

Which panel to ac.
inverter advantages
includes single



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which will limit the output at the desired rated voltage and current, filters used C, L-C type filters.

Our system is a closed-loop system with feedback input given to the DC-DC converter, here we are getting a sine wave AC with an efficiency of 80%.

Keywords: PV- photovoltaic, OTG- off the grid. Introduction: A solar inverter is the type of inverter designed to operate with a single PV cell, the micro-inverter converts the variable DC output from each panel to AC. Inverter advantages include single power optimization, independent operation of each panel, plug and play installation, improved installation and fire safety, minimum cost of system design. The inverter we are introducing is solely an off-grid system, typically to provide a smaller community with electricity. By using it on a large scale even a huge company can be powered.

OTG homes are autonomous, they do not rely on municipal water supply, electrical power grid or similar utility services. Our motive is to at least reduce the dependency of houses on government for electricity or reduce the cost and make houses partially self-sustained. The DC-AC inverters on the market today are essentially two different forms of AC output generated: Pure sine wave, and Modified sine wave. A modified sine wave can be seen as more of a square wave than a sine wave; it passes the high DC voltage for specified amounts of time so that the average power and RMS voltage are the same as if it were a sine wave. These types of inverters are very much cheaper than pure sine wave inverters and therefore are attractive alternatives.

Pure sine wave inverters, on the other hand, produce a sine wave output replica to the power coming out of an electrical outlet. These devices are able to run more sensitive devices that a modified sine wave may cause damage to such as: LASER printer, computer, power tool, digital clock and medical equipment. This form of AC supply also reduces audible noise in devices such as fluorescent lights and runs inductive loads like motors, faster and quieter due to the less harmonic distortions.

Methodology The construction of the pure sine wave inverter can be complex when thought of as a whole but when broken up into smaller projects and divisions it becomes a much easier to manage project. The following sections detail each specific part of the project as well as how each section is constructed and interacts with other blocks to result in the production of a 240 volt pure sine wave power inverter. H-BRIDGE ; Driving four MOSFETs in an H-bridge configuration allows +270, 270, or 0 volts across the load at any time. To utilize PWM signals and this technology, the left and right sides of the bridge will be driven by different signals. The MOSFET driver on the left side of the bridge will receive a square wave at 50Hz, and the right side will receive the 50KHz PWM signal.

The 50Hz square wave will control the polarity of the output sine wave, while the PWM signal will control the amplitude. The MOSFETs to be used in the design are the IRFB20N50KPbF Hexfet Power MOSFET, rated for 500V at 20A with a R_{ds} of . 21ohm. 43mm PVSOLAR CELLS FEEDBACK DC-

DCBUCKCONVERDRIVERCIRCUITFILTERCIRCUITOUTPUT43mm Sine Wave

Generator When the oscillator was first pieced together, all that was

being output was a 6 volt signal, all of the calculations were correctly made <https://assignbuster.com/which-panel-to-ac-inverter-advantages-includes-single/>

and all of the components were correct in their choosing, therefore the team had to understand why the circuit wasn't running. In order to understand if the circuit was operating at all, the power to the circuit was turned on and off while attached to an oscilloscope. While doing this the team noticed that there was some oscillation present but it would attenuate to the 6 volt signal in under a second. The phase shift oscillator works in such a way that if the amplitude of the inverting amplifier is not high enough the system will continually attenuate the signal until the amplitude is zero, it was therefore decided to change the amplification power of the inverting amplifier. By increasing the amplification value the circuit eventually oscillated, in a perfect to the naked eye, sine wave, upon measuring it was seen that the frequency was not as calculated either, looking for a 50Hz sine wave, the oscillator was producing a 47Hz sine wave.

The next task therefore was to return this value to 50Hz, the frequency of the oscillator is controlled by the 4 filters comprised of a resistor and capacitor. The team found that by controlling the size of the resistor in one of the four filters the frequency could be adjusted. Therefore to get the correct size signal, a potentiometer was put in place of one of the resistors and adjusted while measuring the output on an oscilloscope to determine what size resistor should be used to oscillate at 50Hz.

