PROGRESS REPORT FOR RAMC (REMOTE ANTENNA MOUNT CONTROLLER)

TEAM RAR:

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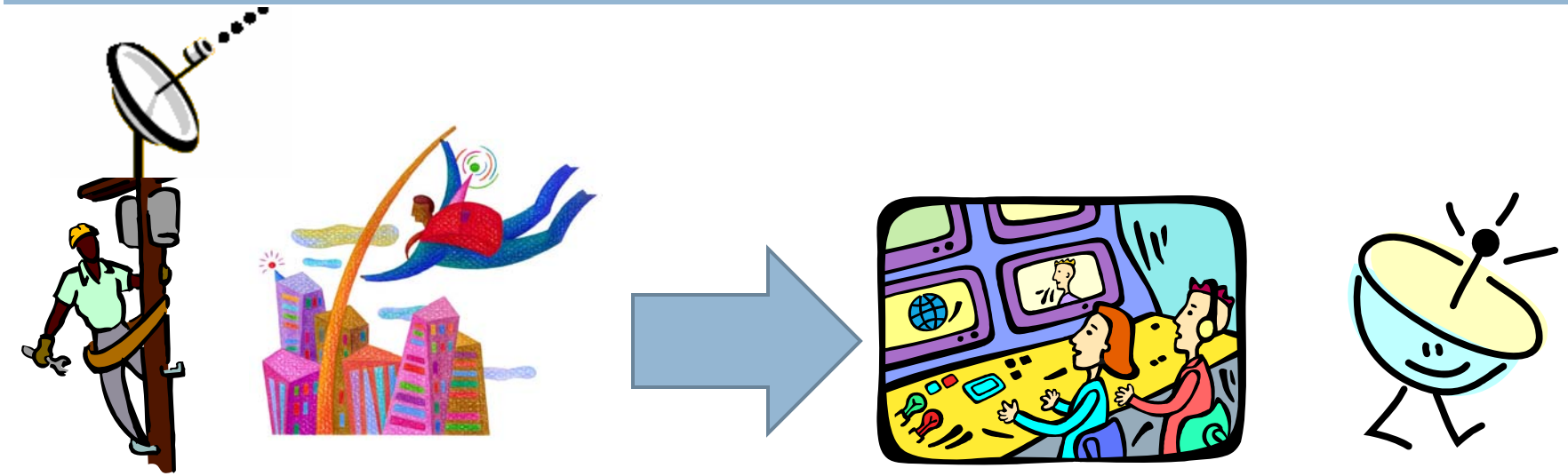
AGENDA

- Introduction
- Solution generation and Top Design Selection
- Final Solution Product
- Progress made and Current status
- Milestones and Outcomes
- Plan for next 5 weeks
- Conclusion

INTRODUCTION

PROJECT BACKGROUND



- Antennas are installed on towers, masts, water tanks
- Manual adjustments of antenna are necessary but cumbersome and dangerous
- With RAMC, antenna adjustments can be made wirelessly

PROBLEM FORMUALTION

- Problem Statement
  - Design and build a wirelessly controlled antenna mount with the capability to adjust antenna tilt and azimuth
- Industry Affected
  - Communications
- Customer
  - Telephone Service providers

DESIGN REQUIREMENTS

- Accuracy within (±)5 to 10 degrees
- Cost estimated to be $1500
- Compliance with
  - IEEE 1680 (RoHS)
  - RS-232
  - IEEE 802.15.4-2006
- Speed of 1 rev/min
  - Response time of at most 60 seconds.
- Maximum weight of 30 lbs

SOLUTION GENERATION AND TOP DESIGN SELECTION

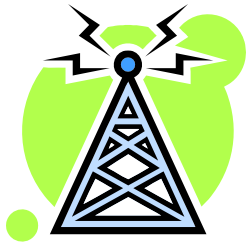
SOLUTIONS

- GUI Based interface (GBI)
  - Elaborate(GUI) user interface with simple logic implementation for the control system
- Sophisticated Control System (SCS)
  - Less emphasis on user interface with sophisticated implementation for control system
- Hybrid Control System (HCS)
  - Software and hardware implementation of equally intelligent user interface and control system

HCS: DESIGN ALTERNATIVES

Key areas considered include:

- Transmission technologies
  - AM
  - FM
  - Wi-fi
  - Bluetooth



- User interfaces
  - FPGA
  - Computer
  - Playstation Pad and PIC

- Motors

Transmission techniques

		WI-FI		AM		BLUETOOTH		FM	
Selection Criteria	**Weight**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**
Cost	30	3	0.90	3	0.90	**4**	**1.20**	2	0.60
Ease of acquiring components	20	4	0.80	4	0.80	**4**	**0.80**	4	0.80
Size	5	3	0.15	3	0.15	**3**	**0.15**	3	0.15
Ease of Use	15	1	0.15	4	0.60	**2**	**0.30**	3	0.45
Power Requirements	10	3	0.30	3	0.30	**4**	**0.40**	2	0.20
Capabilities and Constraints	20	3	0.60	1	0.20	**4**	**0.80**	4	0.80
Total Score			**2.90**		**2.95**		**3.65**		**3.00**
Rank			**4**		**3**		**1**		**2**

User interfaces

		FPGA		PLAYSTATION PAD		COMPUTER CONTROLLED TRANSMITTER	
Selection Criteria	**Weight**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**
Cost	30	2	0.60	4	1.20	2	0.60
Ease of acquiring components	20	4	0.80	2	0.40	3	0.60
Size	5	3	0.15	3	0.15	3	0.15
Ease of Use	15	3	0.45	2	0.30	3	0.45
Power Requirements	10	2	0.20	4	0.40	3	0.30
Capabilities and Constraints	20	5	1.00	2	0.40	3	0.60
Total Score			3.20		**2.85**		**2.70**
Rank			1		2		3

FPGA

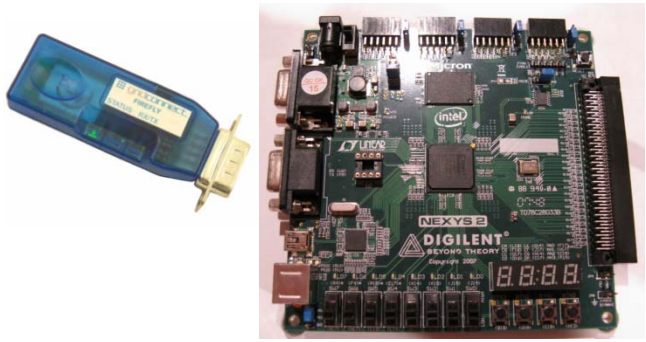
		SPARTAN -3E		CHIPCON CC2420DBK		MICROCHIP PICDEMZ	
Selection criteria	**Weight**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**
Cost	30	4	1.20	1	0.30	3	0.90
Ease of integration with preferred transmission technique	20	4	0.80	1	0.20	1	0.20
Ease of acquiring components	15	4	0.60	1	0.15	2	0.30
Ease of Use	15	2	0.30	3	0.45	3	0.45
Power Requirements	5	4	0.20	3	0.15	2	0.10
Capabilities and Constraints	15	2	0.30	4	0.60	3	0.45
Total Score			**3.40**		**1.85**		**2.40**
Rank			**1**		**3**		**2**

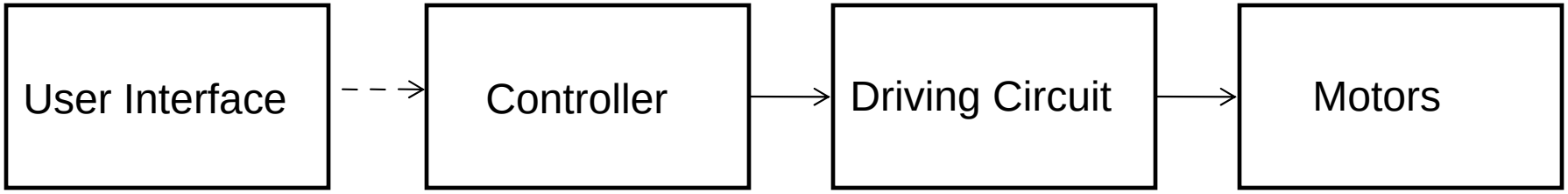
Motor Options

		Applied Motion HT 17-068 Stepper motor		Applied Motion 5017-006D Stepper motor		Applied Motion 834-HT17-071 Stepper motor	
Selection Criteria	**Weight**	**Rating**	**WS**	**Rating**	**WS**	**Rating**	**WS**
Cost	25	3	0.75	4	1.00	2	0.50
Torque specification	25	4	1.00	2	0.50	3	0.75
Weight	15	4	0.60	3	0.45	2	0.30
Rotor Inertia	15	4	0.60	2	0.30	3	0.45
Status	20	4	0.80	2	0.40	4	0.80
Total Score		**3.75**		**2.65**		**2.80**	
Rank		**1 st**		**3rd**		**2nd**	

