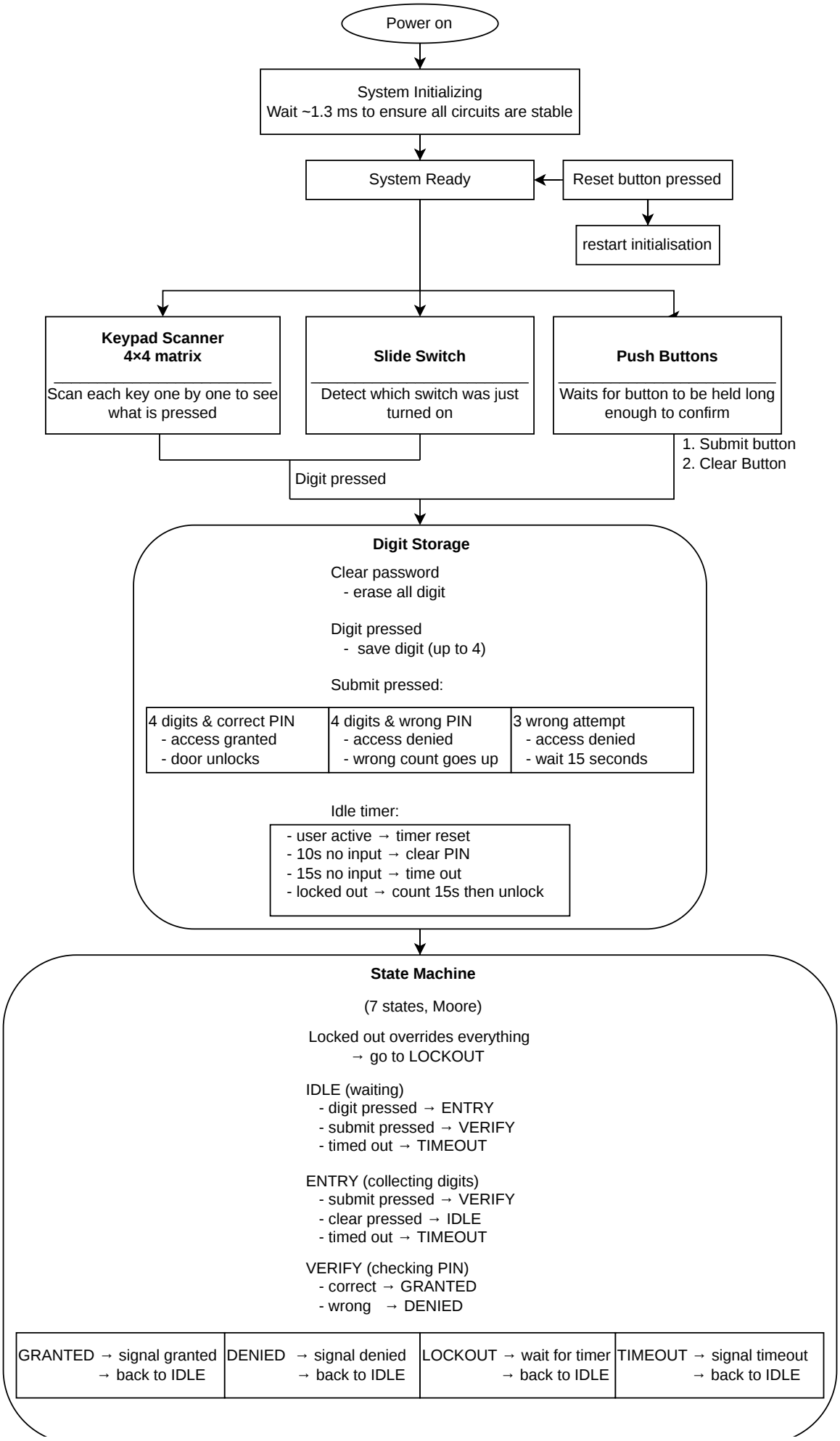
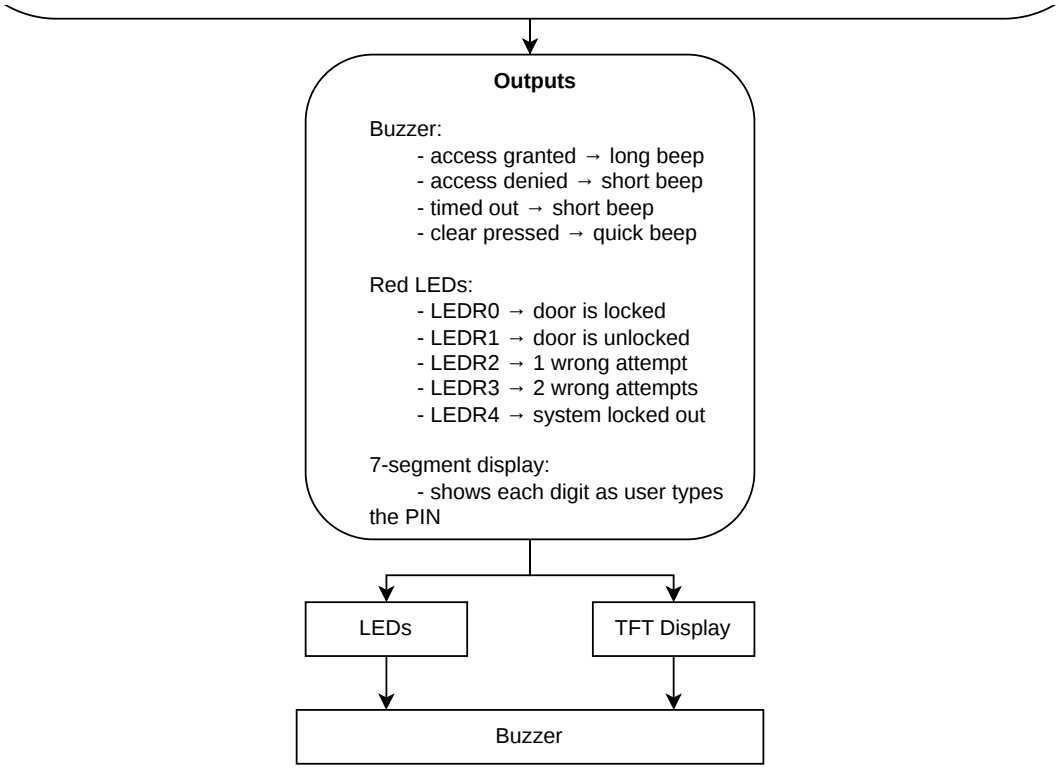

Power on
System Initializing
Wait ~1.3 ms to ensure all circuits are stable
System Ready
Reset button pressed
restart initialisation
Keypad Scanner
4×4 matrix
Scan each key one by one to see what is pressed
Slide Switch
Detect which switch was just turned on
Push Buttons
Waits for button to be held long enough to confirm
1. Submit button
2. Clear Button
Digit pressed
Digit Storage
Clear password
- erase all digit
Digit pressed
- save digit (up to 4)
Submit pressed:
4 digits & correct PIN
- access granted
- door unlocks
4 digits & wrong PIN
- access denied
- wrong count goes up
3 wrong attempt
- access denied
- wait 15 seconds
Idle timer:
- user active → timer reset
- 10s no input → clear PIN
- 15s no input → time out
- locked out → count 15s then unlock
State Machine
(7 states, Moore)
Locked out overrides everything
→ go to LOCKOUT
IDLE (waiting)
- digit pressed → ENTRY
- submit pressed → VERIFY
- timed out → TIMEOUT
ENTRY (collecting digits)
- submit pressed → VERIFY
- clear pressed → IDLE
- timed out → TIMEOUT
VERIFY (checking PIN)
- correct → GRANTED
- wrong → DENIED
GRANTED → signal granted
→ back to IDLE
DENIED → signal denied
→ back to IDLE
LOCKOUT → wait for timer
→ back to IDLE
TIMEOUT → signal timeout
→ back to IDLE


Outputs
Buzzer:
- access granted → long beep
- access denied → short beep
- timed out → short beep
- clear pressed → quick beep
Red LEDs:
- LEDR0 → door is locked
- LEDR1 → door is unlocked
- LEDR2 → 1 wrong attempt
- LEDR3 → 2 wrong attempts
- LEDR4 → system locked out
7-segment display:
- shows each digit as user types the PIN
LEDs
TFT Display
Buzzer