# Decoders
# Wilfrid Laurier University

Terry Sturtevant

Wilfrid Laurier University

January 27, 2012

# Introduction

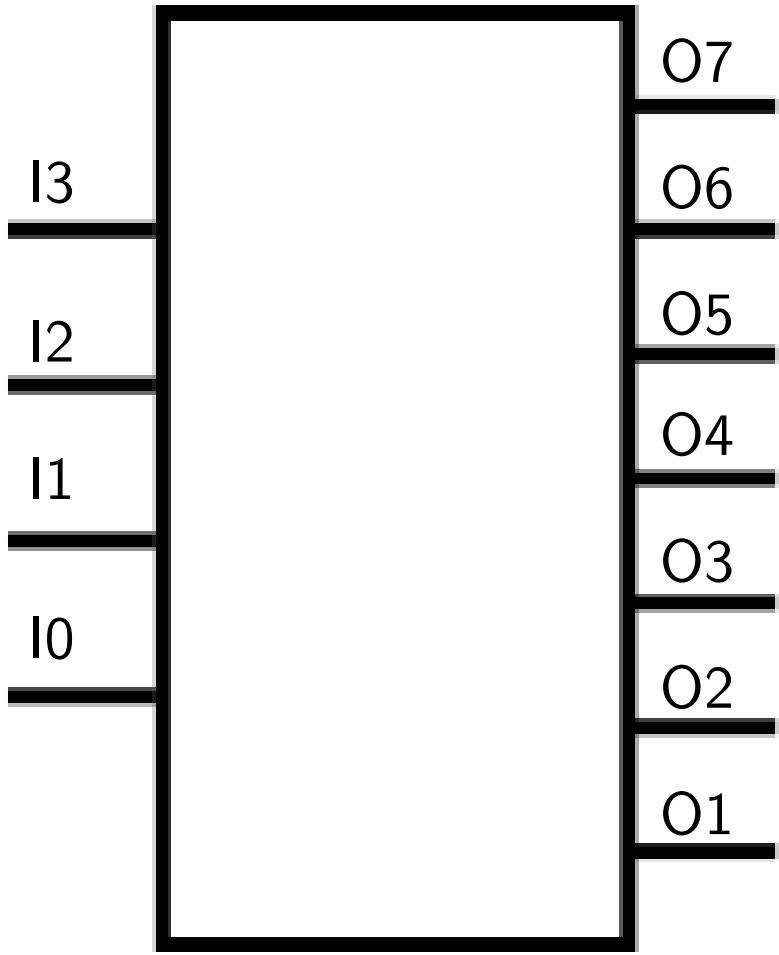
# Introduction

- A decoder usually converts one type of input pattern into a corresponding output pattern.

# Introduction

- A decoder usually converts one type of input pattern into a corresponding output pattern.

  In principle, virtually any combinational logic circuit could be thought of as some kind of “decoder”.




Here's a generic decoder.

# 7 Segment Decoder

# 7 Segment Decoder

- A common type of decoder is used to take a numeric input, and produce outputs which will drive some sort of display.

# 7 Segment Decoder

- A common type of decoder is used to take a numeric input, and produce outputs which will drive some sort of display.
- A **binary coded decimal**, or **BCD** number, is simply a four bit value representing numbers from 0 to 9.

# 7 Segment Decoder

- A common type of decoder is used to take a numeric input, and produce outputs which will drive some sort of display.
- A **binary coded decimal**, or **BCD** number, is simply a four bit value representing numbers from 0 to 9.

  (It's the same as hexadecimal, except that the combinations from A to F are not valid.)

# 7 Segment Decoder

- A common type of decoder is used to take a numeric input, and produce outputs which will drive some sort of display.
- A **binary coded decimal**, or **BCD** number, is simply a four bit value representing numbers from 0 to 9.

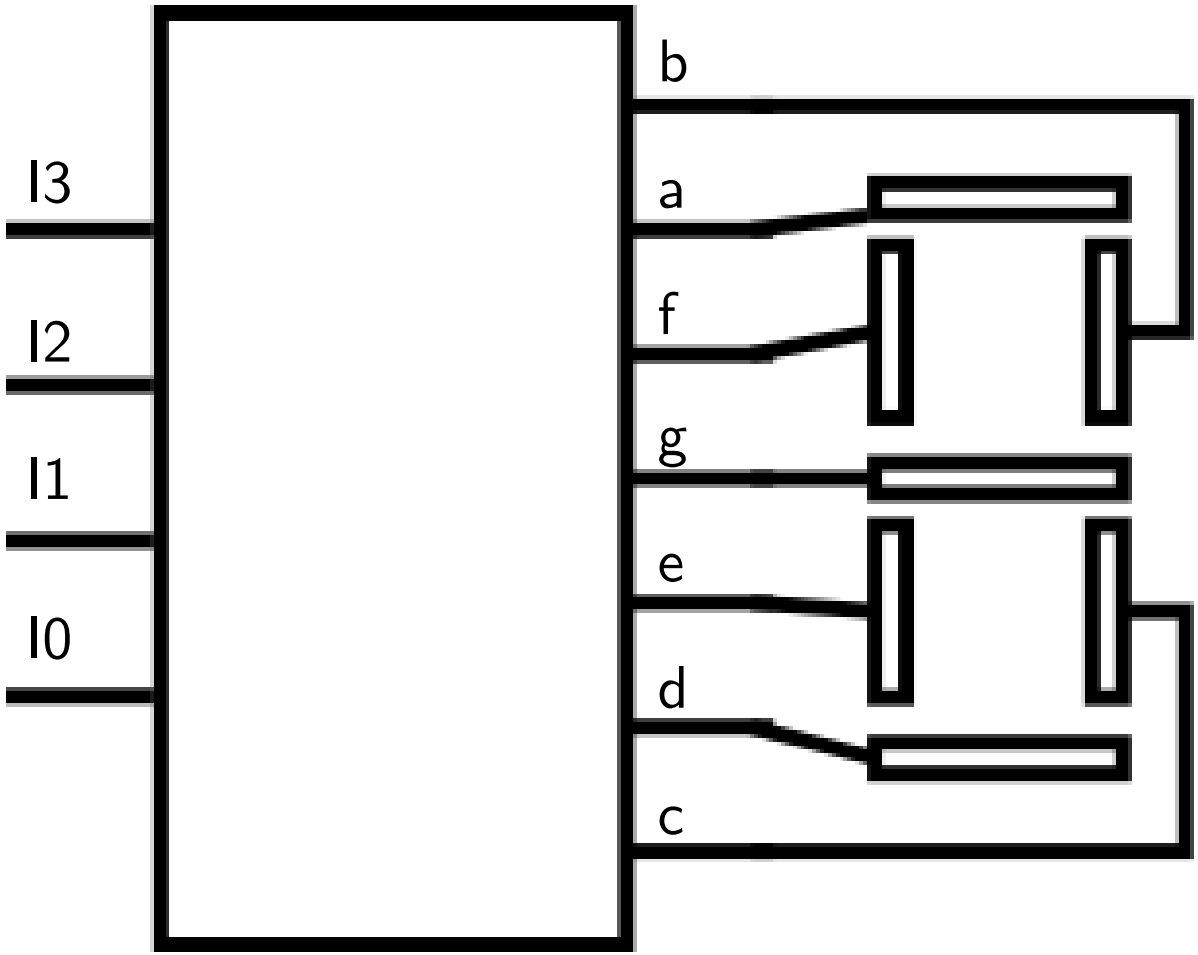
  (It's the same as hexadecimal, except that the combinations from A to F are not valid.)
- A **7 segment display** uses 7 LEDs in the shape of the number 8 to show any digit from 0 to 9, depending on which segments are lit.

