



Aula 6

CODIFICADOR/DECODIFICADOR BINÁRIO ↔ DECIMAL

Projeto de Ensino

Material didático para lógica digital I: circuitos combinacionais

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Codificador “Decimal → Binário”

- No codificador “Decimal → Binário” serão utilizadas 10 entradas, cada uma representando um dígito entre 0 e 9.
- As saídas representam o código BCD 8421.

Decimal	A	B	C	D
e0	0	0	0	0
e1	0	0	0	1
e2	0	0	1	0
e3	0	0	1	1
e4	0	1	0	0
e5	0	1	0	1
e6	0	1	1	0
e7	0	1	1	1
e8	1	0	0	0
e9	1	0	0	1

Codificador “Decimal \rightarrow Binário” – Circuito combinacional

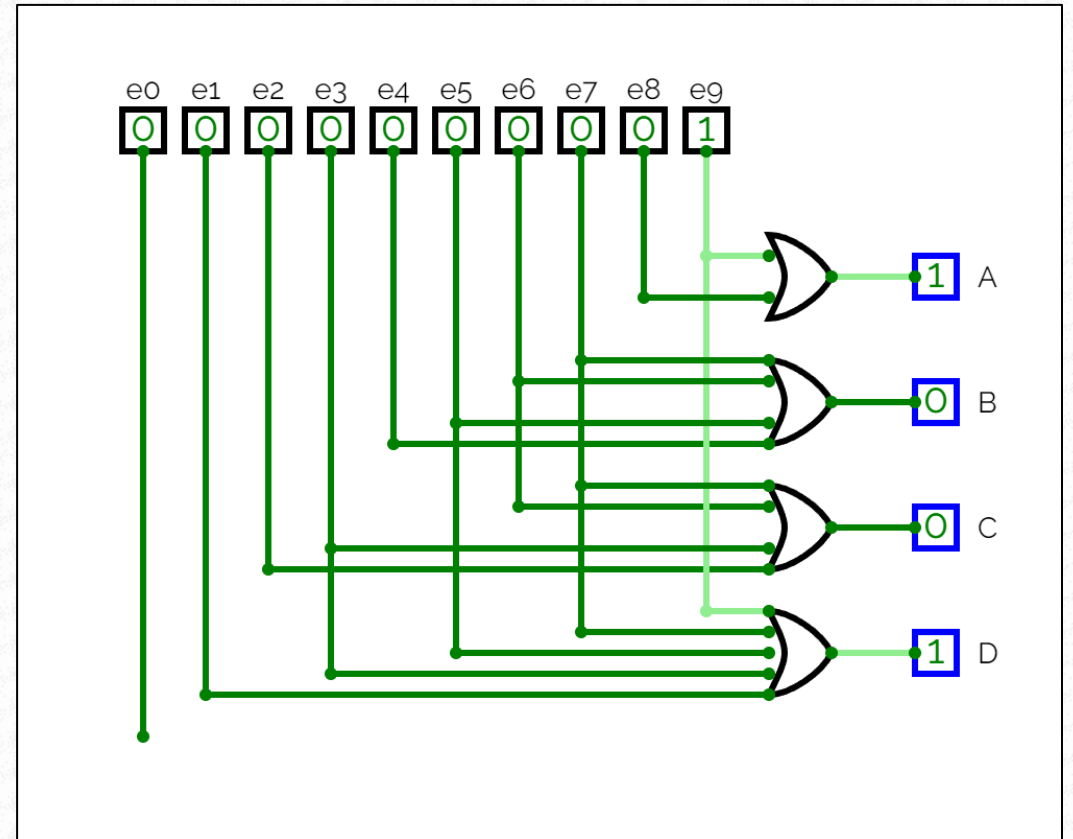
- Através da tabela verdade é possível obter facilmente as expressões mínimas de cada saída.

- $A = e8 + e9$
- $B = e4 + e5 + e6 + e7$
- $C = e2 + e3 + e6 + e7$
- $D = e1 + e3 + e5 + e7 + e9$

Decimal	A	B	C	D
e0	0	0	0	0
e1	0	0	0	1
e2	0	0	1	0
e3	0	0	1	1
e4	0	1	0	0
e5	0	1	0	1
e6	0	1	1	0
e7	0	1	1	1
e8	1	0	0	0
e9	1	0	0	1

