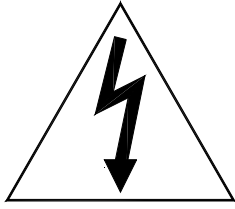


600 GPM EC System Operation Manual (AUTO VALVE)

US & WORLD WIDE PATENTS & PATENTS PENDING
POWELL WATER SYSTEMS, INC.
19331 East Tufts Circle
Centennial, CO 80015-5820
Tel: 303-627-0320 - Fax: 303-627-0116
E-mail: powellwater@powellwater.com
Web: www.powellwater.com

Engineered and Manufactured by:
Powell Water Manufacturing Corp.
1621 N. Spruce St. La Grande, OR. 97850
T-541-963-2410 / F-541-963-2435



ELECTRIC SHOCK CAN KILL, INJURE, AND CAUSE PROPERTY DAMAGE! To reduce the risk of electric shock and fire, ensure of properly fused and grounded connections.

WARNING

**THE BLADES THROUGH THE REACTION CHAMBER CARRY A HIGH VOLTAGE.
NEVER OPERATE THE MACHING WITH THE ENCLOSURES OPEN**

The electrocoagulation system must be tuned to the liquid to be treated. For best results an operator should be assigned to the unit who will care for the unit and monitor the liquid and process stream. The operator will observe over time the best blade material combination, polarity reversing settings, air purge timing, and the clean in place sequence.

When questions arise that are not covered in the manual please call the sales representative for assistance. If the sales representative is not available or cannot answer your question then call Powell Water Systems, Inc. or the manufacture for assistance. Please record the PO Number and Shop Order number from the nameplate on the electrical cabinet before you call. Those numbers will specifically identify the machine in question. The contact information is on the first page of this manual.

WARRANTY	4
INTRODUCTION	5
Design and Performance Parameters	5
Principal of Operation	5
SYSTEM OVERVIEW	6
Reaction Chamber	6
System Operation Overview	7
Electrical.....	8
<i>Main Power</i>	8
<i>Electrical Interface</i>	8
Remote Switching Devices	8
i. Normally Open (NO) Remote Switching Contacts	8
ii. Normally Closed (NC) Remote Switching Contacts	8
Plumbing.....	9
Fluid Preparation	10
Reaction Chamber Blades.....	11
Pneumatic	14
Air Purge	14
ELECTRICAL CABINET DOOR.....	175
PANEL VIEW TOUCH SCREEN.....	17
Start-up	17
Pre -Operation	17
Auto Controls Screen.....	20
Main Menu Screen.....	22
Manual EC System Operation Screen.....	23
Manual Influent Valve/Pump Controls Screen	24
Manual CIP Valve/Pump Control Screen	25
Alarm Status Screen.....	26
Timers Screen	27
System Pump Controls Screen.....	28
Overview Screen.....	29
Water Treatment	30
<i>Voltage</i>	30
<i>Amperage</i>	31
Cleaning the Blades	312
<i>Auto Clean-In-Place</i>	32
<i>Clean-In-Place (manual)</i>	33
SPARE PARTS.....	35
TROUBLESHOOTING.....	36
MAINTENANCE LOG.....	37
<i>Daily Record</i>	37
<i>Check List</i>	37
<i>Periodic record</i>	38
<i>Check List</i>	38
a. <i>Weekly</i>	38
a. <i>Monthly</i>	38
b. <i>Semiannually</i>	38
c. <i>Annually</i>	38
d. <i>As Required</i>	38
<i>Daily record</i>	39
<i>Monthly Periodic Record</i>	40
<i>Annual Periodic Record</i>	41
<i>Reaction Blade Replacement Schedule</i>	42

Warranty

The products are warranted to be free of defects in material and workmanship for a period of eighteen months from the date of shipment. The defective material or workmanship will be repaired or replaced at the point of manufacture, free of charge to the customer. This warranty does not cover defects arising from the incompatibility of third party equipment, damage or deterioration due to improper or excess use, misuse, abuse, negligence, accident, wear, and tear due to exposure, and covers only such products as have not been altered or modified in any respect (unless prior written approval has been given by Powell Water Systems, Inc.) and have been properly stored, installed, used, operated, and maintained. The warranty shall not apply to disposable items such as electrocoagulation blades, and normal pump wear and tear.

Powell Water Systems, Inc.'s exclusive liability and Customers exclusive remedy under this warranty shall be limited to (at Powell Water Systems, Inc. option) repair or replacement F.O.B. at the point of manufacture, of the defective products, or refunding of the purchase price to Customer, upon proof of defect satisfactory to Powell Water Systems, Inc., and the return of the Product in good condition to Powell Water Systems, Inc. Powell Water Systems, Inc shall have no further liability under any circumstances for damages of any kind, including lost profits, or exemplary damages, and whether in tort or contract, to Customer or Customer's employees, agents, subcontractors, invites, or any third parties, including but not limited to personal injuries and property damage resulting from use or handling of products. This warranty is expressed in lieu of all other warranties expressed or implied, including but not limited to any sample warranty or any implied warranty of merchantability or fitness for any particular purpose.

No warranties, whether expressed or implied, including the warranties of merchantability or fitness for a particular purpose, are made by any distributor or dealer of the product herein warranted, nor shall such dealer or distributor be liable for payment of any direct, consequential or incidental damages.

Introduction

Design and Performance Parameters

Electrocoagulation is a process that will remove a variety of contaminants from an aqueous waste stream and will tolerate surges and spikes of contaminants up to a point. However, all technologies have limits of effectiveness and require the responsible use of normal operating procedures and precautions to safeguard the welfare of the equipment.

It is necessary to avoid corrosive or abrasive material in the unit as this will cause premature wear on pumps, valves, or other wetted parts.

High concentrations of strong solvents must also be avoided, as these will dissolve seals, fittings, and the exterior finish of the unit. The Reaction Chamber life is shortened by the use of excessive power, corrosive materials, abrasive materials, and by not flushing the Chamber with clean water before leaving idle for extended periods of time.

Warranty replacement or repair items caused from improper operating procedures will be billed to the customer including parts, freight charges, labor, travel expenses, etc.

Principal of Operation

Electrocoagulation is the process of destabilizing suspended, emulsified, or dissolved contaminants in an aqueous medium by introducing an electrical current into the medium. The electrical current provides the electromotive force to drive the chemical reactions. When reactions are driven or forced, the elements or compound will approach the most stable state. Generally, this stable state is a solid that is less colloidal, less emulsifiable, or less soluble than the element or compound at equilibrium values. As this occurs the contaminants form hydrophobic entities such as precipitates or phase separations that can easily be removed by a number of secondary separation techniques.

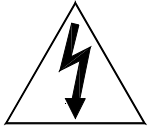
Reaction Chamber

The Reaction Chamber contains a series of metal blades placed parallel to each other. Typically, aluminum and steel blades are used in the process. The influent to be treated is introduced into the bottom of the chamber and dispersing it evenly as it moves upward through the blades. Direct Current (DC) is introduced into the chamber by attaching the positive (+) and negative (-) leads to the first and last terminal, located outside the chamber. The liquid then becomes a conductor, allowing the DC current to pass freely throughout the chamber. The metal blades react to the current by releasing charged metal ions into the influent at a rate of 0.20 pounds per 1,000 gallons. The flooding of electrons into the influent neutralizes charged particles, causing them to be pulled out of suspension. The metal ions tend to form metal oxides that electromechanically attract to the contaminants that have been destabilized. The Reaction Chamber includes an air purge system to keep debris from accumulating inside the chamber and polarity reversing is applied to extend blade life and prevent contaminants from coating the blades. The chamber may be divided into sub-chambers, (refer to the Reaction Chamber Blades section). This adjustment can be used to increase the amount of amperage passing through the liquid. The system should be operated with the least number of sub-chambers to reduce the electrical and blade consumption

System Operation Overview

The system pump will pull the influent from the Influent Supply Tank through the trash filter; (the screen is for protection of the equipment and not intended to remove large quantities of material. The incoming liquid should be screened to 1/32 of an inch before it reaches the electrocoagulation system.) The fluid will then be pumped up through the Reaction Chamber.

The System pumps and CIP pump of the Powell EC System is supplied by the customer at their request.



ELECTRIC SHOCK CAN KILL, INJURE, AND CAUSE PROPERTY DAMAGE! To reduce the risk of electric shock and fire, ensure of properly fused and grounded connections.

Electrical

Main Power

This system is designed to operate on a properly grounded, 3 \emptyset , 440-480 Volt, 50-60 Hertz, power source protected with a 2000 Amp Time-Delayed fuse or circuit breaker.

Electrical Interface

Communication is provided for additional devices (i.e. turbidity, PH, conductivity, etc.), supplied by customer.

Remote Switching Devices

Two inputs are provided which will monitor additional devices that may be desired or required by the operator

Normally Open (NO) Remote Switching Contacts

A normally open device, provided by the customer, will need to be terminated at terminals +24 & NO.

