**CHAPTER FOUR**

**CONSTRUCTION AND TESTING**

**4.0 INTRODUCTION TO THE CHAPTER**

In this chapter, the construction procedure of the domestic energy scheduler was discussed. A list of the tools used was listed and the step by step procedure that the components were arranged was mentioned. The testing and the results were then stated. The concluding articles are on the precautions and the bill of quantity.

**4.1 CONSTRUCTION PROCEDURE**

The circuit diagram was gotten after a careful design and calculation has been done. All the components were bought from the Nigerian electronics market. The resistance of the resistors, the capacitance of the capacitors, and the workability of all the other discreet components were verified before they were all used in the project.

The complete project was first simulated with electronic simulation software, found to be working satisfactorily, before the actual components were then assembled on a bread board.

It was only after the testing of the project has been done and its workability verified that the components were then transferred to a Vero board and soldered carefully.

The resistors, capacitor, the integrated circuit and diodes were first placed on the board, before the bigger components like the relay and voltage regulator were placed and soldered carefully. Finally, the transformer was introduced so were the other sensors. The complete system was mounted on a large wooden base

**4.2 TOOLS USED**

The tools used for the construction of the project and the casing of the project is as listed below

* Solder Iron
* Screw Driver
* Pliers
* Solder Sucker
* Wire Cutter
* Hand Saw
* Multimeter

**4.3 SOLDERING TECHNIQUE**

Soldering is a method of joining metal parts using an [alloy](http://en.wikipedia.org/wiki/Alloy) of low [melting point](http://en.wikipedia.org/wiki/Melting_point) filler material ([solder](http://en.wikipedia.org/wiki/Solder)) which has a melting temperature below 450 °C (800 °F). Soldering is distinguished from [brazing](http://en.wikipedia.org/wiki/Brazing) by virtue of a lower-temperature filler metal; it is distinguished from [welding](http://en.wikipedia.org/wiki/Welding) by virtue of the base metal not melting. In a soldering process, heat is applied to the metal parts, and the alloy metal is pressed against the joint, melts, and is drawn into the joint by [capillary action](http://en.wikipedia.org/wiki/Capillary_action) and around the materials to be joined by '[wetting action](http://en.wikipedia.org/wiki/Wetting)'. After the metal cools, the resulting joints are not as strong as the base metal, but have adequate strength, electrical conductivity, and water-tightness for many uses. Soldering is an ancient technique that has been used practically as long as humans have been making articles out of metal.

**4.5 VERO BOARD**

Vero board is the panel on which all the component used are mounted. The board consists of holes which are arranged in matrix format. The small size consists of 25 rows and 55columns, while the big size consists of 35 rows and 65 columns. The holes are meant for mounting the components on the panel. The row are connected across the column I.e. row one is connected to all the column and row two is connected to all the column also but separated from row one.

The row is connected together by a metallic sheath which makes it possible for easy soldering of components on the Vero board. With proper design knowledge, this layout of Vero board makes assembling easy and it reduces the use of jumper cures and it also makes the work to look neat. Tracing at faults is easier when Vero board layout is properly criticized.

As with the bread board, each block is soldered at a time, tested and if working well before the next state is soldered.

4.6 TESTING AND RESULT

The tests performed, the observation discovered and the observation and subsequent result and its conclusions are tabulated as follows

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| s/N | TESTS | PROCEDURE | OBSERVATION | RESULT AND CONCLUSION |
| 1. | Power test | A Multimeter was set to ac and used to test the power output from the mains. The result was recorded. It was then set to dc and used to measure the power output from the voltage regulators. The result was also recorded. | The output power from the mains registered 216 volts ac on the Multimeter screen. While the Multimeter screen displayed 4.82 volts dc when used to measure the voltage regulators output. | The required power for the domestic energy scheduler circuit is correct and adequate to power the system. Also the dc voltage as well as the ac voltage that the rest of the circuit needs for their operation is available for use. |
| 2. | Load switching test | The individual loads were turned on separately | As each command was given, the loads are automatically turned on and off | The load switching ability of the system is assured |
| 3. | Clock setting test | When the system was powered, the input switches were used to set the time duration of the on and off timing of the loads as well as the clock | The up button responded well, the down button as well as the enter buttons, all responded well as the time actually increased and decreased as commanded. | The setting ability of the system is assured |
| 4. | Activation response test | The clock was set for several durations and the loads were also set to correspond to other durations based on the clock. | As the time that was set was reached, the system was observed carefully. It was discovered that as the clock reached each set time (on or off), the appropriate load that was set tto respond, actually responded as commanded | The loads are in perfect alignment with the clock setting. |
|  |  |  |  |  |

**4.7 PRECAUTIONS**

In a project as complex and delicate as this a lot of precautions were observed.

* The circuit diagram was followed carefully so as not to make a mistake.
* The work place was well ventilated and illuminated.
* The project was first assembled on a bread board before it was transferred to a veroboard
* sensitive components were being dealt with that heat could easily damage so a great care was taken when soldering so that the components could not get damaged by heat.
* Great care was taken to properly identify the cathode anode and other terminals in the components to prevent damage by improper connectivity.
* Care was taken to first assembly the circuit on a bread board before mounting on the Vero board to avoid mistake on unwarranted de-soldering.
* While soldering, precaution were taken so as to avoid bridging and short circuiting the board.
* The ratings of all the components were carefully verified so as not to damage sensitive components with over voltage.