

# Truth Table

Input					Output		
S <sub>c</sub>	S <sub>o</sub>	LDR	L <sub>o</sub>	L <sub>c</sub>	Forward	Reverse	Error
0	0	0	0	0	0	1	0
0	0	0	0	1	0	0	0
0	0	0	1	0	0	1	0
0	0	0	1	1	0	0	1
0	0	1	0	0	1	0	0
0	0	1	0	1	1	0	0
0	0	1	1	0	0	0	0
0	0	1	1	1	0	0	1
0	1	0	0	0	1	0	0
0	1	0	0	1	1	0	0
0	1	0	1	0	0	0	0
0	1	0	1	1	0	0	1
0	1	1	0	0	1	0	0
0	1	1	0	1	1	0	0
0	1	1	1	0	0	0	0
0	1	1	1	1	0	0	1
1	0	0	0	0	0	1	0
1	0	0	0	1	0	0	0
1	0	0	1	0	0	1	0
1	0	0	1	1	0	0	1
1	0	1	0	0	0	1	0
1	0	1	0	1	0	0	0
1	0	1	1	0	0	1	0
1	0	1	1	1	0	0	0
1	1	0	0	0	0	0	0
1	1	0	0	1	0	0	0
1	1	0	1	0	0	0	0
1	1	0	1	1	0	0	1
1	1	1	0	0	0	0	0
1	1	1	0	1	0	0	0
1	1	1	1	0	0	0	0
1	1	1	1	1	0	0	1

S<sub>c</sub> —> Slide Switch to close the curtain by the user input

S<sub>o</sub> —> Slide Switch to open the curtain by the user input

L<sub>c</sub> —> Limit Switch to indicate whether the curtain is close or not

L<sub>o</sub> —> Limit Switch to indicate whether the curtain is open or not

LDR —> The sensor that determines whether the sun is shining or not

Forward —> Motor movement to open the curtain

Reverse —> Motor movement to close the curtain

Error —> a LED that lights up when the two limit switches are on

# Logic Design

## 1- Forward Equation:

Using SOP

$$\text{Output} = \overline{Sc} \overline{So} LDR \overline{Lo} \overline{Lc} + \overline{Sc} \overline{So} LDR \overline{Lo} Lc + \overline{Sc} So \overline{LDR} \overline{Lo} \overline{Lc} + \overline{Sc} So \overline{LDR} \overline{Lo} Lc + \overline{Sc} So LDR \overline{Lo} \overline{Lc} + \overline{Sc} So LDR \overline{Lo} Lc$$

Abbreviate the equation

$$\therefore \text{Output} = \overline{Sc} \overline{So} LDR \overline{Lo} (\overline{Lc} + Lc) + \overline{Sc} So \overline{LDR} \overline{Lo} (\overline{Lc} + Lc) + \overline{Sc} So LDR \overline{Lo} (\overline{Lc} + Lc)$$

$$\therefore \text{Output} = \overline{Sc} \overline{So} LDR \overline{Lo} + \overline{Sc} So \overline{LDR} \overline{Lo} + \overline{Sc} So LDR \overline{Lo}$$

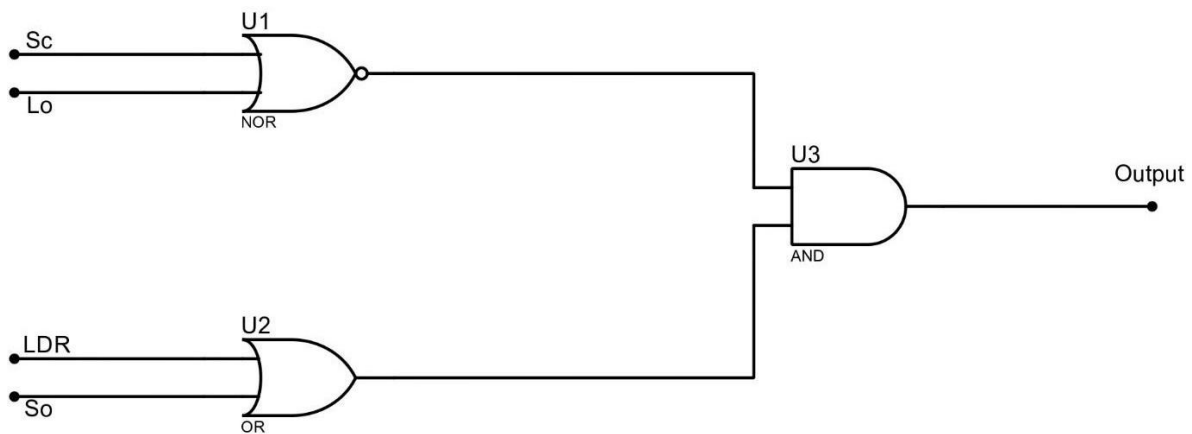
$$\therefore \text{Output} = \overline{Sc} \overline{Lo} (\overline{So} LDR + So \overline{LDR} + So LDR)$$