Normally Closed (NC) Remote Switching Contacts

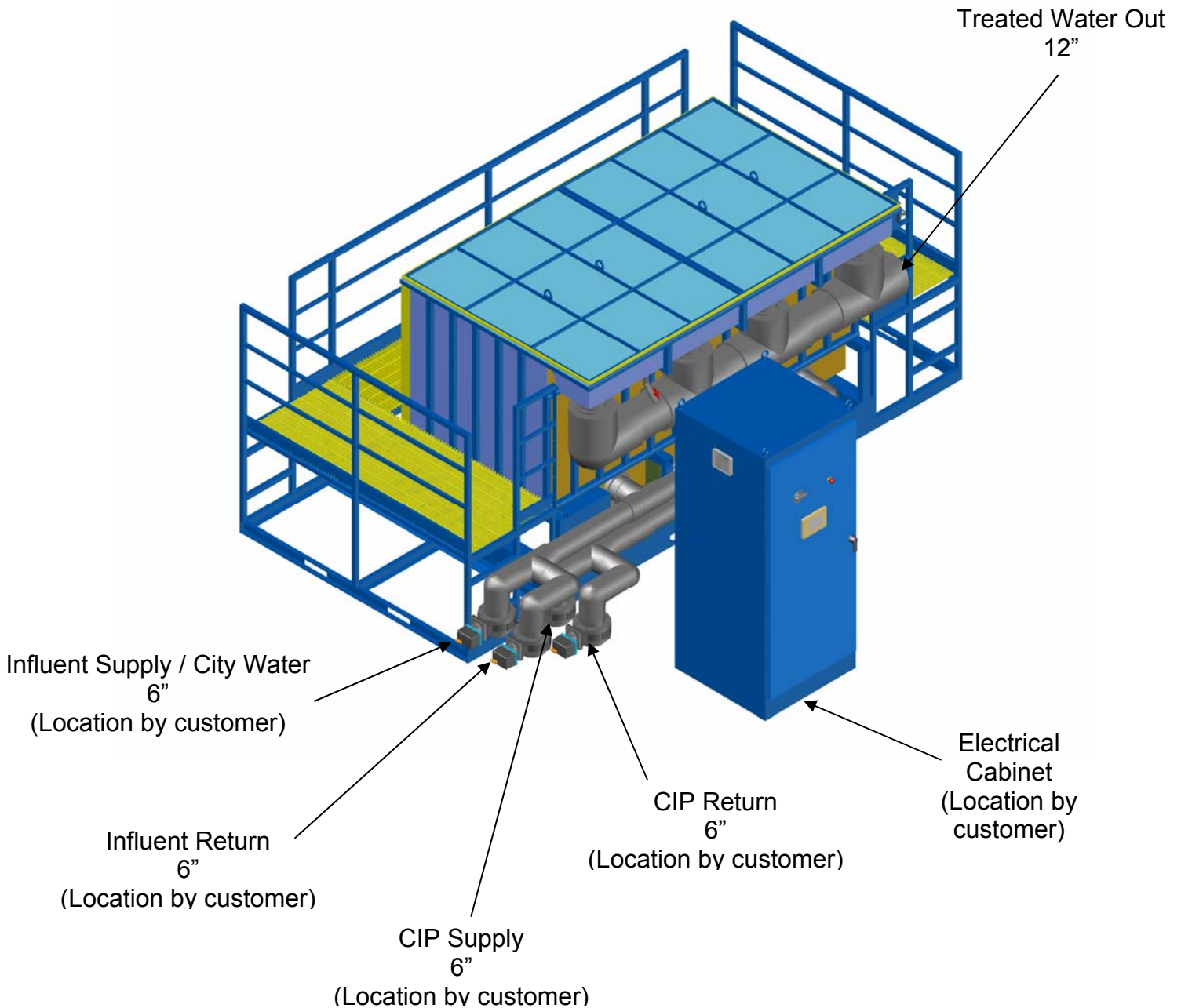
A normally closed device, provided by the customer, will need to be terminated at terminals +24 & NC.

NOTE: A temporary purple jumper is located between these terminals for proper operation and must be removed when the operators NC signal(s) are terminated.

Refer to the system schematic located in the back of the manual for additional information.

Plumbing

The plumbing from the influent source and city water (rinse water), to the Powell EC System is supplied by the customer. This includes any pumps, valves and piping attached to the plumbing supplied by Powell Water Systems Inc. The diagram below shows the proper assembly of piping to the Powell Water Systems Inc. 600 gpm system.



Fluid Preparation

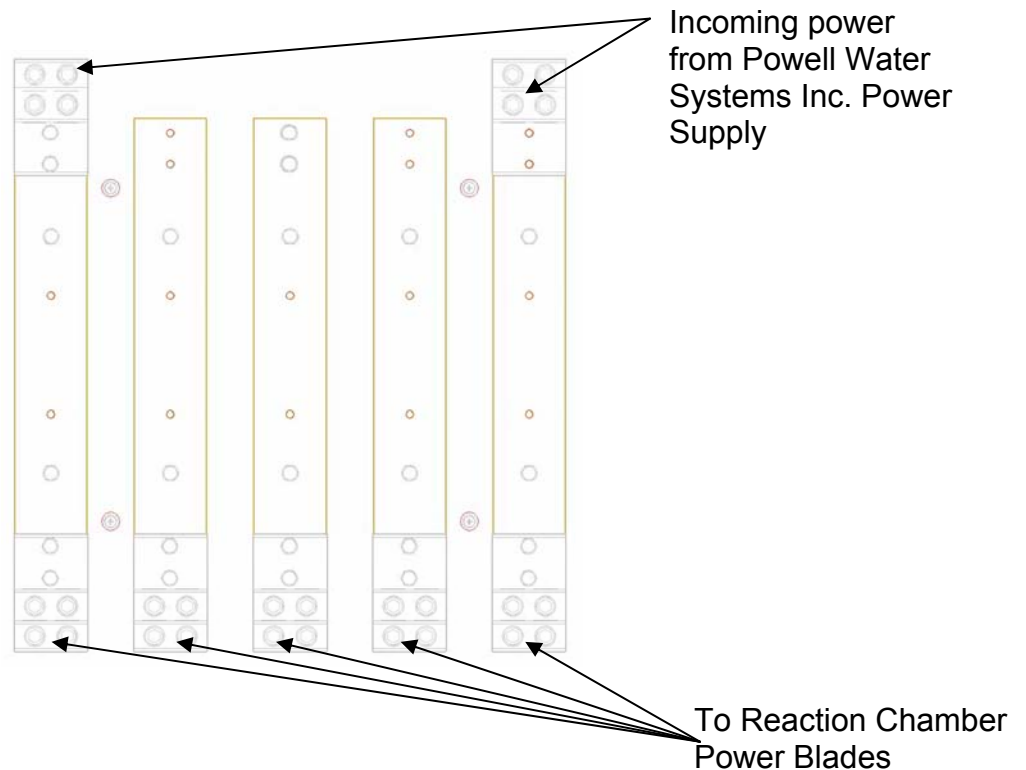
Influent fluid sometimes requires conditioning prior to electrocoagulation to optimize the removal of the contaminants for the trouble free operation of the unit. Many times it is possible to treat a liquid without any conditioning. Other times it may be possible to treat the liquid, but with difficulty or excessive power usage. There are 5 categories of pretreatment conditioning that may be required.

1. Waste streams with solids in excess of 1/32 inch or 1 mm can be prescreened cost effectively to reduce or eliminate the possibility of plugging. A protective screen should be placed on the inlet side of the pump to protect the equipment. This screen is not designed for the removal of oversize contaminants, but is only a safety device to prevent larger particles from entering the unit. If there are larger particles and the screen plugs frequently, a pre-screen should be installed for proper operation of the unit. Do not remove or modify the protective screen.
2. Waste streams with total solids in excess of 10,000 parts per million (PPM) may not treat well and may have to be diluted. It is suggested that the dilution water could be a portion of the treated water after the unit is in operation and clean treated water is available. Fresh dilution water may be required to start up the unit if solids are too high. Treated dilution water is generally more effective due to the residual charge which can pre treat the incoming contaminated water. Generally, waste streams with more than 50,000 PPM of total solids will not treat. The solids provide too much electrical resistive interference and simply absorb the electricity as resistance heat. This would be indicated by temperatures elevated more than 4 degrees Celsius from the inlet to discharge.
3. Temperatures in excess of 130 degrees Fahrenheit or 55 degrees Celsius should be cooled before entering the unit as the excessive temperature could cause damage to the unit or weaken parts causing a potentially dangerous problem.
4. The pH should be between 3 and 10 to prevent corrosive damage to parts of the unit. The pH may need to be adjusted to optimize the process. This will need to be determined by experimentation with the demo unit or if nuisance plugging occurs during normal operation of the unit.
5. Sometimes a processing aid may need to be added to the waste stream such as carbon or fly ash to absorb smaller particles or soluble organic compounds.

Reaction Chamber Blades

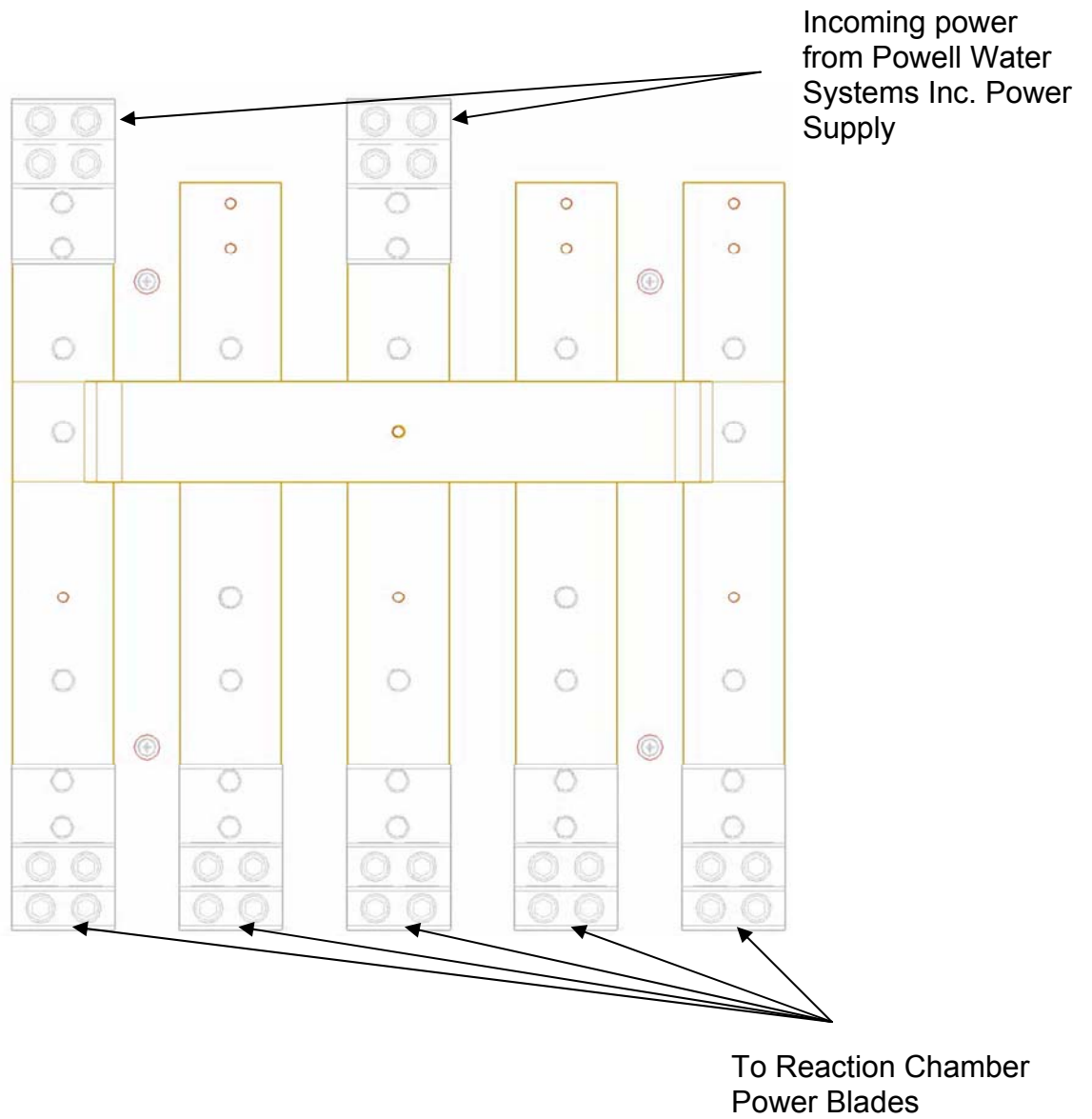
Once the unit is un-crated and placed in the final position, the Reaction Chamber blades will need to be attached to the power supply. In the Reaction Chamber there will be 5 power blades spaced equally in the blade guides. The 5 power blades with buss bar/wire lugs were installed at the factory.

