

ELECTRONICS II

Lecture No.(11)- Semester 2

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Faculty of Science

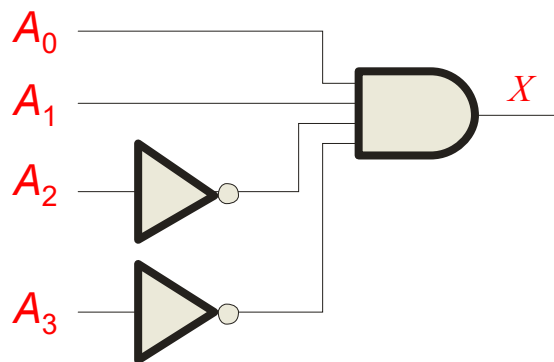
Al-Muthanna University

2018-2019

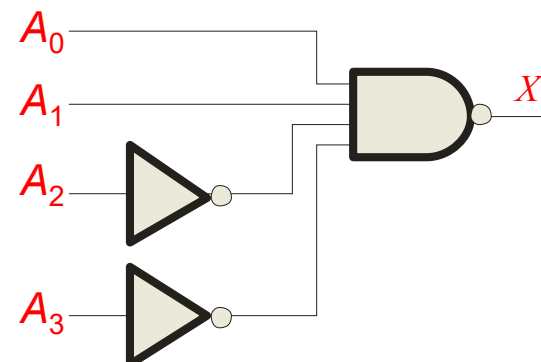
Summary

محلل الشفرة Decoders

A **decoder** is a logic circuit that detects the presence of a specific combination of bits at its input. Two simple decoders that detect the presence of the binary code 0011 are shown. The first has an active HIGH output; the second has an active LOW output.



