

Prototyping : The Process

Use the M.G. Chemicals system to make your own circuit boards quickly and easily. Perfect for prototyping, hobbyists, and educational applications.

Technicians will be impressed with the high resolution, while amateurs will be impressed with the simplicity of our system.

1 Create Artwork

Print on 600 DPI Laser Printer

Transparency Film 416-T

2 Expose

10 min

Acrylic

Artwork from Step 1 (Facing Down)

Copper Clad Board

Peel protective covering before use

Presensitized Copper Clad Boards 600 Series

Exposure Kit 416-X

3 Develop

1-2 min

Wear Gloves

416-G

Brush board lightly with Smoother Brush

Cold tap water

Developer Cat # 418

1 Part Developer
10 Parts Water

Photofabrication Kit 416-K

4 Rinse

~1 min

Tap water

Select Step 5 based on which kit you are using:

5a Etch (Using Photofabrication Kit 416-K)

416-S

- Warm Ferric Chloride to 50°C
- Etch board in tray for 10 - 30 min.
- Mix etchant over board with brush
- Move on to step 6

Warm to 50°C

Ferric Chloride
Cat # 415
Opaque

5b Etch (Using Process Kit 416-ES)

10 - 30 min

Wear Gloves

Warm to 50°C

Ferric Chloride
Cat # 415

Warm to 40°C

Ammonium Persulphate
Cat # 410
Transparent

Warm to 40°C

Sodium Persulphate
Cat # 4101
Transparent

Select an Etchant

5c Etch (Using Process Kit 416-E)

10 - 30 min

Wear Gloves

Warm to 50°C

Ferric Chloride
Cat # 415

Warm to 40°C

Ammonium Persulphate
Cat # 410
Transparent

Warm to 40°C

Sodium Persulphate
Cat # 4101
Transparent

Select an Etchant

6 Rinse

~1 min

Tap water

Board is Complete

Prototyping : Copper Clad Boards

Copper Clad Board

Standard 500 SERIES



A 1/16", 1/32", 1/64" laminate with 1 ounce copper. This flame retardant laminate is made of continuous woven glass cloth impregnated with epoxy resin. Developed specifically for the circuit processing industries' requirements. Provides ultraviolet blocking and fluorescence when using automated optical inspection (AOI).

Format	Cat. No.	Approximate Size
Single sided 1/16" (1.60mm)	503	3" x 5" (76mm x 127mm)
	506	4" x 6" (101mm x 152mm)
	509	6" x 6" (152mm x 152mm)
	512	6" x 9" (152mm x 228mm)
	515	8" x 10" (203mm x 254mm)
	521	12" x 12" (304mm x 304mm)
	575	24" x 36" (609mm x 914mm)
	580	36" x 48" (914mm x 1219mm)
	Double sided 1/16" (1.60mm)	550
555		12" x 12" (304mm x 304mm)
576		24" x 36" (609mm x 914mm)
585		36" x 48" (914mm x 1219mm)
Single sided 1/32" (0.80mm)		586
	588	6" x 9" (152mm x 228mm)
	590	12" x 12" (304mm x 304mm)
Double sided 1/32" (0.80mm)	587	4" x 6" (101mm x 152mm)
	589	6" x 9" (152mm x 228mm)
	591	12" x 12" (304mm x 304mm)
	596	36" x 48" (914mm x 1219mm)
Double sided 1/64" (0.40mm)	598	6" x 9" (152mm x 228mm)

Positive Presensitized 600 SERIES



Available in 1/16" (62 mil) and 1/32" (30 mil) laminate with 1 ounce copper. Provides high resolution and excellent fine line control. Ideal for prototypes, small production runs, student training.

Format	Cat. No.	Approximate Size
Single sided 1/16" (1.60mm)	603	3" x 5" (75mm x 125mm)
	606	4" x 6" (100mm x 150mm)
	609	6" x 6" (150mm x 150mm)
	612	6" x 9" (150mm x 230mm)
	630	8" x 12" (200mm x 300mm)
Double sided 1/16" (1.60mm)	650	6" x 6" (150mm x 150mm)
	660	6" x 9" (150mm x 230mm)
Single sided 1/32" (0.80mm)	687	4" x 6" (100mm x 150mm)
	689	6" x 9" (150mm x 230mm)
Double sided 1/32" (0.80mm)	690	6" x 9" (150mm x 230mm)
Double sided 1/64" (0.40mm)	698	6" x 9" (152mm x 228mm)

Paper Phenolic Positive Presensitized CCB

1/32" laminate with one ounce copper

Easily cut this material into custom sizes.