FINAL SOLUTION

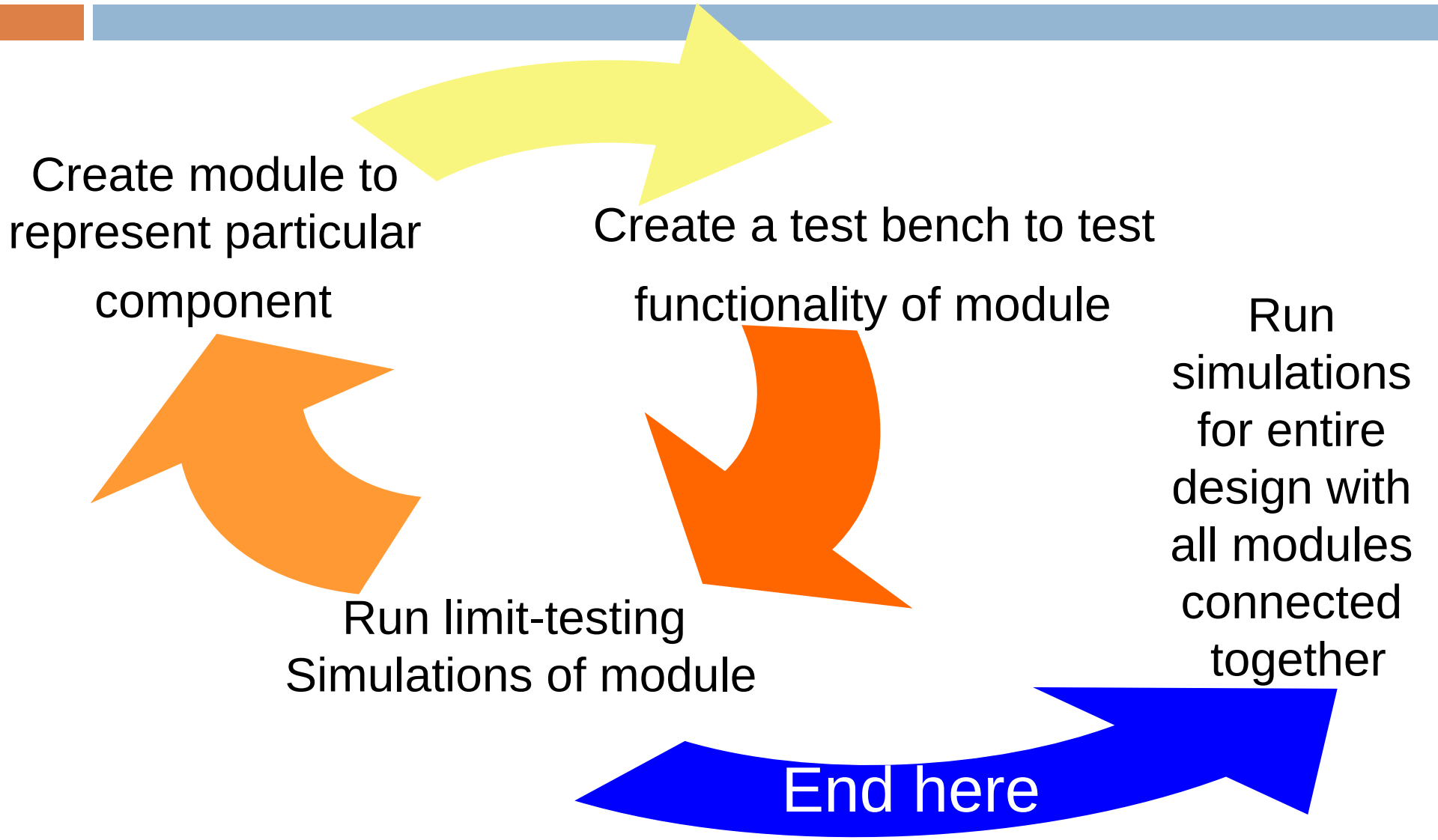
- HCS
  - User interface: Spartan 3E FPGA
  - Bluetooth transceiver
  - Controller
  - Driving circuit
  - Stepper motor



