cpac, INC. Equipment Division

SILVPAC® XLM-400B

WITH BATCH CONTROLLER, DIGITAL DISPLAY, MICROPROCESSOR CONTROLS, AND CAUSTIC DOSER TIMER

(230 VAC, 50/60 Hz)

USER'S MANUAL

- **INSTALLATION**
- **OPERATION**
- **MAINTENANCE**

CPAC Equipment Division 2364 Leicester Road, Leicester, New York 14481
Phone (585)382-3223 Fax (585)382-3031 www.cpacequipment.com

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RECOMMENDATIONS

Read the entire instruction manual *before* installation or operation of the SilvPAC® XLM-400B silver recovery system. It will help you to understand the operation of the system, how various sub-assemblies work together, and the operating sequence of the controls.

WARNING: NEVER ATTEMPT TO PERFORM ANY ELECTRICAL TROUBLESHOOTING ADJUSTMENT(S) OR SERVICE(S) UNLESS YOU ARE A QUALIFIED ELECTRICIAN, ELECTRONICS TECHNICIAN OR FACTORY TRAINED SERVICE TECHNICIAN.

IMPORTANT SAFEGUARDS

When using the SilvPAC XLM-400B silver recovery system, these basic safety precautions should be followed:

1. Read and understand all instructions.

2. Care must be taken to avoid burns from touching hot parts.

4. Do not operate this appliance with a damaged cord or if the equipment has been dropped or damaged until it has been examined by a qualified service technician.

4. Do not let power cord hang over edge of table or counter or touch hot surfaces.

5. An extension cord should not be used with this unit. The unit should be plugged directly into a power outlet.

6. To protect against electrical shock hazard, do not allow water or any other liquid to enter the electrical cabinet or any of the electrical assemblies.

7. To avoid electrical shock hazard, do not disassemble this equipment. Call a qualified service technician when service or repair work is required. Incorrect re-assembly can cause electric shock hazard when the appliance is switched ON.

SAVE THESE INSTRUCTIONS

STATEMENT OF WARRANTY AND LIABILITY

All equipment manufactured by CPAC is guaranteed against defects in materials and workmanship for a period of six months, from the date of shipment from our factory. Any claimed defects must be reported, and the materials and/or equipment must be returned, freight prepaid, to our plant within the guarantee period. Our liability for defects in material and/or workmanship shall be limited to the replacing or repairing at our option, such defective materials and/or equipment at no cost to the purchaser. Any damages or loss occurring during shipment are not covered by this warranty, but are the responsibility of the carrier(s). Please report all shipping damage to the carrier(s) immediately.

All materials and/or equipment furnished by other suppliers carry no warranty except said supplier's warranty as to materials and workmanship. Transportation, handling damage, wear and tear, and other causes of damage outside the control of the manufacturer are not covered by this warranty. Under no circumstances will CPAC be responsible for any damage, loss or liability of any nature arising out of the installation and/or use of materials and/or equipment furnished.

There are no other warranties, expressed or implied, except as stated above. This warranty becomes null and void if any devices or accessories other than those distributed or officially recommended by CPAC, are installed or attached to, this equipment.

GENERAL INFORMATION

XLM-400B

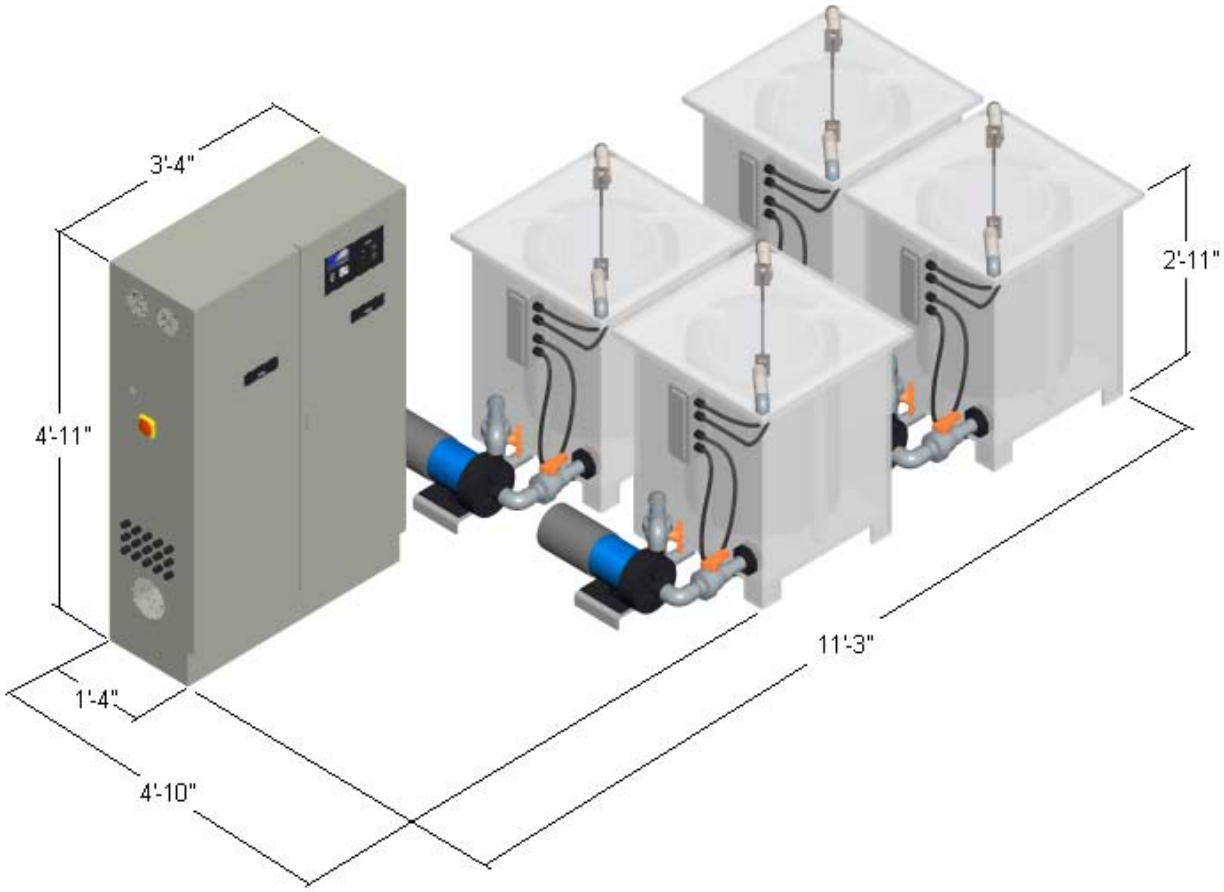
Drawing 1 shows the XLM-400B. The standard XLM-400B includes:

1 – Electrical Control Cabinet
4 – Desilvering cells

Each desilvering cell includes one cathode and one cell recirculation pump. The four cells are identical in construction.

