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# Introduction to Electronics

*An introduction to electronic components and a study of circuits containing such devices.*

**TECH**



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# AC to DC Conversion

*Introduce ac to dc conversion*

**TECH**

# Previous Lesson

- Introduced voltage transfer characteristics

# Lesson Objectives

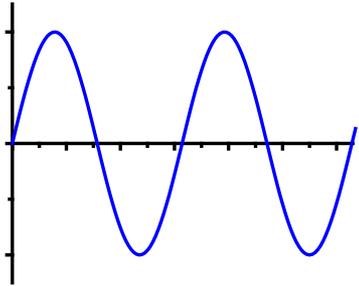
- Introduce ac to dc conversion
- Examine circuits that perform this conversion

# AC to DC Conversion

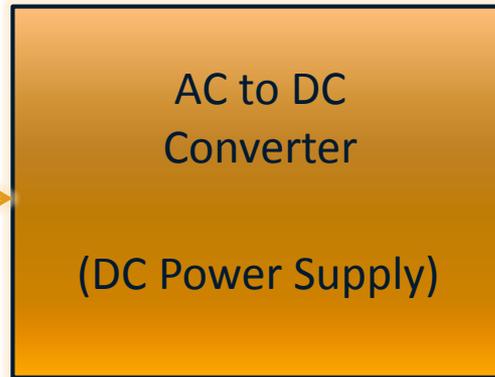
- ⦿ AC used in power transmission
- ⦿ DC used to power electronics
- ⦿ Diode rectifiers are used in converting an alternating current to a direct current