Codificador “Decimal \rightarrow Binário” – Simulação

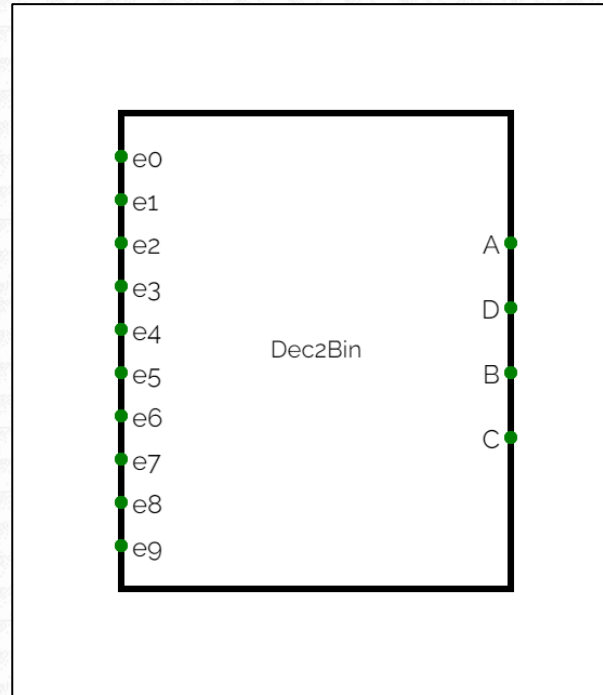
- $A = e8 + e9$
 - $B = e4 + e5 + e6 + e7$
 - $C = e2 + e3 + e6 + e7$
 - $D = e1 + e3 + e5 + e7 + e9$
- O circuito foi então simulado no CircuitVerse.



- Disponível em: <https://circuitverse.org/users/166835/projects/decimal-binario>

Codificador “Decimal → Binário” – Simulação

- Abaixo o circuito encapsulado.



- Disponível em: <https://circuitverse.org/users/166835/projects/decimal-binario>

Decodificador “Binário → Decimal”

- Para o codificador “Binário → Decimal” será feita a correspondência entre o código BCD 8421 e o código 9876543210. Ambos abordados na “Aula 05”.
- A seguir a tabela verdade que relaciona esses dois códigos:

Decodificador “Binário → Decimal”

A	B	C	D	S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0	0	0
0	0	1	1	0	0	0	1	0	0	0	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0	0
0	1	1	1	0	0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0	0	1	0
1	0	0	1	0	0	0	0	0	0	0	0	0	1

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

- Para esse circuito existem 4 entradas (A, B, C e D) e 10 saídas.
- A seguir serão feitas as deduções das expressões mínimas para cada saída.
- Como o mapa de Karnaugh para 4 entradas possui 16 casas, casos que não estão explícitos na tabela verdade serão preenchidos com X e podem ser agrupados de acordo a conveniência.

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S0
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S0		\bar{C}		C	
\bar{A}	1	0	0	0	\bar{B}
	0	0	0	0	B
A	X	X	X	X	B
	0	0	X	X	\bar{B}
		\bar{D}	D	\bar{D}	

A	B	C	D	S0
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário → Decimal” – Circuito Combinacional

S0

	\bar{C}		C	
\bar{A}	1	0	0	0
A	0	0	0	0
	X	X	X	X
	0	0	X	X
	\bar{D}	D	\bar{D}	

\bar{B}
B
 \bar{B}

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	
2	
3	
4	
5	
6	
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S1
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S1		\bar{C}		C	
\bar{A}	0	1	0	0	\bar{B}
	0	0	0	0	B
A	X	X	X	X	B
	0	0	X	X	\bar{B}
		\bar{D}	D	\bar{D}	

A	B	C	D	S1
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S1

	\bar{C}		C	
\bar{A}	0	1	0	0
A	0	0	0	0
	X	X	X	X
	0	0	X	X
	\bar{D}	D	\bar{D}	

\bar{B}
B
 \bar{B}

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	
3	
4	
5	
6	
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S2
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S2		\bar{C}		C	
\bar{A}	0	0	0	1	\bar{B}
	0	0	0	0	B
A	X	X	X	X	
	0	0	X	X	\bar{B}
		\bar{D}	D	\bar{D}	

