**Hardware Design and Lab: Lab5**

**Team 28**

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**Catalog**

**1. Advanced Question:**

**Sliding Window Sequence Detector……………...………………P3**

**2. Advanced Question:**

**Traffic Light Controller…………………………..…...………….P5**

**3. Advanced Question:**

**Greatest Common Divisor….………………...……….………..P7**

**4. Advanced Question:**

**Booth Multiplier……………………………………….….…..P12**

**5. What I Have Learned…...................................................P14**

1. **Advanced Question: Sliding Window Sequence Detector**
2. **Finite State Diagram**

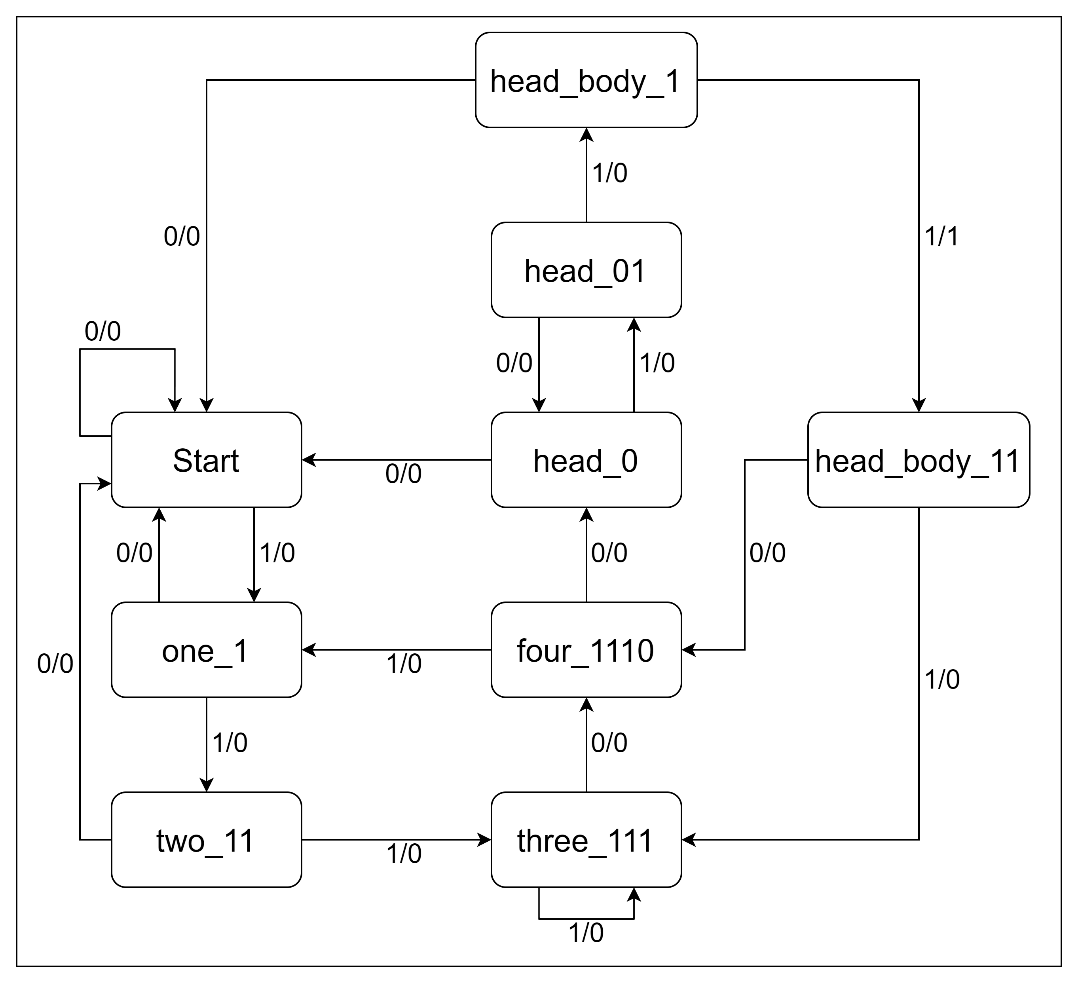
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Figure 1.1

1. **Explanation**

**Start:** Detect 0 bit that match the pattern.

**one\_1:** Detect the first bit **1** of the pattern.

**two\_11:** Detect the second bit **1** of the pattern.

**three\_111:** Detect the third bit **1** of the pattern.

**four\_1110:** Detect the fourth bit **0** of the pattern.

**head:** It means 1110.

**head\_0:** Detect **0** of the "several **01**".

**head\_01:** Detect **1** of the "several **01**".

**body:** It means "several **01**".

**head\_body\_1:** Detect the second-to-last bit **1** of the pattern.

**head\_body\_11:** Detect the last bit **1** of the pattern

1. **Testbench**

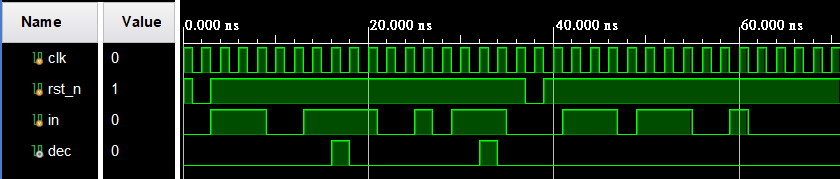


Figure 1.2

I use the testcase of the lab slide to check if there is something wrong and it seems that the design works properly.

