



## ***ML-27***

(115 Volt, 60 Hz)  
(230 Volt, 50 Hz)

### **User's Manual**

- **Installation**
- **Operation**
- **Maintenance**

10/2002

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## *Statement of Warranty*

All equipment is manufactured to exacting standards and has been tested and inspected for proper workmanship and performance before shipping.

Any parts which are defective will be repaired or replaced within a one year period after date of shipment, provided the equipment has been used according to the instruction manual and has not been abused or tampered with.

The company will not be responsible for any damage resulting from leakage of water or chemicals caused by improper installation, operator carelessness or defective/loose plumbing fittings associated with installation and operation of the equipment. The company assumes no responsibility for damage in transit and the customer should present any claim for such damage to the carrier.

This warranty gives you specific legal rights. You may also have additional rights that vary from state to state.

Any unit to be repaired under warranty must be shipped, freight prepaid, or delivered to a facility authorized to render services provided hereunder. Returned unit must be either in its original package or a similar package affording an equal degree of protection. All units must have a Material Return Authorization code (MRA) visible on the returned item. MRA's can be obtained by calling 585-382-3223.

## RECOMMENDATIONS

Read the entire instruction manual *before* installation or operation of the ML-27 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.

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**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.**

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## IMPORTANT SAFEGUARDS

When using your ML-27 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.
3. Do not operate this appliance with a damaged cord or if the appliance 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 immerse this appliance in water or other liquids.
7. To avoid electrical shock hazard, do not disassemble this appliance. Call a qualified service technician when service or repair work is required. Incorrect reassembly can cause electric shock hazard when the appliance is switched ON.

SAVE THESE INSTRUCTIONS

## DESCRIPTION

### General Comments

The ML-27 is an automatic electrolytic silver recovery system for minilabs, graphic arts, and x-ray processing facilities. Plating current, time, and silver concentrations vary between bleach fix/fixer solutions and must be set by the operator for each particular application. After this initial setting, the system is automatic from batch to batch. The time and amperage setting are easily changed by the operator. The unit eliminates the need for fussy “wiring into the film processor”. It is also designed to eliminate the worry of turning it off at night or weekends and on again in the morning.

The ML-27 includes accumulation and desilvering tanks. The 10.5-gallon (40 liters) accumulation tank collects the fixer awaiting desilvering, while the desilvering tank has been designed to desilver 4.5 gallons (17 liters) per batch of fixer. Also included is a silver recovery unit (SRU), which houses the electrolytic cell for the desilvering process. The system also includes two pumps, one for transferring the fixer from the accumulation tank into the desilvering tank and the other for transferring the fixer out of the desilvering tank. All internal connections are provided. The unit is shipped assembled for ease of installation.

During the desilvering cycle, additional silver bearing chemicals are being collected in the accumulation tank with no intermingling.

At the end of the plating cycle, the delivered chemicals are automatically pumped out to a metallic exchange “tailing” cartridge\* or directly into the sewer by means of the discharge pump (P-2).

See figure 1 for the recommended operating configuration.

*\*The use of the CPAC/IMG Trickle Tank and Vault I, optional accessories, are highly recommended to minimize silver discharge to the drain.*