A	B	C	D	S2
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S2

	\bar{C}		C	
\bar{A}	0	0	0	1
	0	0	0	0
A	X	X	X	X
	0	0	X	X
	\bar{D}	D	\bar{D}	

Diagram illustrating a 4-variable Karnaugh map for a binary-to-decimal decoder. The map is a 4x4 grid with variables A , B , C , and D . The top row is labeled \bar{A} and the bottom row is labeled A . The left column is labeled \bar{D} and the right column is labeled D . The top two columns are labeled \bar{C} and C . The rightmost column is labeled \bar{B} and the leftmost column is labeled B . The map shows the output for each combination of inputs. The output is 1 for the combination $\bar{A}\bar{B}\bar{C}D$ (top-right cell) and 0 for all other combinations. The output is X for the combinations $\bar{A}BCD$, $A\bar{B}\bar{C}D$, $A\bar{B}CD$, $AB\bar{C}D$, $ABC\bar{D}$, $ABCD$, $\bar{A}BC\bar{D}$, and $A\bar{B}C\bar{D}$ (bottom-right cell). The output is 0 for the combinations $\bar{A}\bar{B}\bar{C}\bar{D}$, $\bar{A}\bar{B}C\bar{D}$, $\bar{A}B\bar{C}\bar{D}$, $\bar{A}BC\bar{D}$, $A\bar{B}\bar{C}\bar{D}$, $A\bar{B}C\bar{D}$, $AB\bar{C}\bar{D}$, and $ABC\bar{D}$ (bottom-left cell).

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{A}\bar{B}C\bar{D}$
3	
4	
5	
6	
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S3
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S3

	\bar{C}		C	
\bar{A}	0	0	1	0
A	0	0	0	0
	X	X	X	X
	0	0	X	X
	\bar{D}	D	\bar{D}	
				\bar{B}
				B

A	B	C	D	S3
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S3

	\bar{C}		C	
\bar{A}	0	0	1	0
A	0	0	0	0
	X	X	X	X
	0	0	X	X
	\bar{D}	D	\bar{D}	
				\bar{B}
				B
				\bar{B}

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	
5	
6	
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}C\bar{D}$	$\bar{A}\bar{B}CD$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BC\bar{D}$	$\bar{A}BCD$	
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABC\bar{D}$	$ABCD$	B
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}C\bar{D}$	$A\bar{B}CD$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S4
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S4		\bar{C}		C	
\bar{A}	0	0	0	0	\bar{B}
	1	0	0	0	B
A	X	X	X	X	B
	0	0	X	X	\bar{B}
		\bar{D}	D	\bar{D}	

A	B	C	D	S4
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S4

	\bar{C}		C	
\bar{A}	0	0	0	0
A	1	0	0	0
	X	X	X	X
	0	0	X	X
	\bar{D}	D	\bar{D}	

\bar{B}
B
 \bar{B}

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	$B\bar{C}\bar{D}$
5	
6	
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}C\bar{D}$	$\bar{A}\bar{B}CD$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BC\bar{D}$	$\bar{A}BCD$	
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABC\bar{D}$	$ABCD$	B
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}C\bar{D}$	$A\bar{B}CD$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S5
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S5

	\bar{C}		C		
\bar{A}	0	0	0	0	\bar{B}
	0	1	0	0	B
A	X	X	X	X	
	0	0	X	X	\bar{B}
	\bar{D}	D	\bar{D}		

A	B	C	D	S5
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S5

	\bar{C}		C		
\bar{A}	0	0	0	0	\bar{B}
	0	1	0	0	B
A	X	X	X	X	
	0	0	X	X	\bar{B}
	\bar{D}	D	\bar{D}		

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	$B\bar{C}\bar{D}$
5	$B\bar{C}D$
6	
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C			
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}	
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$		
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	B	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$		
		\bar{D}	D		\bar{D}		

A	B	C	D	S6
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S6		\bar{C}		C	
\bar{A}	0	0	0	0	\bar{B}
	0	0	0	1	B
A	X	X	X	X	\bar{B}
	0	0	X	X	B
		\bar{D}	D	\bar{D}	

A	B	C	D	S6
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S6

	\bar{C}		C	
\bar{A}	0	0	0	0
A	0	0	0	1
	X	X	X	X
	0	0	X	X
	\bar{D}		D	\bar{D}

\bar{B}
 B
 \bar{B}

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	$B\bar{C}\bar{D}$
5	$B\bar{C}D$
6	$BC\bar{D}$
7	
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}C\bar{D}$	$\bar{A}\bar{B}CD$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BC\bar{D}$	$\bar{A}BCD$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABC\bar{D}$	$ABCD$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}C\bar{D}$	$A\bar{B}CD$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S7
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S7		\bar{C}		C		
\bar{A}		0	0	0	0	\bar{B}
		0	0	1	0	B
A		X	X	X	X	
		0	0	X	X	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S7
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S7

	\bar{C}		C		
\bar{A}	0	0	0	0	\bar{B}
	0	0	1	0	B
A	X	X	X	X	
	0	0	X	X	\bar{B}
	\bar{D}	D	\bar{D}		

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	$B\bar{C}\bar{D}$
5	$B\bar{C}D$
6	$BC\bar{D}$
7	BCD
8	
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S8
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S8

	\bar{C}		C	
\bar{A}	0	0	0	0
A	0	0	0	0
	X	X	X	X
	1	0	X	X
	\bar{D}	D	\bar{D}	

Diagram illustrating a 4-to-1 multiplexer configuration for the S8 output. The inputs are \bar{A} and A, and the outputs are \bar{B} and B. The data inputs are 0, 0, X, X for \bar{B} and 1, 0, X, X for B. The select inputs are \bar{D} and D.