Active HIGH decoder for 0011



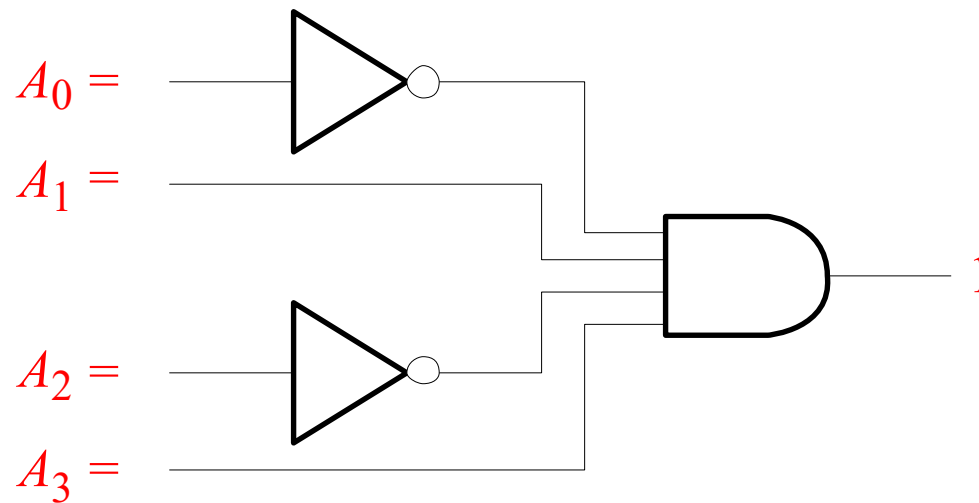
Active LOW decoder for 0011

Summary

Decoders

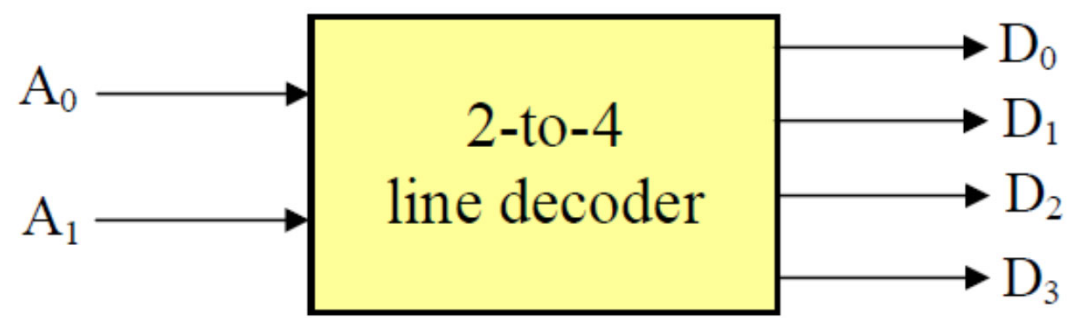
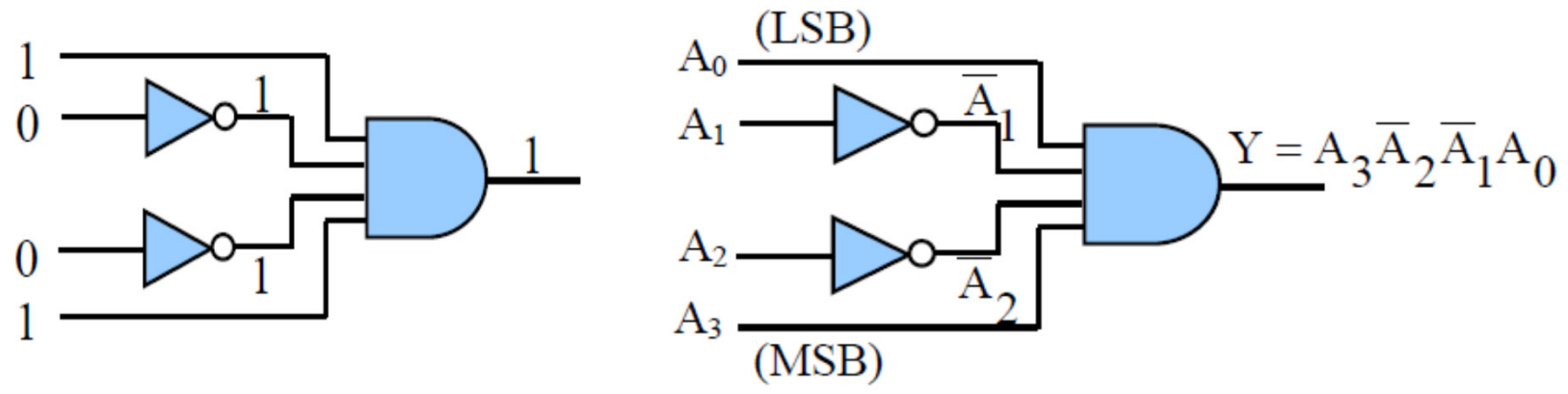
Question

Assume the output of the decoder shown is a logic 1. What are the inputs to the decoder?





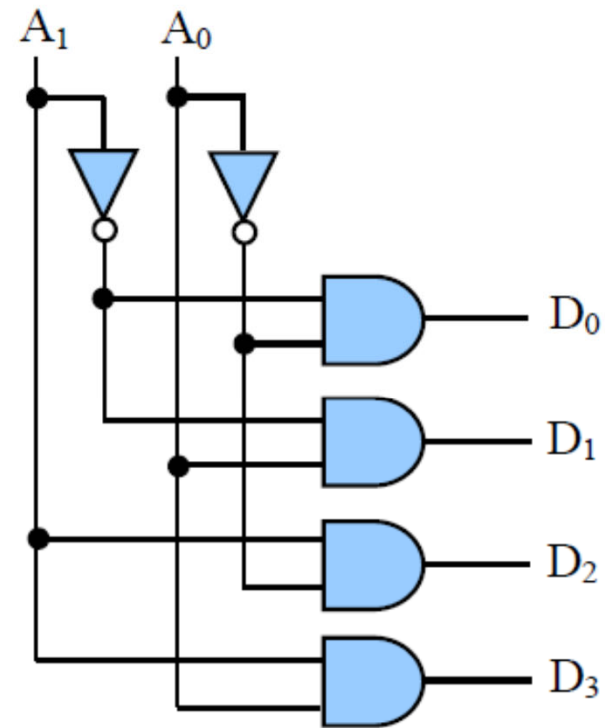
جامعة القادسية





جامعة القادسية

المدخلات		الخرج			
A_1	A_0	D_0	D_1	D_2	D_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1



