



Electronics Limited

ABC

Through Hole Plating Line

PL903S

(PART No: 500-085)
ABC Copper Plating Line
12" x 10"
(1 x 50A PSU)

&

PL904S

(PART No: 500-086)
ABC Plating Line
12" x 18"
(1 x 100A PSU)

Panel Plating Instruction Manual

IMPORTANT

ELECTRICAL SAFETY NOTICE

CONNECTIONS TO MAINS ELECTRICAL SUPPLY

This equipment is designed to safety class 1.

Before connecting this equipment to the mains electricity supply, examine the information on the apparatus rating label.

Ensure that the mains supply is single phase alternating current (a.c.) of the stated frequency (Hz), with neutral nominally at earth potential.

Check that the supply voltage is in the range stated on the rating label.

The equipment rating label states the value of the fuse fitted to the apparatus itself. Ensure that the plug or outlet circuit is fitted with an appropriate fuse of higher value.

WARNING : THIS APPARATUS MUST BE EARTHED

The wires in the mains lead are coloured in accordance with the following code:

Green/Yellow	-	Earth (E)
Blue	-	Neutral (N)
Brown	-	Live (L)

Connect the wires to a non-reversible 3 pin plug as follows:

Green/Yellow wire to terminal marked :	E (earth)	or
	G (ground)	or
	Coloured Green	or
	Coloured Green/Yellow	or

Blue wire to terminal marked :	N (neutral)	or
	Common	or
	Coloured Blue	or

Brown wire to terminal marked :	L (live)	or
	Phase	or
	Coloured Brown	

LIVE PARTS SHOULD NEVER BE EXPOSED UNLESS THE EQUIPMENT HAS BEEN SWITCHED OFF AND ISOLATED FROM THE MAINS ELECTRICITY SUPPLY.

CORRESPONDENCE

In the event of any correspondence concerning this equipment, please quote the catalogue number and serial number shown on the rating label together with the voltage and frequency of the local mains electricity supply. This will help to process your enquiry quickly.

Any spare parts which may be required, are supplied on the understanding that the replacement of these requiring the exposure of live electrical connections will be undertaken by an electrically qualified person.

Motor driven appliances should not be run unless all covers have been properly replaced.

SITING AND SETTING UP

(A) Siting

Position the plating unit in a well ventilated area with access to mains cold water inlet supply and drain and near a 13 amp single phase 50Hz 220/240v a.c. supply socket.

(B) Contents

The PL903S /PL904S should include the following :-

- (1) 1 *PL903S /PL904S Plating Line*
- (2) 1 *Oscillating Frame*
- (3) 1 *Washing Machine Hose*
- (4) 1 *Washing Machine Tap*
- (5) 5 *Lids to cover Tanks when not in use*
- (6) 2 *Board Holders*
- (7) 1 *Set of Operating Instructions*
- (8) 1 *Bag of Plastic balls to cover Copper Plating Solution.*
- (9) 1 *32mm push fit T piece with blanking plug.*

(C) Electrical Requirements

A single 13 amp 220/240v 50Hz single phase socket will be required. It must be properly earthed and it is recommended that an earth leakage (RCCD) device should be fitted in case of heater breakage - available from us if required at £16.95 (part number 161053)

(D) Mains Water Supply (Spray Wash)

The plating unit is supplied with a washing machine hose and threaded washing machine type tap. One end of the hose is connected to the mains water inlet at the back of the unit and the other end is connected to the threaded end of the tap which should first be fitted to a standard 15mm copper pipe supplying cold water at a minimum pressure of 1.5 Bar by means of its compression type fitting.

E) Water Waste Outlet (Spray Wash)

The unit is supplied with a standard 32mm push fit type T piece with a blanking plug in one side of the T. From here the unit can be plumbed into a suitable drain using standard 32mm polypropylene pipe and push fit joints. **N.B.** If you experience difficulty getting the pipe or joints we can supply these.

N.B. ALWAYS ENSURE THAT ALL TANKS ARE FILLED WITH EITHER WATER OR PROCESSING CHEMICALS BEFORE CONNECTING TO THE MAINS ELECTRICAL SUPPLY

(F) Pre-Test

In order to ensure the unit has suffered no damage in transit it is best to test the unit with water first prior to filling the tanks with chemicals.

For This Reason:

(1) Fill each tank with water to 10mm from shoulder where the lid sits on and in the case of the plating bath unhook and remove anodes and then fill the tank with water so that the level is just below the bottom of the two vertical pillars on the board holder when it is in position on the bar across the oscillating frame. **N.B** The anodes are fitted with white anode bags when shipped and these should not be removed.

(2) Switch on the green mains **ON/OFF** switch which should illuminate.

(3) Check all the functions are working by depressing all the function switches and in the case of the Clean/Condition (Tank 1), Catalyse (Tank 3), Salt Remover (Tank 4) and Copper (Tank 5), leave these switches on and allow the tanks to reach their operating temperatures of 60-65°C, 40-45°C, 30-35°C and 25-30°C respectively, when the orange indicator light will then go out.