A	B	C	D	S8
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S8

	\bar{C}		C	
\bar{A}	0	0	0	0
A	0	0	0	0
	X	X	X	X
	1	0	X	X
	\bar{D}	D	\bar{D}	

Diagram illustrating a 4-variable Karnaugh map for the decoder output S8. The map is a 4x4 grid with variables \bar{A} , A, \bar{C} , C, \bar{D} , and D. The output S8 is 1 for the following minterms: $\bar{A}\bar{B}\bar{C}\bar{D}$, $\bar{A}\bar{B}C\bar{D}$, $\bar{A}B\bar{C}\bar{D}$, $\bar{A}BC\bar{D}$, $A\bar{B}\bar{C}\bar{D}$, $A\bar{B}C\bar{D}$, $AB\bar{C}\bar{D}$, and $ABC\bar{D}$. The map shows groups of 1s for each output line.

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}C\bar{D}$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	$B\bar{C}\bar{D}$
5	$B\bar{C}D$
6	$BC\bar{D}$
7	BCD
8	$A\bar{D}$
9	

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

		\bar{C}		C		
\bar{A}		$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$	\bar{B}
		$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$	B
A		$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$	
		$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$	\bar{B}
		\bar{D}	D		\bar{D}	

A	B	C	D	S9
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S9

	\bar{C}		C		
\bar{A}	0	0	0	0	\bar{B}
	0	0	0	0	B
A	X	X	X	X	
	0	1	X	X	\bar{B}
	\bar{D}	D		\bar{D}	

A dashed purple box highlights the cells (A, \bar{C}) = 1, (A, C) = X, (\bar{A} , C) = X, and (\bar{A} , \bar{C}) = 0, which correspond to the minterms $\bar{A}C + A\bar{C}$.

A	B	C	D	S9
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1

Decodificador “Binário \rightarrow Decimal” – Circuito Combinacional

S9

	\bar{C}		C	
\bar{A}	0	0	0	0
	0	0	0	0
A	X	X	X	X
	0	1	X	X
	\bar{D}	D	\bar{D}	

Diagram illustrating a 4-variable Karnaugh map for the decoder output. The map shows the relationship between inputs A, B, C, D and their complements. The output is 1 for the minterms corresponding to decimal values 2, 3, 6, and 7, which are grouped by a dashed purple line.

DEC	EXPRESSÃO
0	$\bar{A}\bar{B}\bar{C}\bar{D}$
1	$\bar{A}\bar{B}\bar{C}D$
2	$\bar{B}C\bar{D}$
3	$\bar{B}CD$
4	$B\bar{C}\bar{D}$
5	$B\bar{C}D$
6	$BC\bar{D}$
7	BCD
8	$A\bar{D}$
9	AD