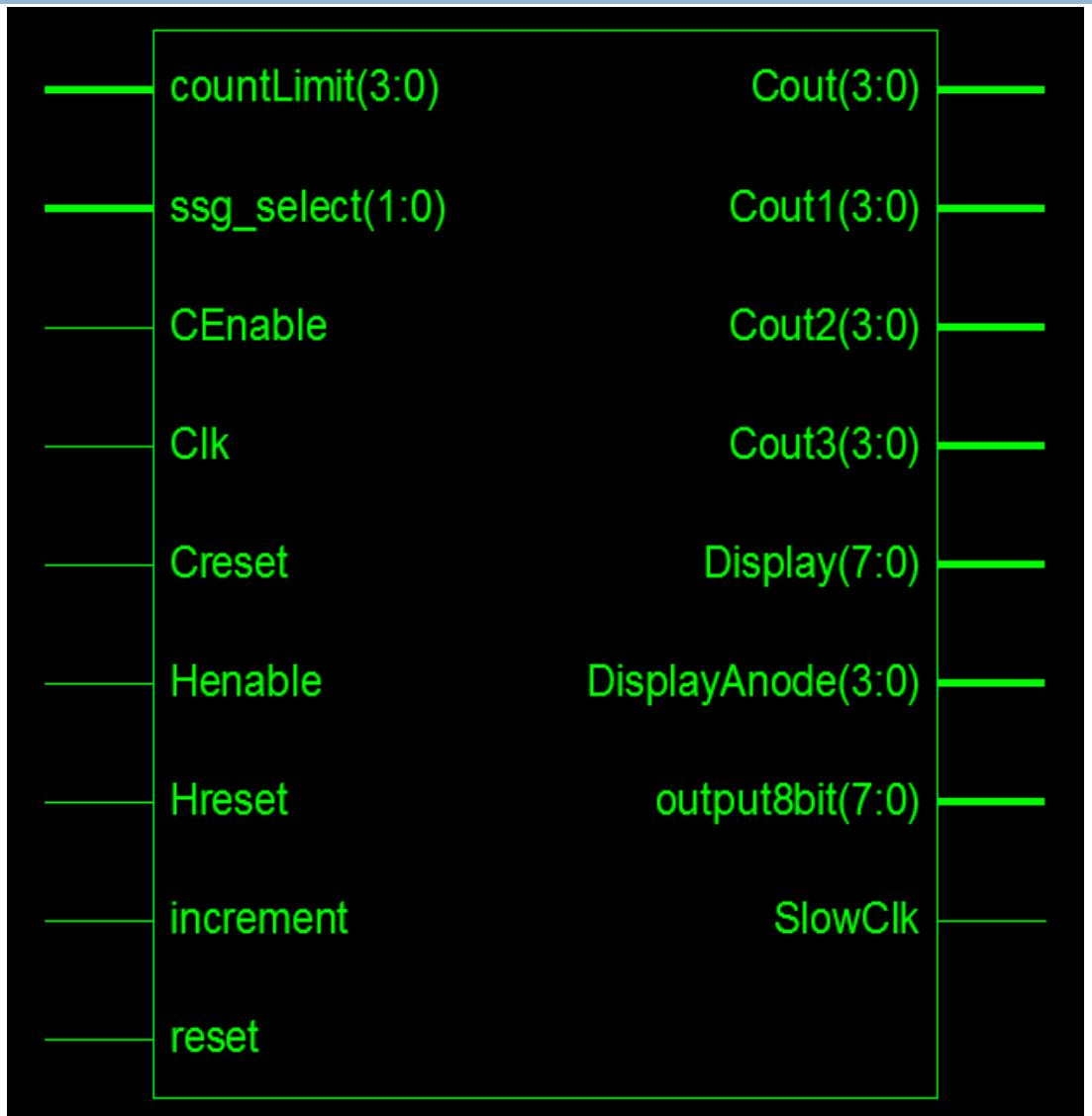


PROGRESS MADE AND CURRENT STATUS

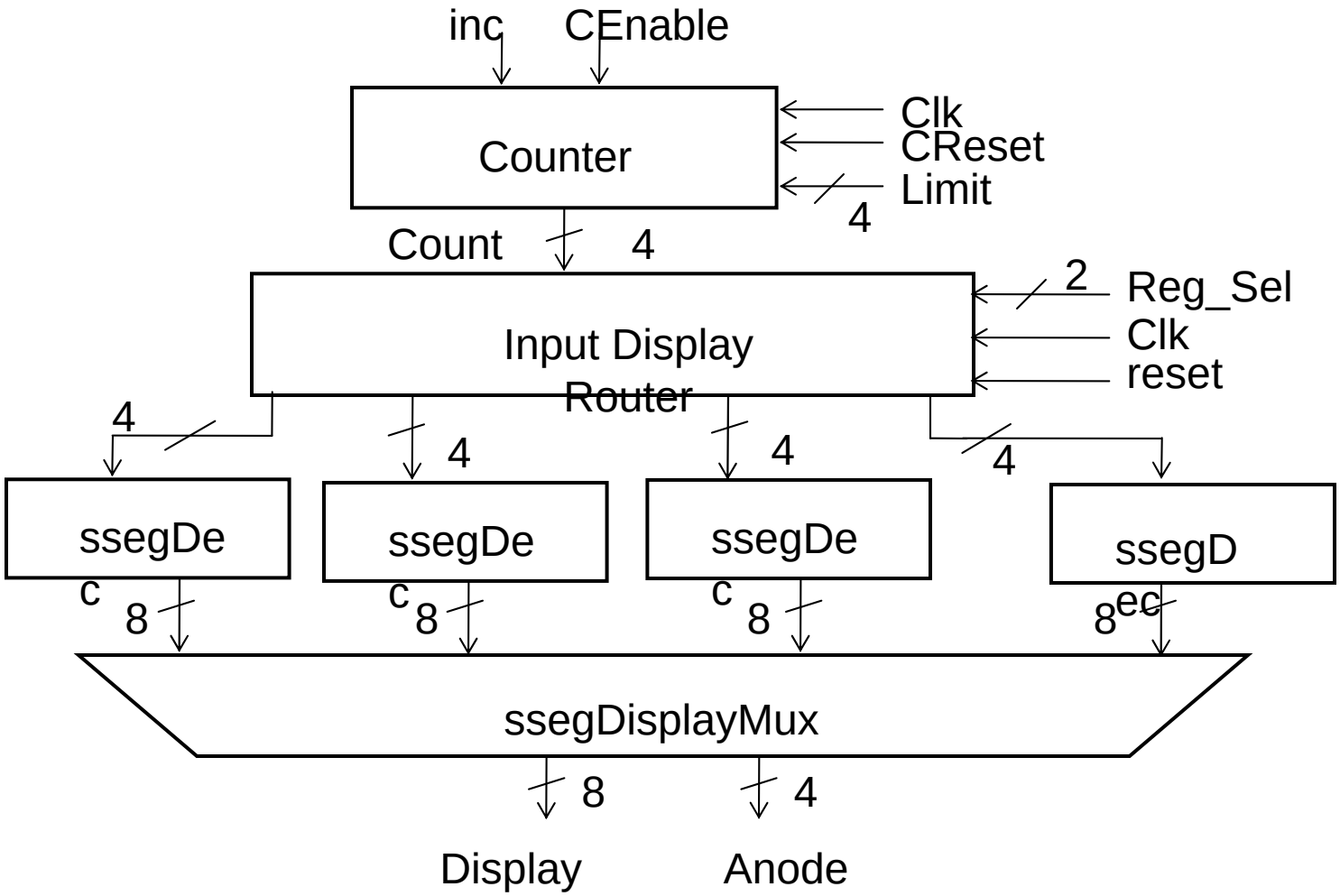
USER INTERFACE: Design Process



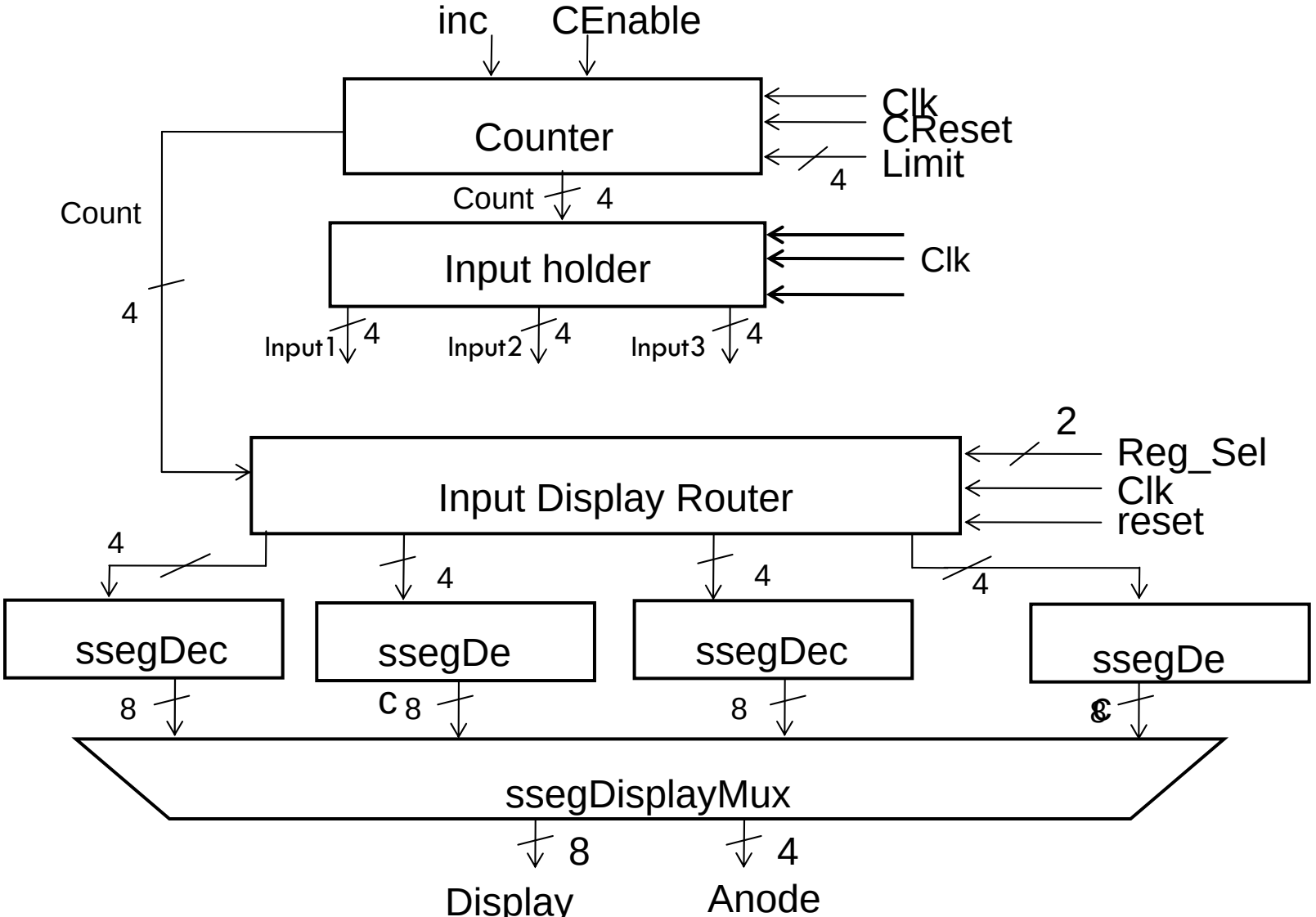
USER INTERFACE: Data Unit



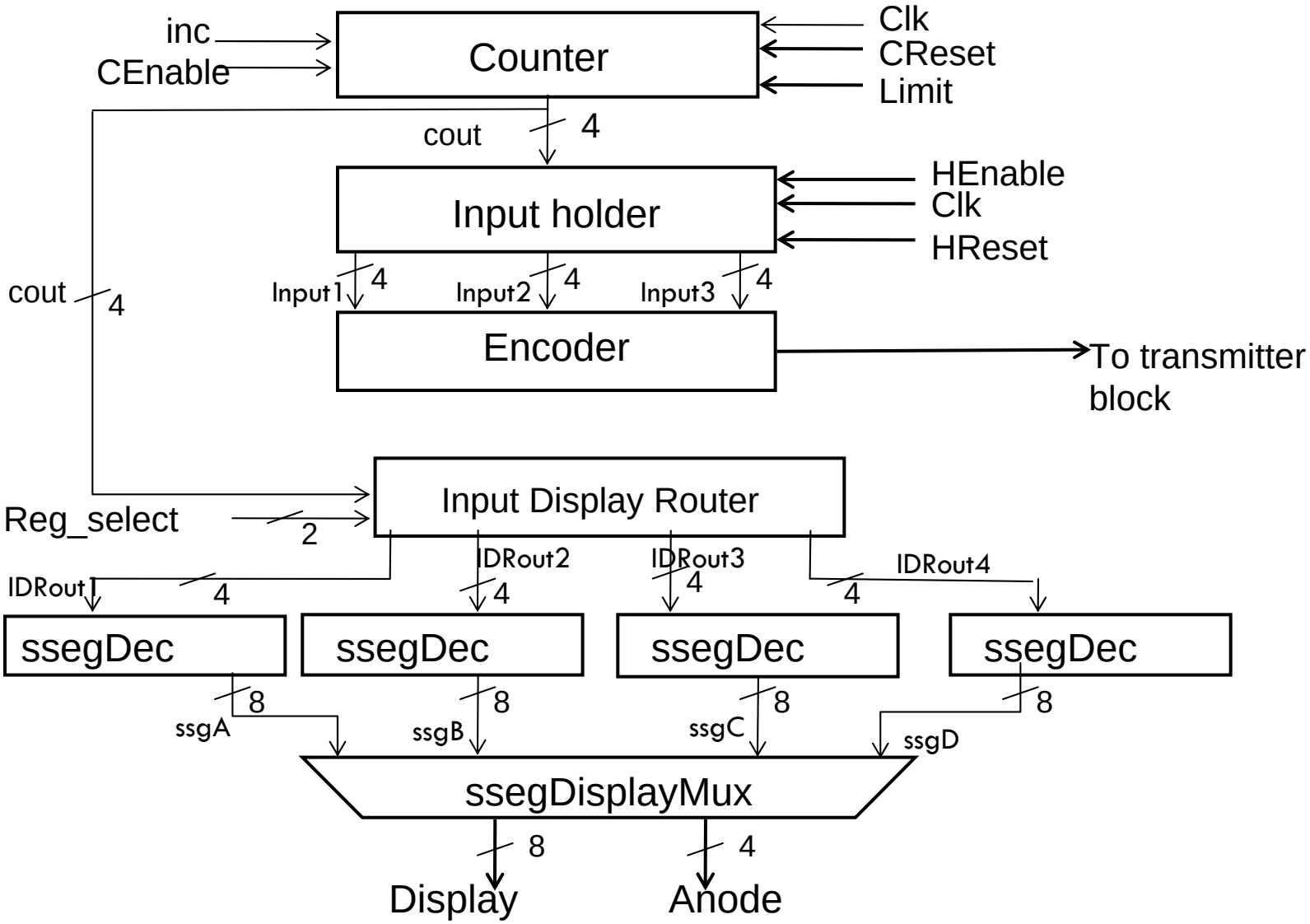
PHASE 1 (Data unit)