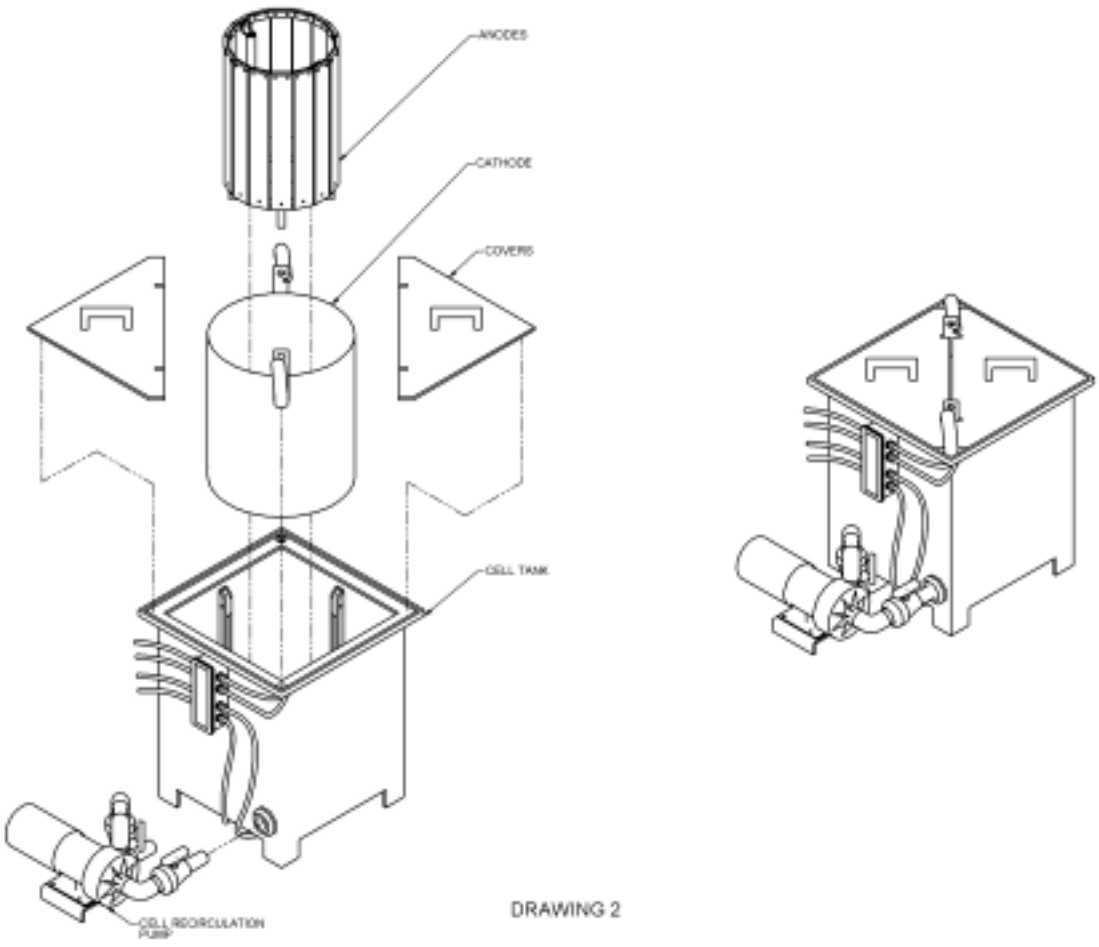
The electrical cabinet contains two separate power supplies. The supplies are referred to as right cell and left cell power supplies. The left cell display is located on the left side of the electrical cabinet and the right cell display is on the right side of the cabinet.

Each power supply operates two cells.



Drawing 1

Drawing 2 is an exploded view of the cell assembly. This drawing will be helpful in identifying parts referred to in this manual.