$$D_0 = \bar{A}_1 \bar{A}_0$$

$$D_1 = \bar{A}_1 A_0$$

$$D_2 = A_1 \bar{A}_0$$

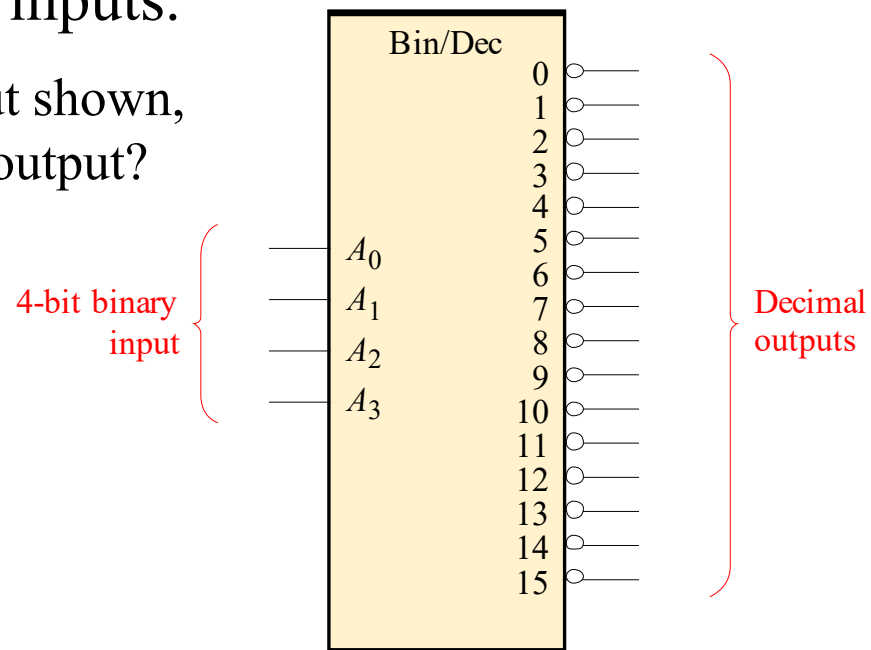
$$D_3 = A_1 A_0$$

Summary

Decoders

IC decoders have multiple outputs to decode any combination of inputs. For example the binary-to-decimal decoder shown here has 16 outputs – one for each combination of binary inputs.

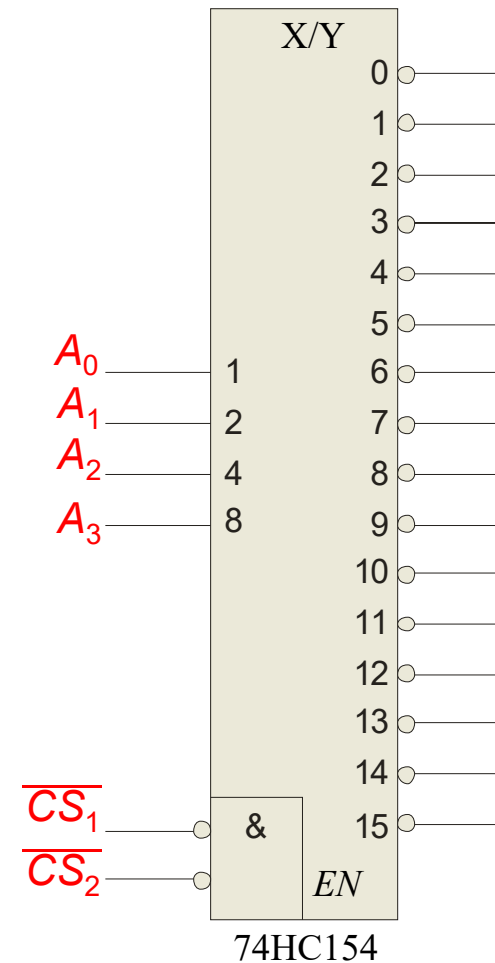
Question For the input shown, what is the output?