## SPECIFICATIONS

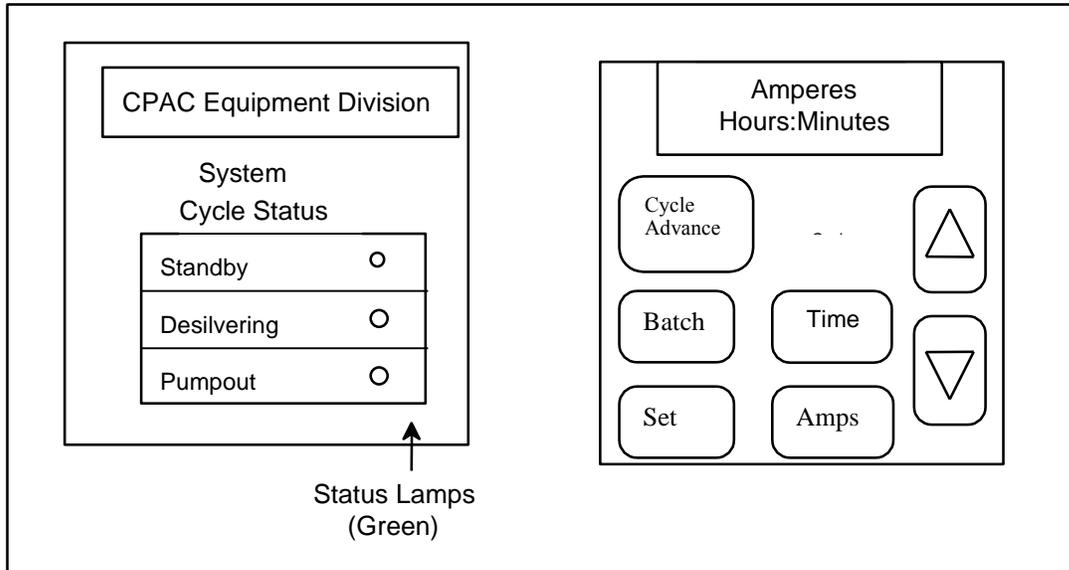
### General Comments

Recovery Capacity	Up to 1 Troy Ounce/hour (31.1 grams/hour)
Plating Range	0-25 Amps
Cathode Size	10.5" Dia. X 9" H (26.7 cm Dia. X 22.9 cm H)
Dimensions	22" D x 16" W x 32" H (55.9 cm x 40.6 cm x 81.3 cm)
Collection Tank Capacity	10.5 Gallons to overflow point (40 liters)
Batch Size	4.5 Gallons (17 liters)
Total Capacity	15 Gallons (57 liters)
Electrical	115 VAC, 50/60 Hz, 350 Watts
Net Weight	57 lbs. (26 kilograms)
Shipping Weight	75 lbs. (34 kilograms)
Materials of Construction	Tank- Polyethylene, Electrical cover-ABS Plastic, Cathode–Stainless steel, Anode- Carbon
Installation	Unit is internally pre-plumbed complete with all fittings.

The ML-27 is shipped in one box and is fully factory assembled. Only three plumbing connections must be made at installation time. They are:

1. On ½" hose from either the processor overflow or the fixer-collecting tank to the ML-25B accumulation tank inlet.
2. One ½" hose from discharge pump (P-2) to cartridge or drain.
3. One ½" hose from safety overflow to drain.