N.B. *It is important that these temperatures are correct and although factory set they could change depending on the ambient temperature.*

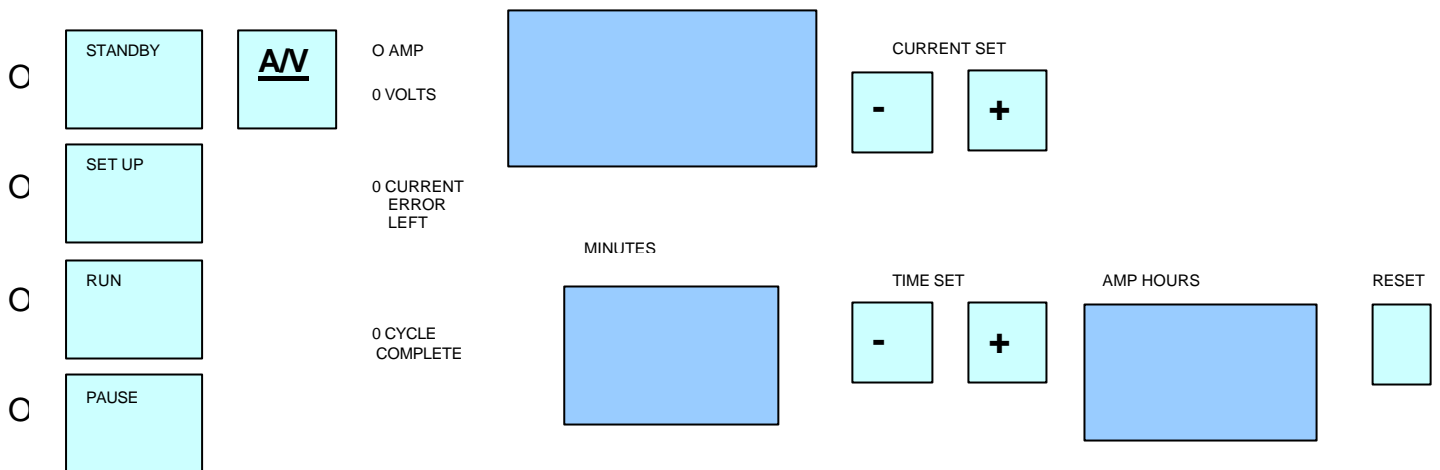
If this is the case open the cabinet doors and you will see a white bracket fixed to each heated tank to which the thermostat controller is fixed. To alter the temperature turn the brass control spindle anti-clockwise to decrease and clockwise to increase. **N.B.** *If you decrease when the heater is on, the orange heater indicator light will go out and if you increase when the heater is off, the orange indicator light will go on.*

(4) Leave the heated tanks on and preferably turn the unit off at the end of the day and leave standing overnight.

(5) Check the next morning that there have been no leaks and ensuring all function switches are in the **OFF** positions empty the tanks through drain taps provided and remove any excess water in the bottoms with paper towels.

N.B. *In all cases before filling the tanks make sure that the drain hose ratchet clips and drain taps are closed and that the taps have been clipped back into the clips provided*

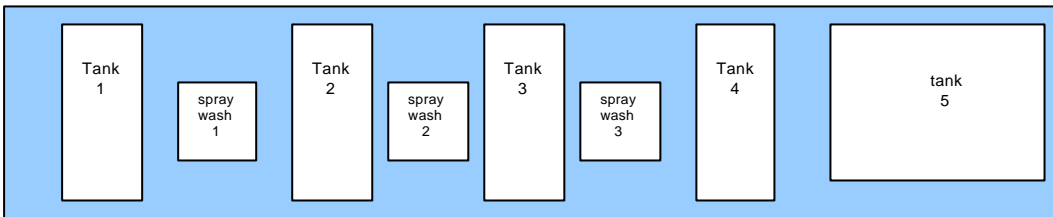
PLATING LINE POWER SUPPLY CONTROL PANEL FUNCTIONS



1. WHEN POWER IS SWITCHED ON THE RED LED NEXT TO THE STANDBY SWITCH LIGHTS UP.
2. PRESS THE STANDBY SWITCH AND ALL DISPLAYS LIGHT UP AS WELL AS THE SET UP LED.
3. THE CURRENT VOLTAGE DISPLAY WILL BE IN AMPS MODE. PRESS THE CURRENT SET + AND - BUTTONS TO SET CORRECT CURRENT. **N.B.** THE CURRENT ERROR LIGHTS WILL COME ON WHEN YOU ARE DOING THIS.
4. SET THE TIMER THE SAME WAY.
5. WHEN YOU ARE READY TO PLATE PRESS RUN. THE PLATING CURRENT WILL BE MONITORED, THE RUN LED WILL ILLUMINATE, THE TIMER WILL COUNT DOWN AND THE AMP HOURS WILL START GOING UP.
6. IF AT ANY TIME YOU NEED TO REMOVE THE BOARD BEFORE PLATING HAS FINISHED PRESS THE PAUSE BUTTON (PAUSE LED ILLUMINATES). THIS WILL REDUCE THE CURRENT TO ABOUT 20% OF THE SET CURRENT AND STOP THE TIMER AND AMP HOURS. WHEN YOU PRESS RUN THE PROCESS WILL CONTINUE UNTIL THE TIMER REACHES 0.0. THE CYCLE COMPLETE LED WILL LIGHT UP AND THE BUZZER WILL SOUND.
7. BEFORE REMOVING THE BOARD PRESS THE SET UP BUTTON AND ALL METERS OTHER THAN AMP HOURS WILL GO BACK TO THEIR ORIGINAL SETTINGS.
8. THE AMP HOUR METER IS BACKED UP WITH A BATTERY AND WILL ONLY NEED RESETTING WHEN THE METER READS 480. WHEN THIS READING IS REACHED YOU ADD THE REPLENISHER TO ALL BATHS - EXCEPT THE COPPER PLATING BATH, AS PER THE REPLENISHMENT SHEET. WITH REGARD TO THE COPPER PLATING BATH, ABC 971M REPLENISHER IS ADDED AFTER EVERY 120 AMP HOURS HAVE BEEN RECORDED.
TO RESET HOLD THE BUTTON DOWN UNTIL METER RESETS (ABOUT 10 SECONDS).
9. PRESSING THE STANDBY BUTTON WILL TURN EVERYTHING OFF EXCEPT THE STANDBY LED.

