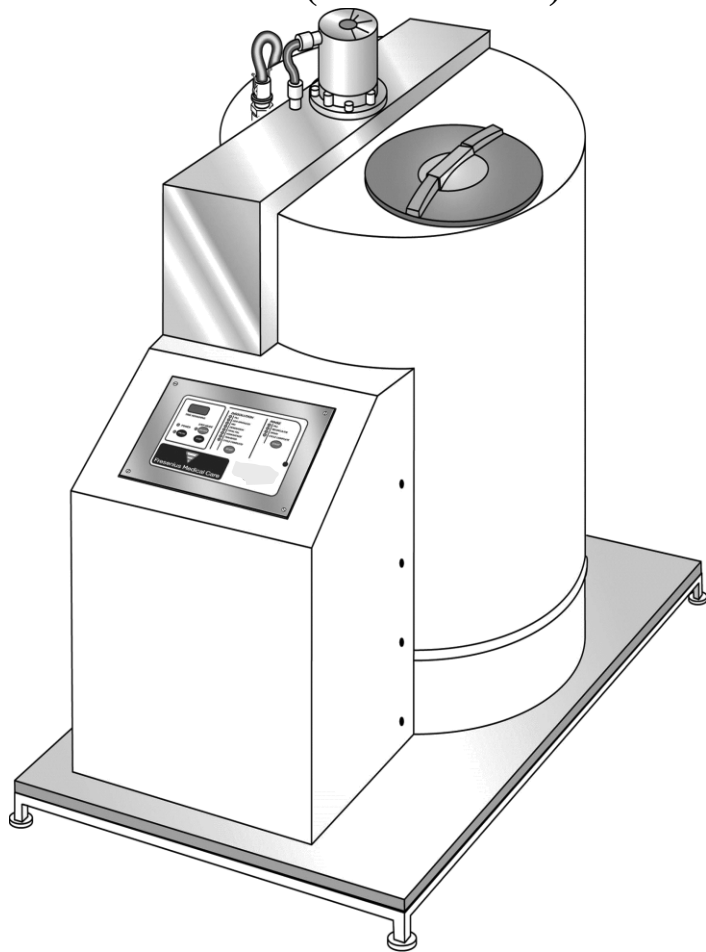




**FRESENIUS
MEDICAL CARE**

**DRY ACID
DISSOLUTION UNIT
132 GALLONS (500 LITERS)**



TECHNICIAN'S MANUAL
P/N 460032 Rev. A

Fresenius Medical Care Dry Acid Dissolution Unit: 132 Gallons (500 Liters) Technician's Manual

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Caution: US Federal Law restricts this device to sale by or on the order of a physician.

Indications for Use: The Fresenius Medical Care Dry Acid Dissolution Unit mixes Fresenius Medical Care distributed dry acid concentrate products with hemodialysis quality water. The resulting liquid acid concentrates are intended for use in three-stream hemodialysis machines calibrated for acid and bicarbonate concentrates.

As part of the Condition for Coverage, it is the Medical Director's responsibility that the operator(s) of the Fresenius Medical Care Dry Acid Dissolution Unit must be trained in its operation and thoroughly familiar with the contents of this manual. Operators must be proficient and able to distinguish between normal and abnormal operation.

Assembly, installation, adjustment, or repair is to be performed only by persons authorized by the facility medical director or by Fresenius USA, Inc. Fresenius Medical Care Concentrate Dry Acid Dissolution Unit spare parts manuals, P/N 450363, Field Service Bulletins, and other documentation are located on the internet at <http://www.fmna.com>.

Only Original Equipment Manufacturer (*OEM*) Fresenius Medical Care parts should be used in the repair or upgrade of the Fresenius Medical Care Dry Acid Dissolution Unit. Although, parts may look similar to parts in various vendor catalogs or brick and mortar stores the Dry Acid Dissolution Unit uses parts that have been specified and tested in accordance to *ANSI/AAMI/ISO* guidelines. The use of non-*OEM* parts will void your warranty and may cause patient harm.

For further information regarding the operation, repair, parts, or maintenance of the Fresenius Medical Care Dry Acid Dissolution Unit, please contact:

Fresenius USA, Inc.
ATTN: Service Department
4040 Nelson Avenue.
Concord, CA 94520.

(800) 227-2572

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- VI Component Replacement

ADDITIONAL DOCUMENTATION

132 Dry Acid Control Console Schematic (P/N 260106)
GranuFlo / Dry Acid 132 Wiring Diagram (P/N 290316)

*The latest revision of the additional documentation can be found at the following web location:

<http://www.freseniusmedicalcare.us/en/home/healthcare-professionals/renal-products/dialysis/product-support-documentation/>

SECTION I - WARNINGS AND CAUTIONS




IMPORTANT SAFETY SYMBOLS AND INSTRUCTIONS

READ ALL INSTRUCTIONS BEFORE USE!

For your safety, the information in this manual must be followed to minimize the risk of electrical shock, prevent property damage, personal injury, or loss of life. There are many important safety messages in this manual and on your Dry Acid Dissolution Unit. The following table lists symbols and the criteria of their descriptions, which is used throughout this manual. Your safety and the safety of others are very important. Always read and abide by all safety messages

The Fresenius Medical Care 132 Gallon Dry Acid Dissolution Unit is designed and manufactured in accordance to the requirements of Systems for Mixing Concentrate at a Dialysis Facility listed in Section 5.3 of the *ANSI/AAMI RD61:2006* and Section 5.4 of *ISO 13958:2009* Regulations.

Proper training and demonstrated user competency must be completed and documented before a designated operator can be authorized to use the Fresenius Medical Care Dry Acid Dissolution Unit to make Fresenius Medical Care Dry Acid Concentrate.

SYMBOL	DESCRIPTION
	WARNING! A WARNING IS A STATEMENT THAT IDENTIFIES CONDITIONS OR ACTIONS THAT COULD RESULT IN PERSONAL INJURY OR LOSS OF LIFE. WARNINGS FOUND IN THIS MANUAL OUTSIDE OF THIS SECTION ARE DESIGNATED WITH THE WARNING SYMBOL.
	CAUTION: A CAUTION IS A STATEMENT THAT IDENTIFIES CONDITIONS OR ACTIONS THAT COULD RESULT IN DAMAGE TO THE MACHINE
	NOTE: NOTES ARE ADVISORY COMMENTS OR RECOMMENDATIONS REGARDING PRACTICES OR PROCEDURES.
BUTTON	A BUTTON IS A PRESSURE-SENSITIVE, RAISED PAD FOUND ON THE CONTROL PANEL THAT IS USED TO INITIATE AN ACTION OR MODE.



WARNING! NEVER PUT YOUR HEAD INTO THE DRY ACID DISSOLUTION UNIT TANK. THIS MAY RESULT IN OPERATOR FALLING INTO TANK.



WARNING! IN THE EVENT OF A FOREIGN OBJECT FALLING INTO THE TANK DURING ANY ACTIVE OPERATION, THE OPERATION SHOULD BE PAUSED. IF NEEDED, USE STEP MODE TO PLACE UNIT INTO A DRAIN OPERATION TO EMPTY THE TANK. IF CONCENTRATE SOLUTION NEEDS TO BE DISPOSED, MAKE SURE TO COMPLY WITH LOCAL, STATE AND FEDERAL REQUIREMENTS. AFTER DRAIN OPERATION, UNPLUG DRY ACID DISSOLUTION UNIT FROM ITS POWER SOURCE. A REACH TOOL IS RECOMMENDED FOR REMOVING FOREIGN OBJECT OUT OF TANK. HOWEVER, SHOULD THE FOREIGN OBJECT BE UNATTAINABLE, THEN CALL TECHNICAL SERVICE FOR FURTHER ASSISTANCE (1-800-227-2572).



WARNING! IF THE DRY ACID DISSOLUTION UNIT IS RELOCATED, THEN A SAMPLE MUST BE DRAWN FROM THE FIRST BATCH OF CONCENTRATE MADE AND IT MUST BE ANALYZED FOR CORRECT SOLUTION MIX BEFORE THE CONCENTRATE CAN BE USED. PRIOR TO RELOCATION, REQUEST TWO (2) EMPTY SAMPLE BOTTLES (P/N G83-535-02) THEN CALL TECHNICAL SERVICE FOR FURTHER ASSISTANCE (1-800-227-2572).



WARNING! THE USE OF EYE PROTECTION, DUST MASK AND GLOVES IS RECOMMENDED WHEN HANDLING DRY ACID PRODUCT. IF CONTACT WITH EYES, RINSE IMMEDIATELY FOR 15 MINUTES. IF CONTACT WITH SKIN, FLUSH WITH PLENTY OF SOAP AND WATER. SEE MATERIAL SAFETY DATA SHEETS (MSDS) FOR THE DRY ACID PRODUCT BEING USED FOR FURTHER PERSONAL PROTECTIVE EQUIPMENT (PPE) OR EMERGENCY REQUIREMENTS/INSTRUCTIONS.



WARNING! SHOULD THE DRY ACID DISSOLUTION UNIT FAIL TO COMPLETE ANY OPERATION WITHIN ANY CYCLE DO NOT PROCEED THROUGH CYCLE USING STEP MODE. CALL TECHNICAL SERVICE FOR FURTHER ASSISTANCE (1-800-227-2572).



WARNING! FAILURE TO INSTALL, OPERATE, AND MAINTAIN THIS EQUIPMENT ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS MAY CAUSE PATIENT DEATH OR INJURY.



WARNING! THIS DRY ACID DISSOLUTION UNIT MAY BE SUSCEPTIBLE TO ELECTROMAGNETIC INTERFERENCE (EMI). DEVICES EMITTING ELECTROMAGNETIC RADIATION SUCH AS ANALOG PORTABLE PHONES, RADIO EQUIPMENT (WALKIE-TALKIES, ETC.), RADIO TRANSMITTERS, AND LIKE EQUIPMENT, SHOULD NOT BE USED IN THE VICINITY OF THIS EQUIPMENT. THE OPERATOR SHOULD MONITOR THE FUNCTION OF THE MACHINE AND REMOVE UNNECESSARY EQUIPMENT FROM THE TREATMENT AREA SHOULD THESE EVENTS OCCUR.



WARNING! THE ELECTRICAL SOURCE MUST BE SINGLE PHASE, THREE-CONDUCTOR TYPE PROVIDED WITH A GROUND FAULT INTERRUPTER AT 120VAC, 60 HZ. THE PROPER POLARITY AND GROUND INTEGRITY MUST BE INITIALLY CHECKED AND MAINTAINED. FAILURE TO DO SO MAY RESULT IN ELECTRICAL SHOCK OR BURN TO THE OPERATOR.



WARNING! SHOCK HAZARD. DO NOT REMOVE COVERS. REFER SERVICING TO QUALIFIED PERSONNEL. REPLACE FUSES ONLY WITH THE SAME TYPE AND RATING.



WARNING! FOLLOWING DISINFECTION, TWO (2) COMPLETE RINSE CYCLES MUST BE PERFORMED AND THE UNIT TESTED TO ENSURE THE ABSENCE OF RESIDUAL BLEACH [REFER TO SECTION 4.3 Bleach Disinfection, page IV-2].



WARNING! USE THE SUPPLIED HYDROMETER TO MEASURE THE *SPECIFIC GRAVITY* OF A SAMPLE OF THE MIXED FRESenius MEDICAL CARE DRY ACID PRODUCT [SEE DRY ACID DISSOLUTION UNIT 132 GALLONS (500 LITERS) OPERATOR'S MANUAL P/N 460018].



WARNING! CONNECT WATER INLET ACCORDING TO THE SPECIFICATIONS FOR THE DRY ACID DISSOLUTION UNIT. THE WATER USED MUST MEET *ANSI/AAMI* OR *ISO* STANDARDS FOR WATER USED IN HEMODIALYSIS (CURRENTLY *ANSI/AAMI RD62*, OR *ISO 13959*). THE CORRECT IONIC CONCENTRATION AND BACTERIAL QUALITY CAN GENERALLY BE ACHIEVED IN THE DIALYSATE ONLY WITH TREATED WATER. BE SURE THAT ALL SPECIFICATIONS ARE SATISFIED. THE WATER SOURCE MUST BE MONITORED PERIODICALLY TO DETECT FLUCTUATIONS IN WATER COMPOSITION AND QUALITY THAT COULD HAVE AN ADVERSE EFFECT ON THE PATIENT, HEMODIALYSIS MACHINE OR DRY ACID DISSOLUTION UNIT. PARTICULAR ATTENTION MUST BE TAKEN FOR CHEMICALS SUCH AS ALUMINUM, CHLORINE, AND CHLORAMINES, AS THESE CHEMICALS CAN CAUSE COMPLICATIONS IN DIALYSIS PATIENTS. THE CHEMICAL QUALITY OF THE TREATED WATER USED FOR DIALYSIS SHOULD BE ANALYZED AT LEAST ONCE A YEAR TO ENSURE IT MEETS THE REQUIREMENTS OF *ANSI/AAMI RD62*, OR *ISO 13959*.



WARNING! THE DIALYSIS PHYSICIAN IS RESPONSIBLE FOR SELECTING THE APPROPRIATE CONCENTRATE MIXING EQUIPMENT FOR DIALYSIS AND THE PRESCRIPTION FOR DIALYSIS.



WARNING! THE DRY ACID DISSOLUTION UNIT IS COMPUTER CONTROLLED. EXTREME CARE SHOULD BE EXERCISED IN ITS OPERATION. WHEN POWER IS CONNECTED TO THE DRY ACID DISSOLUTION UNIT, A FAILURE OF THE COMPUTER COULD START ANY OF THE OPERATIONS AT ANY TIME.



CAUTION! ASSEMBLY, INSTALLATION, ADJUSTMENT, OR REPAIR IS TO BE PERFORMED ONLY BY PERSONS AUTHORIZED BY THE FACILITY MEDICAL DIRECTOR OR BY FRESenius MEDICAL CARE.



WARNING! DISINFECT DRY ACID DISSOLUTION UNIT TANK IF WATER IN TANK UNIT EXCEEDS 200 CFU/ML AS OUTLINED BY ANSI/AAMI RD62, OR ISO 13959 [REFER TO SECTION 4.3: BLEACH DISINFECTION, PAGE IV-2].



CAUTION! THE DRY ACID DISSOLUTION UNIT IS ONLY INTENDED FOR MIXING FRESenius MEDICAL CARE DISTRIBUTED DRY ACID CONCENTRATE. DO NOT MIX BICARBONATE IN THE DRY ACID DISSOLUTION UNIT UNLESS A BATCH OF CONCENTRATE SOLUTION REQUIRES NEUTRALIZATION FOR PROPER DISPOSAL. CONCENTRATE SOLUTION MUST BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS. SEE DRY ACID DISSOLUTION UNIT 132 GALLONS (500 LITERS) OPERATOR'S MANUAL P/N 460018 FOR THE PROCEDURE TO NEUTRALIZE CONCENTRATE FOR DISPOSAL.



WARNING! AN ANSI/AAMI OR ISO STANDARD PURIFIED WATER ANALYSIS FOR BACTERIA AND ENDOTOXIN IS RECOMMENDED MONTHLY.



WARNING! A BACK PRESSURE REGULATOR MAY BE REQUIRED ON THE TREATED WATER FEED LINE IF THE DRY ACID DISSOLUTION UNIT IS TO BE USED AT THE SAME TIME AS OTHER DIALYSIS EQUIPMENT. THE MAXIMUM INPUT WATER PRESSURE IS 60 PSI AT A MINIMUM FLOW RATE OF 1/2 GALLON PER MINUTE FOR THE DRY ACID DISSOLUTION UNIT.



WARNING! KEEP THE DRY ACID DISSOLUTION UNIT MIXING AREA FREE OF CLUTTER. THE FLOOR NEAR THE UNIT SHOULD BE KEPT FREE OF WATER TO AVOID SLIP-AND-FALL INJURIES



NOTE: SOME FACILITIES MAY BE REQUIRED TO PURCHASE AND INSTALL A STORAGE TANK FOR CENTRALIZED ACID FEED LOOPS. IF SO, THE STORAGE TANK AND ASSOCIATED PLUMBING INTERCONNECTIONS MUST BE COMPLETED PRIOR TO THE INSTALLATION OF THE DRY ACID DISSOLUTION UNIT.



WARNING: IF THE FINAL FILL SENSOR NEEDS ADJUSTMENT OR REPLACEMENT, THEN A QUALIFIED TECHNICAL PERSONNEL SHALL COMPLETE THIS AND THE FOLLOWING TASKS. A SAMPLE MUST BE DRAWN FROM THE FIRST BATCH OF CONCENTRATE MIXED. THIS SAMPLE MUST BE ANALYZED FOR CORRECT SOLUTION MIX BEFORE THE CONCENTRATE CAN BE USED. BEFORE REPLACING THE FINAL FILL SENSOR OR RELOCATING THE DRY ACID DISSOLUTION UNIT CONTACT FRESenius MEDICAL CARE TECHNICAL SERVICE AT 1 (800) 227-2572



CAUTION: THE PUMP IS NOT SELF-PRIMING AND IS INSTALLED WITH A POSITIVE FLOODED SUCTION. THE LIQUID BEING PUMPED SERVES AS THE LUBRICATION FOR THE IMPELLER ASSEMBLY SPINNING ON A POLYPROPYLENE STATIONARY SHAFT. IF THE PUMP IS RUN DRY FOR LONGER THAN 30 SECONDS THIS MAY CAUSE IMPELLER DAMAGE.