## CONTROLS



**Figure 2 ML-27 Control Panel**

### Front Panel of Silver Recovery Unit

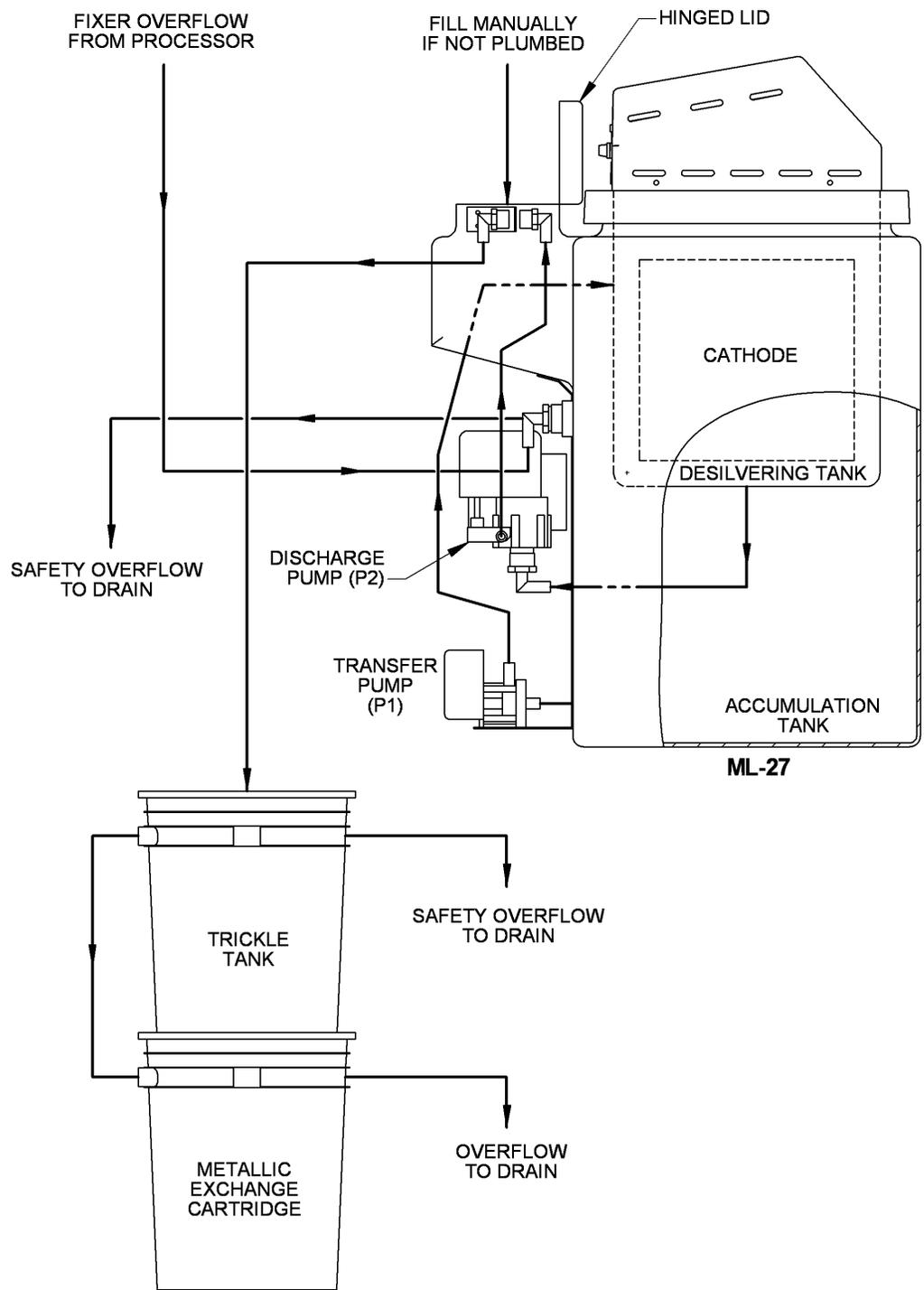
<u>Control</u>	<u>Function</u>	<u>Operation</u>
System Power ON/OFF	Controls the power for the entire system.	Push the upper part Of the rocker switch to turn ON; Push the lower part Of the rocker switch To turn power OFF.
Ammeter Hours/Minute	This display shows the pre-set plating current as well as remaining plating time.	Alternates between time and the Amperage approximately every four seconds.

## **Keypad**

<u>Control</u>	<u>Function</u>
System Cycle Advance	Each push on the key will advance the system one step of the cycle.
Batch	Will display the number of batches processed.
Time	Will display the amount of time in the desilvering cycle.
Set	Pushing this key lights Indicator lamp in the upper Right hand corner, allowing The operator to 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.

## **Status Lamps**

<u>Control</u>	<u>Function</u>	<u>Operation</u>
Standby	The unit is idle. It will start a batch as soon as the accumulation tank fills and fixer is transferred into the desilvering tank.	Lamp is lit in STAND-BY mode only.
Desilvering	Chemicals are being desilvered. The agitation motor and cell current are ON.	Lamp is lit when solution is being Desilvered.
Pump Out	The desilvered chemicals are being pumped out thru the discharge pump.	Lamp is lit when the discharge pump is ON



**ML-27  
RECOMMENDED OPERATING CONFIGURATION**

*Figure 1*

## INSTALLATION AND SET-UP

### General Comments

1. Remove the ML-27 from shipping container and check for signs of damage such as cracked tanks, broken fittings, and etc. Notify CPAC immediately if any damage exists. Remove all packing materials and save.
2. Position the system three to four feet from a grounded 120 VAC, 3 Amp power source. ( 230 VAC 2 Amp power source for export units: or 100 VAC, 4 Amp power source for Japan export units. Check the serial number label for the voltage)
3. Drain provisions must be provided for the unit as well as other accessories used. (See Figure 1)
4. Connect the safety overflow hose to a drain.
5. Connect the silver bearing overflow hose from the processor(s) to either a solution collecting tank or directly to the ML-27 tank inlet.
6. Insert pump-out hose (from P-2 pump) securely into a drain or a cartridge feed tank.

*CAUTION: Use hose clamps on all connections to prevent leaks.*

## **Programming the ML-27**

Refer to Figure 2 for keypad layout.