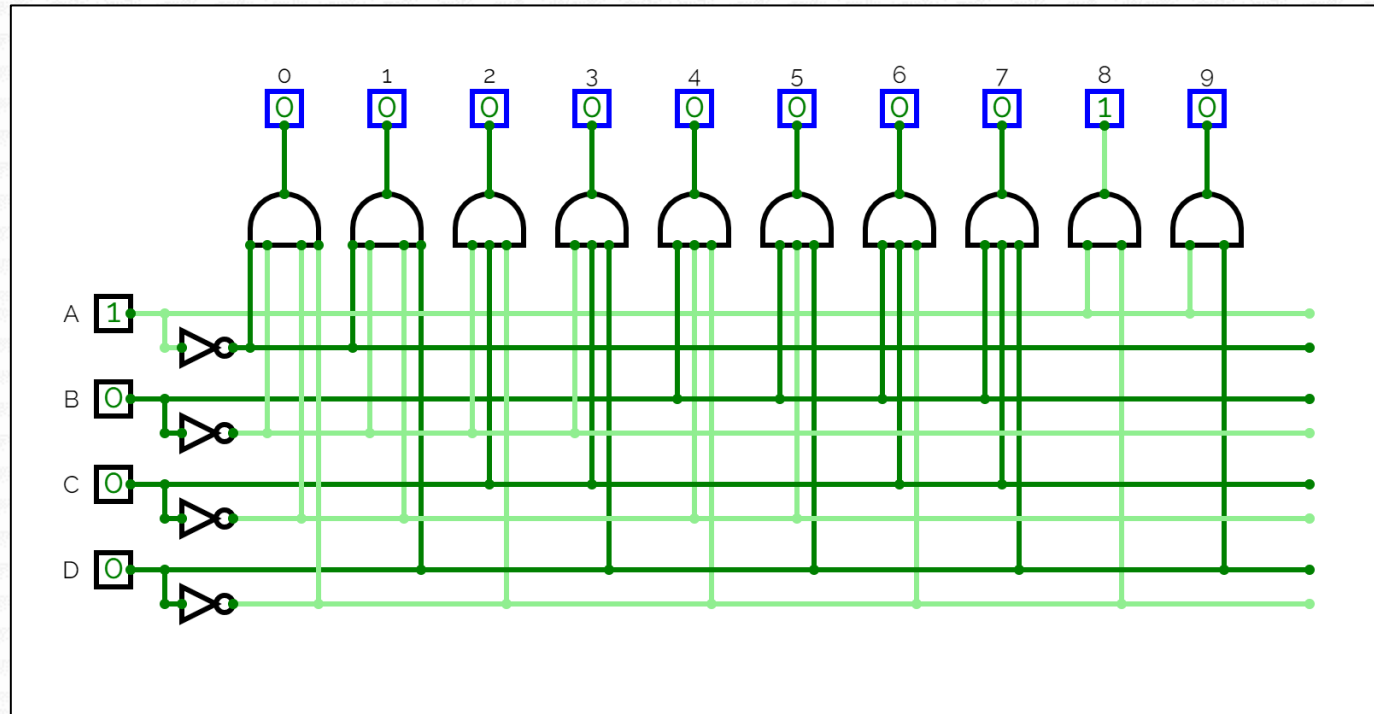
Decodificador “Binário → Decimal” – Circuito Combinacional

- Por fim temos a tabela ao lado, que relaciona as expressões mínimas para cada número de 0 à 9 em decimal.
- Com isso é possível simular o circuito usando portas lógicas.

DEC	EXPRESSÃO
0	$\overline{A}\overline{B}\overline{C}\overline{D}$
1	$\overline{A}\overline{B}\overline{C}D$
2	$\overline{B}C\overline{D}$
3	$\overline{B}CD$
4	$B\overline{C}\overline{D}$
5	$B\overline{C}D$
6	$BC\overline{D}$
7	BCD
8	$A\overline{D}$
9	AD

Decodificador “Binário \rightarrow Decimal” – Simulação

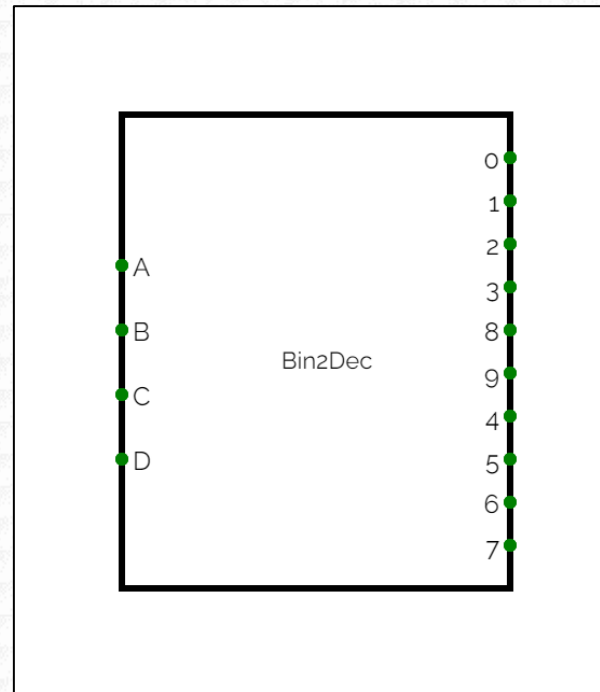
- Abaixo o circuito para o “Decodificador binário \rightarrow decimal”.



- Disponível em: <https://circuitverse.org/users/166835/projects/decimal-binario>

Decodificador “Binário → Decimal” – Simulação

- Em versão componentizada:



- Disponível em: <https://circuitverse.org/users/166835/projects/decimal-binario>

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