The Reaction Chamber is designed to accept five power blades through the bottom of the chamber. The Reaction Chamber can be separated into 1, 2 or 4 chambers by adjusting to buss bar assembly located in the Powell Water Systems Inc. main electrical cabinet. The diagram below shows how to assemble the buss bars into each chamber configuration. Please note that the positive and negative Buss Bar's must alternate Power Blades within the Reaction Chamber.



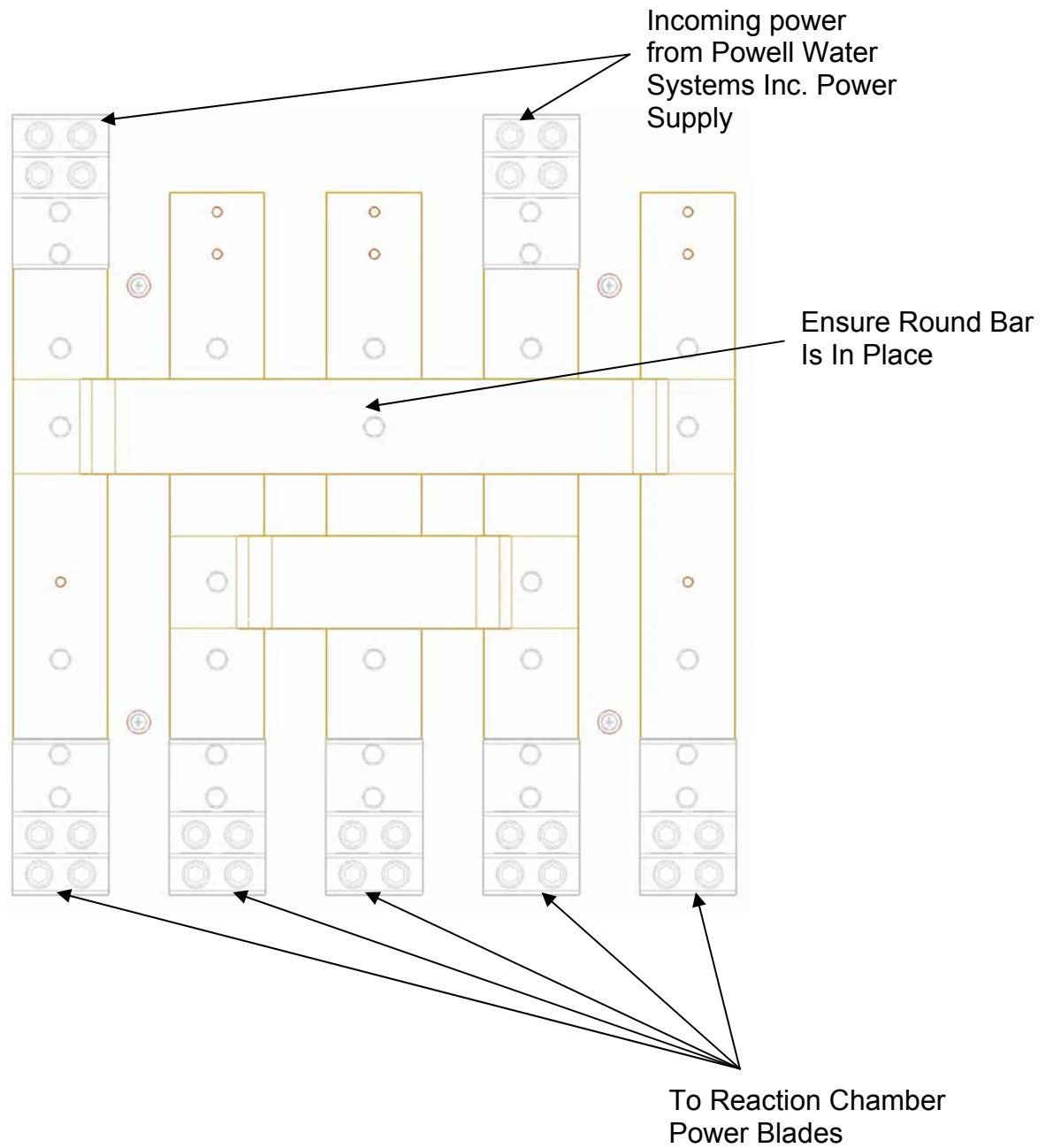
Single Chamber (First & Last)

When the number of sub-chambers within the Reaction Chamber is increased, the voltage between the blades is increased and the amperage in the fluid increases.



Two Chambers

When the number of sub-chambers within the Reaction Chamber is increased, the voltage between the blades is increased and the amperage in the fluid increases.

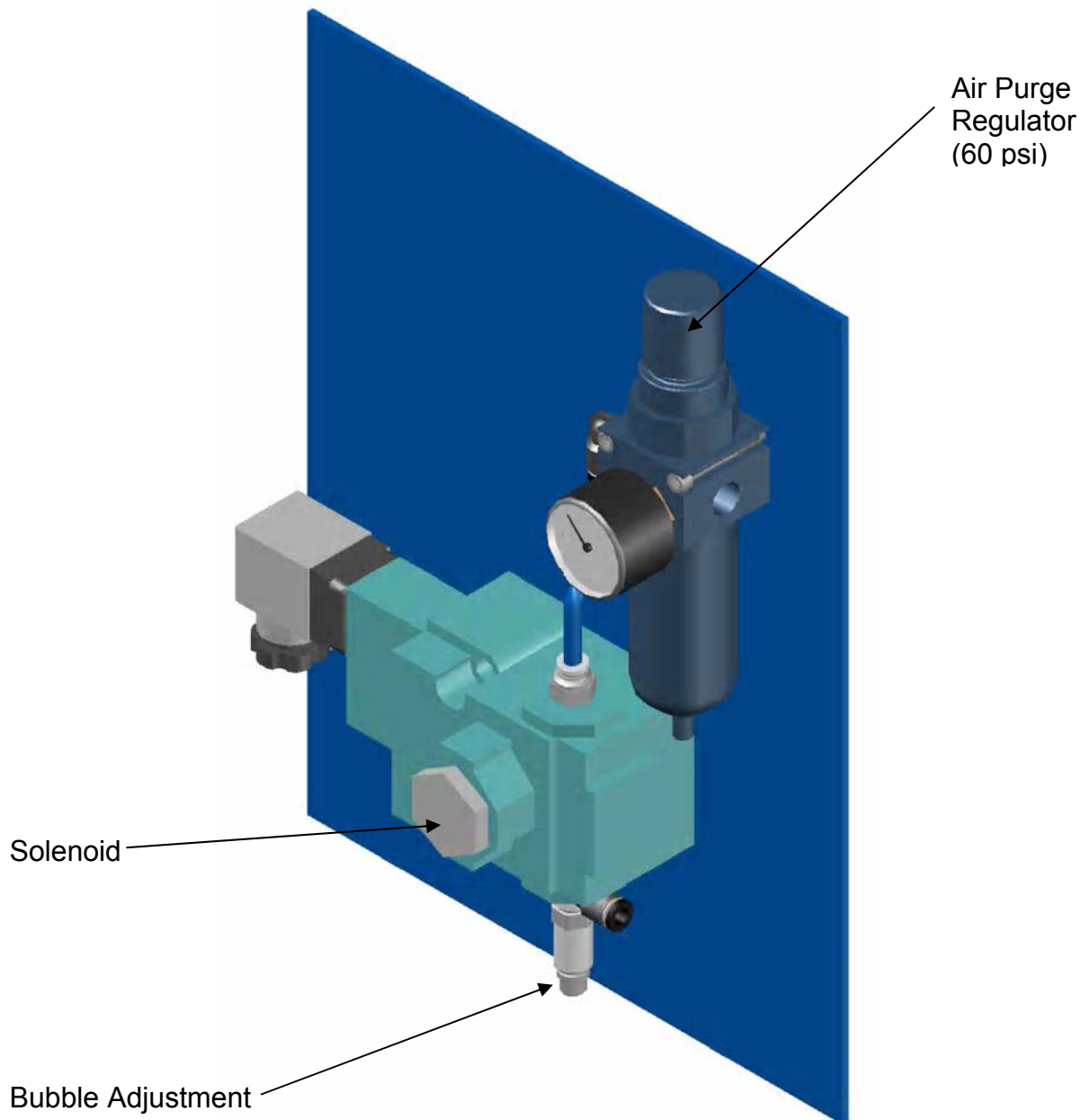


Four Chambers

When the number of sub-chambers within the Reaction Chamber is increased, the voltage between the blades is increased and the amperage in the fluid increases.

Pneumatic

A 60psi clean, dry source of air must be supplied to this equipment for proper operation. A 3/8" NPT regulator is located on the front side of the catwalk near the treated water outlet, for air hook-up.