1. The unit is factory programmed for 25 Amps and five hours. Both of these parameters can be changed and other values reprogrammed into the unit.
2. The ML-27 can be reprogrammed using the keypad. The keys and their functions are described below:

**SET**: Press this key to enter the programming mode. Either the present plating time or amperage will be displayed. A light in the upper right corner of the 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 that this parameter can now be changed. Change the value by pressing either the "INCREASE" or "DECREASE" key. When the new hours have been selected, press the "TIME" key again and the existing minutes will begin to flash. Again change this value by pressing the "INCREASE" or "DECREASE" key. After selecting the new time, press the "AMPERAGE" key to advance to that mode.

**AMPERAGE**: Pushing this key will cause the present amperage setting to be displayed and flashing, which indicates that it can be changed. Change this setting by using the "INCREASE" or "DECREASE" key .

3. When using the "INCREASE" or "DECREASE" key, 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.
4. 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 will be entered into the microprocessor. Note that it is not mandatory to make all the above changes at the same time. New parameters can be entered into the system at any time by pressing the "SET" key.

## **Programming the Two Stage Plating**

“Fine tuning” of the time and amperage can be obtained by reprogramming the percentage of elapsed time before the unit switches to a reduced amperage. When the unit leaves the factory, its set so that when 20% of the batch time remains, the unit automatically reduces the amperage to 80% of its set value. For example: Using E-6 fixer set for one hour and 8 Amps, the unit decreases its amperage to 80% or 6 amps when 12 minutes remains in the batch.

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 will begin 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.

This “fine tuning” may not be needed by all labs when operating the ML-27. As a lab becomes more proficient with the operation, this procedure may be implemented.

## **System Cycle Advance Key**

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

When the “SYSTEM CYCLE ADVANCE” key is pressed the unit will go into the next mode. 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 to fill the desilvering tank. Damage to this pump, which is timed to remain on for four minutes, could occur if there is not enough fixer to adequately fill the desilvering tank.

**BATCH:** Pressing the “BATCH” key will display the present batch accumulation number. Pressing the “DECREASE “ key will reset the accumulator to 0. After holding down this key for three seconds, the permanent batch counter will be displayed. The permanent counter cannot be reset.

## START-UP

### General Comments

The following steps must be performed by a qualified technician.

1. The unit leaves the factory programmed as follows:
  - Plating Amps set at 25 Amps.
  - Time set for 5 hours.
  - Two stage plating set so that when 20% of the set time remains, the amperage is reduced to 80% of the set amount. (These percentages can be changed. See “*Programming the Two Stage Plating*” section.)
2. Initially measure the silver concentration of your fixer, either directly from the collection tank or from within the desilvering tank using silver estimating test strips. Silver concentration should be over 1 gram/liter (1,000 ppm).
3. Turn on the “SYSTEM ON” switch. Front panel lights will light for approximately one second. (This is a diagnostic test and all lamps should light.)
4. Time and current setting are variable depending on the type of chemicals being desilvered. Suggested starting settings are as follows:
  - Black and White Fixer – 8 Amps at two hours and 30 minutes.
  - RA-4 “Washless Chemicals” – 15 Amps at four hours.
  - C-41 Fixer – 10 Amps at three hours.
  - 25% C-41 and 75% RA-4 Bleach Fix – 18 Amps at four hours.
5. Set both the time and amperage as described in the “*Programming the ML-25B*” section. For the initial test for the chemicals described above, use the settings given in step 4. At the times specified above, check the silver content of the processed chemicals using the test paper provided.

*Example: For C-41 fixer, set the time for three hours and the amperage for 10 Amps.*

In order to obtain a sample of the chemicals from the desilvering tank, the unit must be turned OFF and the power head assembly lifted from the unit. (Refer to “Desilvering the Cathode” section for the basic power head removal procedure.)

If the silver is 1 gm/liter or more (shades of brown or above on test strips), reinstall the power head and run the unit for another 30 minutes and recheck. Continue to do this until 1gm/liter (yellow) is obtained. Note the total time.

*Caution: During the test runs, never let the unit's time go to 0. If this happens, the discharge pump will come on and drain the desilvering tank.*

6. After step 5 is completed record the type of chemicals, silver concentration, time and amps. Keeping this information will help optimize settings for future batches of that particular chemistry.

7. Press the "SYSTEM CYCLE ADVANCE" key to advance to the "PUMP OUT" mode. This will cause the discharge pump to come on and drain the desilvering tank. It takes about three minutes to completely drain this tank. Upon completion of pumping out the desilvering tank, the unit goes into the "STANDBY" mode.
8. Reprogram in the new time determined in step 5. (If there is sufficient chemicals in the accumulation tank, the desilvering tank will begin to fill while reprogramming is in process.)
9. The ML-25B will retain its operating status for this particular mix while the power is turned OFF. During the lamp test (see step 3) the internal microprocessor verifies this.