Score on both sides with a utility knife and snap in half.

Format	Cat. No.	Size
Single sided 1/32" (0.80mm)	675	12" x 18" (300mm x 450mm)
Double sided 1/32" (0.80mm)	676	8" x 12" (200mm x 300mm)

Exposure Kit 416-X

Convenient kit includes major components required to expose presensitized copper-clad boards.

Includes:

- Fluorescent light fixture with stand (brackets)
- Daylight fluorescent tube
- Clear acrylic weight for artwork
- Complete instructions



Available Sizes

416X	Catalog No.	Size	Format
	416-X	Fits 17" tube	Kit

Photofabrication Kit 416-K

Produce printed circuit boards using the positive photofabrication process.

Contains:

- One 3"x5" presensitized single sided PCB Cat# 603
- One 4"x6" presensitized single sided PCB Cat# 606
- One 6"x6" presensitized single sided PCB Cat# 609
- One 500ml bottle Developer Cat# 418
- One 500ml bottle Ferric Chloride Cat# 415
- Two Foam Brushes Cat# 416-S
- Plastic development tray
- Rubber gloves
- Instruction sheet



Additional items Required

- Exposure Kit Cat# 416-K
- Etchant tank, or glass tray, or plastic tray (for etching purposes)
- Artwork laser printed on a transparency, Cat# 416-T
- Eye protection

Available Sizes

416K	Catalog No.	Size	Format
	416-K	Tank size L x W x H: 11"x 7"x 5"	Kit

Etch Resist Pen 416-RP



For drawing or touching up etch resist circuits on PC boards and on positive films. Draws lines 1/32" wide. Dries instantly.

Available Sizes

416RP	Catalog No.	Size	Format
	416-RP	5.5" long	Pen

Transparency Film 416-T



Letter size (8 1/2" x 11") heat stabilized film sheets for use in most laser printers. For use in producing the artwork required for the photofabrication process.

Available Sizes

416T	Catalog No.	Size	Format
	416-T	8.5" x 11"	Envelope of 5 sheets

Developer 418

For use with MG Chemicals' 600 series positive presensitized boards. Concentrated formulation. Dilute one part developer to ten parts of tap water. The image appears quickly as the exposed photo resist is dissolved. After developing is complete, rinse with water and the board is ready for etching. Use 416-S foam brush for best results.



Also available in the 416-K Photofabrication Kit

Available Sizes

418	Catalog No.	Size	Format
	418-500ML	500ml (17 oz)	Liquid

Liquid Tin

421

Quickly tinplates copper circuits on PC boards in 5 minutes or less at room temperature.



- Provides excellent solderability
- Protects against oxidation
- No mixing or dilution required
- For commercial / industrial use only

Directions

Clean PC Board thoroughly. Pour Liquid Tin into an appropriate size tray constructed of polypropylene, polyethelene, or similar material. Do not use stainless steel. Immerse PC Board in the solution for 3 to 5 minutes. Rinse with warm water and dry.

Available Sizes

421	Catalog No.	Size	Format
	421-500ML	500ml (17 oz)	Liquid

Conductive Print

- Quick drying
- Durable acrylic base pigmented with high purity flakes
- Excellent for repairing and modifying printed circuits and EMI / RFI shielding applications



Silver Print 842

Resistivity: 0.2 Ohm · mil
Also available in a micro-tip dispensing pen format.
Silver pigment provides excellent corrosion resistance

Silver Coated Copper Print 843

Resistivity: 0.4 Ohm · mil



Nickel Print 840

Resistivity: 0.7 Ohm · mil

Silver Print Pen 8420-P



Available Sizes

	Catalog No.	Size	Format
842	842-20G	20g (0.75 oz)	Liquid
	842-250G	250g (8.8 oz)	Liquid - Bulk
	8420-P	8.5g (0.3 oz)	Microtip Pen
843	843-250G	250g (8.8 oz)	Liquid
	843-900ML	900ml (30 oz)	Liquid - Bulk
840	840-20G	20g (0.75 oz)	Liquid
	840-250G	250g (8.8 oz)	Liquid - Bulk

Premium Etching Kit 416-E

- Etch copper clad circuits professionally
- Accommodates two 8" x 12" double-sided copper clad boards



Contains:

- 7 litre capacity heavy-duty polyethylene etching tank
- Sturdy mounting bracket
- Clear acrylic lid
- Heavy duty air pump
- Sparging unit with 3 way adjustable air manifold
- Requires a minimum of 7 liters of etching solution: 415-4L, 410-1KG, or 4101-1KG.