1. **Vending Machine**
2. **Finite State Diagram**

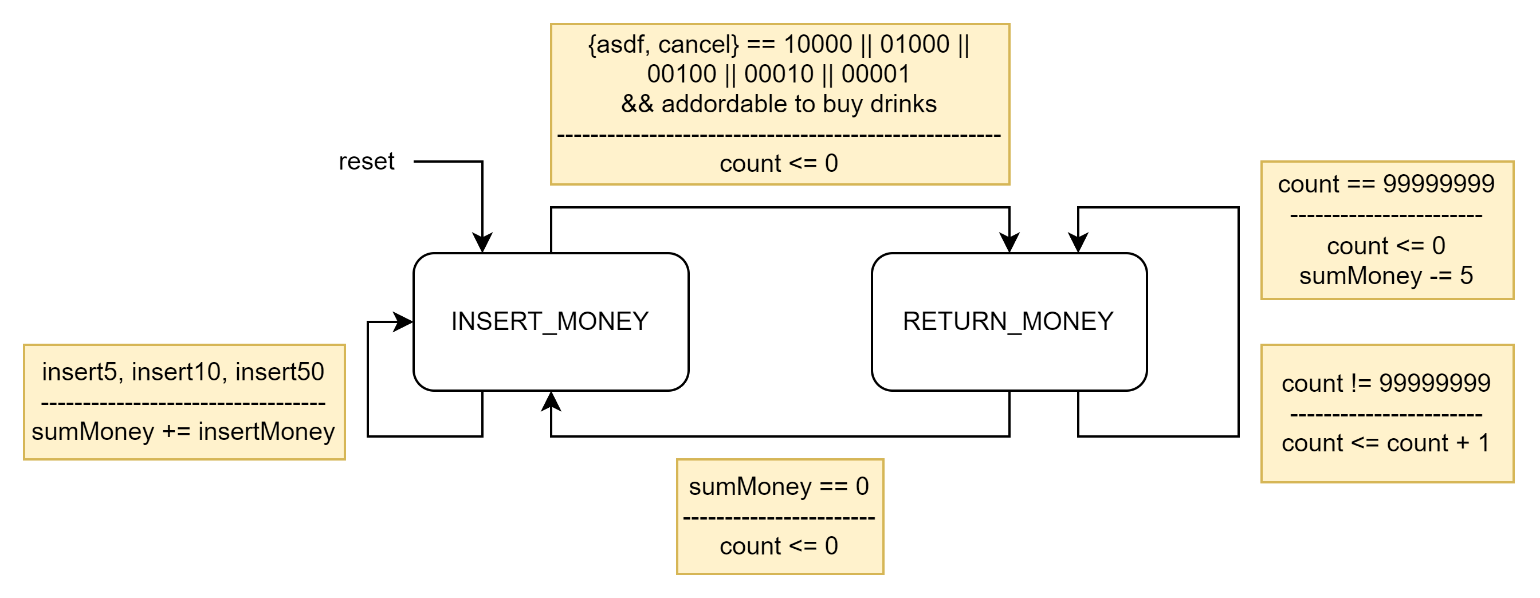
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Figure 2.1

