EP1 - MAC0329

Integrantes:

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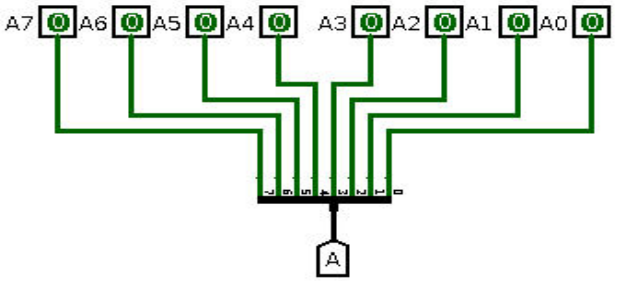
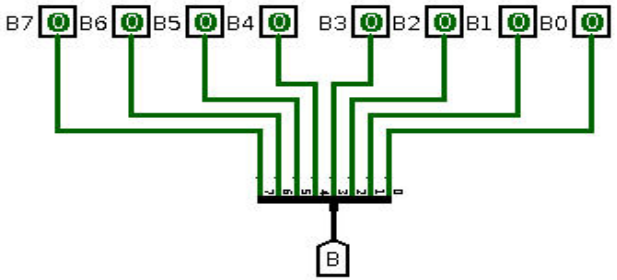
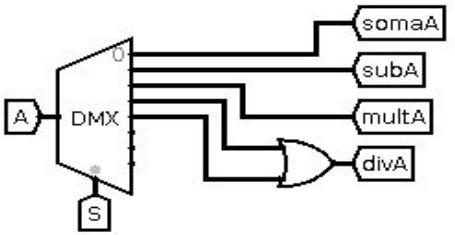
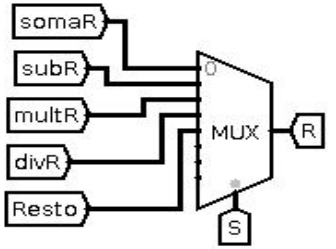
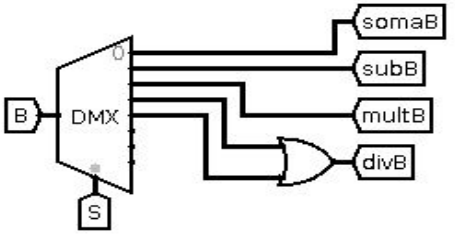
ULA