Summary

Decoders

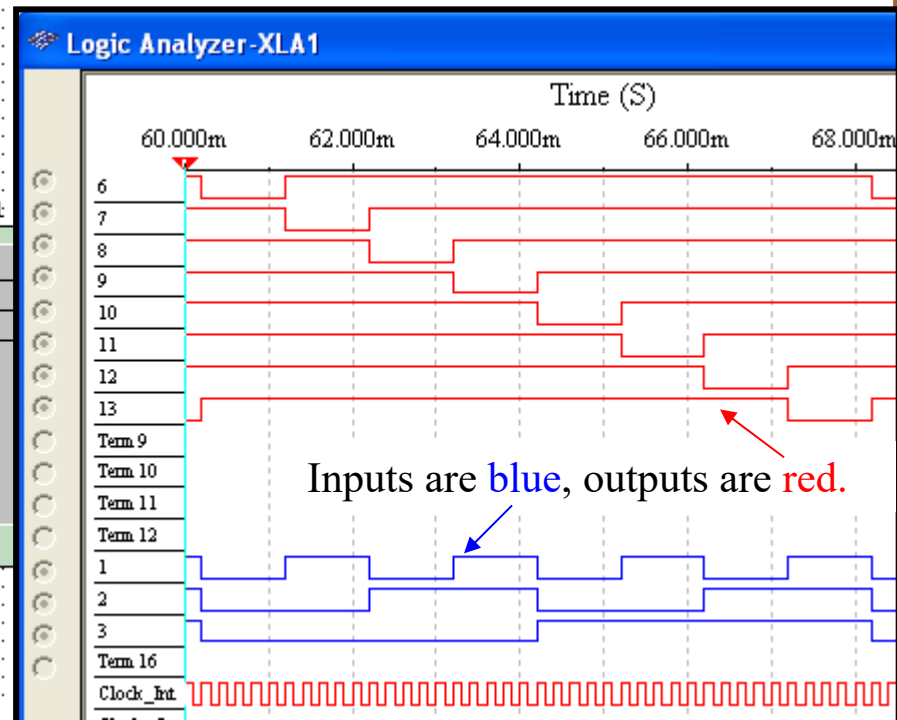
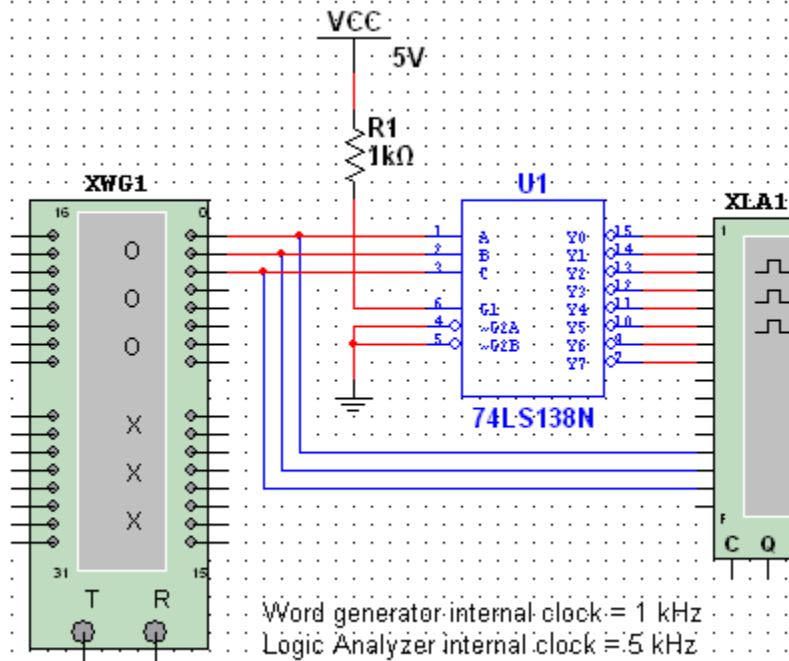
A specific integrated circuit decoder is the 74HC154 (shown as a 4-to-16 decoder). It includes two active LOW chip select lines which must be at the active level to enable the outputs. These lines can be used to expand the decoder to larger inputs.