$$\therefore \text{Output} = \overline{Sc} \overline{Lo} (LDR (\overline{So} + So) + So \overline{LDR})$$

$$\therefore \text{Output} = \overline{Sc} \overline{Lo} (LDR + So \overline{LDR})$$

$$\therefore \text{Output} = \overline{Sc} \overline{Lo} (LDR + So)$$

$$\therefore \text{Output} = \overline{Sc + Lo} (LDR + So) \#$$



## 2- Reverse Equation:

### Using SOP

$$\text{Output} = \overline{Sc} \overline{So} \overline{LDR} \overline{Lo} \overline{Lc} + \overline{Sc} \overline{So} \overline{LDR} Lo \overline{Lc} + Sc \overline{So} \overline{LDR} \overline{Lo} \overline{Lc} + Sc \overline{So} \overline{LDR} Lo \overline{Lc} + \\ Sc \overline{So} LDR \overline{Lo} \overline{Lc} + Sc \overline{So} LDR Lo \overline{Lc}$$

### Abbreviate the equation

$$\therefore \text{Output} = \overline{Sc} \overline{So} \overline{LDR} \overline{Lc} (\overline{Lo} + Lo) + Sc \overline{So} \overline{LDR} \overline{Lc} (\overline{Lo} + Lo) + Sc \overline{So} LDR \overline{Lc} (\overline{Lo} + Lo)$$

$$\therefore \text{Output} = \overline{Sc} \overline{So} \overline{LDR} \overline{Lc} + Sc \overline{So} \overline{LDR} \overline{Lc} + Sc \overline{So} LDR \overline{Lc}$$

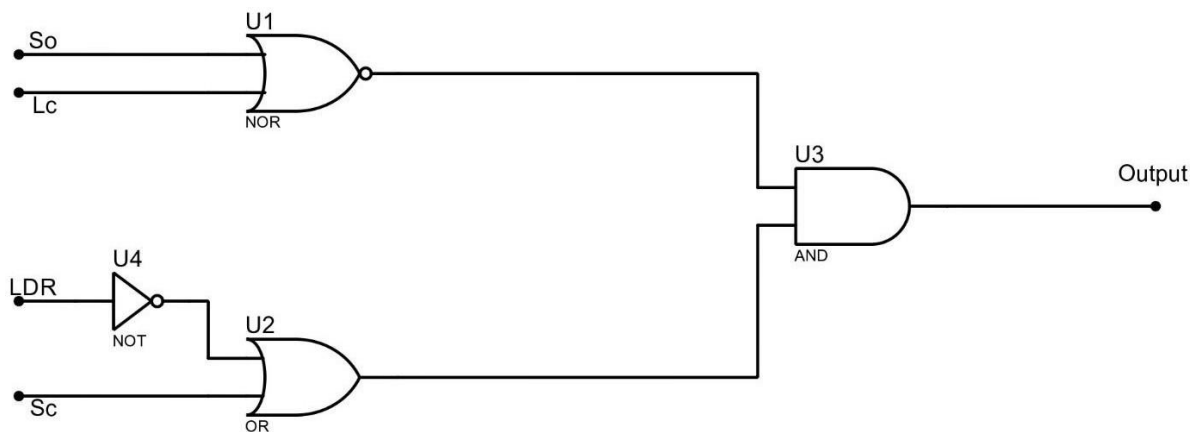
$$\therefore \text{Output} = \overline{So} \overline{Lc} (\overline{Sc} \overline{LDR} + Sc \overline{LDR} + Sc LDR)$$

$$\therefore \text{Output} = \overline{So} \overline{Lc} (\overline{LDR} (\overline{Sc} + Sc) + Sc LDR)$$

$$\therefore \text{Output} = \overline{So} \overline{Lc} (\overline{LDR} + Sc LDR)$$