# 7 Segment Decoder

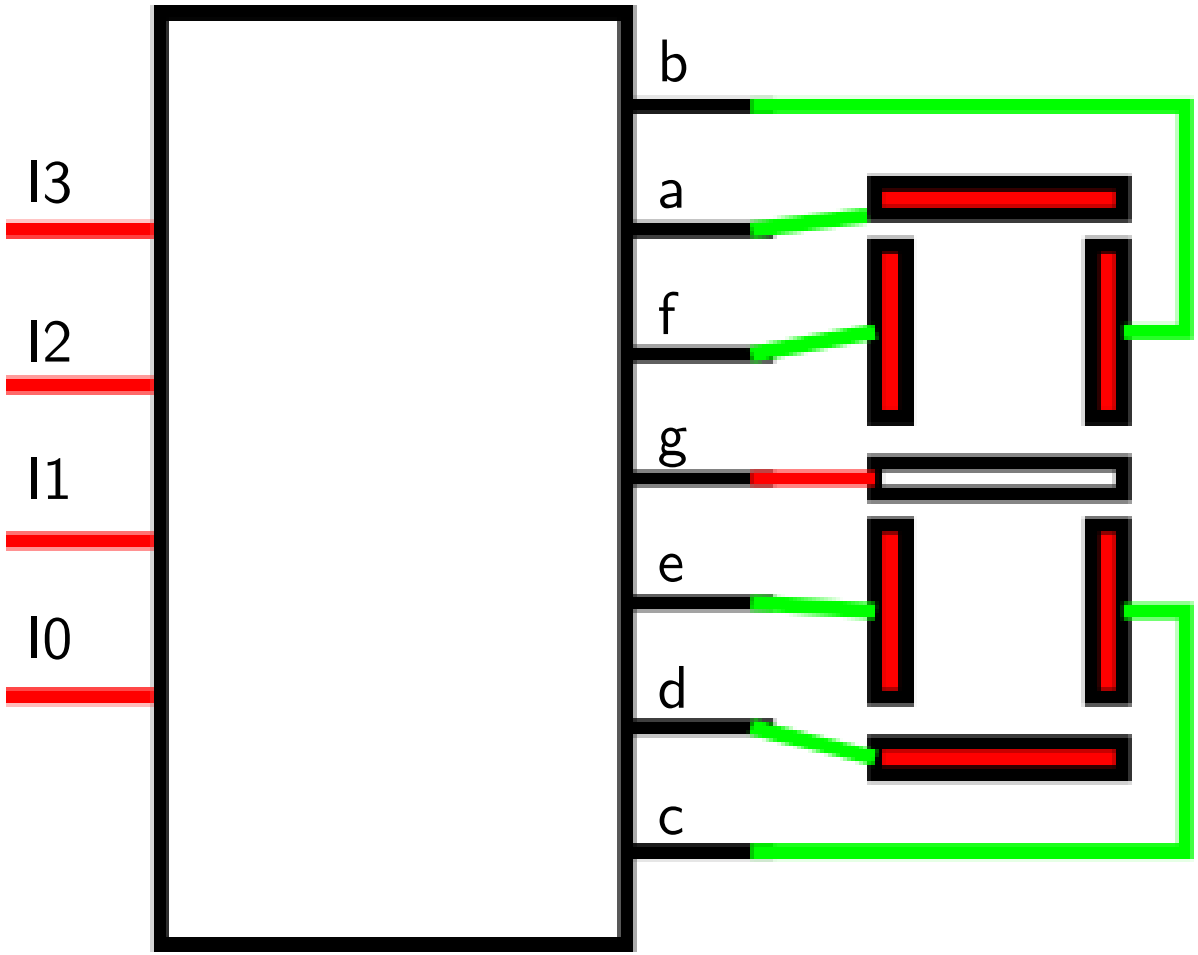
- A common type of decoder is used to take a numeric input, and produce outputs which will drive some sort of display.
- A **binary coded decimal**, or **BCD** number, is simply a four bit value representing numbers from 0 to 9.