1. **Block Diagram**

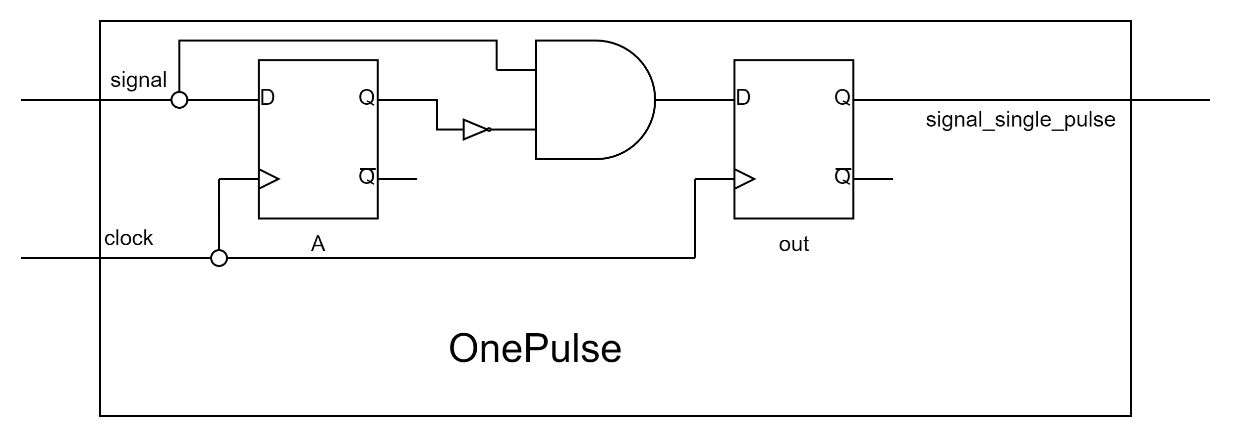


Figure 2.2

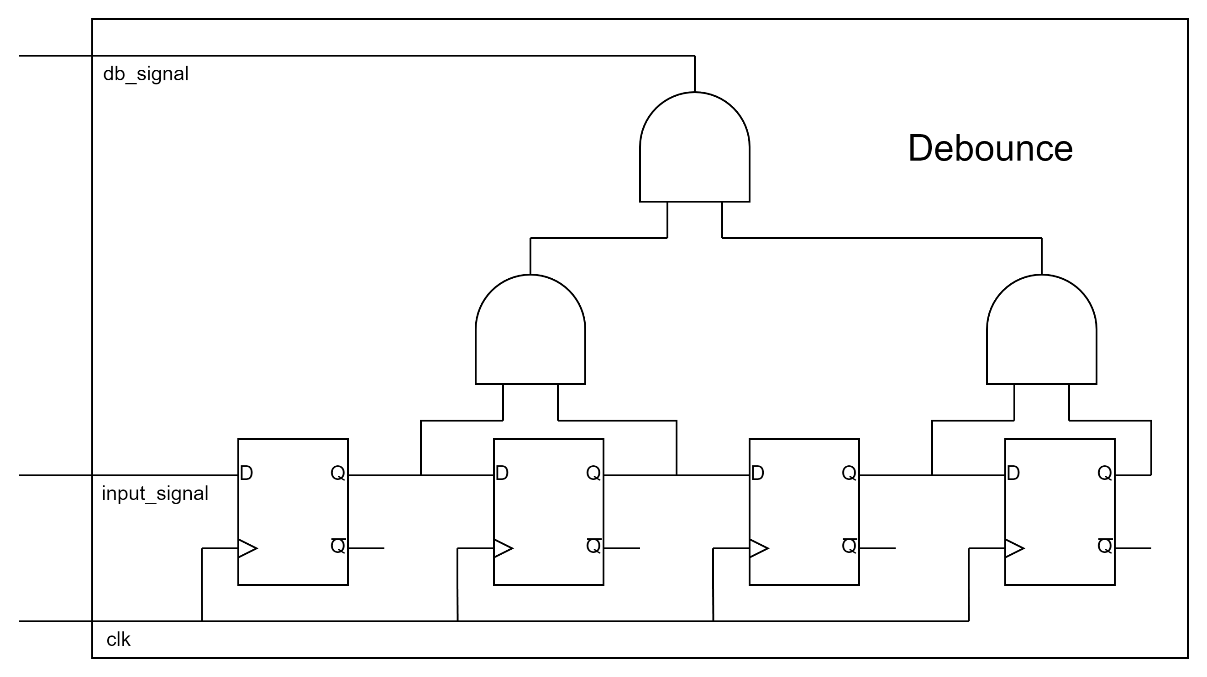