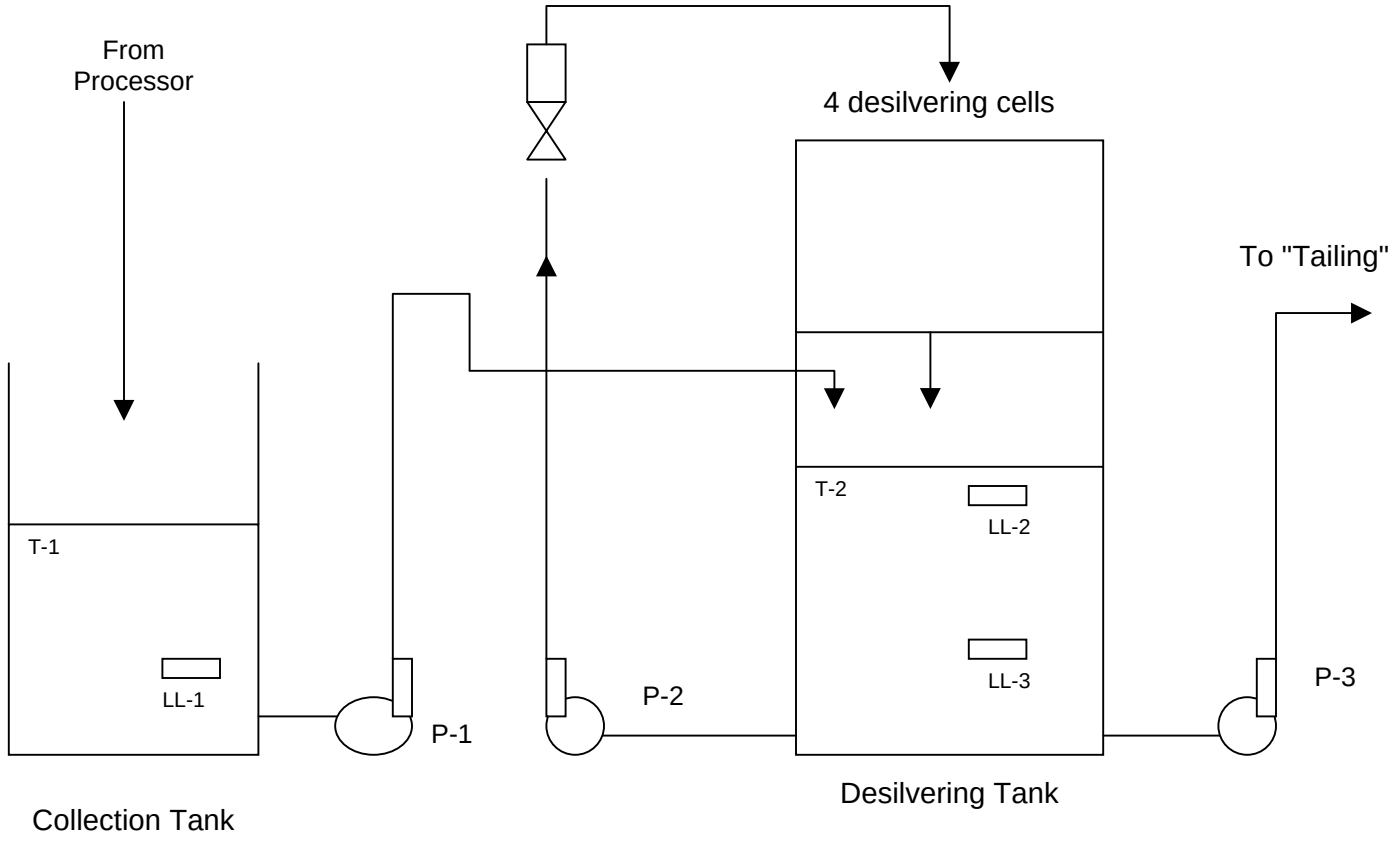


DRAWING 2

The Desilvering Process

The SilvPAC® XLM-400B may be used to desilver RA bleach-fix, plus low flow wash, C-41 fixer, E-6 fixer or combinations of these fixes and bleach-fix solutions. The recovery rate may vary with the type of chemistry desilvered, but good results can be achieved with all. The assay for silver recovered by the SilvPAC XLM-400B is normally greater than 96%.

The SilvPAC XLM-400B has been designed for batch desilvering only. The unit includes an electronic batch controller to automate the batch process. The necessary tanks, pumps, and plumbing is supplied as an optional tank package or provided by the customer. A typical installation is shown in Drawing 3.



Drawing 3
Standard SilvPAC System for Non-Regenerated Bleach-fix

***Step One – Collection*:** Overflow silver laden solution(s) is collected at the processor and transferred to the collection tank (T-1). This may be done using a CPAC ATS-5 Transfer Station (sump pump) or equivalent.

***Step Two – Desilvering*:** When sufficient silver laden solution(s) have been collected in tank T-1, the unit automatically transfers solution into the desilvering tank (T-2) via pump P-1. After tank T-2 is full, the silver laden solution is pumped (P-2) into the four cell tanks where the silver is removed.
Bleach-fix will dissolve silver off the cathodes if the cell tanks are not drained after the desilvering cycle is complete. The cell tanks are typically elevated above the desilvering tank to allow all the bleach-fix to gravity drain from the cell tanks at the conclusion of the desilvering cycle.

Step three- Transfer: After the desilvering cycle has been completed, desilvered solution is transferred from the desilvering tank via pump P-3 to a tailing feed tank or post treatment collection tank.

INSTALLATION AND SET-UP

Refer to Drawings 1,2, and 3 to identify components and pages 11 and 12 for electrical connections.

1. Install the desilvering tank (T-2), pump out pump (P-3), and liquid level switches LL-2 and LL-3.

2. Install the four cell tanks. Cell tanks are typically located above the desilvering tank. During the desilvering cycle, solution is recirculated between the desilvering tank and the four cell tanks. Typically, each cell tank has a separate P-2 pump to transfer solution from the desilvering tank to the cell tank. Each cell tank has an overflow line that returns solution to the desilvering tank. Each cell tank requires two plumbing connections:
    1. Cell tank inlet (from discharge of P-2 pump). This is typically located close to the bottom of the cell tank. When the P-2 pump is off, solution flows back through the P-2 pump to drain the cell tank. *
    2. Overflow back to desilvering tank. When the cell recirculation pump is running, the solution level is slightly higher inside the cathode than outside. The overflow should be located so that the solution level inside the cathode is within approximately 1.5" (4 cm) of the top of the cathode when the unit is running. The easiest way to achieve this is to locate an elbow on the inside of the overflow fitting. The elbow can be rotated (and extended upward if necessary) to adjust the solution level in the cell tank. *

    *Inlet and overflow bulkheads are typically installed during start-up. Bulkheads should be located as far from the cathode as possible (toward the tank corners). Cell tanks are fabricated from ½" (1.27 cm) thick plastic. Standard hole saws can be used to cut holes in the tanks. Dull hole saws will tend to melt the plastic. New hole saws are highly recommended.

3. Install P-2 pumps. Connect the pump discharge lines to the cell tanks.

4. Connect overflow lines from each cell tank to the desilvering tank (T-2). To minimize splashing and foaming, the overflow lines should extend 2 to 3 inches below the solution level in tank T-2.

5. Connect the electrical cords from P-2 pumps, P-3 pump, LL-2, LL-3, cell recirculation pumps, and pressure switches as directed on pages 11 & 12.

6. Place the collection tank (T-1) in the desired location. Install pump P-1 with the necessary plumbing and liquid level switch LL-1. The discharge of pump P-1 must be connected to the desilvering tank (T-2). The discharge must be connected in such a way that the collection tank will not siphon when the P1 pump is switched off. Wire the P1 pump into the XLM-400B control box. Connect liquid level switch LL-1. (Refer to pages 11 & 12 for electrical connections). Connect the overflow from tank T-1 to a suitable tank for emergency collection and storage.

7. Install a post treatment collection tank. Connect the discharge of the P-3 pump to the inlet of this tank.

8. Connect the cell wires (anode and cathode connections are made inside the electrical box that is mounted on the side of the cell tank). The two left cells are wired in series and the two right cells are wired in series. For example: The left cell power supply has two anode wires and two cathode wires. The two cathode wires both connect to the cathode of cell #2. Two wires connect the anode of cell #2 to the cathode of cell #1. The anode of cell #1 attaches to the two anode wires from the power supply. The two right cells are wired the same as the left cells. Refer to the schematic on page 24 for a diagram of the cell connections.

