

# Learning About The NEC NP60 DLP Projector



The *NEC NP60 Projector* is 2.90" x 9.70" x 7.10", and is 3.5 lbs with a resolution of 1024x768. It has an audible noise of 40 dB and is 285 Watts 100V - 240V. It uses Digital Light Processing (DLP) technology and is an 8-bit color processing projector.

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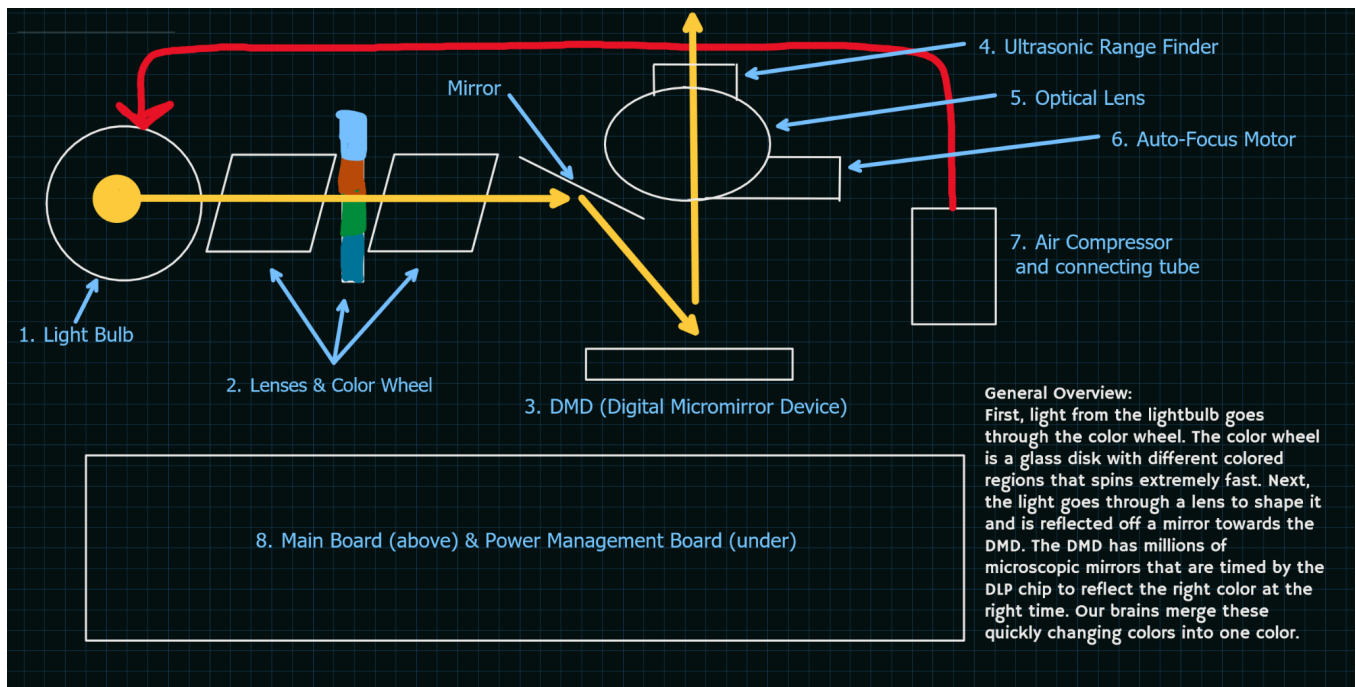
# Learning About DLP Projectors

*All pictures were taken and edited by Team 9421R unless otherwise noted.*

## Introduction:

The projector is the most underappreciated, yet most used classroom item. This item was chosen because all students use this in their everyday lives, and don't even know how they function. We wanted to understand the main components of a basic projector and how they work together to make one product.