Figure 2.3

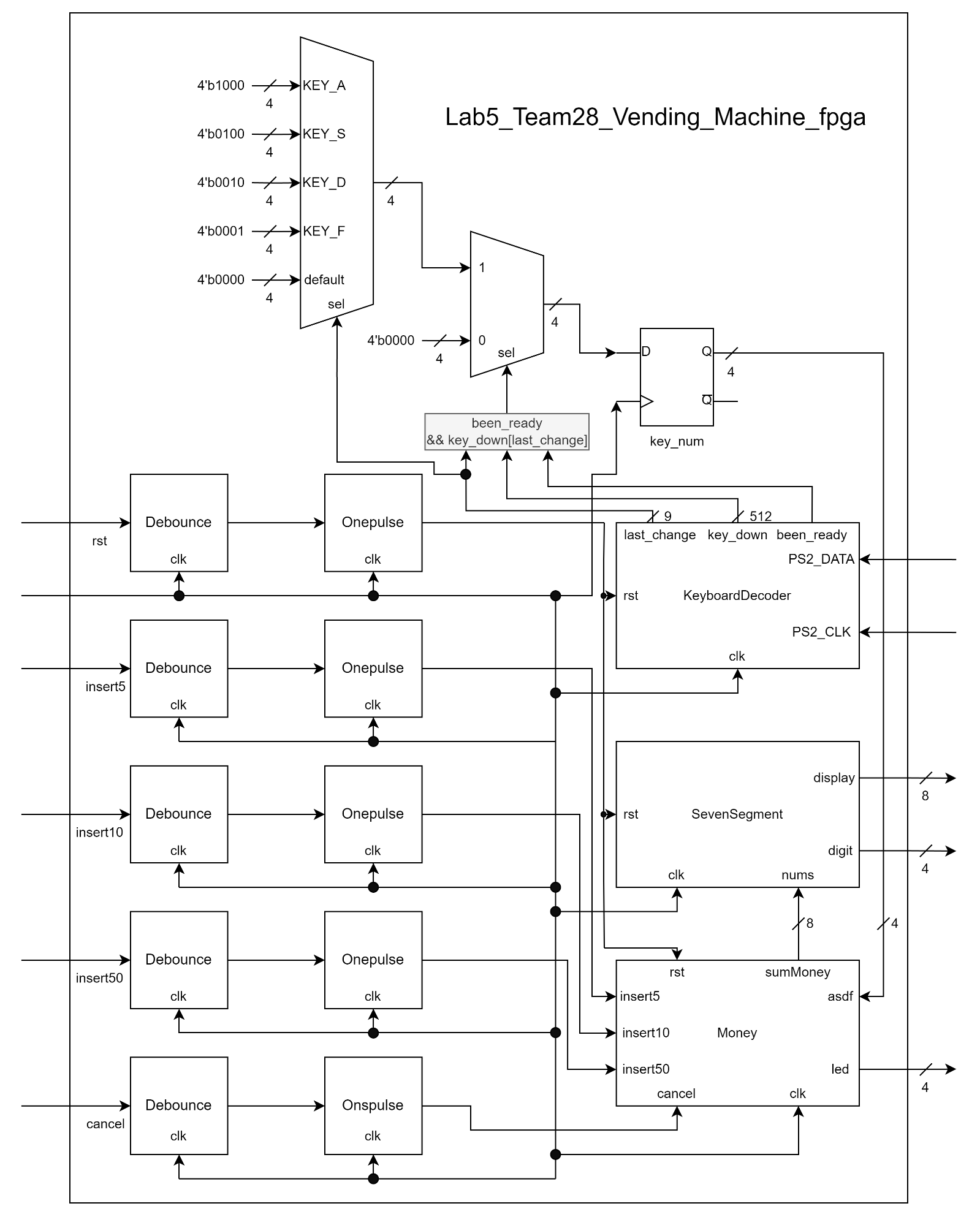


Figure 2.4

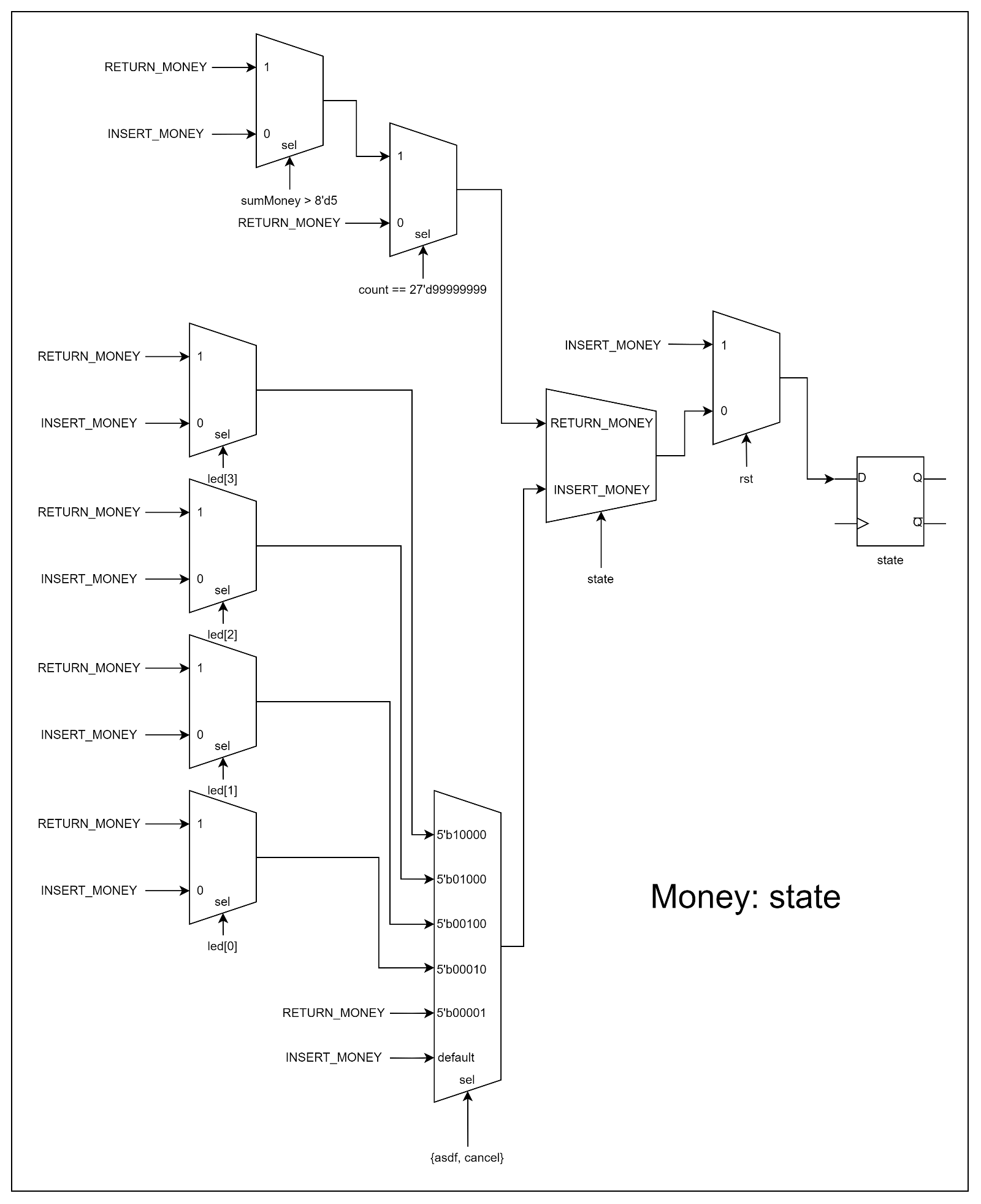


