

Enable, Gate, and Strobe Inputs

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Often they are called **gate**, **strobe**, or **enable**.

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When using a device for the first time, there may be “extra” inputs,

i.e. pins which you aren’t sure how to use.

Often they are called **gate**, **strobe**, or **enable**.

There may be more than one of them.

Here's a simple example:

ENABLE	SELECT	A	B	OUTPUT Y
1	X	X	X	0
0	0	0	X	0
0	0	1	X	1
0	1	X	0	0
0	1	X	1	1

Here's a simple example:

ENABLE	SELECT	A	B	OUTPUT Y
1	X	X	X	0
0	0	0	X	0
0	0	1	X	1
0	1	X	0	0
0	1	X	1	1

Note the row that has 'X' in all of the input columns except 1.

Here's a simple example:

ENABLE	SELECT	A	B	OUTPUT Y
1	X	X	X	0
0	0	0	X	0
0	0	1	X	1
0	1	X	0	0
0	1	X	1	1

This column doesn't have an equal number of ones and zeros.

Here's a simple example:

ENABLE	SELECT	A	B	OUTPUT Y
1	X	X	X	0
0	0	0	X	0
0	0	1	X	1
0	1	X	0	0
0	1	X	1	1

When the **ENABLE** input is '1', none of the other inputs matter.

Here's a simple example:

ENABLE	SELECT	A	B	OUTPUT Y
1	X	X	X	0
0	0	0	X	0
0	0	1	X	1
0	1	X	0	0
0	1	X	1	1

Normal operation of the chip is when the **ENABLE** input is '0'.

This chip has an input called “**STROBE**”:

		INPUTS								OUTPUTS			
C	B	A	STROBE	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	Y	W
X	X	X	1	X	X	X	X	X	X	X	X	0	1
0	0	0	0	0	X	X	X	X	X	X	X	0	1
0	0	0	0	1	X	X	X	X	X	X	X	1	0
0	0	1	0	X	0	X	X	X	X	X	X	0	1
0	0	1	0	X	1	X	X	X	X	X	X	1	0
0	1	0	0	X	X	0	X	X	X	X	X	0	1
0	1	0	0	X	X	1	X	X	X	X	X	1	0
0	1	1	0	X	X	X	0	X	X	X	X	0	1
0	1	1	0	X	X	X	1	X	X	X	X	1	0
1	0	0	0	X	X	X	X	0	X	X	X	0	1
1	0	0	0	X	X	X	X	1	X	X	X	1	0
1	0	1	0	X	X	X	X	X	0	X	X	0	1
1	0	1	0	X	X	X	X	X	1	X	X	1	0
1	1	0	0	X	X	X	X	X	X	0	X	0	1
1	1	0	0	X	X	X	X	X	X	1	X	1	0
1	1	1	0	X	X	X	X	X	X	X	0	0	1
1	1	1	1	0	X	X	X	X	X	X	1	1	0

This chip has an input called “**STROBE**”:

			INPUTS									OUTPUTS	
C	B	A	STROBE	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	V	W
X	X	X	1	X	X	X	X	X	X	X	X	0	1
0	0	0	0	X	X	X	X	X	X	X	X	0	1
0	0	0	1	X	X	X	X	X	X	X	X	1	0
0	0	1	0	X	0	X	X	X	X	X	X	0	1
0	0	1	1	X	1	X	X	X	X	X	X	1	0
0	1	0	0	X	X	0	X	X	X	X	X	0	1
0	1	0	1	X	1	X	X	X	X	X	X	1	0
0	1	1	0	X	X	0	X	X	X	X	X	0	1
0	1	1	1	X	X	1	X	X	X	X	X	1	0
1	0	0	0	X	X	X	0	X	X	X	X	0	1
1	0	0	1	X	X	X	1	X	X	X	X	1	0
1	0	1	0	X	X	X	X	0	X	X	X	0	1
1	0	1	1	X	X	X	X	1	X	X	X	1	0
1	1	0	0	X	X	X	X	X	0	X	X	0	1
1	1	0	1	X	X	X	X	X	1	X	X	1	0
1	1	1	0	X	X	X	X	X	X	X	X	0	1
1	1	1	1	X	X	X	X	X	X	X	X	1	0

Note the row where **STROBE** is one.