# Sinusoidal Input Voltage

Voltage varying with time

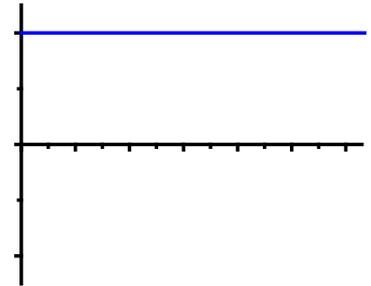


AC Input

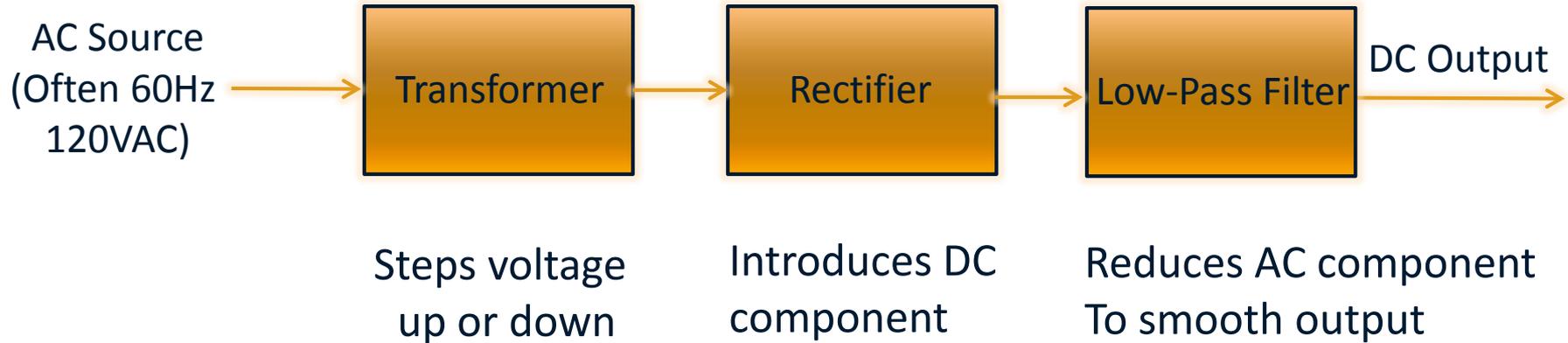


DC Output

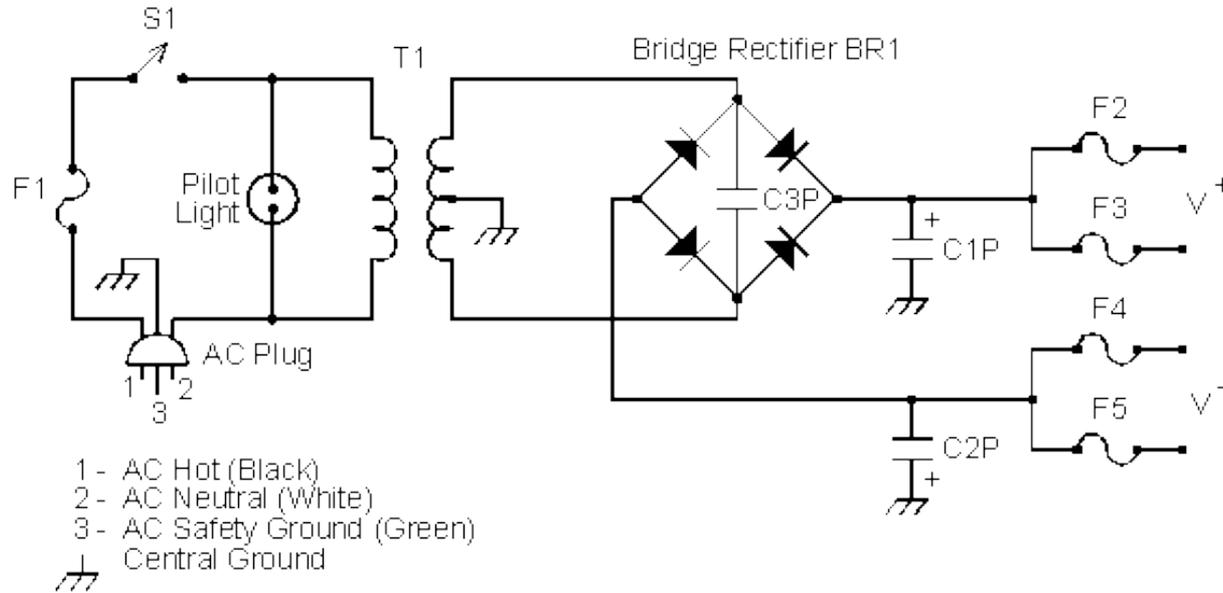
Voltage constant with time



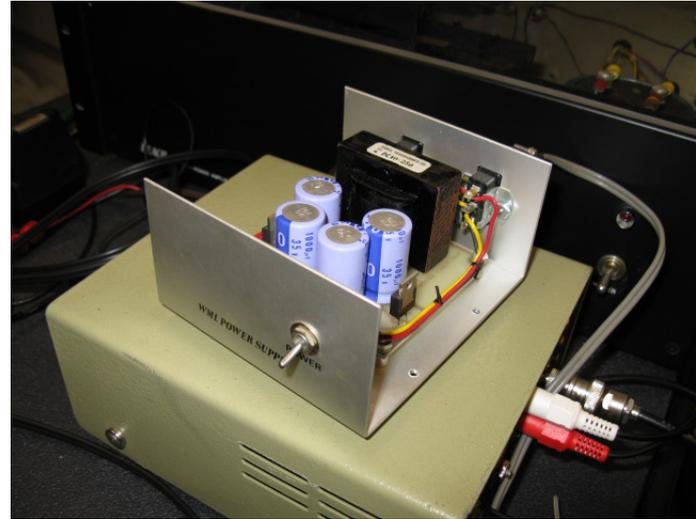
# DC Power Supply Components



# Bipolar DC Power Supply Schematic



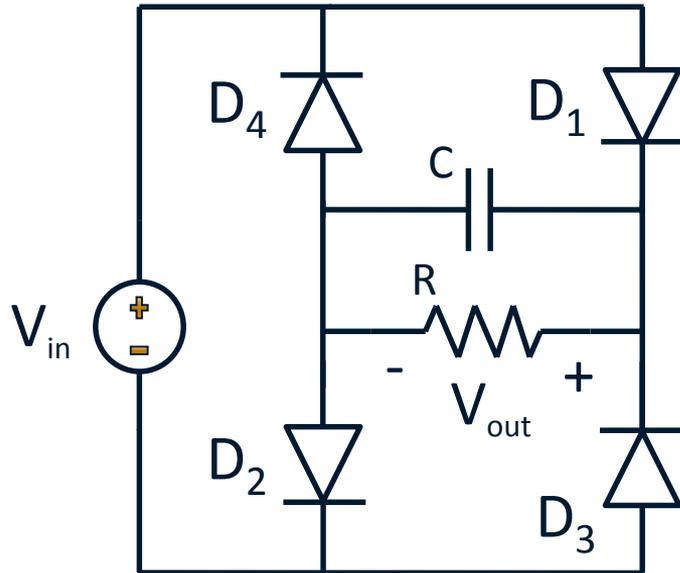
# Example DC Power Supplies



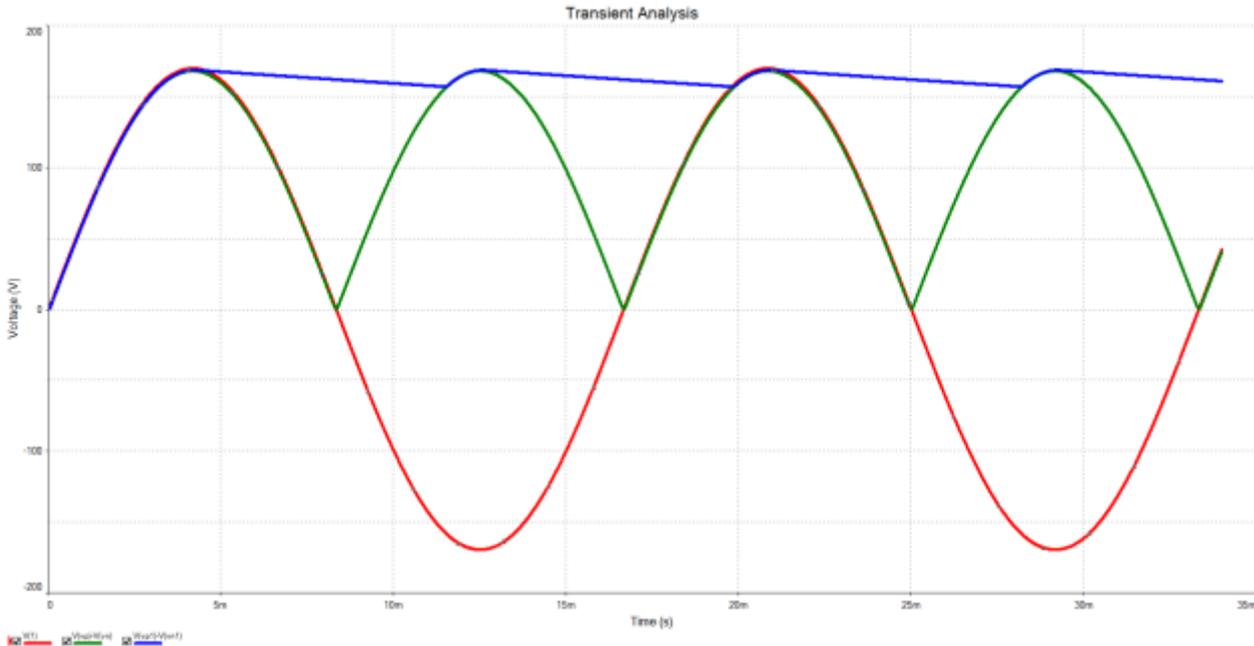
# Example DC Power Supplies



# Rectifier with Filter Capacitor

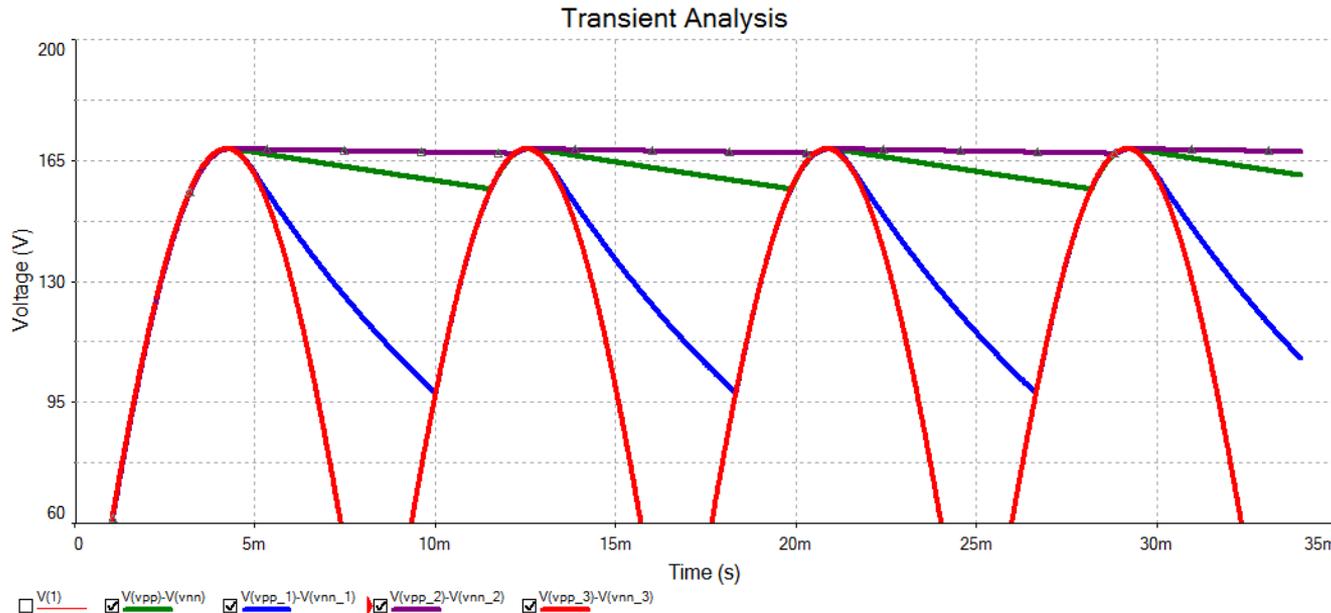


# Circuit Voltages



# Varying Capacitor Values

$$\tau = RC$$



- Larger time constant = slower discharge
- Smaller time constant = faster discharge

# Output Voltage Level

For a sine wave:  $V_{\text{peak}} = V_{\text{rms}} * \sqrt{2}$

$$V_{\text{DC}} = V_{\text{peak}} - 2V_f$$

Two diode voltage drops  
are lost in the full-wave rectifier



$$V_{\text{DC}} = V_{\text{rms}} * \sqrt{2} - 2V_f$$

$$V_{\text{DC}} = 120 * \sqrt{2} - 2(0.65) = 168.4 \text{ V}$$

# Summary

- ⦿ AC to DC conversion is performed using a transformer, a rectifier, and a filter capacitor
- ⦿ Larger filter capacitors result in a smoother output voltage

# Next Lesson

- Diode Waveshaping Circuits