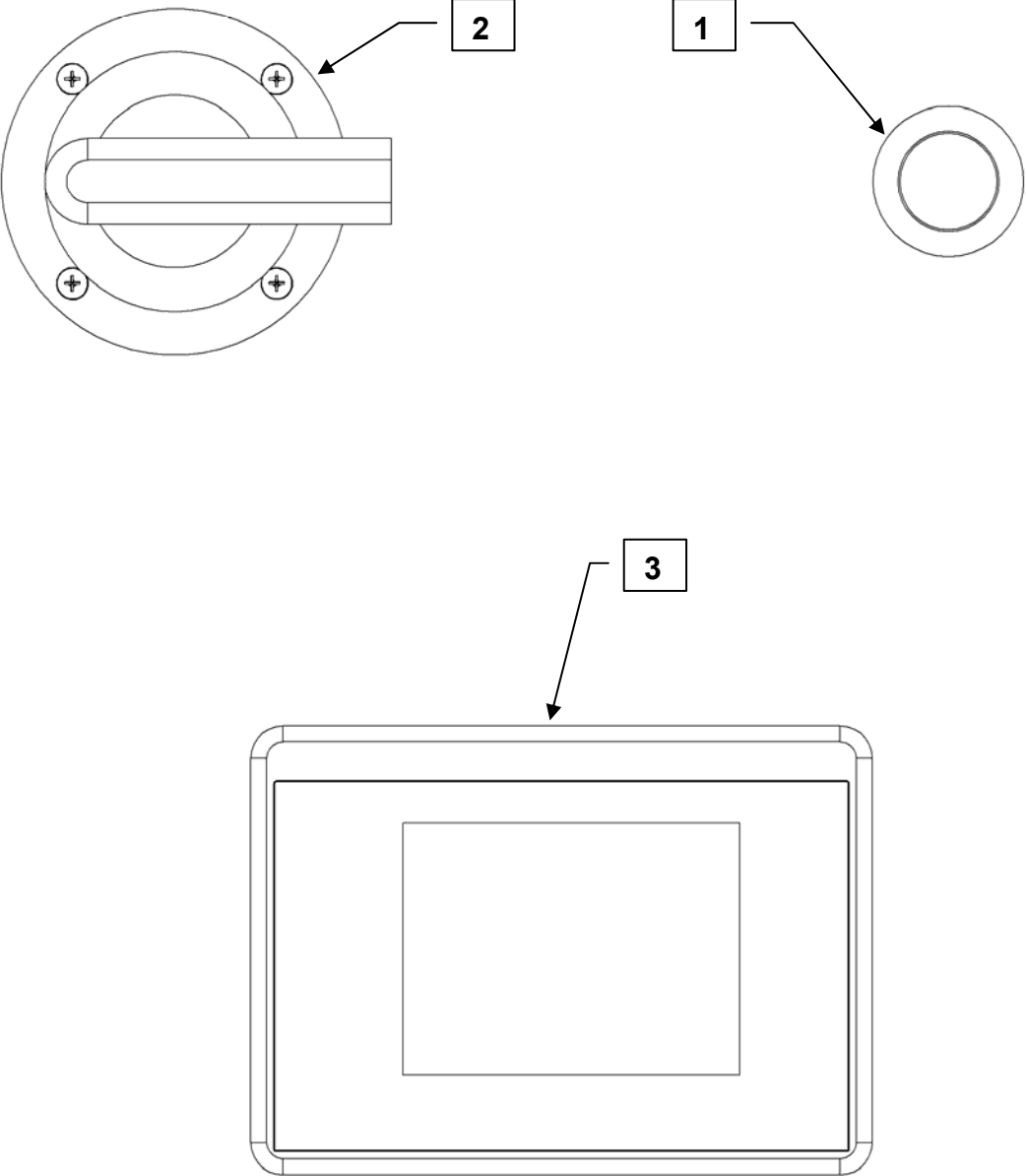
Air Purge

Air is introduced into the chamber to help prevent flock and/or build up on the blades. A regulator is provided to control the bubbles of the air purge.

Treated Water Discharge Side of Catwalk

(Smaller bubbles are better than bigger bubbles.)

Electrical Cabinet Door



Electrical Cabinet Door

Descriptions

- | | | |
|----|-------------------------|---|
| 1. | Emergency stop | When this button is pushed it shuts off all power to the EC system until it is pulled out for normal operation. |
| 1. | Disconnect Switch | The disconnect switch is used to control the power into the to the system. |
| 2. | Panel View Touch Screen | This touch screen is used to operate the Powell EC System. |

Panel View Touch Screen

Start Up

Once the system has been completely plumbed up, all chamber blades are in place and electrical power has been supplied to the Powell Water Systems Inc. unit, turn the Disconnect Switch (#2) to the “ON” position.

NOTE: The Emergency Stop button must be in the “OUT” position. If the Emergency Stop button is engaged:

1. Pull the Emergency Stop button “OUT”.
2. Move the Disconnect Switch to the “OFF” position then back to the “ON” position. This resets the main circuit breaker.

Pre-Operation

1. Touch the Panel View Screen and the Auto Controls (default screen) screen should be showing.
2. Press the Main Menu button.
(This shows the Main Menu Screen)
3. Press the Manual Influent System button.
(This shows the Manual Influent Valve/Pump Controls Screen)
4. Press the green **OPEN** button under the City Water Valve indicator.
(This opens the City Water Valve)
5. Press the green **ON** button under the System Pump indicator.
(This starts the system pump. Ensure that the pump has a flood suction supplied to it prior to starting)
6. Fill the Reaction Chamber until the water just covers the top of the Reaction Chamber Blades.
7. Press the red **OFF** button under the System Pump indicator.
(This stops the system pump)

THE SYSTEM PUMP MUST BE TURNED OFF PRIOR TO CLOSING THE CITY WATER VALVE TO PREVENT PUMP DAMAGE!

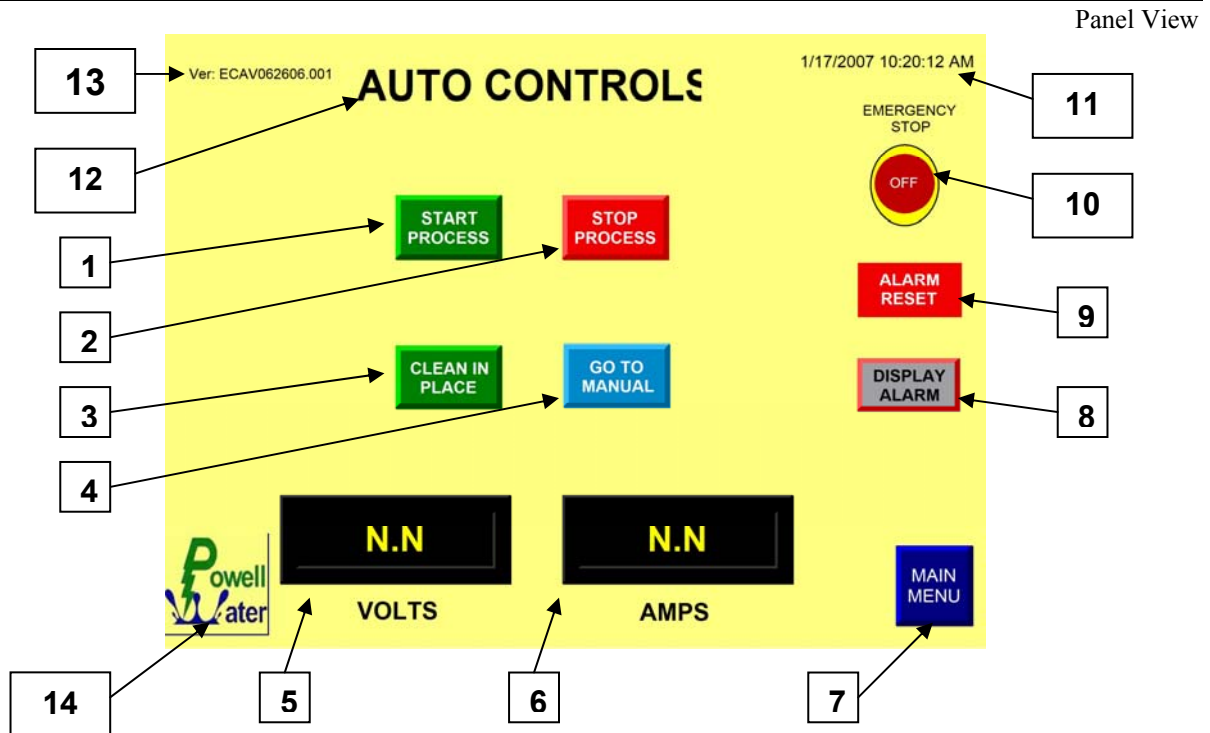
Pre-Operation

(continued)

8. Press the red **CLOSED** button under the City Water Valve indicator.
(This closes the City Water Valve)
9. Press the BACK button and return to the Main Menu Screen.
10. Press the SYSTEM PUMP CONTROLS button.
11. Select which pump is to be used. *(system pump or back up pump)*
12. Press the MAIN MENU button.
13. Press the AUTO CONTROLS button.
14. Press the green **START PROCESS** button to begin treating influent in the Auto Mode.

PANEL VIEW SCREENS

Auto Controls (Default Screen)



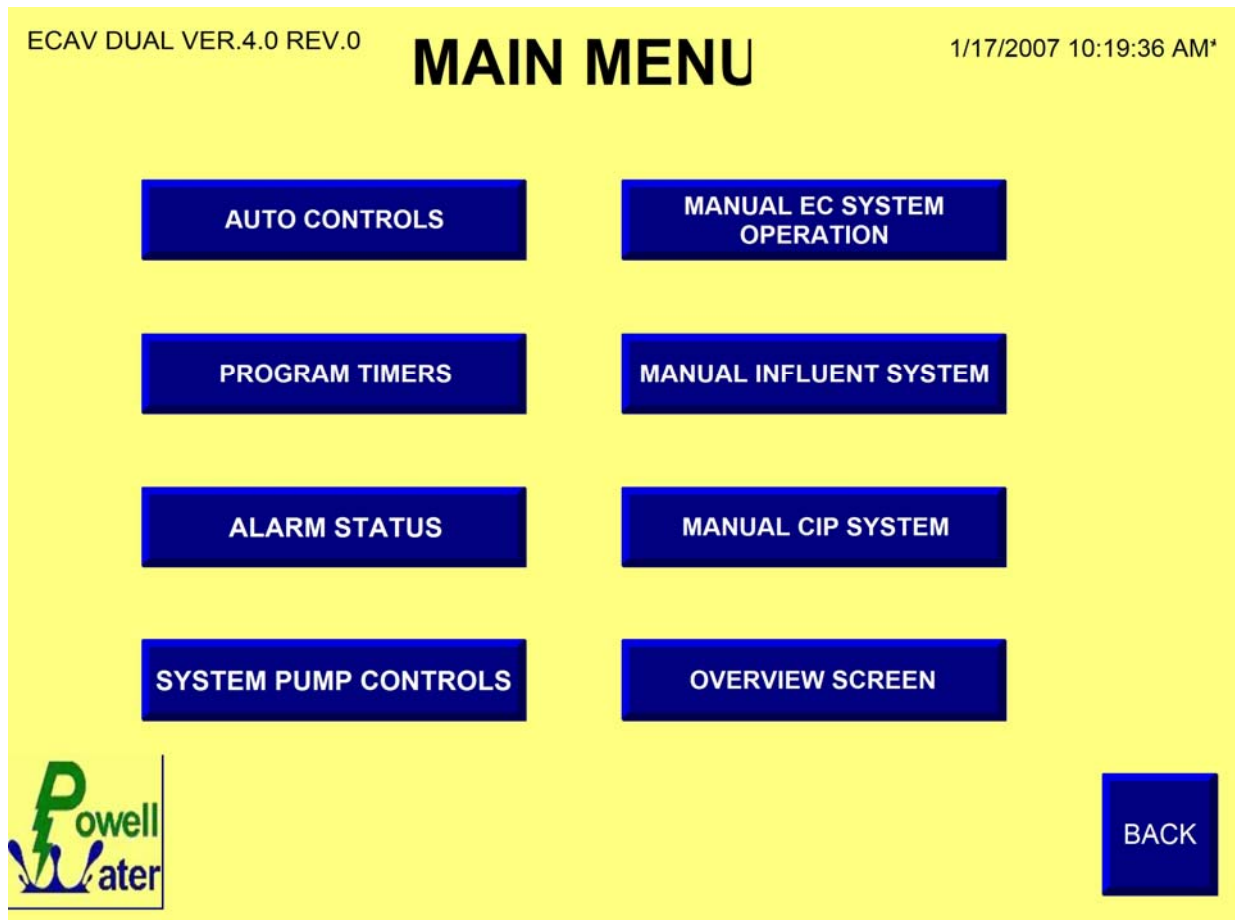
This screen allows the operator to run the Powell Water Systems Inc. EC unit in the Auto mode.

