

## REFLOW OVEN VERIFICATION SYSTEM

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### ABSTRACT

The purpose of the project is verifying the accuracy of the Reflow Oven's top, bottom zones temperature readings comparing original system with a newly designed system. This Reflow Oven (FL-VP1060N Nitrogen Lead-free) machine is mainly used in the reflow soldering of printed circuit board (PCB). Temperature readings were measured using K-type thermocouple, amplify the thermocouple output and this analog outputs were converted to digital data using NI USB. The data were displayed using LabVIEW software.

**Keyword:** Reflow Oven, Temperature, K type thermocouple

### 1. INTRODUCTION

“Reflow Oven Verification System” is designed to measure the accuracy of the temperature reading of FL-VP1060N Nitrogen Lead-free Reflow Oven manufactured by FOLUNGWIN. This machine is mainly used in the reflow soldering of printed circuit board (PCB)<sup>1</sup>. Reflow Oven is used in SMT (Surface Mount Technology) assembling line. Temperature of each zone is closed loop controlled and this ensures the best controlled accuracy. The machine has a tunnel styled structure with automated conveyor system and consists of multi preheating zones, soldering zones and cooling zones<sup>2</sup>. It has the following features: hot air convection heating method, heat source supply for top zone and bottom zone is independent from each other, PID independent temperature control for each zone, air and nitrogen (nitrogen is option) and pin chain and mesh belt conveyor system. The machine can be connected with other SMT equipment online.

## 2. EXPERIMENTAL

### 2.1 Block diagram of the design method

There are 10 heating zones in the reflow oven. The original system is used number of 20 k type (TC) thermocouple to read top and bottom temperature of the heaters. So the new system is also used k type thermocouples. An Amplifying circuit was designed to amplify mV range TC's output to V range. Then the analogue voltage is fed to NI USB card to convert digital voltage. That digital output is fed to software program.

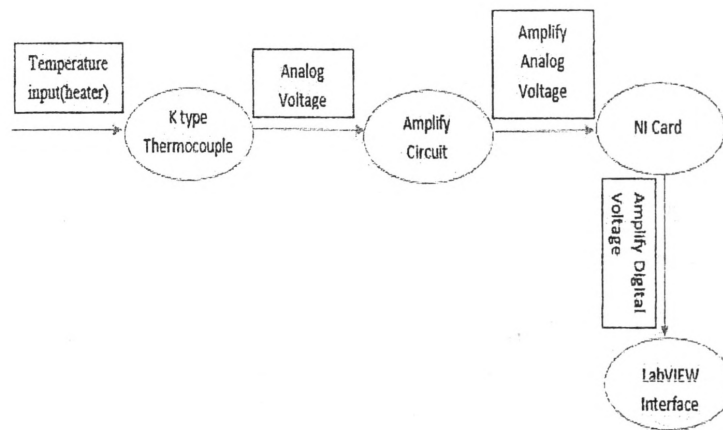


Figure 1: Block diagram of the design method

### 2.2 Circuit Diagram of the System

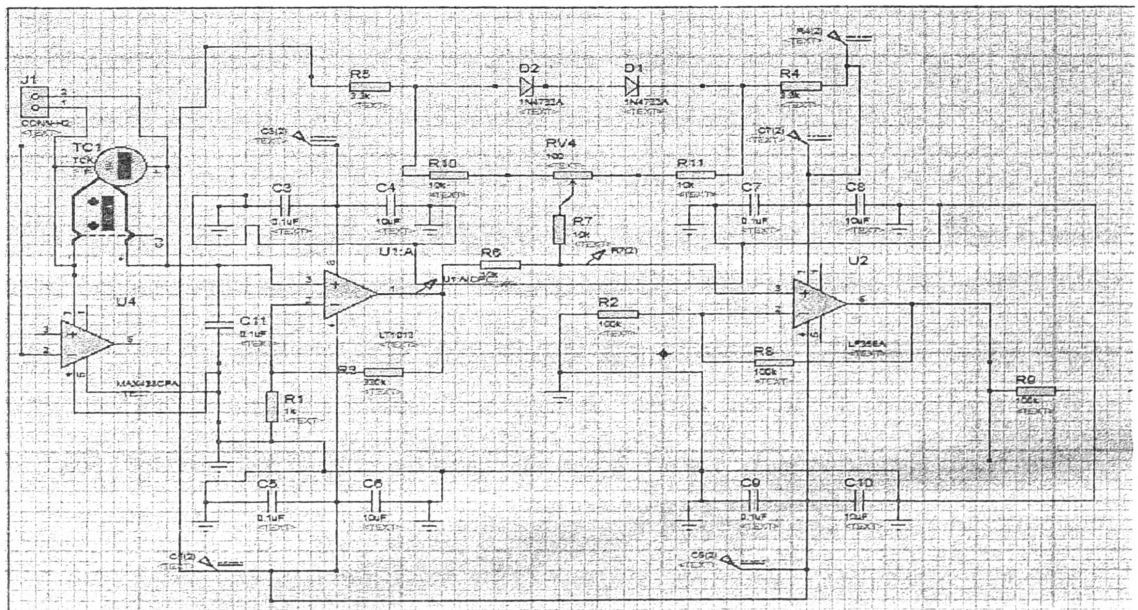


Figure 2: Circuit diagram of the system

The LT 1025 is a micropower thermocouple cold junction compensator for use with type E, J, K, R, S, and T thermocouples<sup>1</sup>. It utilizes wafer level and post-package trimming to achieve 0.5°C initial accuracy. The circuit can approximately initial value by varying 10 K potential meter.<sup>2</sup>

### 3. RESULTS AND DISCUSSION

“Reflow Oven Verification System” is used to measure the accuracy of the heaters using K type thermocouple. And also the values are displayed on the LabVIEW software interface. The measurements are more accurate and display the user friendly, easy to understand data.