## Overview of System:



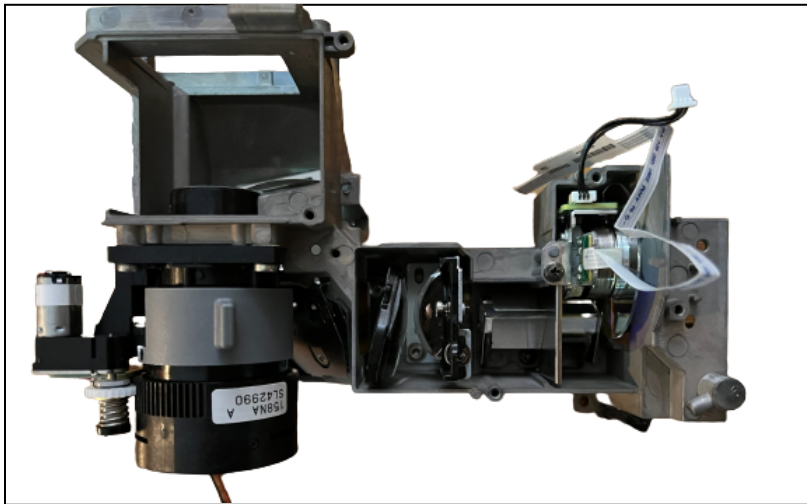
## **Components:**

### **I. Light Bulb:**

The bulb used in this projector is a 220W Metal Halide bulb. It has around 2,000 hours of normal life and 3,000 hours of lamp life in power-saving mode. It is a 3,000 ANSI Lumens/2,400 Lumens bulb on power-saver mode.

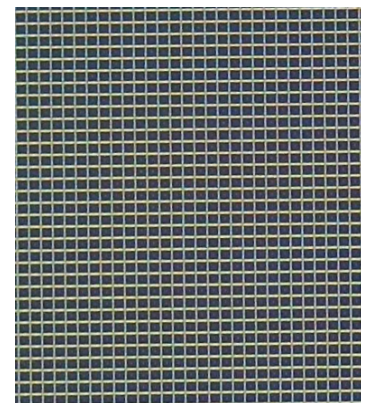


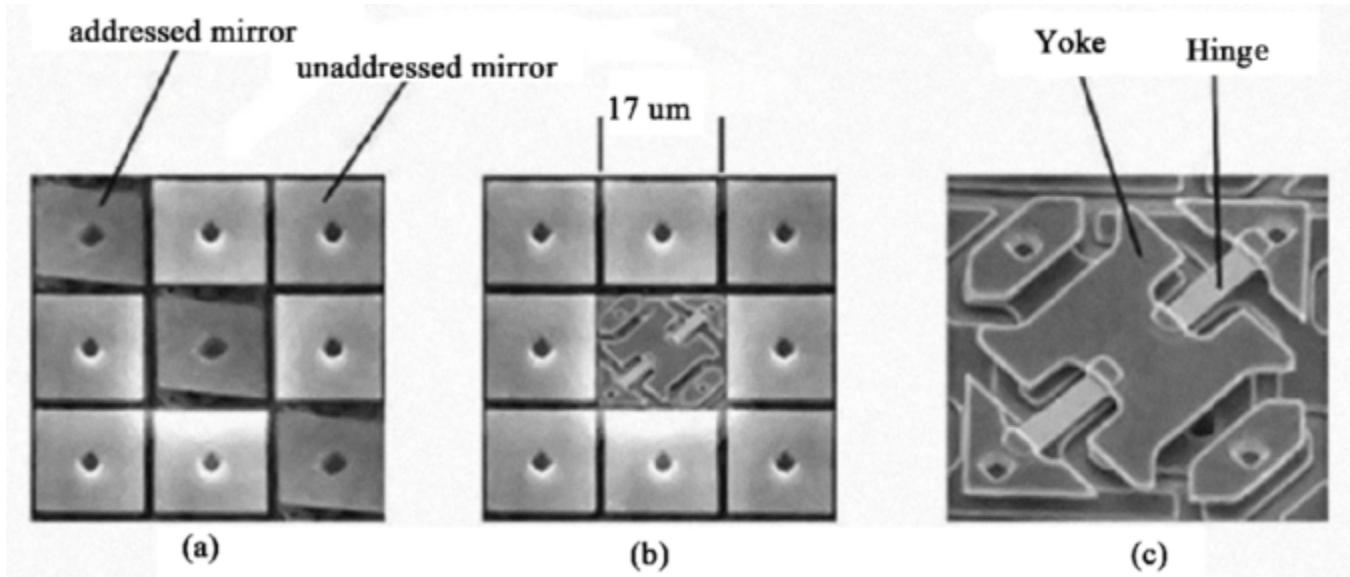
### **2. Color Wheel:**



The color wheel (right side of image) is a constantly spinning glass disk with different colored sections. The DLP chip coordinates the DMD mirror direction with what colors are being directed towards the DMD. As the different colors are reflected on to a screen, our brain merges these quickly changing colors to be one color.

