# Dress Up Your Projects

## *The simple photographic procedure described here will let you produce project front panels that are indistinguishable from those on commercial products*

**By C. R. Ball**

When was the last time you *really* finished a project, taking the time to give it a professional-looking front panel, with control legends and perhaps an eye-catching logo neatly and permanently rendered? If you're like many hobbyists, you just spray on a coat or two of enamel paint and label your panels with a dry-transfer lettering kit or a plastic tape labeler. Dry-transfer lettering is okay at first, but it inevitable wears away and/or drops off, while tape labels give a project an unprofessional "klugy" look, no matter what other pains you might take to give is a classy appearance. Worse still, both types of labeling eventually wear away or drop off, leaving you with a project whose control functions are a complete mystery if you haven't used it for some time. This is obviously leading up to something.

That something is the fact that you *can* make very durable front panels that are indistinguishable in appearance from those you see on commercially-made products. Using the procedure described here, you can make panels and decals that really dress up your projects, actually making you want to display them with pride. You can even use this procedure to make printed-circuit component identification overlays similar to the silk screening used on commercial pc boards. Best of all, you don't have to be specially trained to turn out professional-looking panels, and all materials are readily available at reasonable cost.

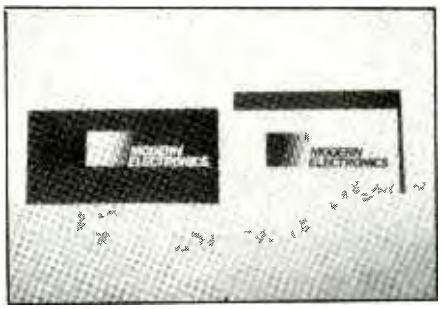
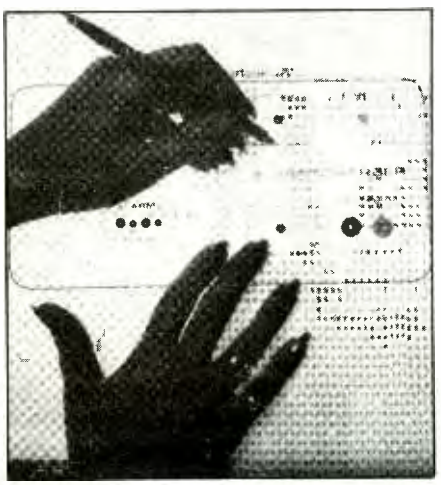


*Fig. 1. Starting with positive art, first exposure and development produces the negative shown at the left. This negative is then used as original art to expose and develop the positive film shown at the right.*

*Fig. 2. After penciling your layout onto paper, cover with transparent film and use dry-transfer lettering and other drafting aids to transfer the drawn image. If the image is very small or contains lots of fine detail, work twice life size and then have the image photographically reduced.*



### *Types of Nameplates*

There are a number of processes for making professional-looking nameplates, all requiring easy-to-use light-sensitive material. Some nameplate fabrication methods use the light-sensitive material for selectively coloring, etching or screening a panel. Another process uses the light-sensitive material as the finished nameplate image. These fabrication methods go by such names as anodizing, etching, silk-screening, and photoreproducing, respectively.

*Anodized Nameplates* are prepared by trapping various colored dyes in the "pores" of an aluminum nameplate panel. The pores are opened electrolytically by immersing the aluminum (as the anode) in a sulfuric-acid solution. Then the opened pores are selectively filled with colored dye through an exposed and developed light-sensitive material (photoresist mask). The pores are then closed by immersing the panel in a boiling-water solution, permanently trapping the dye pattern under the surface of the aluminum.

The anodizing process produces an extremely durable and attractive nameplate. Since you can use any thickness of aluminum, the nameplate can be self-supporting and, therefore, be used as part of the chassis or as a front panel.