Summary

Decoders

The 74LS138 is a 3-to-8 decoder with three chip select inputs (two active LOW, one active HIGH). In this Multisim circuit, the word generator (XWG1) is set up as an up counter. The logic analyzer (XLA1) compares the input and outputs of the decoder.

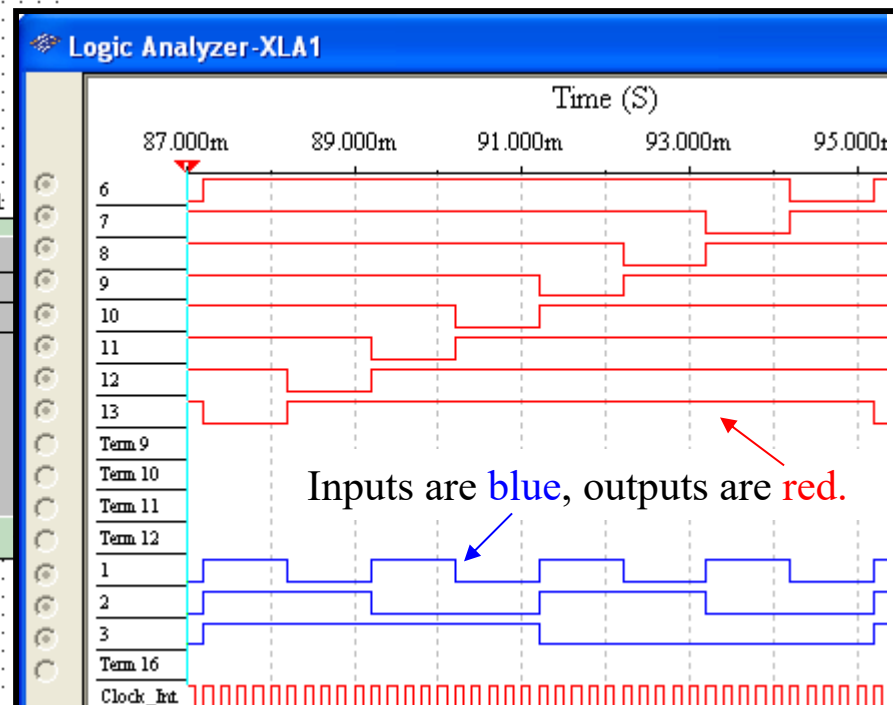
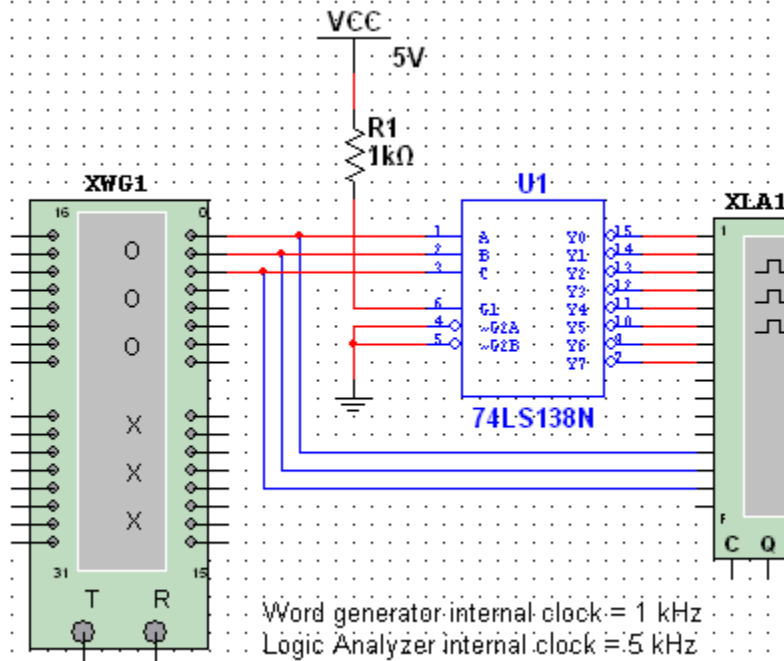


