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Control of Two Parallel Connected Inverters in a Standalone AC Power Supply System

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Abstract: ***A design for controlling of two parallel connected inverters in a standalone ac supply system and parallel operation of two inverters for load sharing conditions in grid are presented in this study. These schemes are suitable for the controlling of two parallel connected inverters to distribution system andto grid such as in distributed uninterrupted power supply (UPS) and isolated ac system.This system has two parallel connected inverters if in any case one inverter is failed then other inverter can supply power without any interruption and vice versa because these inverters are connected parallel to each other with relay to loads. All these interruption of power supplies are controlling from micro-controller with other equipment. Data and graphs are taken by PWM technology with duty cycle, CRO.***

Keywords: Inverters, PWM, AC Loads, Micro-controller, CRO and other electronic equipments

1. Introduction

Energy is one of the fundamental demands of the modern society. According to use energy may be of various type likes electrical, thermal, tidal energy etc. But due limitation of conventional source of energy it is required to overcome from these energy sources and make use of non-conventional energy sources. So for this purpose here we use inverter control technique for power supply.

As DC TO AC power converters feed power to ac supply systems become more numerous, the issue relatingto their control need to be addressed in better details. Inverters are connecting dc power supplies to ac systems occur in severalapplications. Solar Photovoltaic power plants and battery storage system installations are examples of good application. In either case,the inverter interfaces could be connected to a common acsystem. Distributed uninterruptible power supply (UPS) systemsfeeding power to a common ac system are also possibleexamples. In addition, over the past many years; there hasbeen significant interest in applying inverters technology tolow voltage dc mesh power transmission systems.The feasibility from the control viewpoint of a low voltage dc mesh has been demonstrated in. The transmission system couldtypically consist of inverters connected at several points on the low voltage dc mesh which are providing power to ac systems that couldbe interconnected as well. Multiple inverters connected to acommon ac system essentially operated in parallel and need tobe controlled in an approach that ensure stable operation andprevent inverter overloads. Although inverters topologies are usedfor power transmission have traditionally been current sourced,in recent years, voltage source inverters have beenever more used for high-power applications like electrictraction and mill drives, photovoltaic power systems andbattery storage systems. Control schemes for voltage source inverters in powersystem environments have formed the topic of recent works. In additional, with inverter topologies like the neutral point clamped inverter it is possible to achieve substantialharmonics reduction at reasonably low pulse width modulations switchingfrequencies.

2. Literature Survey

This survey presents, controlling of parallel- connected inverters with stand-alone ac supply system and also presents ac supply system without any single communications. It has highly modular structure for the controlling of parallel- connected inverter to ac supply system. The simulation results also provides that the effectively scheme achieves to the aims of power sharing to the presence of changing loads and this scheme also provides the P-I regulators to find the set points for δ_p^*.

This system is operated for large ac supply system, where inverter makes communication impractical and also operated with UPS systems with communications breakdown. In this survey mainly controlling two independent quantities- power angle and magnitude of fundamental inverters voltage and this can also presenting the controlling of frequency and voltage of parallel connected inverters.

3. Experimental Setup

The aim of experiment is to study the performance of parallel connected inverters in standalone AC power supply system. In this setup two inverters are synchronized through parallel connection and operate on different conditions such as normal mode, overload and uninterruptable power supply in case of failure of any inverter. The Setup is shown below in figure 1:

