ-4	OTT Throttle		
V-1	Mix Pump Discharge		
V-2	Spray Head Supply		
V-3	Inlet Water		
V-4	Mix Pump Suction		
V-5	Mix Tank Drain		
V-6	Bicarb Head Tank Drain		
	Indicates current valve position		

50. Move the Bicarb Wand to the Drain port on the SDS manifold.
51. Open the following valves:
 - a. V-2 (Spray Head Supply)
 - b. V-3 (Water Inlet Valve)
 - c. V-5 (Mix Tank Drain Valve)
 - d. V-6 (Bicarb Head Tank Drain Valve)
52. Verify that the Mix Tank and Bicarb Head Tank are empty by ensuring that no flow is coming from the drain line. If flow is present, wait until flow has ceased before proceeding.
53. Set the timer to calculated number of minutes to achieve 120 liters. Turn the Mix Tank Auto Fill switch momentarily to the START position. This will open the Inlet Water Solenoid Valve.
 - a. Open the Flow Meter Adjust Valve (V-8) to obtain a flow rate no greater than twenty (20) LPM.
54. Visually confirm water is flowing through the flow meter. After a few seconds, water should flow from the Mix Tank Drain Valve (V-5) to drain.



55. After one (1) minute, turn the Mix Tank Auto Fill switch momentarily to the START position to close the Inlet Water Solenoid Valve and allow the tank to drain.
56. Verify that the Mix Tank is empty by checking that no flow is coming from the drain line. If flow is present from the drain line, wait until the flow has ceased before proceeding.
57. Close Valve
 - a. V-5 (Mix Tank Drain Valve)
 - b. V-2 (Spray Head Supply)
58. Set fill timer to fill tank with 120L of water. Turn the Mix Tank Auto Fill switch momentarily to the START position. This will open the Inlet Water Solenoid Valve. Allow the mix tank to fill with 120L of water.

NOTE:

Use the baseline value from step 29 to determine when the system has been rinsed.

NOTE:

If required, confirm the absence of ozone from the Mix Tank with the sample drawn from V-7, using a manufacturer's approved test method.

59. When fill is complete, turn the Mix Pump Switch to MIX. After 20 seconds, turn the Mix Pump OFF and confirm the absence of ozone from the Mix Tank with the sample drawn from V-7. If the test is positive, open V-5 (Mix Tank Drain Valve), drain all water from the tank and then close V-5 (Mix Tank Drain Valve). Repeat steps 58 and 59 until a negative residual is achieved. When the negative residual is confirmed, draining of the Mix Tank is not required.
60. Set timer to fill the Bicarb Mix Tank with 120 liters (or amount needed for your facility) of water. Turn the Mix Tank Auto Fill switch momentarily to the START position to open the Inlet Water Solenoid Valve and begin filling the Bicarb Mix Tank. Visually confirm the Mix Tank water level at the end of the time period. Adjust level as required.
61. Turn the Mix Pump switch to the TRANSFER position.



62. Allow head tank to fill until water is observed flowing from the Bicarb Head Tank Drain Valve (V-6) into the drain manifold. Allow the head tank to rinse for a minimum of five (5) minutes. If a longer rinse is desired, it may be necessary to add water to the Mix Tank. If additional water is required, turn the Mix Pump switch to the OFF position, repeat step 60 and 61. After 5 minutes of flow to drain, close V-6 (Bicarb Head Tank Drain Valve) to start filling head tank.

DUAL BICARB LOOPS:

If the SDS System includes two (2) bicarb loops, the loops must be rinsed separately. Close one of the Loop Isolation valves to force the rinse water through the OPEN loop. Reverse the valve positions and repeat for both loops. Ensure that both loop isolation valves are open after the rinse is complete.

63. Turn the Loop Rapid Distribution Pump switch to the ON position.

NOTE:

When performing routine bacterial and endotoxin level testing after a disinfection procedure, flush approximately 1 liter of water prior to taking the sample.

64. Once the Loop Rapid Distribution Pump is activated, pump water to drain for ten (10) minutes and then begin testing to confirm absence of ozone from the Loop Drain Sample Valve (V-9). If more water is required, add water to the tank by repeating steps 60 and 61.
65. Purge all distribution loop points of use for 15 seconds and verify a negative residual.
67. Turn the Mix Pump switch from TRANSFER position to the OFF position.
68. Turn the Loop Rapid Distribution Pump switch to the OFF position. Open V-6 (Bicarb Head Tank Drain Valve) to drain the head tank.
69. The system has been rinsed. The following steps should be performed to complete the draining of the SDS bicarb system.
 - Ensure the Bicarb Wand is in the Drain connection on the SDS Manifold.
 - Open the Mix Tank Drain Valve (V-5) and Head Tank Drain Valve (V-6).
 - Close the inlet Water Valve (V-3).
 - Remove the Mix Tank lid; place cover loosely over Mix Tank opening.
 - Turn UV lamp switch on.
 - Follow the facility's normal procedures at start-up, including detection of residual disinfectant.
 - Turn OFF main power.