(G) Chemical Charge

The ABC chemicals supplied with the unit should be made up in the tanks as follows with Tank 1 being the first tank on the left hand side with the unit facing you.



Tank 1 - **CLEAN/CONDITION** - - Fill the tank with the ABC 188 Clean/Condition Makeup solution. Top up with deionised water to bring level 10mm below the shoulder on which the lid sits.

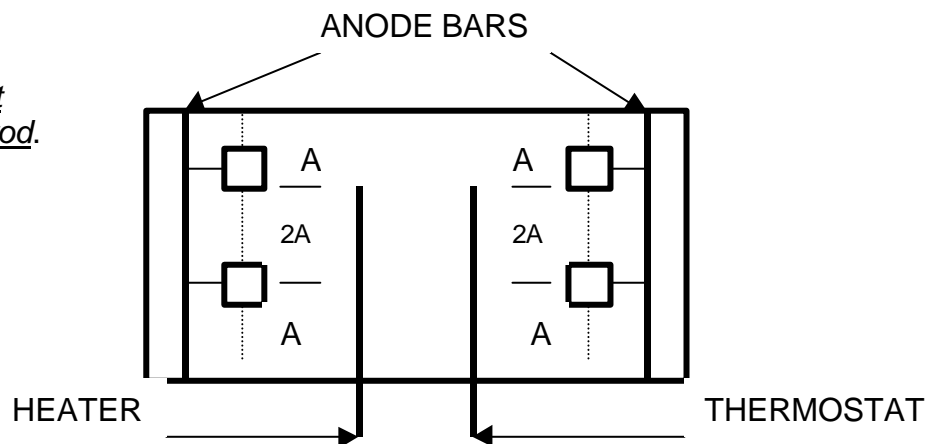
Tank 2 **PRE-DIP**- Fill the tank with Deionised Water.

Tank 3 - **CATALYSE** -Half Fill the tank with the ABC 888M Part A, add 888R Part B solution and then top up with the 888M, Part A to 10ml from the top inside ledge which supports the lid. If level is slightly low top up with 36% Hydrochloric Acid diluted by 50% with deionised water. Bath is now ready for use.

Tank 4 - **SALT REMOVE**- Fill the tank with the ABC 580 Salt Remover Makeup solution. Top up to correct level with deionised water. Bath is now ready for use.

Tank 5 - **COPPER PLATING**- (a) Make sure that the Copper Anodes are in their white anode bags and that the anodes are hooked over the anode rail with the hooks provided (2 anodes each side) and positioned as shown below:-

N.B. When putting left hand anodes in bath be careful not to damage the white heater rod.



(b) Fill the tank with the ABC 9711 Copper Basis Solution so that when the plating line board holder is fixed to the bar across the tank the liquid level is 10mm below the round stainless steel board holder legs. Place plastic balls provided on top of solution until surface is fully covered (These prevent splashing and evaporation).

(c) (1) Press the **STANDBY** switch on the power supply control panel and all the displays will illuminate. (See page 5 for control panel details).

(2) Press the **SET UP** switch and set the current meter to 16 amps.

(3) Set the timer to 95 minutes.

(4) Reset the amp hour counter by holding the **RESET** switch down until the meter reads **0000**

- (5) Place a 12"x10" (305x254mm) double sided copper clad board in the board holder and put the board into the solution.
- (6) Switch on the oscillator and pump buttons.
- (7) Press the Run switch.
- (8) When the timer has reached 0 go into **SET UP** again and then press **RUN**. This will ensure the solution has been properly electrolysed and at the end of the second cycle the amp hours should read about 50.

For the PL904 systems use 18"x12" (457x305mm) double sided board and set the current meter to 28 amps, then repeat steps 3-8. Amp hours should read about 95.

N.B.1. *In both cases scrub clean the copper surfaces before placing the board in the tank.*

N.B.2. *Always press the pause button before removing from, or placing the board into the solution.*

- (9) After solution has been electrolysed add 125ml of **ABC 971M** Additive provided (PL903S and 250ml for PL904S) with the air pumps on to allow it to be thoroughly mixed into the solution. Go into 'Set Up' again and use the same settings but set the timer to 30 minutes and repeat 4-8 above.
- (10) Finally reset the AMP hour counter to **0000**

Your system is now ready for use.

N.B.1. For plating line control panel functions see page 5.

N.B.1. Always maintain the tank levels as discussed above by topping up with deionised water. Except in the case of the Catalyst where you top up with 50% HCL solution.

(H) Producing the Plated Through Hole Board

- (1) Cut the number of 18 micron double sided FR4 1/16" thick epoxy glass board blanks required using one of our shears ensuring that the blank size is 12mm larger than your required finished board size on its two sides and bottom edge and 30mm larger on its top edge as this will be the edge which is placed in the board holders.
- (2) Drill your blank boards to the required hole pattern by either using our CNC drilling machine or by first scrub cleaning, washing and thoroughly drying the blanks and then coating them with dry film photoresist using our Dry Film Laminator, exposing them through the artwork for the drilled side of the boards in our AZ214 double sided UV exposure unit for 20 seconds, developing them in a developing tank or tray using our Dry Film Developer (part number 500-164) for 3 - 4 minutes at 35 - 40°C, spray washing thoroughly then hot air drying. This will leave a 40 micron thick image of your artwork and using this as your template the centres of the holes can be sight drilled to the required size using one of our hand operated drilling machines. After all the blanks have been drilled in this way the photoresist is removed by placing the boards in a stripping tank or tray using our Resist Stripper PC155 (part number 600-019) at room temperature for 4 - 5 minutes. This time would be decreased if the stripper was heated to 45 - 50°C.