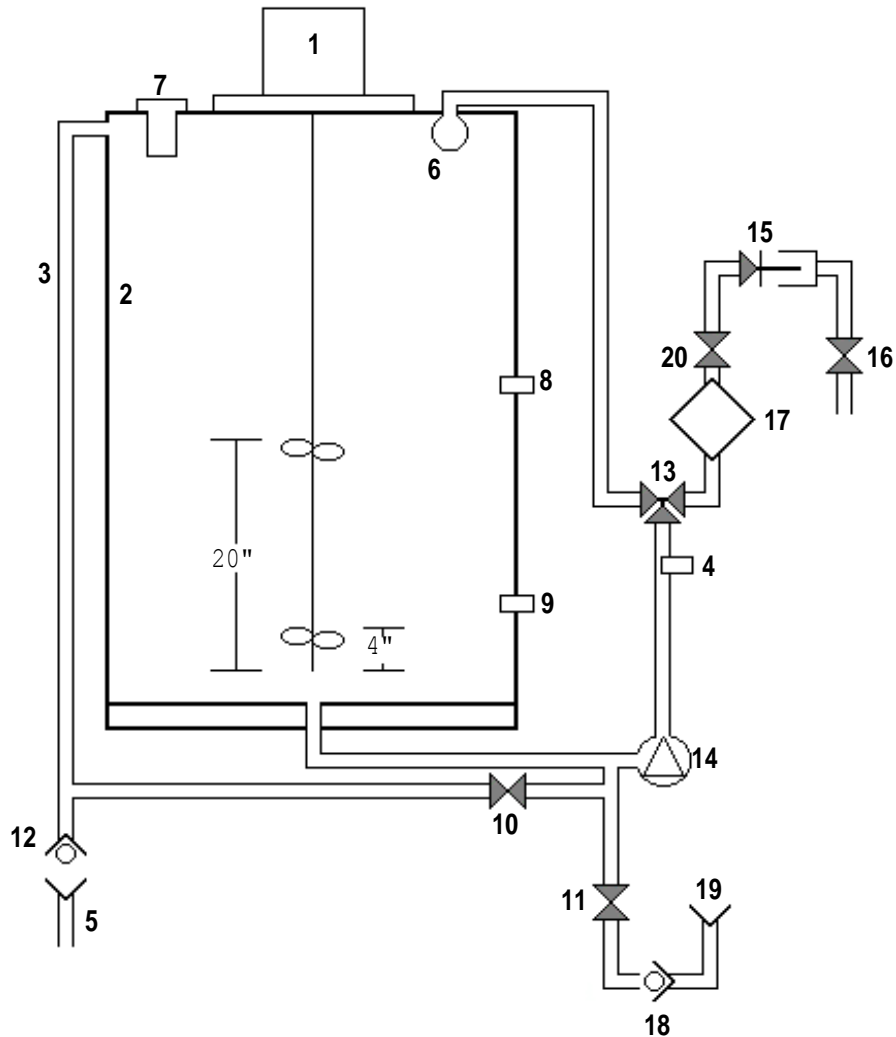


NOTE: CONCENTRATE SOLUTION MUST BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS. IF YOU HAVE QUESTIONS REGARDING THE DISPOSAL OF CONCENTRATE SOLUTION, THEN SEE THE DRY ACID DISSOLUTION UNIT 132 GALLONS (500 LITERS) OPERATOR'S MANUAL P/N 460018

SECTION II - HYDRAULIC DESCRIPTION

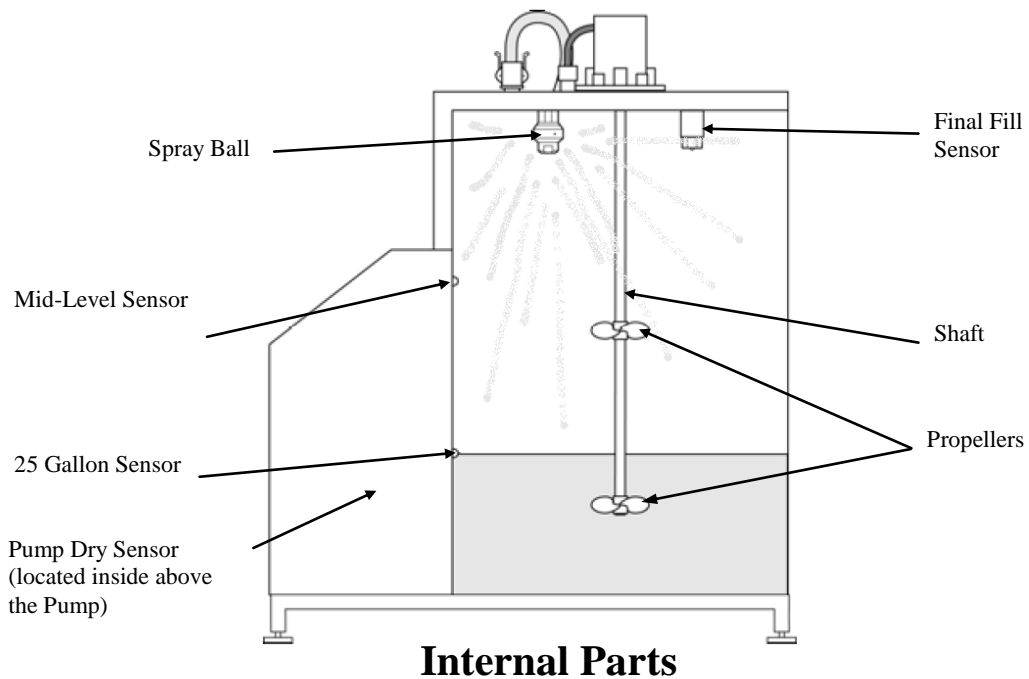
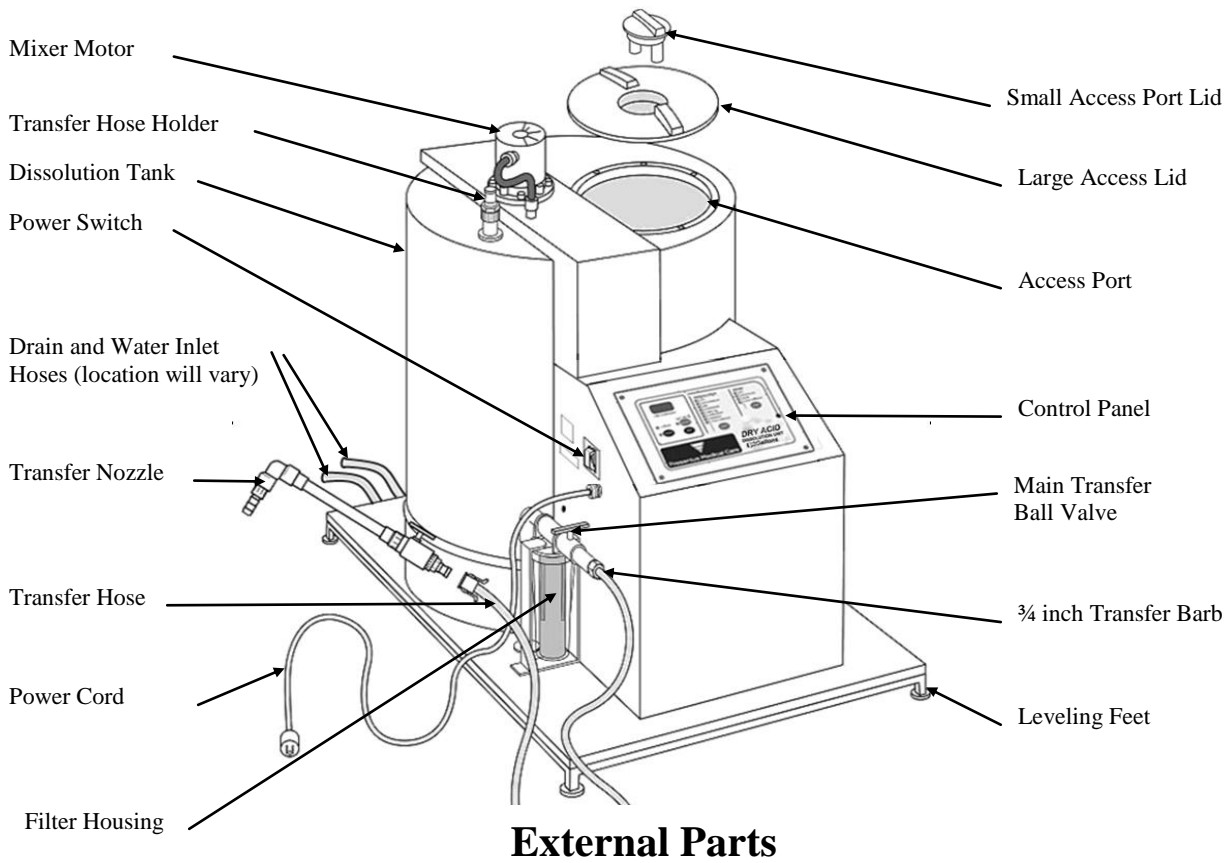
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HYDRAULIC FLOW DIAGRAM



- | | |
|----------------------|--------------------------------|
| 1. Mixer Motor | 11. Fill Valve |
| 2. Dissolution Tank | 12. Check Valve (drain) |
| 3. Overfill Pipe | 13. Transfer Valve |
| 4. Pump Dry Sensor | 14. Pump |
| 5. Drain | 15. Transfer Line Outlet |
| 6. Spray Ball | 16. Transfer Nozzle (Optional) |
| 7. Final Fill Sensor | 17. Filter Housing |
| 8. Mid-Level Sensor | 18. Check Valve (water supply) |
| 9. 25 Gallon Sensor | 19. Incoming Treated Water |
| 10. Drain Valve | 20. Main Transfer Ball Valve |

COMPONENT LOCATION



COMPONENT DESCRIPTION

1) Mixer Motor



The Mixer Motor operates in both cycles:

Dissolution Cycle - turns clockwise, and is used during: Add Granules, Mix and Homogenize Modes. While in Add Granules Mode, the concentrate is added and the Mixer Motor stirs to prevent clumping. During Mix Mode it's used to agitate the solution for 45 minutes allowing the granules to dissolve. During Homogenize Mode it operates for 10 minutes for additional mixing.

Rinse Cycle – turns clockwise and is used during Recirculation Mode.

2) Dissolution Tank



A 500 liter (132 gallon) vessel in which the dry acid concentrate is mixed. The mixed concentrate can be transferred to a storage tank or individual containers.

3) Overflow Pipe



This pipe is connected near the top of the Dissolution Tank and is plumbed directly to drain. In an overflow situation it allows water to flow to the drain, not the floor.

4) Pump Dry Sensor



The Pump Dry Sensor is located on the output of the Pump. Used during Transfer Mode, to turn off the Pump when the Dissolution Tank is empty. This sensor is designated Low-Level on the back of the Control Console.

5) Spray Ball



This is located in the Dissolution Tank, at the top. It is used in Rinse Cycle only. The Pump will send water through the Transfer Valve (Normally Open side) to the Spray Ball. As the water goes through the Spray Ball, it will rotate, creating a spray. This rinses the inside surface of the Dissolution Tank removing all residue.

6) Final Fill Sensor



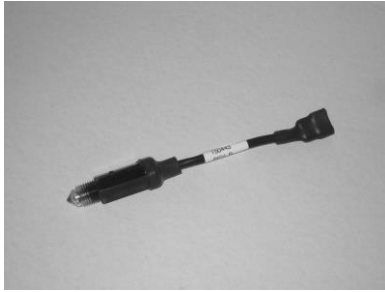
This sensor is mounted on the top of the Dissolution Tank, and is used only during Final Fill Mode. When water reaches the Final Fill Sensor the Fill Valve will close. The Dissolution Tank will have approximately 132 gallons in it. This sensor is only active in the Dissolution Cycle, and is designated Top-Level on the back of the Control Console.

7) Mid-Level Sensor



This sensor is mounted on the side of the Dissolution Tank, toward the middle. It will allow the Dissolution Tank to fill with approximately 100 gallons of water before the granules are added. This sensor is active only in Dissolution Cycle.

8) 25 Gallon Sensor



This sensor is mounted on the side of Dissolution Tank, toward the bottom. It will allow the Dissolution Tank to fill with approximately 25 gallons of water. This sensor is active only in Rinse Cycle.

9) Drain Valve



The Drain Valve operates in both cycles:
Dissolution Cycle – Drain Valve will open in Cycle Complete Mode.
Rinse Cycle – Drain Valve will open in each of the two Drain Modes for 10 minutes, and in Cycle Complete Mode.

10) Fill Valve



The Fill Valve permits treated water to fill the Dissolution Tank to the required level, i.e. 25 gallon, mid or final fill level.

11) Check Valve (drain)



This device prevents fluid from backing up through the drain into the Dissolution Tank

12) Transfer Valve



This 3-Way valve directs flow in both cycles:

Dissolution Cycle – during Transfer Mode the Normally Closed (NC) side of the valve opens, which directs flow from the effluent of the Pump to the Transfer Hose.

Rinse Cycle – during Recirculation Mode the Normally Open (NO) side of the valve directs flow from the effluent of the Pump to the Spray Ball.

13) Pump



The Pump is an assembly; it is an AC motor and a mechanically coupled pump-head. If debris gets in the pump-head it can cause the motor not to turn. The Pump operates in both cycles

Dissolution Cycle – During Transfer Mode empties Dissolution Tank of its liquid contents.

Rinse Cycle – During Recirculation Mode used to pump water through the Spray Ball

14) Transfer Line Output



This is the hose-barb that connects the output of the Main Transfer Ball Valve to the Transfer Hose. It is used to transfer liquid from the Dissolution Tank.

15) Transfer Nozzle (Optional)



If used, it connects to the end of the Transfer Line Output; which allows an individual container to be filled.

16) Filter Housing



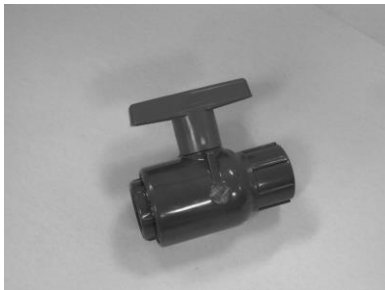
This is located on the left side of the hydraulic housing; it holds a 1 micron filter. The filter is used to remove any packaging particulate matter that may be in the mixed concentrate. Do not allow the filter to stand in fresh water. The filter should only be left completely filled with concentrate.

17) Check Valve (water supply)



This is located below the tank platform, used to prevent backflow into the incoming treated water.

18) Main Transfer Ball Valve



This ball valve is at the output of the Filter Housing and is used to allow flow, or stop flow from the Filter Housing.