### **3. The DMD:**

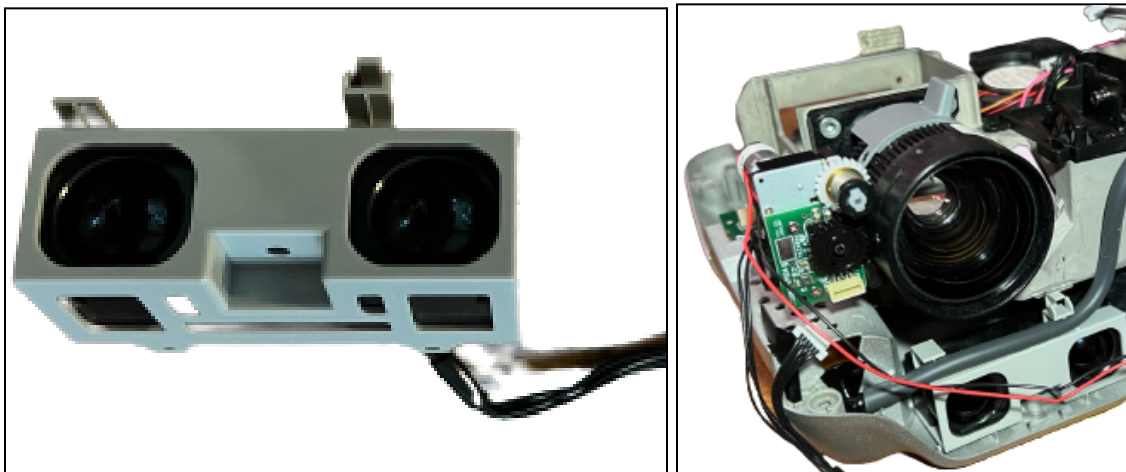




(Image From [ResearchGate.net](https://www.researchgate.net) because we did not have a powerful enough microscope)

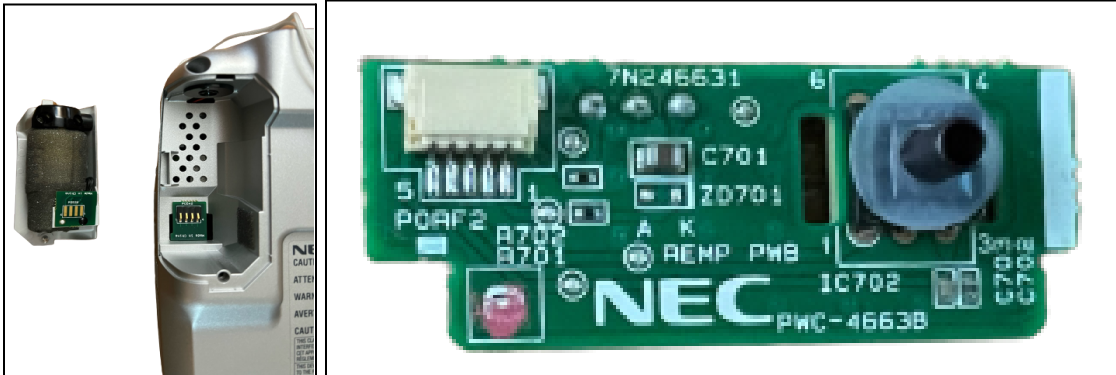
The DMD has many microscope mirrors that are made out of aluminum; each mirror has a diode that controls a hinge to address the mirror towards or away from the light coming from the color wheel. We took this image (Right) with a Tomlov Digital Microscope, of the micro-mirrors to see truly how small they are and how many there are.