# OPERATION

## **General Comments**

The ML-27 follows three successive steps of operation:

1. Standby
2. Desilvering
3. Pump Out (Refer to “Status Lamps” section)

Initially the unit will be in the standby mode waiting for the accumulation tank to fill. When this tank fills to the automatic start level (a switch built into the tank detects this) Fixer is transferred (pumped) into the desilvering tank and the unit switches to the Desilvering mode. Also note that as the desilvering tank is being filled Fill will be shown on the display.

During the desilvering cycle the programmed item and amperage will be alternately displayed changing every four seconds. The time will continually count down as the cycle progresses

At any time during the desilvering cycle, the number of batches can be displayed by pressing the BATCH key. (See the “*Desilvering*” section that follows if there is a need to change the time or amperage settings for the present batch only.)

A convenient feature of the ML-27 is a hinged lid on the top of the accumulation tank. Swinging this lid open allows for manually pouring silver bearing chemicals, such as “washless chemicals”, directly into the tank should you not want to plumb processor overflow lines to the unit (see Figure 1).

## **Desilvering**

It takes approximately four minutes to fill the desilvering tank to its 4.5 gallon (17 liters) capacity. When the fill cycle is complete, the agitation blade begins to rotate. The plating current is on. The unit is now in the “DESILVERING” mode.

The desilvering batch time is the programmed time value. The time being displayed is the remaining time for the batch. If you wish to temporarily change the time, press and hold down the “TIME” key. Either the hours or minutes will flash indicating that it can be changed. If the “HOURS” is flashing and “MINUTES” is desired, again press and hold the “TIME” key and the “MINUTES” will begin to flash indicating that it can now be changed. While holding down the “TIME” key, press either the “INCREASE” or “DECREASE” key to change the flashing value. When the new time is reached, release the “TIME” key.

To temporarily change the amperage setting, press and hold the “AMPERAGE” key and adjust up or down using the “INCREASE” or “DECREASE” keys. When the amperage is reached, release the “AMPERAGE” key. Both time and amperage are now altered for

the current batch only. Upon conclusion of this batch, the unit will revert back to the originally programmed value. (See Section “*Programming the ML-27*” if reprogramming is needed.)

### **Pump Out**

When the desilvering time has expired, the discharge pump will come on and the unit goes into the “PUMP OUT” mode. After the pump out cycle is completed, approximately three minutes, the unit will advance to “STANDBY”. If there is enough solution in the accumulation tank to process another 4.5 gallon batch, it will begin to fill the desilvering tank automatically.

### **Batch**

At any time during the ML-27 cycle, the “BATCH” key may be pushed to display the number of batches processed. This is particularly helpful when determining when to desilver the cathode. The batch counter is advanced each time a pump out cycle is completed.

If the “BATCH” key is held down for more than two seconds, the total number of batches the unit has processed during its lifetime will be displayed.

After the unit processes several batches of chemicals and the cathode has been desilvered, reset the batch count to 0 (to reset temporary batch counter: press BATCH and DECREASE keys).

### **Fail Safe Procedures**

Internally the microprocessor continually checks for mechanical and/or electrical problems.

The digital display will show “ERR 1” if the unit cannot reach the programmed amperage. The display will then show in sequence, “ERR 1 / LO-A” This could be caused by an obstruction in the pump, the desilvering tank not filled, too low silver content of the chemicals, electrical connections not clean, etc. The message will continue to show until the problem is corrected.

When “ERR 1” appears, the total hour countdown continues. This means that a silver sample should be taken just prior to pump out of the desilvering tank if the problem wasn’t noted and repaired immediately after the error occurred.

If the microprocessor circuit loses power, there is an internal system which will reset and restart the microprocessor without operator action. The restarted system will begin exactly where it left off.

## **Chemical Residues**

Chemical residues may build up in both tanks, as well as the inside of the pumps. A regular schedule to disassemble, clean and flush these parts is recommended. The frequency of cleaning will vary according to the demand placed on the equipment.

Once a week, check plumbing for signs of leaking, restrictive kinks, etc.. Annually, a qualified technician should check all electrical connections for good contact. Anode and cathode connections are especially important. A more detailed description is covered in the service and maintenance section of this manual.