  (It's the same as hexadecimal, except that the combinations from A to F are not valid.)
- A **7 segment display** uses 7 LEDs in the shape of the number 8 to show any digit from 0 to 9, depending on which segments are lit.

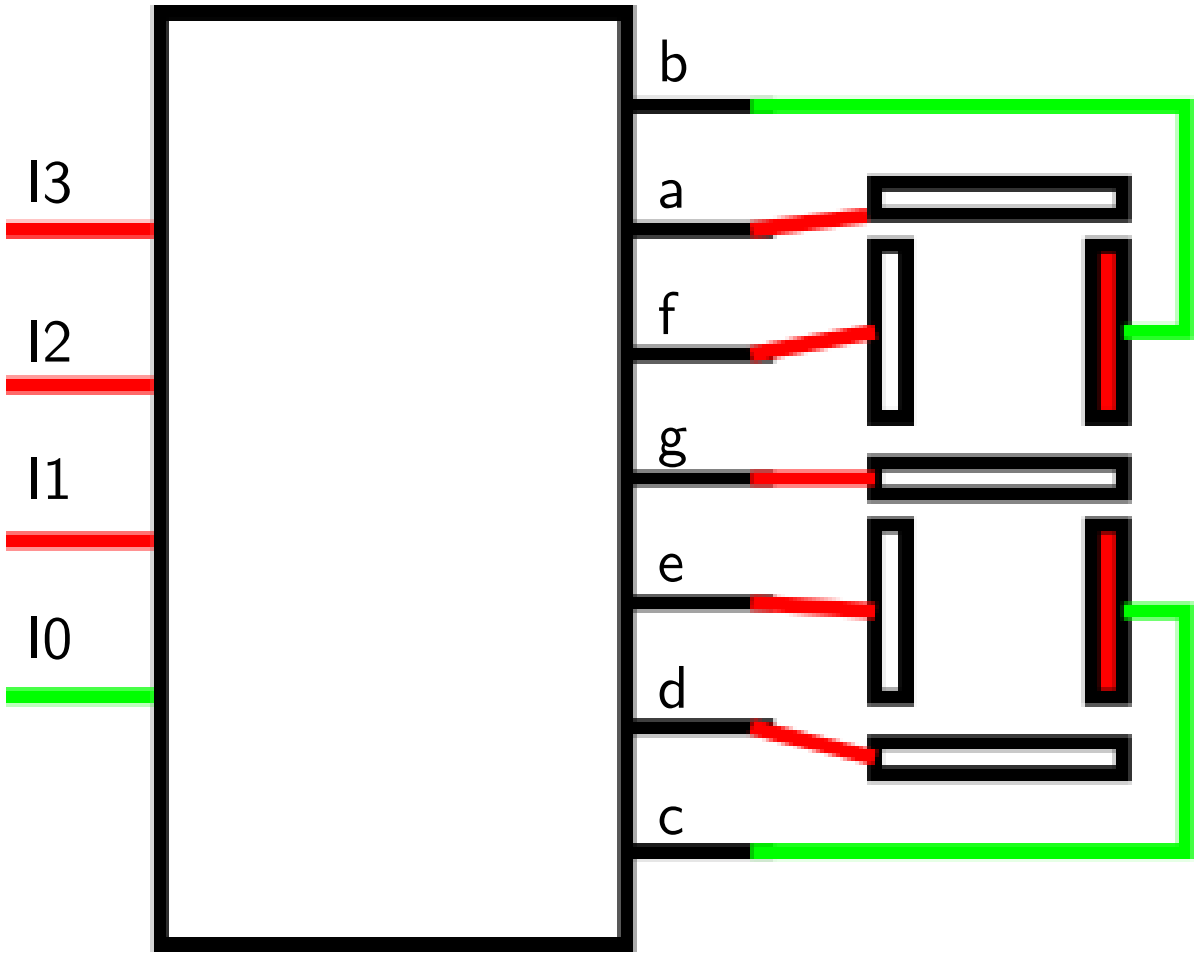
  *BCD to 7 segment conversion is a good example of the use of a decoder.*