- | | | |
|----|----------------|---|
| 1. | Start Process | This green button opens the necessary valves, starts necessary pumps and starts the EC Process. |
| 2. | Stop Process | This red button stops all EC Processes, closes all automatic valves close, all pumps stop. |
| 3. | Clean in Place | This green button begins the Clean in Place process. |
| 4. | Go to Manual | This blue button places the Powell Water Systems Inc. unit into Manual Mode. |
| 5. | Volts | This display shows the DC voltage in the Reaction Chamber during normal operation.
<i>(diagram shows N.N this is for display purpose only)</i> |

Auto Controls (Default Screen)

Panel View (continued)

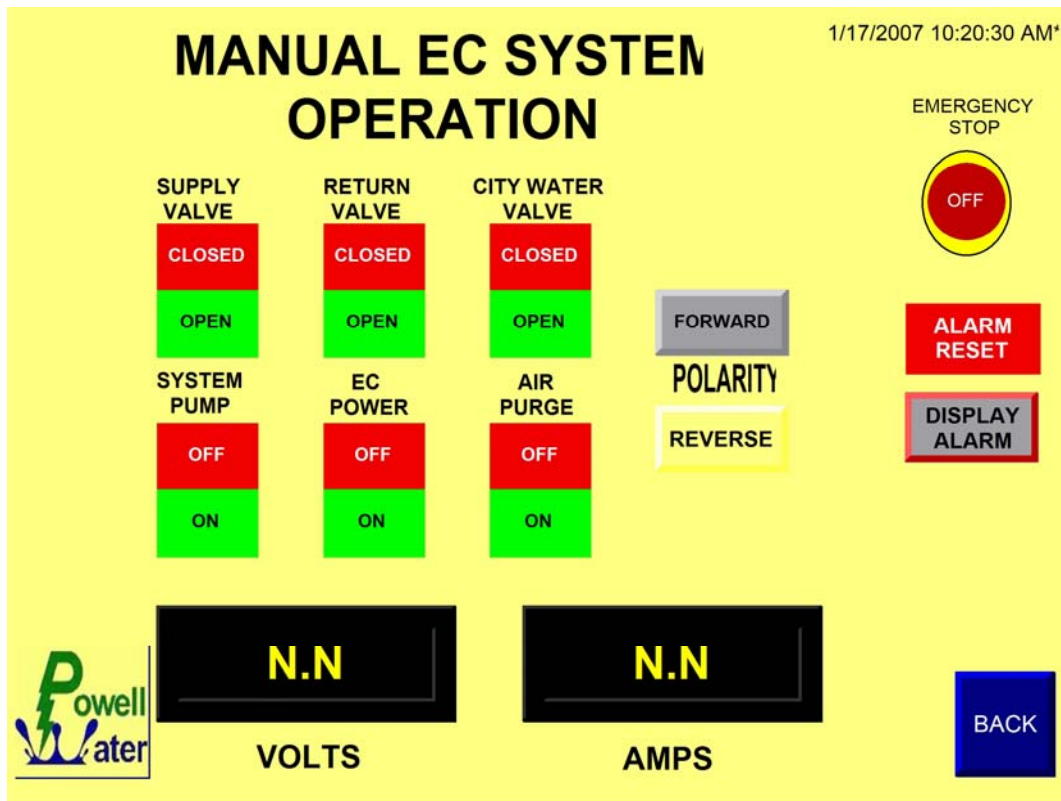
6. Amps
This display shows the DC amperage in the Reaction Chamber during normal operation. *(diagram shows N.N this is for display purpose only)*
7. Main Menu
This button takes you to the Main Menu Touch Screen.
8. Display Alarm
This button takes you to the Alarm Status Touch Screen.
9. Alarm Reset
This button resets all alarms.
10. Emergency Stop
This display flashes if the Emergency Stop button on the Main electrical cabinet has been activated. *(This display is on all Touch Screens)*
11. Date & Time
This display shows the current Date & Time. *(This display is on all Touch Screens)*
12. Screen Title
This display shows the current Screen Title. *(This display is on all Touch Screens)*
13. Version Title
This display shows the Version of Program and the date it was created. *(This display is on all Touch Screens)*
14. Powell Logo
This display is the Powell Water Systems Inc. logo. *(This display is on all Touch Screens)*



This screen allows you to go immediately to any of the Touch Screens.

Manual EC System Operation

Panel View (continued)

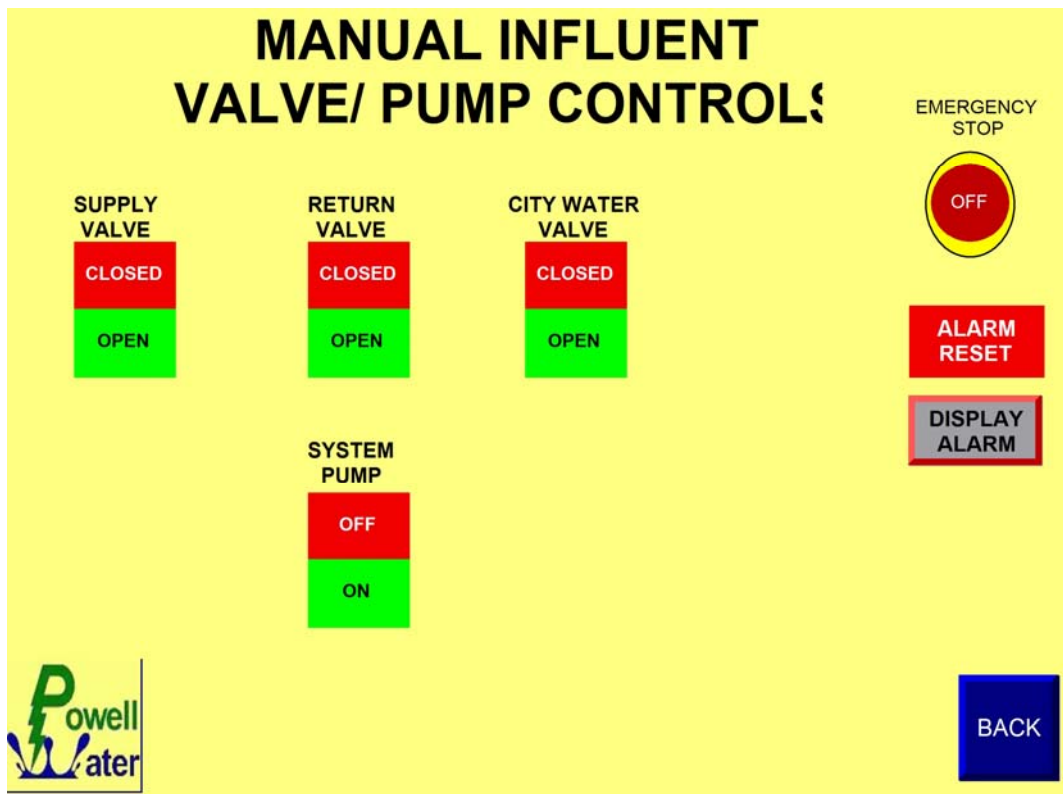


This screen allows the user to operate the Powell Water Systems Inc. unit in the Manual Mode of normal operation. Manual Clean in Place is operated from a separate Touch Screen. The VOLTS, AMPS, DISPLAY ALARM, ALARM RESET and the EMERGENCY STOP buttons and displays are explained in the Auto Controls section of this manual (page 17).

To open & close valves, turn on and off pumps, EC Power or Air Purge, forward or reverse Polarity, simply press the desired action on the Touch Screen.