#### 4, 5, & 6. Rangefinder, Optical Lens, Auto-Focus Motor:

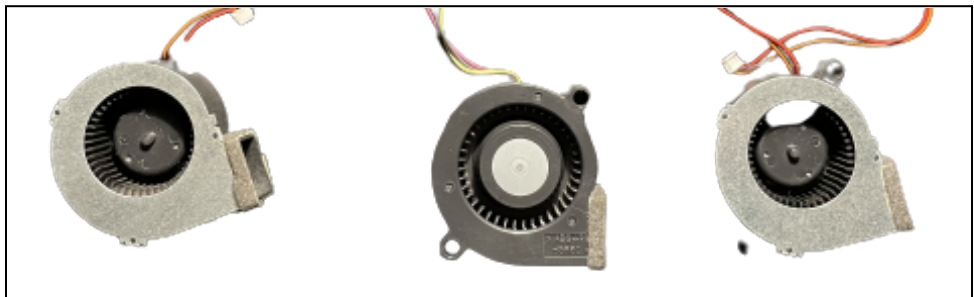
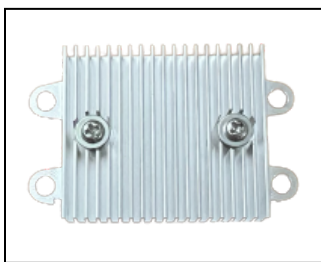


The main purpose of this rangefinder is to autofocus and center the projection. The ultrasonic range finder (Left) is very similar to the one from Vex. The rangefinder works to find the distance from the projector to the surface on which it projects and sends this information to the motor (Right), which adjusts the lens, to autofocus.

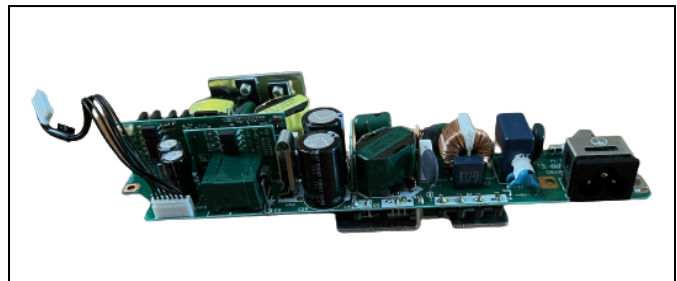
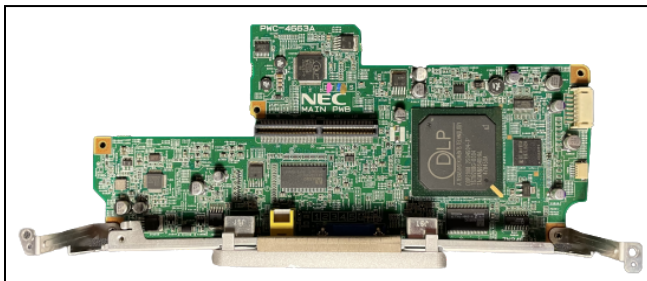
## 7. Cooling Systems:



Inside the projector, there are three different types of cooling systems because the bulb can reach up to 300°F. There is a heatsink for the DMD (Bottom Left), 3 fans for the bulb (Bottom Right), and also a miniature air compressor that pumps air into the bulb (Top Left). The temperature sensor (Top Right) adjusts the fan speeds to find a balance between noise and performance.



## 8. The Boards:



These boards are very complex, but they are the main “brain” of the projector. The main board controls all of the main components of the projector such as the DMD, cooling systems, bulb, sensors and color wheel (Left). It does all this while taking and distributing the energy from the energy processing board (Right).

## **Conclusion:**

We learned many lessons in this project including documentation and teamwork. This project helped our whole team learn what's truly behind engineering and how much thought it takes into developing a product. We also learned about many different components that make up a projector, and how projectors produce their image.

## **Parts List:**

### **Casing/Shell of Projector:**

Zoom Lever, Lens, Lens Cap, Controls, Terminal Panel (Mini D-Sub 15 pin, RCA, Mini DIN 4 Pin, Mini DIN 8 Pin), AC Power Input.

### **Inside the Projector:**

Air Compressor, DMD, Ultrasonic Rangefinder, Color Wheel, 3 Fans, Infrared Remote Sensor, Light Bulb, Main Board, DMD board, Energy Management Board, Autofocus Module (Small Motor and Gear to Rotate Lens), and a Variety of Mounting Plates, Fasteners and Wires.

## **Citations and Credits:**

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