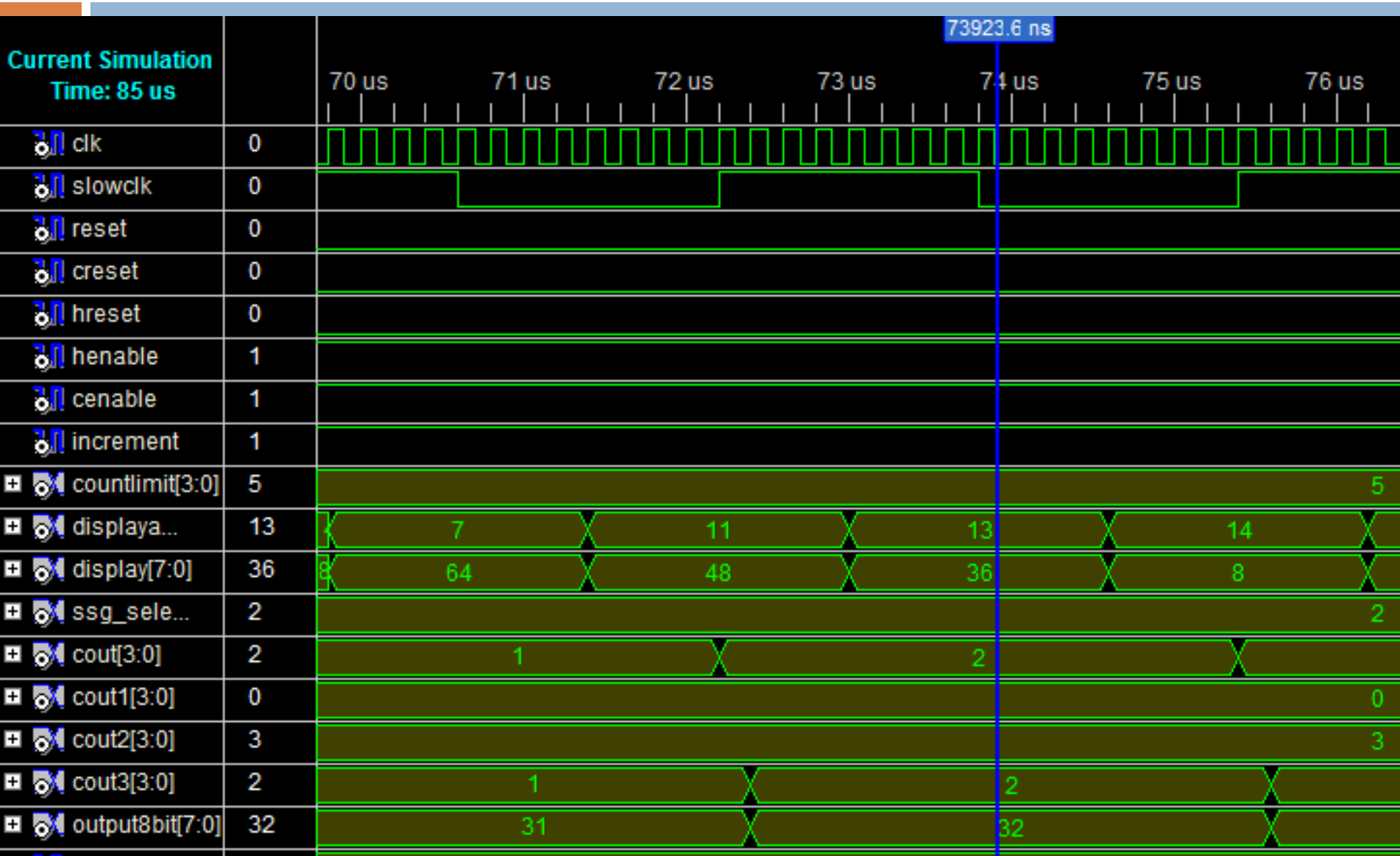
PHASE 2 (Data unit)



PHASE 3 (Data unit)