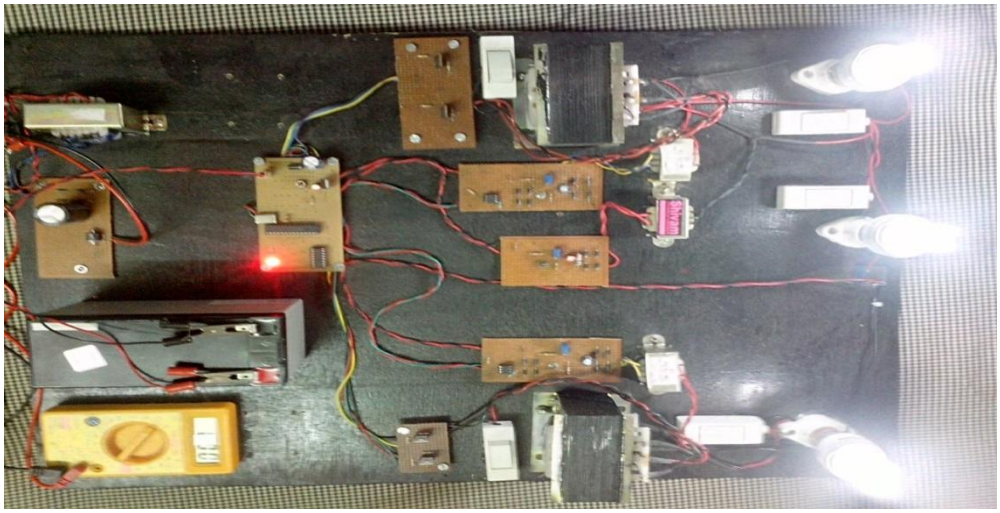

Figure 1: System runs on battery with AC power supply.

4. Working And Methodology

In this system we have used three loads like load A1, load A2 and load A3 and these loads are connected with the relays. We have used two parallel connected inverters with relay for the load sharing.; if load A1 is switch ON condition then first inverter will provide power to load A1 but if inverter first is not at working condition then inverter two will be supplying power to load A1 because inverter two is connected to parallel with inverter first and with stepping up voltages like 12v to 220v without uninterrupted power supply.

If load A3 is switch ON condition then second inverter will provide power but if inverter two is not at working condition then inverter first will be providing power to load A3 because inverter first is connected to parallel with inverter two and with stepping up voltages like 12v to 220v without uninterrupted power supply.

If load A2 is switch ON condition then first inverter and second inverter will be providing power to load A2 because it is connected to both in parallel with relay connection without uninterrupted power supply.

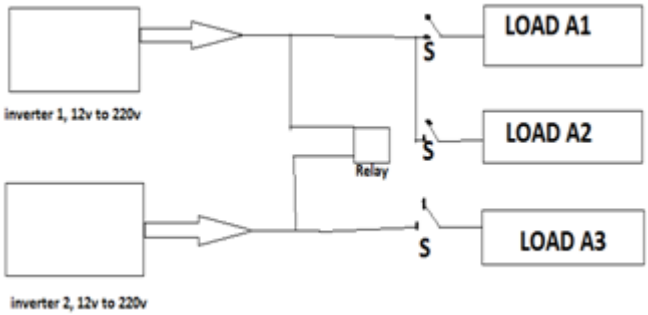

Figure 2: Block diagram of parallel connected load sharing system

5. Waveform and Discussion

This chapter provides the result and analysis of two parallel connected inverters with stand-alone ac supply system and also provides the duty cycle graph which was taken from the CRO with pulse- with- modulation PWM technique

Condition 1

In this condition, all load are connected to inverters and loads are taking very high voltage in cycle r.m.s value is 588.5mV with duty cycle in +56.6 to -43.4 but frequency is 197.3HZ, which is showing in the figure 3