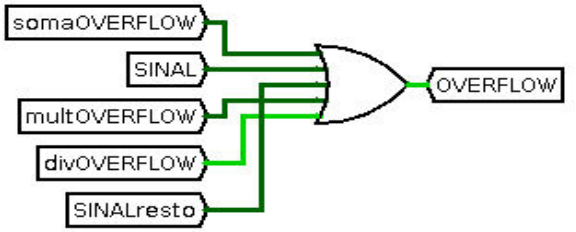




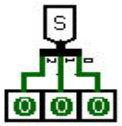




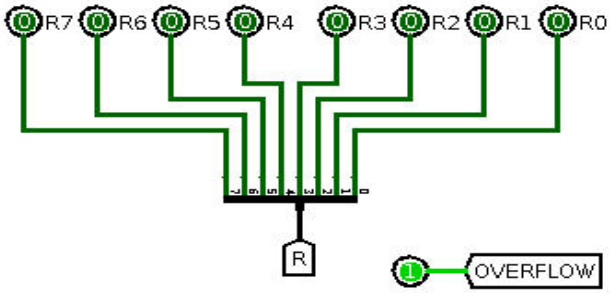




SELECAO da OPERACAO

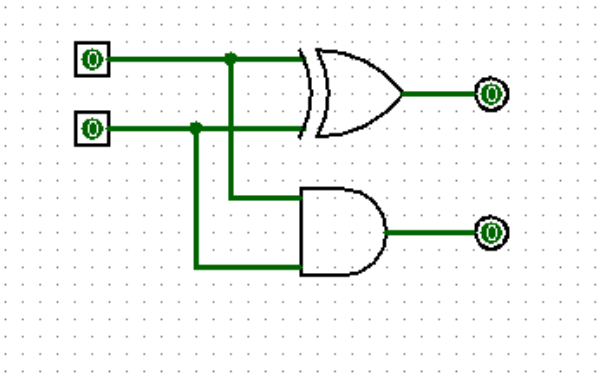


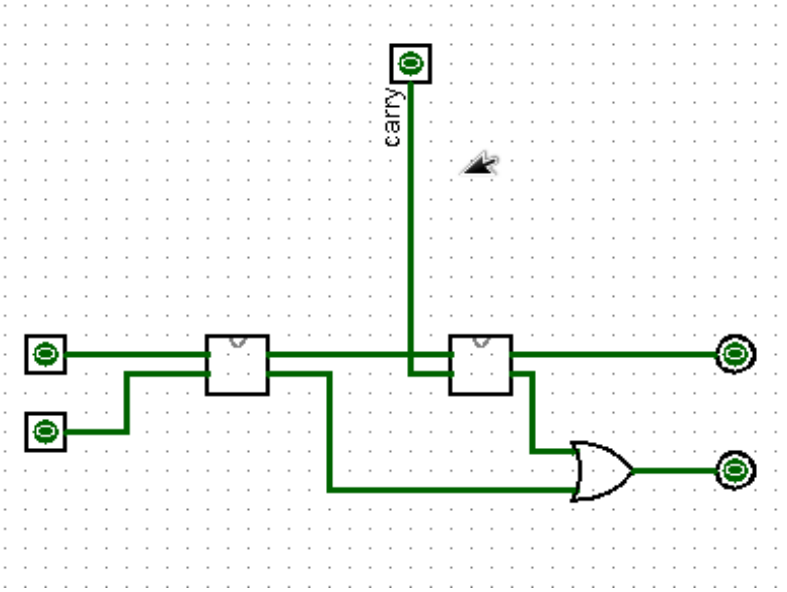
000 - SOMA
001 - SUBTRACAO
010 - MULTIPLICACAO
011 - DIVISAO
100 - RESTO



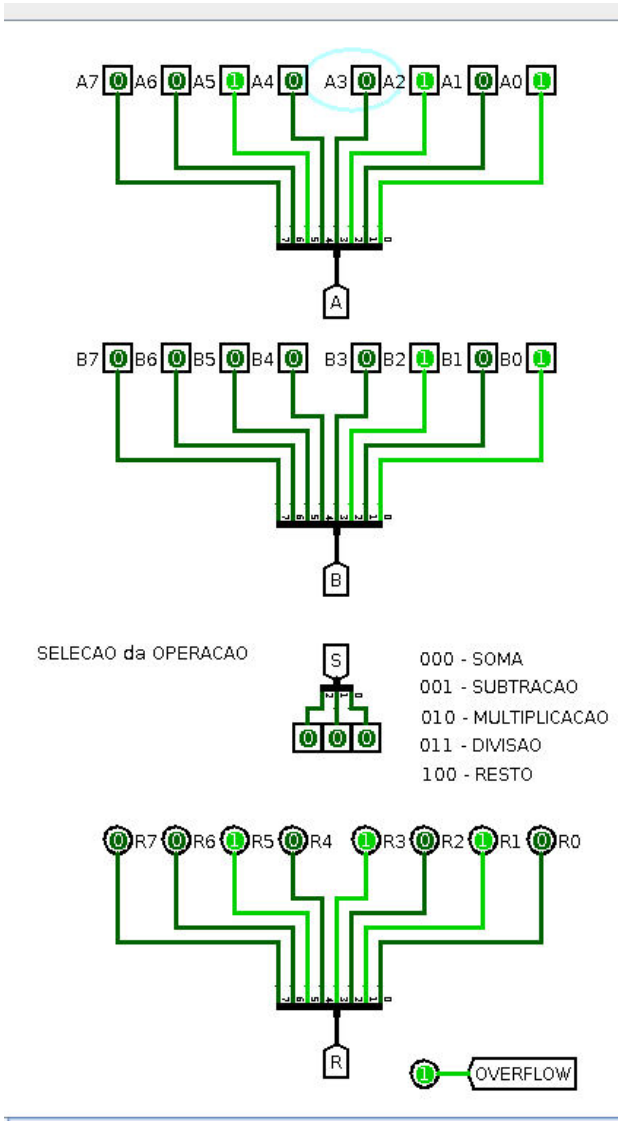
Soma

- Half-Adder : soma de 2 bits;
- Full-Adder: soma de 2 bits considerando o carry-in;
- Somador-8bit : junção de 8 Full-Adders.