Summary

Decoders

Question

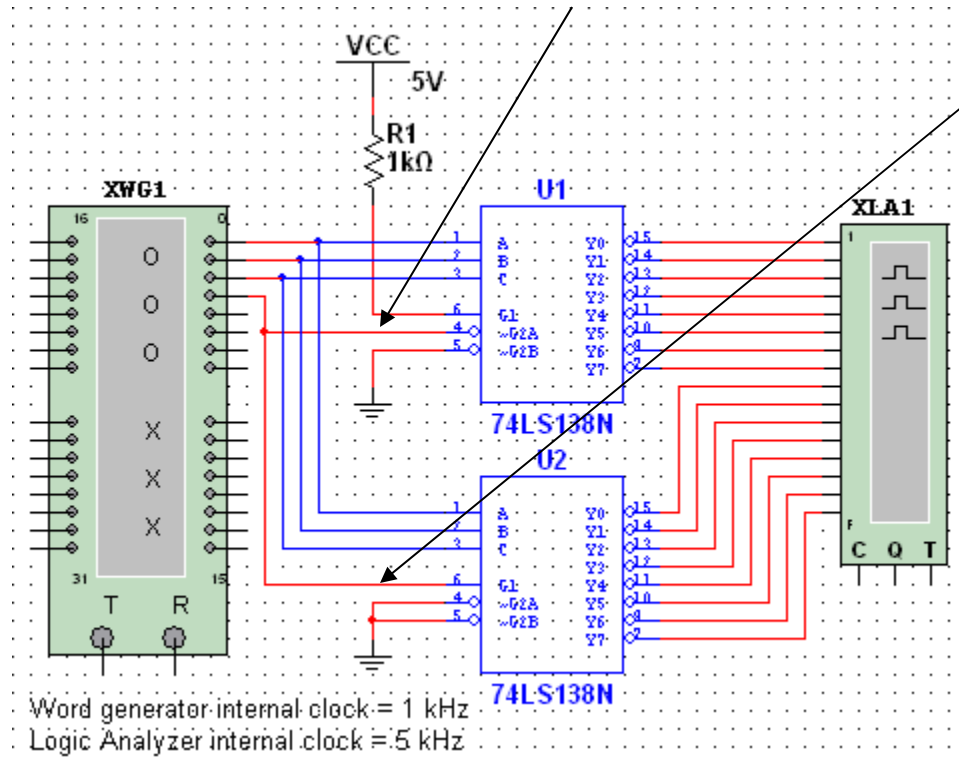
How will the waveforms change if the word generator is configured as a down counter instead of an up counter?



