

Intel Unnati Industrial Training Report

Design and Implementation of
Any Time Electricity Bill Payment(ATP)Machine
Controller

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1 INTRODUCTION

The digitization of payment systems has transformed the way we interact with various services, including utility bill payments. In this era of convenience and efficiency, the design and development of Any Time Electric Bill Payment Machines(ATP) have emerged as a revolutionary solution for seamless and accessible payment transactions. We examined challenges and the various possibilities to make the ATP machine seamless. By offering convenience, accessibility, and transparency in bill payment processes, these machines enhance customer satisfaction.

ATP involves the integration of secure payment gateways, user-friendly interfaces, and multiple payment options (e.g., cash, cheque, demand draft, pay order) to diverse customer preferences. In this, we have gone through various stages of development using block diagram, state diagram, Verilog coding etc. This report describes all the stages of development and process. This report delves into the stages of development of ATP machine. This training led us to procure the fundamentals of Finite State Machines and Verilog.

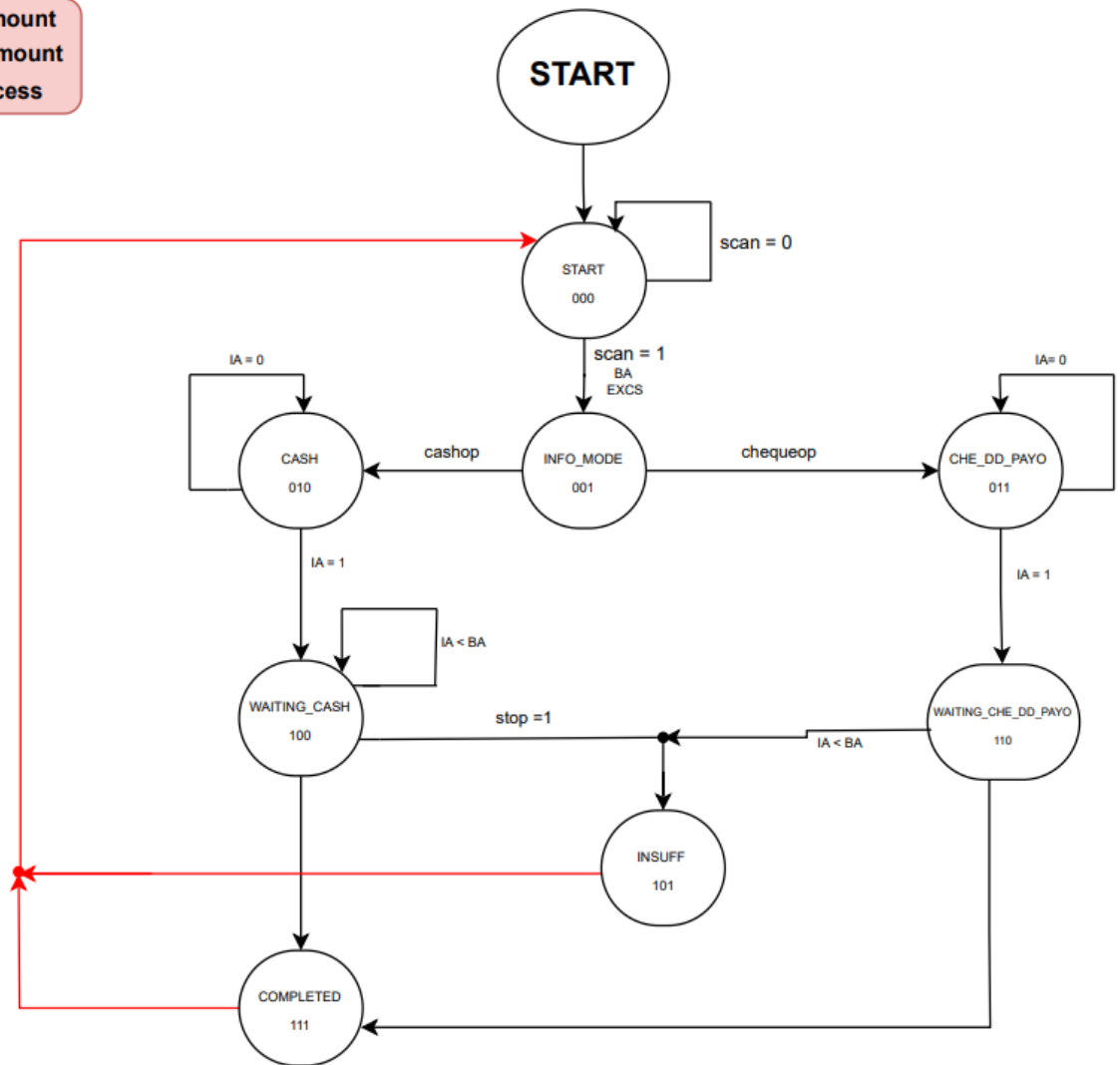
2 PROBLEM DEFINITION

Designing of Any Time Electric Bill Payment(ATP) Machine Controller to collect payment from consumers by cash, cheque, or DD. It will be unmanned and can be operated by the customers 24/7. It accepts cash/cheque/DD/pay order, issues an acknowledgment on every payment made and is a touchscreen and multimedia-based system. When the customer places the voucher/bill in the designated slot under the barcode scanner, the ATP will automatically get started. Suitable prompts are provided for guidance. This ATP designing is done through initial stages of digital designing and then converting it into verilog code, and finally implementing it.