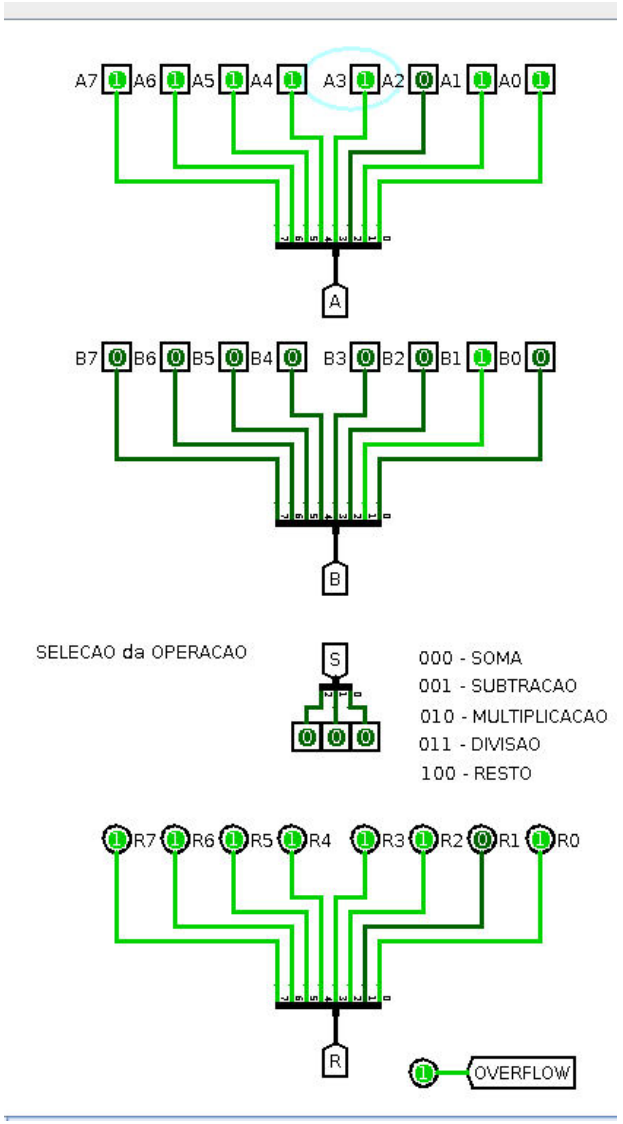


Exemplo 1



A: 0010 0101 = 37
B: 0000 0101 = 5
A + B = 37 + 5 = 42 = 0010 1010

Exemplo 2

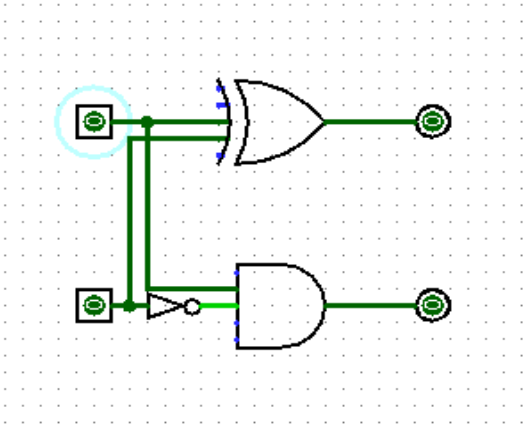


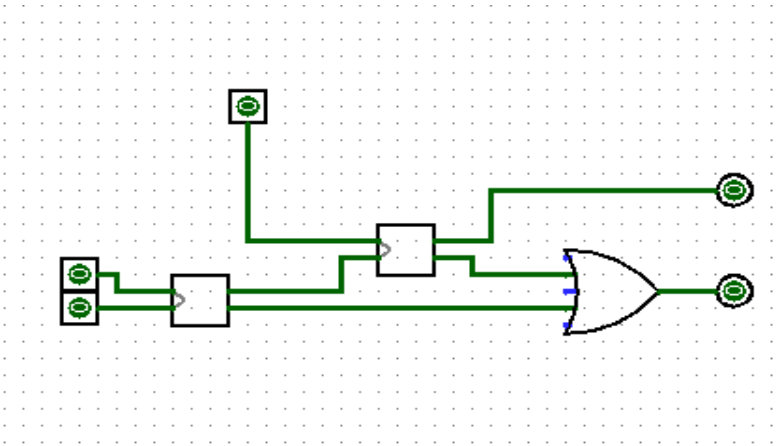
A: 1111 1011 = - 5
B: 0000 0010 = 2

A + B = - 5 + 2 = -3 = 1111 1101

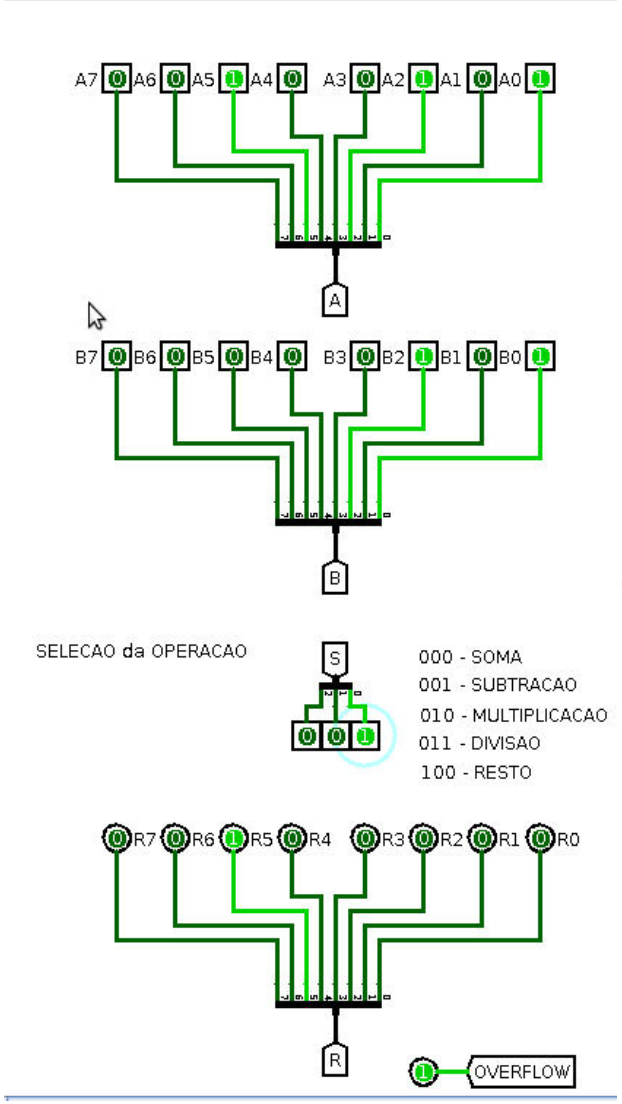
Subtração

- Half-Subtractor : subtração de 2 bits;
- Full-Subtractor : subtrai 2 bits considerando o carry-in;
- Subtrator-8bit : junção de 8 Full-Subtractors.