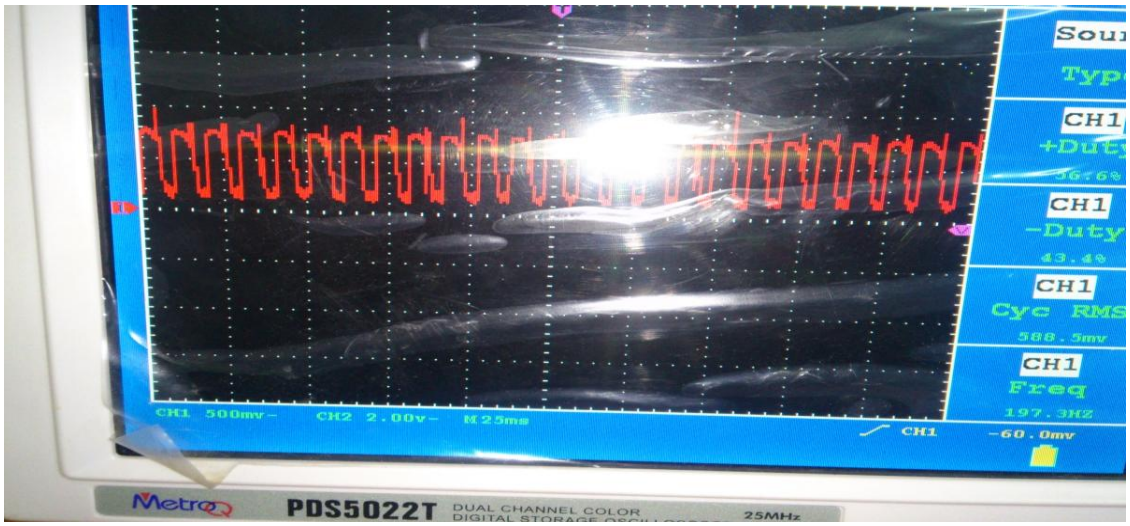

Figure 3: High duty cycle with very high voltage

Condition 2

In this condition, two loads are connected to inverters and loads are taking voltage in r.m.s condition 339.7mV and duty cycle in +26.4 to -73.4 but frequency is 49.28HZ, which is showing in the figure 4

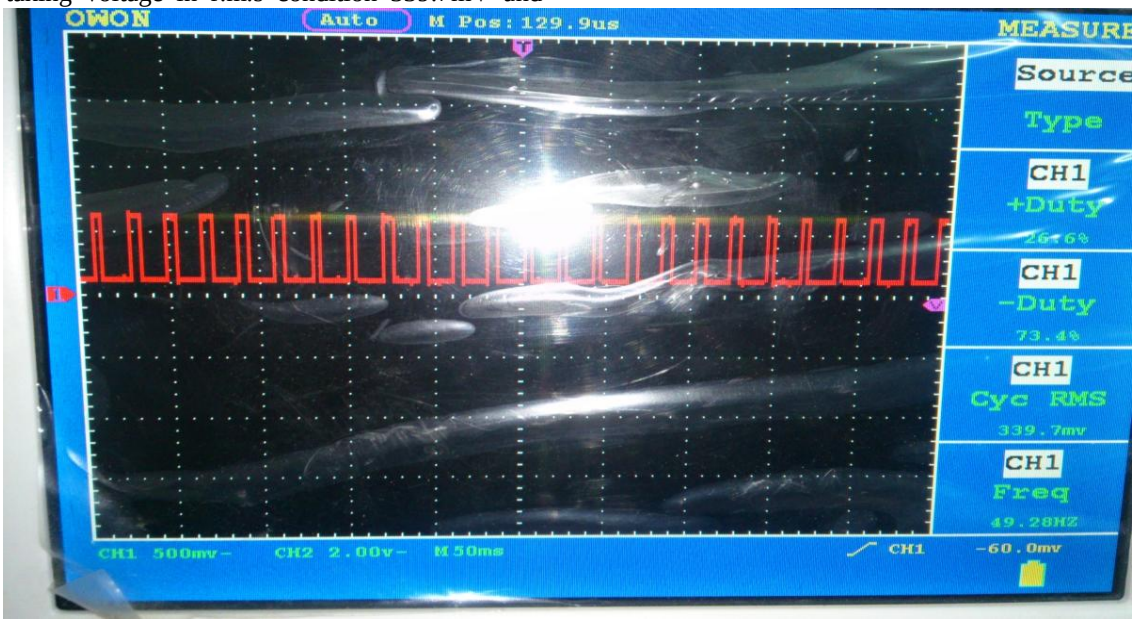

Figure 4: High duty cycle with high voltage and two loads

Condition 3

In this condition, single load is connected to inverters and load is taking voltage in r.m.s condition 332.5mV and duty cycle in +24.6 to -75.4 but frequency is 49.28HZ, which is showing in the figure 5