Filter Design

The other major obstacle in the implementation of this project was the design of the filter, the original design was a simple one pole inductor, capacitor low pass filter designed for passing all signals under 50kHz. When first bread-boarding the circuit the team used low voltage, low power capacitors and inductors that were available in the WPI ECE shop. Using this method the filter worked

as it was designed and the only hurdle was to order parts designed for the voltage and current needed. The problem arose when searching for these parts, because the filter components needed to be capable of handling at least 400 volts and 4 amps (for reliability reasons) these parts were very large and bulky. Therefore in order to rectify this problem the team went back to scratch in designing the low pass filter, instead of a simple first order low pass filter, a two pole low pass filter would be used.

Using this approach there would be twice as many components in the filter but the size of these components would be considerably smaller, lighter and cost less. After first verifying that this filter would work with low voltage/current parts from the shop, the team bought components that could handle the current and voltage demanded of the filter and tests on the new filter were conducted. Implementing the Design To actually implement the design of this DCAC power inverter, certain steps had to be taken to ensure that every block of the project functions correctly. In order to do this the entire project was first placed on a breadboard to ensure functionality and where any glitches or inaccuracies due to small uncalculated losses could be accounted for. The project had to be placed on the breadboard in a specific order so that each block could be tested to see if the desired output occurred before moving onto the next step. The first function blocks to be constructed were the six volt reference, sine wave and carrier wave generators.

The sine and carrier wave generators work independently of each other and therefore were able to be constructed at the same time. Some time was spent on these two sections of the project because their functionality at the precise frequency, shape and amplitudes will affect the outcome of the <https://assignbuster.com/which-panel-to-ac-inverter-advantages-includes-single/>

PWM signal. Putting the Design to Work After the successful debugging of the bread-boarded circuitry it was time to transfer this work to a PCB board.

Using the full schematic in Appendix B and Eagle PCB program the team was able to construct the circuitry for a PCB board and have it made so that the team could piece together the entire circuit on a neat board. The full plans for the PCB board are located in Appendix D. Putting the circuit onto a board of this kind will get rid of all the extra wires and the possibility of any extra noise that can be attributed to the length or crossing of wires typical on a breadboard, thus allowing a neater, more presentable and less noisy circuit. The first revision of our PCB board, and the board our circuit was mounted on, is shown in the picture below.

This revision had a few traces that were not drawn correctly and so wires had to be added and some traces cut. The other detail with this revision was that traces were not made for the final filter design and instead space was left for this addition. With these few changes to be made, the team went back and redesigned the PCB board, however time was not available to construct this board again. Conclusion The goals for this project were to produce a pure sine wave DC-AC inverter that would output at 50Hz, 240 volts RMS with 690 watt output, would be cheap to manufacture, and fairly efficient in the method in which it produces it. Taking a look at these goals and the end result it can be said that they were met, the circuitry and total cost of all the components used in the construction of the circuit was around \$65 as compared to the \$300-600 pure sine wave inverters on the market now. This cost however, is when buying parts one at a time, if manufactured this price tag would drop greatly due to the quantities of parts that would be bought. The second goal,

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to produce a 240 volt RMS sine wave with the capability of providing 690 watts of power was not actually tested, but the team is confident in its ability to produce this waveform. Using parts in the driver portion of the circuit that are rated for at least twice the operating parameters, 240 volts and 3 amps, the team can be assured that these devices will work with the same functionality as they do at 12 volts. At 12 volts powering, the H-Bridge output is a clean 50 Hz sine wave that can easily be controlled in size by the size of the sine reference in the control circuit.

It is in this capability that the option of a closed loop control circuit could be implemented. References 600 Watt Pure Sine Wave Inverter. Donrowe. com. Retrieved December 14, 2006, from http://www.donrowe.com/inverters/puresine_600.html.

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