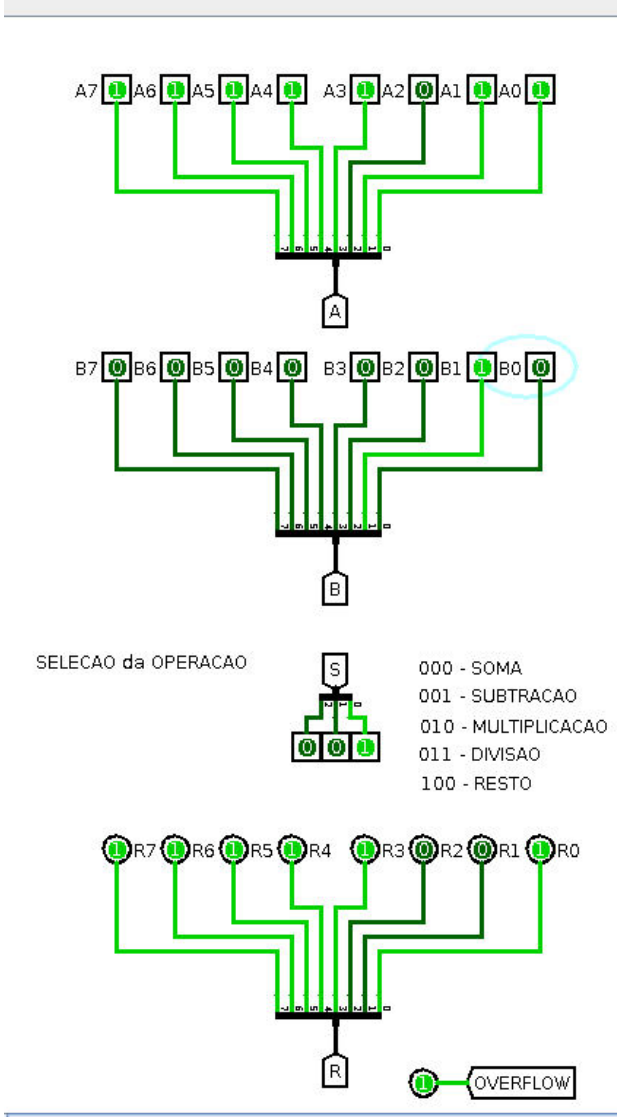


Exemplo 1



A: 0010 0101 = 37
B: 0000 0101 = 5
A - B = 37 - 5 = 32 = 0010 0000

Exemplo 2

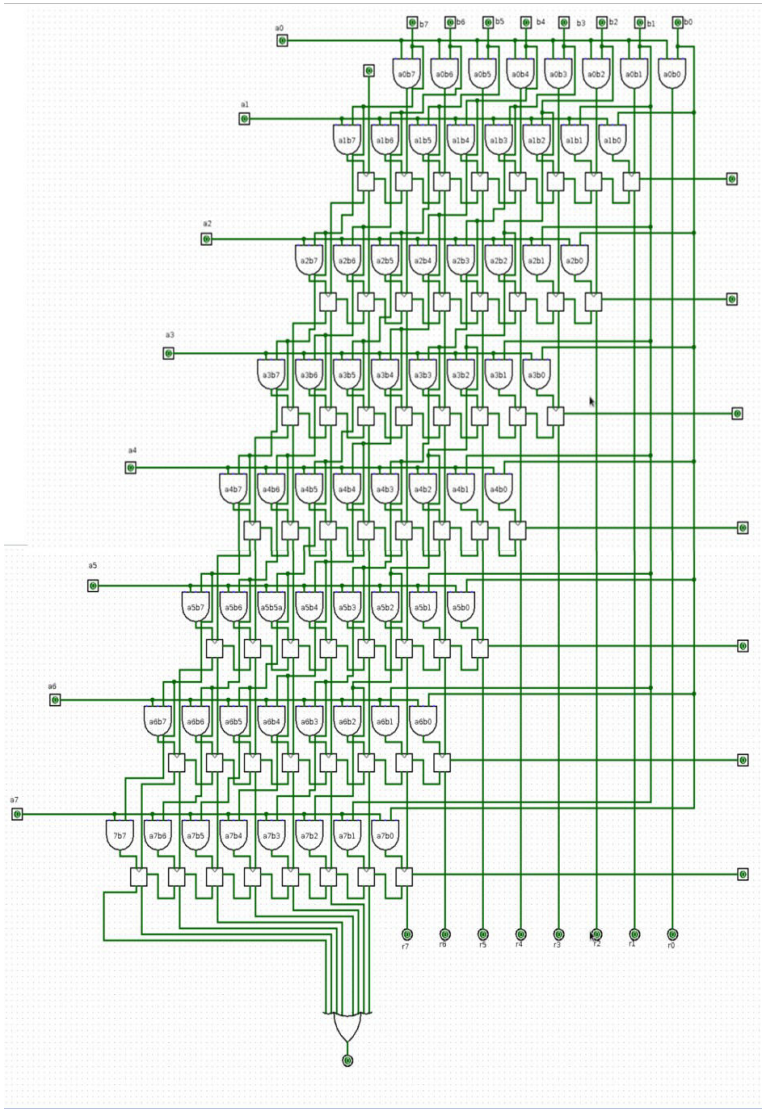


A: 1111 1011 = - 5
B: 0000 0010 = 2

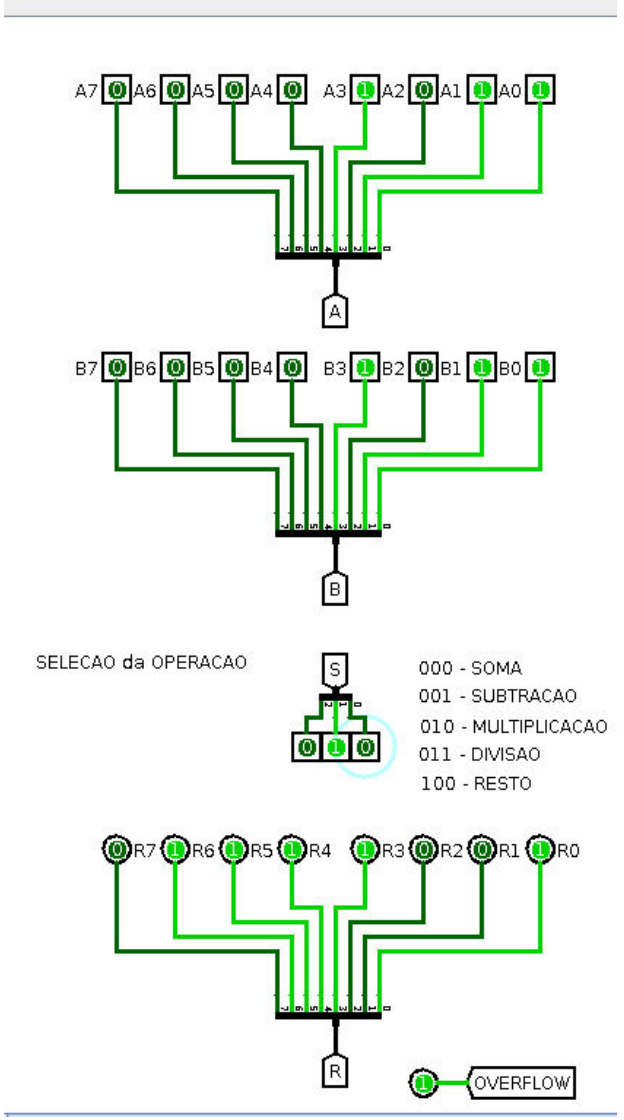
A + B = - 5 - 2 = - 7 = 1111 1001

Multiplicação

- Funciona como simular o algoritmo no papel;
- Mltiplicação de algarismos é feita usando uma porta lógica AND;
- Soma é feita usando o Full-Adder;
- Overflow é obtido colocando os 8 bits mais significativos numa porta OR.