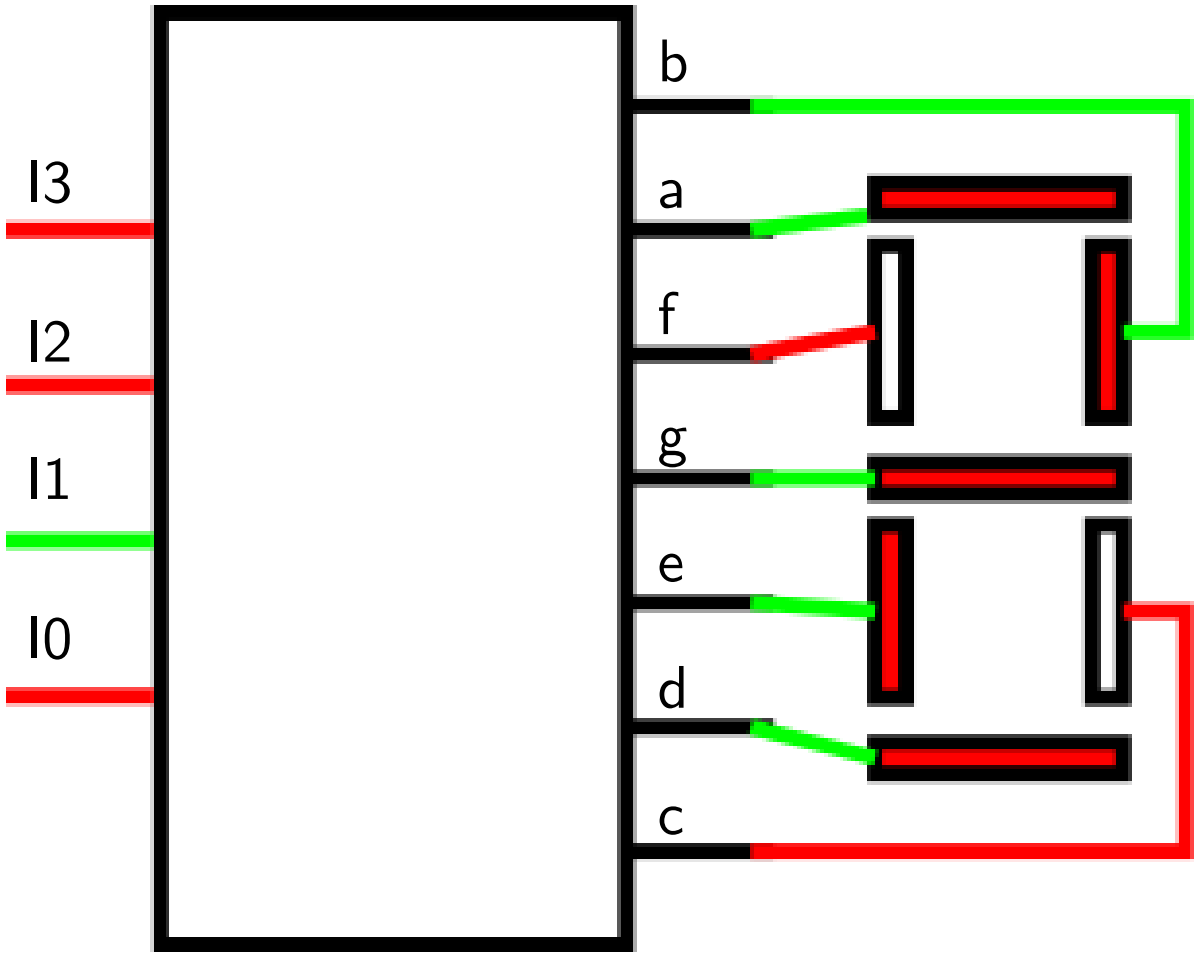

Here's a BCD to 7 segment decoder, shown with a 7 segment display.