## **Desilvering the Cathode**

This procedure is to be used after the cathode surface has a buildup of  $\frac{1}{8}$ " minimum to  $\frac{1}{4}$ " maximum of silver on it. (Initially the unit should be checked after it has processed six batches of chemicals. The actual number of batches will vary from lab to lab depending on the silver concentration of the chemicals processed.) The silver deposited on the cathode should be light brown or gray in color. If its black, the chemicals have been over processed and time and/or amperage need to be reduced.

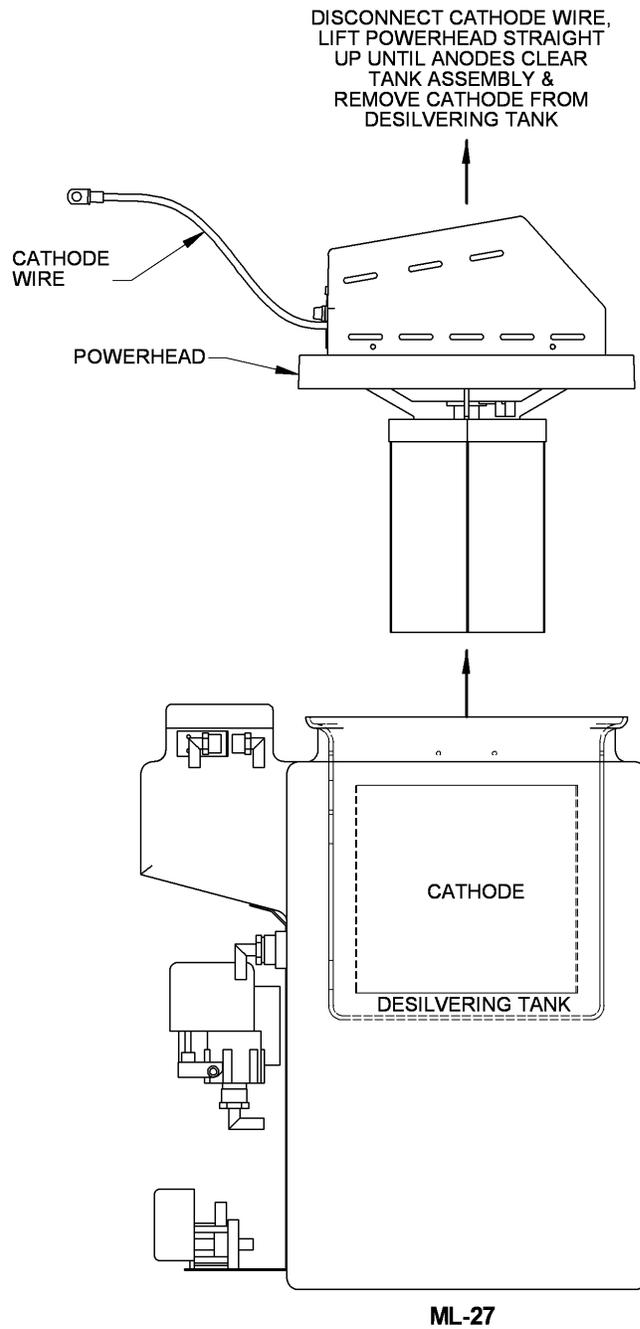
Equipment required for desilvering the cathode follows:

- a) Putty knife, approximately 1" wide.
  - b) Large plastic bag to collect silver flake. (Optional)
1. Turn the unit OFF.
  2. Disconnect electrical power plug from the wall.
  3. Disconnect the two pump plugs and the level switch from the back of the power head. The cathode is connected to the power head with a single electrical cable. The cable connects to the cathode with a large knob on the left side of the power head. Loosen the knob and remove the wire from the cathode.
  4. By grasping center areas of the tank cover, lift the power head straight up from the tank and set it down. The surface must be suitable for catching any chemicals which might drip from the anodes. Be careful not to damage the agitation blade or anodes.
  5. Lift the cathode out of the desilvering tank.
  6. With a putty knife or similar tool, scrape the silver from cathode. For cleanliness, it is recommended that the cathode be placed into a large clear plastic bag during the scraping procedure.

