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Electronic Load Device for Testing DC Power Supply

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Abstract: *The project deals with a programmable electronic load device capable of dynamic variations of its load parameters to simulate a myriad of electrical conditions. Hence, one of the objectives of this paper is to implement, in a designed setup, variously heated loads, such as constant current, voltage, resistance, and power modes. That said, the designed system has hardware and software aspects that integrate advanced microcontroller capabilities so that high accuracy is assured through a series of test procedures on the system. The hardware design of the project encompasses choosing various resistors and relays modules (ESP32), selection of the proper power supplies, and microcontrollers. A program is being developed in the Arduino IDE that will program the microcontroller to do dynamic load control.It all began with the circuit design and resistor value choice, taking into consideration their power rating about effective heat dissipation. Dynamic loading control by the ESP32 microcontroller allows variable changes which are automatic in nature. On top of this, relay modules were used for effective switching of load and its adjustments, hence making the system flexible and responsive. The firmware developed in Arduino IDE automates control processes, which enables the smooth running of operations. In this regard, our experiments output results that show the device—a programmable electronic load mimicking load situations and providing performance information. Notably, the automated control system coupled with adjustable load capabilities increased the testing process efficiency and accuracy to a great deal. The overall effect of the programmable electronic load device is that it makes testing more professional by way of automation and provision of precise management for the test settings of the load. Its versatility also provides simulation of a wide scope of scenarios accommodating test conditions. It is designed to cater to heat regulation and power dispersion for the reliability of performance whiles in operation*

Keywords: DC electronic load, Switch Mode Power Supply, Heat dissipation, Load stability