Manual Influent Valve/Pump Controls

Panel View (continued)



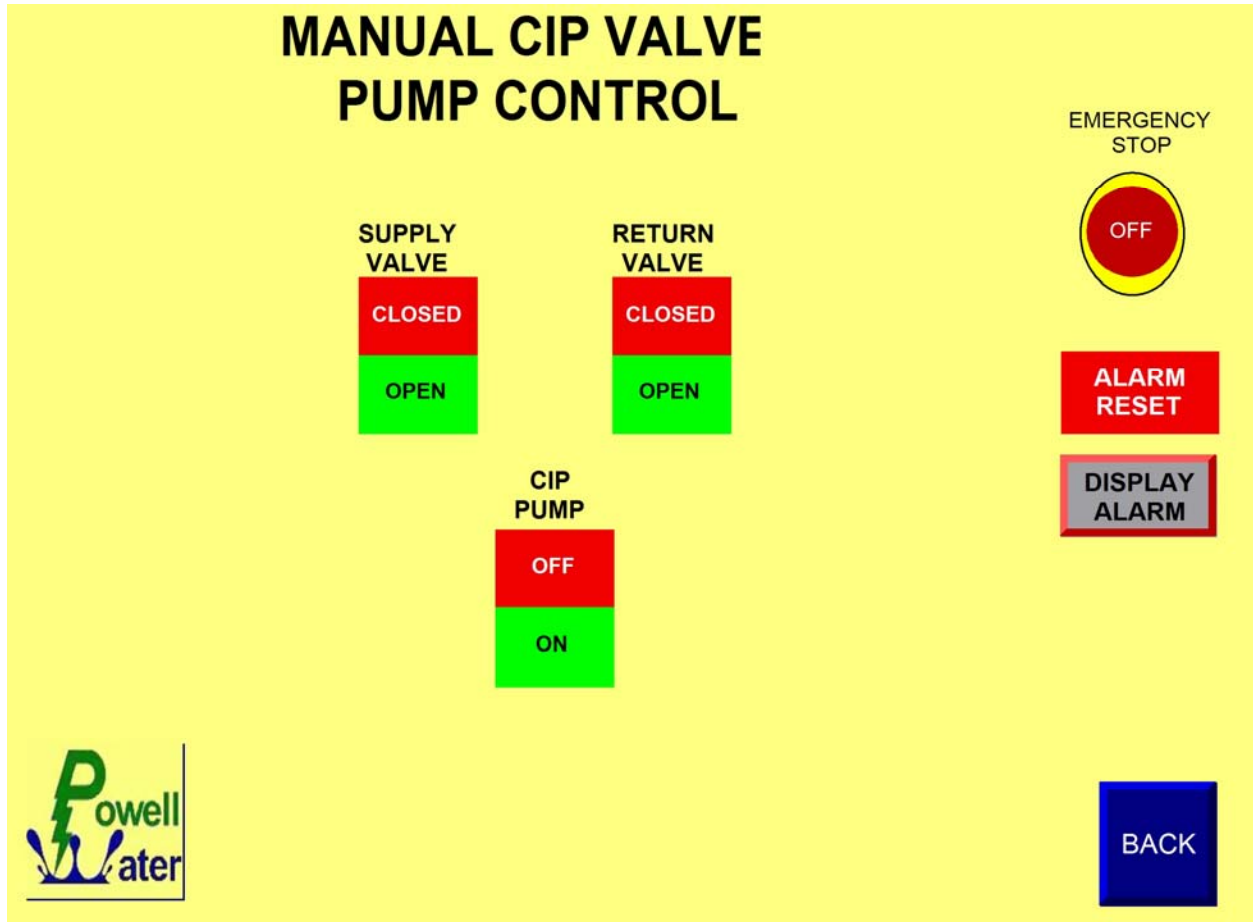
This screen allows the operator to fill and drain the Powell Water Systems Inc. unit. The Powell Water Systems Inc. Reaction Chamber **MUST** be filled with water prior to operation.

To open & close valves and/or turn on and off pumps simply press the desired action on the Touch Screen.

It is recommended that the Powell Water Systems Inc. Reaction Chamber be filled with City Water before EC process begins.

Manual CIP Valve/Pump Control

Panel View (continued)

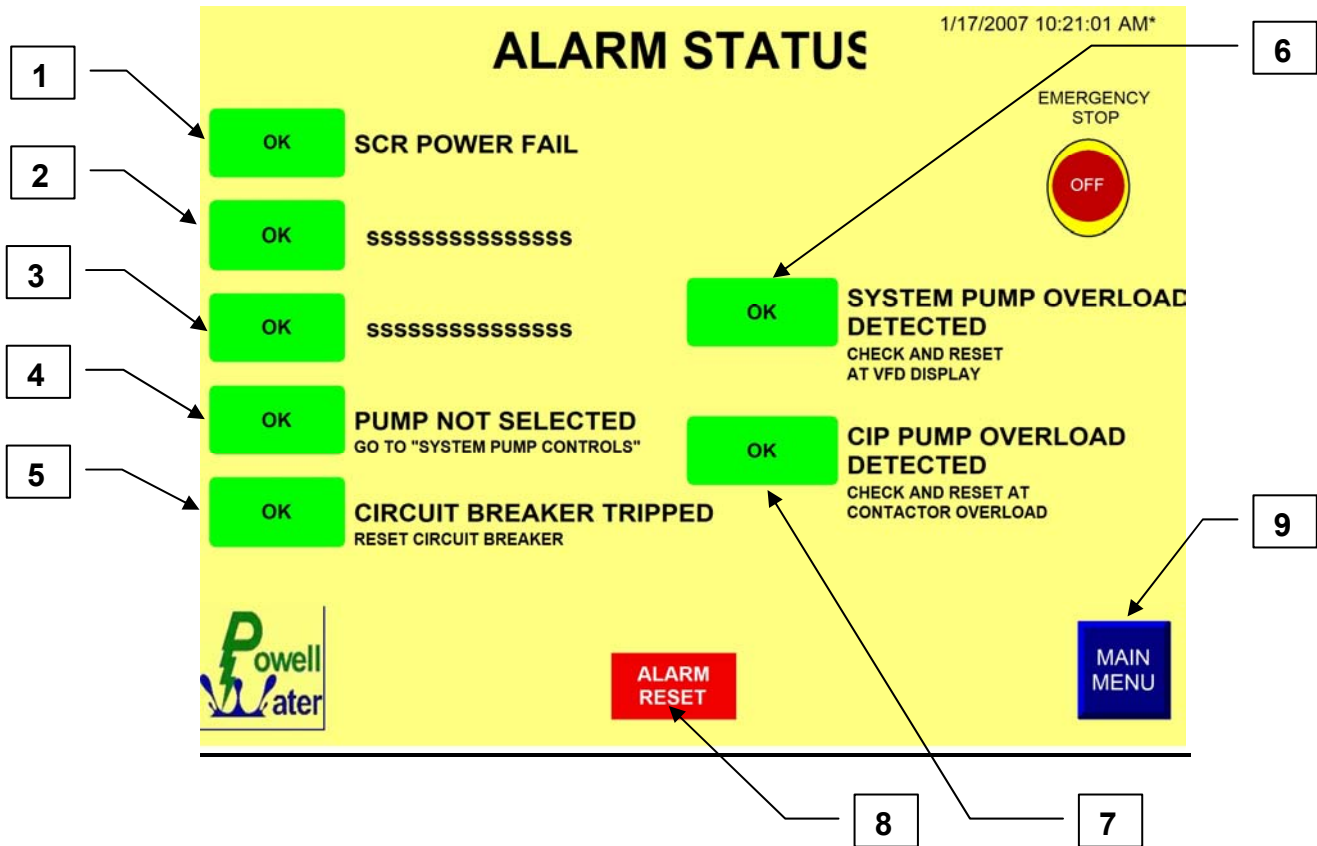


This screen allows the operator to run the Powell Water Systems Inc. EC unit in the Manual Clean in Place mode

To open & close valves and/or turn on and off pumps, simply press the desired action on the Touch Screen.

Alarm Status

Panel View (continued)

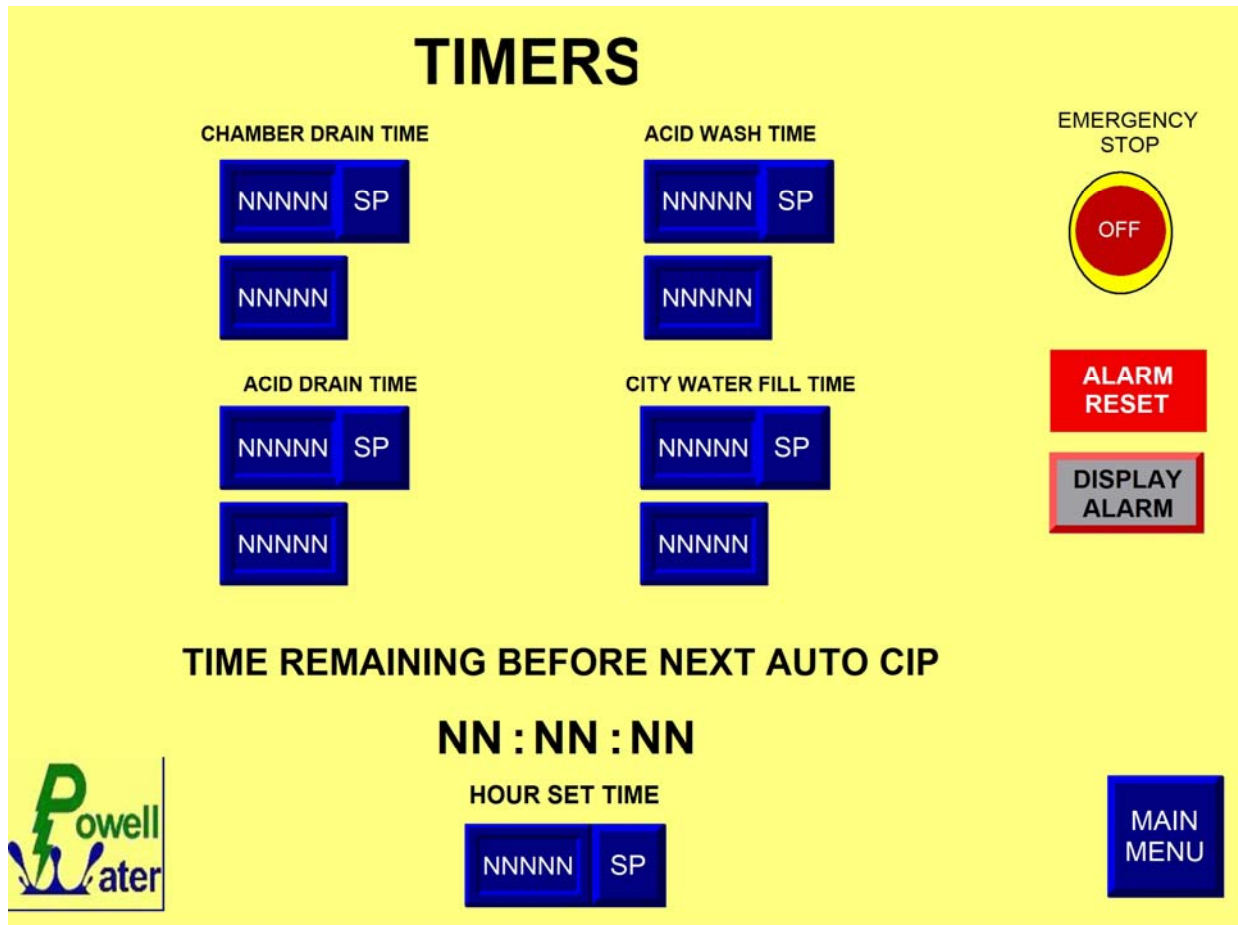


This screen allows the operator to see and reset the alarms.

