

Possible problems and how to solve them.

FAULT	POSSIBLE CAUSES	REMEDY
1. Bad edge definition/Tracks etching away	1. Bad contact in exposure unit	1. Check exposure unit and rectify
	2. Over exposure	2. Reduce exposure time
	3. Over development	3. Reduce development time
	4. Over etching	4. Reduce etching time
	5. Draughting film too thick - causes light to diffuse during exposure	5. Make copy of artwork onto Reprofilm and use this to process board
	6. Fault on artwork	6. Check and repair
2. Unreasonably long development time/board will not develop at all	1. Under exposure	1. Increase exposure
	2. Developer exhausted or contaminated	2. Use new developer
	3. Developer too cold	3. Check temperature of developer and increase if necessary
	4. Shelf life of board expired	4. Use new board
3. Unreasonably long exposure time	1. UV lamps need replacing	1. Replace lamps
	2. UV source unsuitable	2. Replace with suitable source
	3. Draughting film unsuitable - not allowing light to pass through	3. Use suitable film
4. Patches of copper left behind after etching	1. Photoresist left on board due to under development and/or under exposure	1. Increase development and/or exposure time. Check board carefully before etching
	2. Grease on artwork or photomaster	2. Clean artwork
5. Unreasonably long etching time	1. Etching solution exhausted or contaminated	1. Use new etching solution
	2. Photoresist not fully developed	2. Increase development and/or exposure time
6. Copper specks between tracks after etching	1. Dirt on exposure unit glass or photomaster	1. Clean glass or scrape spots from photomaster
7. Resist in non exposed areas breaks down before exposed areas are clear	1. Under exposed/over developed	1. Check UV lamps/increase time for exposure
	2. Developer too hot or concentrated coupled with under exposure	2. Ensure developer is mixed correctly. When a non exposed board is immersed for 2 minutes the resist should show no sign of degradation ie it should remain glossy in appearance



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## PHOTO-RESIST COPPER CLAD BOARD

CAT REF:	<b>141-302</b>	THE PROTECTIVE BLACK PEELABLE CREPE TAPE ENABLES THE MATERIAL TO BE HANDLED IN NORMAL LIGHT CONDITIONS. REMOVE BEFORE EXPOSURE  See overleaf for detailed processing instructions. For best results use within 3 months of purchase.
QUANTITY:	1 Sheet	
SIZE:	233.4mm X 160mm	
SINGLE SIDED		

### SPECIFICATIONS:

Base Material	FR4 epoxy all woven glass laminate to BS4584 Part 3
Thickness	1/16" (1.6mm)
Copper Foil cladding per square ft	1oz (35 microns)
Water absorption	0.10%
Specific gravity	1.85 - 1.90
Dielectric constant $\epsilon$ at 1 MHz	5.0
Dissipation factor $\tan \sigma$ at 1 MHz	0.020
Flex strength length wise	550N/mm <sup>2</sup>
Surface resistance	10 <sup>11</sup> Ω
Volume resistivity	10 <sup>14</sup> Ω cm
Foil pull off strength	140N
Photoresist	Positive working
Sensitivity	Ultraviolet
Coating thickness	7 microns +0.7 micron
Exposure time	2-8 minutes (clear carrier film)
Developed image	Blue/green tint
Photoresist developer	FEC Order Code 141 310
Etchant	FEC Order Code 149 080 or 141 311

Shelf life is approximately 6 months stored at 15-20°C  
Do not store near excessive heat ie radiators, window sill, etc

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## PRODUCT SAFETY DATA

### PRODUCT DESCRIPTION

Laminated material consisting of woven glass fabric bonded with heat cured, flame retardant epoxy resin. Base material is clad on either one or both sides with copper which is itself clad with positive photoresist.

### HAZARDS

During handling there is a slight risk of loose glass fibre dust from the edge of the boards causing reactions to those persons sensitive to skin allergies. In these instances it is advised that rubber or plastic gloves be worn. Do not use woven fabric gloves or barrier creams.

The base material and epoxy coatings are inert at normal room temperatures. At elevated temperatures (above 100°C) adequate ventilation and extraction must be provided.