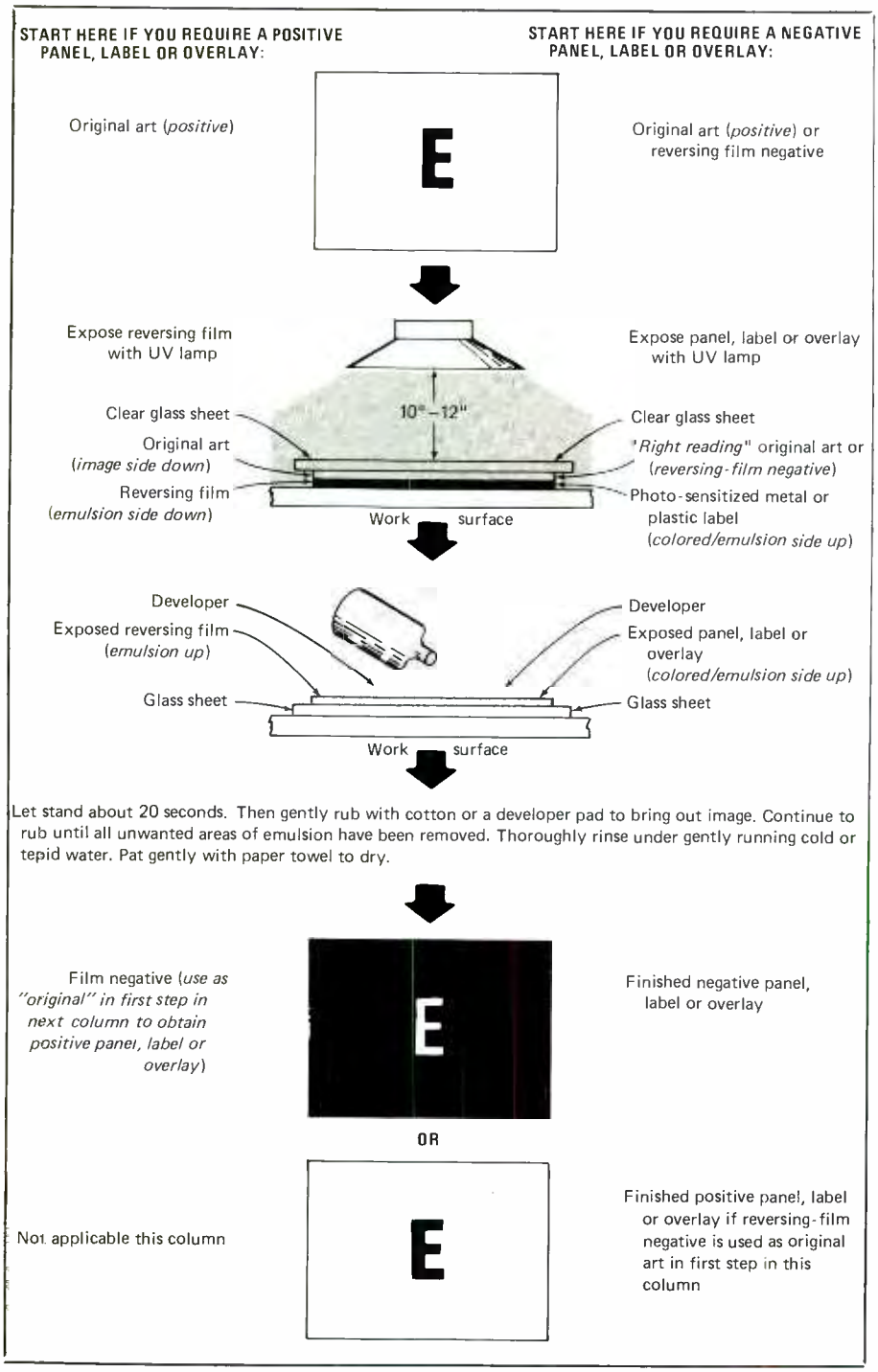



*Fig. 3. To make a panel, label or overlay that is identical to (a positive of) your original art, perform all steps in both columns, starting at the upper-left. For a negative image, simply start at the top of the right-hand column, using your original film as the "original art" called for.*

*Etched Nameplates,* as the name implies, are formed by etching an image into an aluminum surface. The aluminum panel is first coated with a negative-acting photosensitive material (photoresist) that is not affected by the etchant. (Precoated panels are available from the sources listed in the Table.) The panel is then exposed through negative or positive art and developed.

Following development, the aluminum is immersed in an etchant solution, usually caustic soda, that eats away the surface of the unprotected image areas. Then, after removing the photoresist, the etched areas can be ink filled. In the case of precoated panels, the coating is the image color and is selectively etched away.

Etched nameplates are extremely durable and can be self-supporting. Very colorful nameplates can be produced by flowing various colored inks into the etched image.

