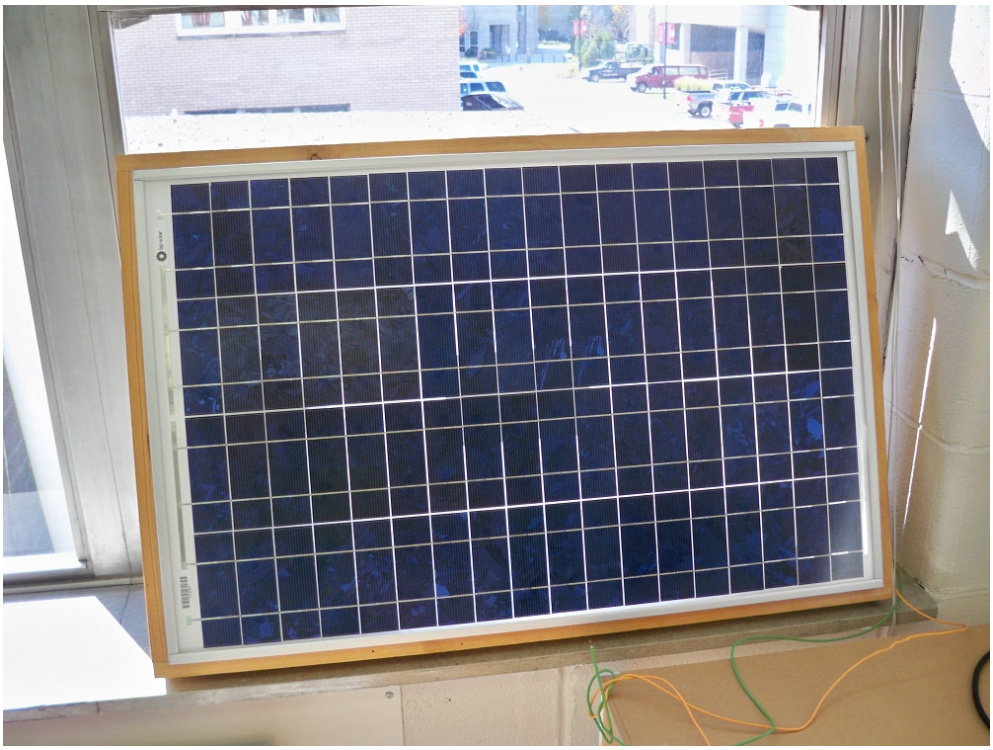
# Photovoltaic Power Converter

**Functional Requirements List and Performance Specifications**

**Date:** 11/10/11

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**Project Introduction and Goals**

The goal of our project is to explore methods of efficiently producing power from a photovoltaic (PV) system. In our project we will design and build a PV system. Our design will include a boost converter controlled by a maximum power point tracking (MPPT) system and an inverter. A DSP board will be implemented to control the DC and AC subsystem. The project goal is to make a photovoltaic system that produces DC and AC power. The system will utilize PV panels to generate DC power. The DC voltage output from the PV panel will be stepped up using a boost converter. The DC power will then be inverted to AC, to potentially be fed into the grid.

**Functional Block Diagram**

The following figure is a functional block diagram of our system.

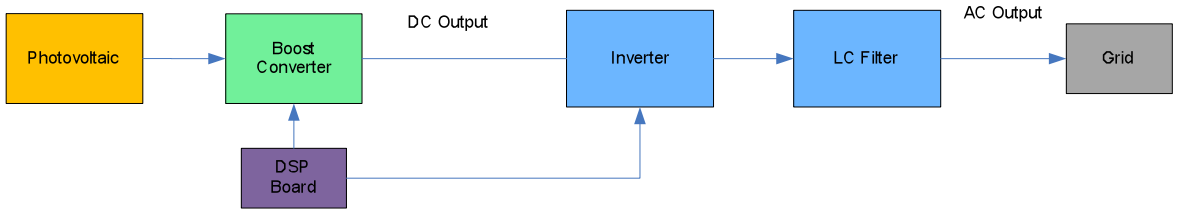


**Figure 1 – Functional Block Diagram**

The total system is broken down into two groups of subsystems, DC and AC. The DC subsystem is shown on the left side of the block diagram in Figure 1, and the AC subsystem is shown on the right side.