N.B.1. Always use a drill which is .05mm larger than your required finished hole size.

N.B.2. Make sure that you use our tungsten carbide drill bits and after you have drilled 3000 holes sharpen or renew the drill.

(3) The board is now deburred and cleaned using a 3M scotch pad, or similar

(4) Having done this, fix the drilled board blank into the board holder provided and fix the holder to the bar across the oscillating frame so that the board is immersed in the solution in the first process tank. This is the **CLEAN/CONDITION SOLUTION (ABC 188)** and the board should only be placed in this solution after it has reached its correct working temperature (60-65°C). Turn on the frame oscillating switch and leave the board in the solution for 4 minutes. After this time has elapsed, turn on the first spray wash tank then remove the board and immediately place it in the spray wash tank. Thoroughly wash the board for 20 seconds by moving the board upwards and downwards through the spray wash bars at least 15 times. Then fix the board over the second process tank which would be filled with water and immersion wash for 30 seconds. Remove and spray rinse for a further 15 seconds.

(5) With the oscillating frame still moving, place the board in the third process tank which contains the **CATALYST SOLUTION (ABC 888)** (40-45°C). After 4 minutes remove the board from the tank allowing liquid on the surface to drain back into the tank and then spray wash in the second spray wash tank for 30 seconds.

(6) With the oscillating frame still moving, immerse the board in the fourth process tank which contains the **SALT REMOVER SOLUTION (ABC 580)** (30 - 35°C). After 1 minute remove the board from the solution and spray wash it in the third wash tank for 30 seconds.

N.B.1. When washing board also make sure board holder is thoroughly washed to ensure no contamination between tanks. N.B.2. Never leave the boards in the spray washes for long periods of time. N.B.3 When removing the boards from the spray wash tanks tap them on the side of the tank to remove the water from the holes. This ensures that the process chemicals are pushed through the holes more easily.

(7) It is possible at this stage to dry the board and store it for several days prior to electroplating. If you do this you must ensure all the water is removed from the holes by tapping it 2 or 3 times against the side of the wash tank. Then dry the board with paper towels and finally with warm air. However, in the normal way, one would place the rinsed board into the **COPPER PLATING SOLUTION (ABC 9711)** (25 - 30°C) having fixed the board holder to the plating bar.

Press the 'Stand-by' switch on the plating control panel and set the current to 3 amps per dm² (per 100 square cms), having first calculated the total board area of both sides which are to be plated e.g. if the board to be plated was 15cm x 15cm then the total area would be

$$\underline{2 \times 225 = 4.5 \text{ dm}^2.}$$

100

Therefore the current would be set at $3 \times 4.5 = 13.5$ amps. This is done by pressing the set up button and setting the current meter to 13.5 amps, at the same time set the timer to 36 minutes. Press the run button and plating will commence. Make sure oscillating frame and pump switches are in the ON position. Leave the board to plate for 36 minutes to give approximately 25 microns of copper plating. When plating time is finished, timer will give an audible sound and cycle complete LED illuminates. If you now press the set up button the displays will go back to your last set up values and the cycle complete LED will turn off.

(8) Remove the board from the plating bath and spray wash for 15 seconds and then thoroughly dry the board.

(9) Make sure the copper surfaces of the board are free of grease and oxidation by scrub cleaning with our PC182 scrub block (part number 900-009) or Scotchbrite Pad (Part No. 500-017) then wiping off any particles with a paper towel. **N.B.** This is done dry.

(10) Place the board on the feed tray of the dry film laminator and having made sure it is up to temperature (110-115°C) feed the board through the laminator rolls. This should be done in **YELLOW LIGHT CONDITIONS**. If lamination is not good then warm the board up in an oven or with a hot air dryer before feeding it through the laminator.

Trim off the excess dry film with a sharp scalpel and transfer it to a light fast bag or box until you are ready to expose it.

(11a) If you have used a CNC drilling machine to drill your holes and produced your artwork positive using a CAD system and plotter so that there are no holes centres in the pads then make a contact black reversal of your artwork using our 8875 reversal film (see separate details). Take your board with the dry film on and using your black negatives, line them up with the holes in the board by using registration pins having pre-punched the artwork and boards. Alternatively, if this has not been possible, cut two slots about 10mm long by 4mm wide in the two longest sides of the artwork so that they are outside the finished board edge but still inside the blank edge. Then stick small pieces of our red litho tape over the slots and align your black artwork for the solder side of the board with holes and press down hard on the tape over the slots to ensure that it sticks to the board so that the artwork is kept in place. Repeat with the artwork for the component side.

(11b) If your artwork has pad centres then make a contact copy of it using our dry peel or ASS10 copy film (see separate details) then spot out all the pad centres on the copy with a touch-up pen. Make a black reversal copy of your spotted out copy and then proceed as in (11a)

(12) Place the board and registered artwork in our AZ218 double sided exposure unit and expose for 20 - 25 seconds.

(13) Remove the board and place it in a developing tank (30°C). After 2 minutes, agitate it vigorously, by moving the basket holder up and down in the solution, until your pattern is left on shiny copper background. Total time about 5 minutes. Then spray wash it thoroughly and having checked your image (which will show your holes and tracks covered by photoresist has been developed properly, thoroughly dry the board with hot air or oven dry at 40 - 50°C for 5 minutes.