*Silk-Screened Nameplates* are produced by screening ink onto the surface of metal, plastic, or other material. The process begins by photographically transferring the artwork to a plastic film that, in turn, is secured to a silk screen. The screen is placed over the nameplate and ink is flowed through the open-mesh image areas of the screen. Aluminum must be anodized or treated with a chemical, such as Alodine 1000, to ensure that ink will adhere properly. Using epoxy inks, extremely durable nameplates can be made. Multicolor nameplates, of course, require a separate screen for each color.

Most nameplates on consumer electronic equipment are produced by the silk-screen process because they are easier and less expensive to manufacture in large quantities. However, because of the set-up time and equipment required, this process is not generally attractive to electronics hobbyists.

*Photo Nameplates* consist of a brushed-aluminum sheet between 0.007" and 0.140" thick or a 0.004"-thick transparent or colored polyester sheet. The aluminum or plastic sheet is coated on one side with a colored light-sensitive material called an emulsion and an adhesive on the other side. (A removable backing protects the adhesive side until the prepared sheet is ready for placement.) The

emulsion is exposed through negative or positive artwork, developed with a one-step rub-on chemical process, and finally coated with a clear protective spray or covered with a clear laminating film. The finished nameplate is easily cut to size with scissors and secured to a sub-panel, case, or chassis by its adhesive backing.

Many colors and color combinations are available on aluminum and plastic. Although the durability of photo nameplates is not as good as the other types, ease of fabrication and low investment cost make photo nameplates the best choice for experimental and prototype applications.

Because of its ready adaptability to home experimenting, the remainder of this article concentrates on the photo technique. We will discuss it in detail to provide you with all the information necessary to make professional nameplates for home and work projects.

*Fig. 4. Place exposed material, emulsion side up, on a sheet of glass and pour on enough developer to soak it.*

*Fig. 5. Allow developer to stand for 20 seconds. Then gently rub with cotton or pad to bring out image.*

## *Making a Photo Nameplate*

The key to any attractive nameplate is good artwork. The finished product can be only as good as your original artwork. The kind of artwork you need depends on the type of final image you want.

Artwork ultimately takes one of two forms—positive or negative. Positive art is usually the original or an exact replica on transparent film. Negative art, on the other hand, is a photographic reversal of the original (positive) art. Figure 1 shows the difference between positive and negative art.

Nameplate material is negative-acting, with the final image being the reverse of the artwork used. For example, a piece of nameplate material exposed and developed using the positive artwork shown at the left in Fig. 1 will have a final image like that shown at the right for negative art.

You begin preparing your artwork by making an actual-size sketch of the nameplate. (If the nameplate is small or is to have fine detail, you may want to make a sketch twice actual size for ease of drafting.) After verifying the dimensions and placement of lettering, place a piece of clear or translucent drafting film, available from most art or office supply dealers, over your sketch.

Using your sketch as a guide, apply dry-transfer lettering as shown in Fig. 2. Alternatively, you can use a drfting pen and a template. Pc drafting tape can be used to group or outline various areas of functions. Once you have completed transferring the details from your sketch to the film, the latter becomes your original artwork. If the original is other than actual-size, you will have to take the artwork to a lithographer or print shop to have an actual-size positive or negative made. However, if the original art is actual-size and you want a negative of it, simply use the reversing film procedure discussed later in this article.

If you are planning to duplicate a nameplate for a project that appeared in a magazine article and want to avoid having to redo the art, again simply have a print shop make a positive or negative.

## *General Information*

Although photo nameplates can be safely and easily made, certain precautions should be observed when handling the chemicals and the exposure light because both the developer and sealing spray are flammable, avoid using them near an open flame and do not smoke in their vicinity. If you have sensitive skin (or even if you do not, for that matter), wear rubber gloves when using the developer. Also, both chemicals are somewhat toxic and should be used in a well-ventilated area and should at all costs be kept out of the reach of children.

Care should also be taken to protect your eyes and skin from prolonged expoure to the ultraviolet light if you use a sun lamp. Wear sunglasses when the lamp is on, and minimize skin expoure to avoid sunburn. Keep in mind that as little as five minutes close to a UV source can result in sunburn.

Amost any ultraviolet light source can be used to expose the photo-nameplate material. You can, of course, make a sizeable investment in either 3M's Model EU800 ($375) or Kepro's Model BTX-200 ($445) exposure box. Or you can use a blueprint machine to expose thin nameplate material. However, you can obtain effective exposure results with a common 375-watt sun lamp, as long as nameplate sizes are kept down to 8″ × 10″ or less. Sunlamps are available in most drug, hardware, and department stores for about $30.