Summary

Decoders

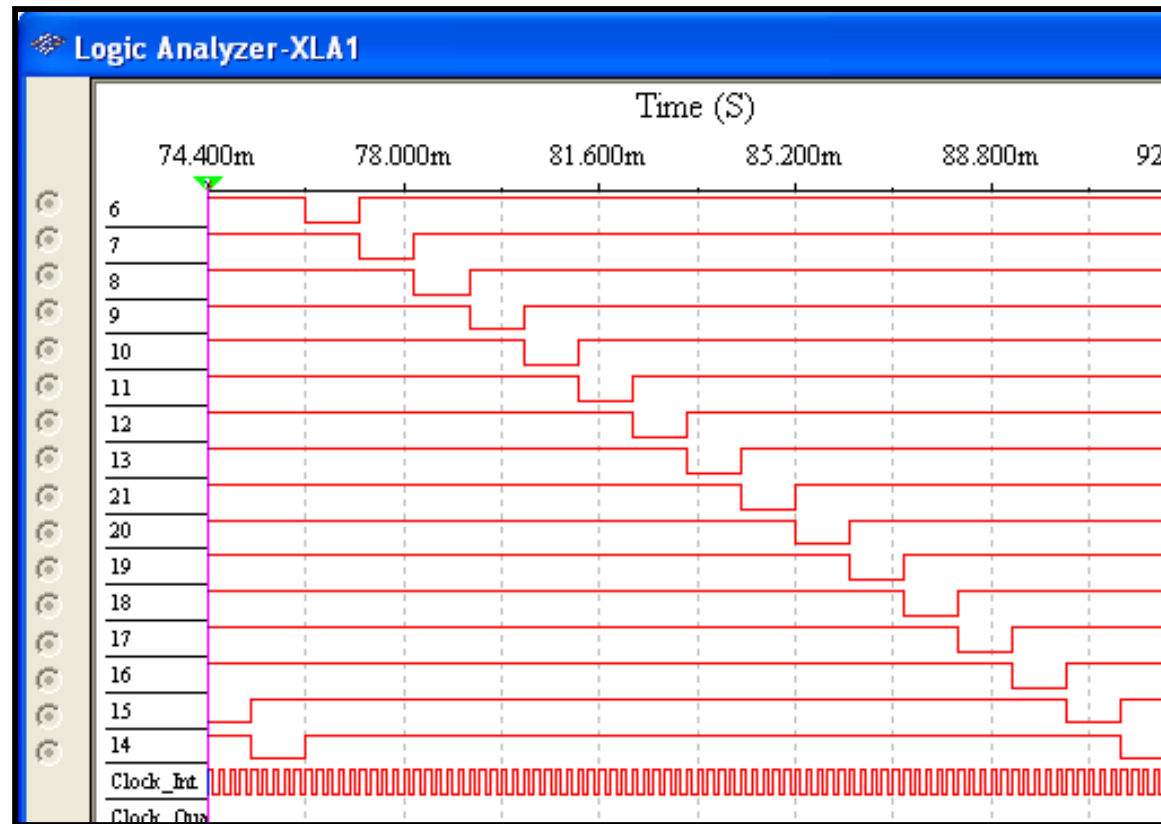
The chip select inputs can be used to expand a decoder. In this circuit, two 74LS138s are configured as a 16 line decoder. Notice how the MSB is connected to one active LOW and one active HIGH chip select.



The next slide shows the logic analyzer output...

Summary

Decoders



Question

Is the word generator set as an up counter or a down counter? (The least significant decoder output at the top). **It is an up counter.**

Summary

Decoders

BCD-to-decimal decoders accept a binary coded decimal input and activate one of ten possible decimal digit indications.

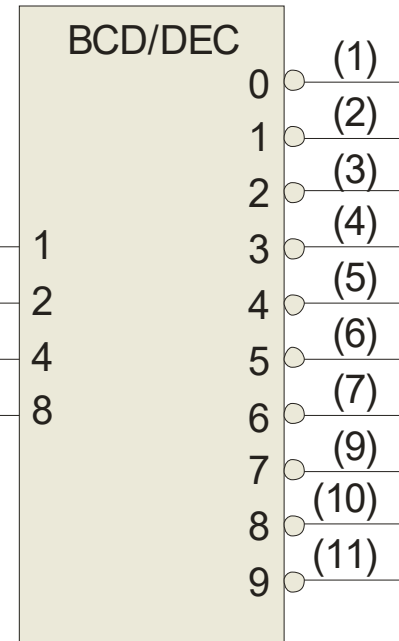
Example

Assume the inputs to the 74HC42 decoder are the sequence 0101, 0110, 0011, and 0010. Describe the output.

Solution

All lines are HIGH except for one active output, which is LOW. The active outputs are 5, 6, 3, and 2 in that order.

A_0 (15)
 A_1 (14)
 A_2 (13)
 A_3 (12)



74HC42



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Finish