

# Electrical Applications - Transformer

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## Abstract

In this final project, we will explore the physics behind a critical device that allows us to harness the massive amounts of power distributed by the electrical grid system, namely the *transformer*. Starting with a cross sectional analysis of the various components of a transformer, we will cover extensively the physics behind stepping down voltage to use usable level. We will also take a look at some interesting questions behind transformers that can be observed on a day to day basis, such as why do transformers hum/vibrate, and what exactly makes a transformer explode during a heavy storm.

## 1 Introduction

**Modern Electrical Applications - The Transformer** Of the many revolutionary discoveries of humanity, the discovery and following applications of electricity and the electromagnetic laws, without hesitation ranks itself among the topmost pinnacles of human achievement, completely transforming our world into the modern era as we know it today. Beginning with the simple application of illuminating a room with a light bulb around a simple circuit, we now enjoy the luxury of fully electrified housing units with the ability to tap into the electrical grid system simply by plugging in to a wall socket unit. And while the electrical grid system as a whole is a modern marvel in itself, the scope of this article could not even begin to cover the full complexities of how a mega system like a communal power grid is engineered. Instead we will take a look into one of the most critical elements to delivering usable and practical electricity to our homes.

This device is known as a *transformer*, and it is the primary reason that we are able to enjoy the use of small scale electronic devices within the household, while also drawing from a power source of incredible energy that unfiltered would destroy any small electrical device connected to it. Simply stated, a transformer is a static electrical device that when supplied an electrical current input, is able to increase or decrease the input voltage and output a different voltage, also known as *stepping up* or *stepping down* voltage.

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