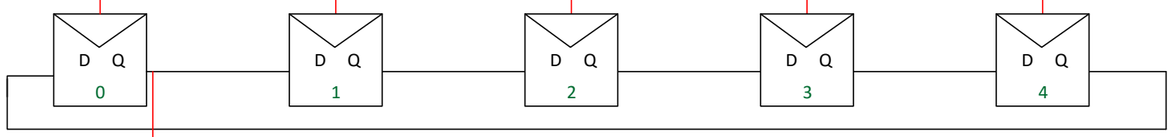
MUX SELECT

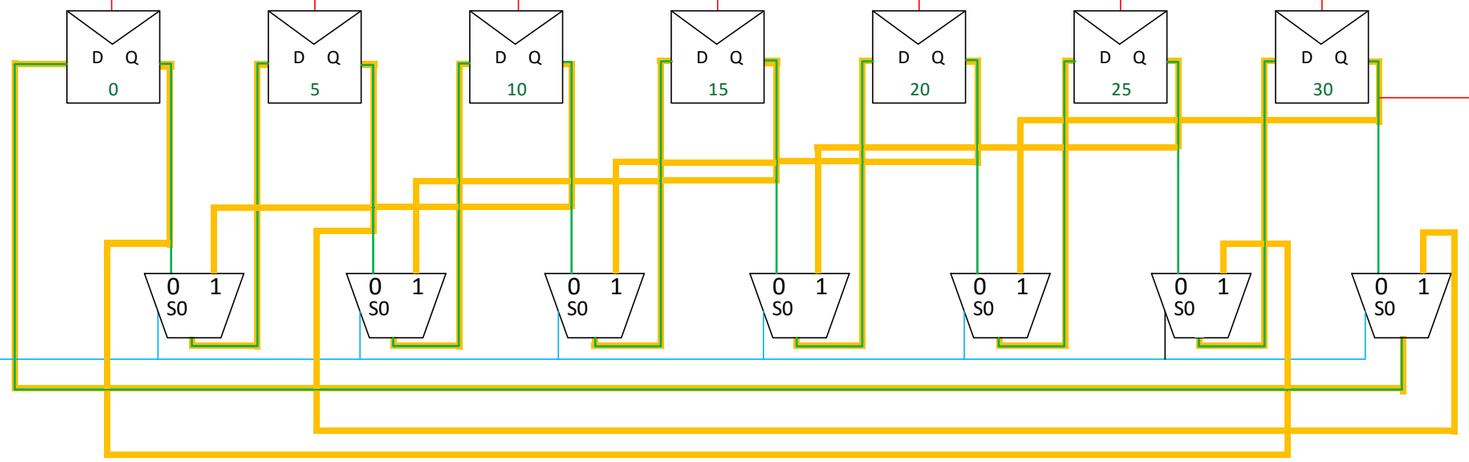
CLK

OVERALL PURPOSE:
Shows hour and minutes in 5 minute intervals
(e.g. 15 to X o'clock, 20 past X o'clock)

Default State: 12:00
i.e. 1st: 0 → HIGH
2nd : 0 → HIGH
3rd : 12 → HIGH

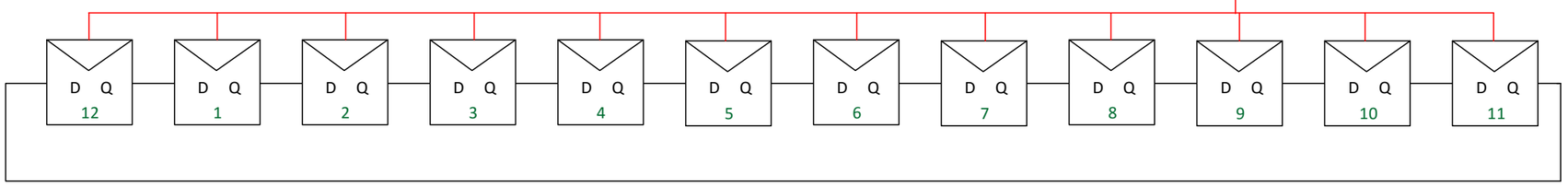


First Layer:
- Used to count the minutes between 5 minute intervals
- 5 States, for 0, 1, 2, 3, 4
- Default state: HI, LOW, LOW, LOW, LOW
  - HI signal cycles through each flipflop every minute (Left to Right)
- Example: 19 minutes would have the 4 flipflop in the 1st layer and the 15 flipflop in the 2nd layer with outputs of HIGH



Second Layer:
- Used to count 5 minute intervals
- 7 states: 0, 5, 10, 15, 20, 25, 30
- Default state: HI, LOW, LOW, LOW, LOW, LOW, LOW. Mux Select: LOW

- Clock signal comes from Q from the first flipflop of 1st layer (i.e. 1st layer takes 5 minutes to cycle, thus sending a signal every 5 minutes)
- DIRECTION SWITCH: Mux select starts LOW at the beginning, making the flipflops go forward (left to right). Switches to HIGH when HIGH state reaches the last flipflop (30), making the chain of flipflops go backwards (right to left), and back to LOW when it reaches the first flopflop (0), restarting the cycle
**Mux select also controls lights saying PAST/TO, thus as the 2nd layer reaches the end, its states read "25 PAST X o'clock" then "30 TO X+1 o'CLOCK"



Third Layer:
- Used to count hours
- 12 states: 12, 1, 2….11
- Default state: HI, LOW, LOW… LOW

- Clock signal comes from Q from the last flipflop of 2nd layer (i.e. 2nd layer takes an hour to reach last flipflop from previous time(30 -> 0 then 0->30), thus sends a signal every hour)
- HI signal cycles through each flipflop every hour (Left to Right)

PAST TO

LEGEND

Flipflop (D Q, 0)
2-to-1 Multiplexer (0 1, S0)
LED

CLK Signal
MUX Select
2nd Layer Forward Path
2nd Layer Backwards Path