- | | | |
|----|----------------|---|
| 1. | SCR Power Fail | This alarm indicates that there is a problem with the power supply to the Powell Water Systems Inc. Reaction Chamber. |
|----|----------------|---|

NOTE: Contact Powell Water Mfg as soon as possible for assistance with this problem.

- | | | |
|----------|-------------|--|
| 2 & 3 | SSSSSS | For Customer use |
| 4,5,6 &7 | | Follow instructions indicated as shown next to alarm. |
| 8. | Alarm Reset | If the problem that caused the alarm has been satisfied, this button resets the alarm. |
| 9. | Main Menu | This button returns the operator to the Main Menu Screen. |



This screen allows the operator to set various timers for the Powell Water Systems Inc. EC system. Above each timer is the description for the timer. Under each description are three (3) boxes.

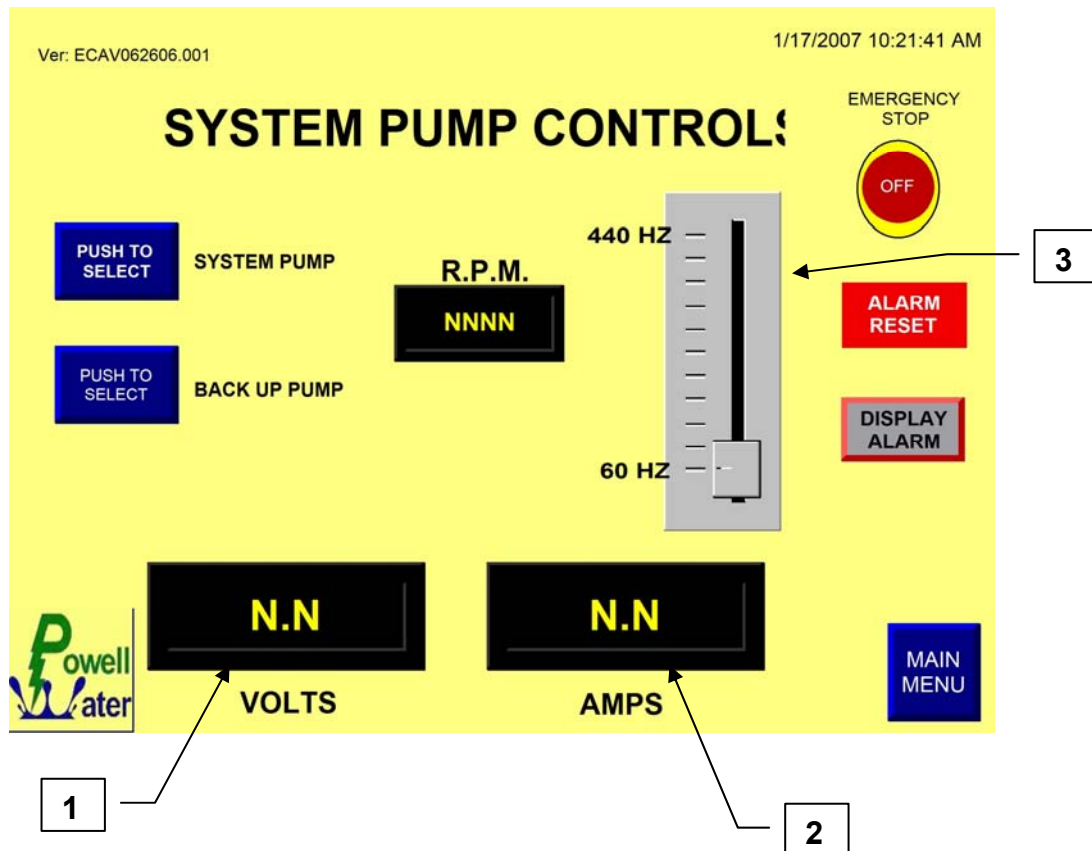
- Top Box This box shows the set time in seconds
- Bottom Box This box shows the accumulated time of the cycle in seconds.
- SP box Pressing this box brings up a key pad that allows the operator to input the cycle time in seconds.

Time Remaining Before Next Auto CIP

- Top Number This number shows the time (in HH:MM:SS) until the next automatic CIP.
- Left Box This box shows the set time in seconds.
- SP Box Pressing this box brings up a key pad that allows the operator to input the cycle time in seconds.

System Pump Controls

Panel View (continued)



This screen allows the operator to select which system pump to operate and the speed in RPM'S.

1. Volts
This display shows the voltage in the Reaction Chamber in DC Volts.
2. Amps
This display shows the Amperage in the Reaction Chamber in DC Amps.
3. Hz Slide
While pressing the slide on this display the operator can adjust the RPM's (flow) of the System pump and Back-up System pump for flow rate adjustment.

Overview Screen

Panel View (continued)

OVERVIEW SCREEN

RUNNING

SYSTEM VALVES / PUMP

- INFLUENT SUPPLY
- INFLUENT RETURN
- CITY WATER
- AIR PURGE
- EC POWER
- POLARITY REV FWD
- SYSTEM PUMP

R.P.M.
NNNN

CLEAN IN PLACE VALVES / PUMP

- CIP SUPPLY
- CIP RETURN
- CIP PUMP
- AUTO CIP PROCESS
- MANUAL CIP PROCESS

EMERGENCY STOP
OFF

ALARM RESET

DISPLAY ALARM

BACK

VOLTS **N.N**

AMPS **N.N**

POWELL WATER

This screen shows the operator the overview of the entire Powell Water Systems Inc. EC unit.

- **Green** This color indicates that the pump is on, valve is in the open position or the process is running.
- **Red** This color indicates that the pump is off, valve is in the closed position or the process is stopped.

Voltage

The voltmeter will indicate the line voltage to the chamber unless one of the following occurs.

1. If there is less voltage than the normal line voltage and the amperage is at the rated capacity. This means that the current control is lowering the voltage in order to limit the current.
 - a. If the water is over treating (rust color, w/ steel blades, is left in the settled water) then reduce the number of chambers.
 - b. When the number of chambers is reduced to one and the water is over treating your voltmeter will continue to show a low reading. This is ok.
2. If the voltage reading is less than full scale and the amperage is less than the rated capacity this indicates that the amperage control pot on the power supply is turned down.
 - a. If the water is treating at the lower voltage that is fine. Continue operating it in this fashion.
 - b. If the water is over treating (the separation is faster than needed) you can turn the current control down further. This will reduce the electrical power consumption and extend your electrocoagulation blade life.
 - c. If the treatment is not fast enough then turn the current control pot up.

Amperage

Current is what causes the treatment in the water. You will want to tune the unit to place the amount of current in the water needed to obtain satisfactory water treatment. Using excess current will increase the power consumption and blade loss above that which is required for efficient treatment. Please keep the following in mind when adjusting the current.

1. The current draw is directly proportional to the voltage input.
2. The number of chambers and current control at the power supply controls the voltage input. (Please see voltage meter above for a discussion on current control).
3. The current flow from between the connected power blades.
 - a. If the chamber is wired for single chamber (first and last) the current going through the water is the same as the reading on the meter.
 - b. If the chamber is divided into two chambers, then the current going through the water is one half the current shown on the current meter.

This happens because one half of the current goes to one chamber and one half goes to the other chamber

By keeping this fact in mind you can determine if dividing the chamber actually increases the current through the water. The goal is to only add the required current to the water to obtain the level of water treatment desired.

4. Non-conductive waters may need to have more chambers to increase the voltage to pull current.

This is necessary when treating transformer oil for PCB.
5. Conductive water like seawater needs fewer chambers because of the high conductivity in the water.

Cleaning the Blades

The magnetic attraction of the solids in the water sometimes adheres to the blades creating a resistive coating. The resistive coating prevents the amps from traveling through the water. The coating may be removed by washing the blades with a liquid that dissolves the coating. That liquid may be selected from acids, bases and other cleaning agents. Hydrochloric acid also known as HCl, or muratic acid will remove everything from steel blades except copper. Coating such as latex can be de-natured and removed using sulfuric acid also known as H₂SO₄ or battery acid. The proper selection of the cleaning liquid must be determined by experimentation. The concentration of the cleaning agent should be diluted to the extent possible to clean the blades and not harm the equipment liner.

Auto Clean-In-Place

The automatic CIP is based on time. The clean time is based on hours and minutes. These times can be changed using the Timers Screen on the Panel View. Experimentation must be done to find the proper length of time between Auto CIP cycles. The process to initiate an Auto CIP is as follows:

(CIP fill time is regulated by a reed switch that allows the CIP solution to fill the Reaction Chamber to just above the Chamber Blades)

1. Bring up the TIMERS screen on the Panel View.
2. Press the SP button under the Chamber Drain Time description.
(This brings up a keypad that allows the operator to set the time it takes the Reaction Chamber to drain the Influent. This is different then the Acid Drain Time due to gravity drain being used to drain the CIP solution).
3. Press the SP button under the Acid Wash Time description.
(This brings up a keypad that allows the operator to set the time that the CIP solution will remain in the Reaction Chamber. Two (2) minutes is recommended)
4. Press the SP button under the Acid Drain time description.
(This brings up a keypad that allows the operator to set the time it takes to empty the Reaction Chamber of CIP solution. This is different then the Chamber Drain Time due to gravity drain being used to drain the Reaction Chamber of Influent).
5. Press the SP button under the City Water Fill time description.
(This brings up a keypad that allows the operator to set the time it takes to fill the Reaction Chamber with city water/rinse water)

6. Press the SP button under the Time Remaining Before Next Auto CIP.
(This brings up a keypad that allows the operator to set the time until the next auto CIP cycle).
7. The Powell Water Systems Inc. EC unit is now set to automatically go into the CIP mode.

TIMES ARE DEPENDENT ON EXPAIRMENTATION DONE AFTER SET-UP OF POWELL WATER SYSTEMS INC. EC UNIT.

INITATE AUTO CIP PROCESS

1. Touch the Panel View Screen. *(This brings up the default Auto Controls screen)*
2. Press the Stop Process button. *(This stops all EC processes)*
3. Press the Clean In Place button. *(This begins the CIP process in auto mode)*
4. Press the Main Menu button. *(This brings up the Main Menu screen)*
5. Press the Overview button. *(This brings up the Overview screen and allows the operator to view the CIP progress through the CIP cycle)*

Once the CIP cycle is complete the Powell Water Systems Inc. unit must be re-started by returning to the Auto Controls screen and pressing the Start Process button.