Figure 2.5

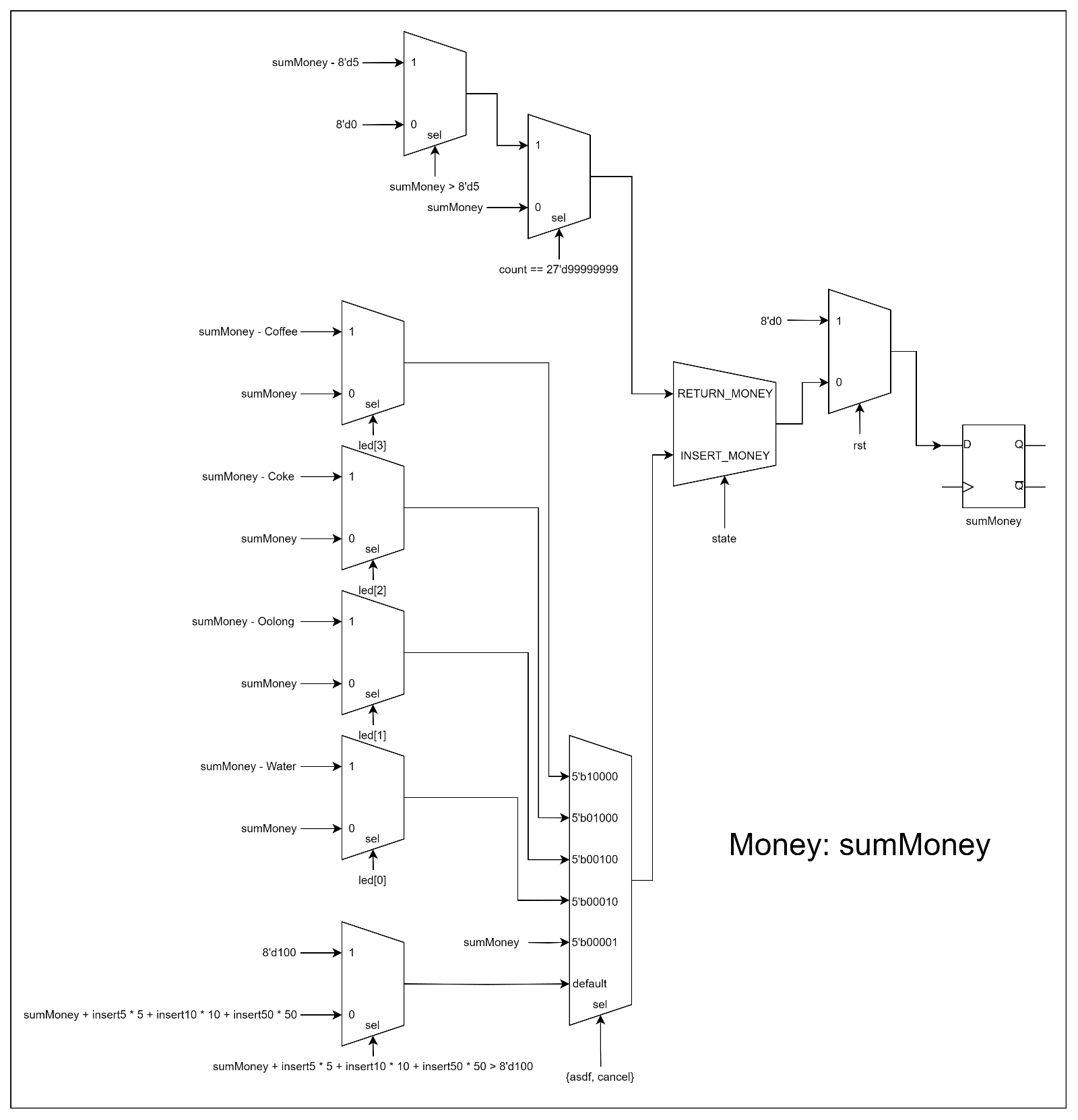


Figure 2.6

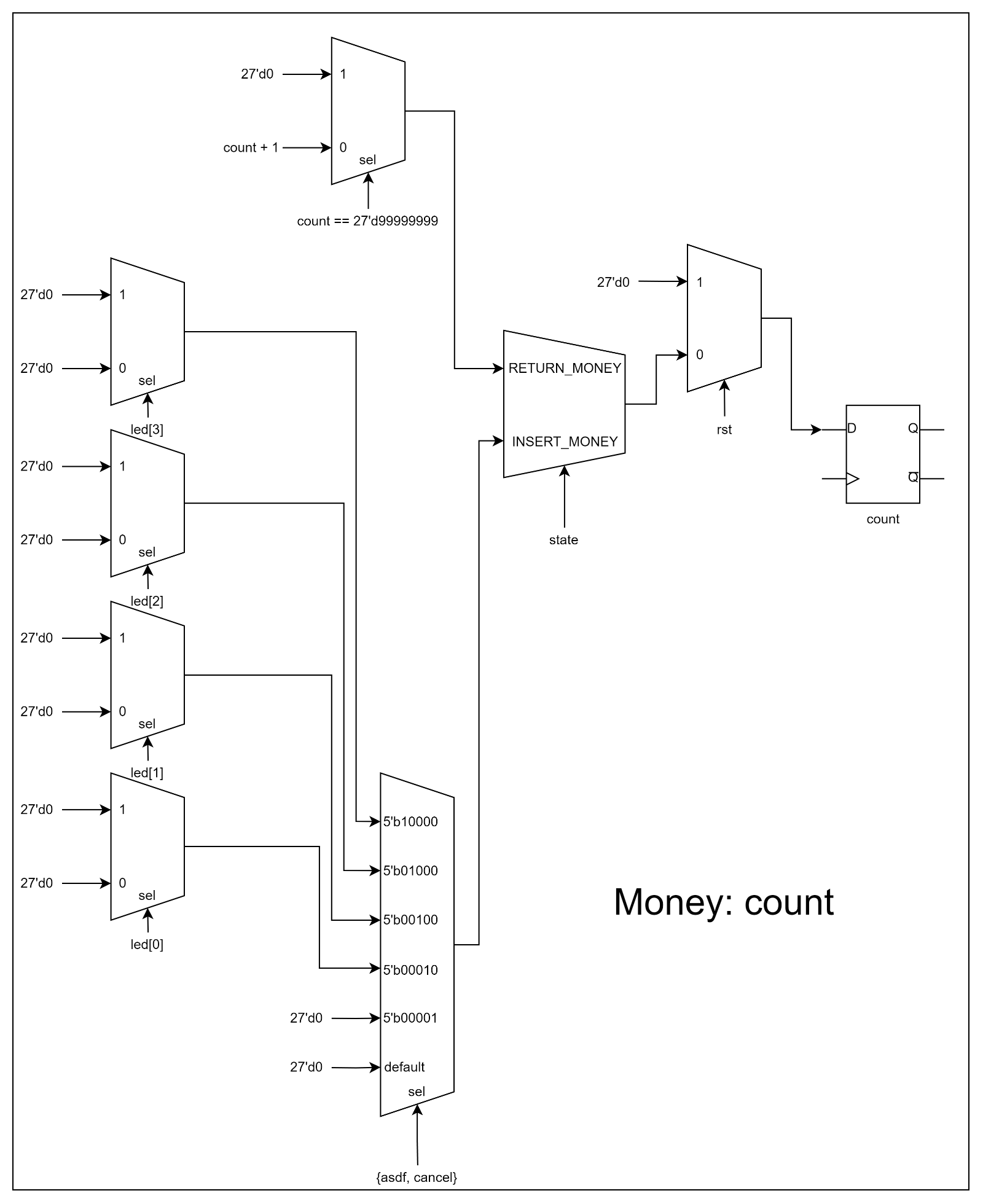