This chip has an input called “**STROBE**”:

			INPUTS							OUTPUTS			
C	B	A	STROBE	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	Y	W
X	X	X	1	X	X	X	X	X	X	X	X	0	1
0	0	0	0	0	X	X	X	X	X	X	X	0	1
0	0	0	0	1	X	X	X	X	X	X	X	1	0
0	0	1	0	X	0	X	X	X	X	X	X	0	1
0	0	1	0	X	1	X	X	X	X	X	X	1	0
0	1	0	0	X	X	0	X	X	X	X	X	0	1
0	1	0	0	X	X	1	X	X	X	X	X	1	0
0	1	1	0	X	X	X	0	X	X	X	X	0	1
0	1	1	0	X	X	X	1	X	X	X	X	1	0
1	0	0	0	X	X	X	X	0	X	X	X	0	1
1	0	0	0	X	X	X	X	1	X	X	X	1	0
1	0	1	0	X	X	X	X	X	0	X	X	0	1
1	0	1	0	X	X	X	X	X	1	X	X	1	0
1	1	0	0	X	X	X	X	X	X	0	X	0	1
1	1	0	0	X	X	X	X	X	X	1	X	1	0
1	1	1	0	X	X	X	X	X	X	X	X	0	1
1	1	1	1	0	X	X	X	X	X	X	X	1	0

STROBE is zero for all of the other rows.

This chip has an input called “**STROBE**”:

			INPUTS								OUTPUTS		
C	B	A	STROBE	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	Y	W
X	X	X	1	X	X	X	X	X	X	X	X	0	1
0	0	0	0	X	X	X	X	X	X	X	X	0	1
0	0	0	1	X	X	X	X	X	X	X	X	1	0
0	0	1	0	X	0	X	X	X	X	X	X	0	1
0	0	1	1	X	1	X	X	X	X	X	X	1	0
0	1	0	0	X	X	0	X	X	X	X	X	0	1
0	1	0	1	X	X	1	X	X	X	X	X	1	0
0	1	1	0	X	X	X	0	X	X	X	X	0	1
0	1	1	1	X	X	1	X	X	X	X	X	1	0
1	0	0	0	X	X	X	0	X	X	X	X	0	1
1	0	0	1	X	X	X	1	X	X	X	X	1	0
1	0	1	0	X	X	X	X	0	X	X	X	0	1
1	0	1	1	X	X	X	X	1	X	X	X	1	0
1	1	0	0	X	X	X	X	X	0	X	X	0	1
1	1	0	1	X	X	X	X	X	1	X	X	1	0
1	1	1	0	X	X	X	X	X	X	X	X	0	1
1	1	1	1	X	X	X	X	X	X	X	X	1	0

For normal operation, set **STROBE** to zero.

This has two inputs, **G1** and **G2**:

INPUTS					OUTPUTS																	
G1	G2	D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
L	L	H	L	L	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
L	L	H	L	L	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
L	L	H	L	H	L	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H
L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H
L	L	H	H	L	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	L	H	H	L	L	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L
L	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Normal operation is when *both* G1 and G2 are low.

Try to spot the input that supersedes others:

CE	DIGIT ADDRESS			WE	OPERATION
	K3	K2	K1		
0	0	0	0	0	Write Digit 1
0	0	0	0	1	Latch Digit 1
0	0	0	1	0	Write Digit 2
0	0	0	1	1	Latch Digit 2
0	0	1	0	0	Write Digit 3
0	0	1	0	1	Latch Digit 3
0	0	1	1	0	Write Digit 4
0	0	1	1	1	Latch Digit 4
0	1	0	0	0	Write Digit 5
0	1	0	0	1	Latch Digit 5
0	1	0	1	0	Write Digit 6
0	1	0	1	1	Latch Digit 6
0	1	1	0	0	Write Null Digit
0	1	1	0	1	Latch Null Digit
0	1	1	1	0	Write Null Digit
0	1	1	1	1	Latch Null Digit
1	X	X	X	X	Disable Writing

Try to spot the input that supersedes others:

CE	DIGIT ADDRESS			WE	OPERATION
	K3	K2	K1		
0	0	0	0	0	Write Digit 1
0	0	0	0	1	Latch Digit 1
0	0	0	1	0	Write Digit 2
0	0	0	1	1	Latch Digit 2
0	0	1	0	0	Write Digit 3
0	0	1	0	1	Latch Digit 3
0	0	1	1	0	Write Digit 4
0	0	1	1	1	Latch Digit 4
0	1	0	0	0	Write Digit 5
0	1	0	0	1	Latch Digit 5
0	1	0	1	0	Write Digit 6
0	1	0	1	1	Latch Digit 6
0	1	1	0	0	Write Null Digit
0	1	1	0	1	Latch Null Digit
0	1	1	1	0	Write Null Digit
0	1	1	1	1	Latch Null Digit
1	X	X	X	X	Disable Writing

When $\overline{\text{CE}}$ is 1, the other inputs don't matter.

