

IDE

JOHNSON COUNTER

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Abstract—This Manual shows the design and Implementation of four bit Johnson counter with 7474 IC's.

I. COMPONENTS

| S.No | Component | Number |
|------|-------------------|----------|
| 1. | Arduino | 1 |
| 2. | Bread Board | 1 |
| 3. | Jumper Wires(M-M) | Required |
| 4. | LED | 4 |
| 5. | 7474 | 2 |

II. INTRODUCTION

- Johnson counters are used to store or process or count the number of events occurred within the circuit.
- 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.
- In Johnson counter
 No. of states = No. of flip-flop used
 Number of used states = $2n$
 Number of unused states = $2n - 2^n$
- Generally, it is implemented by using D flip-flops or JK flip-flops. Here, It is implemented by D flip-flop.

III. CIRCUIT DIAGRAM

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

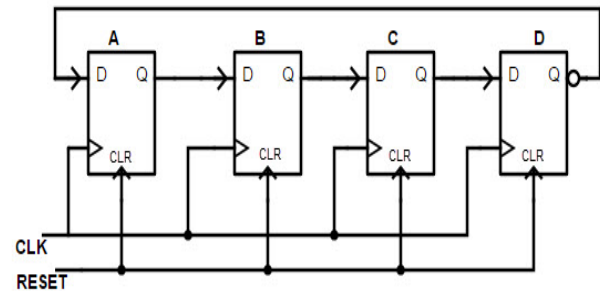


Fig. 1: Four bit Johnson Counter

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

IV. PROCEDURE

- Connect the two 7474 IC's, LED's and Aurdino according to table I
- Observe the states of LED and verify the truth table using the code from the link.

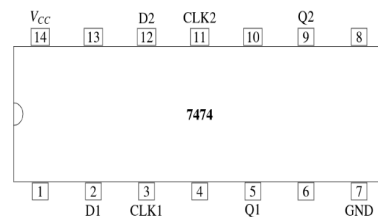


Fig. 2: 7474 IC

<https://github.com/ManojChavva/FWC/blob/main/IDE/JohnsonWithIC/code.cpp>

| Arduino | | | | | | | | | GND | Vcc | | | | | CLK | 13 |
|---------|---|------|------|------|---|------|------|------|-----|-----|---|---|----|---|-----|----|
| 7474 | 2 | 2,5 | 5,12 | 12,9 | 9 | | | | 7 | 14 | 1 | 4 | 10 | 3 | 11 | |
| 7474 | 8 | | | | 2 | 2,5 | 5,12 | 12,9 | 7 | 14 | 1 | 4 | 10 | 3 | 11 | |
| LED | | LED1 | | LED2 | | LED3 | | LED4 | | | | | | | | |

TABLE I: Connection Table.

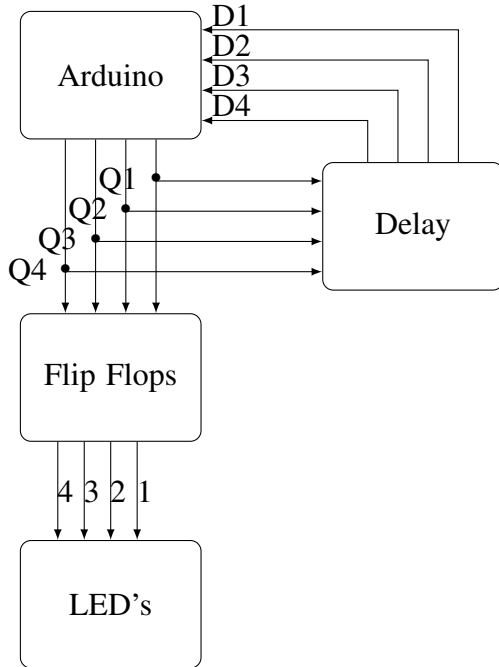


Fig: 3 Sequential Circuit

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.

CONCLUSION

Thus the Johnson counter designed and Implemented.