
120VAC LED Circuit TechTips

class design exercise

by

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This laboratory was suggested by a past Electronics Engineering Technology graduate. The exercise is designed to help the students better understand how the diode (rectifier) can be used in a real non-power supply application.

This task is simple yet it has enough flexibility to allow the students to apply critical thinking when coming up with a solution. There is more than one solution for this task.

Before the students are given this lab, the students should understand basic current flow in diode circuits and LED operation. The students should also have been introduced to the use of half-wave, full-wave, and bridge rectifiers for the generation of the rectified waveform. They also should understand the purpose of filter capacitors which are used to provide the un-regulated DC voltage for inputting to voltage regulators.

The students should have a basic understanding of the following:

- basic diode operation and device specifications
- LED operation and device specifications
- Basic power supply operation
- Understand AC voltage as obtained from the electrical outlet.
- Preparing reports

120VAC LED Circuit

Problem:

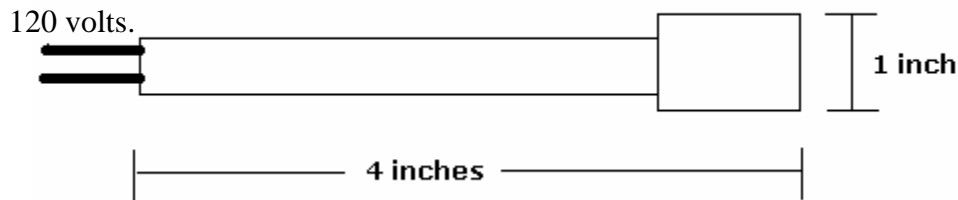
A facility is troubled by power indicator lights on some of their older electronic equipment continually burning out. The equipment is powered on 24-hours a day, 7-days a week. The indicator lights are used to verify that electrical power is being fed to the individual module. The power indicator lights are powered by a 120 VAC connection that is fed directly to each individual electronic module.

Task:

The task is to modify the electronic modules so that the 120 VAC power-on indicator lights can be replaced with an LED circuit. It is expected that the lifetime of the LED will greatly exceed the existing incandescent lamps thereby decreasing the man-hours required to replace the power indicator lamps.

There is a limited space available for incorporating the modification (see below) and there isn't room for an AC transformer. You must make the connection directly to the 120VAC fed to the electronic module.

Design an LED circuit that can be used to replace the AC lamp. Provide a circuit diagram, discussion, and sketch of the proposed modification. Include a parts list and expected cost of the modification.



A Drawing of the existing AC lamp (not to scale).

| AC Lamp Specifications | | LED Specifications | |
|------------------------|----------|-----------------------|-------|
| Length | 4 inches | Forward Current (max) | 30 ma |
| Width | 1/2 inch | Reverse Voltage (max) | 25V |

You are to prepare a technical solution to this problem. You must do the following:

- 1. Present your proposed solution to the instructor by the assigned data. (You must present your proposal to the instructor.)**
- 2. Submit a brief description, parts list, and a schematic of the proposed modification to the instructor.**