9. Connect electrical power to the XLM-400B unit.

10. After installing the unit, water test the system to check for leaks or loose fittings. The CYCLE ADVANCE SWITCH can be used to manually enter cycles. Water should pump from the collection tank to the desilvering tank during the fill cycle. After the desilvering tank is full, water will be pumped into the XLM-400B cell tanks (Desilvering cycle). After the desilvering cycle is complete, water will be pumped into the post treatment tank (Pump Out Cycle). Please note that water is much less conductive than chemistry. Trying to run a desilvering cycle with water will usually result in a low amperage error (ERR1). This error can be eliminated by reducing the amperage setting to 5 amps.

Electrical Connections

The main electrical power supply for the XLM-400B must be:

208 - 240 VAC, single phase, Three wires (HOT, COMMON, EARTH), 50 / 60 Hertz, 100 amps.

The complete schematic is included on page 24.

Connections for XLM-400B

INCOMING POWER

L1 Incoming 220 VAC (HOT)
L2 Incoming 220 VAC (COM)
Chassis Earth GND

TERMINAL BLOCK TB-1 (Low voltage level switches)

1 Collection tank (T-1) full (Normally open)*
2 Collection tank (T-1) full

3 Desilvering tank (T-2) full (Normally closed)*
4 Desilvering tank (T-2) full

5 Desilvering tank (T-2) empty (Normally open)*
6 Desilvering tank (T-2) empty

*The normal position for level switches is the position that the switch will be in when the tank is empty.

TERMINAL BLOCK TB-2 (220 VAC pumps)

1 Fill Pump (P-1)(HOT)
2 Fill Pump (P-1)(COM)
3 Fill Pump (P-1)(Earth)

4 Pump Out Pump (P3)(HOT)
5 Pump Out Pump (P3)(COM)
6 Pump Out Pump (P3)(Earth)

The use of a caustic pump is optional

7 Caustic Pump (HOT)
8 Caustic pump (COM)
9 Caustic pump (Earth)

All pumps must be rated for 220 VAC operation. Current draws must be between .1 and 3.0 Amps AC.

TERMINAL BLOCK TB-3 (220 VAC pumps for left cells)

1 Left Cell Recirculation Pump (HOT)
2 Left Cell Recirculation Pump (COM)
3 Left Cell Recirculation Pump (Earth)

4 Left Recirculation Pump (P2)(HOT)
5 Left Recirculation Pump (P2)(COM)
6 Left Recirculation Pump (P2)(Earth)

TERMINAL BLOCK TB-4 (220 VAC pumps for right cells)

1 Right Cell Recirculation Pump (HOT)
2 Right Cell Recirculation Pump (COM)
3 Right Cell Recirculation Pump (Earth)

4 Right Recirculation Pump (P2)(HOT)
5 Right Recirculation Pump (P2)(COM)
7 Right Recirculation Pump (P2)(Earth)

PRESSURE SWITCH CONNECTIONS (Left Cell)*

Left Slave Circuit Board J3(1)	Pressure Switch Pump P1
Left Slave Circuit Board J3(2)	Pressure Switch Pump P1
Left Slave Circuit Board J3(3)	Pressure Switch Pump P2
Left Slave Circuit Board J3(4)	Pressure Switch Pump P2

PRESSURE SWITCH CONNECTIONS (Right Cell)*

Right Slave Circuit Board J3(1)	Pressure Switch Pump P1
Right Slave Circuit Board J3(2)	Pressure Switch Pump P1
Right Slave Circuit Board J3(3)	Pressure Switch Pump P2
Right Slave Circuit Board J3(4)	Pressure Switch Pump P2

* all pressure switches are normally open at no pressure. They close as pressure (and flow) appear.

Electrical Disconnect Switches

Main Disconnect – This is a Lock Out / Tag Out device that shuts off power to the entire unit (both left and right power supplies).

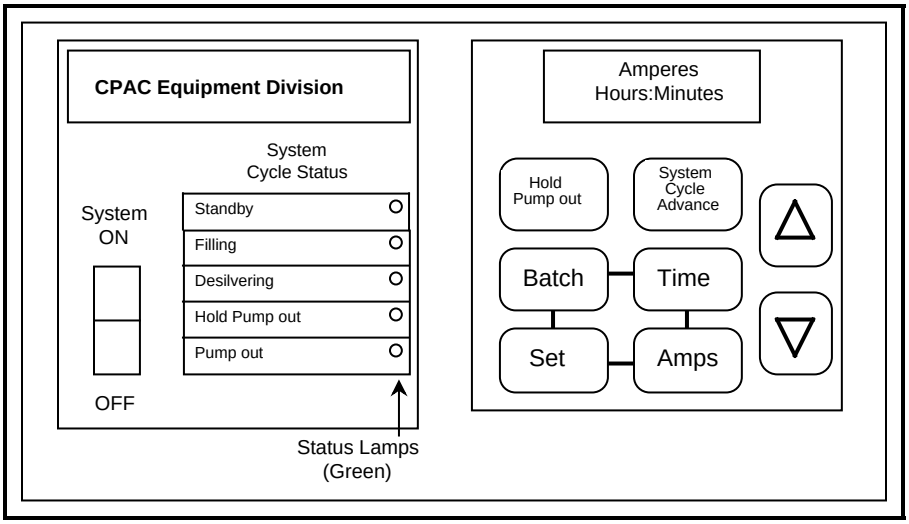
Left Cell Disconnect – This is a Lock Out / Tag Out device that shuts off power to the Left power supply, Left P-2 pumps, and Left cell recirculation pumps.

Right Cell Disconnect – This is a Lock Out / Tag Out device that shuts off power to the Right power supply, Right P-2 pumps, and Right cell recirculation pumps.

For example: to operate the right power supply only, set the main disconnect and the right cell disconnect to the ON (1) position and set the left cell disconnect to the OFF (0) position.

Whenever service is to be performed on the XLM-400B, the appropriate disconnect switches must be locked out and tagged out.

CONTROL PANEL



Drawing 4

Programming the SilvPAC® XLM-400B Unit

Plating time and amperage are the key parameters for batch desilvering.

1. The unit is factory programmed for 115 amps and 4 hours. Both of these parameters can be changed.

2. There is a manual SET/LOCK switch on the component side of the Main Printed Circuit Board (located above the right and left slave boards on the front door of the electrical cabinet). This switch must be in SET position to make permanent changes to the plating time and amperage. When this switch is in the LOCK position, changes to plating time and amperage can be made but will be temporary and will be reflected only in the batch that is currently being desilvered. When the unit completes this batch, the plating time and amperage will return to the previous settings.

