

avr-gcc

JOHNSON COUNTER

Manoj Chavva- FWC22055

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Abstract—This Manual shows the design and Implementation of four bit Johnson counter.

I. COMPONENTS

S.No	Component	Number
1.	Arduino	1
2.	Bread Board	1
3.	Jumper Wires(M-M)	6
4.	LED	4

II. INTRODUCTION

- 1) Johnson counters are used to store or process or count the number of events occurred within the circuit.
- 2) It is designed with a group of flip-flops, where the inverted output from the last flip-flop is connected to the input of the first flip-flop.
- 3) In Johnson counter
No. of states = No. of flip-flop used
Number of used states= $2n$
Number of unused states= $2n - 2*n$
- 4) Here, the functionality of D flip flop is used for the program.

III. CIRCUIT DIAGRAM

- 1) The inverted output of the last flip-flop ' \bar{Q}_n ' is fed back to the first flip-flop in the sequence bit pattern.
- 2) The counter registers cycles in a closed-loop i.e circulates within the circuit.

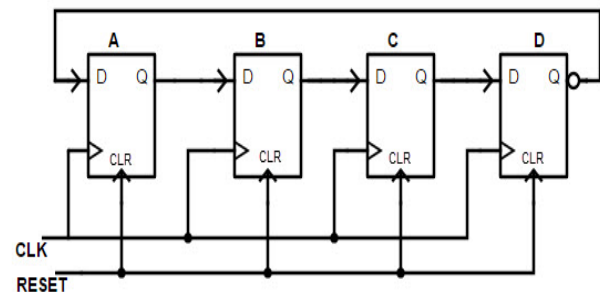


Fig. 1: Four bit Johnson Counter

- 3) Reset pin acts as an on/off switch. So, the flip-flops can be enabled by clicking the Reset switch.
- 4) CLK pin is used to observe the changes in the output of the flip-flops.

IV. PROCEDURE

- 1) Connect the 4 LED's and Aurdino according to table I
- 2) Observe the states of LED and verify the truth table using the code from the link.

Arduino	D2	D3	D4	D5	GND
LED's	LED1	LED2	LED3	LED4	

TABLE I: Connection Table

URL – <https://github.com/ManojChavva/FWC/blob/main/avr-gcc/codes/main.c>

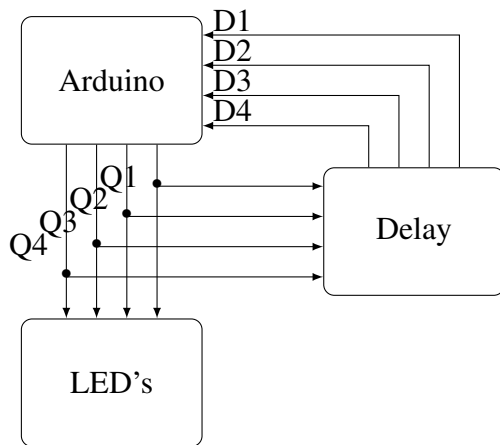


Fig: 2 Sequential Circuit

V. TRUTH TABLE

CLK	D1	D2	D3	D4	Q1	Q2	Q3	Q4
0	0	0	0	0	0	0	0	0
1	1	0	0	0	1	0	0	0
2	1	1	0	0	1	1	0	0
3	1	1	1	0	1	1	1	0
4	1	1	1	1	1	1	1	1
5	0	1	1	1	0	1	1	1
6	0	0	1	1	0	0	1	1
7	0	0	0	1	0	0	0	1

Table II: Truth Table.

- The above table state that
- 1) The counter produces the output 0000 when there is no clock input passed(0).
 - 2) The counter produces the output 1000 when the 1st clock pulse is passed to the flip flops.
 - 3) The counter produces the output 1100 when the 2nd clock pulse is passed to the flip flops.
 - 4) The counter produces the output 1110 when the 3rd clock pulse is passed to the flip flops.
 - 5) The counter produces the output 1111 when the 4th clock pulse is passed to the flip flops.
 - 6) The counter produces the output 0111 when the 5th clock pulse is passed to the flip flops.
 - 7) The counter produces the output 0011 when the 6th clock pulse is passed to the flip flops.
 - 8) The counter produces the output 0001 when the 7th clock pulse is passed to the flip flops.

CONCLUSION

Thus the Johnson counter designed and Implemented.