(14) Place the board in a bubble etch tank with ferric chloride in it and etch until all unwanted copper is removed, normally after about 6 - 7 minutes. When etching is complete remove the board and spray wash it then immerse it in the Resist Strip Tank / tray for 4 - 5 minutes at room temperature or 2 - 3 minutes at 45 - 50°C and again remove board and thoroughly spray wash it.

(15) Spray clean the wet board with Scotchbrite Pad (Part No 500-017), rinse and return it to the Clean / Conditioner tank for 20 seconds. Spray rinse thoroughly and scrub clean again. Rinse and immediately immerse in the immersion tinning tank or tray containing our tinning solution PC163 (part number 600-020 - 1 litre mix or 600-021 - 5 litre mix) for 15 - 20 minutes. Remove the board from the solution and immediately wash with hot water 45°C + then a final cold rinse, after which dry the board with paper towels and hot air.

BATH MAINTENANCE AND FAULT FINDING

BATH MAINTENANCE

Once your baths have been initially made up they should be able to be maintained using a simple replenishment and analysis procedure with the baths only having to be discarded and remade up after 150 square metres of surface area have been processed, or if chemicals have been in the tanks for 1 year.

For replenishment of the chemicals we supply a replenishment kit. This kit will allow 10 sq. metres of surface area to be processed.

Additionally, it is important to check for the following using simple titration after processing 20 square metres of surface area. The titration is shown on the sheet showing the replenishment details on the next page.

Check As Follows:

ABC 188

Do titration to check Sulphuric Acid concentration. This should be maintained between 12% and 15% for ABC 188.

N.B. If your tanks have not been used for 2-3 days then make sure that they are stirred well with a plastic rod taking care to avoid contamination. In the case of the copper plating bath turn on the pump switch which activates the air pump for 2-3 minutes and add 25ml of 971M additive.

ABC REPLENISHMENT PROCEDURE

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After processing 2.4 square metres of copper surface replenish as follows - or when the amp hour meter (if available) reads **480** -

1. ABC 188 Clean/Condition Tank

Add 15ml of ABC 188M Replenisher. Stir the solution thoroughly.

2. ABC 888 Catalyst Tank.

Add 20ml of 888R Replenisher, 20ml of 888M Replenisher and 20ml of 888RM Replenisher to the bath. Stir the solution thoroughly.

3. ABC 580 Salt Remove Tank.

Add 15ml of ABC 580M Replenisher. Stir the solution thoroughly.

4. ABC 888T Stannous Chloride Solution

- a) For a new bath add 65ml of ABC888T solution every time the ABC 888 catalyst tank has been heated up and down for a period of **20 hours**. e.g. After 4 x 5 hour or 10 x 2 hours periods.
- b) If you have an old bath and no 888T has been added, then do analysis for tin according to the analysis results. If you are unable to do this analysis then send us back a 60ml sample and we will advise you how much ABC 888T to add to your bath. Thereafter add as per instructions in (a) above.

ABC 9711 Copper Plating Tank

This tank should be replenished after processing 0.6 square metres of copper surface or after 120 amp hours have elapsed (whichever comes first).

N.B. Amp hours = current in amps x time in hours i.e. 60 amps for 1 hour = 60 amp hours. To replenish add 50ml of 971M copper additive. If boards are still slightly dull or grainy matt copper is forming around the edges add further 25ml. **N.B.** If you have not used the copper plating tank for a few days start plating as normal, then after 10 minutes remove the board from the solution and check if the bottom edges of the board are dull and grainy looking. If so add 15ml to 25ml of 971M additive and continue plating.

Bath Replacement

- | | |
|--|--|
| 1. ABC 188 Cleaner / Conditioner bath. | a) After processing 3 - 5 square metres of laminate through 1 litre of working solution i.e. 30 - 50 sq. m in a 5 litre bath. |
| or | b) When the bath colour becomes green / olive. |
| ABC 888 Catalyst bath | After processing 15 - 20 square metres of laminate through 1 litre of working solution. |
| ABC 580 Salt Remover | a) After processing 4 - 6 square metres of laminate through 1 litre of working solution. |
| or | b) When the bath colour becomes green / olive. |

2. Copper plating bath should occasionally be emptied into its original supply container through a funnel with a coffee filter or similar placed in the funnel. If copper plating seriously deteriorates despite additions of 971M additive and filtration as above, bath should be renewed or anodes may need replacing.

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Analysis

A) The 188 bath needs to be analysed after every 10 square metres of surface area has been processed to ensure the Sulphuric Acid level is between 12 - 15%. Do this as follows:

Replenishment and Analytical Procedures

1. Analytical control to maintain Sulphuric Acid Concentration.

- (a) Pipette a 2.0ml sample into a 250ml Erlenmeyer flask.
- (b) Add 100ml of DI water.
- (c) Add 5 drops of Bromocresolgreen* indicator.
- (d) Titrate with 1N Sodium Hydroxide to a blue endpoint.

CALCULATION:-

150 - (Titre value) x 13.33 = ml/litre of Sulphuric Acid (Conc.) to be added to the bath.

***Bromocresolgreen Indicator Preparation**

Weigh 1gm of Bromocresolgreen Indicator into a 1ltr flask. Dilute with 500ml of DI water, mix well until completely dissolved. Add 14.4ml of NaOH 0.1N to get a milky colour. Add DI water to the 1 litre mark and mix well.

B) Analysis for Stannous Chloride in ABC 888 Catalyst bath. This analysis should be done every 4 weeks.

Analysis kit (part no. 500-174) available from us @ £85.00

Procedure

- 1) Pipette a 10 ml sample into a 250 ml erlenmeyer flask.
- 2) Add 15 ml of reagent grade Conc. Hydrochloric Acid. (34-36% reagent / laboratory grade)
- 3) Add 100 ml of DI water.
- 4) Add 5 - 10 mgs (¼ of teaspoon iodine indicator) (part no. 500-174-8)
- 5) Titrate with 0.1N Iodine to achieve a brown to blue / purple endpoint.

Calculation:- (8 - Titre Value) x 1.8 = gm / ltr of SnCl2 to be added to the bath.

N.B. 4ml of ABC 888T solution contains 1gram of TIN CHLORIDE (SnCl2)

NB. *Maintain this titration between 6 and 10 ml of Iodine. Under no circumstances allow the titration value to fall below 4.0*

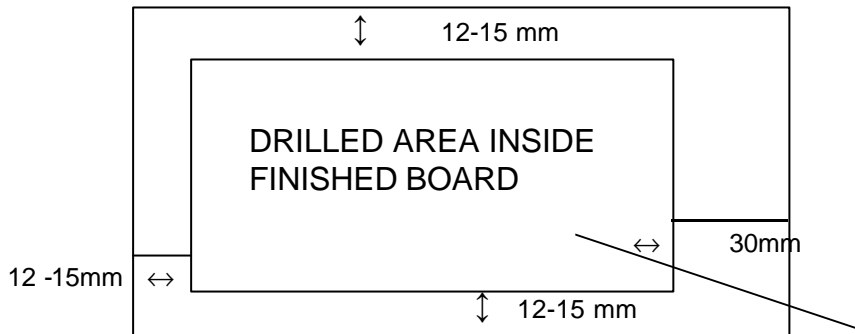
GENERAL FAULT FINDING COPPER PLATING

FAULTS	CAUSE	CORRECTION	ADDITION	
			MIN	MAX
Roughness	Suspended Particles	Filter and/or dummy 12"x10" panel at 1amp/dm ² for 1 hour		
Burning	Lack of Brightener	Add 971M Additive	50ml	150ml
	Low Temperature	Check Temperature	20°C	30°C
	Poor Agitation	Make sure oscillation is taking place		
	Poor Air Bubble pattern	Make sure you have good bubble pattern Check no pipes blocked or air pumps are faulty		
	Current too High	Check it is 3 amps / dm ²		
Dullness on all copper areas	Lack of Brightener	Add 971M Additive		
Bright on outside edges of board. Dull in the Middle.	Too much Brightener	Plate large blank at 3 amps / dm ² for 3 –4 hours Repeat if board is not bright all over		
Bright in the middle of the Board dull at edges.	Lack of Brightener High temperature	Add 971M Additive Check temperature – should be between 25°C – 30°C	50ml	150ml
Faults not corrected by above procedure	Organic Contamination	Change solution. Store contaminated solution in its original container and send 100mls of it back for analysis.		
Crazing Effect or Patchy Appearance	Chloride level too low	Add Conc. Hydrochloric Acid reagent grade 36%	3ml	4ml
Current Error light on when Power supply is in Run Mode or Voltage high (clips at 3.5 volts) and set current starts to decrease	Poor contact	Check anode hooks are in proper contact by sliding anodes backwards and forwards on anode rails and remove any copper deposits around anode hooks		
	Anode Polarisation	Check anodes still have an even black oxide layer over their surface. If they no longer have black layer or are a grey to whitish colour they have become polarised. If so remove and scrub thoroughly clean with water and detergent. Rinse and put back in bags and then return to bath. Add 2 – 3 ml of Conc. HCL 36% Plate large panel at 1.0 amp / dm ² for 120 minutes. Then add 2.5ml / litre of ABC 971M additive.		
	Anodes badly worn.	Replace anodes.		