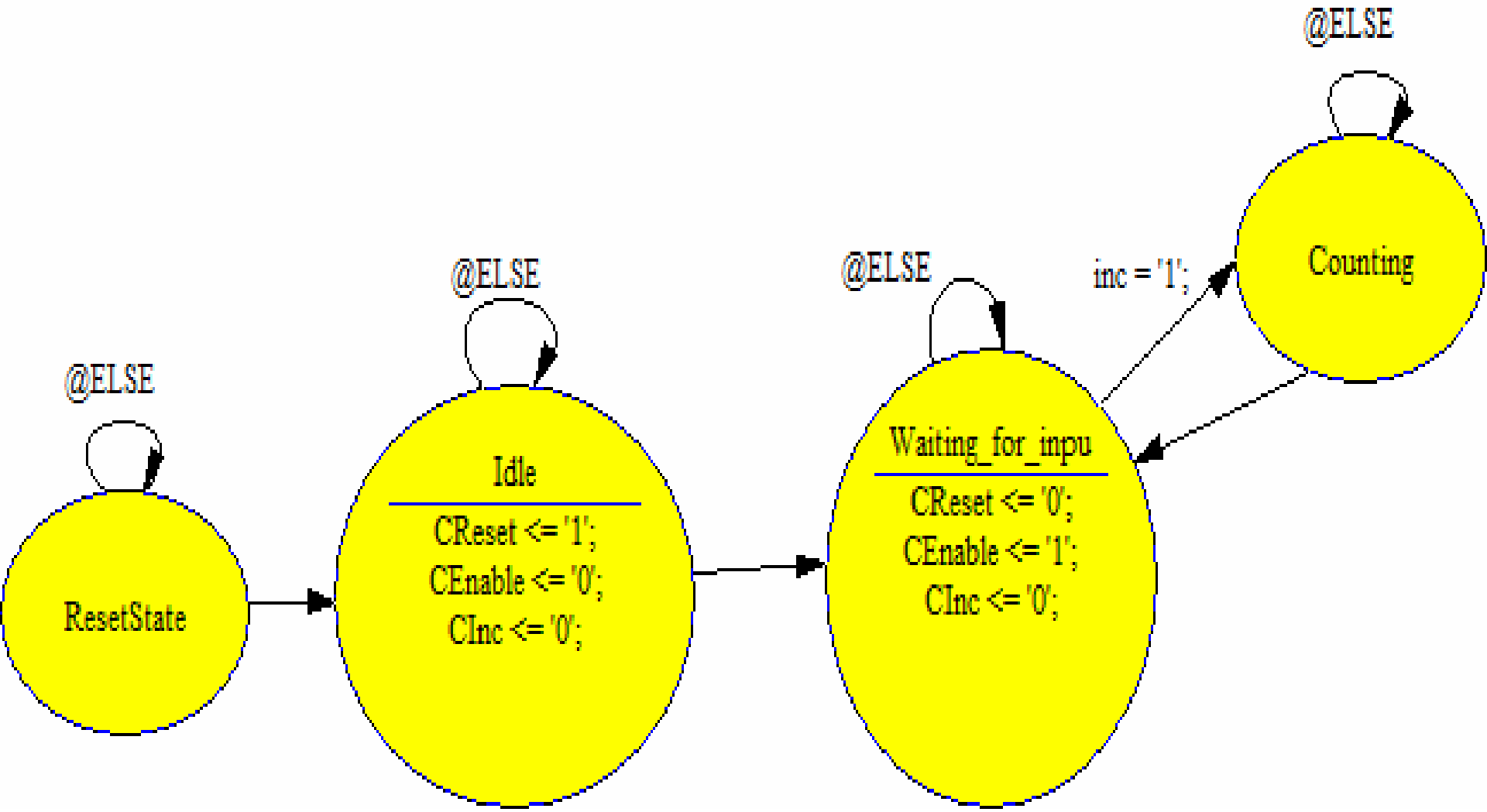
Data Unit Simulation



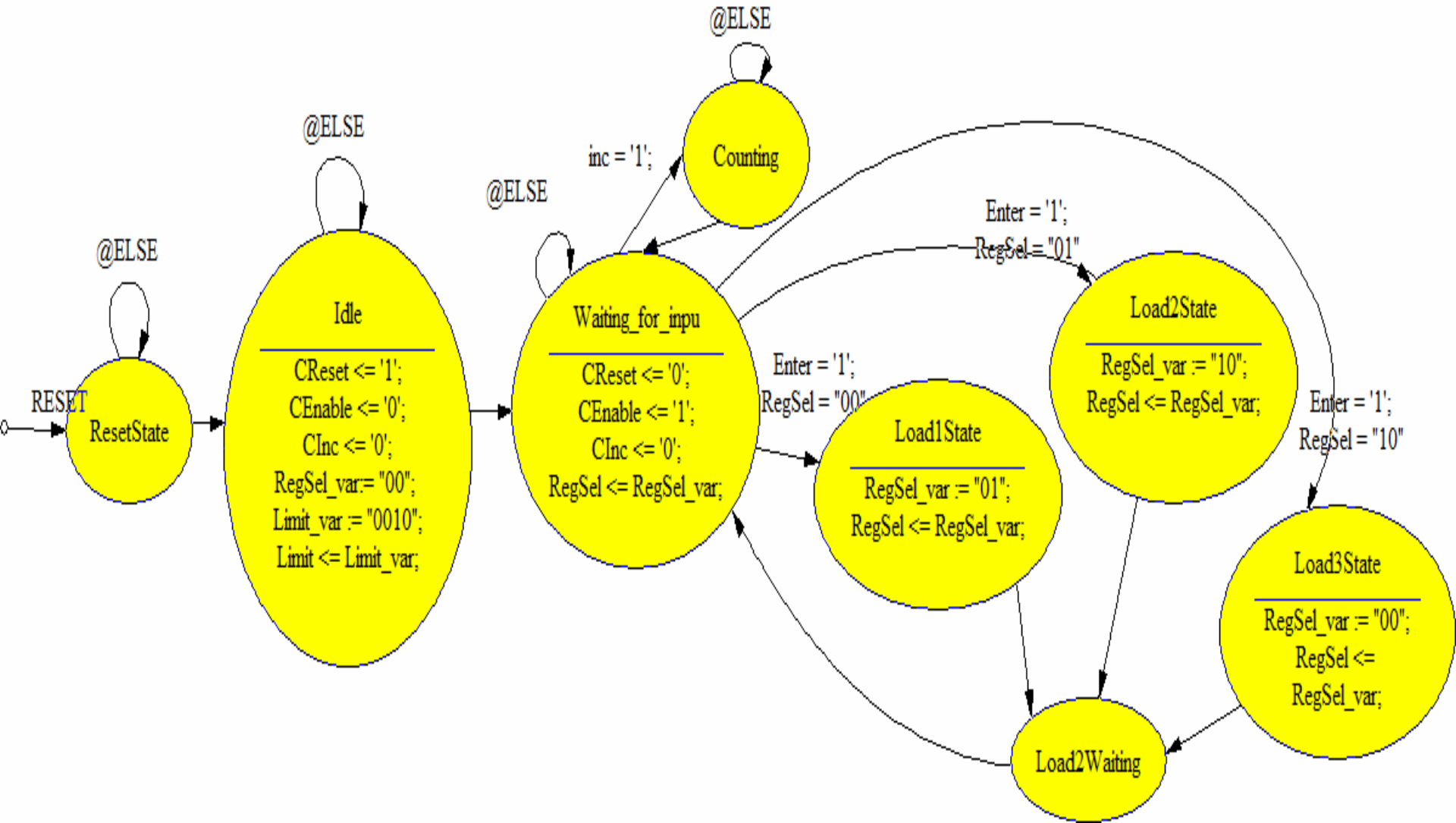
USER INTERFACE: Control Unit

- Provides the necessary timing and control signals to operations in the microcomputer [Data Unit]
- Overall operation is controlled by a system clock, which is closely synchronized to memory cycle speed

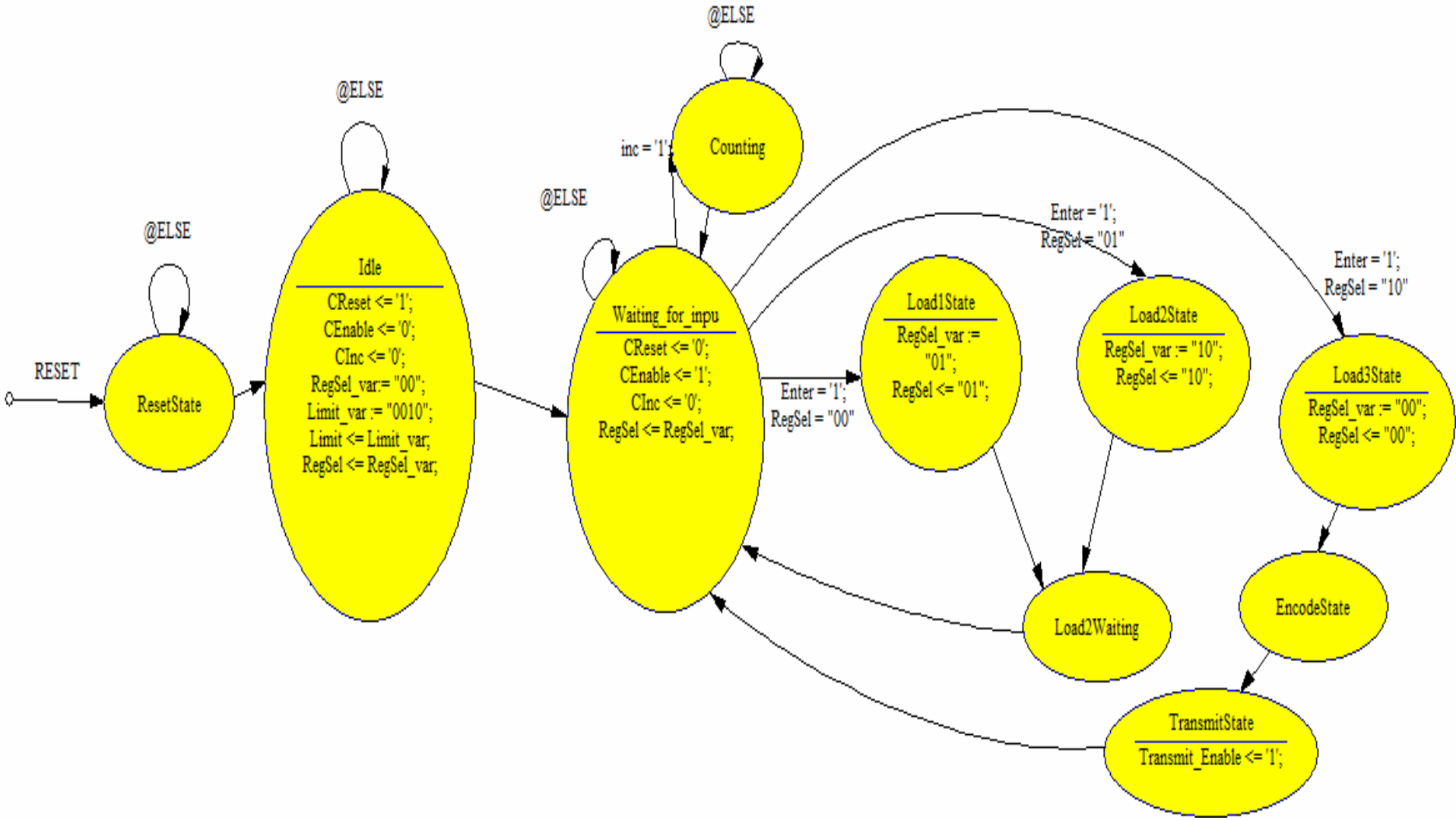
PHASE 1 (Control Unit)



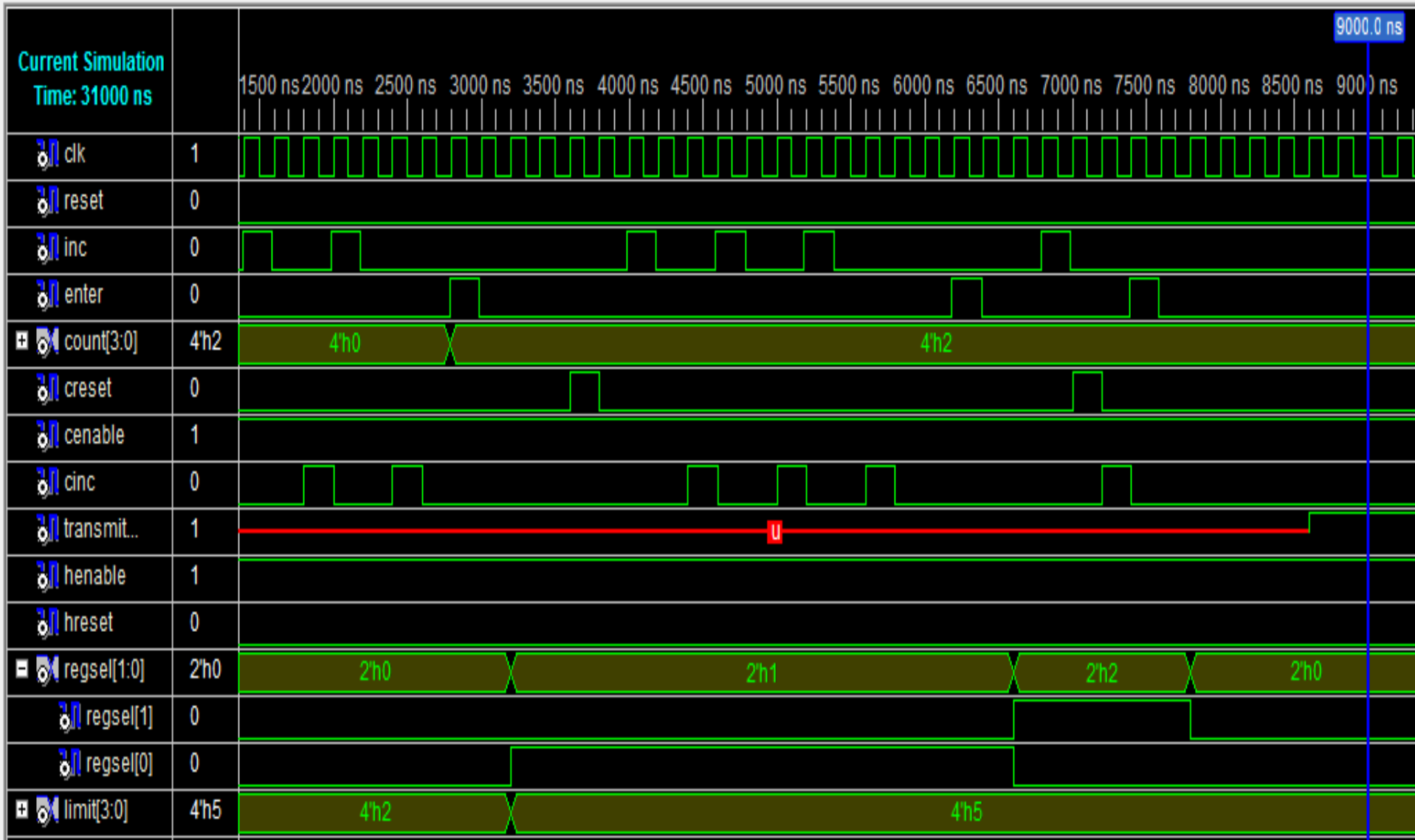
PHASE 2 (Control Unit)