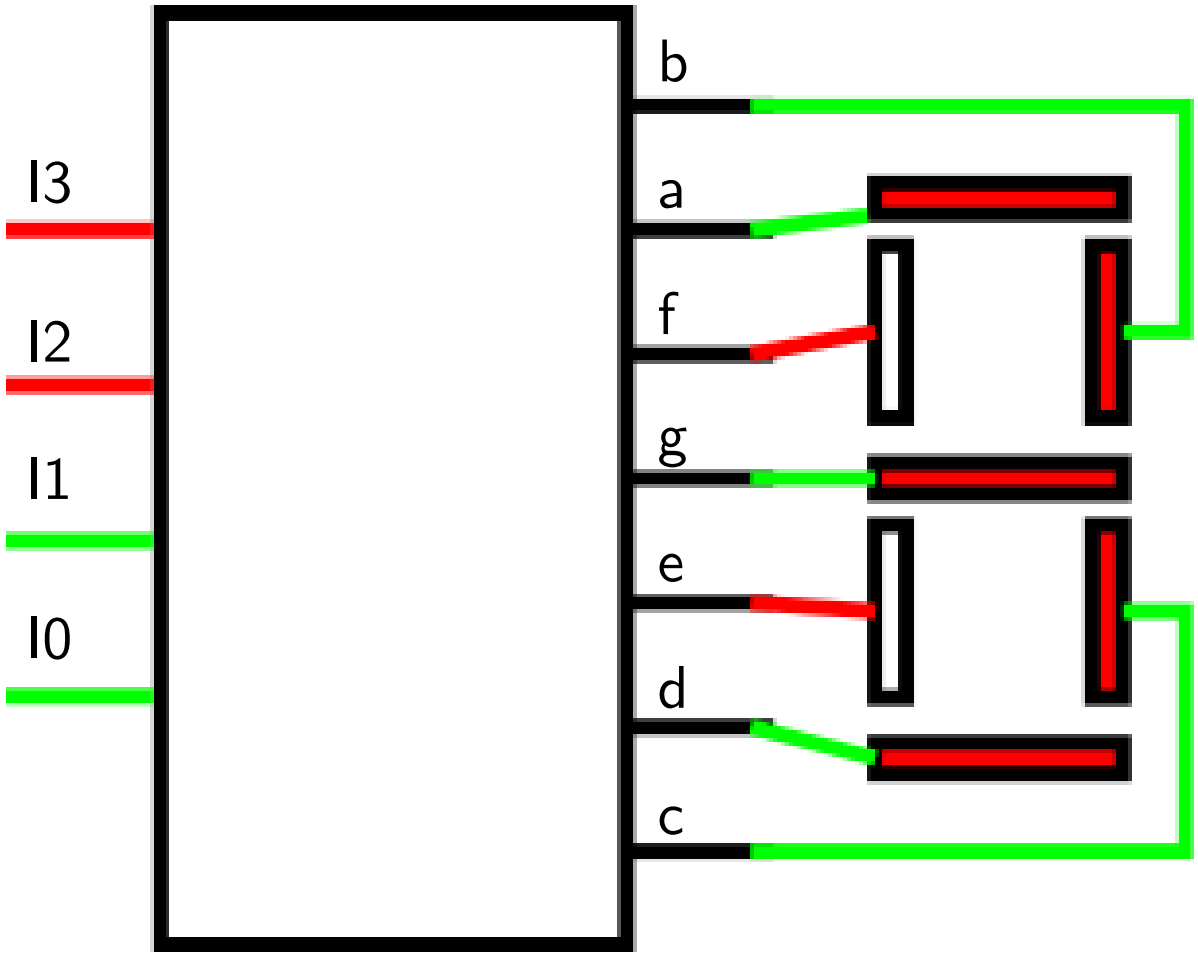

Operation for the input number 0



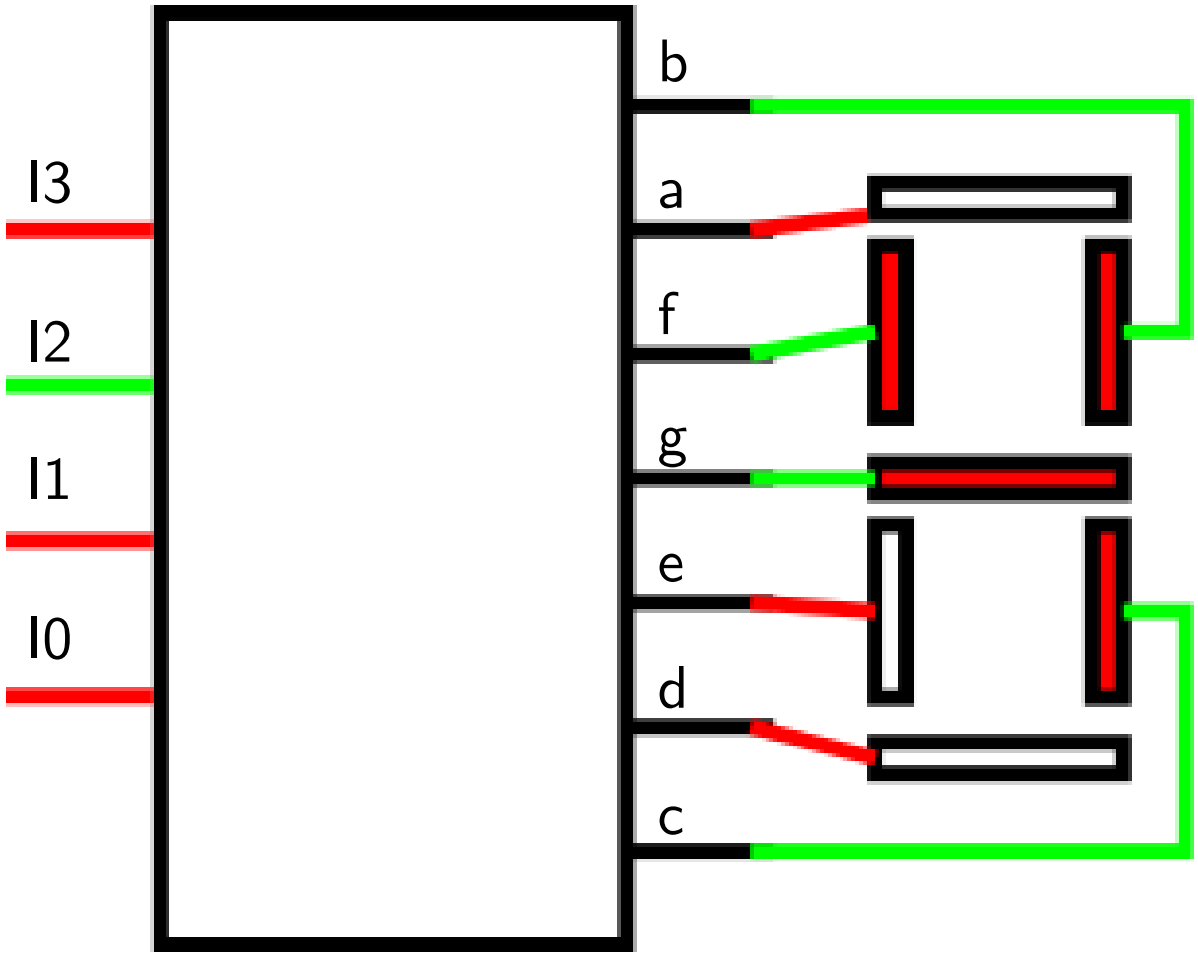

Operation for the input number 1



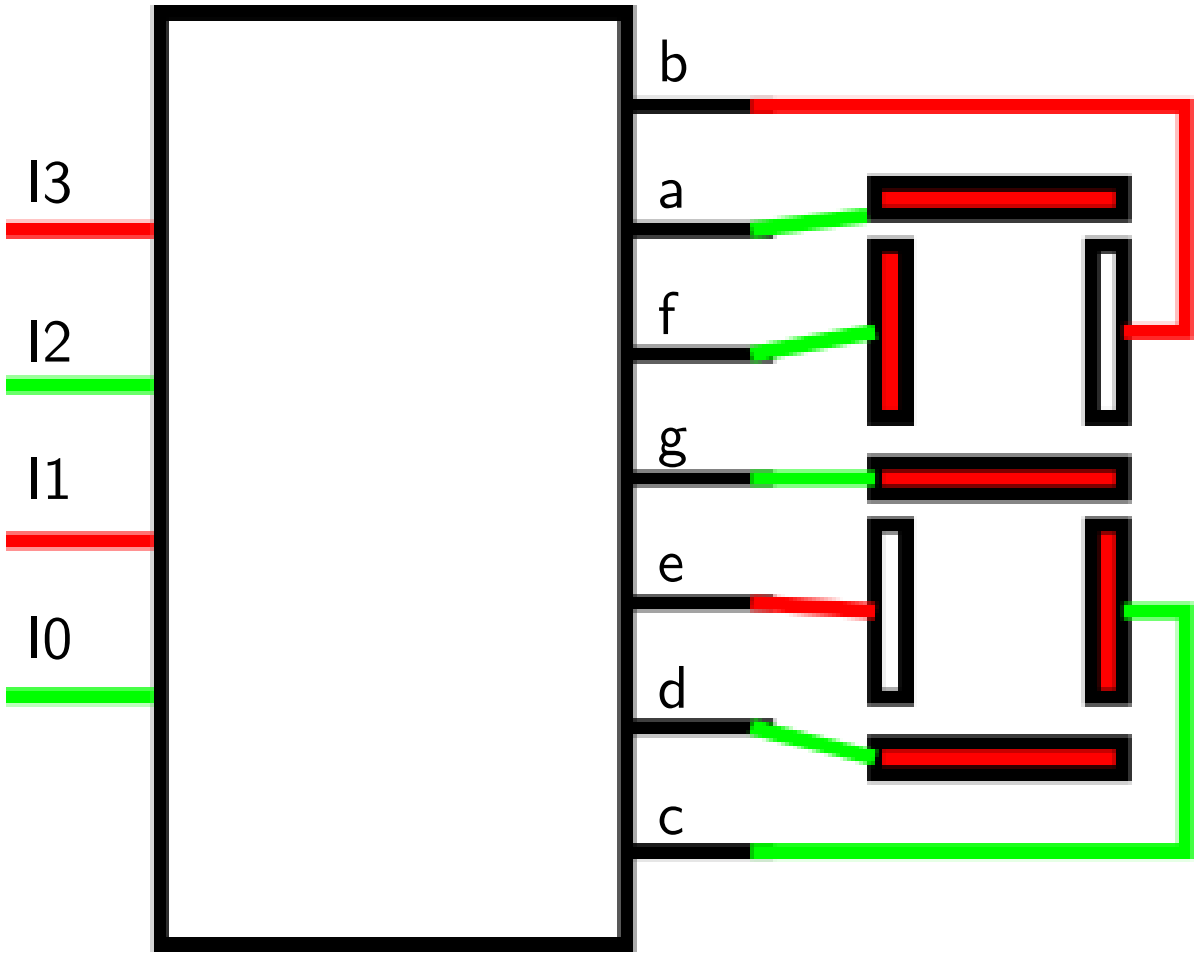

Operation for the input number 2



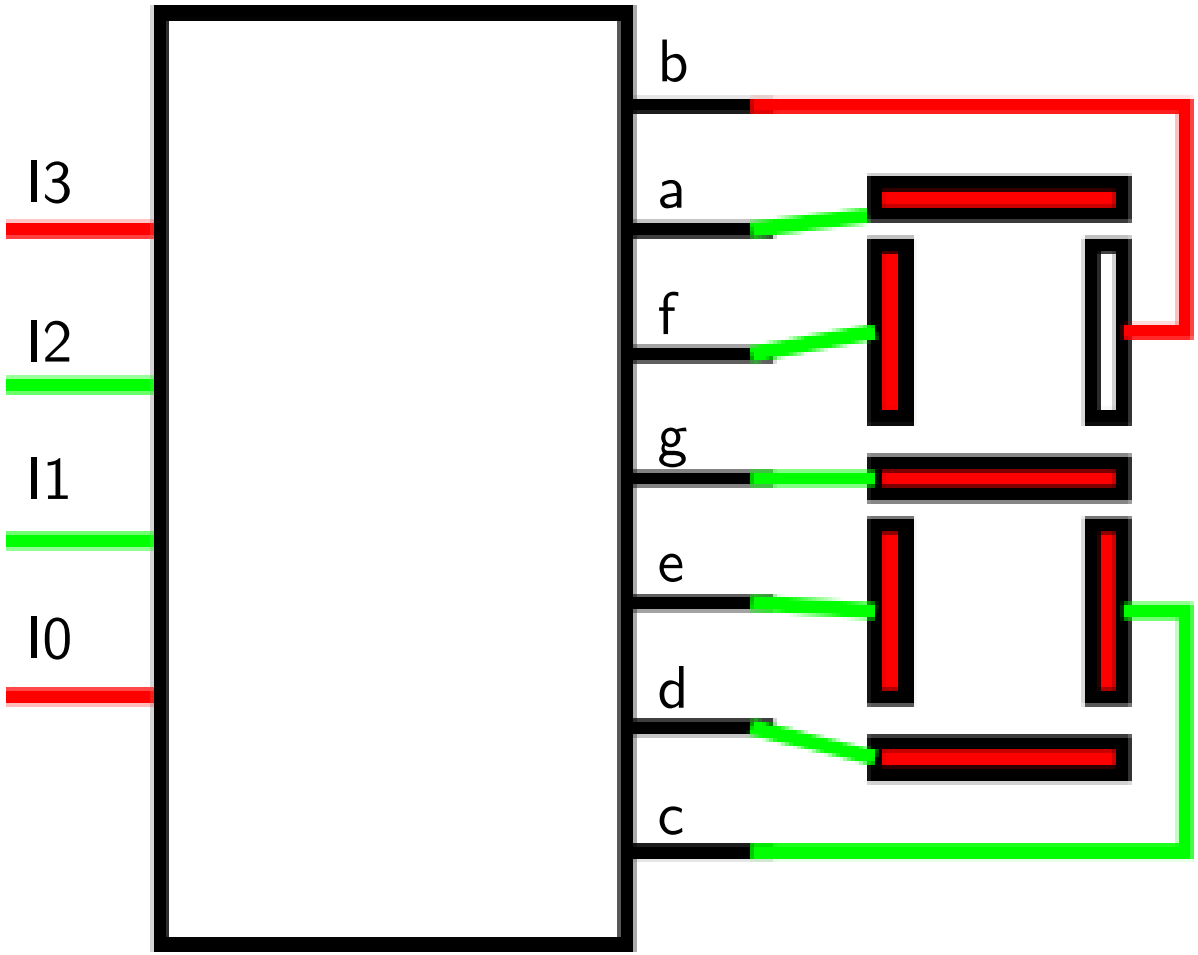