COMPONENT STATE TABLE

DISSOLUTION CYCLE

Description	Duration	Pump Dry Sensor	25 Gallon Sensor	Mid Level Sensor	Final Fill Sensor	Drain Valve	Fill Valve	Transfer Valve	Mixer Motor	Pump
Fill				X			Open			
Add Granules									On	
Mix	45 minutes								On	
Deaeration	5 minutes									
Final Fill					X		Open			
Homogenize	10 minutes								On	
Ready to Transfer										
Transfer		X						Open		On
Cycle Complete						Open				

X=Sensor Input Active

RINSE CYCLE

Description	Duration	Pump Dry Sensor	25 Gallon Sensor	Mid Level Sensor	Final Fill Sensor	Drain Valve	Fill Valve	Transfer Valve	Mixer Motor	Pump
Fill			X				Open			
Recirculation	10 minutes								On	On
Drain	10 minutes					Open				
Fill			X				Open			
Recirculation	10 minutes								On	On
Drain	10 minutes					Open				
Cycle Complete						Open				

X=Sensor Input Active

RINSE CYCLE

The Rinse Cycle consists of four modes:

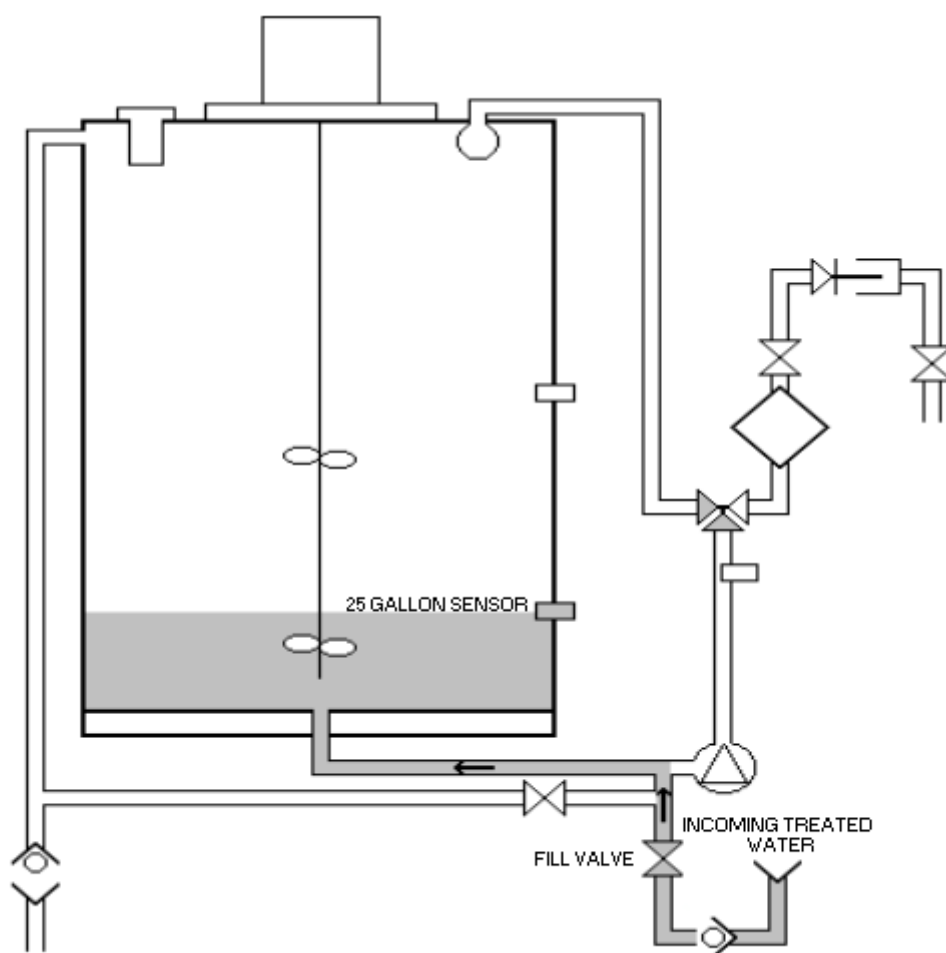
- Fill Mode: During this mode the Dissolution Tank is filled with the Incoming Treated Water up to the 25 Gallon Sensor.
- Recirculate Mode: During this ten (10) minute mode, the water in the Dissolution Tank is recirculated through the Pump to the Spray Ball that rinses the inside of the tank. The Mixer Motor is running to rinse the propellers.
- Drain Mode: During this ten (10) minute mode, the Drain Valve is opened and the water in the Dissolution Tank is emptied to drain via gravity.
- Cycle Complete Mode: During this mode, the Drain Valve is left open to drain any remaining water from the Dissolution Tank.

The first three modes are run twice. After the second Drain Mode the unit will advance to Cycle Complete Mode.

The Rinse Cycle is used to rinse the Dissolution Tank before each batch of dry acid concentrate is made, and following disinfection. Follow the procedures outlined in the Operator's Manual P/N 460018.

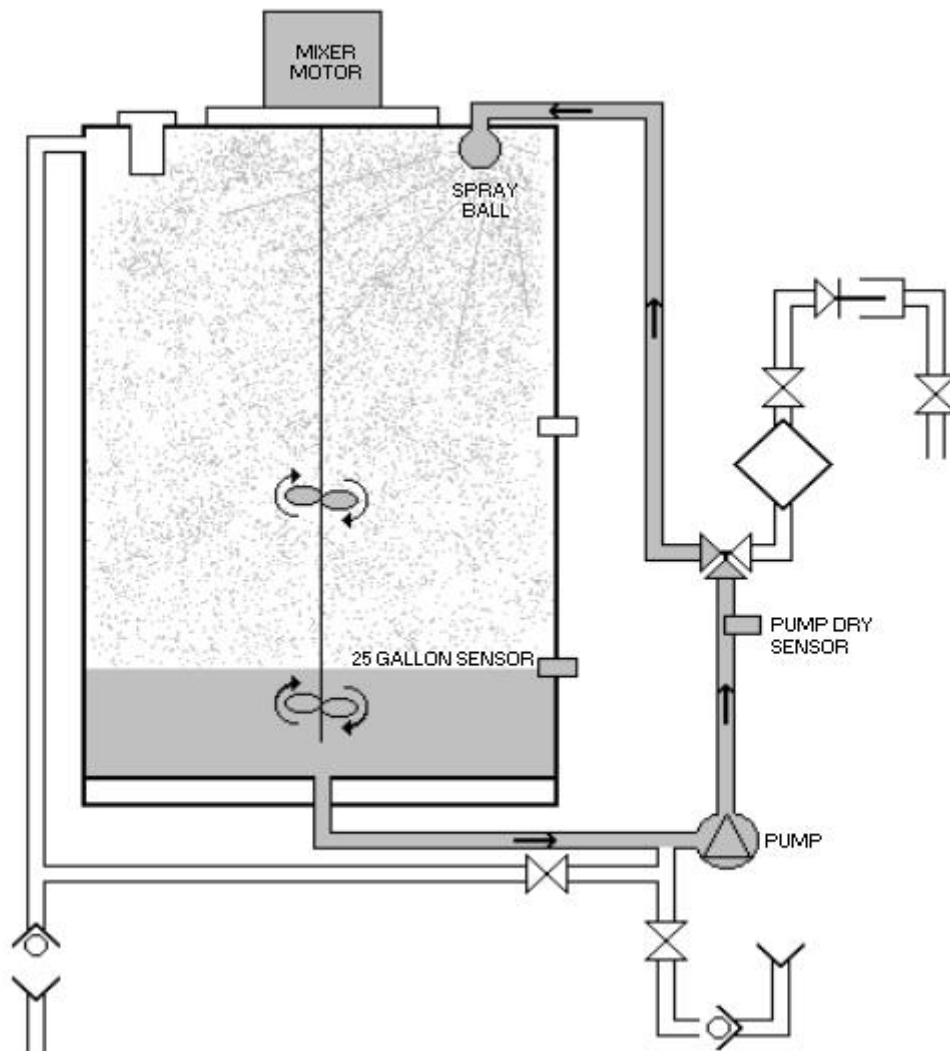
The following pages detail what the Dry Acid Dissolution Unit (DADU) does in each mode.

FILL MODE



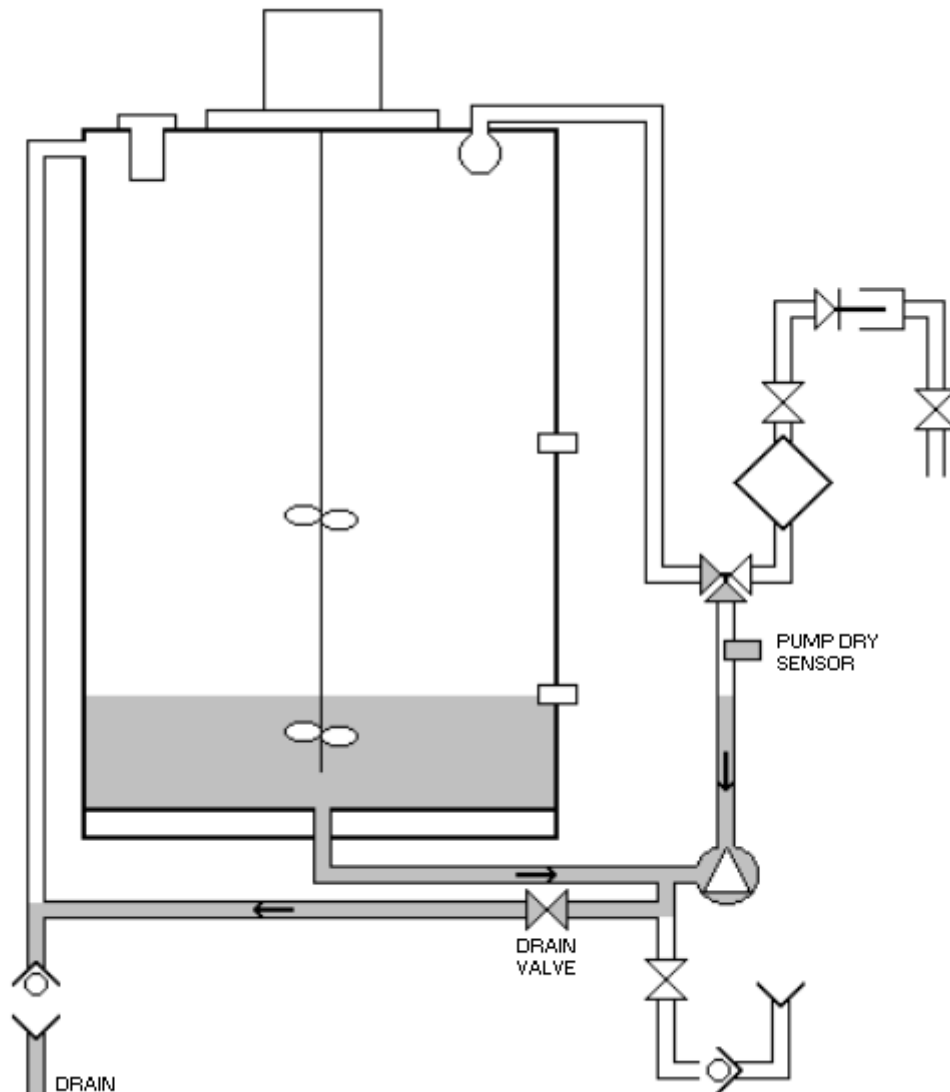
- The Fill Valve opens, allowing treated water to enter the bottom of the Dissolution Tank – Control Board DBJ2 pin 7 sends 120 VAC to pin 1 of the Fill Valve to open it.
- The Fill LED is illuminated.
- The 25 Gallon Sensor is (only) active in this mode. When the 25 Gallon Sensor detects water – pin 1 of 25 Gallon Sensor (white wire) goes to approximately 12 VDC, the 12 VDC signal goes to Control Board DBJ4 Pin 1.
- The Fill Valve closes – Control Board DBJ2 pin 7 goes to 0 VAC thus removing 120 VAC from Fill Valve.
- The machine advances to the next mode – Recirculation.

RECIRCULATE MODE



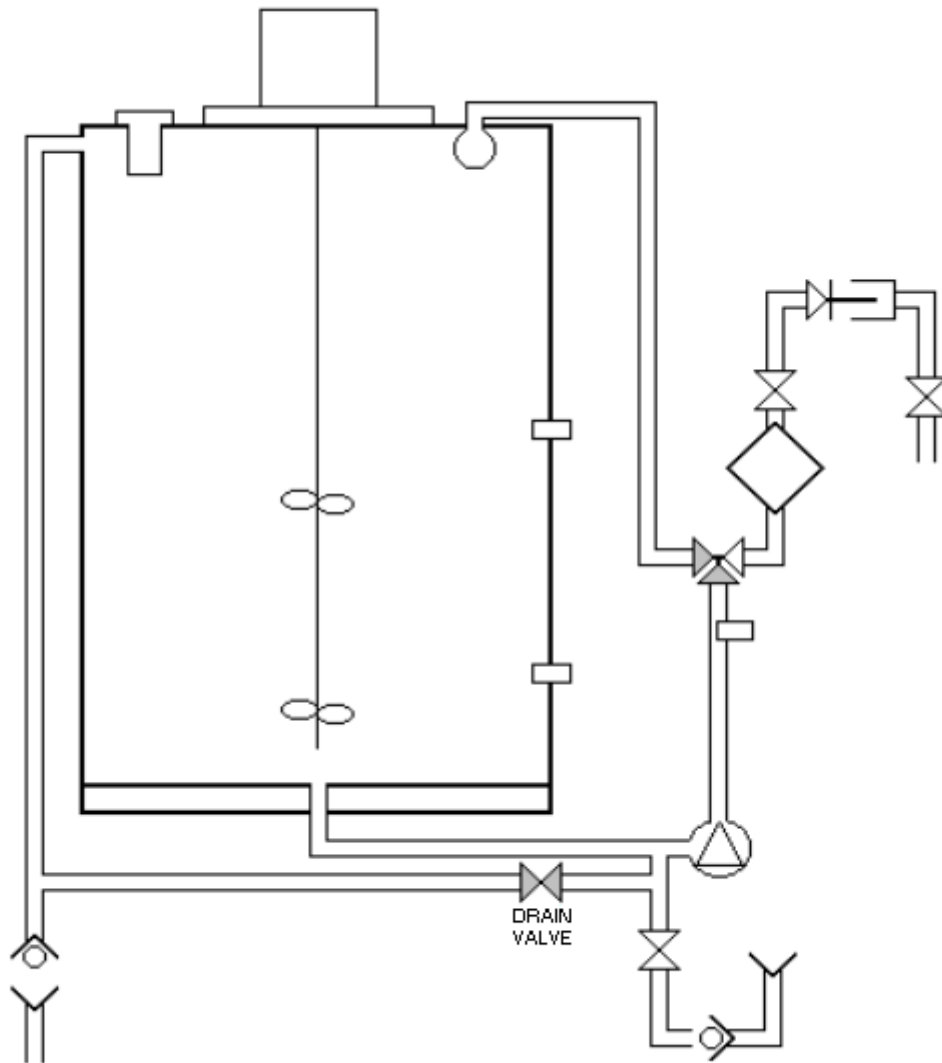
- The fluid in the Dissolution Tank is recirculated through the Spray Ball for 10 minutes.
- The Pump circulates water through the normally open (NO) side of Transfer Valve – the Pump turns on when the Control Board DBJ3 pin 1 sends 120 VAC to pin 0 of the Pump Relay, energizing it, closing the hot and neutral contacts, applying 120 VAC to Pin 1 of the Pump motor.
- The Recirculate LED is illuminated.
- At the end of the 10 minute cycle, the Pump turns off, and the machine advances to the next mode – Drain.

DRAIN MODE



- The Drain Valve opens, draining Dissolution Tank by gravity – Control Board DBJ2 pin 5 sends 120 VAC to pin 3 of the Drain Valve – opening it.
- The Drain LED is illuminated.
- This is a 10 minute cycle.
- After 10 minutes the Drain Valve will close – Control Board DBJ2 pin 3 applies 120 VAC to pin 4 of the Drain Valve closing it.
- After the second Drain, the machine advances to the next mode – Cycle Complete.

CYCLE COMPLETE MODE



- The Drain Valve opens – Control Board DBJ2 pin 5 sends 120 VAC to pin 3 of the Drain Valve – opening it.
- This drains all remaining fluid by gravity.
- The Cycle Complete LED is illuminated.
- The machine will remain in Cycle Complete.

DISSOLUTION CYCLE

The Dissolution Cycle consists of eight modes:

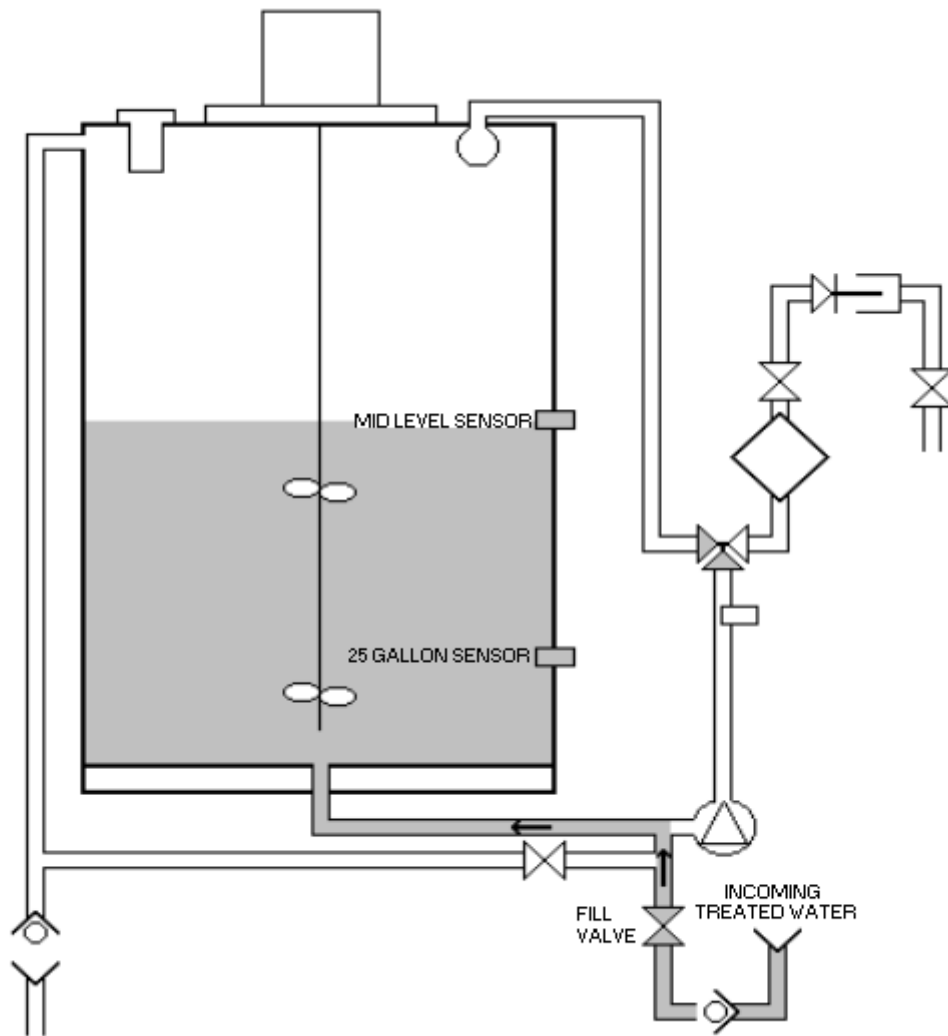
<u>Fill Mode:</u>	During this mode, the Dissolution Tank is filled with the Incoming Treated Water up to the Mid-Level Sensor.
<u>Add Granules Mode:</u>	During this mode, the granules are to be added to the Dissolution Tank. Once the granules are added press the START button and the unit will advance to Mix Mode.
<u>Mix Mode:</u>	During this forty-five (45) minute mode, the solution is agitated by the Mixer Motor, allowing all the granules to dissolve.
<u>Deaeration Mode:</u>	During this five (5) minute mode the Mixer Motor stops to allow air bubbles to separate out of the solution.
<u>Final Fill Mode:</u>	During this mode, the Dissolution Tank is filled with the Incoming Treated Water up to the Final Fill Sensor.
<u>Homogenize:</u>	During this ten (10) minute mode, the Mixer Motor stirs the solution. At the end of this mode the Homogenize LED will flash on the Control Panel. This indicates that the solution is ready for hydrometer testing. Follow the directions in the Operator's Manual P/N 460018

CAUTION: Do not put the hydrometer directly into the Dissolution Tank.