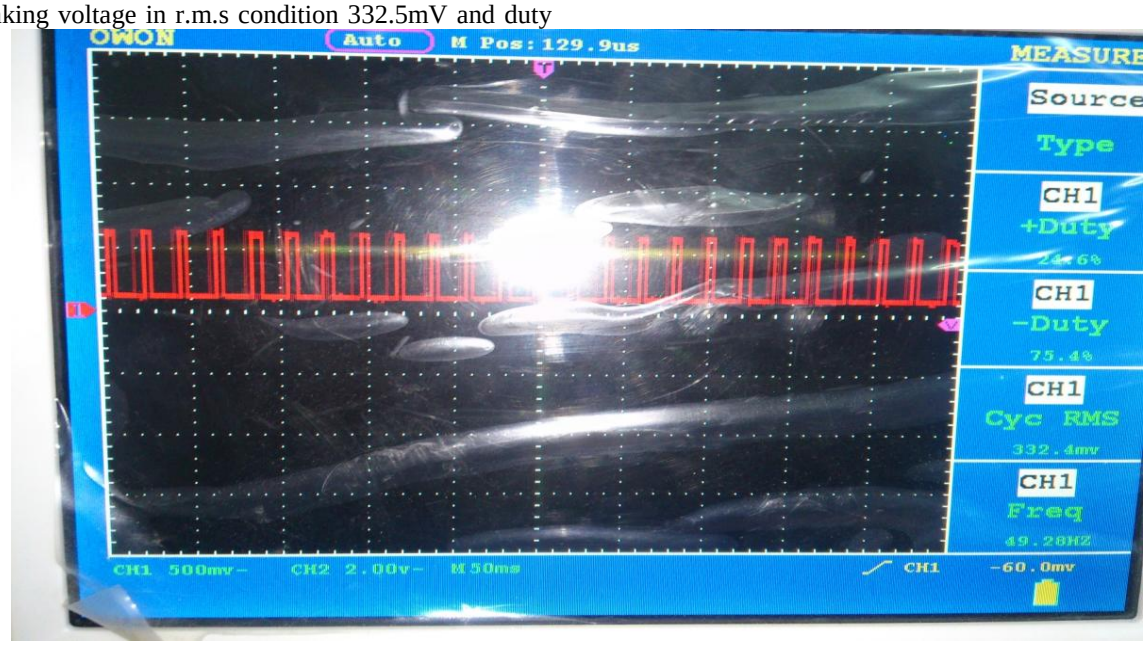

Figure 5: Low duty cycle with voltage and single loads

6. Result & Discussion

This paper provides the results from all above waveform and discussions; we have found the results of two parallel connected inverters with stand-alone ac supply systems are good for the uninterrupted power supply. The waveform of this system show, if duty cycle is very high with positive then loads are taking more power so, in this case system may be overloaded then microcontroller can be controlled by overloaded conditions because the microcontroller can share power from other inverter but continually flow the power to loads without any interruption of power supply system. If any case one inverter is failed then other inverter can be supplied power with any interruption of power supply and if other inverter is failed then one inverter can be supplied power without any interrupted power supply because these inverters are connected parallel to each other with relay to loads. All these interruption of power supplies are controlling from microcontroller with other equipment. So, this system is the best for the uninterrupted power supply to grid connected system and home appliance system.

7. Conclusion

This paper provides the conclusion from all above waveform, discussions and results; we have found the conclusions of two parallel connected inverters with stand-alone ac supply systems are good for the uninterrupted power supply. So, this system is good for uninterrupted power supply system because this system reduce all interrupted power supply to grid connected and home appliance systems. Because in this system has two parallel connected inverters if any case one inverter is failed then other inverter can be supplied power with any interruption of power supply and if other inverter is failed then one inverter can be supplied power without any interrupted power supply because these inverters are connected parallel to each other with relay to loads

8. Future Scope

We have taken input in this system ac supply with rectifier circuit to dc current for the battery charging but we can use solar photovoltaic system and wind energy as an input ac source because solar photovoltaic system provides dc current and wind energy also provides dc currents and it is renewable energy and it does not provides any pollution. So, solar energy is the best option to use in this system and good future scope for this system.

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