Figure 2.7

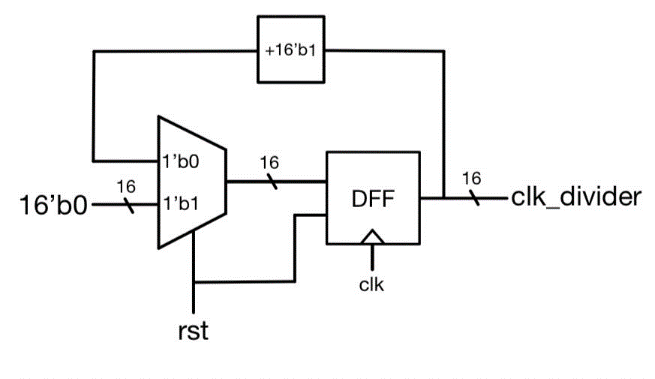
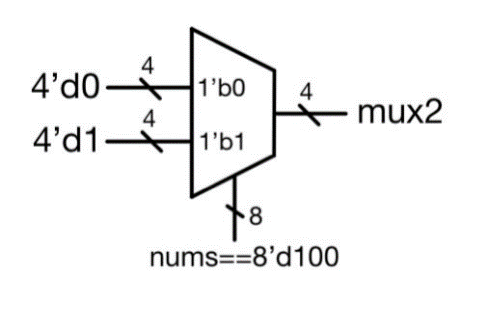