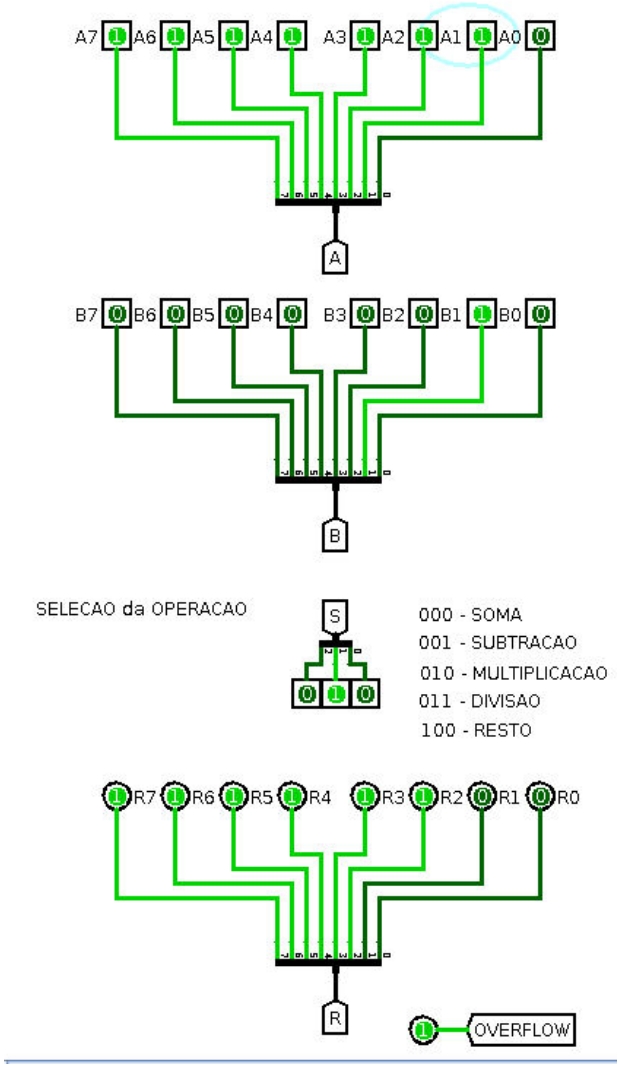


Exemplo 1



A: 0000 1011 = 11
B: 0000 1011 = 11
A * B = 11 * 11 = 121 = 01111001

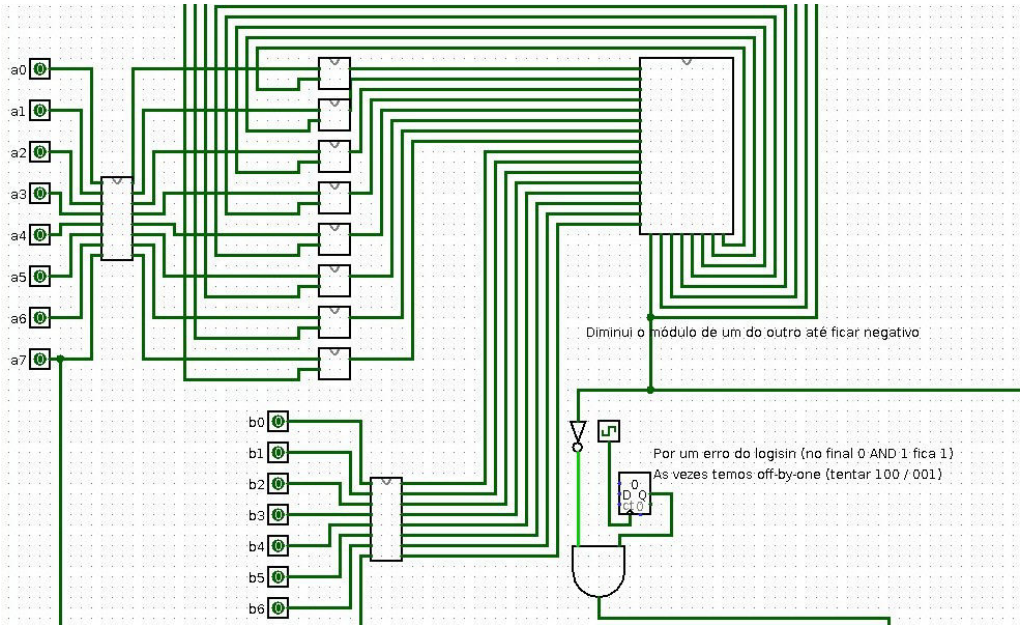
Exemplo 2



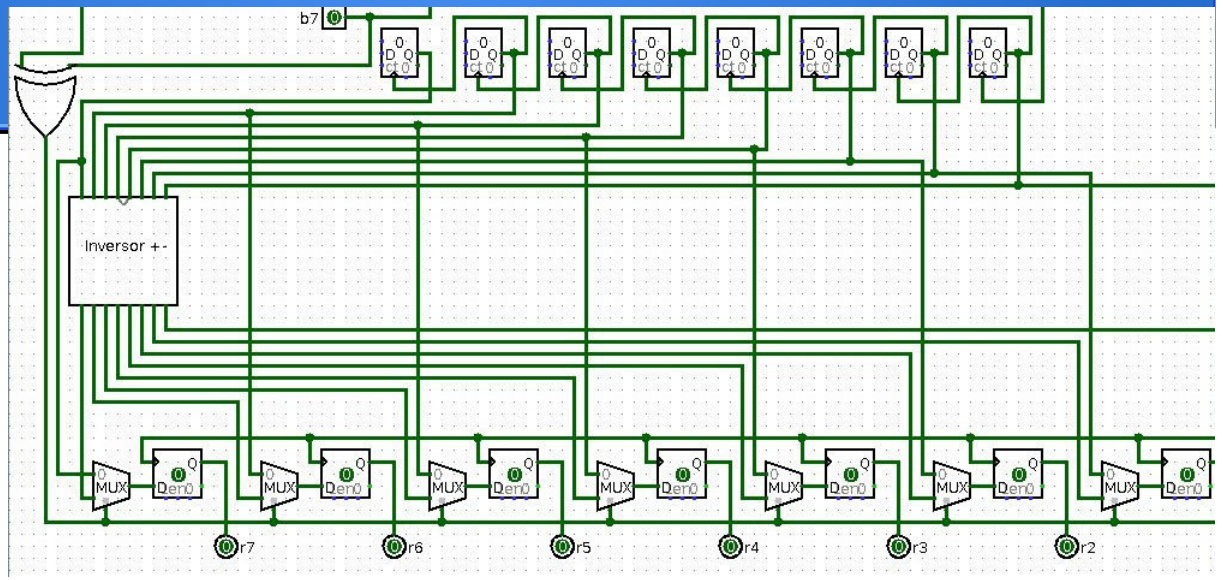
A: 1111 1110 = - 2
B: 0000 0010 = 2

A * B = - 2 * 2 = - 4 = 1111 1100

Algoritmo de Divisão



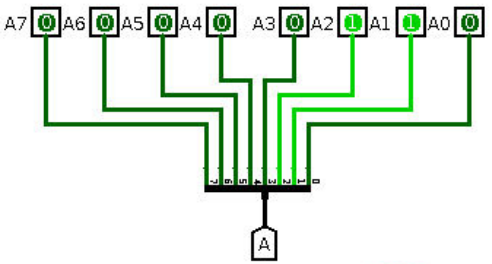
- Algoritmo iterativo (restoring division)
- Particular-> Geral
- Abstração
  - Retroatividade
  - Sinal
  - Aproveitamento de estruturas prontas
- Off-by-one