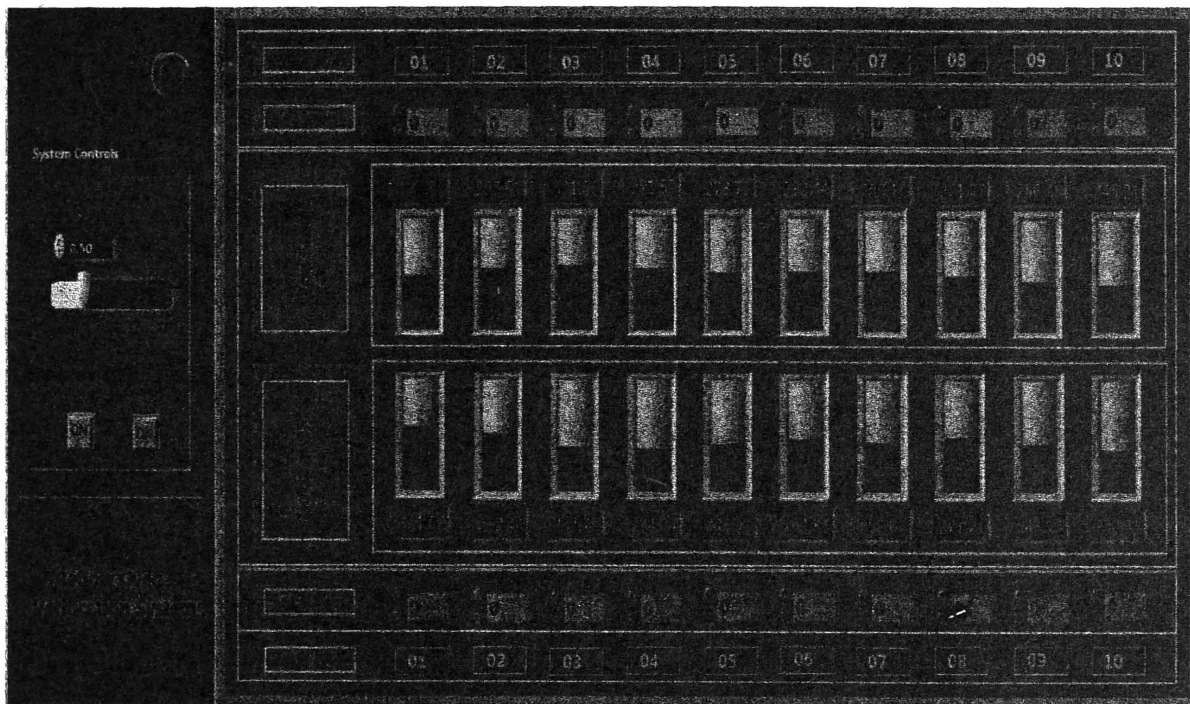


Figure 3: Temperature Display of each Zones

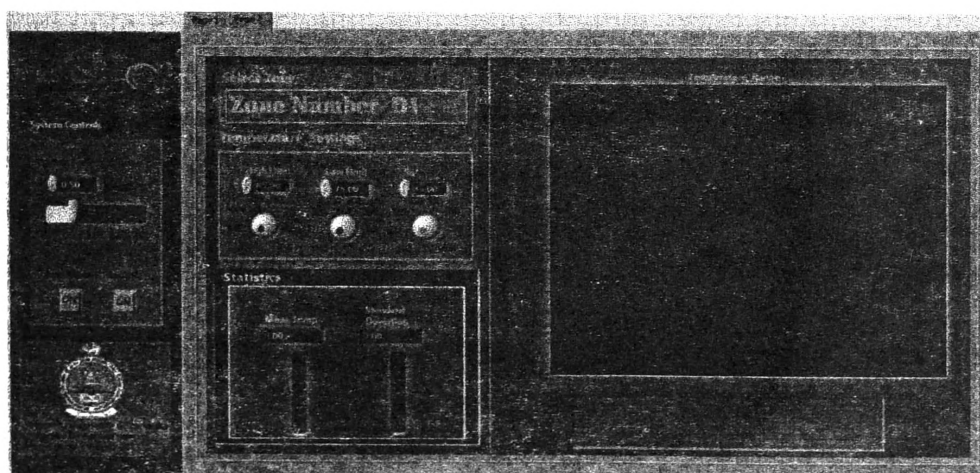


Figure 4: Temperature Curve of a selected zone

#### **4. CONCLUSION**

That system can used to measure more accurate temperature readings, easy to use GUI using LabVIEW. The reliability of the system can improve using best suitable calibration methods.

#### **ACKNOWLEDGEMENTS**

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