Try to spot the input that supersedes others:

CE	DIGIT ADDRESS			WE	OPERATION
	K3	K2	K1		
0	0	0	0	0	Write Digit 1
0	0	0	0	1	Latch Digit 1
0	0	0	1	0	Write Digit 2
0	0	0	1	1	Latch Digit 2
0	0	1	0	0	Write Digit 3
0	0	1	0	1	Latch Digit 3
0	0	1	1	0	Write Digit 4
0	0	1	1	1	Latch Digit 4
0	1	0	0	0	Write Digit 5
0	1	0	0	1	Latch Digit 5
0	1	0	1	0	Write Digit 6
0	1	0	1	1	Latch Digit 6
0	1	1	0	0	Write Null Digit
0	1	1	0	1	Latch Null Digit
0	1	1	1	0	Write Null Digit
0	1	1	1	1	Latch Null Digit
1	X	X	X	X	Disable Writing

For normal operation, $\overline{\text{CE}}$ should be 0.

Try to spot the input that supersedes others:

DIGIT SELECT INPUTS			SELECTED DIGIT
DLE	D1	D0	
L	L	L	Digit 0 (LSD)
L	L	H	Digit 1
L	H	L	Digit 2
L	H	H	Digit 3 (MSD)
H	X	X	Unchanged

Try to spot the input that supersedes others:

DIGIT SELECT INPUTS			SELECTED DIGIT
DLE	D1	D0	
L	L	L	Digit 0 (LSD)
L	L	H	Digit 1
L	H	L	Digit 2
L	H	H	Digit 3 (MSD)
H	X	X	Unchanged

Here's the row to notice.

Try to spot the input that supersedes others:

DIGIT SELECT INPUTS			SELECTED DIGIT
DLE	D1	D0	
L	L	L	Digit 0 (LSD)
L	L	H	Digit 1
L	H	L	Digit 2
L	H	H	Digit 3 (MSD)
H	X	X	Unchanged

DLE needs to be low for normal operation.

Here's one more example:

INPUTS					INTERNAL OUTPUTS		OUTPUT Q_H
SHIFT/ LOAD	CLOCK INHIBIT	CLOCK	SERIAL	PARALLEL	Q_A	Q_B	
				A ... H			
L	X	X	X	a ... h	a	b	h
H	L	L	X	X	Q_{A0}	Q_{B0}	Q_{H0}
H	L	↑	H	X	H	Q_{An}	Q_{Gn}
H	L	↑	L	X	L	Q_{An}	Q_{Gn}
H	H	↑	X	X	Q_{A0}	Q_{B0}	Q_{H0}

Here's one more example:

INPUTS					INTERNAL OUTPUTS		OUTPUT Q_H
SHIFT/ LOAD	CLOCK INHIBIT	CLOCK	SERIAL	PARALLEL	Q_A	Q_B	
				A ... H			
L	X	X	X	a ... h	a	b	h
H	L	L	X	X	Q_{A0}	Q_{B0}	Q_{H0}
H	L	↑	H	X	H	Q_{An}	Q_{Gn}
H	L	↑	L	X	L	Q_{An}	Q_{Gn}
H	H	↑	X	X	Q_{A0}	Q_{B0}	Q_{H0}

This row stands out.

Here's one more example:

SHIFT/ LOAD	INPUTS				INTERNAL OUTPUTS		OUTPUT Q_H
	CLOCK INHIBIT	CLOCK	SERIAL	PARALLEL	Q_A	Q_B	
				A ... H			
L	X	X	X	a ... h	a	b	h
H	L	L	X	X	Q_{A0}	Q_{B0}	Q_{H0}
H	L	↑	H	X	H	Q_{An}	Q_{Gn}
H	L	↑	L	X	L	Q_{An}	Q_{Gn}
H	H	↑	X	X	Q_{A0}	Q_{B0}	Q_{H0}

SHIFT/LOAD should be high for normal operation.

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- ① Look for rows with lots of 'X' (i.e. "Don't care") inputs.
- ② Find the column which has a different value than normal in that row.

Summary

When using a device for the first time, there may be "extra" inputs,

i.e. pins which you aren't sure how to use.

- ① Look for rows with lots of 'X' (i.e. "Don't care") inputs.
- ② Find the column which has a different value than normal in that row.
- ③ Set the associated pin to the value it has for the *rest* of the truth table.

Summary

When using a device for the first time, there may be "extra" inputs,

i.e. pins which you aren't sure how to use.

- ① Look for rows with lots of 'X' (i.e. "Don't care") inputs.
- ② Find the column which has a different value than normal in that row.
- ③ Set the associated pin to the value it has for the *rest* of the truth table.

*Sometimes there may be more than one input like this, as in the example with **G1** and **G2**.*