Available Sizes

416E	Catalog No.	Format
	416-E	Kit

Etching Process Kit - Student 416-ES

- Etch copper clad circuits professionally
- Accommodates two 8"x 9" double sided copper clad boards



Ideal for students and hobbyists. An inexpensive etching system with professional quality output.

Contains:

- 5 liter heavy duty polyethylene etching tank
- Air pump and tubing
- Sparging unit
- Bag of vinyl gloves
- Complete instructions

Also requires a minimum of 4 liters of Ferric Chloride (Cat# 415-4L). There must be enough Ferric Chloride to completely cover your board.

Do not dilute ferric chloride with water.



Available Sizes

416ES	Catalog No.	Format
	416-ES	Kit

Replacement Parts

Replacement Parts

Catalog Number	Quantity	Description
416-AP	1	Air pump <i>Replacement Air Pump for the 416-E Professional Etching Kit</i>
416--AT	1	Tubing <i>Replacement Air Tubing for the 416-E Professional Etching Kit</i>
416-B	1	Bulb <i>The 416B is a direct replacement bulb for the 416-X Exposure Kit.</i>
416-D	1	Hose <i>Replacement part for the 416-E Professional Etching Kit</i>
416-G	10 pack	Gloves <i>Vinyl Gloves - Excellent for use with all corrosive chemicals.</i>
416-H	1	Heater <i>200 watt side mounting immersion heater with quartz element and adjustable temperature control. Replacement part for the 416-E Professional Etching Kit.</i>

Ferric Chloride 415

Liquid

- Copper Etchant
- More aggressive than persulphate alternative
- Ready to use
- Can be stored and reused

Ready to use solution designed for etching printed circuit boards and other metals. Recommended for use with M.G. Chemicals Professional Etching Process Kit (416-E) and M.G. Economy Etching Process Kit (416-ES).



Powder

- Easy to mix.
- No heating required. Solution self heats to ideal operating temperature during mixing process (60°C / 140F°)
- Mixed solution can be stored and reused.
- Just as effective as Liquid Ferric Chloride.
- Easy to transport due to light-weight of powder.



A dry concentrate version that mixes with water to produce 1 liter of etchant solution, enough to etch 400 sq. inches of 1 oz boards.

Directions of Use

Immerse copper board in solution and agitate until etching action is completed. Ferric Chloride can etch up to a maximum of 100g of copper per liter of solution (1.3 square meters or 14 square meters of 1 oz copper clad board). The etching process can be sped up by heating the solution to a temperature no higher than 55°C (135°F). Ferric Chloride is compatible with the 416-E and 416-ES kits. **Do not dilute with water.**

Available Sizes

415	Catalog No.	Size	Format
	415-500ML	500ml (17 oz)	Liquid
	415-1L	1L (34 oz)	Liquid
	415-4L	4L (1 gal)	Liquid
	415-20L	18.9L (5 gal)	Liquid
	415-115G	155 g (4 oz)	Powder

Sodium Persulphate 4101

- Transparent solution allows visual inspection
- Will not stain carpet or clothing
- Compatible with etch resist pens
- Alternative to ferric chloride
- 1 kg of solid crystals makes 4 liters of solution



Available Sizes

4101	Catalog No.	Size	Format
	4101-1KG	1kg (2.2 lbs.)	Crystals
	4101-25KG	25kg (55 lbs.)	Crystals

Ammonium Persulphate 410

- Transparent solution allows visual inspection
- Will not stain carpet or clothing
- Not compatible with etch resist pens
- Alternative to ferric chloride
- 1 kg of solid crystals makes 4 liters of solution



Available Sizes

410	Catalog No.	Size	Format
	410-1KG	1kg (2.2 lbs.)	Crystals
	410-25KG	25kg (55 lbs.)	Crystals