Operation for the input number 3



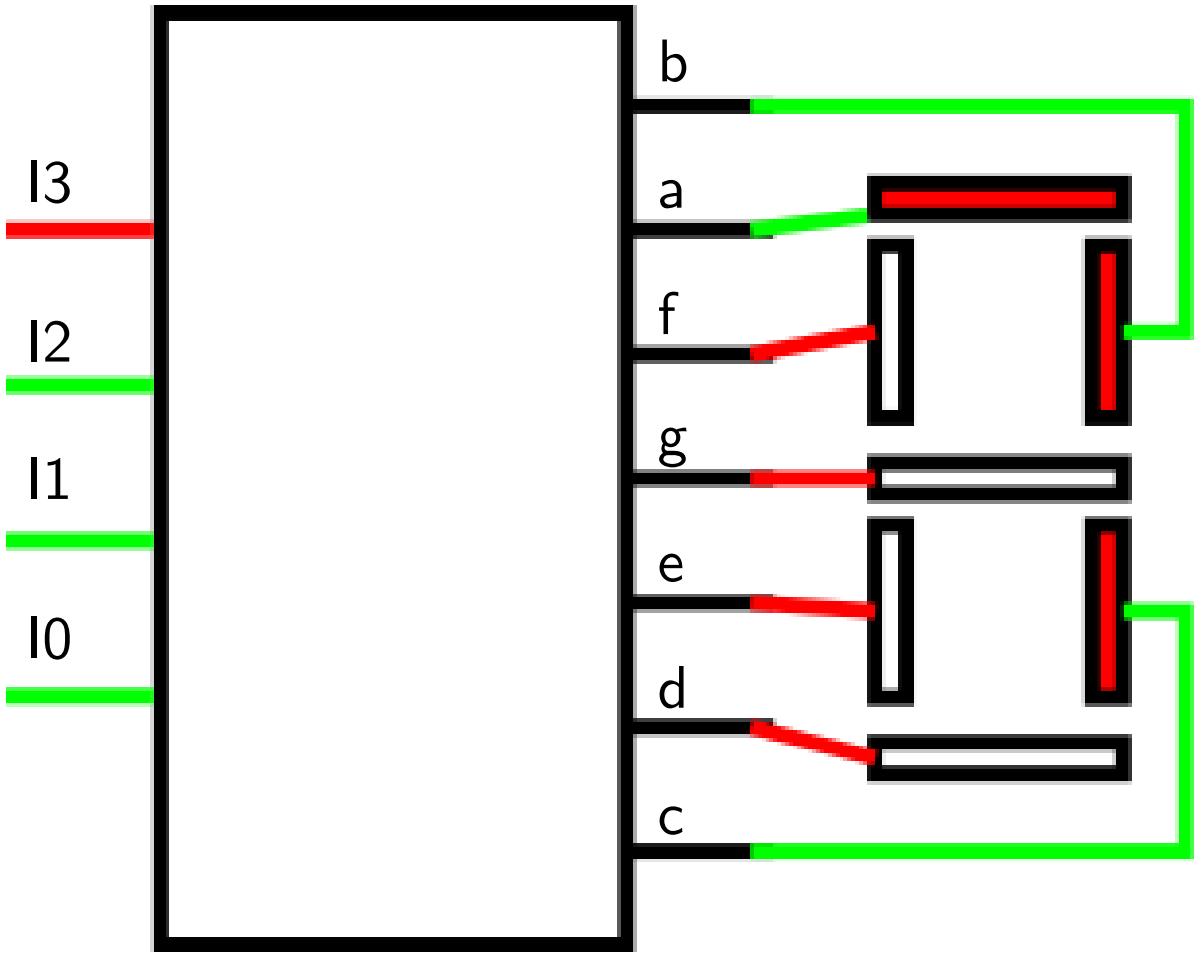

Operation for the input number 4



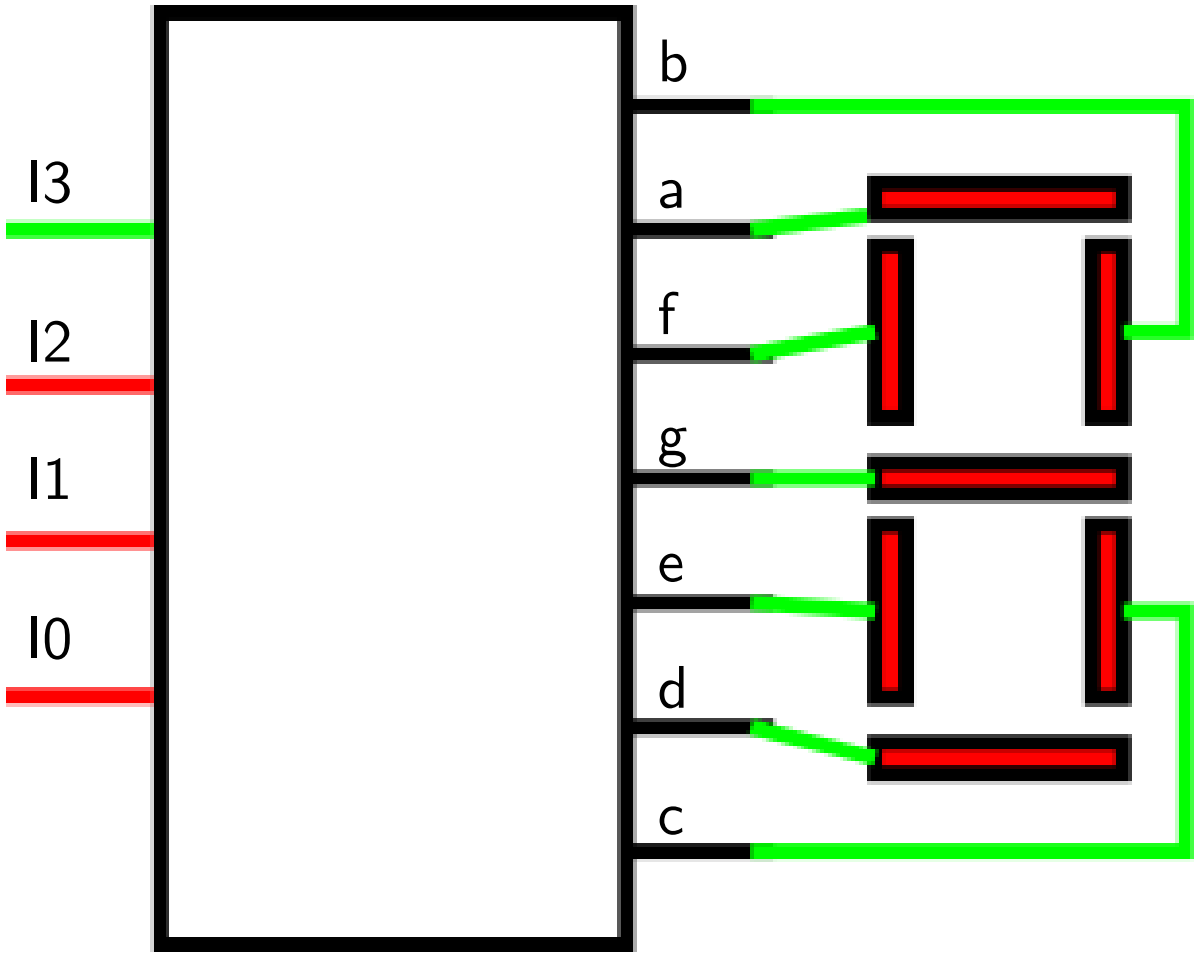

Operation for the input number 5



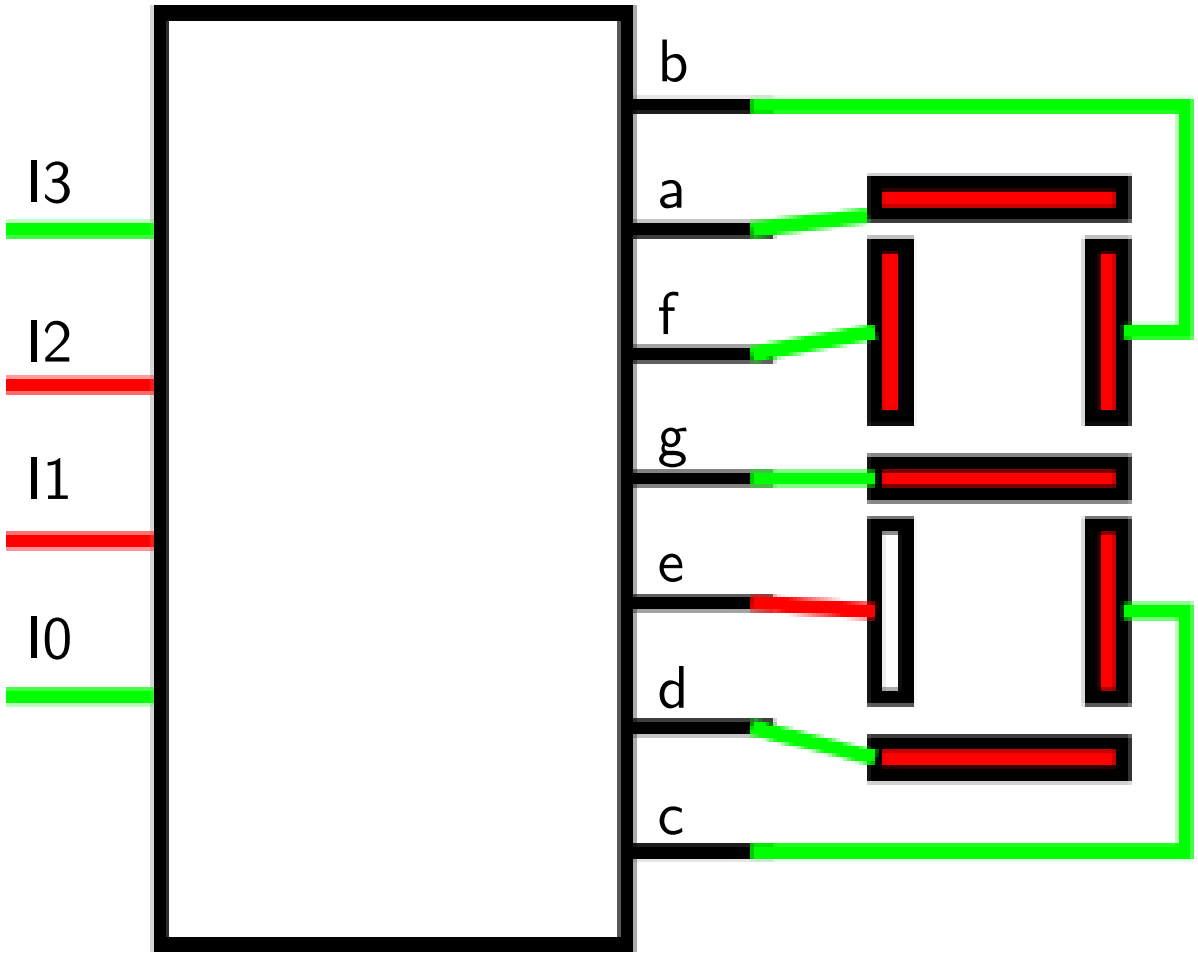

Operation for the input number 6




Operation for the input number 7




Operation for the input number 8




Operation for the input number 9

For a BCD to 7 segment decoder, hexadecimal inputs from A to F are not valid, so the behaviour in this example has not been specified.

For a BCD to 7 segment decoder, hexadecimal inputs from A to F are not valid, so the behaviour in this example has not been specified.

There may be additional inputs on a decoder such as this to do things like turn all of the segments on or off for testing purposes.