3. While in the desilvering cycle, the time remaining in the batch is displayed. If you wish to temporarily change the time remaining in the batch, press and hold down the TIME key. Either the hours or minutes will be displayed. If the HOURS is displayed and MINUTES is desired, release the TIME key and then press it again. Minutes will now be displayed. Adjust using the INCREASE or DECREASE keys. To temporarily change the amperage setting, press and hold down the AMPERAGE key and adjust up or down using the INCREASE or DECREASE

keys. When the desired amperage is reached, release the AMPERAGE key.

4. To permanently reprogram the unit, the operator must enter the SET mode. *NOTE: Any or all of the following can be changed at any time in any order.*

   SET: Press this key to enter the programming mode. Either the plating time or amperage will be displayed. A light in the upper right corner of the SET key glows indicating that the microprocessor is in the SET mode and values can now be changed.

   TIME: Pressing this key will cause the existing hour digit to flash indicating this parameter can now be changed. Change the value by pressing either the INCREASE or DECREASE keys. When the new hours have been programmed, press the TIME key again and the existing minutes will begin to flash. Again change this value by pressing the INCREASE or DECREASE keys.

   AMPERAGE: Pushing this key will cause the present amperage setting to flash on the display, which indicates that it can be changed. Change this setting with the INCREASE or DECREASE keys.

   BATCH: Pressing the BATCH key will display the number of batches processed. To reset this counter, press the BATCH key and then press the DECREASE key -- this will reset the counter to 0. To display the permanent batch counter, press the BATCH key and hold for four seconds. The permanent batch counter cannot be reset.

5. When using the INCREASE or DECREASE keys, each time the arrow is pressed the value will change by one. Holding down an arrow will change the value rapidly after an initial delay of about one second. Use this rapid change to get near the aim value and then use individual pushes until the exact value is reached.

6. When all programming is complete, press the SET key. The light in the upper right corner of the key will go out and the new values are entered into the microprocessor. Note that it is not mandatory to make all the above changes before pressing this key. New parameters can be entered into the system at any time by pressing the SET key.

Programming the Two Stage Plating

Plating amperage can be programmed to automatically decrease at a certain time in the desilvering cycle.

“Fine tuning” of the time and amperage can be obtained by reprogramming the percentage of elapsed time before the unit switches to reduced amperage. When the unit leaves the factory, it is set so that when 10% of the time remains, the unit automatically reduces the amperage to 90% of its set value. For example: If the unit is programmed for four hours and 115 Amps, the unit decreases its amperage to 90% or 103 Amps when 24 minutes remain in the desilvering cycle.

To change the time percentage, press and hold both the SET key and the TIME key together and release both keys when the existing set time percentage begins to flash. Press the INCREASE or DECREASE key to change this percentage. Press the SET key to enter the new time percentage into the microprocessor.

Use the same procedure to change the amperage percentage except press and hold down both the SET and AMPERAGE keys. When desilvering bleach-fix solution, it is not recommended to decrease the amperage by more than 25%.

This “fine tuning” may not be needed by all labs when operating the SilvPAC unit. As a lab becomes more proficient with the operation, this procedure may be implemented.

System Cycle Advance Key

When the SYSTEM CYCLE ADVANCE key is pressed the unit will go into the next cycle. For example, if the unit is in the DESILVERING mode and the SYSTEM CYCLE ADVANCE key is pressed, the unit will go directly into the PUMP OUT mode regardless of where it is in the desilvering cycle. The discharge pump will come ON and drain the desilvering tank.

If the unit is in STANDBY and this key is pressed, it will cause the transfer pump (P1) to switch on and fill the desilvering tank. Damage to this pump could occur if there is not enough liquid to adequately fill the desilvering tank - causing the pump to run dry.

This key should be used by a qualified technician only. Problems, such as shortened cycles, pump head running dry damage, over/under desilvering times, etc. can occur if this key is pressed without knowledge of its primary function, which is to aid in servicing.

Hold Pump Out Key

When the hold pump out light is on, the P-3 pump will not automatically start at the conclusion of a batch. This allows the operator to take a sample of the desilvered chemistry and determine if the batch should be desilvered further before being discharged. Activating the HOLD PUMP OUT key will cause the Hold pump out light to toggle on and off.

ERROR MESSAGES

The XLM-400B constantly monitors the desilvering process and will alert the operator to potential problems. The XLM-400B will detect the following error conditions:

Low Amperage Error – the display will flash between **Lo A and Err1**. This indicates that the power supply cannot achieve the cell current it has been programmed for. Possible causes are: cell wires not properly connected to anode and cathode, water in cell tank, blown cell circuit breaker. The two left cell are connected in series. If one cell is open circuited, no current will flow to either cell and the alarm will be activated. The same is true for the two right cells. For example: if the cathode is removed from one of the right cell tanks, the right cell power supply will be open circuited and the alarm will be activated.

High Amperage Error – the display will flash between **HI A and Err2.** This indicates that the amperage is too high and the power supply is unable to control it. As a safety precaution, a mechanical relay shuts down the power supply during a high amperage error. If a high amperage error should occur, shut off electrical power to the cell – wait at least 30 seconds and reapply power. If the error happens again, check the SCRs (mounted on the back panel not on the circuit board) and all wiring between the shunt and connector J3 (pins 7 and 8) on the circuit board. Check to be sure the cell wires are connected to the proper place.

Low Flow Error – This error is triggered by the pressure sensor on the cell recirculation pump. If the cell is desilvering**,** the electronics expects the pressure switch to be closed. If a pressure switch opens, that indicates a lack of flow and the electronics will stop the desilvering cycle. The display will indicate the pressure switch that caused the alarm by displaying P1 or P2. If a low pressure error should occur, shut off electrical power to the cell – wait at least 30 seconds and reapply power. If the error happens again, check for any obstructions in the pump inlet. Restart the cell recirculation pump and watch the flow. If the flow is normal but the switch will not close, replace the pressure switch. If there is no flow, disassemble the pumphead and check for any obstructions there.

OPERATION

Initial Start-Up

When the SilvPAC® XLM400B is initially started up, the following preliminary steps must be followed since both the collection and desilvering tanks are completely empty.

1. Turn the system ON/OFF switch (on the front panel) to the OFF position. (Refer to Drawing 4)

2. Collect the silver laden solution(s) from the processor(s) in tank T-1 until solution starts overflowing from the safety overflow at the top of the tank.