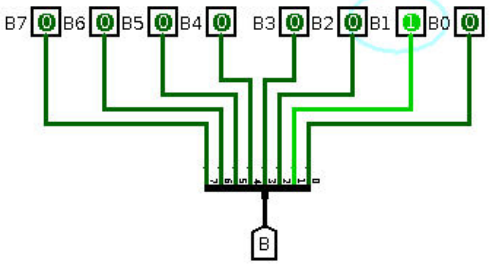


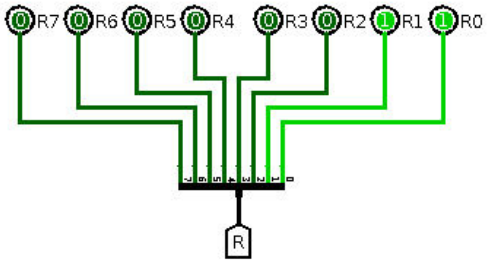
- Flip-flops
- Selecionador de sinal (NAND + Multiplexer)

Prós	Contras
• Abstração • Elegância do código • Simplicidade	• Controle • Demora • Imprevisibilidade

Exemplo

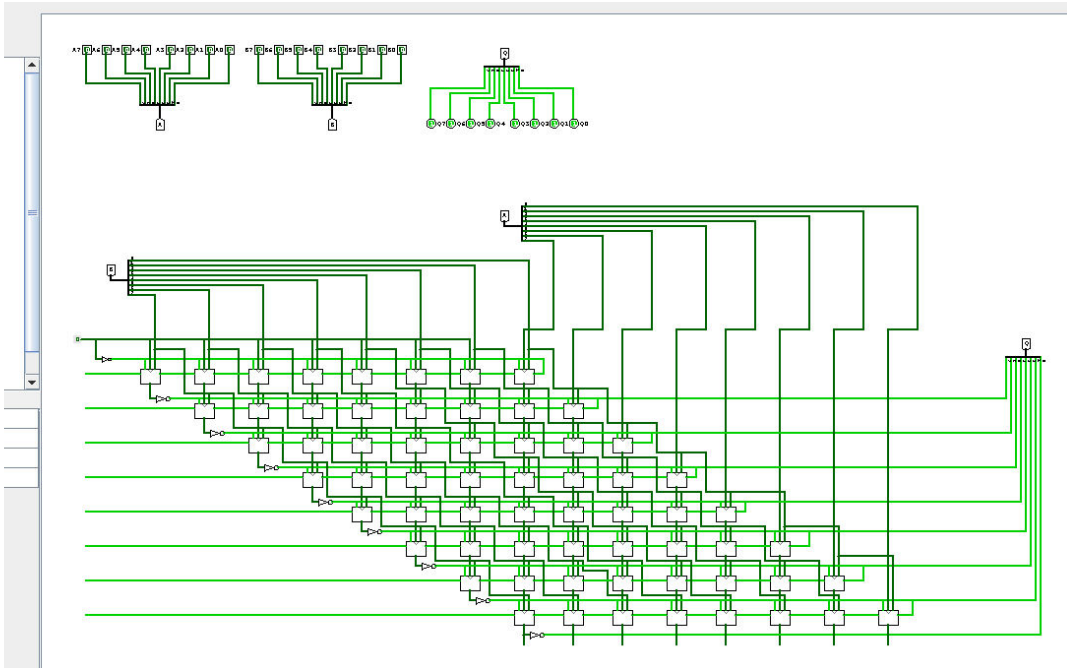






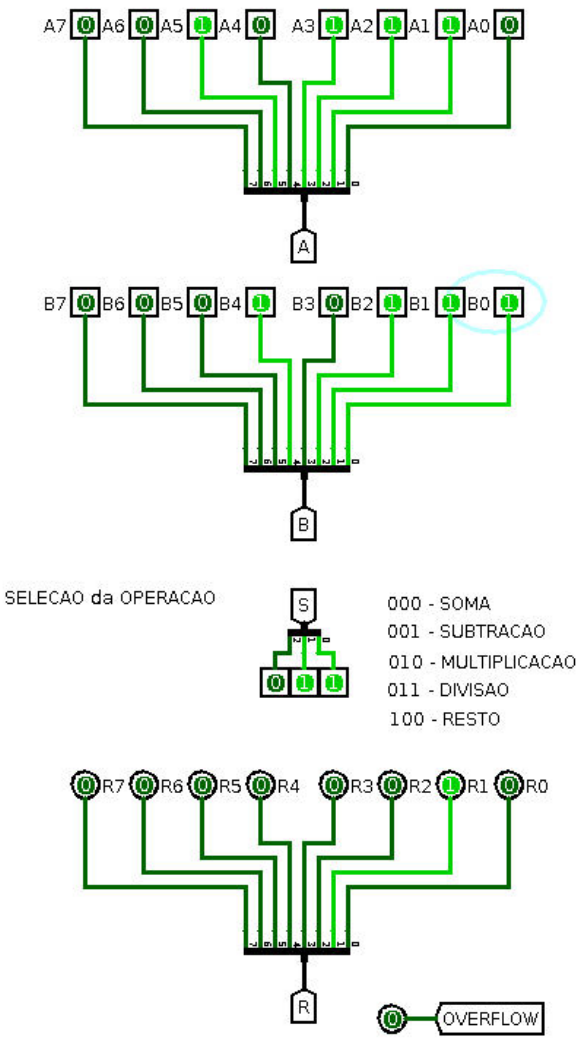
A: 0000 0110 = 6
B: 0000 0010 = 2
A / B = 6 / 2 = 3 = 0000 0011