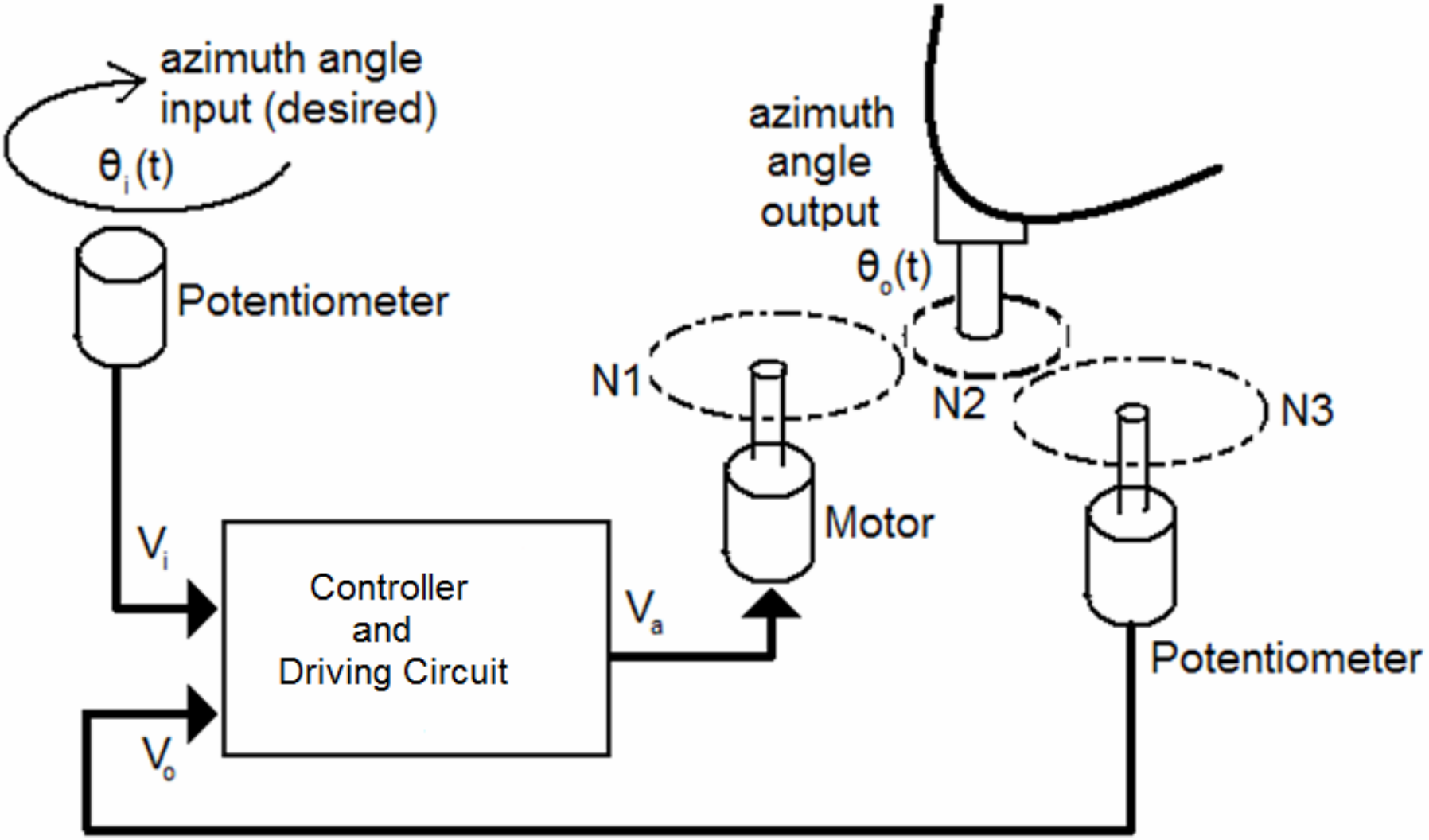
PHASE 3 (Control Unit)