<u>Transfer Mode:</u>	During this mode, the solution is ready to be transferred out of the Dissolution Tank and into individual containers or a storage tank. The solution should not be left in the Dissolution Tank for more than two (2) weeks.
<u>Drain Mode:</u>	During this ten (10) minute mode, the Drain Valve opens and the fluid in the Dissolution Tank empties to drain via gravity.
<u>Cycle Complete Mode:</u>	During this mode, the Drain Valve is left open to drain any remaining fluid from the Dissolution Tank.

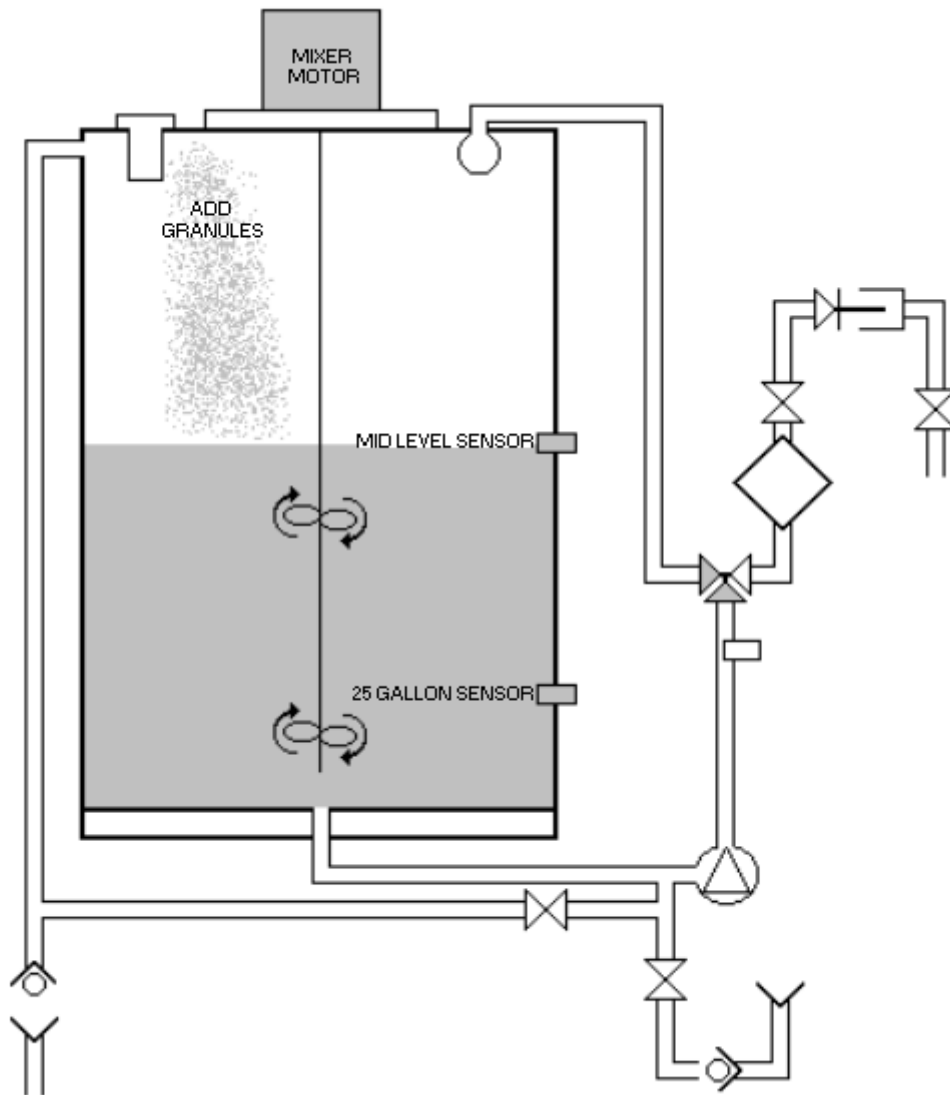
The following pages detail what the unit does in each mode.

FILL MODE



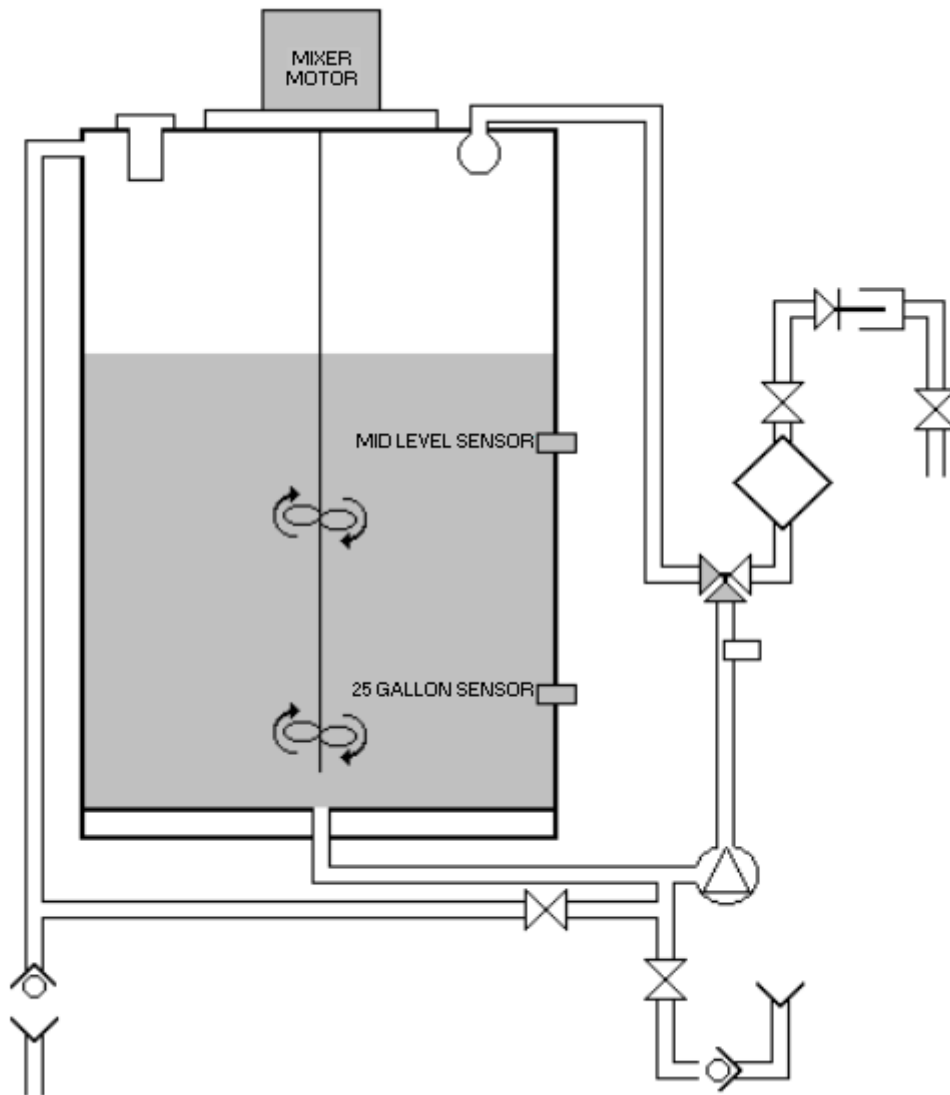
- The Fill Valve opens, allowing treated water to enter the bottom of the Dissolution Tank – Control Board DBJ2 pin 7 sends 120V AC to pin 1 of the Fill Valve to open it.
- The Fill LED is illuminated.
- The Mid-Level Sensor is (only) active in this mode. When the Mid-Level Sensor detects water – pin 1 of Mid-Level Sensor goes to approximately 12 VDC, the 12 VDC signal goes to Control Board DBJ5 Pin 4.
- The Fill Valve closes – Control Board DBJ2 pin 7 goes to 0 VAC, thus removing 120 VAC from pin 1 of the Fill Valve.
- The unit advances to the next mode – Add Granules.

ADD GRANULES MODE



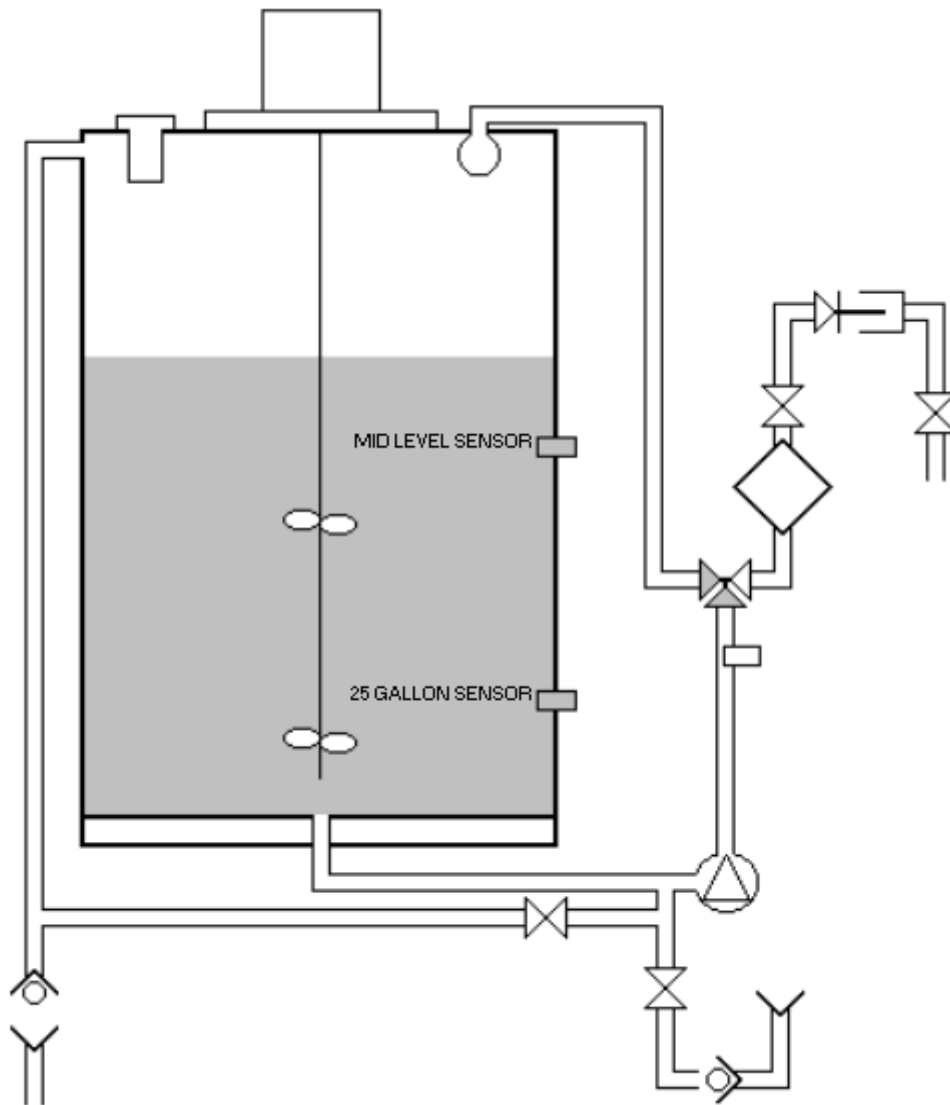
- The Mixer Motor starts, turning clockwise – Control Board DBJ2 pin1 sends 120 VAC to pin 0 of the Mixer Relay, energizing it, closing the hot and neutral contacts. This closed relay will then send 120 VAC to Pin 2 of the Mixer Motor.
- The Add Granules LED will flash indicating that the machine is in a hold state, prompting the operator to add the concentrate granules to the Dissolution Tank.
- It will stay in Add Granules until the operator presses the Start button to advance it to the next mode – Mix.

MIX MODE



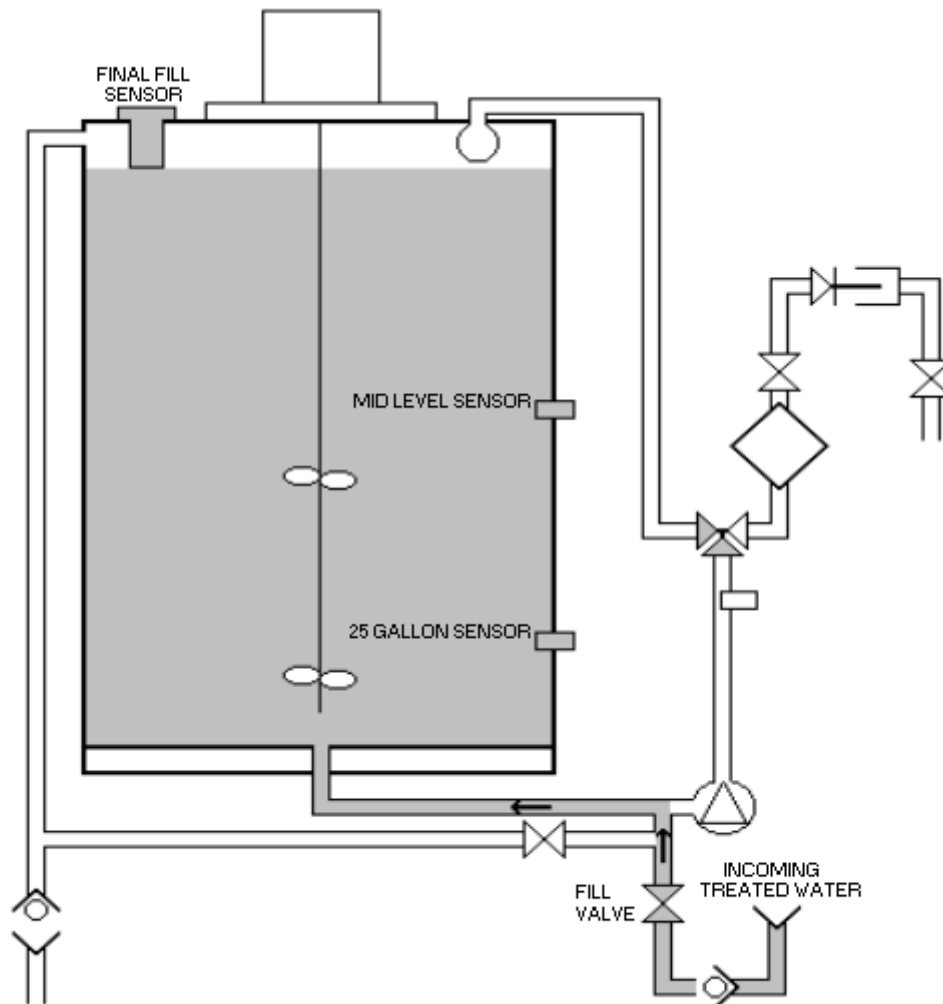
- The Mixer Motor turns clockwise for 45 minutes - Control Board DBJ2 pin1 sends 120 VAC to pin 0 of the Mixer Relay, energizing it, closing the hot and neutral contacts. This closed relay will then send 120 VAC to Pin 2 of the Mixer Motor.
- The Mix LED will illuminate.
- After the 45 minute timed cycle the mixer will advance to the next mode - Deaeration.