3. Determine the correct plating amperage. Amperage varies with the chemical parameters of the solution. Table 1 lists typical amperages for various chemicals. The silver plate should be light to medium brown (cardboard color) and hard. The plate quality determines the maximum amperage. When the amperage is too high, the plate turns dark and soft. When running the first batch with new chemistry, start with approximately half the amperage listed in table 1. Remove the cathode after 30 minutes of plating. If the plate is light brown, increase the amperage by 25 amps and repeat. Keep doing this until the amperage is at or above the values listed in table or 1 or until the plate turns dark. The final amperage can be used on all subsequent batches with similar chemical parameters.

4. Turn the system ON/OFF switch to the ON position. The System cycle status LED should switch from STANDBY to FILLING.

Automatic Operation

The SilvPAC XLM-400B is completely automatic. The entire desilvering process is controlled by liquid level switches and the microprocessor in the unit. The operation is explained below. Please refer to Drawing 3.

1. For typical operation, silver laden solution is collected in the collection tank T-1. During this period, the unit is in a STANDBY mode.
2. When sufficient solution has been collected, the liquid level switch LL-1 is tripped and pump P-1 transfers solution from the collection tank T-1 to the desilvering tank T-2. The FILLING status LED will illuminate.
3. As solution is transferred, liquid level switch LL-3, in the bottom of the desilvering tank, will activate as the desilvering tank fills.
4. When the desilvering tank is full, the solution trips liquid level switch LL-2 near the

top of the desilvering tank, pump P-1 is turned OFF and the P-2 pumps are turned ON. The DESILVERING LED is illuminated and the AMPERAGE/HOURS: MINUTES display functions. *NOTE: While cell current is being delayed – FILL is displayed.*

5. The flow rate of the solution into the cell tanks should be approximately 8 gallons per minute.
6. The bleach-fix will circulate between the desilvering tank T-2 and the cell tank for a preprogrammed time as set on desilvering timer display. When running the first batch with new chemistry, periodically test the silver level in the batch. Note the time required to achieve the desired ending silver level. This time can be programmed into the batch controller for all subsequent batches of chemistry with similar parameters.

TABLE 1
Typical Current Settings

Type of Solution	Iron Concentration	Current Setting	Starting Silver Concentration
Bleach-fix & C-41 Fix (70%:30%)	4.5 gm/L	240 Amps	3.0 grams/liter
NR Bleach-fix, LFW& C-41 Fixer	2.5 gm/L	140 Amps	2.5 grams/liter
C-41 Fix Only	0 gm/L	80 Amps	5 - 6 grams/liter

PLEASE NOTE: Current settings are only approximate and may have to be determined by the user to get efficient recovery and good quality silver. A final silver concentration of 0.2 gm/L can be obtained for NR bleach-fix, C-41 fixer or combination of these solutions. The silver plate should be hard and light to medium brown in color. In some cases, the silver plate may be light gray in color.

7. After the desilvering time has counted down to zero, (and the HOLD PUMP OUT light is not ON) pump P-3 will automatically transfer solution out of the desilvering tank - Pump P-3 will remain on until the desilvering tank T-2 is empty and liquid level switch LL-3 trips. The green LED for PUMP OUT will illuminate.
8. When all of the desilvered solution has been pumped out of the desilvering tank, the desilvering time will automatically reset and the batch counter will record a

completed batch. The SilvPAC XLM-400B is now ready to desilver another batch as soon as the collection tank is full and liquid level switch LL-1 is tripped.

NOTE: In the AUTOMATIC mode, protective circuits are provided to prevent pump P-1 from starting until the desilvering tank T-2 is empty.

NOTE: The SilvPAC unit incorporates a microprocessor to restart the unit for the remaining time when power is interrupted. This prevents the solution from being over or under desilvered. If the pump circuit breaker blows, the unit will stop. If the cell circuit breaker blows, the cell current will shut OFF.

Master Reset

If there appears to be a problem with the circuit boards, it is recommended that the boards be reset.

The circuit boards can be reset to their factory default specifications as follows:

1. Turn OFF the ON/OFF switch
2. Wait 30 seconds
3. Hold down the SYSTEM CYCLE ADVANCE key
4. Turn ON the ON/OFF switch

Chemical Recovery Conditions

The recommended RA bleach-fix solution characteristics for efficient silver recovery using a SilvPAC XLM-400B are:

pH :	7.2 to 8.2•
Iron Concentration:	2 ½ to 4 ½ gm/L
Silver Concentration:	2 to 3 ½ gm /L
Sodium Bisulfate Concentration:	4 gm/L (or greater) for NR Bleach-fix

•*Most RA bleach-fix overflow from the processors will require a pH adjustment. Please consult with the manufacturer of the specific RA bleach-fix being used.*

Caustic Doser Timer

The caustic doser timer is built into the BF-I controller and automatically activates the

caustic doser pump during the FILL cycle. This pump run time is adjustable from 1 to 30 minutes. To set this time, locate the CAUSTIC switch (black) on the main PCB inside the unit (located above the right and left slave PCBs). Set the switch to the SET position. The display will read C13, Caustic 13 minutes. Use the increase or decrease keys to change this setting. Once the desired setting is obtained, place the caustic doser switch into the LOCK position. The factory default setting is C15 (15 minutes). Refer to electrcial connections on pages 11 & 12 for pump connections.

Manual Operation

The right and left power supplies can be operated in a manual mode. In manual, the operator controls the P-2 pumps, cell recirculation pumps, and power supplies using keypads located inside the electrical cabinet. Manual control keypads are located on the rear of the front door (the cabinet door must be open to access the keypads) near the circuit boards.

Manual operation of the SilvPAC® XLM-400B system is not recommended except for testing or overriding the automatic control circuits in the event of a component failure. **WARNING: There is no level switch control in the MANUAL mode. All power supply and pressure switch monitoring is disabled. Strict operator attention is required.**

Initiating the Manual Mode

To operate the right cell power supply in the manual mode:
1. Set the main disconnect to the OFF position.
2. Open the doors to the electrical cabinet.
3. Locate the right slave circuit board on the door of the cabinet.
4. Locate the MAN/AUTO switch located on the component side of the circuit board.
5. Set the switch to the MAN position.
6. Close and lock the door to the electrical cabinet.
7. Set the main disconnect to the ON position.

To operate the left cell power supply in the manual mode:
1. Set the main disconnect to the OFF position.
2. Open the doors to the electrical cabinet.
3. Locate the left slave circuit board on the door of the cabinet.
4. Locate the MAN/AUTO switch located on the component side of the circuit board.
5. Set the switch to the MAN position.
6. Close and lock the door to the electrical cabinet.
7. Set the main disconnect to the ON position.