**Over All Requirements**

- The System shall take a voltage from photovoltaic cells.
- The System shall boost the input voltage.
- The stepped up voltage shall be converted to an AC voltage by means of an inverter.

**DC Requirements**

- The boost converter shall accept a voltage from the photovoltaic cells.
  - The input voltage shall be 48 Volts.
  - The average output shall be 200 Volts +/- 25 Volts.
    - The voltage ripple shall be less than 3 Volts.
  - A MOSFET shall be used as a switch in the boost converter.
- The boost converter shall perform maximum power point tracking.
  - The PMW of the boost converter shall be regulated based on current and voltage from the PV array.
  - The efficiency of the MPPT system shall be above 85%.

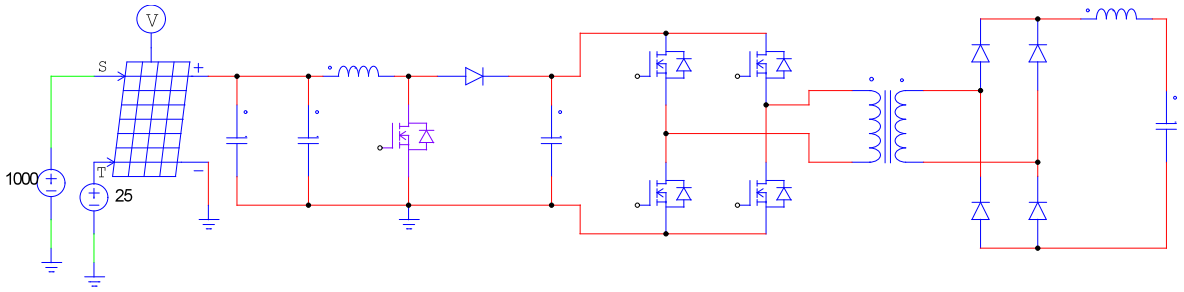


**Figure 2 –Boost Converter with Full Bridge**

**AC Requirements**

- The AC side of the system shall invert the output of the boost converter.
  - The output of the inverter shall be 120 Volts RMS.
  - The output shall be 60Hz +/- 0.1Hz.
  - Total harmonic distortion of the output shall be less than 15%.
  - Four IGBTs shall be the switches for the inverter.
- The inverter shall be filtered by a LC filter.
  - The filter shall remove high switching frequency harmonics.

**Software Requirements**

- A DSP board shall be used to control both the DC and AC subsystems.
- The DSP board shall control the MPPT.
  - The MPPT measurements shall be taken every 1 second.
- The PWM signals controlling the boost converter and inverter shall be generated by the DSP board.
- The test frequencies of the PWM signal shall be from 10kHz to 50kHz.

# Appendix A

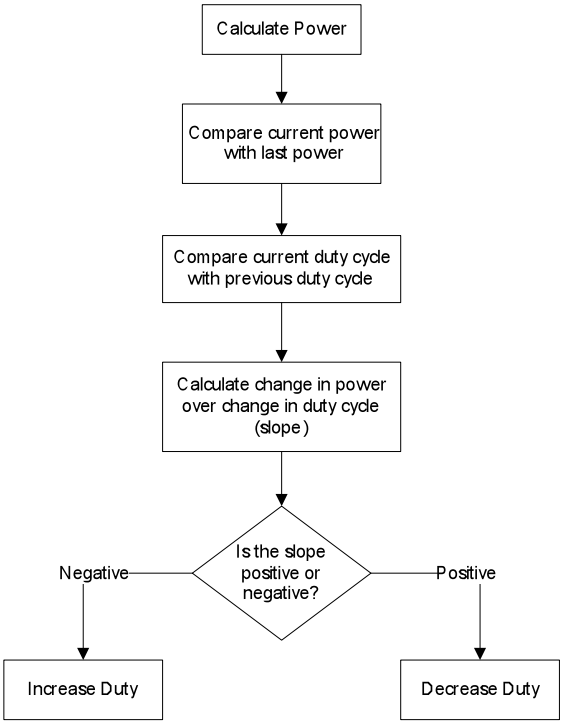


**Figure 1 - MPPT Flowchart**

## References

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