*NOTE: When desilvering fixers, the silver plate might be very hard. To ease removal, immerse the cathode in hot water for several minutes then remove it and immediately*

*run it under cold water. This helps to break the bond between the silver flake and the cathode.*

7. Reinstall the cathode by inserting it back into the desilvering tank. The Power Head assembly can now be reinstalled in the unit.
8. Once again, check all hoses for possible leaks and kinks.
9. Plug in both pumps and level switch into the Power Head. Attach cathode wire and then plug the power cord into the wall. The system is now ready for operation.



**CATHODE REMOVAL, ML-27**

*Figure 3*

**MAINTENANCE AND SERVICE**  
(TO BE PERFORMED BY A QUALIFIED TECHNICIAN ONLY)

1. Turn unit OFF.
2. Disconnect power plug from the wall.
3. Disconnect the two pump plugs and the level switch from the back of the power head. Disconnect cathode wire (remove large knob on left side of power head).
4. By grasping center areas of the tank cover, lift the power head straight up from the tank, and set it down. The surface must be suitable for catching any chemicals which might drip from the anodes. Remove the cathode as described in the *“Desilvering the Cathode”* section of this manual.
5. Thoroughly clean tank and all hoses.
6. Check hoses and bulkhead fittings to see there are no leaks or restrictions.
7. Check lock washers, anode bolts and nuts. Remove any corroded washers.
8. Tighten all anode bolts. Do not over-tighten. Over-tightening can cause the carbon anodes to crack.
9. Remove the two screws on each side of the power head and remove the cover.
10. Check all DC electrical connections (especially anode and cathode connections). These connections must be perfect, clean, and tight.
11. Replace the power head cover and screws. Replace the cathode. Install the power head on the tank assembly.
12. Plug pumps and level switch into power head.
13. Connect cathode wire.
14. Check to see that the plug attached to the ML-27 power cord is clean and fits very tight into the wall socket.
15. Turn unit ON.

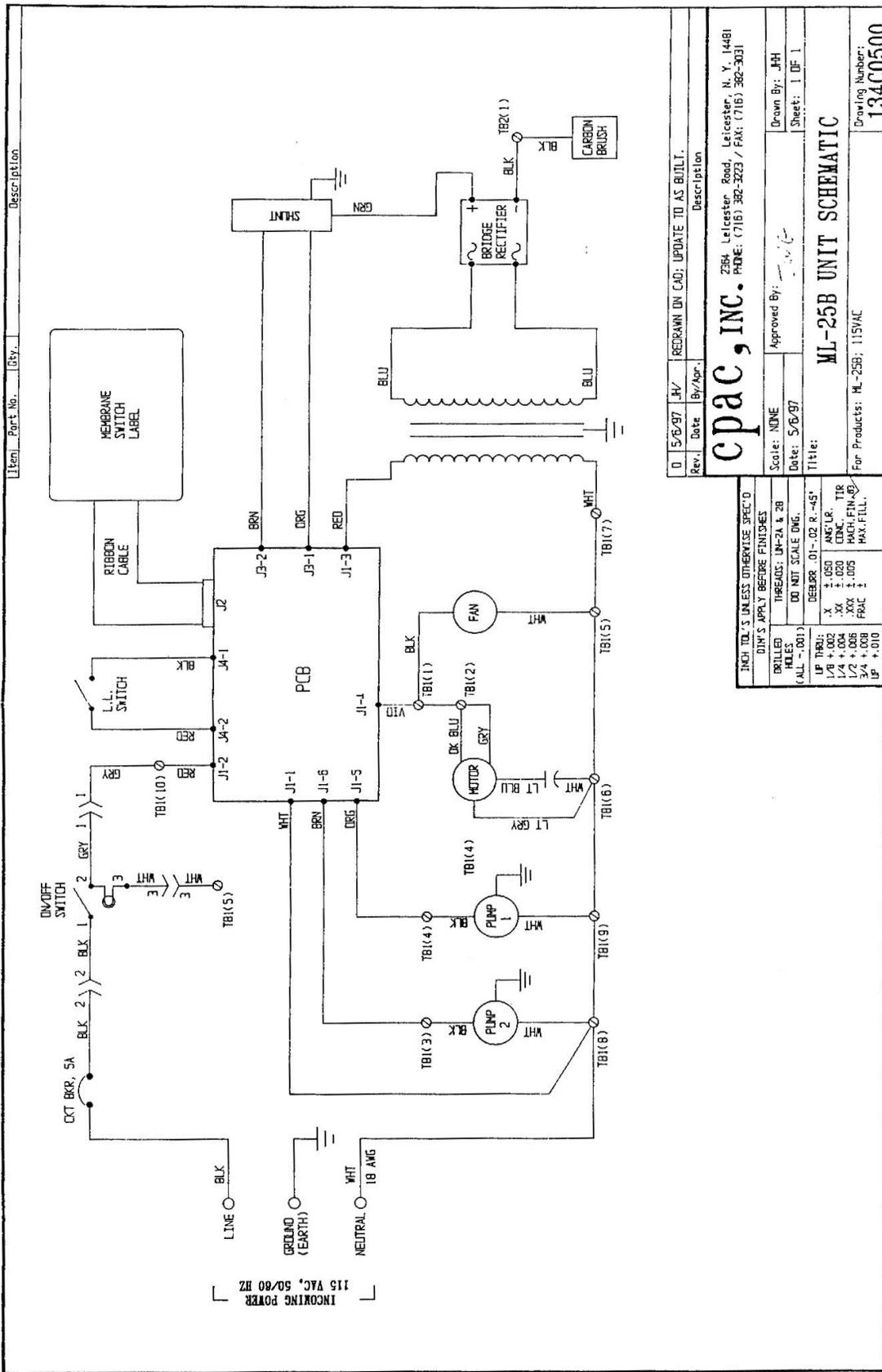
## **Preventive Maintenance and Service**