When using a sunlamp, keep in mind that most use bulbs have an internal starting mechanism that prevents them from starting unless they

**Nameplate Materials and Manufacturers**

| Item | Manufacturer | Item | Manufacturer |
|---|---|---|---|
| Anodized nameplate supplies | Metal Photo Corp.<br>18531 South Miles Road<br>Cleveland, OH 44128 | Silk-screen supplies | Various |
| Etched-nameplate supplies | Kepro Circuit Systems<br>630 Axminister<br>Fenton, OH 63026 | Photo nameplate supplies | Kepro Circuit Systems<br>630 Axminister<br>Fenton, MO 63026 |
| | Fotofoil Division<br>Miller Dial Corp.<br>4400 North Temple City Boulevard<br>El Monte, CA 91734 | | 3M Decorative Products<br>Bldg. 223-1S, 3M Center<br>St. Paul, MN 55144 |
| | | Drating film, dry-transfer lettering, templates, etc. | Bishop Graphics<br>5388 Sterling Center Drive<br>Westlake Village, CA 91359 |

are cool. If you turn off the bulb after use, you will have to leave if off for approximately 15 minutes before attempting to turn it on again.

Nameplate material does not require strict darkroom conditions, but flourescent and other sources of ultraviolet light should be avoided when handling undeveloped material. Yellow "bug" lights make excellent safe lights for handling unexposed material.

## *Nameplate Material*

Photo-nameplate material is manufactured by 3M and Kepro (see Table). The Scotchal™ brand manufactured by 3M offers the widest range of materials with 13 basic color combinations on polyester or aluminum and in sizes up to 24″×48″. (The instructions given below are specifically for the 3M products, although most apply equally to the Kepro product).

A starter kit from 3M contains all nine colors on 10″×12″ polyester film, four sheets of aluminum in various colors, overlay film, reversing film, grey scale, developer, developer pads and laminating sheets. The kit costs about $50. All you need to add is a light source, your artwork, and two pieces of glass. Individual colors and sizes are also available.

When using a sun lamp, two sheets of glass are needed: one to hold the artwork in close contact with the

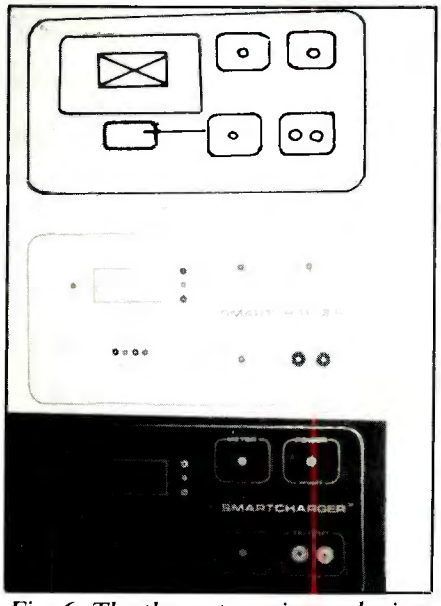



*Fig. 6. The three stages in producing a finished nameplate. At top is pencil drawing; at center is original artwork; at bottom is finished panel.*

nameplate material during exposure, and the other to use as a developing surface. These glass sheets should be at least twice the size of the nameplate you are making. Various sizes are available at hardware stores. (When you purchase the glass, do not get the tinted type. The tint filters out the UV light you need for exposing the photosensitive material.) Paper towels will also be helpful for cleaning up left-over developer and drying developed nameplates.

Before exposing the actual nameplate (details for this are given in diagram form in Fig. 3), it is necessary to determine the proper exposure time for the material color and light source you are using. To do this, select the material you are going to use for your nameplate under safe lighting conditions. Cut a piece slightly larger than the grey scale. (If you don't have the 3M kit, grey scales are available at most photography stores.) If you are using the yellow reversing film to make a negative, cut a similar piece. Place the nameplate material emulsion side up on a smooth, flat surface. Place the grey scale on top, and cover with a piece of glass. (*Cation:* Handle the nameplate material and reversing film *only* under safe-light conditions until the image is developed.)

Using the following exposure times as a starting point, expose the grey scale for the selected amount of time:

| Material color | Exposure time in minutes |
|---|---|
| red | 2½ to 3 |
| blue | 1½ to 2 |
| green | 3 to 3½ |
| black | 15 to 20 |

These are approximate exposure times for a 375-watt sunlamp located 10″ to 12″ from the exposure surface. When using positive art, increase these times by 10%. Keep in mind that these times are guidelines only and are not intended to replace grey-scale tests and that actual exposure time will vary with the UV bulb used,

its age and the distance to the exposure surface.

Position the sun lamp 10″ to 12″ from and parallel to the glass. After exposure, move the light source to a location away from your work area to prevent further exposure. Remove the glass and the grey scale. Place the exposed material, still emulsion side up, on another piece of glass and pour onto it enough developer to cover the surface (Fig. 4). Wait about 20 seconds and then gently rub the developer with a piece of cotton or a developer pad until the image appears (Fig. 5).

Compare the developed image to the original grey-scale exposure mask. If you are using plastic material, the image should be solid through step 2 on the mask. For metal material, the image should be solid through step 3, and for reversing film, it should be solid through step 4.

If you do not obtain the proper results, repeat the test and adjust exposure time accordingly. Longer exposures cause more steps to be solid and vice-versa.

Once you have established the proper exposure time for the material and light source being used, make a note of the time, distance from light source and material color/type for present and future reference.

## *Making a Nameplate*

Cut a piece of the nameplate material so that it is at least ¼ ″ larger than the actual nameplate all around. Repeat the procedure for using the grey scale and expose the nameplate. If the nameplate is large, rotate the light during exposure to be sure all areas receive equal amounts of light. In such a case, it may be necessary to increase exposure time slightly. Develop the nameplate or reversing film as before. If areas that should not wash away do, indicating underexposure, during development, increase exposure time by 10% and try again. Be sure to make a note of the time that works best and save for future use. Figure 6 shows a nameplate sketch, artwork prepared from the sketch and the finished nameplate. Examples of a variety of nameplates that give you some idea of what you can do with these materials are shown in Fig. 7.

There are two ways of protecting the finished nameplate. One is to spray several light coats of a clear acrylic, such as Krylon, or the matte or glossy sprays from 3M over the entire surface of the nameplate. The other is to layer on adhesive-backed clear laminating film, such as that supplied in the 3M starter kit. Both are best applied in a dust-free environment and before the nameplates are trimmed to final size. Other ways to mount the laminating film are detailed in 3M Instruction Bulletin #4-4.

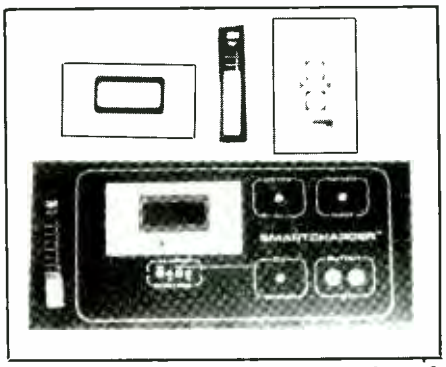


*Fig. 7. Shown here are examples of finished labels to give you an idea of the kind of work that can be done with the photo-chemical materials. Note the grey scale at the lower-left.*

## *Mounting the Nameplate*

Use scissors to trim two adjoining edges of the nameplate. Starting with the corner formed by the trimmed

*(Continued on page 100)*

*Fig. 8. Once you have trimmed two adjacent sides, remove protective backing, starting at finished corner.*

*Fig. 9. A squeege is helpful in layering the finished label onto the panel, working out air bubbles as you go.*

*Fig. 10. After burnishing down the finished label onto the actual panel, use a knife to trim away all unwanted material from holes and cutouts.*

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edges, peel the protective sheet from the adhesive backing (Fig. 8). Align the two trimmed edges with the proper edges of the panel. Finish removing the protective sheet and smooth the nameplate onto the panel. A squeege is helpful in removing air bubbles (Fig. 9).

Once the nameplate is attached and smoothed, holes and other areas can be trimmed, using an X-acto or similar knife (Fig. 10). The nameplate and panel can then be mounted to the equipment.

Pc component identification can also be made into a nameplate on clear plastic and attached to the component side of a pc board in the same manner as attaching a nameplate to a metal or plastic panel. Component leads will then punch through the plastic when they are mounted.

### *Summing Up*

As you can see from the foregoing, making of professional-appearing nameplates, decals and pc board overlays is really a simple, straightforward procedure. If you've already fabricated your own pc boards, using the photographic technique and materials, you'll be right at home with the procedure and materials employed in panel making. The results, of course, are well worth the effort and small additional cost. ME