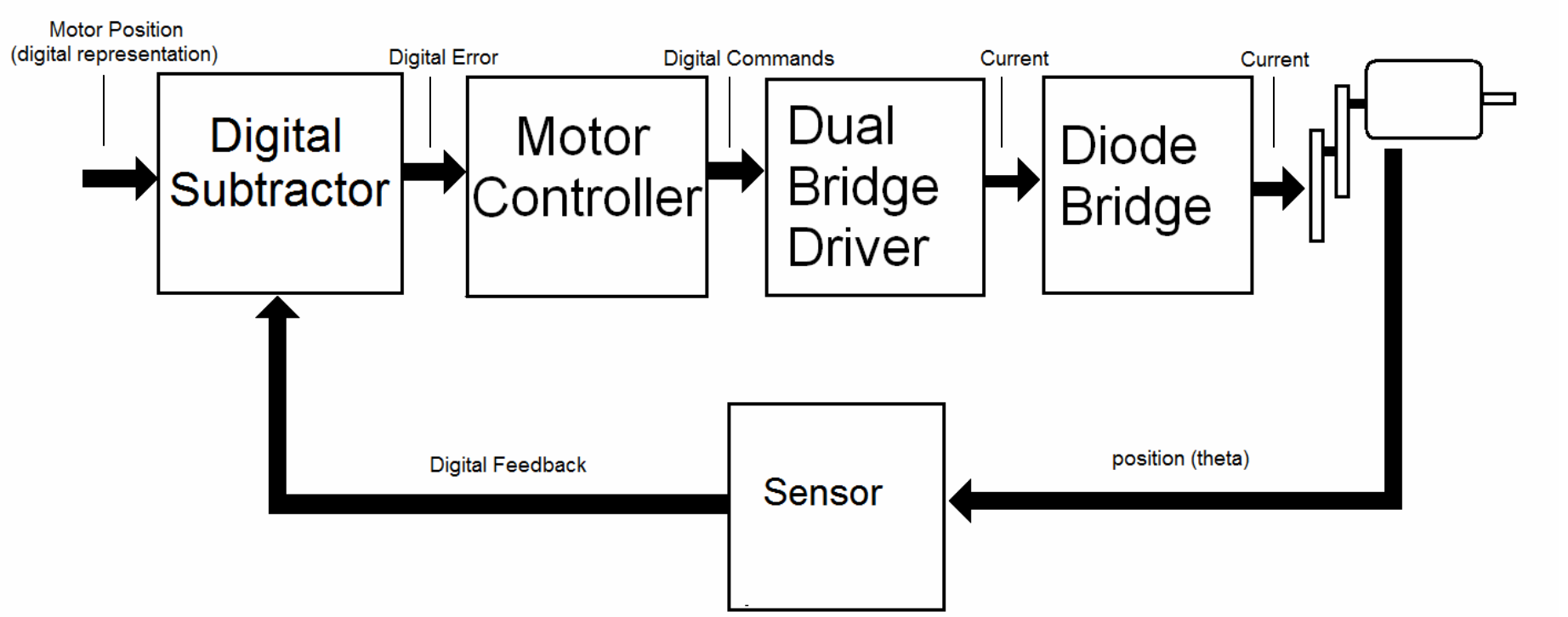
Control Unit Simulation



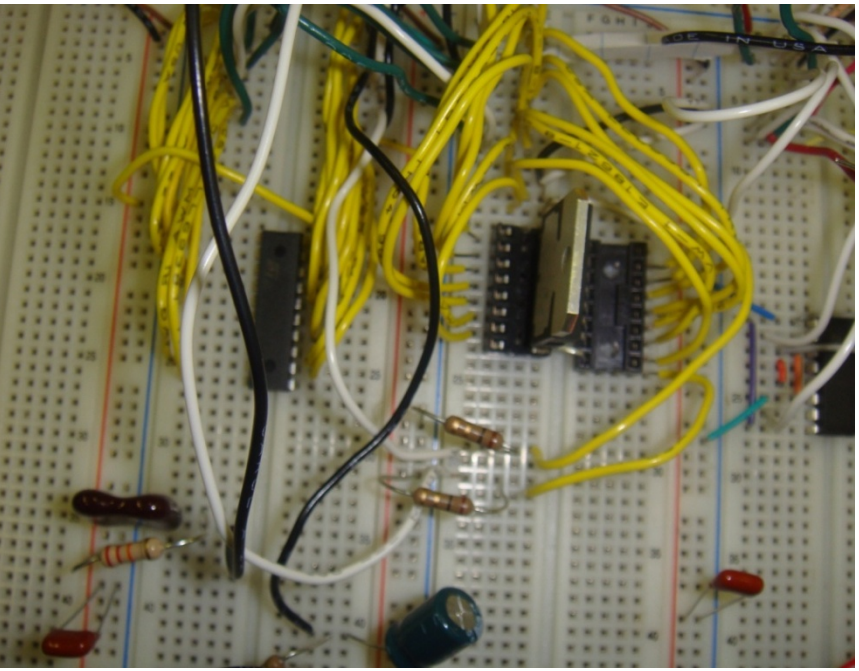
CONTROL SYSTEM: Implementation

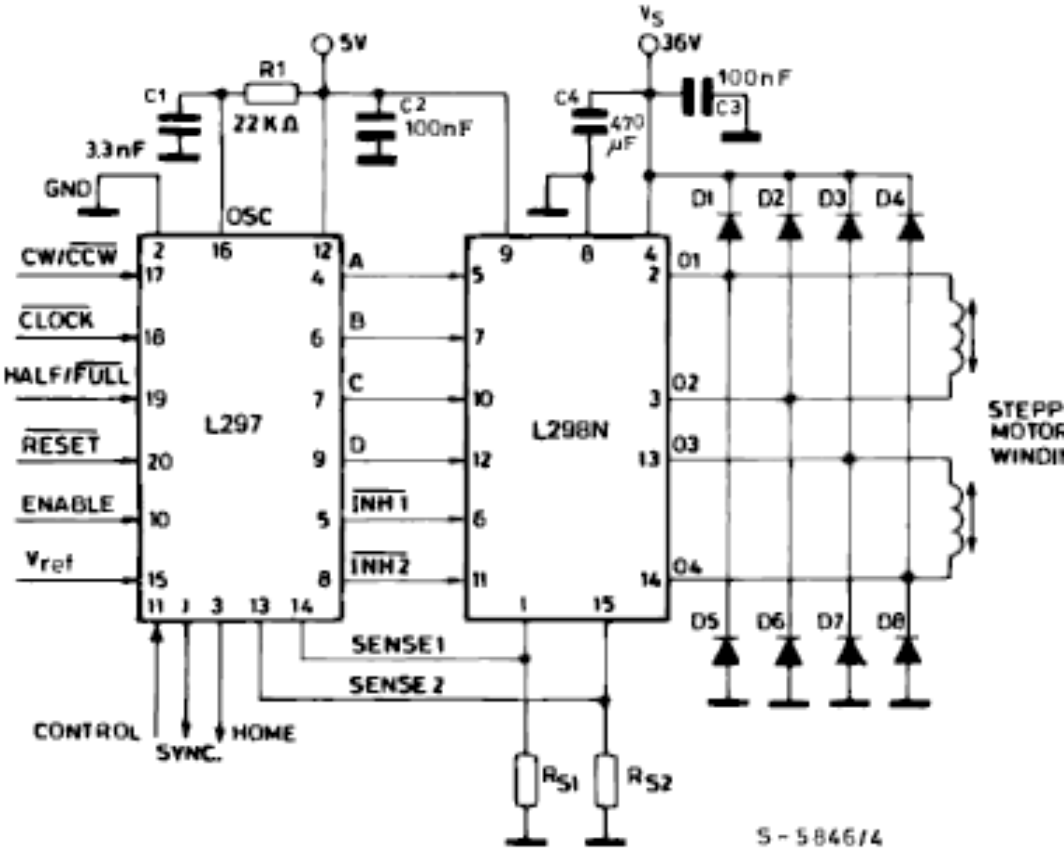


CONTROL SYSTEM : Block diagram

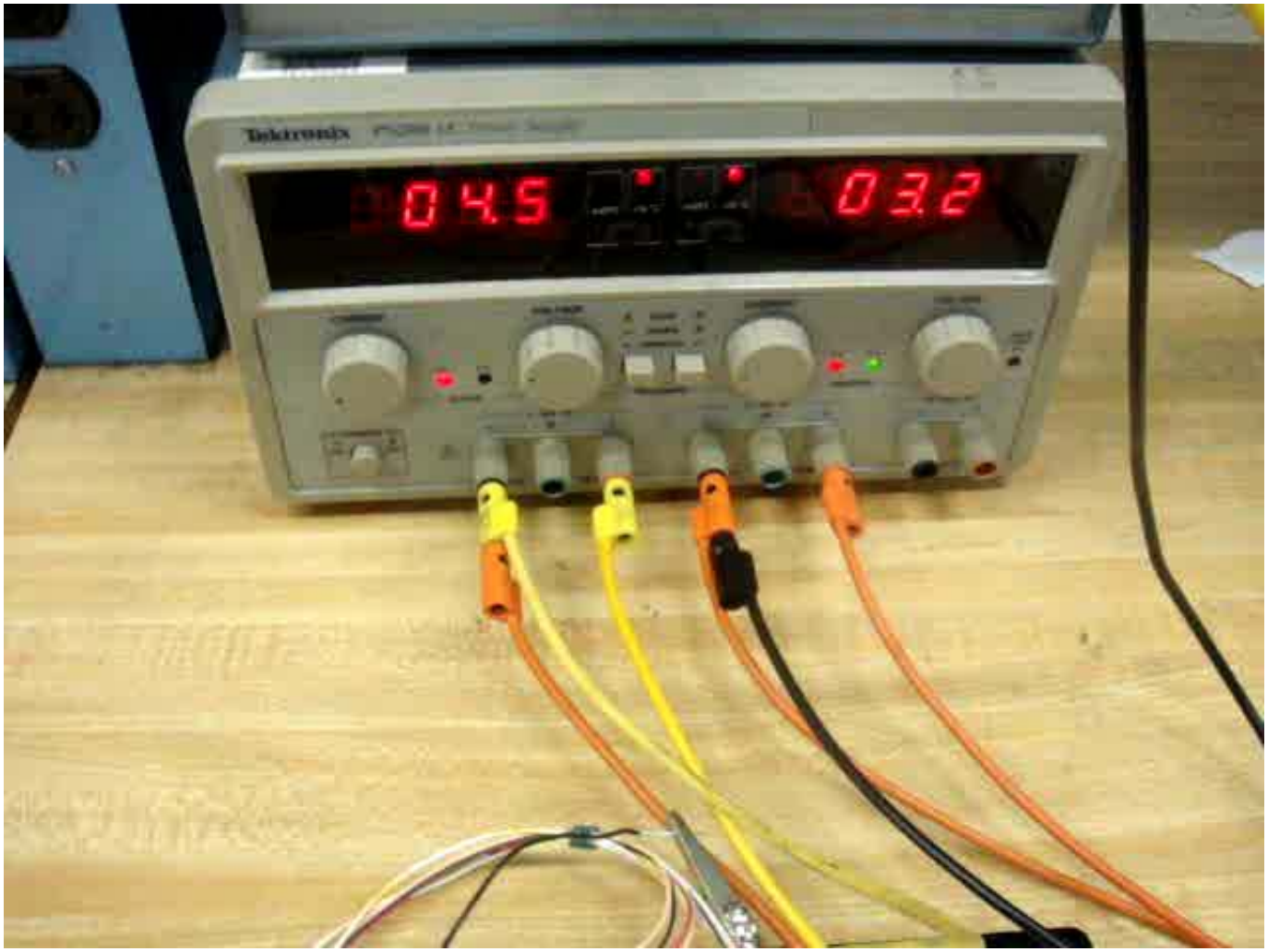


CONTROL SYSTEM : Driving circuit



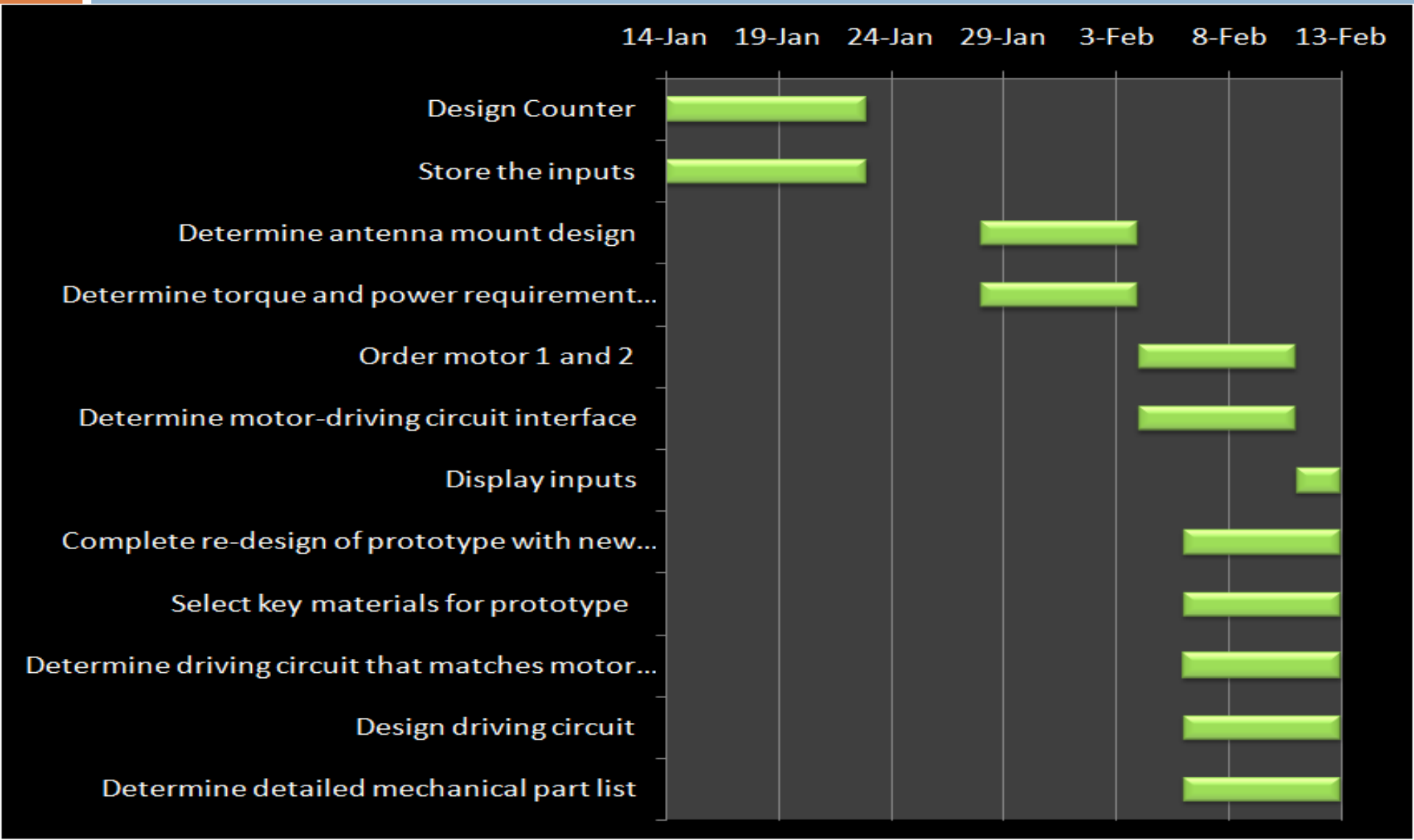


CONTROL SYSTEM : Demo

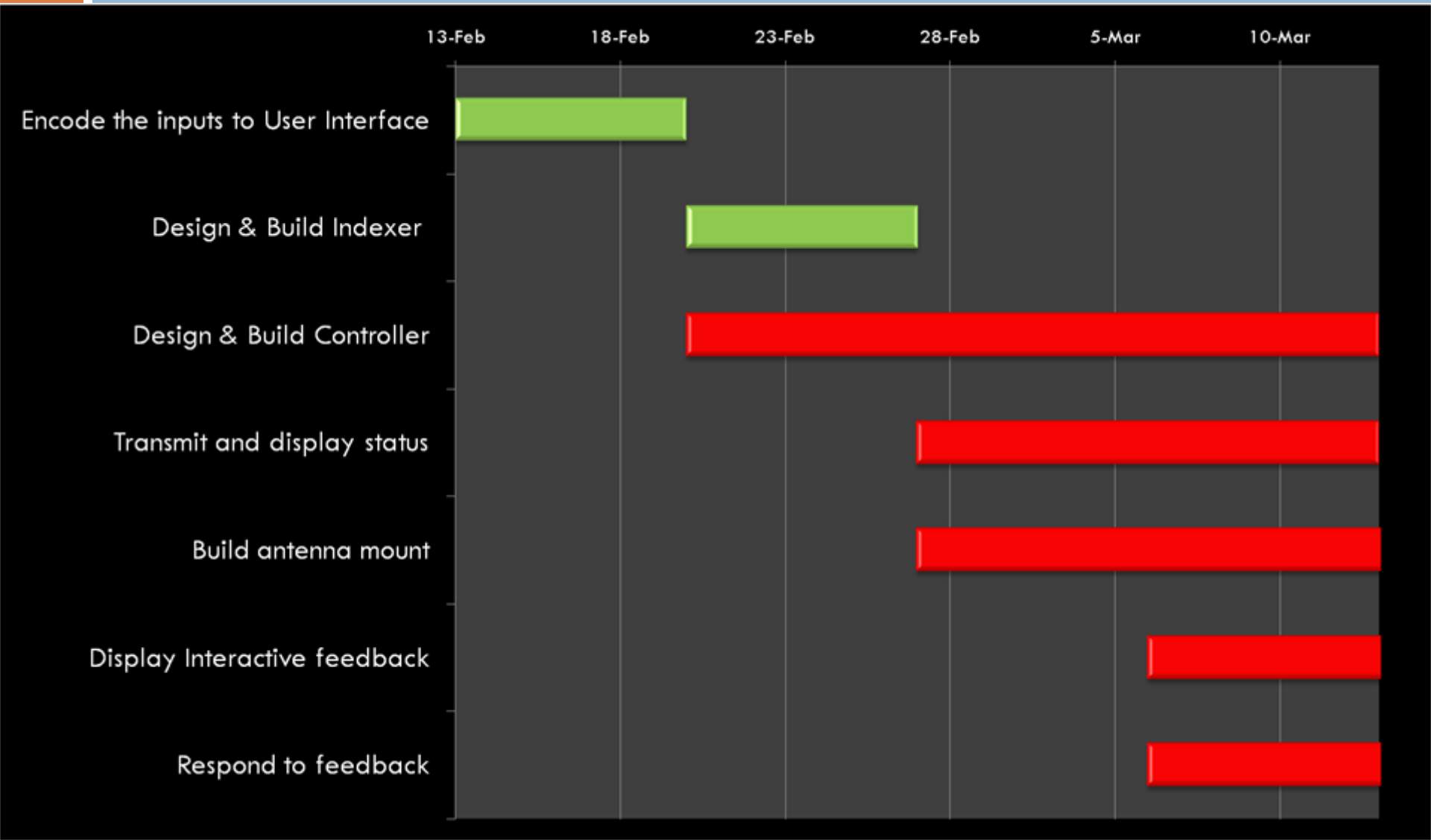


MILESTONES vs. OUTCOMES

MILESTONES


14-Jan
19-Jan
24-Jan
29-Jan
3-Feb
8-Feb
13-Feb
Design Counter
Store the inputs
Determine antenna mount design
Determine torque and power requirement...
Order motor 1 and 2
Determine motor-driving circuit interface
Display inputs
Complete re-design of prototype with new...
Select key materials for prototype
Determine driving circuit that matches motor...
Design driving circuit
Determine detailed mechanical part list

MILESTONES (continued)



OUTCOMES

Milestone	Assigned	Date completed	Date Due
Design Counter	Cyril/Tolu	20-Jan	23-Jan
Store the inputs	Cyril/Tolu	20-Jan	23-Jan
Determine antenna mount design	All	4-Feb	4-Feb
Determine torque and power requirement for motor	Lade/Iverson	4-Feb	4-Feb
Order motor 1 and 2	All	9-Feb	11-Feb
Determine motor-driving circuit interface	Iverson	15-Feb	11-Feb
Display inputs	Cyril/Tolu	20-Jan	13-Feb
Complete re-design of prototype with new dimensions.	Lade	9-Feb	13-Feb
Select key materials for prototype	All	13-Feb	13-Feb
Determine driving circuit	Lade/Iverson	20-Feb	13-Feb
Design driving circuit	Lade/Iverson	20-Feb	13-Feb

OUTCOMES (continued)