DEAERATION MODE



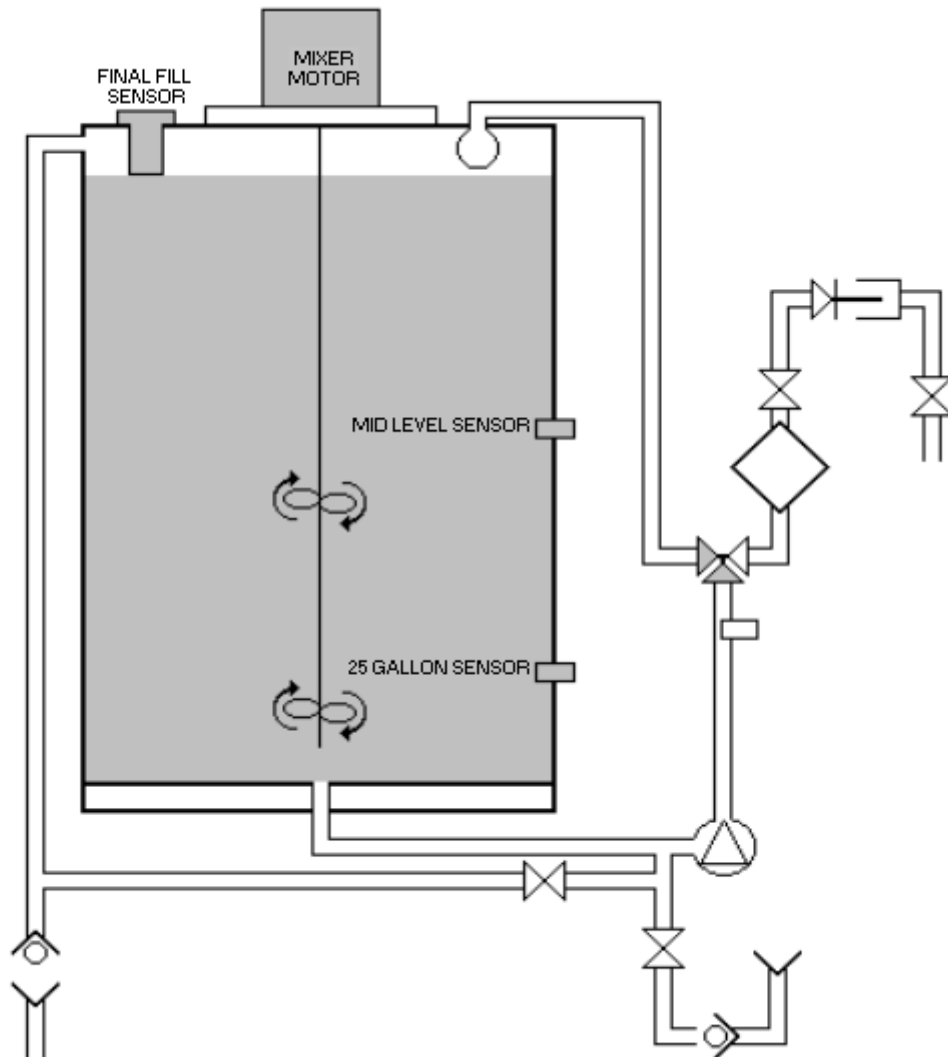
- The machine is idle for 5 minutes.
- No pumps, motors or valves are active.
- During this mode, air that is suspended in solution is allowed to separate from solution, i.e. Deaerate.
- After the 5 minute timed cycle the mixer will advance to the next mode – Final Fill.

FINAL FILL MODE



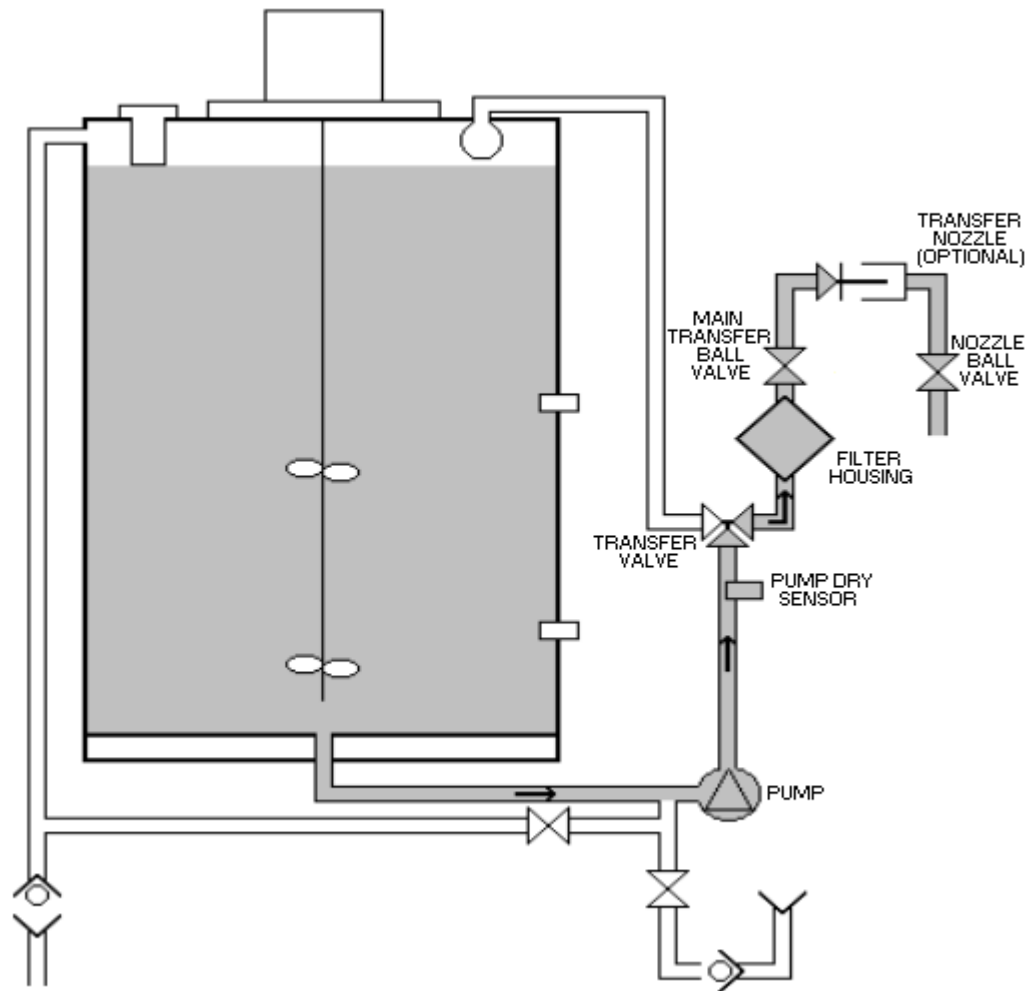
- The Fill Valve opens allowing water to enter the bottom of the Dissolution Tank – Control Board DBJ2 pin 7 sends 120 VAC to pin 1 of the Fill Valve to open it.
- The Final Fill LED is illuminated.
- The Final Fill Sensor is (only) active in this mode. When the Final Fill Sensor detects water – pin 1 of Final Fill Sensor goes to approximately 12 VDC, the 12 VDC signal goes to the Control Board DBJ5 Pin 2.
- The Fill Valve closes – Control Board DBJ2 pin 7 goes to 0 VAC, thus removing the voltage from Fill Valve pin 1.
- The machine advances to next mode – Homogenize.

HOMOGENIZE MODE



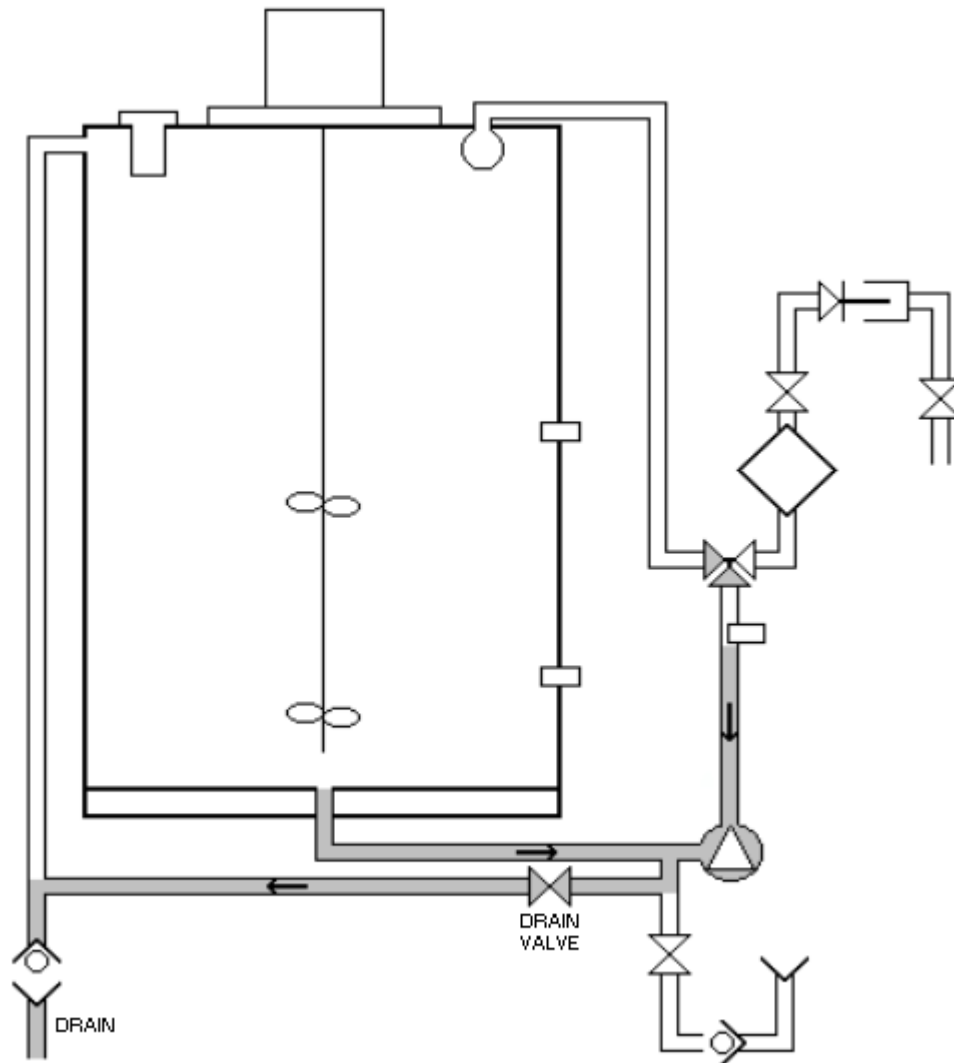
- The Dissolution Tank now has the complete water volume and all concentrate granules in it.
- The Mixer Motor runs clockwise for 10 minutes – Control Board DBJ2 pin1 sends 120 VAC to pin 0 of the solid state mixer relay, energizing it, closing the hot and neutral contacts. This closed relay will then send 120 VAC to Pin 2 of the Mixer Motor.
- The Homogenize LED is illuminated.
- After the 10 minute cycle it will advance to the next mode – Transfer.

TRANSFER MODE



- When in Transfer the Transfer LED will flash, indicating that the solution is ready for hydrometer testing. When the specific gravity is tested and verified within the expected range and the transfer line has been flushed the operator presses Dissolution Start button to begin Transfer.
- The normally closed (NC) side of the Transfer Valve opens – the Control Board DBJ3 pin 5 sends 120 VAC to Pin 2 of the Transfer Valve.
- The Pump turns on, pumping fluid out of the bottom of the Dissolution Tank to the Transfer line.
- The Pump turns on when the Control Board DBJ3 pin 1 sends 120 VAC to pin 0 of the Pump Relay, energizing it, closing the hot and neutral contacts, sending 120 VAC to Pin 1 of the Pump motor.
- When the Pump Dry Sensor detects that the Dissolution Tank is empty – pin 1 of the Pump Dry Sensor sends a 0 VDC signal to Control Board DBJ5 pin 7.
- The Pump will turn off – pin 0 of the Pump Relay goes to 0 VAC, de-energizing the Pump Relay.
- The machine will then go to the next mode – Cycle Complete.

CYCLE COMPLETE MODE



- When in Cycle Complete the Drain Valve opens – Control Board DBJ2 pin 5 sends 120 VAC to pin 3 of the Drain Valve – opening it.
- This drains any remaining fluid by gravity.
- The Drain Valve will remain open.

SECTION III - ELECTRONIC CIRCUIT DESCRIPTION

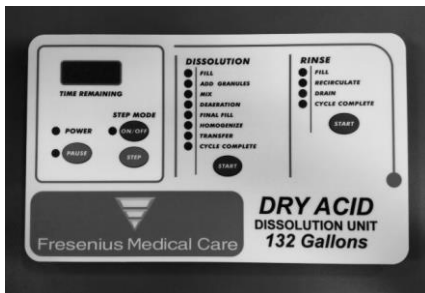
COMPONENT DESCRIPTION

1) Control Console



The Control Console assembly houses most electrical components. It has the Control Panel on top; to which the Control Board is affixed. Also inside are the Mix Motor and Pump relays, the Transformer, Power Board and hot and neutral wire Barrier Strips. The connectors for all hydraulic components are on the back of this housing (See Figure 7 page V-2). It is opened by removing 10 screws from the back panel.

2) Control Panel



The Control Panel is the interface for the operator. Through this the operator can initiate, pause and step through Dissolution and Rinse cycles. The time remaining for any timed mode can be seen on a digital display. The Cycle/Mode status can be determined by LEDs located on the Control Panel.

3) Relays



There are two 120 VAC, 30 amp coil relays in Control Console; one is for the Mixer Motor, and one for the Pump. These are panel mounted relays.

4) Transformer



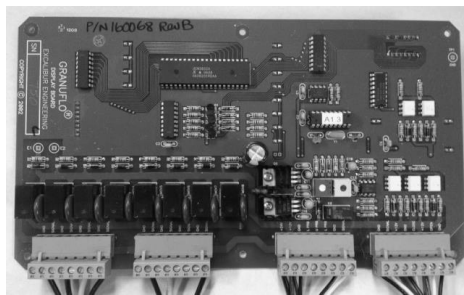
The Transformer is inside the Control Console. The Transformer has an input of 120 VAC and outputs 24 VAC with a built in 12 VAC center tap.

5) Power Board



The 12 VDC output of the Power Board supplies the Control Board the needed power for all sensors: Final Fill, Mid-Level, 25 Gallon and Pump Dry. The Power Board also has an unused 24 VDC output at connector E2.

6) Control Board



This board is inside of the Control Console, it mounts directly to Control Panel. The Control Board contains the necessary circuitry and software for all mixer functions. All component wiring is connected at the bottom of the Control Board – designated as connectors: DBJ2, DBJ3, DBJ4 & DBJ5 (*See Figure 6 page V-2*). Software – The mixer software is a replaceable IC that is located on the Control Board.

7) Power Switch



The Power Switch is 120 VAC, 10 amp device which includes a plastic switch cover. It is located on the left side of the white Control Console shroud.

SECTION IV - MAINTENANCE



WARNING! TO PREVENT ACCIDENTAL SHOCK HAZARD, THIS DEVICE MUST BE PLUGGED INTO A PROPERLY GROUNDED *GFI* PROTECTED THREE WIRE RECEPTACLE AC CIRCUIT. DO NOT EMPLOY EXTENSION CORDS OF ANY KIND. WHEN THE POWER CORD IS NOT LONG ENOUGH TO BE SERVICEABLE, A LICENSED ELECTRICIAN MUST INSTALL A NEW THREE WIRE GROUNDED RECEPTACLE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. DO NOT USE A THREE TO TWO PRONG PLUG ADAPTER WITH THIS DEVICE.

The Dry Acid Dissolution Unit (DADU) has been designed for ease of use and trouble free operation. However, a minimal amount of preventive maintenance is required in order to maintain the DADU in good working condition and minimize the possibility of a system malfunction.

The recommended program for proper care of the DADU consists of five items: They are: (4.1) Regular visual inspection, (4.2) Cleaning, (4.3) Bleach Disinfection, (4.4) Filter Maintenance and (4.5) Clean and inspect Spray Ball.

4.1 VISUAL INSPECTION

Visually inspect the DADU prior to mixing a batch. The operator should look for any defects which may inhibit the safe or proper operation of the DADU. Items such as damaged hydraulic hoses or fittings, damaged electrical cables or connections, loose, missing or damaged hardware or process contamination should be corrected prior to the use of the DADU.

Should the power cord or plug become cracked, frayed or otherwise damaged, it should be replaced immediately. Tag the DADU "OUT of SERVICE" until the repair is made. Always remove the power cord from the power source before attempting to service this device. Never unplug the DADU by pulling on the power cord.