Desilvering in Manual Mode

When the DESILVERING ON switch is activated, the recirculation pump(s) (P-2) will automatically switch ON. One minute later, the cell recirculation pumps will switch ON and five seconds after that, the cell current will be activated. The turn ON and turn OFF of loads is always staggered to reduce the surge currents that are drawn from the incoming power supply.

After the DESILVERING ON switch is activated, the cell voltage will be set to 0 volts. To increase the cell voltage (and cell current), hold down the VOLTAGE ADJUST key and the INCREASE key. The digital ammeter on the front of the unit will show the cell amperage. To lower the amperage, hold down the VOLTAGE ADJUST key and the DECREASE key.

Note that in the MANUAL mode, the power supply maintains a constant voltage and the cell current is a function of the electrical impedance of the cell. In the AUTOMATIC mode, the power supply provides a constant current and automatically changes the voltage to maintain the desired current. In the manual mode, the amperage display will not be as steady as it is in the automatic mode. This is normal and to be expected.

If a cell has to be operated in the MANUAL mode for an extended period of time, it is recommended that the unit be placed in the MANUAL DESILVERING mode, the cell voltage be adjusted to the desired value and the cabinet be locked. The cell can be turned ON and OFF using the electrical disconnect on the side of the cabinet. By following this procedure, the operator will not have to readjust the cell voltage each time the desilvering cycle is started.

MAINTENANCE

The following is a suggested maintenance schedule for the SilvPAC XLM-400B.

CAUTION: Before servicing the SilvPAC, turn both the system ON/OFF and main disconnect switch to the OFF position. ALWAYS use a mechanical device to lock out the disconnect switch before servicing.

Deplating (Stripping) Cathode (approximately ¼" of silver on cathode)

1. "Deplating" the cathode:

a) Remove the lids from the cell tank.
b) Disconnect the cathode from the two electrical connections (loosen the hex nut on the inside of the cathode and swing the electrical connection away from the cathode).
c) Lift the cathode straight up and remove from the cell tank.

The cathode may be "flexed" to break the bond between the cathode and the silver. During each desilvering, check the cell tank and desilvering tank for loose silver. Remove all loose silver before restarting unit.
NOTE: Do not dent the cathode!

After the silver has been removed, the cathode should be cleaned with scouring powder and water before placing it back into the unit. Secure the two electrical connections to the cathode (be sure to clean connections!). Replace the covers on the cell tank. Place the system ON/OFF and main disconnect switch in the ON position.

Every Six Months

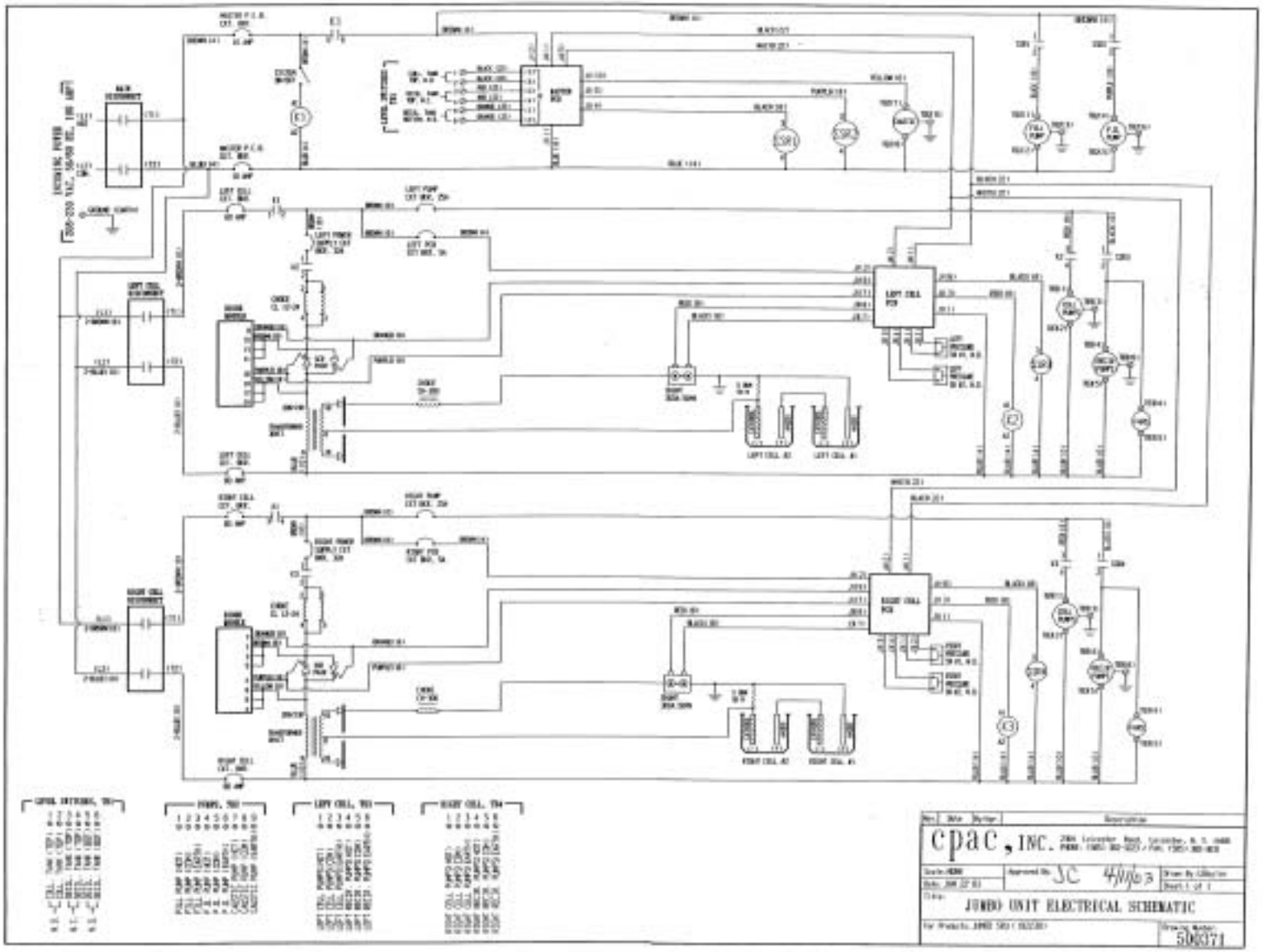
1. Cathode - Check for dents and roundness. Replace as needed.