WARNING: NEVER ALLOW ANY SOLUTION TO GO BELOW 0°C

ABC COPPER PLATING PROCESS SEQUENCE & REPLENISHMENT

1. Cut and drill an 18 micron copper clad double sided board so that borders are allowed for as shown below.



PLACE THIS END IN THE BOARD HOLDER

FINISHED BOARD OUTLINE

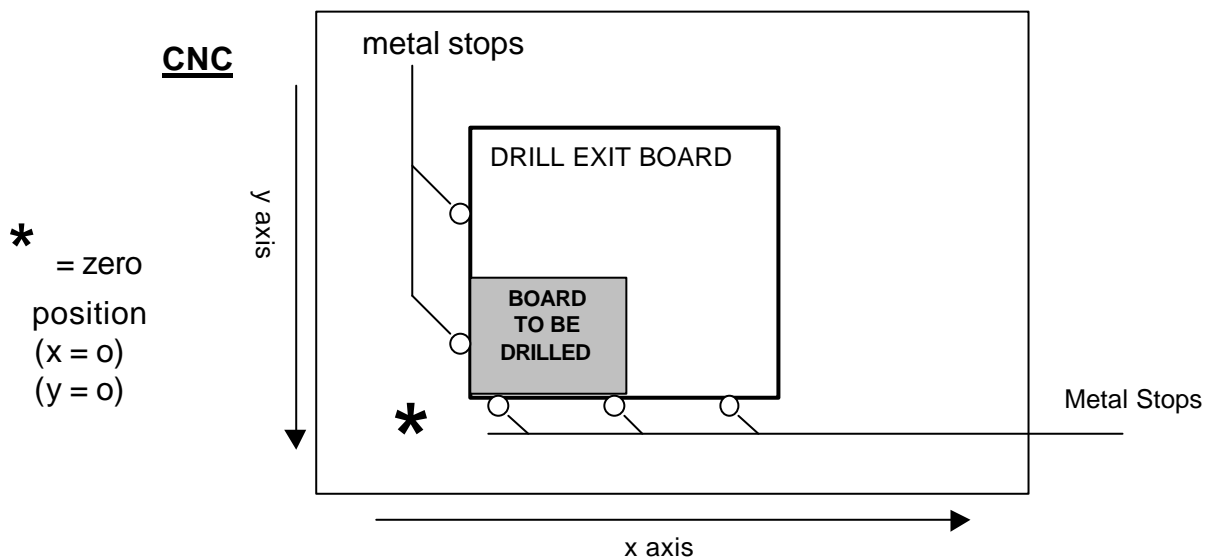
2. Immerse board in 1st process tank which contains the ABC 188 Clean/Conditioner for 4 minutes. Tank temperature should be 60 - 65° C. Heater should be PTFE
 3. Spray rinse immediately for 20 seconds then place it in the 2nd process tank which should contain the ABC 888M pre-dip for 30 seconds - and operate at room temperature.
N.B. *In all spray rinses ensure you move the board up and down between the spray bars and the board holder is also thoroughly washed in the area where it could come into contact with chemicals.*
 4. Then without rinsing place board in 3rd process tank (ABC 888 Catalyst) for 4 minutes. Remove board having first allowed excess chemical to drain off the board back into the tank, tank temperature 40 - 50°C.
N.B. Never allow any ABC 188M to be transferred to the ABC 888 Catalyst. If this has happened, you will firstly see the appearance of voids. Then bath decomposition at a later stage.
 5. Spray rinse for 30 seconds.
 6. Place board in 4th process tank (ABC 580 Salt Remover) for 60 seconds. Tank temperature 30 - 35°C.
 7. Remove and spray rinse for 30 seconds.
 8. Place board in 5th process tank (ABC 9711 Copper Plating) and plate at 3 amps per dm² of surface area for 36 minutes, i.e. if you had a 25.0cm x 25.0cm panel then you would set the current at 37.5 amps (18.75 amps per side). Tank temperature 20 - 30° C.
 9. After plating **immediately** remove board from solution and spray wash for 15 seconds - then dry with paper towels and hot air immediately to avoid the copper surface oxidising.
 10. Any liquid level losses caused by evaporation and drag out should be topped up with deionised water in all cases except the Catalyst bath which should be topped up with 36% Hydrochloric Acid diluted to 50% with deionised water.
 11. When not in use ensure lids are in place.
 12. From time to time slide the anode hooks backwards and forwards along the anode rails to ensure you have a good contact. Make sure anodes are placed back in their original position.
- N. B.** *Please note as tanks are heating up occasionally stir them with a suitable plastic rod being careful not to damage the heaters. Use a separate rod for each tank to avoid contamination.*

The Mega Method for producing Printed Circuit Boards

A

CONVENTIONAL SINGLE OR DOUBLE SIDED BOARDS

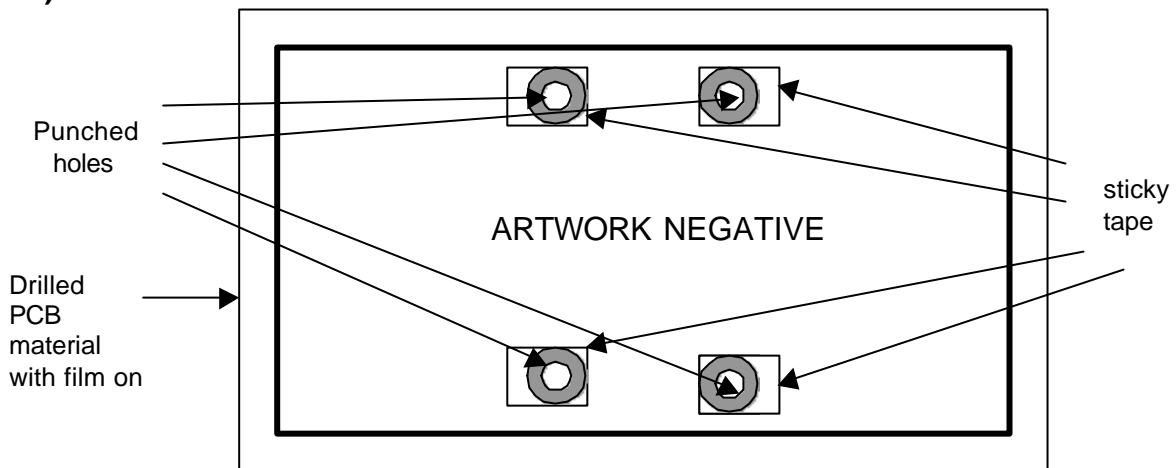
- 1) First place a piece of drill exit board 1.5mm thick on the CNC base against the metal stops in the X and Y axis
- 2) Tape the Drill exit board in place.
- 3) Cut a piece of Copper clad board (35 microns copper) slightly bigger than your finished board with the Model 45 shear.
- 4) Tape the board onto the exit board, so that it is near to the x and y metal stops - See below:



- 6) When all the holes have been drilled remove the board.
- 5) This will mean that the bottom left hand corner will then be near the x and y zero of the machine.
Load the required Excellon drill file which has been created by your CAD package. Check that the co-ordinates of the first and last holes to be drilled in the x and y direction appear to be to the correct scale and also if the two minimum co-ordinates are near the x and y zero. i.e. say $x > 10$ and $y > 10$ mm.
Therefore this will mean that with the offset being $x = 0.000$ $y = 0.000$ the board to be drilled will be in the correct location. If however the minimum co-ordinates had been say $x > 90$ and $y > 90$, then you would need to put in offsets of $x = -80$ and $y = -80$.
Select the drill sizes you need and start the drilling programme.