Divisão – divisor paralelo



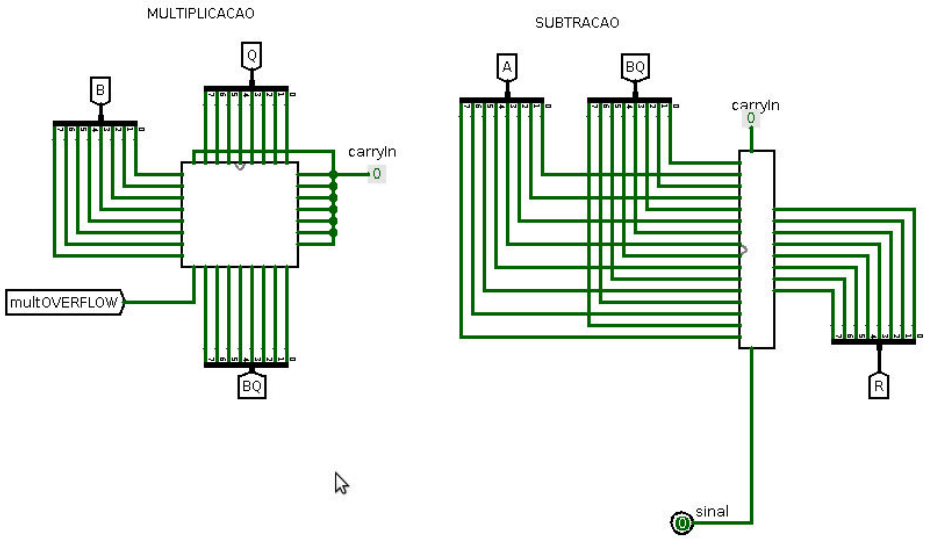
- Divisão unsigned
- Não iterativo
- Baseado no algoritmo non-restoring division

Exemplo



A: 0010 1110 = 46
B: 0001 0111 = 23
A / B = 46 / 23 = 2 = 0000 0010

Resto



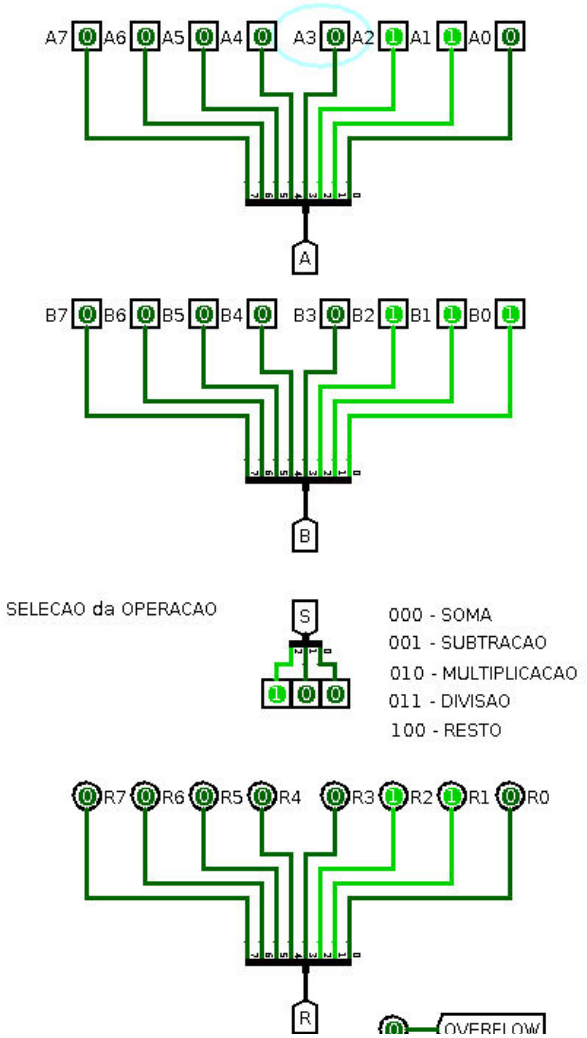
- Algoritmo:

  D = (d * q) + r

  Nosso caso:

  R = A - (B * Q)

Exemplo



A: 0000 0110 = 6
B: 0000 0111 = 7
A % B = 6 % 7 = 6 = 0000 0110