1. Periodically check hoses and bulkhead fittings to ensure that there are no leaks or restrictions.
2. Check all electrical connections for tightness and corrosion. Clean and tighten if necessary. Replace electrical terminals if badly corroded.
3. Once a week, wipe down unit with a damp cloth.
4. Do not allow the transfer pumps to run dry. Turn the unit OFF immediately if this occurs.
5. It is good practice to flush all chemical lines and tanks with warm water monthly. This will prevent crystalline build-up from the dried chemicals. The moving parts of the pumps have been designed and manufactured so that no further lubrication is required.



## TROUBLESHOOTING GUIDE

Symptoms	Possible Cause	Probable Solution
Fixer leaking or crystallizing around inlet, outlet or drain fitting	Loose Bulkhead fitting or tubing.	Tighten fittings or tubing joints. Very bad leaks, remove and clean fittings. After cleaning, securely reinstall fittings to holding tank.
	Cracked Fitting.	Replace the fittings.
Sulfiding (black silver plate and / or rotten egg smell)	Unit has been ON for too long a period of time. All of the silver has been removed from the fixer.	Change time appropriately.
	Recovery unit on too high Amp setting.	Choose lower Amp setting.
Silver falling OFF cathode.	Recovery unit on too long.	Change time appropriately.
	Unit set on too high a setting.	Choose lower Amp setting.
	Cathode contaminated with grease and or oil.	Clean cathode with clean cloth and scouring powder (comet, etc). Rinse thoroughly in water to remove contaminates.
No silver collecting on cathode.	No silver in solution.	Use silver laden fixer.
	Poor contact to anode.	Anode ground not securely connected.
	Bad electrical connection to cathode.	Clean and tighten cathode connections.
Pump not working (motor running)	Chemical residue in pump.	Clean and flush.
	Impeller damaged.	Replace pump or impeller.
Pump not running.	Not plugged into proper socket.	Check power outlet.



INCOMING POWER  
115 VAC, 50/60 HZ

Item	Part No.	Qty.	Description
0	5/6/97	JHV	REDRAWN DN CAD; UPDATE TO AS BUILT.
Rev.	Date	By/Rev.	Description
<p><b>cpac, inc.</b>          2354 Leicester Road, Leicester, N. Y. 14461          PHONE: (716) 362-3223 / FAX: (716) 362-3031</p>			
Scale:	NONE	Approved By:	JMH
Date:	5/6/97	Sheet:	1 OF 1
<p><b>ML-25B UNIT SCHEMATIC</b></p>			
For Products: ML-25B; 115VAC			Drawing Number:
			<b>13400500</b>

INCH DIMS UNLESS OTHERWISE SPEC'D	
DIM'S APPLY BEFORE FINISHES	
DRAWN	THREDS: UN-24 & 28
DRILLED	DO NOT SCALE DIMS.
(ALL -100)	
UP THRU:	DECIM: 01-.02 & -.05*
1/8 +.002	.XX ANGLE
1/2 +.004	.XXX TIR
3/4 +.008	MAX FIN. RD.
UP +.010	MAX FILL.



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