Milestone	Assigned	Date completed	Date Due
Determine detailed mechanical part list	Lade/Iverson	20-Feb	13-Feb
Encode the inputs to User Interface	Cyril/Tolu	20-Feb	20-Feb
Transmit and display status	Cyril/Tolu	on going	13-Mar
Design and Build Controller	All	on going	20-Mar
Build antenna mount	All	on going	20-Mar
Display Interactive feedback	Cyril/Tolu	on going	20-Mar
Respond to feedback	Cyril/Tolu	on going	20-Mar

ISSUES

- A delay in the arrival of parts
- Other involvements and commitments of Team members
- Mid-term examinations
- The team lacked the necessary technical expertise required at the time
- Powering up the blue-tooth transceiver
- Mis-prioritization of essential tasks

RISK ANALYSIS

- Derailment from Initial timeline
- Insufficient funds
- Faulty Design
- Overspecialization
- Part Malfunction
- What if we don’t finish on time?

PLAN FOR NEXT 5 WEEKS

- Completion of User interface and transceiver code
- Establish data transmission with blue-tooth
- Implement Logic controller for motor drive system
- Incorporate feedback into motor drive system
- Build final prototype
- Completion of documentation
- Testing of Complete Prototype

CONCLUSION

- We were able to make significant progress over the last period, including:
  - The design of the controller and driving circuit
  - Implementation of driving circuit and motor control
  - Retrieving and processing user input

- Future work
  - Implement the Logic controller for the motor drive system
  - Complete the User interface and transceiver code
  - Build the final prototype

QUESTIONS