4.2 CLEANING

Clean the exterior surface of the DADU thoroughly after each batch of concentrate is mixed. If necessary a mild detergent solution may be used to clean the exterior surface. Care should be taken not to contaminate the system interior. All spills should be wiped off immediately. Spillage at the Control Panel should be avoided in order to minimize the possibility of electrical malfunction.



CAUTION! DO NOT USE CHEMICAL CLEANING AGENTS THAT MAY DAMAGE THE MATERIAL USED IN THE DRY ACID DISSOLUTION UNIT. AGENTS WHICH CONTAIN *BENZENE, TOLUENE, XYLENE, ACETONE* OR ANY OTHER *AROMATIC OR KETONE SOLVENTS* MUST BE AVOIDED.

4.3 BLEACH DISINFECTION



WARNING! USE ONLY BLEACH (SODIUM HYPOCHLORITE 5% TO 10% WITHOUT ADDITIVES SUCH AS DETERGENTS OR FRAGRANCES) TO DISINFECT THE DRY ACID DISSOLUTION UNIT.

WARNING! ENSURE THE TRANSFER LINE IS NOT CONNECTED TO A CONCENTRATE STORAGE CONTAINER/TANK.

1. To start the disinfection process, power OFF the Dry Acid Dissolution Unit (DADU), remove the Filter Housing and discard the filter. Place the residual fluid from the Filter housing in a Residual Solution Bucket (see Operator's Manual PN 460018 for proper disposal of Residual Solution Bucket). Reinstall Filter Housing, but do not insert a filter at this time. Connect the Transfer Nozzle to the end of the DADU's Transfer Hose and make sure the valve on the Transfer Nozzle is in the CLOSED position. In addition, loosen the top Small Access Port Lid, but leave it in place. Ensure that you are wearing appropriate personal protective equipment.



NOTE: A RINSE CYCLE DOES TWO COMPLETE RINSES THAT RUN CONSECUTIVELY. THE 1ST RINSE CONSISTS OF FILL, RECIRCULATION, AND DRAIN. THE 2ND RINSE CONSISTS OF FILL, RECIRCULATION, DRAIN, AND CYCLE COMPLETE.

2. Turn the power ON and ensure that the water supply valve is OPEN then press the Rinse START button. The Fill LED will turn on indicating the Rinse Cycle has started and the Dry Acid Dissolution Unit is in Fill Mode (Figure 1).

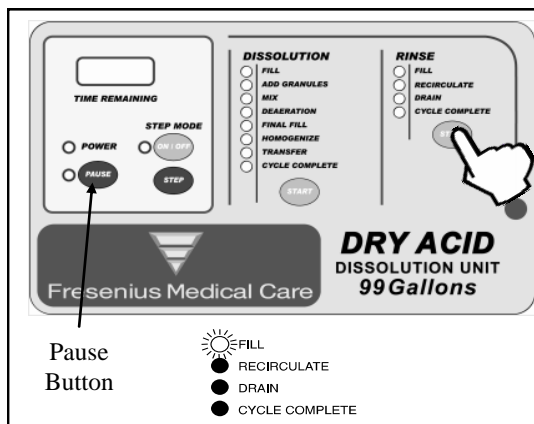


Figure 1

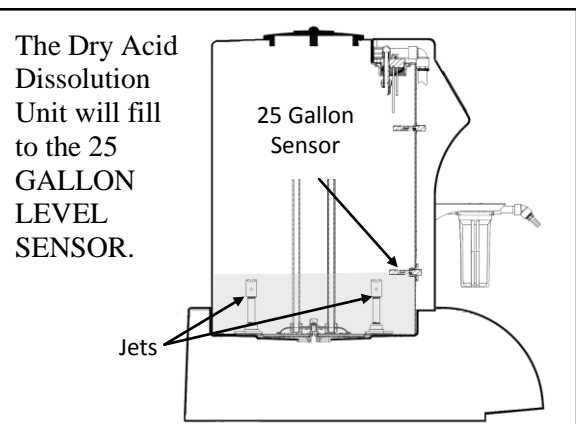


Figure 2

3. Once the 25 Gallon Sensor is reached (Figure 2), the Control Panel will advance to the first Recirculate Mode. With your safety glasses on, lift the Small Access Port Lid and check for correct Spray Ball operation. See section 5.5 for the illustration of correct and incorrect Spray Ball operation.
4. During the second Rinse Cycle, when in Recirculate Mode, press the PAUSE button (the PAUSE LED will turn on), then add 0.5 gallons (1.9 liters) of bleach to the rinse water in the Dissolution Tank. Once the bleach is added, press the RINSE START button (the PAUSE LED turns off) and the Rinse Cycle will continue.
5. When the Rinse Cycle is complete, the Cycle Complete LED is on. Initiate and complete two consecutive Rinse Cycles by following the Operator's Manual P/N 460018.
6. When the two Rinse Cycles are complete, the Rinse Cycle, Cycle Complete LED is on. Use the appropriate chlorine test strips to check for the proper chlorine level at both the Transfer Hose and Drain Hose.

7. To check for residual bleach from the Transfer Hose:

- Have chlorine test strip ready for use
- Press Dissolution Cycle START button.
- When water has reached the 25 Gallon Sensor, press the Step Mode ON/OFF button until the Step Mode LED turns on.
- Use the Step button to step to Transfer Mode, the Transfer LED will be flashing.
- Press the Dissolution Cycle START button. The Transfer LED will be on (no longer flashing) the Transfer Valve will open and the Pump will turn on.
- OPEN the Main Transfer Ball Valve on the DADU.
- With the end of the Transfer Nozzle placed over a drain, slowly OPEN the valve on the Transfer Nozzle. Allow water to flow to the drain for 15 seconds.
- Adjust the output of the Transfer Nozzle to a slow output flow.
- Place chlorine test strip under the flow for 30 seconds or the time interval recommended by the manufacture of the test strip being used.
- CLOSE Transfer Nozzle Valve and press the PAUSE button (the PAUSE LED will turn on).
- Ensure that you check the results of the test strip immediately. If the results are higher than 0.1 ppm (ANSI/AAMI RD61: 2006) go to step 9
- Before proceeding to step 8, ensure the Drain Hose is secure to prevent the hose from flailing around during the Drain Mode.

8. To check for residual bleach from the Drain Hose.

- Have chlorine test strip ready for use.
- Using STEP button step to the Drain Mode.
- Press the Rinse Cycle START button.
- Pause LED will turn off, the Drain Valve will open. Allow water to drain for 30 seconds.
- Place chlorine test strip under the flow for 30 seconds or the recommended time on the test strip manufacture's instruction. Press PAUSE button once you are complete with this step.
- Ensure that you check the results of the test strip immediately.

9. If residual bleach levels are higher than ANSI/AAMI Standard limit of 0.1 ppm (RD61: 2006), at either the Transfer or Drain Hose initiate another complete RINSE Cycle. After the Rinse Cycle is complete, start from section 5.3, step #5, to check for residual bleach. Continue the Rinse Cycle test procedure until residuals bleach levels are within ANSI/AAMI Standard limit of less than 0.1 ppm (RD61:2006) at the Transfer and Drain Hose.

10. Once you have attained an acceptable residual bleach level, ensure the Dissolution Tank is empty, and the power is off. CLOSE the Main Transfer Ball Valve. Then, connect the Transfer Hose back onto the DADU Transfer Hose Holder (See page II-3).

11. Remove Filter Housing and empty all water from the Filter Housing. Install new filter and tighten Filter Housing into place (Figure 3).

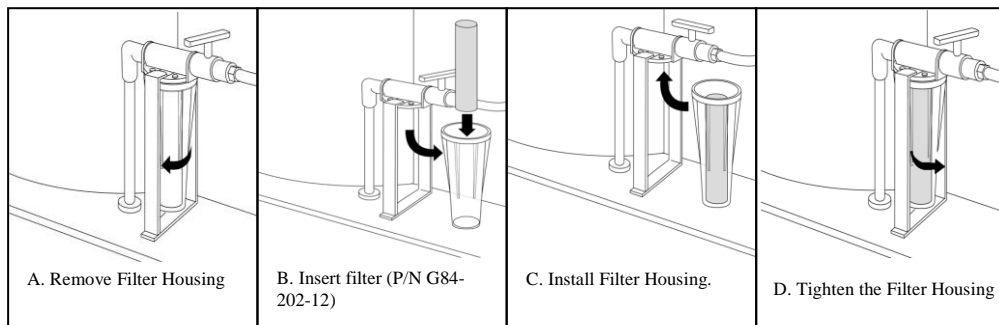


Figure 3

12. Immediately after Rinse Cycle, make a batch of Dry Acid Product. Leaving the DADU with only treated water or wetted with only treated water leaves the DADU susceptible to bacterial growth.



WARNING! DO NOT ALLOW THE UNIT TO REMAIN FULL OF WATER WITHOUT THE ADDITION OF FRESenius MEDICAL CARE DRY ACID PRODUCT. BACTERIAL GROWTH MAY OCCUR.

4.4 FILTER MAINTENANCE

The 1 micron filter should be changed under the following conditions:

1. After mixing 6 batches of Dry Acid concentrate.
2. When the Dry Acid Dissolution Unit (DADU) requires disinfection.

4.4.1 FILTER REMOVAL AND REPLACEMENT

Ensure the Dissolution Tank is empty and that power to the DADU has been turned off and the Main Transfer Ball Valve is CLOSED. Follow the figures A, B, C, and D for removal and replacement of the filter (Figure 4). If the residual fluid in the Filter housing is concentrate, then place the solution in the Residual Solution Bucket.

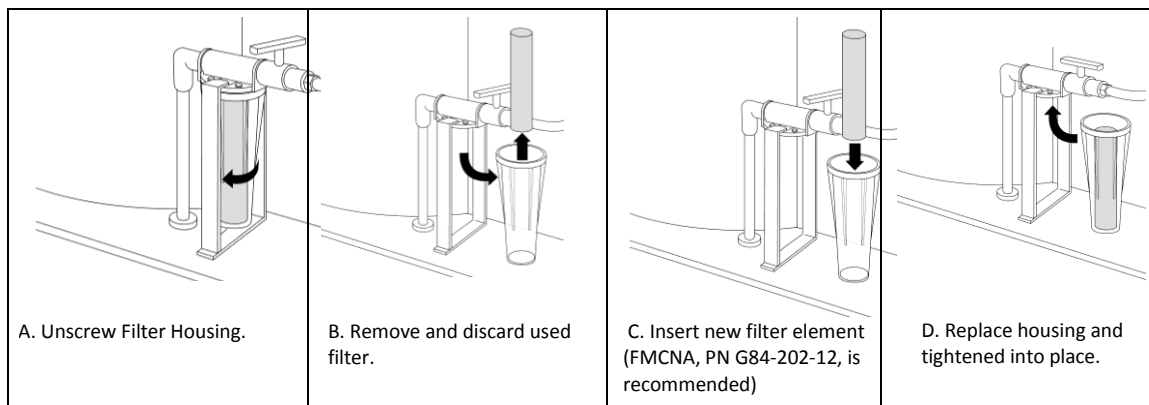


Figure 4



NOTE: THE FILTER USED MUST BE COMPATIBLE WITH FRESenius MEDICAL CARE DRY ACID PRODUCT AND RATED AT 1 MICRON. FRESenius MEDICAL CARE. P/N G84-202-12 IS A POLYPROPYLENE FIBER WOUND ON A POLYPROPYLENE MESH CORE AND MEETS THESE REQUIREMENTS. CELLULOSE FILTERS ARE NOT COMPATIBLE WITH THE FRESenius MEDICAL CARE DRY ACID PRODUCT.



NOTE: IT IS RECOMMENDED TO REPLACE THE FILTER AFTER MIXING 6 BATCHES OR IF THE TANK REQUIRES DISINFECTION.

4.5 CLEAN AND INSPECT SPRAY BALL

Initiate a Rinse Cycle by pressing the Rinse Cycle START button. When the water reaches the 25 Gallon Sensor it will go into Recirculate Mode, then refer to figure 5 to check for proper Spray Ball rotation.

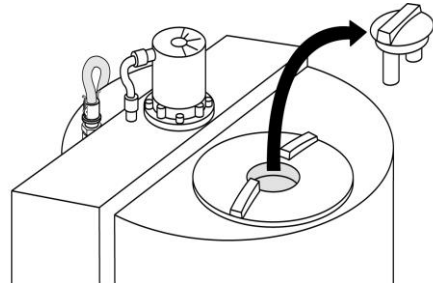
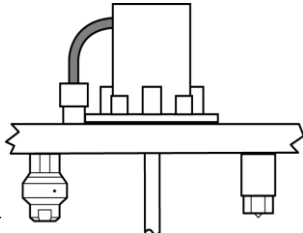
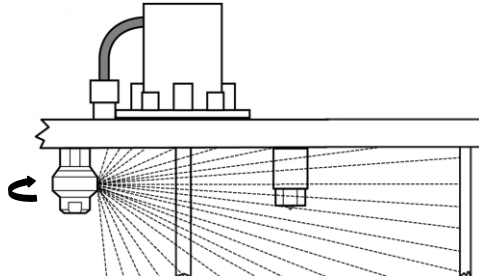
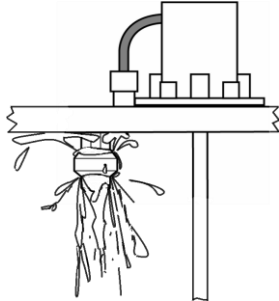
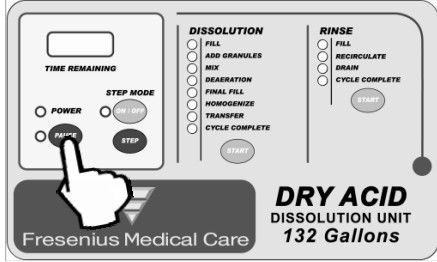
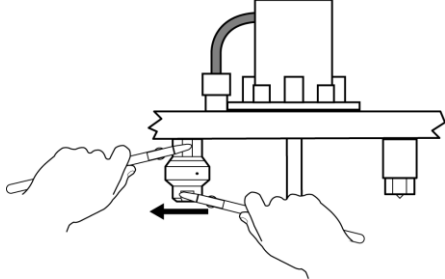
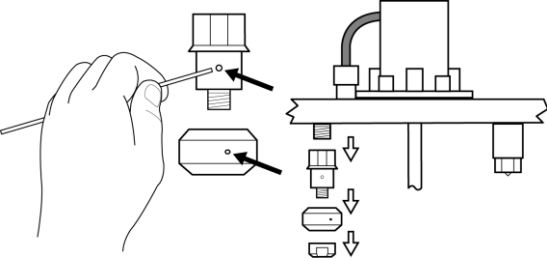
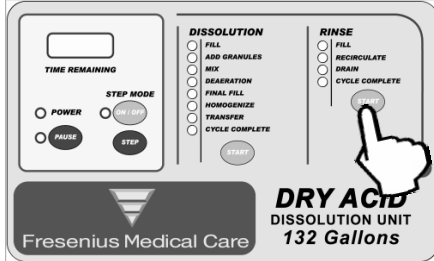
 <p>A. Remove the Small Access Port Lid.</p>	 <p>SPRAY BALL</p> <p>B. Check the Spray Ball for rotation.</p>
 <p>◆ If correct Spray Ball spray pattern is observed, then inspection is complete.</p>	 <p>◆ If Spray Ball is clogged and not rotating go to C.</p>
 <p>C. If the Spray Ball is stationary, push the PAUSE button. Recirculate LED will flash. Turn power OFF</p>	 <p>D. Remove the nut below the Spray Ball to access the Sprayer.</p>
 <p>E. Clear the spray holes in both the Spray Ball and Sprayer of debris and reassemble.</p>	 <p>F. Turn Power ON, press the Rinse Cycle START button. Pause LED will turn off and Recirculate LED will turn on. Check for proper Spray Ball rotation.</p>

Figure 5

ROUTINE MAINTENANCE SCHEDULE

PROCEDURE	PER BATCH	MONTHLY	AS NEEDED	REF. SECTION
RINSE CYCLE	X			Operators Manual part number 460018
VISUAL INSPECTION	X			4.1
CLEANING SURFACES	X			4.2
DISINFECTANT			X	4.3
FILTER			X*	4.4
SPRAY BALL			X	4.5
CORROSION		X**		N/A

* It is recommended to change the filter after mixing 6 batches or when the DADU requires Disinfection. If the Dissolution Tank becomes contaminated, it will need to be disinfected before a new filter is installed.

** It is recommended to check the Final Fill Sensor, propellers, shaft, all valve connectors, and the Dissolution Tank for corrosion and salt deposits. Any excessively corroded part should be cleaned or replaced as needed.