$$\therefore \text{Output} = \overline{So} \overline{Lc} (\overline{LDR} + Sc)$$

$$\therefore \text{Output} = \overline{So + Lc} (\overline{LDR} + Sc) \#$$

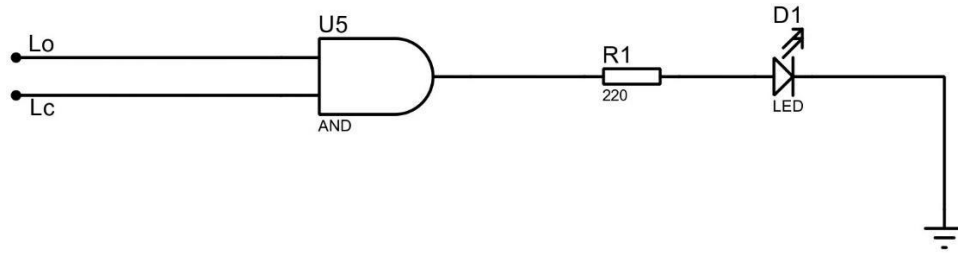


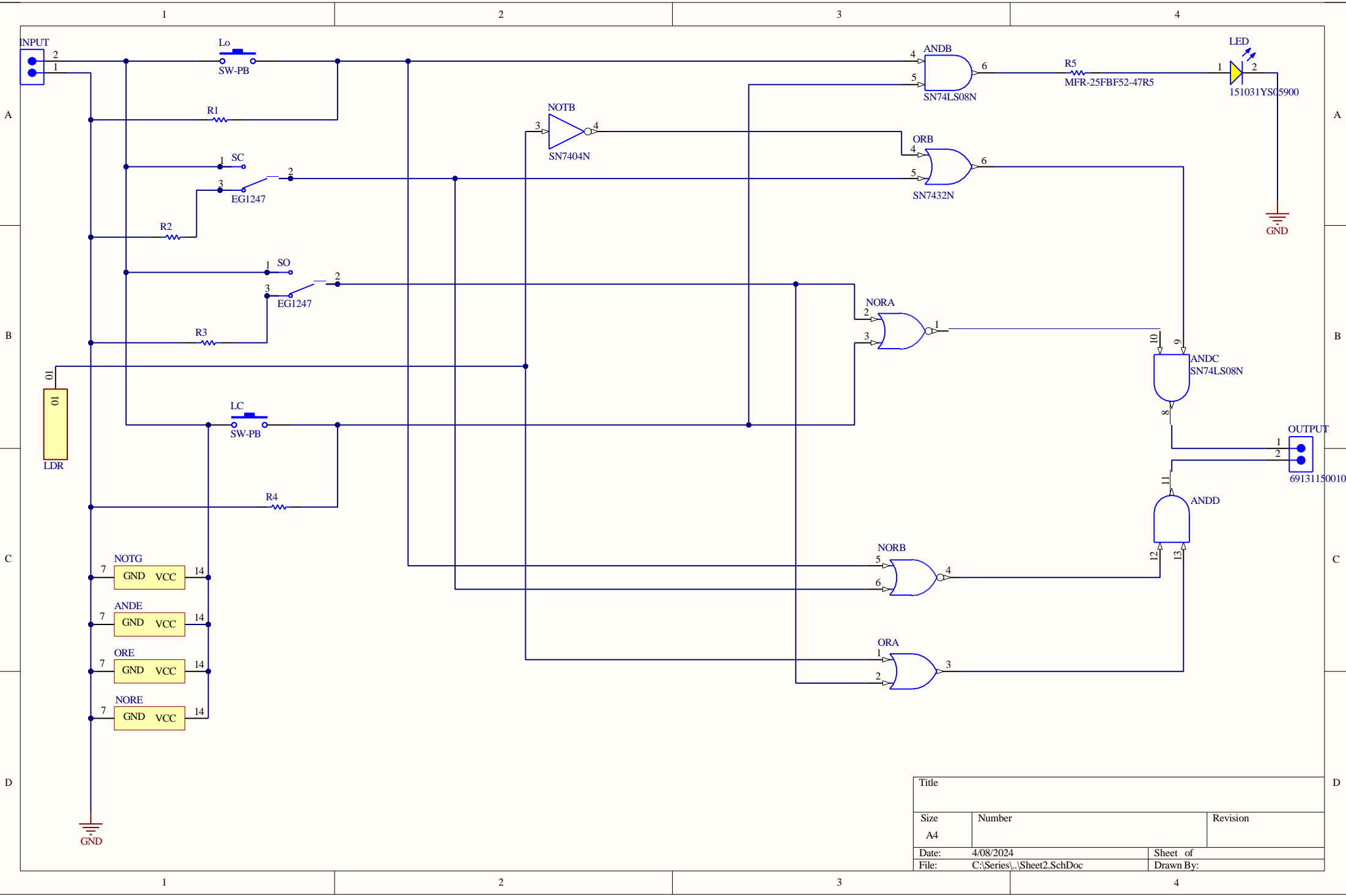
### 3- Error Equation:

The error happens when the two limit switches are on and the motor stops in this case.

$\therefore$  The equation is:

$$\text{Output} = L_o . L_c$$





Title		
Size A4	Number	Revision
Date:	4/08/2024	Sheet of
File:	C:\Series\...\Sheet2.SchDoc	Drawn By:

