



## Illuminated Components Design Guide



# Illuminated Components

Instrument and control panels that may be used in a dark environment require graphics that can be illuminated. In the aerospace industry, avionics systems make extensive use of illuminated components such as panels, buttons, knobs, dials, pointers and keypads. These components must illuminate at the required brightness and chromaticity for safe and effective operation.

Prime Products, Inc. has been manufacturing high quality illuminated components for 40 years. Drawn from our years of experience and industry-leading expertise, here are some important factors to consider while designing illuminated components.



# Light Source

The light source of an illuminated component is typically a printed circuit board (PCB) with lamps or LEDs. When designing a light source, ensure that:

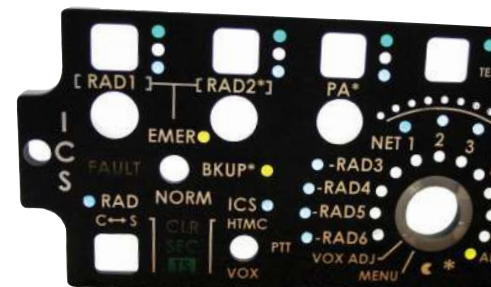
- Lamps or LEDs are selected based on the design voltage (typically 5 or 28 volts)
- Lamps or LEDs are located to ensure ample light is emitted through the areas of the component face that will have illuminated graphics
- Lamp or LED chromaticity is in the range specified for the finished product, or consider adding filters to shift the color of the light as required



# Translucent Substrate

The front face of an illuminated component is typically made of translucent plastic or silicone. Things to consider while designing and specifying the front face include:

- Select a material that is consistent in color and translucence
  - For machined parts, consider acrylic sheet per MIL-PRF-5425 or clear acrylic rod per L-P-391
  - For molded parts, consider acrylic resin per L-P-380 TY II CL 3
  - Other translucent materials such as polycarbonate or silicone are also commonly used
- For components such as panels or dials, embed threaded inserts into the plastic for PCB installation
- For panels, dials and keypads, include cavities to accommodate the lamps or LEDs
- For plastic components, liquid hone all surfaces to promote paint adhesion
- Add edge breaks or radiuses on most edges, particularly face edges, to lessen the chance of damage and paint chipping



## Painting

The paint that is applied to the illuminated component is functional as well as aesthetic. In addition to providing the desired finished product color, the paint is used to control the brightness and the color of the light that emits from the graphics. This is accomplished through a process called “toning”. Toning involves spraying the white paint on the face of the component in a pattern that balances the brightness of the light throughout the face. A photometer can be used to measure the brightness during this process to ensure the desired result is achieved. When specifying paint requirements for an illuminated component, be sure to consider the following key points:

- Specify the paint color and lighting requirements (brightness and chromaticity) but allow the manufacturer to select the type of paint and coating thickness that works best for their process
- Avoid specifying a coating thickness, or if there are assembly fit concerns due to paint build-up, specify only a maximum thickness and allow at least 2 mils per coating
- Specify the surfaces that must be free of paint but allow paint in the lamp cavities as needed to meet the lighting requirements
- Allow bright white paint on the back side and edges, before the opaque overcoat is applied, to maximize light reflection inside the plastic
- Allow overspray or other cosmetic imperfections on the back side surface where the PCB will be assembled
- Allow the white paint that is applied to the face of the part to be tinted as required to meet the chromaticity requirements as long as the final color is still met

## Laser Etching

The graphics of an illuminated component can be achieved by fiber laser etching. To ensure the toning paint is not altered during etching, it will be necessary for the manufacturer to experiment to determine the ideal:

- Laser path
- Speed
- Power
- Frequency
- Focal point



## Clear Top Coat

To protect the finished product and hide cosmetic imperfections, call for a clear matte top coat to be applied over the face and edges.

## About Us

Founded by Ralph Quist and Jim Herrmann Sr. in 1975, Prime Products, Inc. has been manufacturing industry leading avionics components in the 40 years since. We are proud to be a Nadcap, AS 9100 Rev C, and ISO 9001:2008 certified company providing diverse manufacturing capabilities.

To learn more about illuminated components, visit [PrimeProductsInc.com](http://PrimeProductsInc.com) or contact us directly at 616-531-8970.