SECTION V - TROUBLESHOOTING

	Page
Control Console Diagrams.....	V-2
Pump Not Running.....	V-3
Mixer Motor Not Running.....	V-4
Fill Problems.....	V-5
Drain Problems.....	V-8
Transfer Problems.....	V-9
Power Problems.....	V-11

CONTROL CONSOLE DIAGRAMS

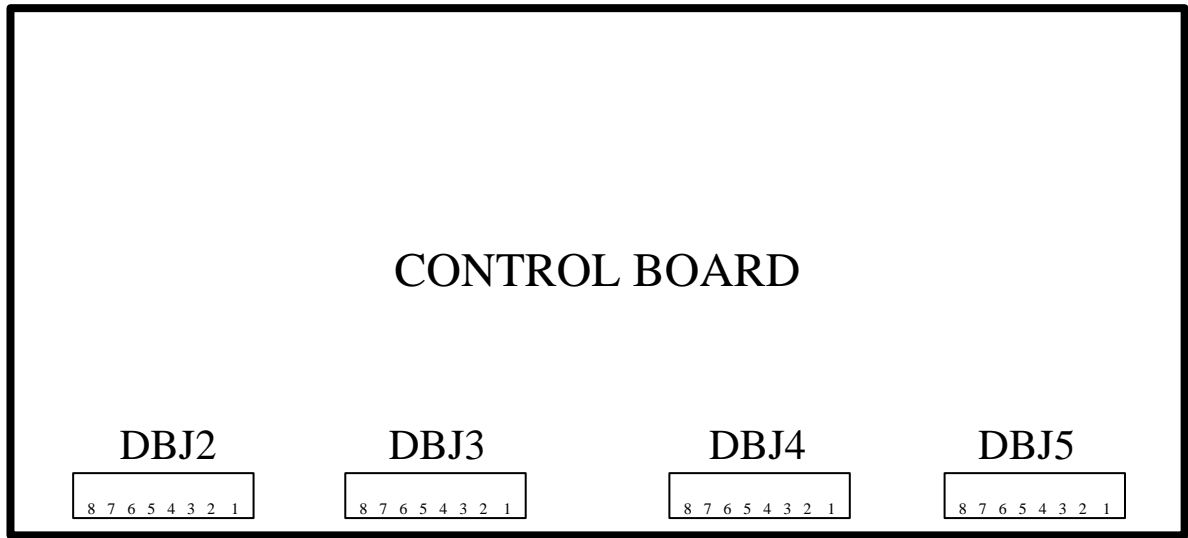


Figure 6



NOTE: ALL PIN OUTS ON THE DBJ CONNECTORS OF THE CONTROL BOARD ARE COUNTED FROM RIGHT TO LEFT. PIN 1 IS THE PIN ON FAR RIGHT OF EACH CONNECTOR AND PIN 8 IS THE PIN ON THE FAR LEFT OF EACH CONNECTOR. SEE FIGURE 6 ABOVE

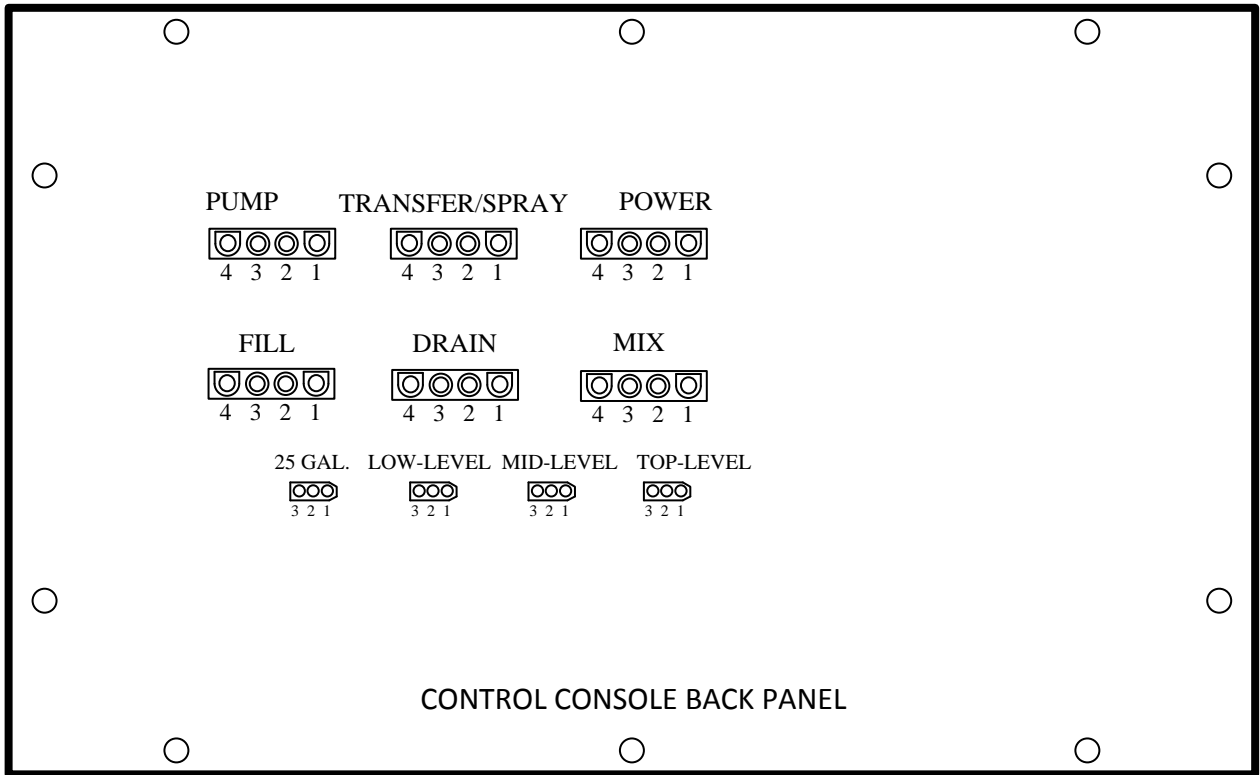


Figure 7

PUMP NOT RUNNING

- 1.0 Verify there is water in the Dissolution Tank and in Recirculate Mode (LED on – not flashing) of the Rinse Cycle.
- 1.1 Unplug the PUMP cable from the back of the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) on the Control Console. *See Figure 7 – page V-2.* Is there 120 VAC?

Yes – Plug the PUMP cable back into the Control Console and go to step 1.2
No – Go to step 1.3

- 1.2 Measure the AC voltage between pins 1 and 4 (black and white wires) at the Pump (motor). *See Figure 8.* Is there 120 VAC?

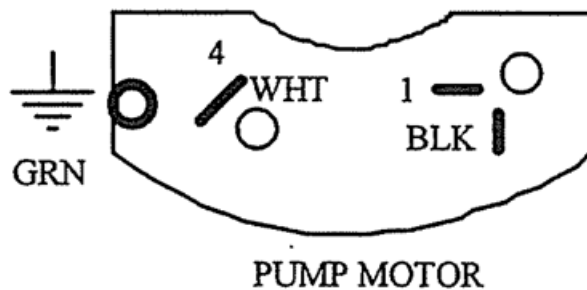


Figure 8

Yes – Check the Pump-head for debris (plastic bags, rubber gloves, tie wraps, etc...) or change the Pump.
No – Change the Pump cable.

- 1.3 Open the Control Console. Measure the AC voltage between DBJ3 pin 1 of the Control Board (*see Figure 6 – page V-2*) and the neutral (white wire) Barrier Strip. Is there 120 VAC?

Yes – Change the Pump Relay.
No – Change the Control Board and software.

MIXER MOTOR NOT RUNNING

- 2.0 Verify that there is water in the Dissolution Tank and in Recirculate Mode (LED on – not flashing) of the Rinse Cycle.
- 2.1 Unplug the MIX cable from the back of the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the MIX connector on the Control Console. *See Figure 7 – page V-2.* Is there 120 VAC?

Yes – Plug the MIX cable back into the Control Console and go to step 2.2
No – Go to step 2.3

- 2.2 While still in Recirculate Mode, measure the AC voltage between pins 1 and 2 (white and black wires) at the Mixer Motor. *See Figure 9.* Is there 120 VAC?

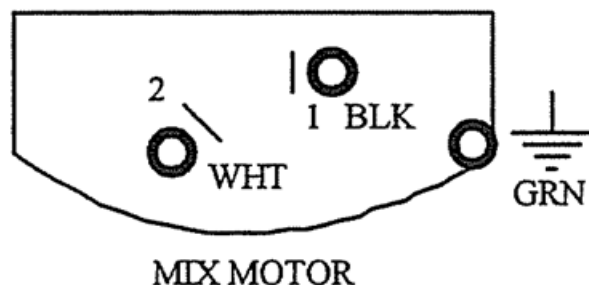


Figure 9

Yes – Change the Mixer Motor.
No – Change the Mixer Motor cable.

- 2.3 Open the Control Console. Measure the AC voltage between DBJ2 pin 1 of the Control Board (*see Figure 6 – page V-2*) and the neutral (white wire) Barrier Strip. Is there 120 VAC? *Note: Still in Recirculate Mode (LED on – not flashing).*

Yes – Change the Mix Relay.
No – Change the Control Board and software.

FILL PROBLEMS

- 3.0 Does the Dissolution Tank (a) not fill, or (b) overflow?
- (a) Does not fill – Go to step 3.1
 - (b) Overflow – Go to step 3.9
- 3.1 Does the Dissolution Tank (a) stay in Fill Mode or (b) advance to the next mode?
- (a) Stays in Fill Mode – Go to step 3.2
 - (b) Advances to next mode– Go to step 3.5
- 3.2 Verify that the Water Inlet valve is turned ON. While in Fill Mode (LED on – not flashing) of the Rinse Cycle, is there water coming from the Drain Hose?
- Yes – Go to DRAIN PROBLEMS step 4.1
 - No – Go to step 3.3
- 3.3 Unplug the FILL cable from the back of the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the FILL connector. *See Figure 7 – page V-2.* Is there 120 VAC?
- Yes – Go to step 3.4
 - No – Change the Control Board and software
- 3.4 Turn OFF the Water Inlet valve, loosen and disconnect the union to the inlet side to the Fill Valve. Slowly turn the Water Inlet valve ON and observe the end of pipe. Is there water to the Fill Valve?
- Yes – Change the Fill Valve
 - No – Change the Check Valve (water supply)
- 3.5 Does the DADU skip Fill Mode and advance to the next step in: (a) Rinse Cycle – Fill Mode, (b) Dissolution Cycle – Fill Mode or (c) Dissolution Cycle – Final Fill Mode?
- (a) Rinse Cycle– Go to step 3.6
 - (b) Dissolution Cycle Fill– Go to step 3.7
 - (c) Dissolution Cycle Final Fill – Go to step 3.8
- 3.6 With the Dissolution Tank empty and the power ON, open the Control Console and measure the DC voltage between pins 1 and 2 on the DBJ4 connector of the Control Board. *See Figure 6 – page V-2.* Is there approximately 12 VDC?
- Yes – Clean or change the 25 Gallon Sensor.
 - No – Change the Control Board and software
- 3.7 With the Dissolution Tank empty and the power ON, open the Control Console and measure the DC voltage between pins 4 and 5 (white and black wires) on the DBJ5 connector of the Control Board. *See Figure 6 – page V-2.* Is there approximately 12 VDC?
- Yes – Clean or change the Mid-Level Sensor
 - No – Change the Control Board and software

- 3.8 With the Dissolution Tank empty and the power ON, open the Control Console and measure the DC voltage between pins 1 and 2 (black and white wires) on the DBJ5 connector of the Control Board. *See Figure 6 – page V-2.* Is there approximately 12 VDC?
- Yes – Clean or change the Final Fill Sensor (*see the Final Fill Sensor Replacement Procedure page VI-2*)
 - No – Change the Control Board and software
- 3.9 Does the DADU overflow in: (a) Rinse Cycle or (b) Dissolution Cycle?
- (a) Rinse Cycle – Go to step 3.10
 - (b) Dissolution Cycle – Go to step 3.13
- 3.10 When the water reaches the 25 Gallon Sensor in the Rinse Cycle does the DADU: (a) stay in Fill Mode and continue to fill or, (b) does it advance to Recirculate Mode and continue to fill.
- (a) Stays in Fill Mode and continues to fill – Go to step 3.11
 - (b) Advances to Recirculate Mode and continues to fill – Go to step 3.12
- 3.11 With water above the 25 Gallon Sensor and the power turned ON, open the Control Console and measure the DC voltage between pins 1 and 2 (white and black wires) of the DBJ4 connector. *See Figure 6 – page V-2.* Is there approximately 12 VDC?
- Yes – Change the Control Board and software
 - No – Clean or change the 25 Gallon Sensor
- 3.12 With the DADU in Recirculate Mode (LED on – not flashing) of the Rinse Cycle, unplug the FILL cable from the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the FILL connector. *See Figure 7 page V-2.* Is there 120 VAC?
- Yes – Change the Control Board and software
 - No – Verify that the incoming water pressure does not exceed 60 psi or change the Fill Valve
- 3.13 While in Dissolution Cycle does the DADU overflow during: (a) Fill Mode or (b) Final Fill Mode?
- (a) Overfills during Fill Mode – Go to step 3.14
 - (b) Overfills during Final Fill Mode – Go to step 3.17
- 3.14 While in Dissolution Cycle when the water reaches the Mid-Level Sensor does the DADU (a) stay in Fill Mode and continue to fill or (b) advance to Add Granules Mode and continue to fill?
- (a) Stays in Fill Mode and continues to fill – Go to step 3.15
 - (b) Advances to Add Granules Mode and continues to fill – Go to step 3.16
- 3.15 With water above the Mid-Level Sensor and the power ON, open the Control Console and measure the DC voltage between pins 4 and 5 (white and black wires) of the DBJ5 connector of the Control Board. *See Figure 6 page V-2.* Is there approximately 12 VDC?
- Yes – Change the Control Board and software.
 - No – Clean or change the Mid-Level Sensor.

- 3.16 While in Add Granules Mode (LED on – not flashing) unplug the FILL cable from the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the FILL connector. *See Figure 7 above.* Is there 120 VAC?
- Yes – Change the Control Board and software.
No – Verify that the incoming water pressure does not exceed 60 psi or change the Fill Valve.
- 3.17 When the water reaches the Final Fill Sensor does the DADU: (a) stay in Final Fill Mode and continue to fill or (b) advance to Homogenize Mode and continue to fill?
- (a) Stays in Final Fill Mode and continues to fill – Go to step 3.18
(b) Advances to Homogenize Mode and continues to fill – 3.19
- 3.18 With water touching the Final Fill Sensor and the power ON, open the Control Console and measure the DC voltage between pins 1 and 2 (black and white wires) of the DBJ5 connector on the Control Board. *See Figure 6 on page V-2.* Is there approximately 12 VDC?
- Yes – Change the Control Board and software
No – Clean or change the Final Fill Sensor (*see the Final Fill Sensor Replacement Procedure page VI-2*)
- 3.19 While in Homogenize Mode, unplug the FILL cable from Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the FILL connector. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Change the Control Board and software.
No – Verify that the incoming water pressure does not exceed 60 psi or change the Fill Valve.