Do not allow foodstuff into the working area and ensure hands are washed with soap and warm water before handling foodstuffs.

### FLAMMABILITY

The material will burn in the presence of an external flame source giving copious black asphyxiating fumes.

The material is self extinguishing if the external flame source is removed.

In the event of fire, then evacuate personnel.

### DISPOSAL

To normal solid city waste. Local regulations must be observed.

**CAUTION - EXPOSURE TO UV LIGHT CAN CAUSE PERMANENT EYE DAMAGE - ENSURE LID IS CLOSED BEFORE SWITCHING ON**

### 3. DEVELOPMENT

- Developer solution should always be kept covered as exposure to air degrades the chemical make-up, and leads to erratic process control.
- Immerse exposed laminate in developer and gently cause the solution to "wash" the surface either by agitating the work or the developer container. Continue for 2 minutes. Wash in clean water.
- Developer solution is chemically balanced to give consistent removal of resist and should be used whenever possible. Throughput approximately eight square feet per litre of working solution.

**CAUTION - DEVELOPER SOLUTIONS ARE CAUSTIC BASED - PROTECTION TO HANDS AND EYES IS ESSENTIAL - WASH SPILLS AND SPLASHES WITH LIBERAL AMOUNTS OF WATER THEN SEEK MEDICAL ADVICE**

### 4. POST DEVELOPMENT CHECK

Prior to etching it is essential (and is considered both economic and professional) to inspect for, and correct, any faults in the conductor patterns. By placing the developed boards into etching solution for a few seconds, rinsing well in water and drying, the non resist areas will show dark pink and offers a suitable contrast to determine whether full development has taken place or if further immersion in developer is required. The contrast also highlights major faults in conductors, which can be corrected using a PCB marker pen.

### 5. ETCHING

Following inspection to satisfaction the board may be etched in a suitable etchant solution such as ferric chloride solution.

After etching the positive resist may be left on the copper to act as protection. Solder flow is readily achieved through the resist.

**CAUTION - ETCHANT SOLUTIONS ARE ACID BASED - PROTECTION TO HAND AND EYES IS ESSENTIAL - WASH SPILLS AND SPLASHES WITH LIBERAL AMOUNTS OF WATER THEN SEEK MEDICAL ADVICE**

### 6. STEP TEST

As the UV content of exposure lamps varies considerably this test should be carried out periodically and whenever problems are experienced to re determine exposure time.

- Set a standard developing condition ie 2 minutes immersion at 25°C using fresh made up developer.
- Expose a piece of laminate for 2 minutes. Using a thin sheet of cardboard cover the board leaving 1/8 of the surface uncovered and expose for a further 1 1/2 minutes, uncover a further 1/8 section of board and expose for 1 1/2 minutes, continue 4 further step exposures of 1 1/2 minute to give a range of 2 to 12 1/2 minutes.
- Develop for 2 minutes at 25 °C wash and dry
- Inspect to see which exposure time the resist has just been removed (immersion in etchant assists here) and calculate the exposure time for the first fully clear area.

## RECOMMENDED PROCESSING INSTRUCTIONS

Positive laminate is produced under strict quality controlled conditions to ensure uniformity in process parameters from batch to batch and high accuracy definition.

In order to maintain consistent quality during process the following instructions should be carefully followed:

### 1. ARTWORK

- Cleanliness and neatness are essential - ensure satisfactory track thickness and spacing - high quality draughting aids should always be used - NEVER INK.
- Where 1:1 artwork is to be used ensure that clear or polyester draughting film is used - tracing paper is not suitable. All tapes must be on the side which is not in contact with the laminate during exposure. (printed pads only may appear on the contact side).

**NOTE:** The track widths will reduce when exposing from the non contact side

### 2. EXPOSURE

- Remove the black protective tape from the laminate, after cutting to the required blank size.
- Using a high resolution exposing lamp system place the artwork in good contact with the laminate and expose for 2-8 minutes. If draughting films are used the exposure times may be considerably longer than for clear film.
- For accurate exposure calculation see **STEP TEST** below.

**NOTE:** The UV content of light emitted by the lamps reduces with age. Lamps and tubes should be renewed on a regular basis.

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