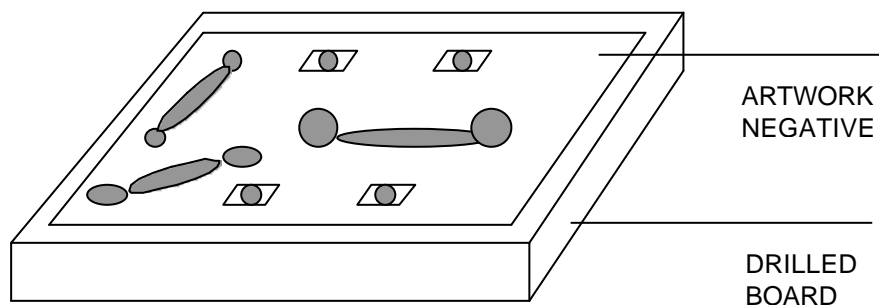
- 7) Scrub clean the surface of the copper with a Scotchbrite pad and then remove any dust with paper towels.
- 8) Feed the board through the dry film laminator having first ensured that the laminator is up to temperature and you have run about 25cms of film through the machine before feeding the board in.
N.B. Trim off all excess dry film around the edges of the board.
- 9) Remove the board and allow it to cool down for about 5 – 10 minutes in a black bag, drawer or subdued light.

10)



Take a negative of your PCB artwork pattern which has no hole centre and make four holes with a paper punch or scalpel, just outside the long borders of the finished board size. Stick Sellotape or similar over the holes on the side of the film that will not be in contact with the board.

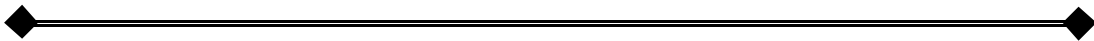
11)



Place your artwork over the Dry Peel film covered copper surface and register the holes with the artwork by eye. When the best fit is achieved press the holes covered with sticky tape, down on to the board to hold the artwork in place. Repeat for the other side of the board.

- 12) Place the board and artwork in the AZ218 Double sided exposure unit – set the timer for 20 seconds. Close the lid and press the 'START' button.

- 13) Remove exposed board from the AZ218 and peel off the clear protective film. You will have a dark blue image of your layout on a light green background.
- 14) Place the board in the PB710 Developing tank. After 3 minutes agitate the board by moving it up and down in the solution, until all the light green background has disappeared, leaving a dark blue image on the copper surface. This usually take approximately 2 minutes more i.e. total 5 minutes.
- 15) Spray wash thoroughly.
- 16) Bubble etch until all unwanted copper has been removed about 6 - 7 minutes. Rotate halfway through cycle.
- 17) Spray wash thoroughly.
- 18) Resist strip dry film photoresist 2 - 3 minutes.
- 19) Spray wash thoroughly.
- 20) Remove board from basket and whilst still wet, scrub copper surface with abrasive pad e.g. Scotchbrite pad and rinse scrubbed board thoroughly.
- 21) Place board in immersion tin tank for 10 - 15 minutes.
- 22) Remove board, rinse firstly in hot water (45 - 50°C) and secondly cold water. Then dry board with paper towels and a hair dryer.
- 23) Using Model 45 Guillotine, cut board to finished size.



B

PANEL PLATED THROUGH HOLE BOARDS

- 1) Using 18 micron FR4 Double sided board material - repeat Steps 1 to 7 as for conventional boards.
- 2) Place board in the Plating Line (PL903) board holder and switch on oscillating motor.
- 3) Fix the board holder in position over the ABC 188 Clean / Condition tank (tank 1) containing ABC 188 clean conditioner and leave in the solution for 4 minutes.
- 4) Remove holder from oscillating frame and thoroughly spray wash the board and the bottom part of the holder (15 - 30 seconds).
- 5) Fix the board holder in position over the still wash tank (tank 2) and leave for 30 seconds.

- 6) Spray wash again for 10 seconds .
- 7) Fix the board holder in position over the ABC888 Catalyst tank (tank 3) and leave in the solution for 4 minutes.
- 8) Remove holder and board having allowed all Catalyst to drain back off the board into the tank.
- 9) Spray wash for 30 seconds.
- 10) Fix the board holder in position over the ABC 580 Salt Remover Tank (tank 4) and leave in the solution for 1 minute.
- 11) Spray wash for 30 seconds.
- 12) Measure board area in square cms. then fix the board holder over the ABC 9711 Copper Plating tank (tank 5) containing the copper plating solution.
- 13) Calculate the plating current to be set as follows:-

$$\frac{\text{board area in sq. cms} \times 6 \text{ amps}}{100}$$
- 14) Press the 'STANDBY' switch on the power supply control panel.
- 15) Press 'SET' button and set current to value in (13).
- 16) Set timer to 36 minutes.
- 17) Press 'PUMP' switch on for air to bubble through solution.
- 18) Press 'RUN' button.
- 19) When timer reaches 0 and buzzer sounds immediately remove the board and holder from solution.
- 20) Spray wash for 15 seconds
- 21) Remove board from holder - tap it against edge of wash tank to remove excess water from the holes, then quickly dry the board with paper towels to remove most excess water and then hot air.
If board shows any signs of brown oxidation, place it in the cleaner / conditioner tank for 10 seconds, then wash and dry it again as above.
- 22) Follow stages 8 to 23 as for conventional Boards in 'A'.

N.B.

Always ensure that when the board is in any of the ABC process Tanks (Tanks 1 - 5) the oscillating frame switch is 'ON'



Printed Circuit Board Production

FLOW CHART FOR PRODUCING SINGLE, DOUBLE SIDED AND PLATED THROUGH HOLE BOARDS