Figure 2.9

Figure 2.8

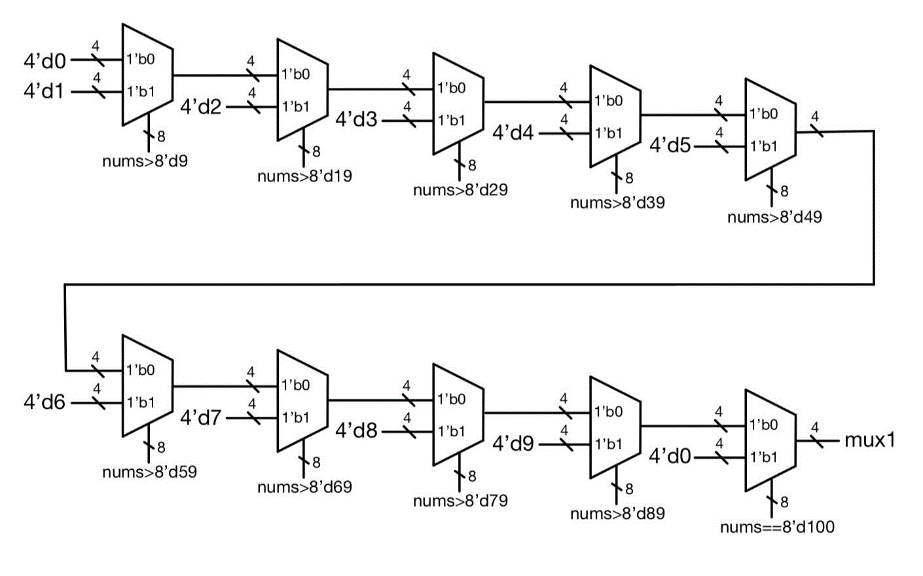
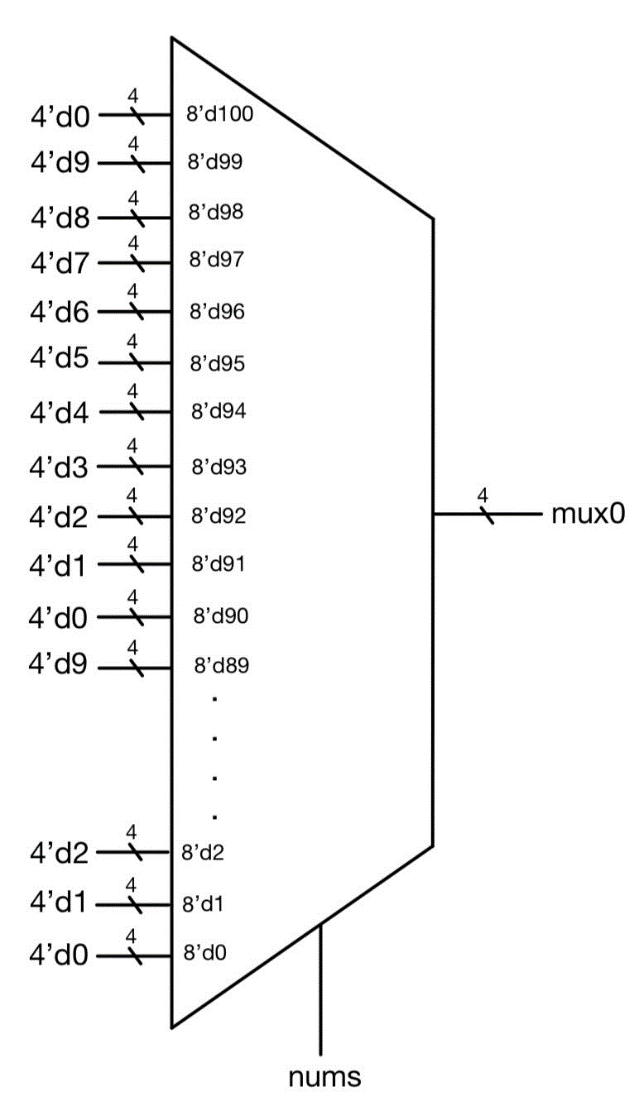