DRAIN PROBLEMS

- 4.0 Is the Drain Valve: (a) leaking or (b) not opening?
- (a) Drain Valve leaks – Go to step 4.1
 - (b) Drain Valve does not open – Go to step 4.4
- 4.1 While in Cycle Complete Mode (LED on – not flashing) of either Rinse or Dissolution Cycle, wait 10 seconds for the Drain Valve to fully open and reset itself. Start the Fill Mode (LED on – not flashing) in Rinse Cycle. Does the Drain Valve continue to leak?
- Yes – Go to step 4.2
 - No – Drain Valve was misaligned. To prevent future occurrences always wait at least 10 seconds between all Steps, Modes and Cycles.
- 4.2 Turn OFF the Water Inlet valve. Start the Rinse Cycle – Fill LED on – not flashing. Unplug the DRAIN cable from the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the DRAIN connector. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Change the Control Board and software.
 - No – Go to step 4.3
- 4.3 While still in Fill Mode (LED on – not flashing) of the Rinse Cycle (DRAIN cable is unplugged) measure the AC voltage between pins 1 and 4 (outer two pins) of the DRAIN connector. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Change the Drain Valve.
 - No – Change the Control Board and software.
- 4.4 While in Cycle Complete Mode (LED on – not flashing) of either Rinse or Dissolution Cycle, unplug the DRAIN cable from the Control Console. Measure the AC voltage between pins 1 and 4 (outer two pins) of the DRAIN connector. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Change the Control Board and software
 - No – Go to step 4.5
- 4.5 While in Cycle Complete Mode (LED on) of either Rinse or Dissolution Cycle (DRAIN cable unplugged). Measure the AC voltage between pins 1 and 2 (two pins on right) of the DRAIN connector. *See Figure 7 above.* Is there 120 VAC?
- Yes – Change the Drain Valve.
 - No – Change the Control Board and software

TRANSFER PROBLEMS

- 5.0 During Transfer Mode, does it (a) stay in Transfer Mode or (b) advance to Cycle Complete Mode?
- (a) Stays in Transfer Mode – Go to step 5.1
 - (b) Advances to Cycle Complete Mode – Go to step 5.6
- 5.1 During Transfer Mode (LED on – not flashing) is there any water from the Spray Ball?
- Yes – Go to step 5.2
 - No – Go to step 5.4
- 5.2 While in Transfer Mode (LED on – not flashing) unplug the TRANSFER/SPRAY cable from the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the TRANSFER/SPRAY connector. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Change the Control Board and software
 - No – Go to step 5.3
- 5.3 While in Transfer Mode (LED on – not flashing) unplug the TRANSFER/SPRAY cable from the Control Console. Measure the AC voltage between pins 1 and 4 (outer two pins) of the TRANSFER/SPRAY connector. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Change the Transfer Valve
 - No – Change the Control Board and software
- 5.4 While in Transfer Mode (LED on – not flashing) do you hear the Pump running? (*Note: If dry acid concentrate is in Dissolution Tank manually transfer it using some other type of pump.*)
- Yes – Go to step 5.5
 - No –PUMP NOT RUNNING step 1.0
- 5.5 Unplug the PUMP cable from the Control Console. This ensures the Pump does not run while dry. Remove the Transfer Valve, but keep the wiring connected. While in Transfer Mode (LED on – not flashing), when looking in the Transfer Valve is there an open fluid path between the Pump and the transfer line (the Transfer Valve openings at the top and toward the front of the DADU)?
- Yes – Check the Pump-head for debris (plastic bags, tie wraps, rubber gloves, etc...) or change the Pump.
 - No - Change the Transfer Valve.
- 5.6 *Note: To prevent the Drain Valve from **not** fully closing (internally leaking), always wait at least 10 seconds at Cycle Complete Mode for the Drain Valve to fully open **before** going to any other Mode or Cycle. If the Drain Valve is leaking (not fully closed), it needs to be reset. Slowly step to the Cycle Complete Mode. This will allow the Drain Valve to fully open, thus reset itself. Go to step 5.7.*

5.7 Change the filter then restart Transfer Mode. Does the DADU still advance to Cycle Complete Mode?

Yes – Go to step 5.8

No – Problem solved

5.8 *(Note: If dry acid concentrate is in Dissolution Tank manually transfer it using some other type of pump.)*
Swap the 25 Gallon Sensor and the Pump Dry Sensor cables on the Control Console. *See Figure 7 – page V-2.*
Start the Rinse Cycle – Fill (LED on – not flashing). When the water reaches the 25 Gallon Sensor does the DADU (a) advance to Recirculate Mode or (b) stay in Fill Mode and fill above the 25 Gallon Sensor?

(a) Advance to Recirculate Mode – Check the Pump-head for debris (plastic bags, tie wraps, rubber gloves, etc...) or change the Pump.

(b) Stays in Fill Mode – Change the Pump Dry Sensor. *(The device currently plugged into the 25 Gallon Sensor connector.)*

POWER PROBLEMS

- 6.0 With the Power Switch ON, does the DADU (a) trip the circuit breaker/GFI or (b) have no power at all?
- (a) Trips circuit breaker/GFI – Go to step 6.1
 - (b) No power – Go to step 6.4
- 6.1 With Power Switch OFF, unplug the DRAIN, FILL and TRANSFER/SPRAY cables from the Control Console. *See Figure 7 on page V-2.* Turn the Power Switch ON. Does it trip the circuit breaker/GFI?
- Yes – Go to step 6.2 – Reconnect the DRAIN, FILL AND TRANSFER cables to the Control Console.
 - No – With Power Switch OFF, plug the Drain Valve cable into Control Console, turn power ON.
Does it trip the circuit breaker/GFI?
 - Yes – Replace Drain Valve
 - No – Repeat the same process for Fill and Transfer valves. Replace Fill or Transfer Valve as indicated.
- 6.2 Unplug the PUMP and MIX cables from the Control Console. *See Figure 7 on page V-2.* Turn Power Switch ON. Does the circuit breaker/GFI still trip?
- Yes – Go to step 6.3 – Reconnect the Pump and Mix Motor cables to the Control Console.
 - No – With Power Switch OFF, plug the PUMP cable into Control Console, turn power ON. Does it still trip the circuit breaker/GFI?
 - Yes – Replace Pump or Pump Cable
 - No – Replace Mix Motor or Mix Cable
- 6.3 With Power Switch OFF, open the Control Console. Disconnect DBJ2 from the Control Board (*see Figure 6 on page V-2 –pull straight down on connector*). Turn Power Switch ON. Does the circuit breaker still trip?
- Yes – Change the Pump Relay
 - No – Change the Mix Relay
- 6.4 Unplug the POWER cable from the Control Console. Measure the AC voltage between pins 1 and 2 (two pins on right) of the POWER cable. *See Figure 7 on page V-2.* Is there 120 VAC?
- Yes – Go to step 6.5 – Plug the POWER cable in to the Control Console
 - No – Go to step 6.9
- 6.5 Open the Control Console. Measure the AC voltage between the Control Board DBJ4 connector pin 8 (black wire) and the neutral (white wire) Barrier Strip. *See Figure 6 on page V-2.* Is there 120 VAC?
- Yes – Go to step 6.6
 - No – Go to step 6.8
- 6.6 Measure the DC voltage between pin 6 (black wire) and pin 7 (two red wires) of the DBJ4 connector. *See Figure 6 on page V-2.* Is there 12 VDC?
- Yes – Change the Control Board and software
 - No – Go to step 6.7

6.7 On the Power Board measure the AC voltage between: E1 and E3 = 24 VAC & E1 and E5 = 12 VAC. Are both voltages present?

Yes – Change the Power Board

No – Check the F1 fuse or change the 24V Transformer

6.8 Measure the AC voltage between the hot (black wires) Barrier Strip and neutral (white wires) Barrier Strip. Is there 120 VAC?

Yes – Check for open connections between the Hot Barrier Strip and the Control Board.

No – Check for open connections between both Barrier Strips and the POWER connector on the back of the Control Console.

6.9 With the DADU unplugged from the wall, remove the two bottom wires (black and white) from the Power Switch. Plug Power Cord into the wall and measure the AC voltage between these two wires. **CAUTION:** *Be very careful not to touch the exposed black and white wires or allow them to touch each other.* Is there 120 VAC?

Yes – Change the Power Switch

No – Change the Power Cord

SECTION VI - COMPONENT REPLACEMENT

	Page
Final Fill Sensor.....	VI-2
Mixer Motor.....	VI-4
Pump.....	VI-5

FINAL FILL SENSOR REPLACEMENT PROCEDURE

1. PURPOSE:

The purpose of these instructions is to define the process of replacing and verifying the Final Fill Sensor on the Dry Acid Dissolution Unit (DADU).

Note: Carefully read and understand all instructions prior to beginning.

2. TOOLS REQUIRED:

Flat Head Screw Driver	Phillips Head Screw Driver
Large Adjustable Wrench	Ruler or Measuring Tape
Hydrometer	Hydrometer Jar

3. PARTS REQUIRED:

Final Fill Sensor – P/N 150440

4. PROCEDURE:

1. Initiate and complete a Rinse Cycle prior to implementing this procedure.
2. Measure and record the distance from the bottom of the Final Fill Sensor housing to the top of the Dissolution Tank (interior). Accurate measurement is crucial. For accurate measurement, make sure the tape measure/ruler does not rest on the lower-jam-nut. The lower-jam-nut is inside the Dissolution Tank. Measurement should be accurate to at least 1/16 of an inch. *See Figures 10 & 11.*

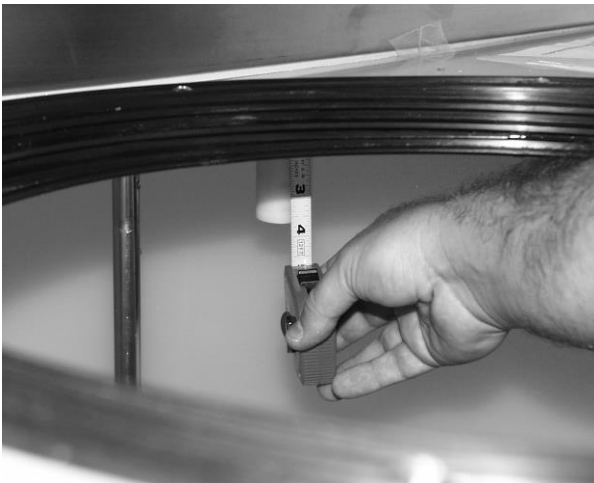


Figure 10

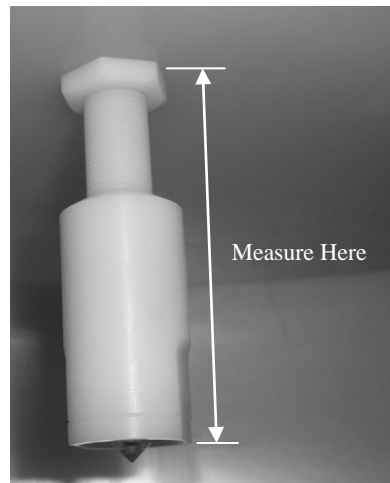


Figure 11

3. To remove end-cover and end-plate from the top-cover assembly, remove the four ½ inch nylon-plugs from the top-cover assembly and unscrew all four screws. (See Figure 12) Lift and twist Mixer Motor and top-cover assembly to allow room to install new Final Fill Sensor. (See Figure 13)

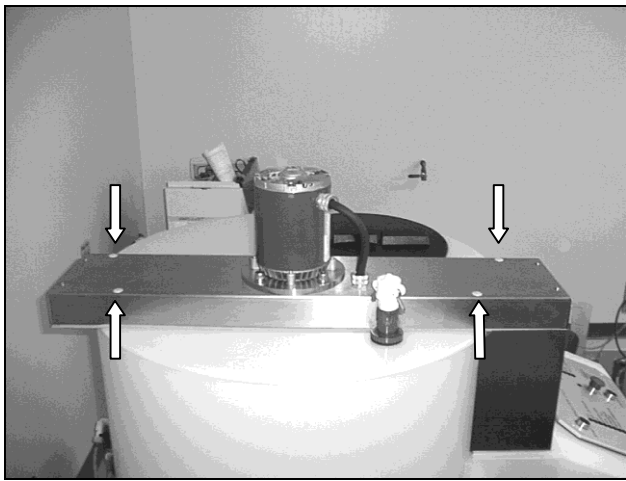


Figure 12. Location of the nylon-plugs. Underneath the nylon-plugs are the Philips-head screws that must be removed.

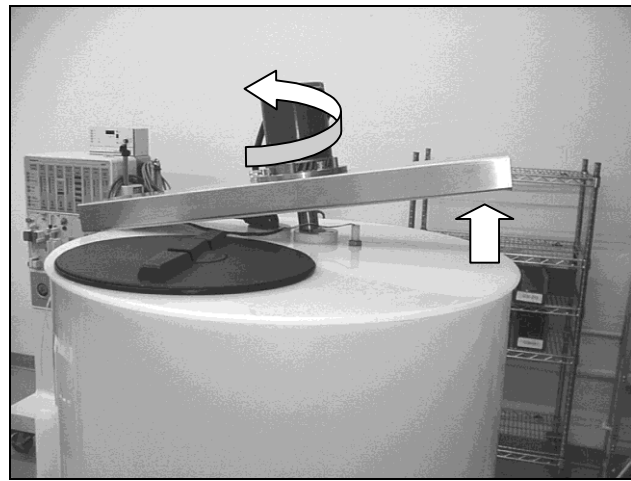


Figure 13. After the removal of the end-plate and the end-cover, lift and wiggle until the top-cover and Mixer Motor assembly lifts up, then twist cover until it lies sideways across the unit.

4. Unplug the Final Fill Sensor from the wiring harness and remove it by unscrewing the upper-jam-nut and gently lower sensor into the Dissolution Tank.
5. Adjust the lower-jam-nut on the new Final Fill Sensor (to closely match the position of the lower-jam-nut on the old Final Fill Sensor) and install in the Dissolution Tank.
6. Adjust the Final Fill Sensor until the distance from the bottom of the sensor housing to the top of the Dissolution Tank (interior) matches what was recorded in step 2.

Note: If unsure of the exact distance between the bottom of the sensor housing and the top of the Dissolution Tank (interior), it is better to have the Final Fill Sensor too low than too high.

7. Plug in the new Final Fill Sensor and reassemble the Dissolution Tank.
8. Rinse the DADU, then mix a batch of dry acid concentrate and check the specific gravity. If the specific gravity is too high, raise the Final Fill Sensor 1 ½ turns and remix the batch.
9. When the specific gravity is within specified limits for the dry acid concentrate being used, send a sample to the lab using the “Batch Analysis Form” (see Operator’s Manual PN 460018).

MIXER MOTOR REPLACEMENT PROCEDURE

1. PURPOSE

The purpose of these instructions is to define the process of replacing the Mixer Motor on the Dry Acid Dissolution Unit (DADU).

2. TOOLS REQUIRED

3/32 Allen Wrench	7/32 Allen Wrench
Flat Head Screw Driver	Slip-joint Pliers

3. PARTS REQUIRED

Mixer Motor – P/N 160075

4. PROCEDURE

1. Unplug the DADU and remove the inspection plate from the top of the Mixer Motor.
2. Disconnect the black, white and green wires from Mixer Motor. *See Figure 14.* Unscrew strain relief and pull the wires out so they are no longer connected to the Mixer Motor.

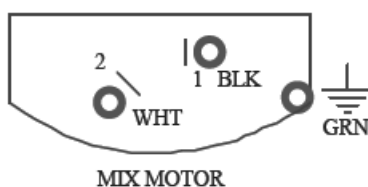


Figure 14

3. Remove the four hex-head bolts that secure the Mixer Motor assembly to the stainless steel base.
4. Raise the Mixer Motor assembly and support it. *Note: two 2x6 blocks of wood work well.*
5. Remove the four hex-head screws that hold the mounting-plate to the Mixer Motor. The Mixer Motor is now free from the mounting-plate.
6. Separate the Mixer Motor from mounting-plate to expose the motor-shaft-coupler.
7. Remove the three lower set screws from the motor-shaft-coupler and remove the Mixer Motor Shaft Assembly. The Mixer Motor can now be removed from the DADU.
8. Remove the top three set screws from the motor-shaft-coupler. Completely remove the motor-shaft-coupler from the Mixer Motor.
9. Insert the Mixer Motor Shaft Assembly through the mounting-plate. Attach the Mixer Motor Shaft Assembly into one end of the motor-shaft-coupler, and then attach the other end of the motor-shaft-coupler to the new Mixer Motor.
Note: Leave 1/8" gap between Mixer Motor and motor-shaft-coupler; do not put set screws into the groove of the motor shaft, secure it to shaft proper.
10. Lower Mixer Motor back onto the mounting-plate and set that assembly on the blocks and secure with the four hex-head screws.
11. Lower Mixer Motor assembly back into position and secure with the four hex-head bolts on to the stainless steel base.
12. Thread the power cable through the strain relief, attach the black, white and green wires to the motor, install and secure the inspection plate. *See Figure 14.*

To test: Begin a Rinse Cycle. When the water level gets to the 25 Gallon Sensor it will advance to Recirculate Mode, the Mixer Motor turns in Recirculate Mode.

PUMP REPLACEMENT PROCEDURE

1. PURPOSE

The purpose of these instructions is to define the process of replacing the Pump on the Dry Acid Dissolution Unit (DADU) and verify correct operation.

2. TOOLS REQUIRED

Adjustable Wrenches	Slip-joint Pliers
Teflon Tape	Flat Head Screwdriver
Absorbent Towels	

3. PARTS REQUIRED

Pump – P/N 160127

4. PROCEDURE

1. Verify that the Dissolution Tank is empty and the DADU is unplugged. Have absorbent towels available to dry up leaks.
2. The input and output of the Pump-head are secured by unions. Unscrew the input (horizontal) and output (vertical) unions of the Pump. Place towels down to absorb leaking fluid.
3. Remove the motor inspection plate.
4. Disconnect the three wires in the motor - black, white and green. Unscrew the strain relief and remove the cable. *See Figure 15.*

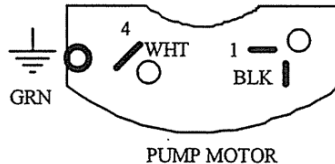


Figure 15.

5. Four bolts secure the Pump to the platform, remove them.
6. Remove both input and output fittings from the Pump-head.
7. Install both fittings on the new Pump-head. When reassembling the fittings all threaded connections require Teflon tape to prevent leaking.
8. Remove old Pump and put new one in its place.
9. Connect both input and output unions to the Pump-head.
10. Secure Pump with mounting bolts previously removed.
11. Insert the motor power cable through the strain relief; attach the black, white and green wires to the motor. *See Figure 15.*
12. Install inspection plate.

To test: Start a Rinse Cycle. When the water level reaches the 25 Gallon Sensor it will advance to Recirculate Mode, the Pump will turn on. Verify that water is coming out of Spray Ball and there are no leaks.

Note: It is recommended that the DADU be disinfected prior to making a batch of dry acid concentrate.