2. Pumps - Check pumps and repair or replace if necessary.

3. Anode Basket - Check for eroded anodes and replace as needed.

4. Anode and cathode connections. Check all connections to the anode and cathode for corrosion. Tighten or remake connections as necessary.

5. Liquid level switch. Inspect the liquid level switch making sure it moves freely and is functioning properly.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JUMBO UNIT ELECTRICAL SCHEMATIC
5000171

CONTROLS

Electrical Box

Control	*Function*	*Operation*
Main power disconnect (Lock out/tag out)	Rotary switch (red handle) that controls the power to the entire system	Turn main disconnect switch to OFF-"0" when servicing unit. Turn main disconnect switch to ON-"1" when operating unit

FRONT PANEL OF Electrical Box (refer to drawing 4)

Control	*Function*	*Operation*
System power ON/OFF	Controls electrical power to the entire unit	Must be ON for unit to operate
Ammeter hours/minutes operating information	This display shows the remaining plating time when in DESILVERING cycle. This display is also used for operating information, troubleshooting and setting cell current and desilvering time	Displays time when in DESILVERING cycle. Displays cell current when settings are entered. Also displays error messages

KEYPAD

Control	*Function*
System Cycle Advance	Each push on the key will advance the system one step of the cycle. For example: from STANDBY to FILL, to DESILVER, to PUMP OUT, to STANDBY
Batch	Will display the number of batches processed
Time	Will display the amount of time in the DESILVERING cycle
Set	Pushing this key lights the indicator lamp in the upper right hand corner, allowing the operator to permanently change the time and/or amperage settings
Amperage	Will display plating amperage
Increase/Decrease	These keys are used to set the values of various system functions
Hold Pump Out	This key holds the P-3 pump from activating

STATUS LAMPS (indicate which cycle is active)

Control	*Function*	*Operation*
Standby	This unit is idle. A batch will start as soon as the collection tank fills and fixer is transferred into the desilvering tank	Green LED is lit in STANDBY mode only
Filling	Pump P-1 is activated filling the desilvering tank (T-2)	Green LED is lit in FILL mode only, display shows FILL
Desilvering	Chemicals are being desilvered. The cell pumps and cell current are ON	Green LED is lit in the DESILVERING mode when solution is being desilvered
Hold pump out	Pump P-3 is deactivated preventing the desilvered solution from pumping out	Green LED is lit in the HOLD PUMP OUT mode
Pump Out	The desilvered chemicals are being pumped out through the discharge pump (P-3)	Green LED is lit in the PUMP OUT mode when the discharge pump is ON

CIRCUIT BREAKERS

Control	*Function*	*Operation*
Main Breaker	Protects unit from power surges	Place in the ON position for normal operation
Cell circuit breaker	This protects the cell current power supply	Place in the ON position for normal operation
Pump circuit breaker	This protects the cell pumps and PCB	Place in the ON position for normal operation

CAUSTIC TIMER

Control	*Function*	*Operation*
Caustic (set/Lock)**	This allows the caustic doser timer to be changed	Place switch in SET position to change caustic doser time from 1 to 30 minutes

PROGRAM SET/LOCK SWITCH

Control	*Function*	*Operation*
SET/LOCK (set/lock)**	This allows the desilvering parameters to be permanently changed	Place switch in SET position to change parameters

** Switches are located on the printed circuit board

TROUBLESHOOTING GUIDE		
A. Chemical	**Possible Cause**	**Corrective Action**
Limited current	Low solution conductivity	Check iron and silver concentration and refer to Table 1
Low plating rate	Low sulfite concentration	Check sulfite concentration. If lower than 4gm/L, increase to 4 gm/L
Silver sulfide formation (Black ppt)	Desilvering time is too long	Shorten time, desilver down to between .2gm/L and .5gm/L of silver
Silver sulfide formation (Black ppt)	Low sulfite concentration	Check sulfite concentration. If lower than 4gm/L, increase to 4 gm/L. If silver is low, end the batch and clean the cathode
Black silver plate	Current setting too high	Refer to the current setting in Table 1 after checking the iron concentration.

TROUBLESHOOTING GUIDE		
B. Mechanical	**Possible Cause**	**Corrective Action**
Internal knocking sound in cell	Cathode out of place	Remove cathode, inspect, and reinstall
Rec. Pump fails to start	Pump circuit breaker blown	Reset circuit breaker
Rec. Pump fails to start	Loose wire	Check and tighten wiring
Rec. Pump fails to start	Defective relay or PCB	Refer to schematic and check relay and PCB outputs
Rec. Pump fails to start	Burned out	Replace pump or pumphead

C. Electrical	Possible Cause	Corrective Action
Green LED in SYSTEM CYCLE STATUS does not illuminate	No power to unit	Check circuit breakers and system switch
Green LED in SYSTEM CYCLE STATUS does not illuminate	Main PCB	Reset main PCB by holding down the SYSTEM CYCLE ADVANCE key when turning ON the main power. If that is not successful, replace main PCB
Limited cell current or fluctuating cell current, limited or no plating	Loss of electrical connection	Disconnect power to unit. Check all connections including; transformer, diode, heat sink, panel terminals, shunt, anode rings and PCB. Tighten any loose connections & replace any corroded wires or terminal connections.
No plating	Operating current too low	Check operating current. Table 1
Limited current	Open diode	Check diodes and replace if necessary
Pumps do not work	Pump circuit breaker blown	Reset circuit breaker
Pumps do not work	Relay or PCB failure	Refer to electrical schematic to check relay and PCB outputs
Pump P-1 doesn't stop	LL-1 or LL-2 switch shorted	Check LL-1 & LL-2, replace if necessary
Pump P-1 doesn't start	LL-1 open	Fill collection tank, check LL-1 for continuity
Pump P-3 does not stop	LL-3 shorted	Check LL-3 and replace if necessary
Pump P-3 does not stop	Faulty relay or main PCB	Refer to electrical schematic to check relay and PCB
Limited cell current or fluctuating cell current	PCB failure	A 20 millivolt DC signal should be obtained across shunt J3(7), J3(8) on PCB at 120 Amps. Replace PCB (1 millivolt DC across shunt = 6.0 Amps through the cell)
Unable to adjust current below 40 Amps on display	SCR shorted	Replace SCRs
No Cell current	Cell tank not full	Check cell tank liquid level
No Cell current	Cathode not connected	Check cathode connection
No Cell current	Open circuit	Check electrical connections, diodes and transformer
No Cell current	Bad SCR	Replace panel mount SCRs

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