Figure 2.10

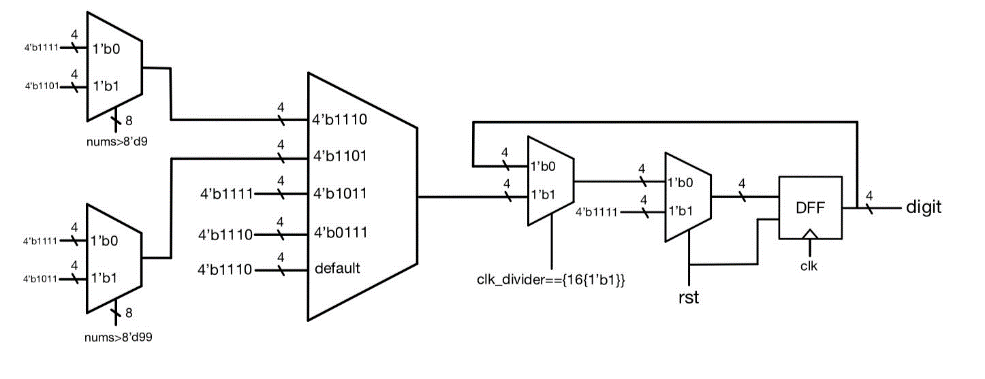
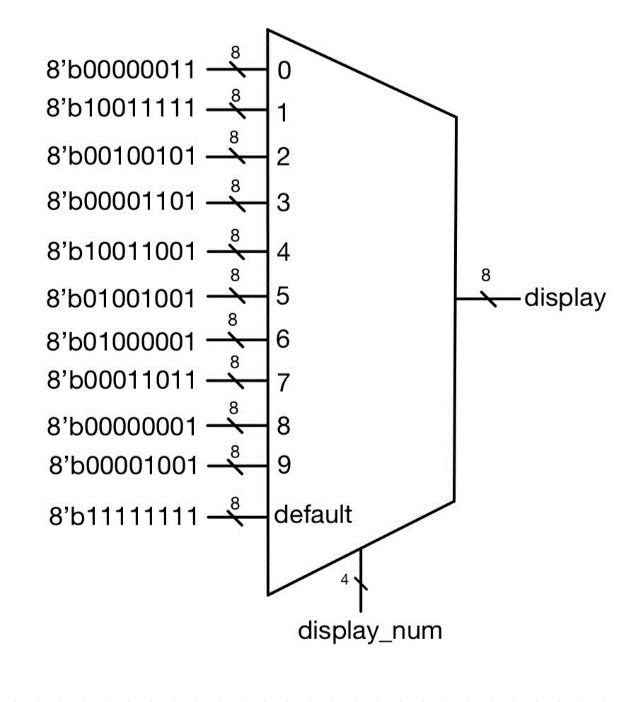


Figure 2.11

Figure 2.12



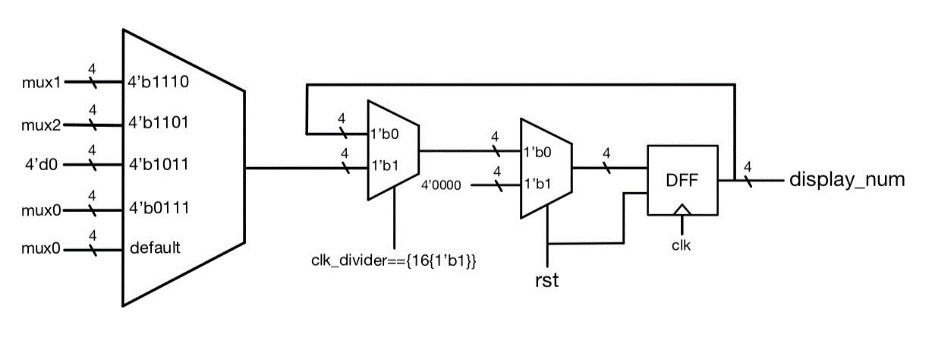


Figure 2.13

Figure 2.14

1. **Explanation**