



## Topic: Two's Complement

Two's complement is a widely used method for representing both positive and negative binary integers in computer systems. It simplifies arithmetic operations and allows for efficient use of binary hardware. In this explanation, we will cover the process of converting positive and negative binary or denary integers to 8-bit two's complement representation and vice versa.

### Positive Binary or Denary Integer to 8-bit Two's Complement Integer:

For positive integers, the two's complement representation is the same as the unsigned binary representation. To convert a positive binary or denary integer to an 8-bit two's complement integer, follow these steps:

- Convert the denary integer to binary, if not already in binary form.
- Add leading zeros, if necessary, to make the binary number 8 bits long.

Example: Convert the positive denary integer 35 to an 8-bit two's complement integer:

- Convert to binary: 35 in binary is 100011.
- Add leading zeros: The 8-bit representation is 0010 0011.

### Negative Binary or Denary Integer to 8-bit Two's Complement Integer:

To convert a negative binary or denary integer to an 8-bit two's complement integer, follow these steps:

- Convert the denary integer to binary, ignoring the negative sign.
- Add leading zeros, if necessary, to make the binary number 8 bits long.
- Invert all the bits (change 0s to 1s and 1s to 0s).
- Add 1 to the inverted binary number.

Example: Convert the negative denary integer -35 to an 8-bit two's complement integer:

- Convert to binary: 35 in binary is 100011.
- Add leading zeros: The 8-bit representation is 0010 0011.
- Invert all the bits: The inverted representation is 1101 1100.
- Add 1: The 8-bit two's complement representation is 1101 1101.





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### 8-bit Two's Complement Integer to Positive or Negative Binary or Denary Integer:

To convert an 8-bit two's complement integer back to a binary or denary integer, follow these steps:

- Check the most significant bit (MSB) of the 8-bit number. If it is 0, the number is positive, and you can directly convert it to denary. If it is 1, the number is negative, and you need to perform additional steps.
- For negative numbers, first subtract 1 from the 8-bit binary number.
- Invert all the bits (change 0s to 1s and 1s to 0s).
- Convert the binary number to denary, adding a negative sign in front of the result.

Example 1: Convert the 8-bit two's complement integer 0010 0011 to a denary integer:

- The MSB is 0, so the number is positive.
- Convert to denary: 0010 0011 in denary is 35.

Example 2: Convert the 8-bit two's complement integer 1101 1101 to a denary integer:

- The MSB is 1, so the number is negative.
- Subtract 1: The binary number becomes 1101 1100.
- Invert all the bits: The inverted representation is 0010 0011.
- Convert to denary and add a negative sign: The denary integer is -35.

By understanding and applying these conversion steps, you can represent and work with positive and negative binary or denary integers using 8-bit two