Cleaning the Blades

(Manual)

MANUAL CIP PROCESS

1. Touch the Panel View Screen. *(This brings up the default Auto Controls screen)*
2. Press the Stop Process button. *(This stops all EC processes)*
3. Press the Go to Manual button. *(Once this button is pushed the wording on it changes to Go To Auto)*
4. Press the Main Menu button. *(This brings up the Main Menu screen)*
5. Press the Manual Influent System button. *(This brings up the Manual Influent Valve/Pump Controls screen)*
6. Press the Return Valve closed button. *(this opens the influent valve and the display will show open)*
7. Once Reaction Chamber is fully drained, press the Return valve open button. *(this will close the valve and return the display to red)*
8. Press the blue BACK button. *(return to Main Menu Screen)*
9. Press the Manual CIP System button. *(This brings up the Manual CIP Valve/Pump Control screen)*
10. Press the Supply Valve Closed button. *(This opens the CIP Supply Valve and the display shows green OPEN)*
11. Press the OFF button under the CIP Pump. *(This starts the CIP Pump and the display shows green ON)*
12. Fill the Reaction Chamber to just above the Chamber blades and reverse steps 11 and 10 *(Stop Pump then Close Valve)*
13. Allow approximately 2 Minutes wash time.
14. Press the Return Valve Close button *(this opens the CIP Return valve and the display will show open)*, until Reaction Chamber is fully drained.
15. Once the Reaction Chamber is fully drained of CIP solution, Press the Return Valve Open button. *(this closes the CIP Return valve and the display will show closed)*
16. Press the blue BACK button. *(return to Main Menu Screen)*
17. Press the Manual Influent System button. *(This brings up the Manual Influent Valve/Pump Controls screen)*

18. Press the City Water Valve & Supply Valve Closed buttons. *(This Closes the Master Influent Valve to the System Pump and opens the City Water & Supply Valves)*
19. Press the System Pump Off button. *(This changes the display to green ON and starts the System Pump.)*
20. Once the Reaction Chamber is filled to just above the Chamber Blades, repeat steps 19 & 18 *(Stop Pump then Close Valves)*
21. Return to Main Menu Screen.
22. Press the Auto Controls button.
23. Press the Go To Auto button.
24. Press the Start Process button for normal operation.

Spare Parts

Suggested spare parts are as follows:

<u>QTY</u>	<u>U/M</u>	<u>PART #</u>	<u>DESCRIPTION</u>
2	EA	GMA-500mA	Terminal block, FUSE, 0.5 A
2	EA	GMA-3	Terminal block, FUSE, 3 A
2	EA	GMA-1	Terminal block, FUSE, 1 A
3	EA	LPJ-40SPI	FUSE, DUEL ELEMENT, CLASS J
1	EA	FNQ-15	FUSE CLASS CC
2	EA	FNQ-R-3-1/2	FUSE CLASS CC
2	EA	RH2BULDC24	Relay. IDEC, SPDT
5	EA	03.114.06	1-½ " BONDED WASHER
217	EA	11.10079	1 SET OF CHAMBER BLADES ALUM OR STEEL
2	EA	11.10078	1 SET OF RIGHT POWER BLADES ALUM OR STEEL
3	EA	11.10078	1 SET OF LEFT POWER BLADES ALUM OR STEEL

Troubleshooting

PROBLEM	CHECK THE FOLLOWING
The Start Pushbutton is pushed and nothing happens.	Is power turned on, (check Blue Lamp)? Are there any blown fuses or circuit breakers?
The Start Pushbutton is pushed, the lamp turns on and nothing happens.	Is there air pressure? If the lamp is blinking, check the remote switches.
The system operates, but there is not any floc in the treated stream.	Check to see that there is amperage going through the Reaction Chamber. Adjust the wiring in the Reaction Chamber to create additional chambers (page 11). Adjust the pH. Use a different type of blade material.

Daily Record

Powell Water Systems, Inc., strongly recommends that the operator keep a daily maintenance log. Sample Record Book pages are provided at the end of this manual for your convenience. The information recorded in the log will provide a guide for optimizing the electrocoagulation process and help determine the approximate time of Reaction Blade replacement.

To begin the record keeping session, draw a sample of the water from the Sample Ports, observe and record observations in the log. Observe the influent conditions and record in the log. Also note any unusual plant or operating conditions.

The following Record Book information is intended as a general list only. Not all of these items apply to this Unit.

Check List

- ✓ Time of day.
- ✓ Amp meter reading.
- ✓ Voltmeter reading.
- ✓ Check pH level with pH paper and compare with the panel reading on the pH meter (if the pH option was ordered with the system).
- ✓ Filter Baskets - Check and Clean (If the tank in a tank clarifier was ordered with the system).
- ✓ "Y" Strainer Screen - Check and Clean.
- ✓ Sludge blanket level (if a clarifier is being used for secondary separation system).
- ✓ Settling time of Sludge/floc.
- ✓ Amount of floc.
- ✓ Texture of floc.
- ✓ Amount of solids in incoming water. Check to see if influent is thicker than usual and note conditions.
- ✓ General notes - color, changes, unusual conditions at plant, etc.

Periodic Record

In addition to the Daily Record, a periodic log recording events, conditions, and maintenance performed should be kept. The following items should be included this part of the Record Book. Please note that this unit may not include all of the options on the checklist.

Check List

a. Weekly

- ✓ Check the acid pump in the pH meter for noise, vibration, low flow or pressure, and high temperature.
- ✓ Check the acid supply.
- ✓ Check the Clarifier.
- ✓ Re-calibrate pH probe.

a. Monthly

- ✓ Set Pressure Switches.
- ✓ Change oil in Feed Pump.

b. Semiannually

- ✓ Change valve seats and balls in acid metering pump.
- ✓ Vacuum solids from bottom of surge tank (more often if needed).

c. Annually

- ✓ Inspect actuated valves for damage or wear; clean or replace worn or damage components, replace diaphragm in pump if needed.

d. As Required

- ✓ Replace Reaction Chamber Blades.

Daily Record

Date:	Time:	Name of Recorder:

		Notes:
Volts:		
Amps:		
pH level (paper test):		
pH level (meter reading):		

		Notes:
"Y" Strainer:		

		Notes:
Amount of Floc:		
Texture of Floc:		
Color of Floc:		
Settling Time:		

Influent Conditions:
General Plant Conditions:

Monthly Periodic Record

Date:	Time:	Name of Recorder:
		Notes:
Set Pressure Switches		
Change oil in Feed Pump		

Date:	Time:	Name of Recorder:
		Notes:
Set Pressure Switches		
Change oil in Feed Pump		

Date:	Time:	Name of Recorder:
		Notes:
Set Pressure Switches		
Change oil in Feed Pump		

Date:	Time:	Name of Recorder:
		Notes:
Set Pressure Switches		
Change oil in Feed Pump		

Annual Periodic Record

Inspect actuated valves for damage or wear; clean or replace worn or damage components, replace diaphragm in pump if needed:		Notes:
--	--	--------

Notes:



특허청

2003년 08월 12일

위의 발명은 특허법에 의하여 특허등록원부에 등록되었습니다.

발명자 포웰, 스크트, 웨이드 미국 코네티컷 80015-5820 오포라 이스트 터프트 서클 19331

특허권자 포웰, 스크트, 웨이드 미국 코네티컷 80015-5820 오포라 이스트 터프트 서클 19331

발명의명칭 액체의 전기응집 방법 및 장치

출원번호 2000-7009568 호
출원일 2000년 08월 28일
등록일 2003년 08월 12일

특허 제 0395731 호

특허청



No. 198983

유 의 사 항

1. 권리 내용의 확인

특허권의 내용은 특허공보와 특허등록원부를 열람하면 구체적으로 확인할 수 있습니다.

2. 특허권의 존속기간

특허권의 설정등록이 있는 날부터 특허출원일후 20년

3. 특허료의 납부

가. 특허료를 소정기간내에 납부하지 아니하면 특허권은 소멸됩니다.

나. 제4년분 이후의 특허료는 설정등록일(출원공고된 경우 출원공고일)을 기준하여 매년 1년분씩 그 전년도에 납부하여야 합니다. 다만, 위 기간이 경과된 후에는 6월이내에 추가 납부할 수 있으며 이 경우에는 당해 특허료의 2배를 납부하여야 합니다.

다. 제4년분 이후의 특허료는 그 납부년차 순위에 따라 수년분 또는 모든 연차분을 일괄 납부할 수 있습니다.

라. 설정등록 이후의 연차특허료는 특허청 종합민원실(서울사무소 포함)에 연차특허료 납부서를 제출하여 접수증을 교부받은 후 납부용지에 납부자번호(접수번호)등을 정확히 기재한 후 접수를 다음날까지 은행·우체국 등 국고수납기관에 납부하여야 합니다.

마. 특허료는 특허권자는 물론 이해관계인이 대납할 수 있습니다.

4. 등록명의인 표시(주소·명칭)변경·경정 등록

특허권 설정등록후 주소 또는 명칭이 변경 또는 착오등록되었을 경우 등록명의인 표시(주소·명칭)변경·경정 등록을 신청하지 아니하면 불이익을 받을 우려가 있으니 유의하시기 바랍니다.

5. 특허권에 대한 권리구제

가. 특허권이 침해된 경우, 특허법에 의거 침해금지청구권, 손해배상청구권, 신용회복청구권, 부당이득반환청구권 등을 행사할 수 있습니다.

나. 특허권에 대한 분쟁이 발생한 경우, 특허청에 설치된 산업재산권분쟁조정위원회에 화해의 알선·조정을 신청할 수 있습니다.

6. 특허권의 표시·광고 요령

가. 위와 같이 등록된 특허권을 외부에 알리거나 광고하는 경우 특허 제000000호로 표기해야 합니다.

나. 실용신안, 의장, 상표로 등록된 것을 “특허 제000000호”라고 표기할 수 없으며, 허위 표기한 경우에는 관계법에 의거 처벌을 받을 수 있습니다.

7. 등록업무에 대한 보다 상세한 문의처는 다음과 같습니다.

특허청 등록과 ☎ 042-481-5237~5260, FAX 042-472-3467, 특허청 종합민원실 ☎ 042-481-5220~3

특허청 서울사무소 ☎ 02-568-8155~7 (교환: 314, 316)

주소 : ☎302-701 대전광역시 서구 둔산동 920 (정부대전청사 4동) 특허청 등록과

* 위의 사항은 관계법령의 개정으로 그 내용이 변경될 수도 있습니다.