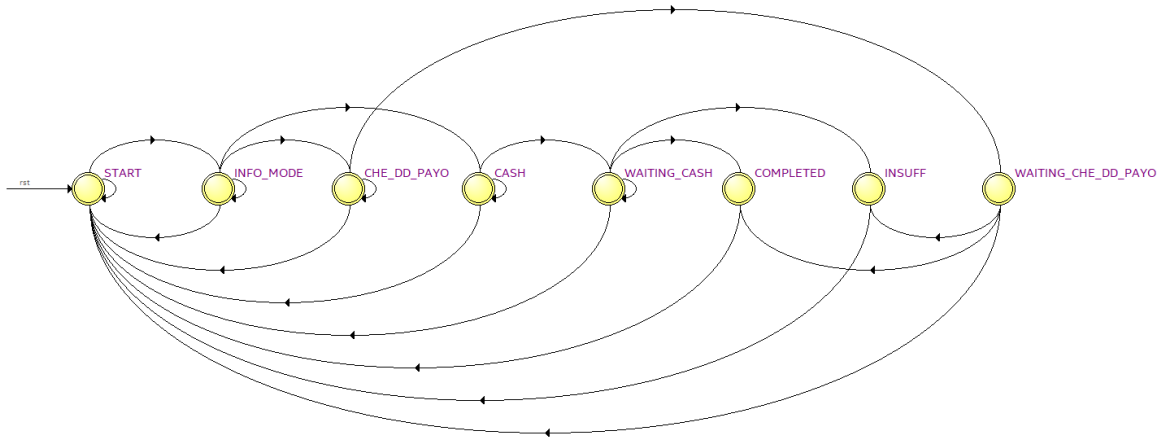
It captures data from the voucher/bill and will display parameters on the monitor. Customer needs to choose the mode of payment. Once the amount is confirmed by the customer, the ATP will give directions on cash/cheque insertion. Parameters such as cheque number etc are read from the MICR fields and an acknowledgment is issued to the customer with the bill. Denominations of cash are given, 1000,500,100,50,20,10,5. Excess amount Paid will be adjusted in the subsequent cycles and any short payment will lead to disconnection of your electricity line without any information.

3 FLOWCHART

BA = Bill Amount
IA = Input Amount
EXCS = Excess



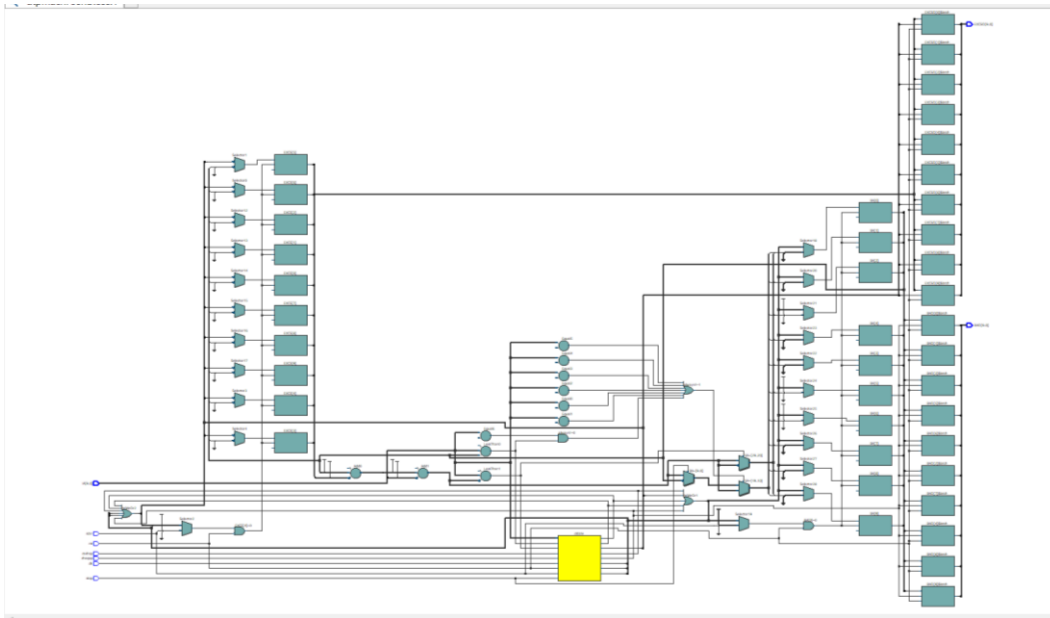
4 STATE DIAGRAM



This state diagram of ATP Machine comprises of eight states in total. Each of those stages are as follows:

1. START representing the start state (3'b000).
2. INFO_MODE: representing the information mode state (3'b001).
3. CASH: representing the cash mode state (3'b010).
4. CHE_DD_PAYO: representing the cheque/DD/pay order mode state (3'b011).
5. WAITING_CASH: representing the waiting for cash state (3'b100).
6. INSUFF: representing the insufficient payment state (3'b101).
7. WAITING_CHE_DD_PAYO: representing the waiting for cheque/DD/pay order state (3'b110).
8. COMPLETED: representing the completion state (3'b111).

5 RTL VIEWER DIAGRAM



This RTL represents the behavior and structure of the digital circuit using registers and the data transfers between them. It describes the flow of data and control signals within the circuit at a high level of abstraction, capturing the functionality of the design.

6 POWER ANALYSIS REPORT

Power Analyzer Summary	
<<Filter>>	
Power Analyzer Status	Successful - Fri Jul 14 12:38:41 2023
Quartus Prime Version	18.0.0 Build 614 04/24/2018 SJ Lite Edition
Revision Name	atpmachroshbless
Top-level Entity Name	atpmachroshbless
Family	Cyclone V
Device	5CSEMA5F31C6
Power Models	Final
Total Thermal Power Dissipation	420.52 mW
Core Dynamic Thermal Power Dissipation	0.00 mW
Core Static Thermal Power Dissipation	411.23 mW
I/O Thermal Power Dissipation	9.29 mW
Power Estimation Confidence	Low: user provided insufficient toggle rate data

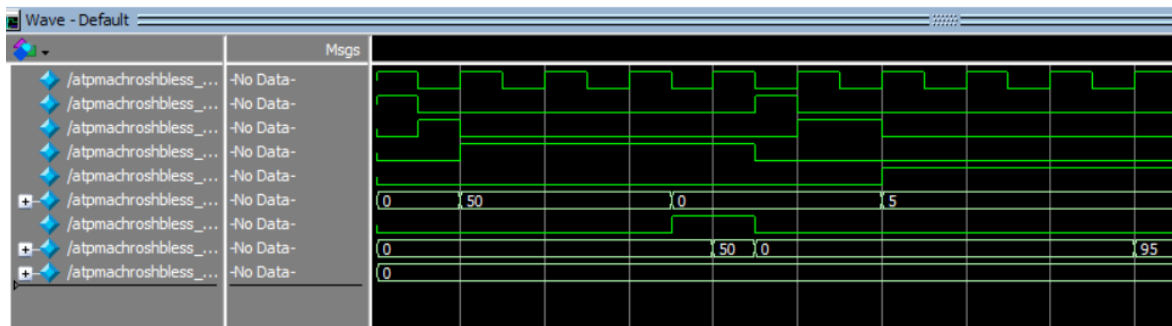
Total thermal power estimated for the design is 420.52m

7 AREA ANALYSIS REPORT

Fitter Summary	
<<Filter>>	
Fitter Status	Successful - Fri Jul 14 11:42:37 2023
Quartus Prime Version	18.0.0 Build 614 04/24/2018 SJ Lite Edition
Revision Name	atpmachroshbless
Top-level Entity Name	atpmachroshbless
Family	Cyclone V
Device	5CSEMA5F31C6
Timing Models	Final
Logic utilization (in ALMs)	67 / 32,070 (< 1 %)
Total registers	8
Total pins	36 / 457 (8 %)
Total virtual pins	0
Total block memory bits	0 / 4,065,280 (0 %)
Total RAM Blocks	0 / 397 (0 %)
Total DSP Blocks	0 / 87 (0 %)
Total HSSI RX PCSs	0
Total HSSI PMA RX Deserializers	0
Total HSSI TX PCSs	0
Total HSSI PMA TX Serializers	0
Total PLLs	0 / 6 (0 %)
Total DLLs	0 / 4 (0 %)

- Total ALM utilization of the design is 67/32,070 (<1%)
- Total number of pins used is 36/457(8%)
- Total number of registers used is 8

8 OUTPUT WAVEFORM



9 CONCLUSION

By utilizing the features of Intel Quatus Prime Lite software,we were able to simulate,synthesize,and verify the functionality of the system, ensuring its reliability and correctness.

In conclusion,the Any Time Electricity Bill Payment system project developed using Intel Quartus prime lite software has successfully addressed the challenges associated with traditional electricity bill payment methods and provided an efficient and convenient solution for users.The Verilog implementation of the system has demonstrated the feasibility of automating bill payment processes,thereby simplifying the overall user experience.